



**Verified Carbon
Standard**

IMPROVED COOKING STOVE PROGRAMME IN BURUNDI



Document Prepared by AERA Group on behalf of Observatoire
Burundais de l'Environnement et de la Nature (OBEN) and POWA S.A.

Project title	Improved Cooking Stove Programme in Burundi
Project ID	2828
Monitoring period	01-January-2023 to 31-December-2023
Original date of issue	26-January-2024
Most recent date of issue	22-August -2024
Version	5
VCS Standard Version	4.5
Prepared by	Aera Group

CONTENTS

PROJECT DETAILS	4
1.1 Summary Description of the Implementation Status of the Project	4
1.2 Audit History	5
1.3 Sectoral Scope and Project Type	6
1.4 Project Proponent.....	6
1.5 Other Entities Involved in the Project.....	6
1.6 Project Start Date	7
1.7 Project Crediting Period.....	7
1.8 Project Location	8
1.9 Title and Reference of Methodology	8
1.10 Double Counting and Participation under Other GHG Programs	9
1.11 Double Claiming, Other Forms of Credit, and Scope 3 Emissions	10
1.12 Sustainable Development Contributions	11
1.13 Commercially Sensitive Information	14
2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT	14
2.1 Stakeholder Engagement and Consultation	14
2.2 Risks to Stakeholders and the Environment	21
2.3 Respect for Human Rights and Equity	22
2.4 Ecosystem Health.....	23
3 IMPLEMENTATION STATUS	24
3.1 Implementation Status of the Project Activity	24
3.2 Deviations.....	25
3.3 Grouped Projects.....	25
3.4 Baseline Reassessment.....	25
4 DATA AND PARAMETERS.....	25
4.1 Data and Parameters Available at Validation.....	25
4.2 Data and Parameters Monitored.....	29
4.3 Monitoring Plan	36
5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS	41
5.1 Baseline Emissions.....	42

5.2	Project Emissions.....	45
5.3	Leakage Emissions	45
5.4	GHG Emission Reductions and Carbon Dioxide Removals	45

PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The purpose of this project is to combat climate change and contribute to sustainable development of Burundi, by reducing non-renewable wood fuel consumption and greenhouse gas (GHG) emissions of household users in rural and/or peri-urban areas of Burundi by selling affordable Improved Cooking Stoves (ICSs) in replacement of traditional wood stoves. Thanks to the higher efficiency of ICS distributed compared to baseline wood stoves, the project reduces the consumption and combustion of wood fuel more efficiently, thus reducing CO₂ emissions regarding the baseline situation. Although the project aims to replace baseline inefficient wood stoves by ICS, for emission reduction calculation, as per para 23 of the methodology AMS II-G v10.0 it is assumed that in the absence of the project activity, the baseline scenario would be the use of fossil fuels to meet similar thermal energy needs as those provided by the project devices.

The project implementer is POWA S.A since September 2021¹. Initially undertaken as CDM PoA 10474 “Improved Cooking Stove Programme in Burundi supported by Republic of Korea”, ECOEYE Co., Ltd. and/or Korean Party(ies) provide all implementation cost for all the stoves disseminated in the PoA until September 2021 (stoves are subsidized to 2,000 BIF instead of 13,426 BIF to make ICS affordable to household) and also provides all operation & maintenance cost of ICS manufacturing and monitoring for OBEN CPA implementer to operate the project under financially sustainable condition). Since September 2021, the, alternate project implementer POWA S.A is tasked with continuous cookstoves dissemination and project implementation.

Since the project start on 02/11/2018, 290,050 ICS have been sold reducing project boundaries emissions by 632,566 tCO₂ during this monitoring period.

Table 1: The vintage wise distribution per batch:

Batch	Start	End	Number of stoves
Batch 1	02/11/2018	01/11/2019	43,906
Batch 2	02/11/2019	01/11/2020	89,919
Batch 3	02/11/2020	01/11/2021	89,697
Batch 4	02/11/2021	01/11/2022	66,528
Total	-	-	290,050

Table 2: Technical specifications of the Matawi stove:

¹ Before this date, OBEN E.A.C was the project implementer of the CPA.

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

Pictures of the Matawi stove:



The PoA and the CPA implementer is POWA S.A since September 2021², the main technology supplier under the PoA, with the assistance of AERA Group, leading carbon finance advisor in Africa. POWA S.A runs the project in compliance with the PoA requirements, disseminating estimated 500,000 affordable Improved Cooking Stoves (ICSs) in replacement of traditional wood fuel cooking stoves, such as 3-stone fires, resulting in an average of 506,373 tCO₂ avoided per year or 3,544,611 tCO₂ over the 7-year crediting period.

1.2 Audit History

Audit type	Period	Program	Validation/verification body name	Number of years
------------	--------	---------	-----------------------------------	-----------------

³ Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: <https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes>

Validation	(02-November-2018–01-November-2025)	VCS	Earthood Services Private Limited	7
Verification	01-January-2021–31-March-2022	VCS	Earthood Services Private Limited	1.25
Verification	01-April-2022–31-December-2022	VCS	EARTHOOD SERVICES PRIVATE LIMITED	0.75
Verification	01-January-2023 – 31-December-2023	VCS	4K Earth Science Private Limited	1

1.3 Sectoral Scope and Project Type

Sectoral scope ³	03 Energy demand
Project activity type	Type II –Energy Efficiency Improvement Project

1.4 Project Proponent

Organization name	POWA S.A
Contact person	Pascal Rwemera
Title	Director
Address	Mumuruwa 105, Kinindo, Muha, Bujumbura-Mairie
Telephone	+257-76-660-334
Email	powainternational@gmail.com

1.5 Other Entities Involved in the Project

Organization name	AERA Group SAS
Role in the Project	Carbon consultant and trader

³ Projects, activities, or methodologies may be developed under any of the 16 VCS sectoral scopes: <https://verra.org/programs/verified-carbon-standard/vcs-program-details/#sectoral-scopes>

Contact person	Alexandre Dunod
Title	COO
Address	28 cours Albert 1er, Paris, 75008, France
Telephone	+33642960978
Email	a.dunod@aera-group.fr

Organization name	Observatoire de l'Environnement et de la Nature « OBEN »
Role in the Project	Project implementer
Contact person	Claver Ndizeye
Title	Director
Address	Avenue Nyabisindu, Q9 Bujumbura
Telephone	+257-76-602-600
Email	loicqueen@yahoo.fr

1.6 Project Start Date

Project start date	02-November-2018
Justification	As per VCS program requirements, the start date is the date of the first ICS emission reductions/installation of first ICS.

1.7 Project Crediting Period

Crediting period	☒ Seven years, twice renewable ☐ Ten years, fixed ☐ Other (state the selected crediting period and justify how it conforms with the VCS Program requirements)
------------------	--

Start and end date of first or fixed crediting period

02-November-2018 to 01-November-2025

1.8 Project Location

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



Figure 1: Map of Burundi

1.9 Title and Reference of Methodology

Type (methodology, tool or module).	Reference ID, if applicable	Title	Version
Methodology	AMS-II.G	Energy efficiency measures in thermal applications of non-renewable biomass	10.0
Guideline	N/A	Guideline: General guidelines for SSC CDM methodologies	...

Tool	N/A	Demonstration of additionality of small-scale project activities	13.1
Tool	N/A	Demonstration of additionality of microscale project activities	10.0
Tool	N/A	Calculation of the fraction of non-renewable biomass	03
Standard	N/A	Sampling and surveys for CDM project activities and programme of activities	9.0
Methodology	AMS-III.BG	Emission reduction through sustainable charcoal production and consumption	4.0

1.10 Double Counting and Participation under Other GHG Programs

1.10.1 No Double Issuance

Is the project receiving or seeking credit for reductions and removals from a project activity under another GHG program?

☐ Yes ☒ No

1.10.2 Registration in Other GHG Programs

Is the project registered or seeking registration under any other GHG programs?

☒ Yes ☐ No

The project activity has already been registered under Clean Development Mechanism (CDM) of UNFCCC, under Kyoto Protocol. This project is a Component Project Activity (CPA) under a registered Programme of Activities (CDM-PoA). The details are as follows:

CDM-PoA Registration number: 10474.

Title: Improved Cooking Stove Programme in Burundi supported by Republic of Korea

Weblink:

https://cdm.unfccc.int/ProgrammeOfActivities/poa_db/U2ZYTf1EWXPBHK0069GCLNSDRIQ78A/view

CPA Reference number: 10474-P1-0001- CP1

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

Weblink:

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

Previous issuance requests:

- Monitoring report: 10 Sep 2019 - 15 Sep 2019 | CERs requested: 826.
- Monitoring report: 16 Sep 2019 - 30 Apr 2020 | CERs requested: 81 469.
- Monitoring report: 01 May 2020 - 31 Dec 2020 | CERs requested : 183 191

1.11 Double Claiming, Other Forms of Credit, and Scope 3 Emissions

1.11.1 No Double Claiming with Emissions Trading Programs or Binding Emission Limits

Are project reductions and removals or project activities also included in an emissions trading program or binding emission limit? See the *VCS Program Definitions* for definitions of emissions trading program and binding emission limit.

☐ Yes ☒ No

1.11.2 No Double Claiming with Other Forms of Environmental Credit

Has the project activity sought, received, or is planning to receive credit from another GHG-related environmental credit system? See the *VCS Program Definitions* for definition of GHG-related environmental credit system.

☐ Yes ☒ No

1.11.3 Supply Chain (Scope 3) Emissions

Do the project activities affect the emissions footprint of any product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

If yes:

Is the project proponent(s) or authorized representative a buyer or seller of the product(s) (goods or services) that are part of a supply chain?

☐ Yes ☒ No

If yes:

Has the project proponent(s) or authorized representative posted a public statement on their website saying, "Carbon credits may be issued through the Verified Carbon Standard project [project ID] for the greenhouse gas emission reductions or removals associated with [project proponent or authorized representative organization name(s)] [name of product(s) whose emissions footprint is changed by the project activities]."

☐ Yes

☒ No

1.12 Sustainable Development Contributions

The country's Poverty Reduction Strategy Paper II (PRSP II) for 2012–2016, extended to 2018 and anchored in Burundi Vision 2025, includes 'promoting development through sustainable environmental and space management' as its 4th pillar, which chief component of (ii) protection of the environment and sustainable resource management.

Table 3: Impact on Sustainable Development Goals in Burundi

SDG	Program Alignment
1: End poverty in all its forms everywhere	The project activity contributes to end poverty by providing stoves to households at affordable prices. The stoves distributed will help households reducing their fuel expenses.
3: Ensure healthy lives and promote well-being for all at all ages	contributes to SDG 3, as it reduces the number of deaths and illnesses from air pollution. The ICSs help cut carbon monoxide and other particles related to incomplete and/or indoor solid fuels combustion and control the fire better reducing accidents. Smoke from combusted wood fuel is the leading cause of acute respiratory infections and eye problems (Peprah, 2010). Other illnesses are lung cancer and asthma, which concern especially women and children, causing more than 1.5 million deaths a year (Rob Bailis, 2009) (World Health Organization, 2006). This SDG is monitored by the percentage of people experiencing less smoke thank to the ICS introduction
7: Ensure access to affordable, reliable, sustainable and modern energy for all	contributes to the goal of doubling the global rate of improvement in energy efficiency by 2030. The project aims to replace inefficient cooking stoves by more efficient cooking stoves (ICSs), an upgraded technology. This SDG is monitored by the number of households equipped with ICS
8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	creates more and better employment (production, marketing, distribution, after-sale services) throughout the PoA lifecycle. Furthermore, ICSs promote safe and secure working environments of kitchen workers. ICSs increase economic productivity through improved technology. Most important

	benefits are reduced workload in wood fuel procurement and/or reduced expenses for wood fuel purchase. This SDG is monitored by the number of decent work created.
13: Take urgent action to combat climate change and its implications.	Apart from CO2 emission reductions, strengthens resilience and adaptive capacity to climate-related hazards and natural disasters due to the increase of financial savings of households or communities.
15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.	Reduce the quantities of wood needed for cooking activities, thanks to the improved cookstoves, which have a better efficiency and require less wood for the same level of output.

Table4: Sustainable Development Contributions

Row number	SDG target	SDG indicator	Net impact on SDG indicator	Current project contributions	Contributions over project lifetime
1)	3.9	Proportion of users experiencing less smoke and time saving while using the cookstoves	Implemented activities to increase	100% of the end-users surveyed experience less fumes & time saving when cooking with the ICS distributed	In total, 290,050 (100%) of the end-users experienced less fumes & time saving during the overall project
2)	7.1	Number of Households equipped with ICS	Implemented activities to increase	0 Households equipped with ICS	290,050 Households equipped with ICS during the project lifetime.
3)	8.0	Number of decent Jobs created	Implemented activities to increase	No new jobs were created during this monitoring period	The project created 30 Jobs during his lifetime.
4)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	The programme avoided the emissions of 632,566, tCO ₂ e during this monitoring period	In total, 1,723,255 tCO ₂ e were reduced during the project lifetime. MP1: 632,878 MP2: 458,281 MP3: 632,566
6)	15.0	Quantity of wood saved.	Implemented activities to increase	691,981 tonnes of wood saved during this monitoring period	In total, 2,221,992 tonnes of wood have been saved during project lifetime. MP1: 970,562.79 MP2: 559,449 MP3: 691,981

1.13 Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the monitoring report.

2 SAFEGUARDS AND STAKEHOLDER ENGAGEMENT

2.1 Stakeholder Engagement and Consultation

2.1.1 Stakeholder Identification

Stakeholder Identification	For the purpose of initiating and developing this project, the implementer, either directly or through his team of professionals, has undertaken correspondence and consultations. Stakeholders were identified at validation and since, the project design has not changed. This was confirmed by auditors during validation and verified during each monitoring period. Thus, this section is not applicable.
Legal or customary tenure/access rights	N/A
Stakeholder diversity and changes over time	N/A
Expected changes in well-being	N/A
Location of stakeholders	N/A
Location of resources	N/A.

2.1.2 Stakeholder Consultation and Ongoing Communication

Ongoing consultation	The PP has established the ongoing communication mechanism with the stakeholders involved during local stakeholders' consultation. All stakeholders were made aware of the possibility to approach the CPA implementer via provided contact details. In this context, the CPA implementer distributed also a non-technical summary with contact details of both the CPA and PoA implementer, who can reach them in case of any grievances. This was confirmed during validation.
Date(s) of stakeholder consultation	19-October-2018
Communication of monitored results	A grievance logbook used for compiling all comments received is available. During this monitoring period, there were 8 comments regarding damaged ICS. All ICS have been replaced or rehabilitated
Consultation records	During stakeholders' consultation, there were no complaints from local stakeholders submitted to the DNA of the host Party on the handling of the outcome of the local stakeholder consultation. This was confirmed by VVB during validation. And since the project validation, the logbook, used for the recording of comments received is available.
Stakeholder input	No negative feedback is received during the interviews with respect to the project operations. Thus, no modifications have been since comments received during the LSC did not question the design of the project activity in principle.

2.1.3 Free, Prior, and Informed Consent

Consent	After the stakeholders consultation, among which, the following entities were present: • The Designated National Authority of Burundi • The Energy Directorate of Burundi • Representatives of local authorities • Administrative representatives of rural communities
---------	--

	• Communal associations delegates • National deputies • Religious leaders • Local population The project proponent received Letter of approval (LoA) from the designated national authority (DNA) for CDM in Burundi on 26-December-2018.
Outcome of FPIC	As the LoA was granted, it is thus confirmed that the project activity is in line with the regulatory requirements of the host country. As per Local Stakeholders Minutes, the project did not encroach on land, relocated people without consent, and forced physical or economic displacement. Furthermore, the project aims at providing improved cookstoves to households thus, there is no need to displace local population.

2.1.4 Grievance Redress Procedure

Grievances received	Resolution and outcome
Damaged ICS.	ICS have been replaced or rehabilitated.

2.1.5 Public Comments

Summary of comments received	Actions taken
• Mr Nzeyimana Déo, farmer Q: How is the stove made? Can its high energy efficiency cause premature wear of the structure?	OBEN: The stove is made of local clay, moulded, dried and cooked. OBEN trains local youth to produce the casings. Thus, there is job creation induced by the project. No, the structure does not wear out faster, only the food is cooked in a shorter time than usual
• Mr. Kubwamungu Jérôme, local representant.	OBEN: There are prerequisites to actually start the project, including this public consultation.

[Comment] Long consideration of the project, including congratulations to developers, effects on household economies, initiative to reduce pressure on existing forests, etc. He encouraged OBEN to promote and spread these stoves throughout the country. If necessary, ask for government support. Q: Is it not possible to speed up the start of the project?	The project must first be validated with the authorized bodies of the United Nations. But until today, OBEN is doing its best to start the project before the end of the year.
Police Regional Commander Q: The police have many positions that include 3 to 4 agents, OBEN could approach the authorities at the highest level to provide these stoves to all positions?	OBEN takes good note of the consideration and will make the necessary contacts. However, because the process can take a long time, we encourage those who are interested to buy them at their own expense given the savings it can achieve for households.
• Ms. Nibigira Aline, farmer. Q: The ordinary fireplace costs 1500 BIF on the market. Everyone does not have the same means of purchase. There are even indigents. Can you not lower the advertised price of 4000 BIF?	Venant Barindogo, GIZ consultant. As a technician and connoisseur of the field, he explained all the stages of manufacturing such stove: cost of the clay, transport, mixing, molding, drying, cooking ... He demonstrated that the stove would sell much more expensive (7 to 8000 BIF) without the support of the promoters OBEN and ECOEYE subsidy. OBEN: To facilitate the acquisition, OBEN will go through local associations to register those who want and allow them to pay in two instalments. For the needy, the Red Cross will identify them and they will be able to benefit from the stoves free of charge.
• Nibaruta Stevens, teacher. Q: I come from far away, Kaburantwa and I understood the interest of buying this home. Can you send them to us?	OBEN: Yes, there is a distribution network that is being set up through the Red Cross volunteers. Delegate of the Red Cross, Mrs Happy: we are going to move them progressively to the chief towns of the communes, then to the level of the zones, hills, and so on towards the households. Thus all the Burundian population

	will be able to benefit from it. The common goal of the Red Cross and OBEN is to see any household use this improved home within 5 years. For now, you can contact the volunteer of the Red Cross in your area who will establish the list of acquirers. The production of stoves on site has not succeeded despite several efforts (poor quality of the sheet metal and firebricks). The cost remains high compared to the purchasing power of citizens.
• Ndayizeye J.Delors, President of association fighting for the environment Q: Suggestion that each improved stove buyer plant a tree in his plot to try to participate in the reforestation of the country, and thus mitigate the effects of climate change.	OBEN takes note of the excellent suggestion and will analyze how to integrate this aspect into its intervention programs for the population.
• Zacharie TUYAGA, Reverend Pastor at EEAC Ruziba, Kanyosha Rural, Bujumbura Province Q: Is it forbidden for craftsmen to mimic and manufacture the fireplace?	OBEN: No, it's not forbidden. They are even encouraged to imitate them, there is no restriction on this, the goal always being to introduce as many households as possible.
• Nijimbere Léonard, local representative and hill chief Q: Since the project is of national interest, can we not ask the government to finance the stoves free of charge for the benefit of the entire population?	Administrative officer of Buganda commune: the current policy is to raise awareness among the population to change their behavior in order to consume less, to have a careful attitude towards the preservation of the environment, to count on his own strength, etc. First, people need to be aware of the benefit that the project brings them, because in 2 months they get their money back. The government will support this. Moreover, it does not have the means to offer free stoves to all the population.
• Nkurunziza Delphine, farmer. Q: Will there not be a problem with distribution and availability?	OBEN will multiply the manufacturing sites all over the country. As the production proceeds, the Red Cross will ensure the distribution of the

	outbreaks in the various localities to the cleaning of the hill as explained by the delegate present here. We will increase the production points accordingly.
Nzokira Mathias, farmer Q: Are there demonstration points for the use of stoves on all hills?	OBEN: The Red Cross distribution agents will initiate the demonstration locations of the new stove at the same time, but also a small explanatory leaflet and how to use it will be available for those who can read.
Uwezowamungu, WFP representative [Comment] He testified of his experience in the production and popularization of improved stoves in Gitega province. Tests and demonstrations carried out in collaboration with the Red Cross have shown that the introduction of the improved stoves reduces the amount of fuel four times. In addition, there is a decrease in cooking time and smoke. But the other aspect that WFP was aiming for through this project is the reduction of violence against women by avoiding spending most of their time in the woods to look for firewood. He said there needs to be a lot of awareness at all levels to make the improved stove more and more of a necessity.	N/A
Stanislas Niyonzima, GIZ representative at the public event [Comment] Considerations about the importance of acquiring an improved stove because of its energy efficiency. Information on the fact that GIZ is committed to supporting the program by supporting awareness raising. It is to facilitate production, affordability for the purchasers, provided that the operation is conceived in the durable sense.	N/A

• Mbonigaba Rachelle, worked in stoves manufacturing and benefited from it [Comment] Praise of the stove, the change it has induced in his habits, saving time, no more fumes that disturbed the children ... Given the very significant decrease in the budget induced by the acquisition of the new home, it turns out to be far less expensive compared to the previous situation	N/A
• Mr. Yvan Kasaba, Adviser to the General Directorate of Energy for the promotion of Renewable Energies. [Comment] Considerations on various sources of energy available in Burundi: hydroelectric, biogas (very very little), solar (very very little), charcoal and wood (more than 90%). But nothing can replace what we consume, hence the importance of reducing what we consume. The improved stove is a solution in this sense. He also reflected on the link between deforestation and the decrease in rainfall. Even dams will end up not working if you do not reduce deforestation. So, there will be no more electricity, so no plants, so no development! Hence the importance of awareness and consciousness.	N/A
• Mr. BONJA Prosper, delegate of AND [Comment] Considerations on the international dimension of the project with regard to global warming. He said the situation is alarming, which is why the world is investing in various projects to lower the level of greenhouse gas emissions. He then encouraged the participants to acquire these stoves and thus contribute	N/A

to the achievement of the objectives of the Government and the United Nations. He also highlighted the positive social aspects of the life of Burundian women: lightening their daily work, saving time, less smoke The project will change the way of living and contribute to its development.	
---	--

2.2 Risks to Stakeholders and the Environment

	Risk identified	Mitigation or preventative measure taken
Risks to stakeholder participation	No risk identified	As per grievance book, no negative feedback is received
Working conditions	No risk identified	The project's personnel is interviewed during monitoring period and never reported any health and safety risk or incident during the operation phase.
Safety of women and girls	No risk identified	As mentioned above, the project's personnel are interviewed during each monitoring period and women never reported any security problem.
Safety of minority and marginalized groups, including children	No risk identified	It is observed during each site visit.
Pollutants (air, noise, discharges to water, generation of waste, release of hazardous materials)	No risk identified	The project activity consists of the distribution of improved cooking stoves, thus those risks are not applicable.

2.3 Respect for Human Rights and Equity

2.3.1 Labor and Work

Discrimination and sexual harassment	OBEN follows the applicable laws in Burundi regarding discrimination and sexual harassment policy. In addition to the applicable law regarding prevention, protection of victims and repression of gender-based violence ⁴ , the state of Burundi developed an action plan, in 2019, in order to enhance the applicable law ⁵ .
Management experience	N/A
Gender equity in labor and work	According to the list of employees provided by the PP, both women and men are part of the operational team.
Human trafficking, forced labor, and child labor	The project aligns with the labour convention and labour rights of Burundi, which is a member of the International Labour Organisation (ILO) since 1963. . The project does not use victims of human trafficking, forced Labour and child labor and this is verified during each site visit for each monitoring period by the audit team.

2.3.2 Human Rights

OBEN employs local population for project management and the project aligns with the labour convention and labour rights of Burundi, which is a member of the International Labour Organisation (ILO) since 1963 and signed the following fundamental conventions⁶:

C029 – Forced Labour Convention, 1930. Since 11.03.1963.

C087 – Freedom of Association and Protection of the Right to Organise Convention, 1948 (No.98). Since 25.06.1993

C098 – Right to Organise and Collective Bargaining Convention, 1949. Since 10.10.1997.

C100 – Equal Remuneration Convention, 1951. Since 25.06.1993.

C105 – Abolition of Forced Labour Convention, 1957. Since 11.03.1963.

C111 – Discrimination (Employment and Occupation) Convention, 1958. Since 25.06.1993.

⁴ <http://www.presidence.gov.bi/wp-content/uploads/2017/07/loi-013-2016.pdf>

⁵ <https://www.unwomen.org/sites/default/files/Headquarters/Attachments/Sections/CSW/64/National-reviews/Burundi.pdf>

⁶ https://www.ilo.org/dyn/normlex/en/f?p=1000:11200:::P11200_INSTRUMENT_SORT:1

C138 – Minimum Age Convention, 1973. Since 19.07.2000.

C182 – Worst Forms of Child Labour Convention, 1999. Since 11.06.2002.

2.3.3 Indigenous Peoples and Cultural Heritage

N/A.

2.3.4 Property Rights

Disputes over rights to territories and resources	N/A
Respect for property rights	N/A

2.3.5 Benefit Sharing

Summary of the benefit sharing plan	N/A
Benefit sharing during the monitoring period	N/A

2.4 Ecosystem Health

	Risk identified	Mitigation or preventative measure taken during the monitoring period
Impacts on biodiversity and ecosystems	No risk identified	The project involves reduction of the deforestation. Thus, this is not applicable.
Soil degradation and soil erosion	No risk identified	The project involves the distribution of ICS. Thus, it is not linked to soil activities and related impacts.
Water consumption and stress	No risk identified	The project involves the distribution of ICS. Thus, it is not linked to water consumption activities and its related impacts.
Usage of fertilizers	No risk identified	Not applicable to project activity.

2.4.1 Rare, Threatened, and Endangered species

Species or habitat	N/A
--------------------	-----

2.4.2 Introduction of species

Species introduced	Classification	Justification for use	Adverse effects and mitigation
N/A	N/A	N/A	N/A

Existing invasive species	Mitigation measures to prevent spread or continued existence of invasive species
N/A	N/A

2.4.3 Ecosystem conversion

Not applicable.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

During this monitoring period, no new households were equipped with cookstoves, in the project boundaries.

There were no events or changes to the project, the project proponent, or entities during the monitoring period.

OBEN conducts regular spot checks to evaluate the status of ICS and give advice on the use of ICS. During this monitoring period, the field team was able to visit 964⁷ households equipped with the stoves as part of the follow-up visits. During those visits, there were 23 households with damaged stoves. All those households have been able to get their stoves repaired or changed. Those 23 stoves correspond to 2% of all households visited, hence an operational status of 98%⁸ which is higher than average operational status of 94% found in monitoring surveys. Maintenance book and proof of follow-up visit are provided to VVB.

⁷ The visits have been registered on KoboToolBox and same have been shared with VVB.

⁸ As monitoring surveys operational status results are more conservative than follow-up visits, the stoves found damaged and replaced during follow-up visits have not been retrieved from database for ERs calculation during this monitoring period.

3.2 Deviations

3.2.1 Methodology Deviations

A temporal deviation has been applied during previous monitoring period, regarding the monitoring of the efficiency that should be monitored on an annual frequency. PP was not able to conduct efficiency test on an annual basis, because of some delays observed with the laboratory.

To ensure that this deviation does not negatively impact the conservativeness of the quantification of GHG emission reductions, it was decided for that monitoring period to use the lowest efficiency of all the batches as the efficiency for all the batches.

Also, this temporary deviation relates only to the procedures for monitoring the efficiency and does not relate to any other part of the methodology.

For actual monitoring period, there is no methodology deviation.

3.2.2 Project Description Deviations

There is no project description deviation applied during previous or actual monitoring period.

3.3 Grouped Projects

There is no new instance added to this grouped project. The monitoring period only include the first instance ⁹of the grouped project.

3.4 Baseline Reassessment

Did the project undergo baseline reassessment during the monitoring period?

☐ Yes ☒ No

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	Bold,p
Data unit	tonnes/person/year

⁹ The first instance included in the grouped project corresponds to the CPA 1 of the CDM PoA 10474 “Improved Cooking Stove Programme in Burundi supported by Republic of Korea”, for its post-2020 accounting of Emission Reductions

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

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

Data / Parameter	B_{old,HH}
Data unit	tonnes/household/year
Description	Annual quantity of woody biomass that would have been used in the household in the absence of the project

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

	activity to generate useful thermal energy equivalent to that provided by the project devices
Source of data	Determined ex ante at CPA level.
Value applied	5.03
Justification of choice of data or description of measurement methods and procedures applied	Option 1. <i>Bold</i> , times $N_{p,H}$
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$B_{old,i,j}$
Data unit	tonnes/year
Description	Annual quantity of woody biomass that would have been used in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project device type i and batch j
Source of data	Determined ex ante at CPA-level
Value applied	5.03
Justification of choice of data or description of measurement methods and procedures applied	$B_{old,HH}$ divided by $N_{d,HH}$
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$\eta_{old,i,j}$
Data unit	Fraction
Description	Efficiency of the device being replaced
Source of data	Determined ex ante at CPA-level, based on AMS-II.G. for default values and/or baseline survey literature, statistics etc.
Value applied	0.1
Justification of choice of data or description of measurement methods and procedures applied	Efficiency of pre - project device, which is a three stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney; for other types of devices, a default value of 0.2 may be optionally used. Weighted average values (amount of woody biomass consumed by each device as the

	weighting factor) will be used if more than one type of device is being replaced.
Purpose of Data	Calculation of baseline emissions
Comments	Use weighted average values if more than one type of system is being replaced.

Data / Parameter	Leakage
Data unit	Fraction
Description	Net to gross adjustment factor to account for leakages
Source of data	AMS-II.G.
Value applied	0.95
Justification of choice of data or description of measurement methods and procedures applied	In case this leakage adjustment factor is applied, it is not required to survey the use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources.
Purpose of Data	Calculation of baseline emissions
Comments	B _{old} is multiplied by a net to gross adjustment factor of 0.95 to account for leakages according to AMS-II.G.

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

Data / Parameter	NCV Biomass
Data unit	TJ/tonne
Description	IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried' may be used if fuel used in project device is also woody biomass. If fuel used in the project device is charcoal, 0.029 TJ/tonne may be used.
Source of data	Data from 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
Value applied	0.0156
Justification of choice of data or description of measurement methods and procedures applied	---
Purpose of Data	Calculation of baseline emissions
Comments	--

4.2 Data and Parameters Monitored

Data / Parameter	Ny,i,j				
Data unit	Units				
Description	Number of project devices of type i and batch j operating during year y				
Source of data	Monitoring surveys and project database				
Description of measurement methods and procedures to be applied	Based on a representative sample. Sampling standard is used for determining the sample size to achieve 90/10 confidence precision. A discount is 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 is applied to number of project devices commissioned in a particular batch. Separate samples are taken for each batch				
Frequency of monitoring/recording	Annual Latest monitoring surveys have been conducted from 04/01/2024 to 21/01/2024 Previous monitoring surveys (MP4) have been done from 30/12/2022 to 15/01/2023				
Value monitored	Batch	Batch 1	Batch 2	Batch 3	Batch 4

	<table><tr><td>Year</td><td></td><td></td><td></td><td></td></tr><tr><td>2023</td><td>40,045</td><td>82,212</td><td>84,260</td><td>64,512</td></tr></table>	Year					2023	40,045	82,212	84,260	64,512
Year											
2023	40,045	82,212	84,260	64,512							
Monitoring equipment	Not applicable.										
QA/QC procedures to be applied	Sampling standard shall be used for determining the sample size to achieve 90/10 confidence precision (or 95/10 confidence precision) for the sample size calculation (if conducted biennially).90/10 applicable for this MP as this is annual monitoring.										
Purpose of the data	Calculation of baseline emissions										
Calculation method	$N_{y,l,j} = Pop\ stoves * N$ ($N_{y,i,j}$ for each batch, is determined by multiplying all devices sold in the batch with the proportion of cooking stoves found to be operating in a representative sample of each batch (Pop_stoves,y).) Batch 1 covers stoves sold between 02/11/2018 and 01/11/2019; Batch 2 covers stoves sold between 02/11/2019 and 01/11/2020; Batch 3 covers stoves sold between 02/11/2020 and 01/11/2021, and Batch 4, stoves sold between 02/11/2021 and 01/11/2022; The monitored proportion of stoves found operational for the batch are represented in the table below: <table><tr><td> Batch Year </td><td>Batch 1</td><td>Batch 2</td><td>Batch 3</td><td>Batch 4</td></tr><tr><td>2023</td><td>94.29%</td><td>91.43%</td><td>93.94%</td><td>96.97%</td></tr></table>	Batch Year	Batch 1	Batch 2	Batch 3	Batch 4	2023	94.29%	91.43%	93.94%	96.97%
Batch Year	Batch 1	Batch 2	Batch 3	Batch 4							
2023	94.29%	91.43%	93.94%	96.97%							
Comments											

Data / Parameter	μ_y
Data unit	Fraction
Description	Adjustment to account for any continued use of pre-project devices during year y
Source of data	It is a fraction based on monitoring surveys results

Description of measurement methods and procedures to be applied	Monitoring surveys			
Frequency of monitoring/recording	At least once every two years (biennial) Latest monitoring surveys have been conducted from 04/01/2024 to 21/01/2024. Previous monitoring surveys (MP3) have been done from 30/12/2022 to 15/01/2023.			
Value monitored	Batch 1	Batch 2	Batch 3	Batch 4
	91.67%	92.45%	92.47%	91.20%
Monitoring equipment	Not applicable			
QA/QC procedures to be applied	---			
Purpose of the data	Calculation of Baseline emissions			
Calculation method	During the annual monitoring campaign, mandated field agents inquire if the baseline stove that was supposed to be replaced by the ICS is still used. Field agents estimate the usage rate of the pre-project stove(s) by formulating questions to determine the frequency of usage of both the project devices and baseline devices. Sampling have been conducted following a 90/10 precision (annual inspection) in accordance with the “Standard for sampling and surveys for CDM project activities and programme of activities”, and 90/10 precision was met. .			
Comments				

Data / Parameter	$\eta_{new,i,j}$
Data unit	%
Description	Efficiency of the device of each type i and batch j implemented as part of the project activity.
Source of data	WBTs results

Description of measurement methods and procedures to be applied	Efficiency based on water boiling test (WBT) conducted by independent lab. Efficiency based on water boiling test (WBT) conducted by independent lab. According to AMS-II.G. efficiency shall be measured/estimated as follows: 1. The efficiency of the project devices shall be based on certification by a national standards body or an appropriate certifying agent recognized by that body. 2. Alternatively, manufacturer specifications on efficiency based on water boiling test (WBT) may be used. The WBT shall be carried out in accordance with national standards (if available) or international standards or guidelines (e.g. the WBT procedures specified by the partnership for clean indoor air (PCIA): . 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 3. However, the following simplified approach may be used, when the efficient cook stoves are produced by a manufacturer with a good quality management system in place to ensure that the individual equipment produced do not vary beyond the range of acceptance limits (e.g. characteristics such as materials, critical dimensions): (i) Conduct a sample test on three cook stoves with three tests conducted for each stove. The test can be carried out by project proponents by themselves or stove manufacturers (ii) If the standard deviation of the nine test results indicated above is very small and 90/10 precision requirement is met (in this case, the value of the t-distribution for 90 per cent confidence shall be used instead of Z value), the efficiency determined is acceptable, otherwise more sample tests would be required until 90/10 precision is met. Option 3 (simplified method) has been selected. 3 stoves have been tested by batch and the precision has been met for all batches. The results are therefore in line with the applied methodology. Thanks to the long track available for OBEN project and cookstoves, both under this project and other projects, it can be demonstrated that OBEN has a good management system for stoves production, with very low variation in stoves performance as demonstrated by WBTs results.
--	--

Frequency of monitoring/recording	Annual Latest WBT were conducted on January 24, 2024. Previous WBT were conducted in January 2023				
Value monitored	Year	Batch 1	Batch 2	Batch 3	Batch 4
	WBT results 2024	30.4%	30.9%	31.6%	32.1%
Monitoring equipment	-				
QA/QC procedures to be applied	Tests are performed by third party “Centre de Recherche Universitaire sur les Energies Alternatives (CRUEA)” (University of Burundi) with calibrated equipment and cross-checked with manufacturer information suggesting an efficiency of 32.10%.				
Purpose of the data	Calculation of baseline emissions				
Calculation method	--				
Comments	The WBTs results for batch 4 (32.3%) has been capped to efficiency of new stoves (32.1%) as per registered CPA-DD value.				

Data / Parameter	Date of commissioning of batch j
Data unit	Date
Description	To establish the date of commissioning, the Project Participant opts to group the devices in “batches” and the latest date of commissioning of a device within the batch shall be used as the date of commissioning for the entire batch
Source of data	Internal records
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	At the time of commissioning
Value monitored	Excel spreadsheet provided to the VVB..

	Batch 1 covers stoves sold between 02/11/2018 and 01/11/2019; Batch 2 covers stoves sold between 02/11/2019 and 01/11/2020; Batch 3 covers stoves sold between 02/11/2020 and 01/11/2021, and Batch 4, stoves sold between 02/11/2021 and 01/11/2022;
Monitoring equipment	-
QA/QC procedures to be applied	---
Purpose of the data	Calculation of baseline emissions
Calculation method	--
Comments	

Data / Parameter	<i>Date of commissioning of project device i</i>				
Data unit	Date				
Description	Actual date of commissioning of the project device.				
Source of data	Internal records				
Description of measurement methods and procedures to be applied	-				
Frequency of monitoring/recording	Fixed and recorded at the time of commissioning/distribution				
Value monitored	Batch	Batch 1	Batch 2	Batch 3	Batch 4
	Date	02/11/2018	02/11/2019	02/11/2020	02/11/2021
Monitoring equipment	-				
QA/QC procedures to be applied	-				
Purpose of the data	Calculation of baseline emissions				
Calculation method	--				
Comments	--				

Data / Parameter	N				
Data unit	Number				
Description	Number of project devices distributed				
Source of data	Internal records (project database)				
Description of measurement methods and procedures to be applied	-				
Frequency of monitoring/recording	Recorded at the time of commissioning/distribution of project devices				
Value monitored	288,616 cookstoves full use equivalent (290,050 ICS sold)				
	Batch	Batch 1	Batch 2	Batch 3	Batch 4
	N	42,472	89,919	89,697	66,528
Monitoring equipment	-				
QA/QC procedures to be applied	Every time an ICS is sold a sale agreement is filled and an electronic database is filled. Based on the information collected into this electronic database, the number of ICSs distributed is determined.				
Purpose of the data	Calculation of baseline emissions				
Calculation method	--				
Comments	--				

Data / Parameter	N _{d,HH}
Data unit	Number
Description	Number of project devices distributed per household
Source of data	Internal records
Description of measurement methods and procedures to be applied	Project database is checked to ensure that each household receives only one ICS.
Frequency of monitoring/recording	Annual

Value monitored	1.03
Monitoring equipment	Only one cooking stove per household is registered in the electronic database. If a household purchases more than one cooking stoves, monitoring surveys of sampled kitchens' stoves in use will account for any additional project device and be reflected in adjustment factor $N_{d,HH}$.
QA/QC procedures to be applied	Is verified during monitoring campaigns
Purpose of the data	Calculation of baseline emissions
Calculation method	--
Comments	The $N_{d,HH}$ value used for ex-ante estimation is 1. However, by assessing the database an average of 1.03 is found. This value as more conservative than ex-ante value (1.0) and value from monitoring surveys (1.0) is taken into consideration for ER calculation.

4.3 Monitoring Plan

The monitoring plan is designed to monitor the parameters listed in Section 4.2. 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 is determined based on sampling procedures as outlined below. The project proponent is responsible for conducting the sampling surveys and maintaining a database with all operating stoves.

No monitoring for leakage through competitive uses of biomass is required, as the parameter B_y is multiplied by 95% to account for leakage.

As per the Guideline for Sampling and Surveys for CDM Project Activities and Programme of Activities, version 04, the sampling plan is the following:

Objectives and reliability requirements

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

Target population and sampling frame

The target population is the totality of households equipped with ICS. The sampling frame is the data on ICS sales entered and/or available in the project electronic database. The electronic database records information for each sale at least on the following:

- Sales date (age class)/date of replacement of the ICS
- Household serial number(s)
- Type and size of ICS(s) distributed
- Installation date of the ICS
- Contact details of household

Sampling Method

For this monitoring period, sampling has been carried out over all the households currently covered in the user database.

Random sampling has been carried out to draw a sample of 140 households to carry out monitoring surveys, using Excel's RAND function. In final 136 households were able to be surveyed for this monitoring period.

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

Parameter values are estimated by sampling in accordance with the requirements in AMS-II_G

As per methodology para 48, "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 parameters. In cases where survey results indicate that 90/10 precision or 95/10 precision are not achieved, the lower bound of the 90 per cent or 95 per cent confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10 or 95/10 precision".

An annual inspection has been conducted for this monitoring period, the sample size has been calculated to obtain a 90/10 confidence precision.

The sample size for estimating the proportional parameters pop_y and the proportion of meals cooked with preproject devices (or their reverse) is calculated using the formula provided in the "Guideline: Sampling and surveys for CDM project activities and PoAs" Appendix 1 para 12:

$$n \geq \frac{1.645^2 N \times p(1-p)}{(N-1) \times 0.1^2 \times p^2 + 1.645^2 p(1-p)}$$

The monitoring of pop_y and the proportion of meals cooked with preproject devices is based on the same sample, which is the sample with the larger sample size of the two.

For the average efficiency of the cookstoves, the sample size is calculated using the formula mentioned in the “Guideline: Sampling and surveys for CDM project activities and PoAs” version

04.0 (simple random sampling, Appendix 1, para.51) applicable to the determination of a mean value parameter:

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

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

The t-value depends on (i) the level of confidence (90%) and (ii) the size of the sample (n=40, with oversampling). The exact figure is derived in Microsoft Excel using the TINV function, as per para. 13 of the “Guideline: Sampling and surveys for CDM project activities and PoAs.”

Please refer to the ER calculations for a detailed calculation

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

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

Batch 1

Parameter	$Z_{\alpha/2}$	N	p	Minimum sample size	Final sample size	Monitoring precision achieved
pop household,y	1.645	43,906	96.77 %	12	35	Yes
1-UY	1.645	43,906	94.67 %	20	35	Yes

Batch 2

Parameter	$Z_{\alpha/2}$	N	p	Minimum sample size	Final sample size	Monitoring precision achieved
pop household,y	1.645	89,919	98.33 %	6	35	Yes
1-UY	1.645	89,919	97.79 %	9	35	Yes

Batch 3

Parameter	$Z_{\alpha/2}$	N	p	Minimum sample size	Final sample size	Monitoring precision achieved
-----------	----------------	---	---	---------------------	-------------------	-------------------------------

pop household,y	1.645	89,697	97.50 %	9	35	Yes
1-UY	1.645	89,697	99.21 %	4	35	Yes

Batch 4

Parameter	$Z_{\alpha/2}$	N	p	Minimum sample size	Final sample size	Monitoring precision achieved
pop household,y	1.645	66,528	100%	0	35	Yes
1-UY	1.645	66,528	99.64 %	2	35	Yes

Table 6: Calculation of sample size of means (90/10 confidence/precision)

The WBTs are conducted annually for each batch. For this monitoring period, stoves distributed from batch 2019,2020,2021 & 2022 have been tested in 2024.

Batch 2019 tested in 2024:

Parameter		N	SD	Mean	Calculated sample size	Calculated sample size w/ oversampling	Final sample size	Precision achieved
efficiency	1.645	43,906	0.02	29.8%	2	3	3	2%

Batch 2020 tested in 2024

Parameter		N	SD	Mean	Calculated sample size	Calculated sample size w/ oversampling	Final sample size	Precision achieved
efficiency	1.645	89,919	0.02	29.75%	2	3	3	1%

Batch 2021 tested in 2024

Parameter		N	SD	Mean	Calculated sample size	Calculated sample size w/ oversampling	Final sample size	Precision achieved
efficiency	1.645	89,697	0.02	29.75%	2	3	3	1%

Batch 2022 tested in 2024

Parameter		N	SD	Mean	Calculated sample size	Calculated sample size w/ oversampling	Final sample size	Precision achieved
efficiency	1.645	66,528	0.02	29.75%	2	3	3	1%

Final total sample sizes during this monitoring period have been 136 households.

A sample of 136 households have been drawn among the full database of the participating households. The sample have been drawn by AERA Group, and the identification of the 136 households have been shared with OBEN for the monitoring.

The z-value depends on the level of confidence. For 90% confidence it is 1.645 as per para. 116 of the “Guideline: Sampling and surveys for CDM project activities and PoAs”

Please refer to the ER calculations for a detailed calculation.

Organization of the monitoring

The project proponent is responsible for overall monitoring organization. The sampling plan, data collection & consolidation and results analysis are implemented by an adequately trained monitoring team, well aware of monitoring requirements and they were supervised by the project implementer (OBEN). The monitoring team consists of following:

The survey of the households has been conducted by OBEN team from 04/01/2024 to 21/01/2024, under the supervision of Claver NDIZEYE. During this monitoring period, the surveys have been done thanks to the usage of Kobo ToolBox, which is an improvement with regards to prior practices (paper-based monitoring). Thanks to the usage of Kobo, pictures of end-user’s agreements, stoves, GPS coordinates and end-users monitored have been collected. Same are provided to VVB.

Table 7: Monitoring team and responsibilities

Role	Responsibilities	Identity
------	------------------	----------

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

During this monitoring period, monitoring has been carried out by OBEN Team. Therefore, the project's consultant (AERA Group) has transmitted the digital survey form to the OBEN monitoring team indicating the selected random sample of households to be interviewed and some guidance on how to carry out the survey. After conducting the survey, the team has sent back the filled forms to the project's consultant team, who checked and processed the data collected.

Procedures used for handling any internal auditing performed and any non-conformities identified:

Project proponent trained monitoring personnel on monitoring procedures, including provisions for maximizing response rates, documenting out-of-population cases, refusals and other sources of non-response. The monitoring survey included several questions to support the information on the key monitoring parameters. These included visual inspections to confirm stove use and presence of baseline stoves, comments by surveyors, check of randomly selected households against actual household information, and refusal tracking. These strategies were aimed at minimizing surveyor or non-response biases. No non-conformities were identified during this monitoring period.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Emission reductions are calculated as:

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

Where:

- i = Indices for the situation where more than one type of project device is introduced to replace the pre-project devices¹¹
- j = Indices for the situation where there is more than one batch of project device
- ER_y = Emission reductions during year y in t CO₂e
- ER_{y,i,j} = Emission reductions by project device of type i and batch j during year y in t CO₂e
- LE_y = Leakage emissions in the year y

$$ER_{y,i,j} = B_{y,savings,i,j} \times N_{y,i,j} \times \mu_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected_fossil\ fuel}$$

Where:

- B_{y,savings,i,j} Quantity of woody biomass that is saved in tonnes per cook stove of type i and batch j during year y
- f_{NRB,y} Fraction of woody biomass saved by the project activity in year y (established as non-renewable biomass using survey methods)
- NCV_{biomass} Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne, based on the gross weight of the wood that is 'air-dried')
- EF_{projected_fossilfuel} Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers. Use a value of 63.7 tCO₂/TJ
- N_{y,j,j} Number of project devices of type i and batch j operating during year y.
- μ_y Adjustment to account for any continued use of pre-project devices during the year y applying equation 6

$$B_{y,savings,i,j} = B_{old,i,j} \times \left(1 - \frac{\eta_{old,i,j}}{\eta_{new,i,j}}\right)$$

Where:

- η_{old,i,j} Efficiency of the old devices being replaced by project devices of type i and batch j.
- η_{new,i,j} Efficiency of the project device i and batch j

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

¹¹ For example, in some instances, full replacement of the pre-project device would require the implementation of more than one project device (e.g. one stove suitable for cooking and the other stove suitable for cooking/boiling water).

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

Where:

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

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

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

Jiko Matawi stove:

Taking into account Jiko Matawi stoves in use for 100% of the time over the monitoring period, the calculation results in the below table.

	Value					Unit	Source/refere nce	Precision/con fidence level
$N_{y,i,j}$	Year	Batch 1	Batch 2	Batch 3	Batch 4	n/a	Calculated $N_{y,i,j} = N * pop_stoves,y$	90/10 (Annual)
	2023	40,045	82,212	84,260	64,512			
pop_stoves,y	Year	Batch 1	Batch 2	Batch 3	Batch 4	%	Monitoring surveys	90/10 (Annual)
	2023	94.29%	91.43%	93.94%	96.97%			
μ,y	Year	Batch 1	Batch 2	Batch 3	Batch 4	fraction	Monitoring see section 4.2. above	90/10 (Annual)
	2023	91.67%	92.45%	92.47%	91.20%			
fNRB,y	0.8183					fraction	Section E.1 of registered CPA1	N/A
NCVbiomass	0.0156					TJ/tonne	Section E.2 of registered CPA1	N/A
EFprojected_fossilfuel	63.7					tCO ₂ /TJ	Methodology AMS-II.G version 10.0	N/A

By,savings,i,j							tonnes/ye ar	ER calculations By,savings,i,j = Bold,i,j*(1 – ηold,i,j/ηnew,i, j)*0.95	N/A
	Year	Batc h 1	Batc h 2	Batc h 3	Batc h 4				
	202 3	3.21	3.23	3.27	3.30				
Bold,i,j	5.03						tonnes/ye ar	Section E.1 of registered CPA1	N/A
Bold,HH	5.03						tonnes/HH /year	Section E.1 of registered CPA1	N/A
Nd,HH	1.03						Personnes /HH	Monitoring surveys see section 4.2 above	N/A
ηold,i,j	10						%	Section E.1 of registered CPA1	N/A
ηnew,i,j	Yea r	Batch 1	Batch 2	Batch 3	Batc h 4		%	WBTs results	90/10 (annualy)
	202 3	30.4 3%	30.9 5%	31.6 0%	32.1 %				
Project emissions (PEy)	0						tCO2/year	Section 5.4, ER calculations <i>below</i>	
Leakage emissions (LEy)	9,278						tCO2/year	Section 5.4 below. Only leakage due to charcoal is considered here as Adjustment factor (0.95) already	N/A

			applied at By,savings,i,j level											
Emission reductions	<table> <tr> <th>Year</th><th>Batch 1</th><th>Batch 2</th><th>Batch 3</th><th>Batch 4</th></tr> <tr> <td>2023</td><td>94,304</td><td>196,852</td><td>203,964</td><td>155,620</td></tr> </table>	Year	Batch 1	Batch 2	Batch 3	Batch 4	2023	94,304	196,852	203,964	155,620	tCO2/year	ER calculations $ER_y = \sum_i \sum_j ER_{y,i,j} - LE_y$	N/A
Year	Batch 1	Batch 2	Batch 3	Batch 4										
2023	94,304	196,852	203,964	155,620										

After taking account of the effective usage days of each individual stove after the date of sale, effective emissions reductions are shown in the section below. .

5.2 Project Emissions

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

5.3 Leakage Emissions

As per AMS II.G, leakage is already taken account of in the calculation of baseline emissions by multiplying By,savings,i,j by a net to gross adjustment factor of 0.95 to account for leakages. In such case, surveys to determine leakage ex-post are not required. This leakage is already taken in consideration at By,savings level. Further leakage emissions occur due to switching from baseline device using firewood to efficient project device using charcoal. These emissions are calculated by using a default value of 0.030 t CH4/t charcoal in accordance with “AMS-III.BG.: Emission reduction through sustainable charcoal production and consumption”.

Leakage emissions due to switch from firewood to charcoal have been assessed for this monitoring period. It was found that approx. 15% of the end-users switched to charcoal, hence resulting in leakage emissions of 9,278¹² tCO2e.

5.4 GHG Emission Reductions and Carbon Dioxide Removals

Vintage period	Baseline emissions (tCO2e)	Project emissions (tCO2e)	Leakage emissions (tCO2e)	Reduction VCUs (tCO2e)	Removal VCUs (tCO2e)	Total VCUs (tCO2e)
----------------	----------------------------	---------------------------	---------------------------	------------------------	----------------------	--------------------

¹² Please refers to ER sheet for detailed leakage calculation.

01-Jan-2023 to 31-Dec-2023	641,844	0	9,278	0	0	632,566
Total	641,844	0	9,278	0	0	632,566

Vintage period	Ex-ante estimated reductions/removals	Achieved reductions/removals	Percent difference	Explanation for the difference
01-Jan-2023 to 31-Dec-2023	684,862	632,566	-5%	Due to less ICS operational (Ny,i,j parameter) during this monitoring period.