



**Verified Carbon
Standard**

KENYA JIKO KISASA IMPROVED COOKSTOVE PROGRAM I



冰川环境

Document Prepared by Guangzhou Iceberg Environmental Consulting Services
Co., Ltd.

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CONTENTS

1	PROJECT DETAILS.....	4
1.1	Summary Description of the Project	4
1.2	Sectoral Scope and Project Type	4
1.3	Project Eligibility	5
1.4	Project Design	5
1.5	Project Proponent	5
1.6	Other Entities Involved in the Project	5
1.7	Ownership.....	5
1.8	Project Start Date	6
1.9	Project Crediting Period	6
1.10	Project Scale and Estimated GHG Emission Reductions or Removals	6
1.11	Description of the Project Activity	7
1.12	Project Location	8
1.13	Conditions Prior to Project Initiation	9
1.14	Compliance with Laws, Statutes and Other Regulatory Frameworks.....	9
1.15	Participation under Other GHG Programs	10
1.16	Other Forms of Credit.....	10
1.17	Sustainable Development Contributions	10
1.18	Additional Information Relevant to the Project	12
2	SAFEGUARDS	13
2.1	No Net Harm	13
2.2	Local Stakeholder Consultation	13
2.3	Environmental Impact	14
2.4	Public Comments	14
2.5	AFOLU-Specific Safeguards	14
3	APPLICATION OF METHODOLOGY.....	15
3.1	Title and Reference of Methodology	15
3.2	Applicability of Methodology	15
3.3	Project Boundary	17
3.4	Baseline Scenario	20

3.5	Additionality	21
3.6	Methodology Deviations	22
4	QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS	22
4.1	Baseline Emissions	22
4.2	Project Emissions	22
4.3	Leakage.....	22
4.4	Net GHG Emission Reductions and Removals	22
5	MONITORING	30
5.1	Data and Parameters Available at Validation	30
5.2	Data and Parameters Monitored.....	32
5.3	Monitoring Plan.....	37

1 PROJECT DETAILS

1.1 Summary Description of the Project

The project involves distribution of fuel-efficient Jiko Kisasa improved cookstoves (hereinafter referred to as “ICSs”) in the Republic of Kenya. The ICSs disseminated through this project replace the old low efficient baseline cookstoves in rural area of Kenya. The ICSs are produced by local factories.

Through this project, Guangzhou Iceberg Environmental Consulting Services Co., Ltd. (hereinafter referred to as “Iceberg”) plans distribute approximately 100,000 ICSs free of charge to households in rural area of Kenya in 2 years¹.

Before the implementation of the project, local people mostly used traditional solid-fuel cooking solutions such as open fire or three-stone fires. They spent plenty of time to collect firewood every day due to low combustion efficiency of baseline cooking devices. The ICSs burn wood more efficiently thereby improving thermal transfer to pots, hence saving firewood. The project reduce the GHG emission by less non-renewable firewood combustion as well as slowing the rapidly progressing deforestation in Kenya.

The baseline scenario existing prior to the implementation of the project is widely used traditional solid-fuel cooking solutions such as three-stone fires. Due to low income, people would have continued to use them to meet thermal energy needs without project activity.

The average annual GHG emission reduction from the project is expected to be 222,137 tCO_{2e}, the crediting period is expected to be 10 years. The total GHG emission reduction is 2,221,373 tCO_{2e}.

1.2 Sectoral Scope and Project Type

The project is categorised under type/category as below:

- a) Sectoral scope: 03 - Energy demand
- b) Type: II – Energy efficiency improvement projects

The project is not a grouped project.

¹ The distribution period may be extended due to the progress of fundraising.

1.3 Project Eligibility

The project involves replacing traditional cooking solutions with fuel-efficient improved cookstoves which falls into the category of efficiency improvements in thermal applications., According to VCS Standard Version 4.4, efficiency improvements in thermal applications (e.g., cook stoves) are not excluded, therefore it is eligible under the scope of VCS Program.

1.4 Project Design

- ☐ The project includes a single location or installation only
- ☒ The project includes multiple locations or project activity instances, but is not being developed as a grouped project
- ☐ The project is a grouped project

Eligibility Criteria

Not applicable because the project activity is not a grouped project.

1.5 Project Proponent

Organization name	Guangzhou Iceberg Environmental Consulting Services Co., Ltd.
Contact person	Ji BAO
Title	General Manager
Address	No.106 Fengze East Road, Nansha District, Guangzhou, China
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1.6 Other Entities Involved in the Project

No other entities involved.

1.7 Ownership

The project ownership belongs to Guangzhou Iceberg Environmental Consulting Services Co., Ltd. The Iceberg takes responsibility of the entire project and pays the costs of producing and distributing to manufacturers and local partners.

The ICSs are distributed to end users (Households) free of charge. The participating households, ICS manufacturer and distributor(the same one) as well as Iceberg have signed donation and carbon transfer agreements to transfer the ownership of the carbon assets generated from this project belongs to Iceberg. The agreement has been submitted to confirm that the project ownership belongs to Guangzhou Iceberg Ltd.

1.8 Project Start Date

21/06/2022, which is the date of distribution of the first improve cookstove.

1.9 Project Crediting Period

10 years fixed crediting period from 21/06/2022 to 20/06/2032.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	X
Large project	

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
Year 2022	23,340
Year 2023	160,369
Year 2024	273,525
Year 2025	254,886
Year 2026	219,224
Year 2027	197,267
Year 2028	241,799
Year 2029	281,862
Year 2030	254,886
Year 2031	219,224
Year 2032	94,991

Total estimated ERs	2,221,373
Total number of crediting years	10
Average annual ERs	222,137

1.11 Description of the Project Activity

Before the implementation of the project, local people in the project location used traditional solid-fuel cooking solutions such as open fire or three-stone fires. The project plans distribute 100,000 fuel-efficient improved cookstoves (ICS) in 2 years to replace the baseline cookstoves in households from 100-400 villages² all over the country. 50,000 ICSs are expected to be distributed per year. The local partners are in charge of the distribution³. They are local experienced organizations who can ensure that the cookstoves reach the households that need them most. Iceberg maintains close contact with local partners to resolve issues during distributing process in time. A digital database is used to store the information of distribution.

The ICS continues to consume non-renewable biomass for cooking, but the ICS consumes less wood fuel to meet thermal needs as it has higher thermal efficiency and it results in a reduction of GHG emissions compared to the baseline scenario.

Technology

The type of ICS distributed in the project is Jiko Kisasa improved cookstove. According to independent stove efficiency tests performed by KIRDI Stove Testing Centre in Kenya on the Jiko Kisasa improved cookstove, the thermal efficiency is 27.2%. It was tested according to WBT test protocol 4.2.3, which has met the requirements of applied methodology VMR0006.

The cooking system is made of a combustion chamber, a pot rest and an air inlet window. The stove has no bottom utilizing the ground surface where it is placed as a bottom. The stove weighed approximately 8251 grams.

Table 1: Technical Specification of Jiko Kisasa Improved Cookstove

No.	Parameter	Value
1	High power thermal efficiency	27.2%
2	Life span	7 years
3	Dimensions	Height:13cm (+/-0.5cm)

² The number of villages may be adjusted according to real conditions

³ The distribution period may be extended while the number of ICS distributed per year may be adjusted due to the progress of fundraising.

		Diameter :27cm (+/-0.5cm)
4	Weight	8,251gm
5	Material	Combustion Chamber and Stove Top Ceramic made from locally available clay

Figure 1: Photo of Jiko Kisasa ICS



The lifetime of Jiko Kisasa improved cookstove is about 7 years according to manufacturer specifications. In the sixth year after ICSs distribution, the project proponent will provide a new ICS to Households without cost, so that households will have access to them for the full crediting period.

All ICSs are produced in local factories and distributed to households free of charge.

1.12 Project Location

The project location is in the Republic of Kenya.

Table 2: Geographical coordinates of the Republic of Kenya

Orientation	Latitude	Longitude
Eastmost	3° 48'58" N	41° 53'59" E
Westmost	1° 03'35" S	33° 55'46" E
Southmost	4° 40'33"S	39° 19'32" E
Northmost	4° 15'41" N	35° 23'57" E



Figure 2: Map of the Republic of Kenya

1.13 Conditions Prior to Project Initiation

The condition prior to project initiation is the continued use of non-renewable wood fuel (firewood) by the target population to meet similar thermal energy needs as provided by project cookstoves in absence of project activity, which is the baseline scenario according to the baseline survey. Please refer to Section 3.4 of the PD for more information.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

After searching, there are no laws and regulations about the application of improved cookstoves in Kenya households. Energy Act 2019⁴ of Kenya has no mention of cooking. The project is voluntarily implemented by the project proponent.

⁴ <https://www.ilo.org/dyn/natlex/docs/ELECTRONIC/109334/135598/F1714620448/KEN109334.PDF>

1.15 Participation under Other GHG Programs

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

The project has not been registered, nor is it seeking registration under any other GHG program.

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG program.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The project is not included in an emissions trading program or any other mechanism that includes GHG allowance trading.

1.16.2 Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related credit, including renewable energy certificates.

Supply Chain (Scope 3) Emissions

Not applicable. The manufacturer of the cookstoves has signed Donation and Carbon Transfer Agreements to declare that the ownership of the carbon assets generated from this project belongs to Iceberg.

1.17 Sustainable Development Contributions

Before the implementation of the project, local people in the project location use non-renewable biomass for cooking with open fire or three-stone fire. The project distributes fuel-efficient ICS to replace the baseline cookstoves in households. The project enables and enhance households to achieve several sustainable development goals:

Goal 1: No poverty

Indicator 1.1.1: Proportion of the population living below the international poverty line by sex, age, employment status and geographic location (urban/rural)

Improved cookstove is a basic service necessary to lead a healthy and productive life, including saving time and money for wood fuel at the household level. The project proponent will distribute 100,000 ICSs, and the ICSs are produced in local factories. Hence the

implementation of the project results in more job opportunities and higher income for local residents.

Goal 2: Zero hunger

Indicator 2.1.1: Prevalence of undernourishment.

The project improves food security and nutrition status, particularly for children and women by reducing inadequate cooking, the burden of firewood collection, the time to prepare food, the need to buy firewood.

Goal 3: Good health and well-being

Indicator 3.9.1: Mortality rate attributed to household and ambient air pollution.

Most of non-renewable biomass local people used for cooking is firewood, which generates high PM2.5 and high CO biomass smoke when incompletely burnt. By using ICS, it reduces people's exposure to high PM2.5 and high CO due to higher efficiency of combustion leading to faster cooking and more complete combustion. It also reduces the burn risk, significant to children and toddlers due to enclosure of the fire in the combustion chamber.

Goal 4: Quality education

Indicator 4.3.1: Participation rate of youth and adults in formal and non-formal education and training in the previous 12 months, by sex.

The project reduces the time spend on firewood collection for children, especially for girls, which increases their time for education. The implementation of project needs plenty of local people to participate in production, distribution or use steps. They get relevant skills and sustainable development and global citizenship education through training by project proponent.

Goal 5: Gender equality

Indicator 5.4.1: Proportion of time spent on unpaid domestic and care work, by sex, age, and location.

The project reduces women and children's drudgery through time savings in reducing time spent cutting, collecting, and carrying firewood from trees far removed from households and reduce time spent cooking over toxic smoky open fires. These tasks, if being undertaken without relief, are a major cause of gender inequality.

Goal 6: Clean water and sanitation

Indicator 6.6.1: Change in the extent of water-related ecosystems over time

Clean cooking technology provides an essential tool to addressing energy poverty and ensuring sustainable energy security in approximately 100,000 Kenya households during the project lifecycle. It also reduces the smoke and GHG emissions during water boiling.

Goal 7: Affordable and clean energy**Indicator 7.1.2: Proportion of population with primary reliance on clean fuels and technology**

The ICS distributed to Household is a clean cooking technology. The project will increase the proportion of population with primary reliance on clean cooking technology in project area.

Goal 8: Decent work and economic growth**Indicator 8.3.1: Proportion of informal employment in total employment, by sector and sex.**

The factories which produce ICS are local enterprises. They hire more workers to produce ICSs for the project. During the project crediting period, the project proponent and its local partners are in charge of maintenance and monitoring plan, which creates working opportunities for local people.

Goal 9: Industry, Innovation, and Infrastructure**Indicator 9.3.1: Proportion of small-scale industries in total industry value added**

The local factories which produce ICS for project are small-scale industries. They expand production capacity to satisfy the needs. Thus, the upstream and downstream supply chain benefit from the project. Many of the workers hired by the factories for the project were peasants before. So the project increases manufacturing employment.

Goal 13: Climate action**Indicator 13.2.2: Total greenhouse gas emissions per year**

The average annual GHG emission reduction from the project is expected to be 222,137 tCO₂e due to less non-renewable firewood combustion for cooking and heating in the households.

Goal 15: Life on land**Indicator 15.1.1: Forest area as a proportion of total land area**

The project helps local people consume less firewood as the ICS has higher thermal efficiency and it results in a reduction of GHG emissions compared to the baseline scenario. It also helps reduce deforestation and protect biodiversity and natural habitats in Kenya.

1.18 Additional Information Relevant to the Project

Leakage Management

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

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of the project description.

Further Information

No further information.

2 SAFEGUARDS

2.1 No Net Harm

The project activity reduces the use of non-renewable biomass for combustion. No potential negative environmental or socio-economic impacts have been identified for the project.

2.2 Local Stakeholder Consultation

Local people, communities and or representatives who are directly or indirectly affected by the project, such as end-users, stove manufacturer, local NGOs and local officials were identified as stakeholders. Iceberg also identified and encouraged anyone who were interested in the project to attend the local stakeholder consultation. Iceberg and its local partner invited local authorities, end-users, stove manufacturer and local non-governmental organisations (NGOs) to participate in the local stakeholder consultation. Various inviting methods were applied for the stakeholder consultation meeting. For the convenience of stakeholders, the invitations were in both English and Swahili. The invitation was sent to villagers through broadcast in villages to make sure everyone can understand. Some local people were invited by phone call. For local officers and entrepreneurs, invitation letters were sent to them as formal invitation. National government officials, local and international NGOs were invited by email. Iceberg and its local partners had already established contact with most of identified stakeholders when started preparing the project. They also communicated with stakeholders in person or by phone before they set the date so that as many as possible stakeholders could participate. The official invitations were sent out a few days before the consultation meeting started.

Stakeholder consultation meeting was held separately on 16/05/2022 in Kiambu County and on 19/05/2022 in Murang'a County. The agendas of two stakeholder meetings were almost same. First, the chief of the area introduced himself and welcomed all the stakeholders. He

welcomed Iceberg's local partner JCI to address the stakeholders what he did and the team which would manage the project.

Then the representative of Iceberg briefly described the relationship with Iceberg and why they had decided to provide the cookstoves for free. The stakeholders asked him a few questions and he handled all the issues effectively.

The chief told the attendees that the objective of the meeting was to receive feedback about the project from all stakeholders involved and therefore everybody was free to present his/her opinions concerning the project, which would be considered during the implementation of the project.

In the end, continuous input and grievance mechanism was discussed. We agreed on the following

1. Set up a hotline that would be used to complain any problems concerning the project by phone.
2. Have a hard copy of opinion book in each village to record any incidences or occurrences.
3. Ensure that a close collaboration is groomed and maintained between the representatives of JCI and Iceberg with the users and the village elders.

The village leaders are in charge of reporting the problems stated in the opinion books to the representative of JCI, and the latter will also check the opinion books occasionally to see the problems reported and find solutions with users. They will also report problems to their team leaders, who will transfer these opinions to Iceberg and JCI to make improvements.

2.3 Environmental Impact

No negative environmental impacts have been identified from the project and environmental impact assessment is not applicable for the project.

2.4 Public Comments

This project was open for public comment from 21/09/2022 to 21/10/2022⁵. There are no comments received during the public comment period.

2.5 AFOLU-Specific Safeguards

This section is not applicable as the project is a non-AFOLU project.

⁵ <https://registry.terra.org/app/projectDetail/VCS/3197>

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Methodology:

VMR0006 Methodology for Installation of High Efficiency Firewood Cookstoves, Version: 1.1

Reference:

TOOL30: Calculation of the fraction of non-renewable biomass, version 03.0

3.2 Applicability of Methodology

The project activity meets each of the applicability conditions:

No.	Applicability criterion	How the project complies
1	Project activities shall be implemented in domestic premises, or in community-based kitchens.	The project activity replaces traditional wood-based stove (mainly three stone) in individual households only.
2	The project stove shall have specified high-power thermal efficiency of at least 25% per the manufacturer's specifications and shall exclusively use woody biomass and can be single pot or multi-pot; in case of project stove replacing fossil fuel baseline stove, it shall exclusively use renewable biomass.	The Jiko Kisasa improved cookstove has a specified high-power thermal efficiency of 27.2% as per the manufacturer's specifications. It uses non-renewable biomass only.
3	Both 'Projects' and 'Large Projects' can use this methodology.	Since the average annual GHG emission reduction from the project is expected to be 222,137 tCO ₂ e, it is a large project as per Paragraph 3.10.1 of VCS Standard (Version 4.4).
4	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.	A literature published in 1989 showed that firewood was the principal cooking and heating fuels in rural area of Kenya, which caused dramatically increasing environmental damage like deforestation, soil erosion ⁶ . Biomass

⁶ <https://journals.sagepub.com/doi/abs/10.1177/014459878900700205>

		Energy Use in Kenya ⁷ , IEA(International Energy Agency) report in 2019 ⁸ , and baseline survey conducted by project proponent before the implementation of the project, all demonstrate that non-renewable biomass has been used since 31 December 1989 till date in Kenya.
5	For the specific case of biomass residues processed as a fuel (e.g. briquettes, wood chips), it shall be demonstrated that: (a) It is produced using exclusively renewable biomass (more than one type of biomass may be used). (b) The consumption of the fuel should be monitored during the crediting period and (c) Energy use for renewable biomass processing (e.g. shredding and compacting in the case of briquetting) may be considered as equivalent to the upstream emissions associated with the processing of the displaced fossil fuel and hence disregarded.	According to baseline survey, all of the sampled households used firewood for cooking while no biomass residues such as briquettes and woods were used. The consumption of the fuel used in the project activity will be monitored. If the specific case of biomass residues processed as a fuel (e.g. briquettes, wood chips) are used in project stoves, it will be demonstrated that: (a) It is produced using exclusively renewable biomass (more than one type of biomass may be used). (b) The consumption of the fuel should be monitored during the crediting period and (c) Energy use for renewable biomass processing (e.g. shredding and compacting in the case of briquetting) may be considered as equivalent to the upstream emissions associated with the processing of the displaced fossil fuel and hence disregarded. Otherwise, the emission reduction of the project stoves using biomass residues will be excluded from the ER calculation.
6	The project description shall explain the proposed method for distribution of project devices including the method to avoid double counting of emission reductions	Each ICS distributed in this project has a unique identification ID, and the user's basic information (e.g. name, location, unique identification ID) are recorded.

⁷ <https://iied.org/sites/default/files/pdfs/migrate/G02985.pdf>

⁸ <https://www.iea.org/articles/kenya-energy-outlook>

	such as unique identifications of product and end-user locations (e.g. programme logo).	The ICS is also labelled with programme logo. Hence, the above methods can make sure that it avoids double counting of emission reductions.
7	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 local partner and end users have signed agreements with project proponent stating clearly that the PP has the sole ownership of the VCUs arising from the project.
8	Tool30 may be used by: (a) DNAs to submit region- or country-specific default fNRB values, following the procedures for development, revision, clarification and update of standardized baselines (SB procedures); or (b) project participants to calculate project- or PoA-specific fNRB values.	The project proponent has used tool30 to calculate project-specific fNRB value.

3.3 Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Emission from use of non-renewable biomass/Fossil fuel	CO ₂	Yes	Major source
		CH ₄	Yes	Major source
		N ₂ O	Yes	Major source
		Other	No	No other source identified
	Production & Transport of Fuel	CO ₂	No	Baseline and project fuels are same thus no transportation and production triggering from project activity.
		CH ₄	No	Baseline and project fuels are same thus no transportation and production triggering from project activity.
		N ₂ O	No	Baseline and project fuels are same thus no transportation and production triggering from project activity.

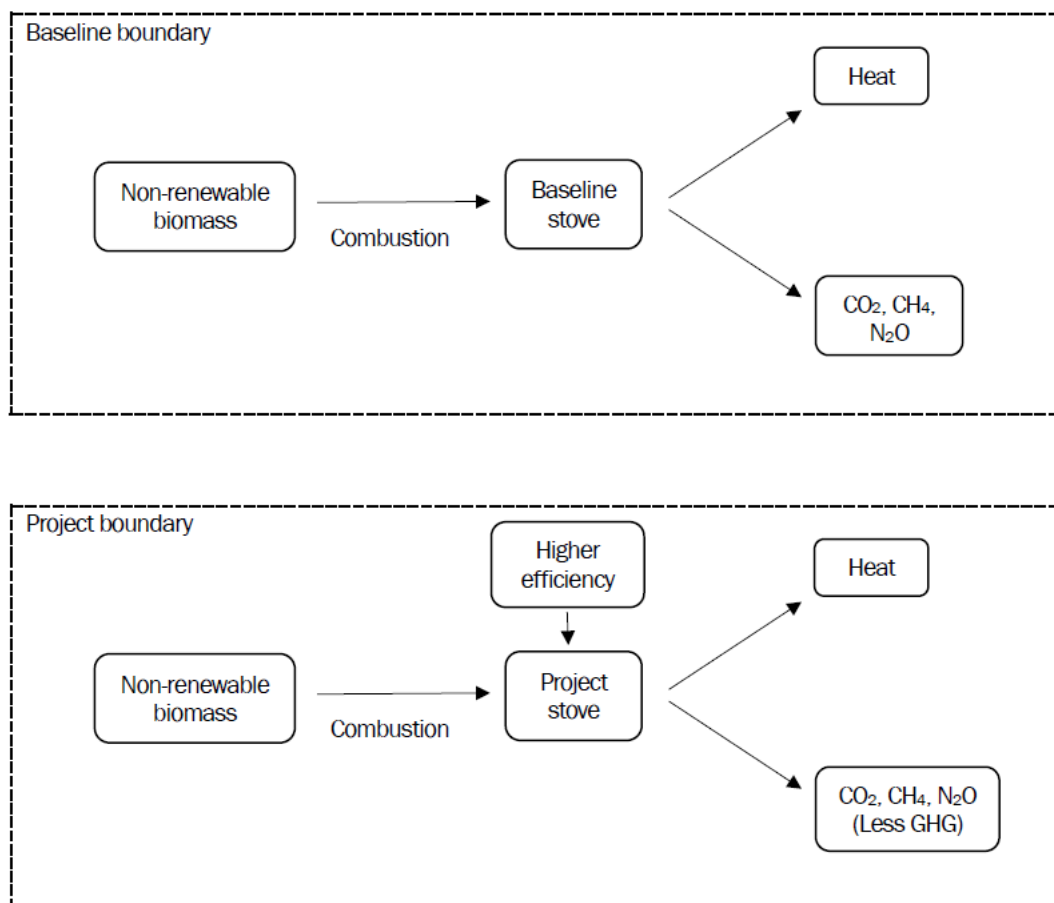
Source		Gas	Included?	Justification/Explanation
		Other	No	No other source identified
Project	Emission from use of nonrenewable biomass/Fossil fuel	CO ₂	Yes	Major source
		CH ₄	Yes	Major source
		N ₂ O	Yes	Major source
		Other	No	No other source identified
	Production & Transport of Fuel	CO ₂	No	Baseline and project fuels are same thus no transportation and production triggering from project activity.
		CH ₄	No	Baseline and project fuels are same thus no transportation and production triggering from project activity.
		N ₂ O	No	Baseline and project fuels are same thus no transportation and production triggering from project activity.
		Other	No	No other source identified

The project boundary is shown below:



Figure 3: Project boundary is across Kenya

A diagram of the energy flow in baseline boundary and project boundary is shown below:



3.4 Baseline Scenario

Over 90% of the rural population and around 75% of all Kenyan households still cook with wood or charcoal⁹. The project proponent has conducted a baseline survey from 25/05/2022 to 06/06/2022 among 120 households from 6 villages, which shows that 96.67% of surveyed households used three-stone fire and 3.33% used open fire before the project implemented. All of the households used firewood for cooking. The baseline scenario is the continued use of non-renewable wood fuel (firewood) by the target population to meet similar thermal energy needs as provided by project cookstoves in absence of project activity.

Multi-stage sampling was applied in the baseline survey to determine η_{old} , the only parameter requires to be determined by baseline survey for ER calculation according to the applied methodology. According to Equation 16 in Guideline for sampling and surveys for project activities and programmes of activities (Version 04.0) as well as the baseline survey:

⁹ https://ambitiontoaction.net/wp-content/uploads/2021/07/A2A_Kenya_CleanCookingStudy_July2021.pdf#:~:text=Even%20though%20Kenya%20has%20made%20significant%20progress%20over,petroleum%20gas%20%28LPG%29%20as%20their%20primary%20cooking%20fuel.

$$c \geq \frac{\frac{SD_B^2}{p^2} \times \frac{M}{M-1} + \frac{1}{u} \times \frac{SD_W^2}{p^2} \times \frac{(\bar{N} - \bar{u})}{(N-1)}}{\frac{0.1^2}{1.645^2} + \frac{1}{M-1} \times \frac{SD_B^2}{p^2}} \quad \text{Equation (16)}$$

Where:

C	=	Number of groups that should be sampled
M	=	Total number of groups in the population (120 villages)
$\bar{u}$	=	Number of units to be sampled within each group (pre-specified as 10 households)
$\bar{N}$	=	Average units per group (50 households per village)
SD_B^2	=	Unit variance (variance between villages)
SD_W^2	=	Average of the group variances (average within village variation)
p	=	Overall proportion
1.645	=	Represents the 90% confidence required
0.1	=	Represents the 10% relative precision

Since the result of baseline survey is 100% using open fire and three-stone fire, which means the η_{old} of all the surveyed households belongs to option(a) of parameter table η_{old} . in Section 5.1. Therefore, the default value $\eta_{old} = 0.1$ is used for all the surveyed households. Thus, SD_B^2 =the variance between villages=0, SD_W^2 =average within village variation =0. Therefore, when the number of villages that were sampled is 6, 90/10 confidence/precision was achieved in the baseline survey. (because when $SD_B^2=SD_W^2=0$, the calculation result of the right side of Equation 16 is 0, which means C =number of groups (it means villages for the project) that should be sampled ≥ 0 . So when $C=6$, 90/10 confidence/precision has been achieved).

3.5 Additionality

The methodology uses activity method for the demonstration of additionality.

Step 1: Regulatory Surplus

The project is not mandated by any law, statute or other regulatory framework in the host country, or for UNFCCC non-Annex I countries, any systematically enforced law, statute or other regulatory framework.

The project is implemented by Iceberg as well as its local partners and participated by local households voluntarily.

Step 2: Positive List

As per Section 3.2 of the PD, the project meets all the applicability conditions of the methodology which represent the positive list.

The ICSs are distributed at zero cost to local households. The project is not implemented as part of government schemes or supported by multilateral funds. Iceberg undertakes all the expenditures for project implementation and has no other source of revenue other than the sale of GHG credits.

Conclusion: As the project meets the conditions above, it is deemed additional as per the applied methodology.

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 applied methodology does not account for baseline emissions separately, but instead 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. Please refer to Section 4.4 of the PD.

4.2 Project Emissions

The applied methodology does not account for project emissions separately, but instead 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. Please refer to Section 4.4 of the PD.

4.3 Leakage

Leakage shall be considered as default 0.95 in accordance with the applied methodology.

4.4 Net GHG Emission Reductions and Removals

The project activity will replace traditional wood-based stove with ICS, therefore net GHG emission reductions are calculated by applying Equations 1 and 2.

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

Where:

- i = Indices for the situation where more than one type/model of improved cook stove is introduced to replace three-stone fire
- j = Indices for the situation where there is more than one batch of improved cook stove of type i
- ER_y = Emission reductions during year y in t CO₂e
- $ER_{y,i,j}$ = Emission reductions by improved cook stove of type i and batch j during year y in t CO₂e

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

Equation (2)

Where:

- $B_{y,saving,i,j}$ = Quantity of woody biomass that is saved in tonnes per improved cook stove of type i and batch j during year y
- $f_{NRB,y}$ = Fraction of woody biomass that can be established as non-renewable biomass (f_{NRB}). The value is calculated to be 0.89.
- $NCV_{wood\ fuel}$ = Net calorific value of the non-renewable woody biomass that is substituted or reduced (IPCC default for wood fuel, 0.0156 TJ/tonne)¹⁰
- EF_{wf,CO_2} = CO₂ emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO₂/TJ)¹¹
- $EF_{wf,non\ CO_2}$ = Non-CO₂ emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO₂/TJ)¹²
- $N_{y,i,j}$ = Number of improved cook stoves of type i and batch j operating during year y
- 0.95 = Discount factor to account for leakage

According to "TOOL30: Calculation of the fraction of non-renewable biomass", equation below is used to calculate f_{NRB} :

$$f_{NRB} = \frac{NRB}{NRB + RB}$$

Where:

¹⁰ AMS II.G. Version 11

¹¹ 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Chapter 2 Stationary Combustion

¹² 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Chapter 2 Stationary Combustion

f_{NRB}	=	Fraction of non-renewable biomass in the applicable area in the relevant period (fraction or %)
NRB	=	Quantity of non-renewable biomass consumed in the applicable area in the relevant period (tonnes)
RB	=	Quantity of renewable biomass that is available on a sustainable basis in the applicable area in the relevant period (tonnes)

The quantity of non-renewable biomass consumed in the applicable area (NRB) shall be determined as the difference between the total consumption of woody biomass in the applicable area (H) and the quantity of renewable biomass that can be sustainably harvested in the applicable area (RB):

$$NRB = H - RB$$

Where:

H	=	Total consumption of woody biomass in the applicable area in the relevant period (tonnes)
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The total consumption of woody biomass (H) is calculated using the following equation, accounting for all consumption within the applicable area (not only wood fuel but also timber and industrial consumption):

$$H = HW \times N + CE + NE$$

Where:

HW	=	Average consumption of wood fuel per household, including fuelwood and charcoal, in the applicable area in the relevant period (tonnes//household)
CE	=	Commercial woody biomass consumption for energy applications (e.g. commercial, industrial or institutional uses of woody biomass in ovens, boilers etc.) that are extracted from forests or other land areas in the applicable area in the relevant period (tonnes)
NE	=	Commercial woody biomass consumption for non-energy applications (e.g. construction, furniture) that are extracted from forests or other land areas in the applicable area in the relevant period (tonnes)
N	=	Number of households consuming wood fuel within the applicable area in the relevant period (number)

The quantity of renewable biomass available in the applicable area (RB) is estimated using the following equation:

$$RB = \sum (MAI_{forest,i} \times (F_{forest,i} - P_{forest,i})) + \sum (MAI_{other,i} \times (F_{other,i} - P_{other,i}))$$

Where:

- $MAI_{forest,i}$ = Mean Annual Increment of woody biomass growth per hectare in sub-category i of forest areas in the relevant period (tonnes/ha/yr)
- $MAI_{other,i}$ = Mean Annual Increment of woody biomass growth per hectare in sub-category i of other land areas in the relevant period (tonnes/ha/yr)
- $F_{forest,i}$ = Extent of forest in sub-category i in the relevant period (ha)
- $F_{other,i}$ = Extent of other land in sub-category i in the relevant period (ha)
- $P_{forest,i}$ = Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within forest areas (in sub-category i) in the relevant period (ha)
- $P_{other,i}$ = Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within other land areas (in sub-category i) in the relevant period (ha)
- i = Sub-category i of forest areas and other land areas

The Total woody biomass consumption(H) has been calculated as follows:

Variable		Unit	Value
Domestic fuelwood consumption		t/yr	18,797,667
	Wood fuel	m ³ /yr	25,927,816 ¹³
Non-domestic (energy) wood consumption		t/yr	7,532,660
	Wood charcoal	t/yr	1,255,443
Non-domestic (non-energy) wood consumption		t/yr	1,403,956
	Industrial roundwood	m ³ /yr	1,010,175
	Sawnwood	m ³ /yr	288,918
	Veneer sheets	m ³ /yr	7,275
	Wood-based panels	m ³ /yr	171,480

¹³ <https://www.fao.org/3/cc3475m/cc3475m.pdf>

Conversion factors			
	Wood density	t/m ³	0.725 ¹⁴
	Biomass conversion and expansion factor	t/m ³	0.950 ¹⁵
	Charcoal to wood biomass factor	-	6
H: Total woody biomass consumption		t/yr	27,734,283

The Renewable biomass (RB) has been calculated as follows:

FAO Global Ecological Zone	Total forest cover (ha)	Protected area cover (ha)	Remote area cover (ha)	Accessible area cover (ha)	MAI (t/ha/yr)	Annual growth (t/yr)
Tropical dry forest	49,299.0	4,706.0	1,870.0	42,723.0	1.7	70,827.2
Tropical moist forest	623,476.0	1,409.0	459,002.0	163,065.0	0.9	143,831.2
Tropical mountain system	2,115,850.0	309,620.0	379,228.0	1,427,002.0	1.7	2,472,472.9
Tropical rainforest	97,453.0	15,705.0	997.0	80,751.0	3.6	292,364.6
Tropical shrubland	125,391.0	5,120.0	39,830.0	80,441.0	0.9	71,480.4
Total RB	3,011,469	336,560	880,927	1,793,982	-	3,050,976

Data source: Global Forest Resources Assessment (FRA) 2020 Kenya - Report (fao.org)

Therefore, the NRB = H - RB = 27,734,283 - 3,050,976 = 24,683,307 t/yr.

Then the f_{NRB} is calculated as:

Variable	Unit	Value
Total woody biomass consumption (H)	t/yr	27,734,283
Renewable biomass (RB)	t/yr	3,050,976
Non-renewable biomass (NRB)	t/yr	24,683,307
f_{NRB}	-	0.89

A value of 0.89 is calculated. The details of the calculation please refer to submitted document “21_Kenya f_{NRB} ”.

The quantify of woody biomass saved due to implementation of improved cook stoves can be estimated by one of the following options¹⁶ set out in Equations 3 and 4:

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

$$B_{y,savings,i,j} = B_{y=1,new,i,survey} \times \left(\frac{\eta_{new,y,i,j}}{\eta_{old}} - 1\right) \quad \text{Equation (4)}$$

¹⁴ <https://www.fao.org/3/cb0019en/cb0019en.pdf>

¹⁵ <https://www.fao.org/3/i6935e/i6935e.pdf>

¹⁶ The option to determine the $B_{y,savings,i,j}$ shall be decided prior to validation of the project.

Where:

B_{old}	=	Annual quantity of woody biomass that would have been used in the absence of the project activity (in tonnes per device) to generate useful thermal energy equivalent to that provided by the improved cook stove. The value of Bold can be sourced from historical data or baseline surveys. Alternatively, a default value of 0.5t/capita/year may be used.
η_{old}	=	Efficiency of baseline cookstove. The value is 0.1 based on baseline survey.
$\eta_{new,y,i,j}$	=	Efficiency of the improved cook stove type i and batch j determined through water boiling test (WBT). Alternatively, efficiency may be determined using Equation 5.
$B_{y=1,new,i,survey}$	=	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 value is assumed to be 3.19 kg/device/day or equal to 1.16 tonnes/device/year.

Equation 4 is chosen to estimate the quantify of woody biomass saved due to implementation of improved cook stoves.

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

Where:

η_p	=	Efficiency of project stove (fraction) at the start of project activity; the value is 27.2% as per the specifications provided by manufacturer
$(DF_n)^{y-1}$	=	Discount factor to account for efficiency loss of project cookstove per year of operation (fraction). This value may be based on actual monitoring or based on manufacturer's declaration on expected loss in efficiency or through publicly available literature on relevant industry standards. Alternatively default value of 0.99 efficiency loss per year can be considered.
0.94	=	Adjustment factor to account for uncertainty related to project cookstove efficiency test

The Equation 6 in the applied methodology is used when the project households continue to use baseline cookstoves along with improved cookstoves. Since only the firewood used in the ICSs implemented by the project will be taken into account for calculation of emission reductions, the Equation 6 is not applicable in PD for ex-ante estimation.

The Equation 7 and 8 in the applied methodology is used for project stoves replacing fossil fuel with renewable biomass. The project involves replacing low thermal efficient wood fuel combusted cookstoves with high thermal efficient wood fuel combusted cookstoves only. Relatively rich households who can afford fossil fuel will not be involved in the donation project. Thus Equation 7 and 8 are not applicable.

For ex-ante calculation purpose, the assumption below is applied.

$$\eta_p = 27.2\%$$

$$DF_n = 0.99;$$

Therefore, $\eta_{new,y,i,j}$ is calculated as below:

Age(y)	$\eta_{new,y,i,j}$
1	25.57%
2	25.31%
3	25.06%
4	24.81%
5	24.56%
6	24.31%
7	24.07%

The project will install up to 100,000 ICSs in 2 years, hence 50,000 ICSs each year. The life span of ICS is 7 years. In the sixth year of the ICSs installed, the project proponent will provide a new ICS to Households or repair existing ICS without cost, so that households will have access to them for the full crediting period. The annual loss rate is assumed to be 10%.

Therefore, the $N_{y,i,j}$ and $\eta_{new,y,i,j}$ are estimated as below:

	Year(y)	ICSs installed in year 1&6		ICSs installed in year 2&7	
		$N_{y,i,j}$	$\eta_{new,y,i,j}$	$N_{y,i,j}$	$\eta_{new,y,i,j}$
First-time Distribution	1	50000	25.57%		
	2	45000	25.31%	50000	25.57%
	3	40000	25.06%	45000	25.31%
	4	35000	24.81%	40000	25.06%
	5	30000	24.56%	35000	24.81%
	6	25000	24.31%	30000	24.56%
	7	0	24.07%	25000	24.31%
Second-time Distribution	6	50000	25.57%	0	0.00%
	7	45000	25.31%	50000	25.57%

8	40000	25.06%	45000	25.31%
9	35000	24.81%	40000	25.06%
10	30000	24.56%	35000	24.81%

$B_{y=1,new,i,survey} = 3.19 \times 365 / 1000 = 1.16$ tonnes/device/year according to ex-ante estimation.

The expected emission reduction is as below:

Year(y)	ERs from ICSs installed in year 1&1	ERs from ICSs installed in year 2&7	Total
1	82,622	0	82,622
2	146,278	82,622	228,900
3	127,875	146,278	274,152
4	110,029	127,875	237,903
5	92,730	110,029	202,759
6	120,608	92,730	213,338
7	146,278	120,608	266,885
8	127,875	146,278	274,152
9	110,029	127,875	237,903
10	92,730	110,029	202,759

The applied methodology does not account for baseline and project emissions separately, but instead 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. The ex-ante calculation in the table below.

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)
21/06/2022-31/12/2022	N.A.	N.A.	0	23,340
01/01/2023-31/12/2023	N.A.	N.A.	0	160,369

01/01/2024-31/12/2024	N.A.	N.A.	0	273,525
01/01/2025-31/12/2025	N.A.	N.A.	0	254,886
01/01/2026-31/12/2026	N.A.	N.A.	0	219,224
01/01/2027-31/12/2027	N.A.	N.A.	0	197,267
01/01/2028-31/12/2028	N.A.	N.A.	0	241,799
01/01/2029-31/12/2029	N.A.	N.A.	0	281,862
01/01/2030-31/12/2030	N.A.	N.A.	0	254,886
01/01/2031-31/12/2031	N.A.	N.A.	0	219,224
01/01/2032-20/06/2032	N.A.	N.A.	0	94,991
Total	N.A.	N.A.	0	2,221,373

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$f_{NRB,y}$
Data unit	Fraction
Description	Fraction of woody biomass saved by the project activity during year y that can be established as non-renewable biomass
Source of data	Calculated
Value applied	0.89
Justification of choice of data or description of measurement methods and procedures applied	As per the "TOOL30: Calculation of the fraction of non-renewable biomass, version 3.0". Please refer to Kenya f_{NRB} calculation sheet.
Purpose of Data	Calculation of emission reductions

Comments	.
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Data / Parameter	$NCV_{wood\ fuel}$
Data unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass that is substituted or reduced
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 1 Introduction: Table 1.2 Default net calorific values (NCVs) and lower and upper limits of the 95 percent confidence intervals.
Value applied	0.0156
Justification of choice of data or description of measurement methods and procedures applied	IPCC default value
Purpose of Data	Calculation of emission reductions
Comments	

Data / Parameter	EF_{wf,CO_2}
Data unit	tCO ₂ /TJ
Description	CO ₂ emission factor for the use of wood fuel in baseline scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion: Table 2.5 Default emission factors for stationary combustion in the residential and agriculture/forestry/fishing/fishing farms categories.
Value applied	112
Justification of choice of data or description of measurement methods and procedures applied	IPCC default value
Purpose of Data	Calculation of emission reductions
Comments	

Data / Parameter	$EF_{wf,non\ CO_2}$
Data unit	tCO ₂ /TJ
Description	Non-CO ₂ emission factor for the use of wood fuel in baseline scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion
Value applied	26.23
Justification of choice of data or description of measurement methods and procedures applied	IPCC default value
Purpose of Data	Calculation of emission reductions
Comments	

Data / Parameter	η_p
Data unit	Fraction
Description	Efficiency of project stove at the start of project activity.
Source of data	Manufacturer's specification and Test Report by KIRDI Stove Testing Centre in Kenya using WBT test protocol 4.2.3
Value applied	27.2%
Justification of choice of data or description of measurement methods and procedures applied	This parameter shall be determined ex-ante
Purpose of Data	Calculation of emission reductions
Comments	

5.2 Data and Parameters Monitored

Data / Parameter	$N_{y,i,j}$
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Data unit	Number
Description	Number of project devices of type i and batch j operating during year y
Source of data	Monitoring
Description of measurement methods and procedures to be applied	Measured directly or based on a representative sample. Sampling standard shall be used for determining the sample size to achieve 90/10 confidence precision according to the latest version of Standard for sampling and surveys for CDM project activities and programme of activities.
Frequency of monitoring/recording	At least once every two years
Value applied	For ex-ante emission reduction calculation, it is assumed that the project will distribute up to 100,000 ICSs and the installation/ distribution of ICSs to be implemented in 2 years with each year comprises of 50,000 ICSs.
Monitoring equipment	Monitoring survey
QA/QC procedures to be applied	
Purpose of data	Calculation of emission reductions
Calculation method	Proportion of operational stoves obtained from the survey is multiplied by the total commissioned stoves to arrive at this value
Comments	

Data / Parameter	$\eta_{\text{new},y,i,j}$
Data unit	Fraction
Description	Efficiency of the improved cookstove type i and batch j implemented as part of the project activity
Source of data	Calculation

Description of measurement methods and procedures to be applied	Efficiency of the improved cookstoves is estimated ex-ante using equation 5 above where loss in efficiency per year is calculated, and therefore this parameter does not need to be monitored.																	
Frequency of monitoring/recording	Annually																	
Value applied	<table> <tr> <td>Age(y)</td> <td>$\eta_{new,y,i,j}$</td> </tr> <tr> <td>1</td> <td>25.57%</td> </tr> <tr> <td>2</td> <td>25.31%</td> </tr> <tr> <td>3</td> <td>25.06%</td> </tr> <tr> <td>4</td> <td>24.81%</td> </tr> <tr> <td>5</td> <td>24.56%</td> </tr> <tr> <td>6</td> <td>24.31%</td> </tr> <tr> <td>7</td> <td>24.07%</td> </tr> </table>		Age(y)	$\eta_{new,y,i,j}$	1	25.57%	2	25.31%	3	25.06%	4	24.81%	5	24.56%	6	24.31%	7	24.07%
Age(y)	$\eta_{new,y,i,j}$																	
1	25.57%																	
2	25.31%																	
3	25.06%																	
4	24.81%																	
5	24.56%																	
6	24.31%																	
7	24.07%																	
Monitoring equipment	Not applicable																	
QA/QC procedures to be applied	Not applicable																	
Purpose of data	Calculation of emission reductions																	
Calculation method	Equation 5 above: $\eta_{new,y,i,j} = \eta_p \times (DF_n)^{y-1} \times 0.94$																	
Comments																		

Data / Parameter	$B_{y=1,new,i,j,survey}$
Data unit	tonnes
Description	Quantity of woody biomass used by project devices in tonnes per device of type i
Source of data	Survey
Description of measurement methods and procedures to be applied	Minimum sample size of each type i and batch j should be in line with the latest version of Standard for sampling and surveys for project activities and programmes of activities or guidelines provided in section 8.4 option (b).

	Determined in the first year of the introduction of the devices (e.g., during the first year of the crediting period, $y=1$) through measurement campaigns at representative households and/or sample survey. Sample surveys to estimate this parameter, that are solely based on questionnaires or interviews (i.e. that do not implement measurement campaigns) may only be used if the following conditions are satisfied : (a) Baseline cookstoves have been completely decommissioned and only improved cookstoves are exclusively used in the project households; (b) If multiple devices are used in the project, it is possible from the results of the survey questions to clearly differentiate the quantity of firewood being used by each device. In other words, if more than one device, or another device that consumes firewood, are in use in project households, then the sample survey needs to distinguish the quantity of firewood used by the project device and the other devices that use firewood.
Frequency of monitoring/recording	Determined in the first year of project implementation
Value applied	For ex-ante emission reduction calculation, it is assumed as 3.19kg/device/day, equal to 1.16 tonnes/device/year.
Monitoring equipment	Monitoring survey
QA/QC procedures to be applied	
Purpose of data	Calculation of emission reductions
Calculation method	N/A
Comments	

Data / Parameter	η_{old}
Data unit	Fraction
Description	Efficiency of baseline cookstove
Source of data	- Default value: 0.1 or 0.2; or - Surveyed prior to implementation of project activity

	The baseline survey was conducted by local staff of the project proponent in Kenya. It was taken from 25/05/2022 to 06/06/2022 among 120 households from 6 villages.																														
Description of measurement methods and procedures to be applied	(a) A default value of 0.1 shall be used if baseline device 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. (b) A default value of 0.2 shall be used for other types of devices. (c) If more than one type of baseline device is being replaced in the project region, weighted average values (taking the amount of woody biomass consumed by each device as the weighting factor) shall be used. (d) If this parameter is surveyed, project promoters may use simplified guidelines stated under Option (b) in Section 8.4 above for arriving at the minimum sample size. The following is outcome of baseline survey: <table><tr><th>Kind of cook stove in baseline scenario</th><th>Number of households</th><th>Percentage</th></tr><tr><td>open fire</td><td>4</td><td>3.33%</td></tr><tr><td>three-stone fire</td><td>116</td><td>96.67%</td></tr><tr><td>conventional stove without grate or chimney</td><td>0</td><td>0.00%</td></tr><tr><td>LPG stove</td><td>0</td><td>0.00%</td></tr><tr><td>basic charcoal or coal cookstove</td><td>0</td><td>0.00%</td></tr><tr><td>improved stove with grate or chimney</td><td>0</td><td>0.00%</td></tr><tr><td>portable improved cookstove</td><td>0</td><td>0.00%</td></tr><tr><td>others</td><td>0</td><td>0.00%</td></tr><tr><td>Total</td><td>120</td><td>100.00%</td></tr></table> The result of baseline survey is 3.33% using open fire and 96.67% three-stone fire, which 100% of them belongs to option(a) above. Hence, the applied value is 0.1 of η_{old}.	Kind of cook stove in baseline scenario	Number of households	Percentage	open fire	4	3.33%	three-stone fire	116	96.67%	conventional stove without grate or chimney	0	0.00%	LPG stove	0	0.00%	basic charcoal or coal cookstove	0	0.00%	improved stove with grate or chimney	0	0.00%	portable improved cookstove	0	0.00%	others	0	0.00%	Total	120	100.00%
Kind of cook stove in baseline scenario	Number of households	Percentage																													
open fire	4	3.33%																													
three-stone fire	116	96.67%																													
conventional stove without grate or chimney	0	0.00%																													
LPG stove	0	0.00%																													
basic charcoal or coal cookstove	0	0.00%																													
improved stove with grate or chimney	0	0.00%																													
portable improved cookstove	0	0.00%																													
others	0	0.00%																													
Total	120	100.00%																													
Frequency of monitoring/recording	Fixed for each individual household at the time of project implementation																														
Value applied	0.1 is applied based on baseline survey																														
Monitoring equipment	-																														
QA/QC procedures to be applied	-																														
Purpose of data	Calculation of emission reductions																														
Calculation method	-																														

Comments	-
Data / Parameter	Life span
Data unit	Years
Description	Project promoters to state the operating lifetime of project device for projects opting Equation 5 for determining project stove efficiency.
Source of data	Manufacturer's specification
Description of measurement methods and procedures to be applied	
Frequency of monitoring/recording	Once at the time of Project stove installation
Value applied	7
Monitoring equipment	
QA/QC procedures to be applied	
Purpose of data	Calculation of emission reductions
Calculation method	N/A
Comments	

5.3 Monitoring Plan

The local partners of Iceberg (i.e. project proponent) are in charge of the implementation of the monitoring plan and reporting to the project proponent. The project proponent is in charge of designing the monitoring plan and completing the monitoring report. Sampling survey will be applied for monitoring.

(a) Sampling Plan

As per the Standard for Sampling and Surveys for CDM Project Activities and Programmes of Activities, Version 09.0:

Sampling design

(1) Objectives and reliability requirements

The objective is determining the value of parameter $N_{y,i,j}$ and $B_{y=1,new,i,survey}$ during the crediting period, and with a 90/10 confidence/precision compliance with the applied methodology.

The following parameters may be determined by sampling:

Parameter	Description	Frequency
$N_{y,i,j}$	Number of project devices of type i and batch j operating during year y	Biennial
$B_{y=1,new,i,survey}$	Quantity of woody biomass used by project devices in tonnes per device of type i and batch j	Determined in the first year of project implementation

(2) Target population

The target population will be the complete set of appliances (ICS) deployed under the project.

(3) Sampling method and size

The sampling requirements of methodology are:

Parameter	Measurement procedures
$N_{y,i,j}$	Measured directly or based on a representative sample. Sampling standard shall be used for determining the sample size to achieve 90/10 confidence/precision levels. Separate samples shall be taken for each batch
$B_{y=1,new,i,survey}$	Determined in the first year of the introduction of the devices (e.g. during the first year of the crediting period, $y=1$) through measurement campaigns at representative households and/or sample survey. Sample surveys to estimate this parameter, that are solely based on questionnaires or interviews (i.e. that do not implement measurement campaigns) may only be used if the following conditions are satisfied: Pre-project devices have been completely decommissioned and only efficient project device(s) are exclusively used in the project households; If multiple devices are used in the project, it is possible from the results of the survey questions to clearly differentiate the quantity of woody biomass being used by each device. In other words, if more than one device, or

	another device that consumes woody biomass, are in use in project households, then the sample survey needs to distinguish the quantity of biomass used by the project device and the other devices that use biomass. Only the quantity of biomass used by the project device will be accounted in project caused emission reductions.
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According to “Standard sampling and surveys for CDM project activities and POAs (Ver9.0)” and “Guideline for sampling and surveys for CDM project and POA_(Ver 4.0)”, multi-stage sampling will be used. The sample size will be decided by the actual distribution quantity of ICSs then. The equations are shown below:

$$c \geq \frac{\frac{SD_B^2}{\bar{p}^2} \times \frac{M}{M-1} + \frac{1}{u} \times \frac{SD_w^2}{\bar{p}^2} \times \frac{(\bar{N}-u)}{(\bar{N}-1)}}{\frac{0.1^2}{1.645^2} + \frac{1}{M-1} \times \frac{SD_B^2}{\bar{p}^2}}$$

Where:

C	=	Number of groups that should be sampled
M	=	Total number of groups in the population
u	=	Number of units to be sampled within each group
N	=	Average units per group
SD_B^2	=	Unit variance (variance between villages)
SD_w^2	=	Average of the group variances (average within village variation)
p	=	Overall proportion
1.645	=	Represents the 90% confidence required
0.1	=	Represents the 10% relative precision

And

$$c \geq \frac{\left(\frac{SD_B}{Clustermean} \right)^2 \times \left(\frac{M}{M-1} \right) + \left(\frac{1}{u} \right) \times \left(\frac{SD_w}{Overallmean} \right)^2 \times \left(\frac{\bar{N}-u}{\bar{N}-1} \right)}{\left(\frac{0.1}{1.645} \right)^2 + \frac{1}{M-1} \left(\frac{SD_B}{Clustermean} \right)^2}$$

Where:

C	=	Number of groups that should be sampled
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M	=	Total number of groups in the population
u	=	Number of units to be sampled within each group
N	=	Average units per group
SD_B^2	=	Unit variance (variance between villages)
SD_W^2	=	Average of the group variances (average within village variation)
1.645	=	Represents the 90% confidence required
0.1	=	Represents the 10% relative precision

(b) Data to be collected

Besides the above parameters, the following data need to be collected as per the applied methodology:

- Date of distribution
- Geographic area of distribution
- Model/type of project technology distributed
- Quantity of project technologies distributed
- Name and telephone number (if available), and address of recipient
- unique identification alpha/numeric ID for each device that is sold/distributed

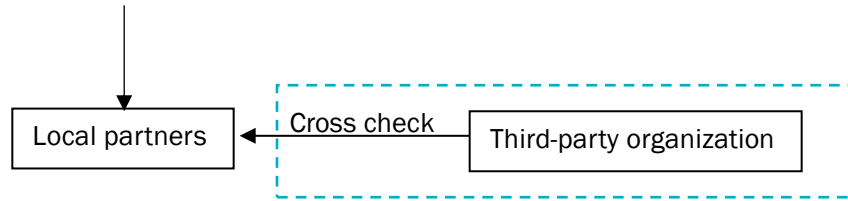
The information collected will be stored in the electronic database for 2 years after the end of crediting period.

Quality assurance/Quality control

Training about monitoring plan will be provided to local partners, including survey method, data record and analysis. The monitoring plan will be carried out by qualified personnel trained for quality assurance and quality control. The project proponent will inspect local partners to confirm that the personnel are qualified and the monitoring plan has been properly implemented. The data collected may be cross checked by the project proponent or a third-party organization.

The organizational structure for monitoring is shown as the bellow:

Project proponent



(c) Implementation plan

The main survey methods applied in the sampling plan include hardcopy questionnaires, online questionnaires, face to face interview and telephone interview. The potential of refusals and other means of non-responses will be taken into account for calculation of sample size. Meanwhile, in order to minimize the rates of non-response and answer bias, the questionnaires will be designed by professional team and widely tested before use.

Any non-conformances with the validated monitoring plan will be recorded and analysed. If they are in accordance with the applied methodology and other related rules, a change may be conducted in the validated monitoring plan. Otherwise, revision and improvement will be conducted in the monitoring. The related ERs will not be claimed in the monitoring report until the non-conformance has been corrected in the latter case.