



**Verified Carbon
Standard**

DISTRIBUTION OF IMPROVED COOK STOVES IN SUB-SAHARAN AFRICAZAMBIA-CPA-007

Document Prepared by

C-Quest Capital Malaysia Global Stoves Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Project

Summary description of the technologies/measures to be implemented by the project

The project involves distribution of 150,000 domestic fuel-efficient improved cookstoves (ICS) in Zambia. The ICS distributed through this project replaced the prevailing inefficient three-stone fires, or traditional pot supports¹. The ICS combusts wood more efficiently and improves thermal transfer to pots, hence saving fuel and lowering greenhouse gas emissions.

This is the seventh CPA implemented under the CDM Programme of Activities (PoA) titled “Distribution of Improved Cook Stoves in Sub-Saharan Africa”. C-Quest Capital Malaysia Global Stoves Limited (CQC) is the Coordinating / Managing Entity (CME) for the PoA in which this CPA is to be included. CQC also responsible for implementation of this project including management and coordination activities with local partners, promotion and installation of ICS and provide all necessary marketing and promotion assistance to partners. It is also responsible for monitoring activities of this project. Korea Impact Carbon Corporation (henceforth referred as KICC) provided all implementation cost for all ICS under this CPA. The ICS subsidized by KICC so that affordable clean technology can be made available to the participating households. KICC also made available all operation and maintenance costs along with ICS production and distribution cost.

It is intended that under this project single pot, TLC-CQC Rocket Stove are distributed. In this grouped project, each ICS constitutes a single project activity instance which is in line with its definition stated in VCS Program Definitions version 4.3.

The end user were informed that carbon finance is being generated by the use of the ICS, and this finance is in turn used to facilitate the access to ICS (eg. subsidize the price of the ICS) and helps to cover project implementation costs.

The relevant implementation dates (e.g., dates of construction, commissioning, and continued operation periods)

Milestone of the project	Timeline
The date of the commencement of the project (Registration of first ICS under this project)	01-January-2019
Registration of the project under CDM (CPA inclusion date under CDM)	05-June-2019

¹Traditional pot supports and three stone fires, as used in the project.

Milestone of the project	Timeline
CDM CPA Crediting period	From 05-June-2019 till 04-June-2026 (Renewable)
1 st monitoring period successfully verified under CDM (for this CPA)	01-September-2018 to 30-November-2019 (including both days) (Issued)
2 nd monitoring period successfully verified under CDM (for this CPA)	01-December-2019 to 31-July-2020 (including both days) (Issued)
3 rd monitoring period successfully verified under CDM (for this CPA)	01-August-2020 to 31-December-2020 (including both days) (Issued)
1 st monitoring under VCS-Period 1	01-January-2021 to 31-December-2022(including both days)

Installation of ICS -

Date of first ICS installed	01-January-2019
Date of last ICS installed	23-November-2021
Total no. of ICS distributed till end of date MP (31-December-2022)	150,000

First Monitoring Survey under VCS–

Survey dates for parameters $N_{y,i,j}$ and μ_y	25-August-2022 to 25-September-2022
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Project Location

The project has been implemented in Zambia. The details of the project location are provided in Section 1.12.

Explanation of how the project is expected to generate GHG emission reductions

The ICS substituted the currently common cooking using wood fuel on open three stone fire. The ICS burns wood more efficiently thereby improving thermal transfer to pots, hence saving fuel and lowering greenhouse gas emissions.

Scenario existing prior to the implementation of the project

The scenario existing prior to the implementation of the project is the same as the baseline scenario. See Section 3.4.

Estimate of annual average and total GHG emission reductions

The estimated total GHG emission reductions for the 10-year fixed crediting period of the project are 7,113,247 tCO₂e with an estimated average annual of 711,325 tCO₂e.

<u>Audit Type</u>	<u>Period</u>	<u>Program</u>	<u>VVB Name</u>	<u>Number of years</u>
CDM CPA Inclusion	05-June-2019	CDM	Carbon Check India Pvt. Ltd.	-
CDM Verification	01-September-2018 to 30-November-2019 (including both days) (Issued)	CDM	LGAI TECHNOLOGICAL CENTER, S.A. (APPLUS+)	1.25
CDM Verification	01-December-2019 to 31-July-2020 (including both days) (Issued)	CDM	LGAI TECHNOLOGICAL CENTER, S.A. (APPLUS+)	0.67
CDM Verification	01-August-2020 to 31-December-2020 (including both days) (Issued)	CDM	LGAI TECHNOLOGICAL CENTER, S.A. (APPLUS+)	0.42
VCS Validation (Ongoing)	14-June-2022 (VCS Listing Date)	VCS	LGAI TECHNOLOGICAL CENTER, S.A. (APPLUS+)	-
VCS Verification (Ongoing)	01-January-2021 to 31-December-2022	VCS	LGAI TECHNOLOGICAL CENTER, S.A. (APPLUS+)	2
<u>Total</u>	=	=	=	4.34

1.2 Sectoral Scope and Project Type

Sectoral scope applicable to the project: 3. Energy demand

Type: II – Energy efficiency improvement projects

The project is a non-AFOLU grouped project.

1.3 Project Eligibility

The project involves energy efficient cookstove distribution which falls under the category of efficiency improvements in thermal applications. Therefore, it is eligible under the scope of the VCS Program. The project activity does not fall under the excluded list of projects as described under table 1 of section 2.1.3 of the VCS Standard version 4.4.

Appendix 2 of the VCS Standard v4.4 mentions the eligibility conditions, for a CDM Component Project Activity (CPA) that does not include afforestation and/or reforestation activities, which shall be eligible to complete a gap validation and/or transfer to the VCS Program. The three conditions are:

- i) The CPA must be part of a Program of Activities (PoA) with an original program crediting period start date on or after 1 January 2016; or
- ii) Where the CPA is part of a Program of Activities (PoA) with an original program crediting period start date from 1 January 2013 to 31 December 2015 and where the CPA has an original crediting period start date from 1 January 2013 to 31 December 2015, the CPA shall have issued credits during the period 1 January 2016 to 5 March 2021, or shall have a status of “issuance requested” by 5 March 2021; or
- iii) Where the CPA is part of a PoA with an original program crediting period start date from 1 January 2013 to 31 December 2015 and where the CPA has an original crediting period start date on or after 1 January 2016, no prior credit issuance is required.

This project activity is CDM CPA 9007-P1-0007-CP1, which is part of CDM PoA 9007, for which the PoA period starts from 25-April-2013 (PoA CDM registration date) and CPA crediting period started from 05-June-2019. Therefore, condition (iii) is applicable.

1.4 Project Design

The project is a grouped project. In this grouped project, each ICS constitutes a single project activity instance which is in line with its definition stated in the VCS Program Definitions version 4.3.

Eligibility Criteria

For the inclusion of new project activity instances i.e., ICS, the project proponent shall ensure that it meets the eligibility criteria described below –

No.	Criterion	Compliance Requirement	How the new project activity instances to comply
1.	Methodology :Meet the applicability conditions set out in the	The project activity instance shall use VCS approved methodology-VMR0006: Methodology for Installation	All project activity instances (TLC-CQC Rocket Stoves) will meet the applicability conditions as described and

	methodology applied to the project	of High Efficiency Firewood Cookstoves, Version 1.1 and shall meet the applicability conditions set out in the methodology.	set out in Section 3.2 of this document.
2.	Technology: Use the technologies or measures specified in the project description.	The project activity instance shall implement TLC-CQC Rocket stoves having minimum efficiency of 25%;below which it shall not be eligible under this grouped project.	Only TLC-CQC Rocket stoves to be adopted under this grouped project activity.Thermal efficiency of TLC-CQC Rocket stove is 34.5%.
3.	Baseline Scenario: Are subject to the baseline scenario determined in the project description for the specified project activity and geographic area.	All new project activity instances will be installed within Zambia only and the baseline scenario is the continued use of non-renewable wood fuel by the target population to meet similar thermal energy needs as provided by project cookstoves in absence of project activity. This also conforms to the applied methodology.	The new project activity instances will be installed within Zambia only and subject to the same baseline scenario determined in Section 3.4 of this document.
4.	Additionality: Have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area.	Each project activity instance shall demonstrate its compliance with- 1. Regulatory Surplus: The project should not be mandated by any law, statute or other regulatory framework, or for UNFCCC non-Annex I countries, any systematically enforced law, statute or other regulatory framework 2. Positive List:	All new project activity instances will use the activity method for demonstration of additionality. Step 1: Regulatory Surplus There is no mandated government programme or policy in Zambia which intends to mandate for distribution of project activity instances (ICS). Step 2: Positive List

		The inclusion of new project activity instances shall have to comply with positive list that is the ICS are installed/ distributed at zero cost to end user and the project activity instance has no other source of revenue but GHG credits.	Copy of Consent Letter/ record of consent signed by end user mentioning that end users were not charged for the ICS.
5.	Occur within one of the designated geographic areas specified in the project description	All new project activity instances will be installed within Zambia only.	Project Activity Instance Database containing Geographical Coordinates of each household to which ICS are distributed.
6.	Ownership: Have evidence of project ownership, in respect of each project activity instance, held by the project proponent from the respective start date of each project activity instance	A default Beneficiary Agreement for end users including the provision that emission reductions generated by the project activity are owned by the Project Proponent will be provided for project activity instance.	Copy of Consent Letter/ record of consent given from end user to Project Proponent regarding emission reduction claims.
7.	Start Date	The start date of project activity instance shall be same as or later than the grouped project start date.	Project Activity Instance Database containing date of installation of each ICS.
8.	Capacity Limits: Where a capacity limit applies to a project activity included in the project, no project activity instance shall exceed such limit.	1. The aggregate energy savings by a single project activity shall not exceed the equivalent of 180 GWh _{th} /year as mentioned in the methodology AMS II G: Energy efficiency measures in thermal	1. Project Activity Instance Spreadsheet containing estimation of annual energy saving from each project activity instance (i.e., each ICS).

		applications of non-renewable biomass.	
		2. Each project activity instance that exceeds one percent of the capacity limit (i.e., 1.8 GWh _{th}) shall be identified.	2. Project Activity Instance ER Spreadsheet containing estimation of annual energy saving from each project activity instance (i.e., each project ICS).
		3. Such instances shall be divided into clusters, whereby each cluster is comprised of any system of instances such that each instance is within one kilometer of at least one other instance in the cluster. Instances that are not within one kilometer of any other instance shall not be assigned to clusters.	3. The expected annual energy saving for each project activity instance (i.e., each project ICS) comes out to be 16.36MWh _{th} , which is well below 1% (i.e., 1.8 GWh _{th}) of capacity limit. Therefore, the project activity instances under this grouped project activity shall not be assigned to clusters.
9.	Double Counting	The Improved Cookstove distributed under this project shall be uniquely identifiable based on the distribution records.	Project Activity Instance Database containing unique serial number of each ICS. Each ICS distributed will have corresponding end user details (i.e., name, geographical coordinates, address, unique serial number).
10.	Crediting period	Be eligible for crediting from the start date of the instance through to the end of the project crediting period (only). Note that where a new project activity instance starts in a previous verification period,	The start date of the instance will be the date, the stove began generating GHG emission reductions or removals. The end of the crediting period of instance will be the end date of project

		no credit may be sought for GHG emission reductions or removals generated during a previous verification period (as set out in Section 3.4.4) and new instances are eligible for crediting from the start of the next verification period.	crediting period as mentioned in section 1.9 of this VCS-PD.
11	Target Population	End user for each project activity instance shall be households with non-renewable biomass on inefficient wood stoves. Each ICS will be assigned a unique serial number with name of ICS user, address, GPS of household, stove model, distribution date, etc	End user registration certificate and stove installation database .

1.5 Project Proponent

Organization name	C-Quest Capital Malaysia Global Stoves Limited
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Title	Director
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Organization name	Korea Impact Carbon Cooperation
Contact person	Mr. Sangsun HA
Title	CEO
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Telephone	+82- 2-6480-7346
Email	kicc-operations@korea-kicc.com

Organization name	Ecoeye Co., Ltd.
Contact person	Mr. Soobok RHEE
Title	CEO
Address	#11, 61 Yeouniaru-ro. Yeongdeungpo-gu, Seoul, Republic of Korea
Telephone	+82- 2-6480-7300
Email	operations@ecoeye.com

1.6 Other Entities Involved in the Project

There is no other entity involved in this grouped project.

1.7 Ownership

The project ownership is with C-Quest Capital Malaysia Global Stoves Limited, Korea Impact Carbon Cooperation and Ecoeye Co., Ltd.

Records of Consent letter/ record of consent signed by end user (ICS owner) to PP during the registration process includes the statutory clause that "household hereby transfers and waives all and any rights in connection with the improved cookstove or project and greenhouse gas emission reductions or other environmental or social attributes generated by the installation and use of the improved cookstove to PP" .

This is in line with clause 5 of section 3.7.1 of VCS Standard v4.4.

1.8 Project Start Date

01-January-2019 (Date of installation of first ICS under this grouped project activity). This is in line with "CLARIFICATIONS TO VCS PROGRAM RULES AND REQUIREMENTS" published on 19-April-2022, which clarifies that each CPA will be assigned a VCS project start date reflecting the date on which the specific CPA began reducing or removing GHG emission.

1.9 Project Crediting Period

01-January-2019 to 31-December-2028, ten years fixed crediting period.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	
Large project	√

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
Year 2019	184,106
Year 2020	827,620
Year 2021	920,189
Year 2022	870,126
Year 2023	822,769
Year 2024	777,972
Year 2025	735,598
Year 2026	695,517
Year 2027	657,605
Year 2028	621,745
Total estimated ERs	7,113,247
Total number of crediting years	10
Average annual ERs	711,325

1.11 Description of the Project Activity

The project was included as a CPA under CDM PoA on 05-June-2019 with CDM reference 9007-P1-0007-CP1.

https://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/SI6LZ5AGKR037UPH84WJYTVCDQN1F9/view

The project involves the distribution and installation of TLC-CQC Rocket Stoves for use by households in Zambia. Before the adoption of the TLC-CQC Rocket Stove, households in Zambia used inefficient, conventional open fire. The ICS burns wood more efficiently thereby improving thermal transfer to pots, hence saving fuel. Not only this halts the rapidly progressing deforestation in Zambia but also reduces health hazards from indoor smoke pollution. Women and children have to spend less time collecting firewood.

The ICS deployed under this project is TLC-CQC Rocket Stove which substantially reduces fuel consumption and emissions for conducting cooking and water heating tasks in homes. The ICS improve the efficiency of combustion and thermal transfer to the pot compared with a traditional pot support or three-stone fire by incorporating a number of cutting-edge components, including one or more of; a 'rocket elbow'; a highly insulated combustion chamber which provides a conducive environment for clean and efficient combustion of wood. It substantially reduces fuel wood consumption compared with a three-stone fire or traditional pot support.



According to independent stove efficiency tests performed by Aprovecho Research Centre on the TLC-CQC Rocket Stove, the WBT results yielded an average thermal efficiency of 34.5% for boiling 5 litres of water.

Technical Specifications	
Stove Size	Depth: 35 cm; Width: 35 cm; Height: 28 cm

Combustion Chamber Size	Depth: 12 cm; Width: 12 cm; Height: 28 cm
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Efficiency	34.5%
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Average Life	10 years
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The life of TLC-CQC Rocket stove is at least 10 years owing to it being a clay and brick stove which can be easily repaired using a mixture of local clay, cow dung/ash, sand and water etc. on a regular basis. The metal parts used in the stoves are under extended warranty from PP/manufacturer side throughout the projected life span and will be replaced in case of request received from the stove owner for replacement. PP has confirmed the life span of 10 years through the above measures.

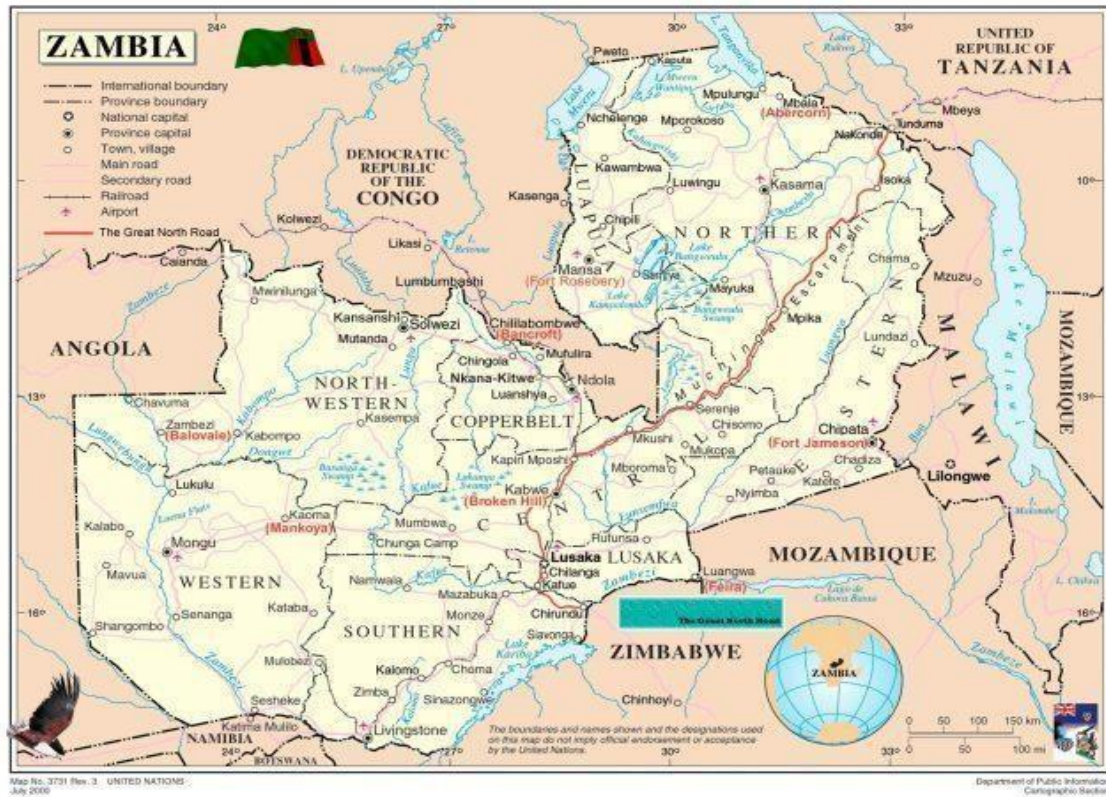
The first TLC-CQC Rocket Stove was installed on 01-January-2019. As of date, a total of 150,000 TLC-CQC Rocket Stoves has been installed under this grouped project activity.

All the data recorded during stove registration process was captured via handheld digital devices (smart phones and/or tablets). The information collected is then transferred to a centralized online project database.

1.12 Project Location

The project location is the geographical boundary of Republic of Zambia with coordinates- 13°08'02.0"S latitude and 27°50'57.6"E longitude².

²<https://www.geodatos.net/en/coordinates/zambia>



Zambia map



Map of project area (KML file submitted to VVB)

During this monitoring period following province have been covered –

Province Name	Districts Covered	Total no. of ICS distributed till end of date MP (31-December-2022)
Central Province	Chibombo District, Chisamba District, Chitambo District, Kabwe District, KapiriMposhi District, Mumbwa District.	7,788
Copperbelt Province	Chingola District, Kitwe District, Lufwanyama District	214
Eastern Province	Chadiza District, Chasefu District, Chipangali District, Chipata District, Kasenengwa District, Katete District, Lumezi District, Lundazi District, Mambwe District, Petauke District, Vubwi District	72,938
Luapula Province	Chiengi District, Chifunabuli District, Chipili District, Kawambwa District, Lunga District, Mansa District, Milenge District, Mwense District, Nchelenge District, Samfya District	9,530
Lusaka Province	Chilanga District, Chongwe District, Kaufe District, Shibuyunji District	4,159
Muchinga Province	Chama District, Lavushimanda District, Nakonde District	3,844
Northern Province	Kasama District,	6,582

	Kaputa District, Luwingu District, Lupososhi District, Lunte District, Mbala District, Mungwi District, Mzimba District, Senga Hill District.	
North-Western Province	Ikelenge District, Mwinilunga District	6,328
Southern Province	Chikankata District, Choma District, Gwembe District, Itezhi-Tezhi District, Kalomo District, Kazungula District, Livingstone District, Mazabuka District, Monze District, Namwala District, Pemba District, Sinazongwe District, Zimba District	37,765
Western Province	Kalabo District, Mitete District	852

1.13 Conditions Prior to Project Initiation

The conditions prior to project initiation are the same as the baseline scenario. Please refer to Section 3.4 for an explanation of the Baseline Scenario.

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. The pre-project devices are inefficient three-stone fires or conventional systems lacking improved combustion air supply mechanism and flue gas ventilation system i.e., traditional stoves.

The project has not been implemented to generate GHG emissions for the purpose of their subsequent reduction, removal, or destruction.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

There are no laws and regulations governing the use of improved cookstoves in Zambia households.

1.15 Participation under Other GHG Programs

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

The project has been included under CDM PoA with project reference 9007-P1-0007-CP1.

Evidence has been provided to the VVB that the emissions reductions arising from this program are not double counted under the CDM and VCS.

Apart from the above, the project has not been submitted for validation/certification under any other GHG or environmentally related program or mechanism, so it is not eligible to create another form of GHG-related environmental credit other than CERs and VCUs.

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

Does the project reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading?

☐ Yes ☒ No

The project does not reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading.

1.16.2 Other Forms of Environmental Credit

Has the project sought or received another form of GHG-related credit, including renewable energy certificates?

☐ Yes ☒ No

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

1.16.3 Supply Chain (Scope 3) Emissions

As per Section 3.23.9 of the VCS Standard, v4.4, the “producer(s) or retailer(s) of the impacted good or service are known but not involved in the project or do not have a website”. The Project

Proponent has informed the manufacturer of the TLC-CQC Rocket Stove metal parts as well as the implementing partner in Zambia at the time of signing agreement for the goods and services provided by them, that ICS were distributed in Zambia under this project. Also, intimated them about the project registration under CDM and VERRA for the generation of CERs and VCUs. A copy of the agreement signed with manufacturer of this ICS and implementing partners shared with VVB during validation.

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development Contributions Activity Description

The project contributes to sustainable development in a number of ways:

- Environmental Sustainability
 - The project helps significantly reduce greenhouse gas emissions over its lifetime.
 - The project helps reduce the use of non-renewable biomass from forests, thus assist in conserving existing forest stock and the protection of natural forest eco-systems and wildlife habitats.
- Social Sustainability
 - Considerably less time need to be spent collecting wood fuel for the family home thereby reducing the work burden on rural families and presenting alternative opportunities for economic development.
 - The amount of indoor pollutants from the burning of biomass in the family home reduced. Less carbon dioxide, carbon monoxide and particulates emitted due to the decrease in total biomass burned and an increase in the temperature of combustion.
 - The stove provides a safer method for combusting biomass for cooking, helping to reduce burn injuries, especially for children, in the family home.
- Economic Sustainability
 - The project helps develop a section of the local economy, in the distribution, local assembly, maintenance and monitoring activities.
 - Household expenditures on cooking fuel reduced through the use of the ICS.
 - Saved household labor can be diverted to more productive economic activities.
 - The project created local employment opportunities in operational and management roles, as well as future assembly and/or manufacturing initiatives.

The project leads to the achievement of the following SDGs due to the implementation of project activities:

Project Activity	Estimated Project Contribution	SDG Target	SDG Indicator	Monitoring approach				
Distribution of ICS to households within the project area	The project activity by replacing 150,000 traditional cookstoves with energy efficient project cookstoves will contribute to improved health and well-being brought about by reduced levels of fine particulate matter (PM _{2.5}) emissions within households by approximately 47% below baseline emission level	3.9	Number of individuals experiencing health benefits due to reduced exposure to indoor air pollution	$Net\ Benefit = PM_{2.5\ baseline} - PM_{2.5\ project}$ where <table><tr><td>$PM_{2.5\ baseline}$</td><td>PM_{2.5} emissions in baseline stoves (TSF) default of 52.699 mg/min (or 3.9 g/Kg fuel) Clean Cooking Catalog (cleancookstoves.org)</td></tr><tr><td>$PM_{2.5\ project}$</td><td>PM_{2.5} emissions in project stoves.</td></tr></table> Source: Lab test report of Project stoves providing emission level of PM_{2.5}³.	$PM_{2.5\ baseline}$	PM _{2.5} emissions in baseline stoves (TSF) default of 52.699 mg/min (or 3.9 g/Kg fuel) Clean Cooking Catalog (cleancookstoves.org)	$PM_{2.5\ project}$	PM _{2.5} emissions in project stoves.
$PM_{2.5\ baseline}$	PM _{2.5} emissions in baseline stoves (TSF) default of 52.699 mg/min (or 3.9 g/Kg fuel) Clean Cooking Catalog (cleancookstoves.org)							
$PM_{2.5\ project}$	PM _{2.5} emissions in project stoves.							
Capacity building and training of local people in project area	The project will lead to increasing vocational and relevant skills of more than 100 local individuals by providing non-formal education and training on issues related to climate change, with specific skill building in operations and surveying activities related to stove distribution and its monitoring under VCS	4.4	Number of individuals trained	$Net\ Benefit = Training_{project} - Training_{baseline}$ Where- <table><tr><td>$Training_{project}$</td><td>Trainings provided in project scenario</td></tr><tr><td>$Training_{baseline}$</td><td>Trainings provided in baseline. A value of 0 shall be considered as in absence of project activity, these trainings would not have been undertaken by PP or PI.</td></tr></table> Source: Training Records	$Training_{project}$	Trainings provided in project scenario	$Training_{baseline}$	Trainings provided in baseline. A value of 0 shall be considered as in absence of project activity, these trainings would not have been undertaken by PP or PI.
$Training_{project}$	Trainings provided in project scenario							
$Training_{baseline}$	Trainings provided in baseline. A value of 0 shall be considered as in absence of project activity, these trainings would not have been undertaken by PP or PI.							

³ Details on PM_{2.5} estimation for subsequent years has been provided in Appendix F of the document

Distribution of ICS to households within the project area	Contribute to reducing drudgery and reducing gender inequality, especially for women and children by saving time spent in collecting fuel wood below the baseline fuelwood collection time. The project will lead to time savings and associated reduction in drudgery in 150,000 households translating to benefiting an equal number of women as they are primary cooks and fuel wood collectors in most of the households. The women can use the time saved for doing more productive activities or personal care	5.4	5.4.1 Time spent on unpaid domestic and care work, by sex, age, and location.	$Net\ Benefit = T_{baseline} - T_{project}$ Where- <table><tr><td>$T_{baseline}$</td><td>Average time spent in fuel collection and cooking in baseline scenario. Determined once prior to or concurrent with first verification</td></tr><tr><td>$T_{project}$</td><td>Average time spent in fuelwood collection and cooking in project scenario</td></tr></table> Source: monitoring surveys conducted to determine average time saved in project scenario.	$T_{baseline}$	Average time spent in fuel collection and cooking in baseline scenario. Determined once prior to or concurrent with first verification	$T_{project}$	Average time spent in fuelwood collection and cooking in project scenario
$T_{baseline}$	Average time spent in fuel collection and cooking in baseline scenario. Determined once prior to or concurrent with first verification							
$T_{project}$	Average time spent in fuelwood collection and cooking in project scenario							
Distribution of ICS to households within the project area	Contribute to increasing access to clean cooking technology with 150,000 TLC-CQC Rocket Stove installations in 150,000 households that have been using traditional three stone fire, over the project lifetime	7.1	7.1.2 Proportion of population with primary reliance on clean technology	$NetBenefit = ICS_{project} \times N_y$ Where <table><tr><td>$ICS_{project}$</td><td>Number of ICS installed representing access to clean technology in project scenario</td></tr><tr><td>N_y</td><td>Proportion of operational stoves</td></tr></table> Source: ICS distribution records and ex-post monitoring surveys conducted to determine proportion of operational stoves	$ICS_{project}$	Number of ICS installed representing access to clean technology in project scenario	N_y	Proportion of operational stoves
$ICS_{project}$	Number of ICS installed representing access to clean technology in project scenario							
N_y	Proportion of operational stoves							
Employment of local individuals in project area	Contribute to generation of employment in informal sector (total economy, agriculture, and non-agriculture) by contracting locals with a target employment of more than 100 employees for varying lengths of time over the project lifetime with a focus on hiring females	8.3	8.3.1 Proportion of informal employment in non-agriculture employment, by sex	$Net\ Benefit = ES_{project} - ES_{baseline}$ where <table><tr><td>$ES_{project}$</td><td>Gainfully employed staff in project scenario.</td></tr><tr><td>$ES_{baseline}$</td><td>Gainfully employed staff in baseline. A value of 0 shall be considered as in absence of project activity no employment opportunities would have been created.</td></tr></table> Source: employment records	$ES_{project}$	Gainfully employed staff in project scenario.	$ES_{baseline}$	Gainfully employed staff in baseline. A value of 0 shall be considered as in absence of project activity no employment opportunities would have been created.
$ES_{project}$	Gainfully employed staff in project scenario.							
$ES_{baseline}$	Gainfully employed staff in baseline. A value of 0 shall be considered as in absence of project activity no employment opportunities would have been created.							

Distribution of ICS to households within the project area	Contribute to GHG emission reduction through an estimated reduction of ~4.97 tCO ₂ e per stove on an average due to replacement of baseline stoves with 150,000 stove over 10 years of crediting period	13.0	Project Specific Indicator: Reduction in GHG emissions as compared to the baseline scenario (open fire)	$ER_{y,i,j} = B_{y,sav,i,j} \times N_{o,i,j} \times n_{y,i,j} \times \mu_y \times f_{NRB,y} \times NCV_{biomass} \times (EF_{wf,CO2} + EF_{wf,nonCO2})$ Source-Monitoring Report for the corresponding VCS period of VCS Project
Distribution of ICS to households within the project area	Contribute an estimated reduction in removal of woody biomass to the tune of 3.86tons per stove per year on an average, from forests surrounding the communities thereby leading to an increase in above ground biomass in these forests	15.2	15.2.1 Progress towards sustainable forest management by increasing above ground biomass in forests	$B_{y,savings,i,j} = B_{old} \times \left(1 - \frac{\eta_{old}}{\eta_{new,i,j}}\right)$ Source-Monitoring Report for the corresponding VCS period of VCS Project

1.17.2 Sustainable Development Contributions Activity Monitoring

The details of the project activity's contribution to the Sustainable Development Goals have been provided in the Table below.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	3.9 ⁴	Project specific indicator: Reduction in PM _{2.5} emissions	Implemented activities to decrease	During the present monitoring period, the effort helped the 150,000 families who received single ICS, have reduced their PM_{2.5} emissions by 0.0075 ton/HH/stove during the current monitoring period. The same is demonstrated by survey findings, which indicate that 100% of respondents noticed less smoke close to TLC-CQC Rocket stoves' cooking areas. while 44% of respondents reported experiencing lower levels of eye irritation linked to cooking, 38% of respondents noted a reduction in chronic cough.	The project activity by replacing 150,000 traditional cookstoves with energy efficient project cookstoves has contributed to improved health and well-being brought about by reduced levels of fine particulate matter (PM_{2.5}) emissions within households by approximately 47 % below baseline emission level of 3.9 g/kg fuel⁵.

⁴<https://unstats.un.org/sdgs/metadata/>
⁵PM_{2.5} emissions from three stone fire. Source: Clean Cooking Catalog

2)	4.3	Project specific indicator: Number of individuals who received any informal training	Implemented activities to Increase	Helped increase the vocational and relevant skills of 9local people during the current monitoring period by providing non-formal education and training on issues related to climate change, with specific skill building in operations and surveying activities related to stove distribution and its monitoring under VCS.	Contributed to increasing vocational and relevant skills of 9local individuals by providing non-formal education and training over project lifetime.
3)	5.4	5.4.1 Time spent on unpaid domestic and care work, by sex, age, and location.	Implemented activities to Decrease	The project has contributed to time savings and reduced drudgery in 150,000 households translating to benefiting an equal number of women. The survey results augment the above claim, as 100% of the respondents using TLC-CQC Rocket Stoves reported having experienced fewer trips for wood collection as well as reduced cooking time, freeing up their time for other more productive activities or personal care.	The project has led to time savings and reduced drudgery in 150,000 households translating to benefiting an equal number of women as they are primary cooks and fuel wood collectors in most of the households.

4)	7.1	7.1.2 Proportion of population with primary reliance on clean technology	Implemented activities to Increase	Contributed to increasing access to clean cooking technology with 150,000TLC-CQC Rocket Stoves installations in same number of households of Zambia that have been using traditional three stone fire or other traditional open fire, etc.	Contributed to increasing access to clean cooking technology with 150,000TLC-CQC Rocket Stoves installations in 150,000 households of Zambia.
5)	8.3	8.3.1 Proportion of informal employment in non-agriculture employment, by sex.	Implemented activities to Increase	Contributed to generation of employment in informal sector (total economy, agriculture, and non-agriculture) by contracting 5locals for varying lengths of time over the project lifetime with a focus on hiring females.	Contributed to generation of employment in informal sector (total economy, agriculture, and non-agriculture) by contracting 5locals for various project related activities over the project.
6)	13.0	Project Specific Indicator: Reduction in GHG emissions as compared to the baseline scenario (open fire)	Implemented activities to Decrease	Contributed to total GHG emission reduction of 1,598,600tCO ₂ e due to replacement of baseline stoves with TLC-CQC Rocket Stoves in the current monitoring period.	Contributed to GHG emission reduction through an estimated reduction of ~1,776,222tCO ₂ e due to replacement of baseline stoves with TLC-CQC Rocket Stoves over project lifetime.

7)	15.2	15.2.1 Progress towards sustainable forest management by increasing above ground biomass in forests.	Implemented activities to Increase	Contributed an estimated reduction in removal of non-renewable woody biomass to the tune of ~3.75tons per stove (TLC-CQC Rocket Stoves) per annum in the current monitoring period, from forests surrounding the communities thereby leading to an increase in above ground biomass in these forests.	Contributed an estimated reduction in removal of woody biomass to the tune of ~3.75tons per stove (TLC-CQC Rocket Stoves) per annum, over project lifetime.
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1.18 Additional Information Relevant to the Project

Leakage Management

Not applicable as the project applies 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

Not applicable.

2 SAFEGUARDS

2.1 No Net Harm

No potential negative environmental or socio-economic impacts have been identified for the project. The project only brings positive impacts on environmental and socio-economic aspects as elaborated in Section 1.17 of this VCS-PD.

2.2 Local Stakeholder Consultation

Local Stakeholder Consultation for this CPA has been undertaken at CDM PoA Level. The project was included as a CPA under the PoA on 05-June-2019 with CDM reference 9007-P1-0007-CP1. The CPA-DD can be referred at the following link to confirm the CDM stakeholders' consultation details:

https://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/SI6LZ5AGKR037UPH84WJYTVCDQN1F9/view

For projects registered under an approved GHG program which are seeking registration with the VCS Program, according to paragraph 3.22.6 (sub-paragraph 3) of the VCS Standard (Version 4.4), this section need not be completed.

On-going Communication Mechanism

The stove owner can contact the local implementation partner in case any support or replacement of any stove part is required. The contact details of the local implementation partner

Grievance Redressal Mechanism

```
graph TD; Beneficiary[Beneficiary] --> GSC[Ground Staff/Field Coordinator]; GSC --> IP[Implementation Partner]; IP --> OM[Operational Manager]; OM --> COH[Country Operational Head/ Project Head/ Lead]; COH --> CQC[Country Quality Council Head Office]; VC[Village Chief] -.->|Traditional approach| GSC;
```

The Grievance Policy and Procedure is accessible as a phone number of the PP/implementing partner office in Zambia which is available on the brochure provided to each household. During the current monitoring period, PP has received three grievances from the end users and all the grievances which were received have been addressed by the PP. The grievance register records have been shared with VVB.

Grievance(s) Received	Action Taken
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Improper use of pot skirt while cooking the food were observed during spot check	CQC field coordinator retrained the beneficiary to properly use the pot skirt and also explained about its importance and benefits.
Smoke in the kitchen or improper ventilation	The end-users were properly instructed/sensitized on the significance of kitchen ventilation, and they were encouraged to use small dry twigs and allow more air flow to filter any smoke out of the kitchen either by safely adding windows or increasing the spaces between the roof and wall.
Improper maintenance of project stoves & lack of awareness about stove benefits	Households were given training on proper stove maintenance along with information about the numerous health, nutritional, and safety benefits of the project stoves to the intended HHs.

2.3 Environmental Impact

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

The project was included as a CPA under the PoA on 05-June-2019 with CDM reference 9007-P1-0007-CP1. The CPA-DD can be referred at the following link to confirm the CDM stakeholders' consultation details:

https://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/SI6LZ5AGKR037UPH84WJYTVCDQN1F9/view

For projects registered under an approved GHG program which are seeking registration with the VCS Program, according to paragraph 3.22.6 (sub-paragraph 3) of the VCS Standard (Version 4.4), this section need not be completed.

2.4 Public Comments

This project was open for public comment from 14/06/2022 to 17/07/2022. No comment received during public comment period.

2.5 AFOLU-Specific Safeguards

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

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

VMR0006: Methodology for Installation of High Efficiency Firewood Cookstoves, Version 1.1⁶.

3.2 Applicability of Methodology

Applicability criterion	How the project complies
Project activities must introduce efficiency improvements in thermal applications of non-renewable biomass in the following premises: households, community-based kitchen, institutions (e.g., schools) or small and medium-sized enterprises (SMEs).	The project involves deployment of ICS only in households.
The project stove shall have specified high-power thermal efficiency of at least 25% per the manufacturer's specifications and shall exclusively use woody biomass and can be single pot or multi-pot; in case of project stove replacing fossil fuel baseline stove, it shall exclusively use renewable biomass.	TLC-CQC Rocket stoves planned to be installed under this project are single pot wood cookstoves that have an efficiency of 34.5% as per the manufacturer's specifications. WBT test report conducted by third party (Aprovecho Research Centre) has been provided to the VVB .
Both 'Projects' and 'Large Projects' can use the methodology	Estimated average annual emission reductions for the grouped project activity are more than 300,000 tonnes CO ₂ e per year. Therefore, it is categorized under "Large Projects" as per 3.10.1 of the VCS Standard Version 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	Non-renewable biomass has been used in Zambia since 31 December 1989 as demonstrated below in this section using published literature.
For the specific case of biomass residues processed as a fuel (e.g. briquettes, wood chips), it shall be demonstrated that: (a) It is	Not applicable since the project does not involve biomass residues processed as a fuel.

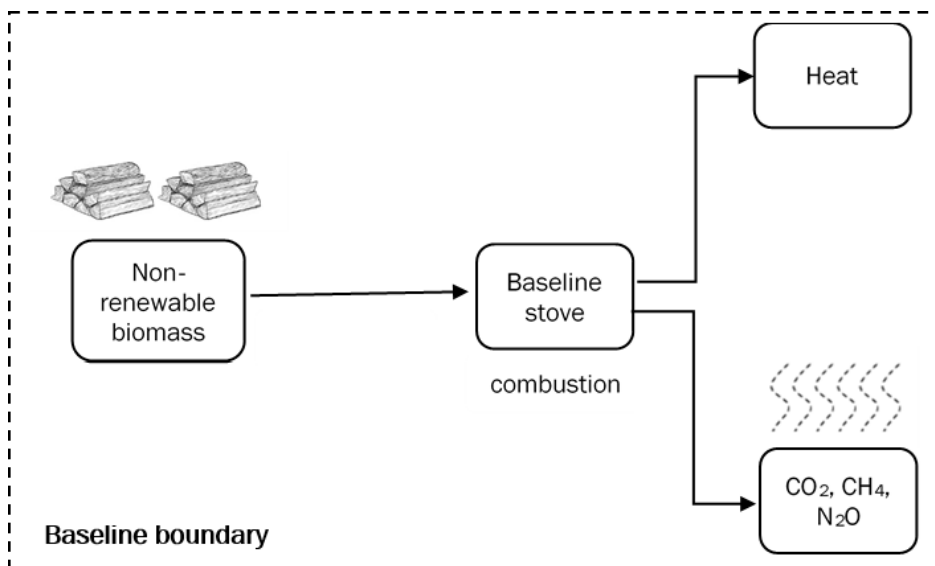
⁶<https://verra.org/methodology/vmr0006-methodology-for-installation-of-high-efficiency-firewood-cookstoves/>

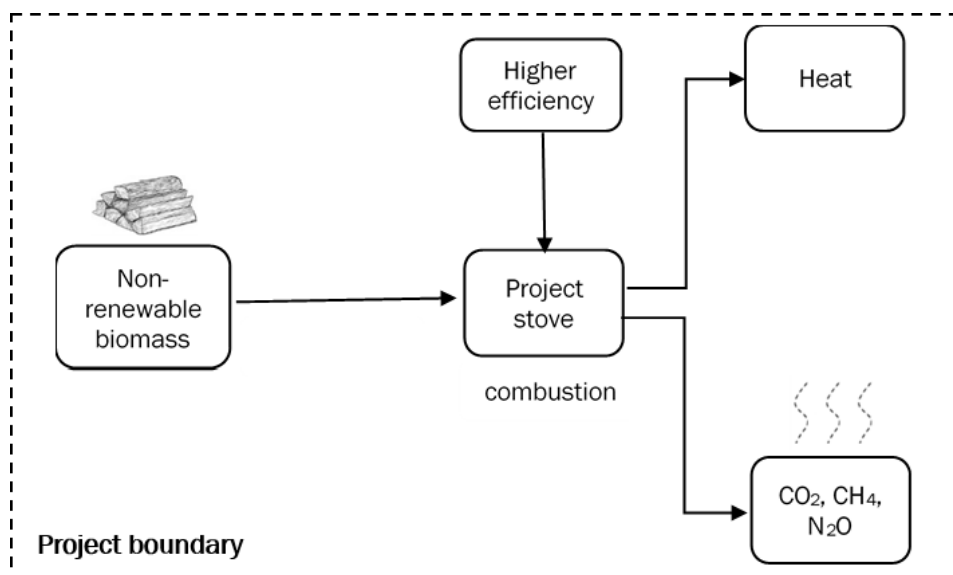
produced using exclusively renewable biomass (more than one type of biomass may be used). (b) The consumption of the fuel should be monitored during the crediting period and (c) Energy use for renewable biomass processing (e.g., shredding and compacting in the case of briquetting) may be considered as equivalent to the upstream emissions associated with the processing of the displaced fossil fuel and hence disregarded.	The ICS is introduced as an energy efficiency measure to replace baseline stoves and reduce the use of non-renewable biomass for combustion.
The project design shall explain the proposed method for distribution of project devices including the method to avoid double counting of emission reductions such as unique identifications of product and end-user locations (e.g., programme logo)	Each ICS in this project can be identified by a unique combination of customer name and geographical location, as well as a serial number. The serial number is a unique number which allows for a clear distinction between the stoves. No individual serial number can be repeated within the project, thus ensuring that each stove is counted only once in the proposed project. In addition, the project has been cross-checked against other CDM project activity operating in the country using the UNFCCC, the Gold Standard, and other relevant voluntary carbon schemes to ensure that the ICS is not included in any other CDM project activity or voluntary project activity.
The project design 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 stove manufacturers/wholesale providers/end users shall sign an undertaking stating clearly that the PP or an entity authorized by it shall be the sole owner of the VCU arising from the project CO₂

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
Project	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

A representation of the baseline boundary and project boundary are given as below –





A map of the project boundary along with the coordinates have been provided above in section 1.12 of this document.

3.4 Baseline Scenario

As defined in the methodology, 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 the project cookstoves in absence of project activity. The baseline cookstoves are three-stone fires or conventional systems lacking improved combustion air supply mechanism and flue gas ventilation system i.e., traditional stoves.

CDM-CPA-DD:

https://cdm.unfccc.int/ProgrammeOfActivities/cpa_db/SI6LZ5AGKR037UPH84WJYTVCDQN1F9/view

3.5 Additionality

The methodology uses activity method for the demonstration of additionality.

Activity Method

Step 1: Regulatory Surplus

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

Households only participated voluntarily in this project. It is hereby confirmed that the proposed project is a voluntary coordinated action by CQC.

Step 2: Positive List

As demonstrated in section 3.2 of this document, the project meets the applicability conditions of the methodology which represent the positive list. The project installs the ICS at zero cost to the household and has no other source of revenue other than the sale of GHG credits. The project is not implemented as part of government schemes or supported by multilateral funds.

Conclusion: As the project fulfills the conditions of step 1 and step 2 above, it is deemed additional.

3.6 Methodology Deviations

This project does not deviate from the applied methodology VMR0006 version 1.1. However, during the transition from the CDM to the VCS, the PP has shifted from the old CDM methodology AMS-II.G Version 4.0 to VMR0006 version 1.1.

Under the transition from CDM to VCS, Project Description Deviation has been applied to switch from the previous CDM methodology AMS-II.G. to the new VERRA methodology VMR0006, v1.1. The reasons for switch to the methodology VMR0006, v1.1 have been mentioned below:

- i. **Reduced efforts in monitoring:** The thermal efficiency of the project stoves has been estimated ex-ante using equation 5 in VMR0006, v1.1. The project proponent is not required to conduct Water Boiling Tests to monitor the thermal efficiency of project stoves throughout the crediting period. Efforts in monitoring will reduce with increased savings in resources as compared to monitoring plan requirements under AMS-II.G.
- ii. **Representativeness** of fuel type consumption in baseline scenario: The methodology switch has changed the default value for the emission factor applied, increasing from 81.6 tCO₂/TJ to the CO₂ emission factor of 112 tCO₂/TJ plus the non-CO₂ emission factor of 26.23 tCO₂/TJ, which sums up to 138.23 tCO₂/TJ. The default emission factor applied in the project under CDM considers a mix of present and future fuels used in households. Thus a 50% weight is assigned to coal as the alternative solid fossil fuel (96 tCO₂/TJ) and a 25% weight is assigned to both liquid and gaseous fuels (71.5 tCO₂/TJ for Kerosene and 63.0 tCO₂/TJ for Liquefied Petroleum Gas (LPG) arriving at the 81.6 t CO₂/TJ value. However, this value assumes a hypothetical situation of fuel mix-use and is not representative of the ground situation.

A considerable percentage of the rural population in Zambia depends on wood fuel for meeting their cooking needs. Moreover, the target population selected for the project activity is exclusively wood fuel using rural households, it is therefore only fair to consider the wood emission factor of 112 tCO₂/TJ to be more appropriate than the previously used

value of 81.6 t CO₂/TJ for calculating emission reduction as it corroborates with the ground reality.

- iii. **Higher accuracy in avoided GHGs calculations:** The previous CDM methodology AMS-II.G. did not account for non-CO₂ emissions. However, the VMR0006 v1.1. methodology considers CO₂ and Non-CO₂ emissions in calculating emission reductions (using conservative IPCC default factors). This approach leads to more accurate calculations and quantifies the actual avoided emissions by the project stoves.

Based on explanation provided in this section under point (ii), the project proponent deems it fit to use the wood emission factor instead of the hypothetical fuel mix since it represents the actual ground condition and estimates the avoided emissions as a sum of CO₂, N₂O, and CH₄ emissions since a wood fuel stove are known to emit all three GHGs and not just CO₂. Hence, the new VERRA methodology VMR0006 v1.1 has been applied using the default values of the parameters applicable as per the VERRA methodology by the Project Proponent.

Project Proponent hereby concludes that there is no negative impact on the conservativeness of GHG emission reduction quantification because of the deviation in methodology which is in line with Section 3.19.2 of VCS Standard, v4.4. Further, there is no deviation from the applied VERRA methodology during this project cycle. Hence, the conservativeness and accuracy of emission reduction quantification are exactly as per the newly applied methodology and not to be compared with previous CDM methodology AMS-II.G.

4 IMPLEMENTATION STATUS

4.1 Implementation Status of the Project Activity

As on date, total 150,000 TLC-CQC Rocket Stoves have been distributed to in households across Zambia. Each Household received one ICS under this grouped project.

VCS methodology VMR0006, version 1.1 allows the use of a correction factor of 0.95 applied to the overall emissions reductions to account for any possible leakage. This factor has been applied to the emissions reductions presented in this report.

During the current monitoring period, no incident or event occurred, that could affect GHG emissions reduction and approved monitoring plan.

5 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

5.1 BaselineEmissions

The methodology does not account for baseline emissions separately. It quantifies net emission reductions achieved by the project which has been described in Section 5.4 of this document.

5.2 ProjectEmissions

The methodology does not account for project emissions separately. It quantifies net emission reductions achieved by the project which has been described in Section 5.4 of this document.

5.3 Leakage

Default leakage adjustment factor of 0.95 shall be considered in accordance with methodology.

5.4 Estimated Net GHG Emission Reductions and Removals

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

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

Where:

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

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

Where:

$B_{y,savings,i,j}$	=	Quantity of woody biomass that is saved in tonnes per improved cookstove 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})
$NCV_{wood\ fuel}$	=	Net calorific value of the non-renewable woody biomass that is substituted or reduced (IPCC default for wood fuel, 0.0156 TJ/tonne) ⁷
EF_{wf,CO_2}	=	CO ₂ emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO ₂ /TJ) ⁸
$EF_{wf,non\ CO_2}$	=	Non-CO ₂ emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO ₂ /TJ) ⁹
$N_{y,i,j}$	=	Number of improved cookstoves of type i and batch j operating during year y
0.95	=	Discount factor to account for leakage

The quantify of woody biomass saved due to implementation of improved cookstoves to be estimated using equation below:

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

where

η_{old}	=	Efficiency of baseline cookstove
$\eta_{new,y,i,j}$	=	Efficiency of the improved cookstove type i and batch j determined through water boiling test (WBT) during year y Alternatively, efficiency may be determined using Equation 5
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.

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

⁷ 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 1 Introduction

⁸ 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion

⁹ 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion

where

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

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

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

Where

$B_{old,adjusted}$	=	Adjusted B_{old} to account the ex post usage of firewood in baseline cookstove(s) by project households in addition to improved cookstove (in tonnes per device).
μ_y	=	Baseline stove usage factor to account for use of baseline cookstoves along with improved cookstoves

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

- 1) The project has installed 150,000 ICS as on 31-December-2022.
- 2) ICS installation done within 1st year of project implementation.
- 3) The life span of ICS is 10 years. For conservative estimate of ER, the annual stove loss rate is estimated at 5%
- 4) $B_{old,adjusted}$ is assumed as 5.6950 tonnes / device / year considering μ_y as 0 (0% baseline usage).

Hence, the number of ICS operating during year y is as below -

Year (y)	$N_{y,l,j}$
1	28,194
2	1,27,326
3	1,42,224
4	1,35,113
5	1,28,357
6	1,21,939
7	1,15,842
8	1,10,050
9	1,04,548
10	99,320

Thermal Efficiency of Project Cookstove in year y –

Year (y)	$\eta_{new,y,l,j}$
1	32.43%
2	32.11%
3	31.78%
4	31.47%
5	31.15%
6	30.84%
7	30.53%
8	30.23%
9	29.92%
10	29.63%

Determination of quantity of woody biomass that is saved in tonnes per ICS during year y –

Year (y)	$B_{old,adjusted}$	$\eta_{new,y,i,j}$	η_{old}	$B_{y,savings,i,j}$
1	5.6950	32.43%	0.1	3.939
2	5.6950	32.11%	0.1	3.921
3	5.6950	31.78%	0.1	3.903
4	5.6950	31.47%	0.1	3.885
5	5.6950	31.15%	0.1	3.867
6	5.6950	30.84%	0.1	3.848
7	5.6950	30.53%	0.1	3.830
8	5.6950	30.23%	0.1	3.811
9	5.6950	29.92%	0.1	3.792
10	5.6950	29.63%	0.1	3.773

Determination of emission reductions for each year –

Year	$B_{y,savings,i,j}$	$NCV_{wood\ fuel}$	$f_{NRB,y}$	$EF_{wf,CO2}$ + $EF_{wf,non\ CO2}$	$N_{y,i,j}$	$ER_{y,i,j}$
1	3.939	0.0156	0.81	138.23	28,194	184,106
2	3.921	0.0156	0.81	138.23	1,27,326	827,620
3	3.903	0.0156	0.81	138.23	1,42,224	920,189
4	3.885	0.0156	0.81	138.23	1,35,113	870,126
5	3.867	0.0156	0.81	138.23	1,28,357	822,769
6	3.848	0.0156	0.81	138.23	1,21,939	777,972
7	3.830	0.0156	0.81	138.23	1,15,842	735,598
8	3.811	0.0156	0.81	138.23	1,10,050	695,517
9	3.792	0.0156	0.81	138.23	1,04,548	657,605
10	3.773	0.0156	0.81	138.23	99,320	621,745

The below table mentions the estimated emission reductions generated during the project crediting period. The estimated baseline emissions, project emissions & leakage emission have been reflected as Not Applicable (NA) because of the following reasons:

1. The methodology does not quantify baseline & project emissions separately. It directly quantifies net emission reductions achieved by the project as described in sections 5.1 & 5.2 of this document.
2. A default leakage adjustment factor of 0.95 has been considered, in accordance with methodology, in the calculation of net emission reductions as mentioned in section 5.3 of this document.

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)
Year 2019	-	-	-	184,106
Year 2020	-	-	-	827,620
Year 2021	-	-	-	920,189
Year 2022	-	-	-	870,126
Year 2023	-	-	-	822,769
Year 2024	-	-	-	777,972
Year 2025	-	-	-	735,598
Year 2026	-	-	-	695,517
Year 2027	-	-	-	657,605
Year 2028	-	-	-	621,745
Total	-	-	-	7,113,247

6 MONITORING

6.1 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	Approved revised PoA DD; version 17, dated 27/12/2018
Value applied:	0.81
Justification of choice of data or description of measurement methods and procedures applied	This parameter determined ex-ante in registered CDM PoA-DD for PoA 9007.
Purpose of Data	Calculation of emission reductions
Comments	Considered same as CDM CPA-DD, since project implementation was started from CPA inclusion of the project under CDM.

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
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	No comments

Data / Parameter	$EF_{wf,CO2}$
Data unit	tCO ₂ /TJ
Description	CO ₂ emission factor for the use of wood fuel in baseline scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion
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	No comments

Data / Parameter	$EF_{wf,non\ CO2}$
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	No comments

Data / Parameter	η_{old}
Data unit	Fraction
Description	Efficiency of baseline cookstove
Source of data	Methodological default value
Value applied:	0.1
Justification of choice of data or description of measurement methods and procedures applied	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
Purpose of Data	Calculation of emission reductions
Comments	No comments

Data / Parameter	B_{old}
Data unit	tonnes/year
Description	Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices.
Source of data	The baseline survey assessed the average woody biomass usage per household per annum amongst users of 3-stone fires, / pot support according to interviews in Zambia. This data was gathered according to: Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities
Value applied:	5.695

Justification of choice of data or description of measurement methods and procedures applied	This parameter was determined ex-ante at the time of CDM CPA inclusion.
Purpose of Data	Calculation of emission reductions
Comments	The value of this parameter has been considered same as that in the CDM CPA-DD, since project implementation commenced from CPA inclusion of the project under CDM.

Data / Parameter	η_p
Data unit	Fraction
Description	Efficiency of project stove at the start of project activity.
Source of data	Manufacturer's specification
Value applied:	0.345
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 $\eta_{\text{new},y,i,j}$
Comments	No comments

6.2 Data and Parameters Monitored

Data / Parameter	$N_{y,i,j}$
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 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 150,000 ICS and the installation/distribution of ICS to be implemented in 1 st year of project start date.
Monitoring equipment	Monitoring survey
QA/QC procedures applied	No Comments
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	No comments

Data / Parameter	$\eta_{new,y,i,j}$
Data unit	Fraction
Description	Efficiency of the improved cookstove type i and batch j determined through water boiling test (WBT) during year y
Source of data	Calculation
Description of measurement methods and procedures applied	To adopt Option (v.) given in the methodology: “Efficiency of the improved cookstoves to be estimated using equation 5 above where loss in efficiency per year is calculated, and therefore this parameter does not need to be monitored”

Frequency of monitoring/recording	Annual																						
Value applied:	For ex-ante calculation, the value below is applied.																						
	<table> <tr> <th>Year</th><th>$\eta_{new,y,i,j}$</th></tr> <tr><td>1</td><td>32.43%</td></tr> <tr><td>2</td><td>32.11%</td></tr> <tr><td>3</td><td>31.78%</td></tr> <tr><td>4</td><td>31.47%</td></tr> <tr><td>5</td><td>31.15%</td></tr> <tr><td>6</td><td>30.84%</td></tr> <tr><td>7</td><td>30.53%</td></tr> <tr><td>8</td><td>30.23%</td></tr> <tr><td>9</td><td>29.92%</td></tr> <tr><td>10</td><td>29.63%</td></tr> </table>	Year	$\eta_{new,y,i,j}$	1	32.43%	2	32.11%	3	31.78%	4	31.47%	5	31.15%	6	30.84%	7	30.53%	8	30.23%	9	29.92%	10	29.63%
Year	$\eta_{new,y,i,j}$																						
1	32.43%																						
2	32.11%																						
3	31.78%																						
4	31.47%																						
5	31.15%																						
6	30.84%																						
7	30.53%																						
8	30.23%																						
9	29.92%																						
10	29.63%																						
Monitoring equipment	Not Applicable																						
QA/QC procedures applied	Not Applicable																						
Purpose of data	Calculation of emission reductions																						
Calculation method	Calculation to be performed using equation below: $\eta_{new,y,i,j} = \eta_p \times (DF_n)^{y-1} \times 0.94$																						
Comments	No comments																						

Data / Parameter	μ_y
Data unit	Fraction
Description	Adjustment to account for any continued use of pre-project devices during the year y

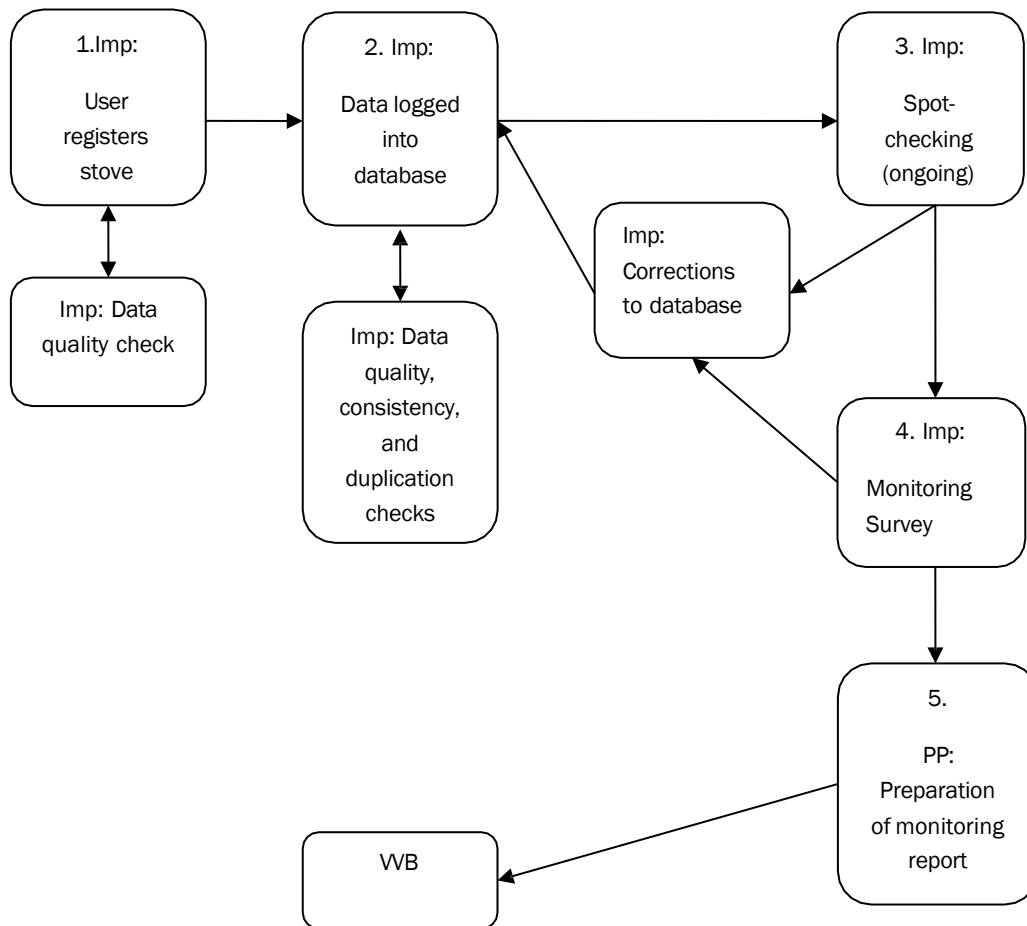
Source of data	Monitoring survey
Description of measurement methods and procedures applied	Minimum sample size of each type i and batch j should be in line with the latest version of Standard for sampling and surveys for CDM project activities and programme of activities or guidelines provided in methodology Section 8.4 option (b). (a) If the baseline cookstoves are decommissioned and no longer used, as determined by the monitoring survey its value is 0 and Bold, adjusted is equal to Bold. (b) If both the improved cookstove and baseline cookstoves are used together then surveys shall be conducted to record the average continued operation of baseline cookstoves in a sample of households. The surveys should be designed to capture the cooking habits and stove usage of households in the region, including quantification of use of baseline cookstoves, by formulating questions and/or collecting evidence to determine the frequency of usage of both the improved cookstoves and baseline cookstoves. The end user will be asked for the average number of meals prepared in a week's time on all available stoves (project and baseline stove) and then asked for number of meals prepared on project stove and baseline stove separately. For arriving at the continued usage rate of pre-project devices (baseline stove), total number of meals prepared on baseline stove per week will be divided by the total number of meals prepared on all available stoves (project and baseline stove) in the household.
Frequency of monitoring/recording	At least once every two years
Value applied:	For ex-ante calculation, the value is assumed as 0.
Monitoring equipment	Not Applicable
QA/QC procedures applied	Not Applicable
Purpose of data	Calculation of emission reductions
Calculation method	Not Applicable
Comments	No comments

Data / Parameter	Life Span
Data unit	Number of years
Description	The operating lifetime of the project device. The life span should be reported if the methodology equation 5 is adopted to determine the project stove efficiency
Source of data	Manufacturer's specification
Description of measurement methods and procedures applied	Not Applicable
Frequency of monitoring/recording	Once at the time of project stove installation
Value applied:	10
Monitoring equipment	Not Applicable
QA/QC procedures applied	No comments
Purpose of data	Calculation of emission reductions
Calculation method	Not Applicable
Comments	The life of TLC stove is at least 10 years owing to it being a clay and brick stove which can be easily repaired using a mixture of local clay, cow dung/ash, sand and water etc. on a regular basis. The metal parts used in the stoves are under extended warranty from PP/manufacturer side throughout the projected life span and will be replaced in case of request received from the stove owner for replacement. PP has confirmed the life span of 10 years through the above measures.

6.3 Monitoring Plan

The monitoring system applied involves a number of key elements that ensure that the PP and Implementer have high-quality, unbiased and reliable information regarding the performance of the project in terms of implementation and outcomes.

The below flow-chart illustrates the roles and responsibilities of the parties during the implementation of the monitoring system for the grouped project. In the below flowchart, the Implementer is abbreviated to “Imp”, and can be the PP or another party authorized by the PP.



Below is the description of the above steps on the flow-chart.

- 1. Imp: User registers stove:** Implementer collects/receives the necessary information requested on the Registration Card from the user. Means of collecting this information is through a physical Registration Card filled by Imp staff, end-users or partner organization’s staff, or

through the use of ICTs or SMS. Implementers' staff checks the accuracy of information provided, and request for field staff additional clarifications if needed.

2. Imp: Data logged into database: Implementer trained staff input the data in the database either manually (if data collected from physical Registration Card) or automatically if data was collected using ICTs or SMS. Implementer staff double check the information included on the database and check for duplications. Any duplicate information is investigated, and errors corrected or excluded from the database if it is a true duplicate entry.

3. Imp: Spot-checking (ongoing): Implementer field staff randomly select households included in the database and visit them to cross-check the information on the database with the factual evidence in the field. Any inconsistencies found (e.g. change in the address of a user) gets updated on the database, and in the case ICS are found to be no longer in use, they will be clearly marked as such and excluded from emission reductions calculations. During the spot check, if any ICS was found to be in poor working condition like crack in the stove body or with missing metal parts, field staffs either repaired the stoves or reported to the management of implementer who then either provided the parts from their existing stocks or order the same to PP who procured those from their suppliers. Implementers then provided those parts to the stove users. This is a continuous process.

4. Imp: Monitoring Survey : Implementer follows the requirements as per VCS-PD and CPA-DD to collect the necessary information for a monitoring period.

5. PP: Preparation of monitoring report: the PP prepare the final monitoring report to be provided to the verifier VVB for verification of emission reductions.

Responsibilities of PP and Implementer

Project Proponent -

- Maintain copies of the project database and back-up records necessary to verify stoves distributed within each project.
- Provide overall coordination of ICS distribution across the geographical boundary of the project.
- Oversee day-to-day operation of the project
- Coordinate with a VVB to verify emissions reductions from project; and
- Communicate in all matters with the VERRA.

Implementer -

- Coordinate and manage the market promotion necessary for successful distribution.
- Coordinate and manage the implementation of the monitoring plan.
- Develop and undertake stove distribution.
- Develop and maintain a stove tracking and monitoring and reporting system with a high level of data integrity.
- Maintain an accurate database of stove location for verification and issuance of carbon credits under a design agreed with PP.
- Keep all records necessary to verify distributed stoves within project;

- Implement and oversee day-to-day operation of the project, including ensuring users of the stoves are aware of how they should be used.
- Track stoves to end users and verify use.
- Facilitate the field work of commissioned VVBs for verification services;
- Supervise and provide training to local personnel for, monitoring and stoves distribution.
- Organize training sessions
- Distribute training materials

Sampling Plan

As per Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities; version 09.0, the sampling plan is the following:

(1) Sampling Design

Due to the large number of ICS envisioned to be distributed as part of the project activity, it is not economically feasible to monitor each individual ICS unit distributed. Therefore, representative sampling undertaken as part of a Sampling Plan that is designed in line with the requirements of the “Standard for sampling and surveys for CDM project activities and programme of activities”.

(1.1) Objective and Reliability Requirements

The objective is to obtain an unbiased and reliable estimate of the proportion or mean value of the following key variables over the course of the crediting period, and with 90/10 confidence/prevision (as per ap biennial plied methodology VMR 0006; version 1.1).

Monitored Parameters:

Sr. no	Parameter	Description of Parameter	Monitoring Frequency
1	$N_{y,i,j}$	Number of project devices of type i and batch j operating during year y	At least once every two years
2	μ_y	Adjustment to account for any continued use of pre-project devices during the year y	At least once every two years

(1.2) Target Populations

The target population are all households in the project database which are using fuelwood in ICS distributed under the project for cooking.

(1.3) Sampling Frame

It is expected that the geographical locations do not have influence on the parameters of interest that is $N_{y,i,j}$ & μ_y . Therefore, these parameters can be assumed to be highly homogeneous regardless of how the end user group and distribution/installation location is defined since the end users shall always be households and geographical location is restricted to the project

boundary. The Sampling Frame for individual parameters have been defined in the following paragraphs

The sample frame refers to all the information sources on the Database. The ICT system is the primary mechanism for data collection for distributed ICS and the Monitoring Survey (which includes a household questionnaire and visual inspection of ICSs) that used throughout the lifetime of the project. The ICT data is used to populate the stoves Database and the Monitoring Survey follows the “Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities”; version 09.

The project activity is only distributing one model of ICS. As explained below (on section “sampling method”), ICS shall be grouped together to create a Primary Sampling Unit which is homogenous. The procedure to determine the sample of households ensure that they adequately represent the broader project population, minimizing sampling error. Using, a 90 per cent confidence level, and a 10 per cent margin of error, a random sample be selected from the target population.

Sampling frame for proportion of ICS still in operation ($N_{y,i,j}$) and Adjustment to account for any continued use of pre-project devices (μ_y)

The first step is to identify the Primary Sampling Units. Factors such as model of the ICS do not effect parameter $N_{y,j}$ and μ_y . Therefore, Primary sampling unit in case of these parameters is independent of model of stove.

(1.4) Sampling Method

The sampling method for the monitored parameters $N_{y,i,j}$, and μ_y is Simple Random Sampling and samples randomly selected from the primary sampling units as illustrated above. To ensure a random selection of ICS, random number generators shall be applied. Each ICS in the target population is uniquely identifiable by its unique ID number. Each ICS can thus be allocated a Sample Selection Number in each monitoring period, starting at 1 and increasing up to the total number of ICS in the Database for that pre-defined sampling frame. Applying the random number generators, the ICS can then be randomly chosen from the defined population up to the required sample size as calculated by the project proponent.

To determine the parameters, sampling involve the following approaches (outcome in brackets):

$N_{y,i,j}$ Visual inspection of the premises to see if ICS is operational and in use. Interview with end user if required to verify that ICS is still in use (Yes/No)

μ_y Interview with end user for average number of meals cooked using baseline stove per week out of total meals cooked by household in a week.

Using the formulas below, the PP randomly sample the required number of ICS from the primary sampling units.

(1.5) Sample Size

For the estimation of the proportion or mean value of the parameters investigated, the minimum sample size for each sample frame has to achieve the 90/10 confidence/precision.

The procedure to determine the sample of households ensure that they adequately represent the broader project population, minimizing sampling error. Using a 90 per cent confidence level, and a 10 per cent margin of error, random samples selected from each Primary Sampling Unit. The parameter number of stoves still in operation during the monitoring period as determined by the monitoring survey ($N_{y,ij}$ and μ_y) estimated through sampling annually/biennially. Both parameters to be monitored, are proportion/percentage parameter.

In order to calculate the required sample size estimates, values for the proportions are required. Furthermore, the standard deviation needs to be assumed in case of sampling for a mean value.

As per Guidelines for Sampling and surveys for CDM project activities and programmes of activities, there are different ways available to obtain the estimates of the parameter of interest:

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

For the registration purpose of project, option (c) as stated above shall be applied. For the following monitoring periods, the estimates can be adjusted taken the results of the previous monitoring period(s) into account or the result from recent pilot study which is conducted after the previous monitoring periods.

Parameter $N_{y,ij}$ and μ_y

To estimate the sample size for both parameters the following equation is used:

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

Where:

n = Sample size

N = Population size (Total number of households/ICS)

p = Expected proportion

1.645 = Represents the 90% confidence required

0.1 = Represents the 10% relative precision

The following assumptions are made to exemplify the sample size calculation for the parameters.

- (i) An overview of the estimated sample sizes for a hypothetical population of 150,000 ICS units applying a level of 90/10 is provided below. It is likely that all the sample frames for each parameter include 150,000 ICS in the first monitoring period, so this is a conservative approach. Hence, population size, N, is taken as 150,000 households/ICS (Assuming one ICS for one household).
- (ii) It is expected at least 85% of ICS still in operation and continuous usage rate of baseline stove is 15%, hence the expected proportion p is taken as 0.85.

Sample size calculation:

The calculation of the required sample size for each parameter in the first monitoring period (from 01-January-2021 to 31-December-2022) is illustrated below. In all cases a conservative approach is taken, however if for any parameter the required confidence/precision is not met then the PP randomly select an additional sample and collect further data from this sample to ensure the pooled data meet or exceed the required thresholds.

Based on the above assumptions, the resulting sampling size is calculated as:

$$n \geq \frac{1.645^2 \times 150,000 \times 0.85(1 - 0.85)}{(150,000 - 1) \times 0.1^2 \times 0.85^2 + 1.645^2 \times 0.85(1 - 0.85)} = 47.68$$

Therefore, in this case a sample size of 48 is to be sampled from each primary sampling unit.

Since parameters $N_{y,j,j}$, and $\mu_{y,share}$ share the same sampling units, PP may choose to have one common survey for these two parameters with largest number of sample size between these two parameters being chosen. Sampling more than one parameter within the same sample (household) helps reduce travel needs for monitoring and the associated costs. At the same time this approach ensures the random selection of samples for every parameter.

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

(2) Data

(2.1) Field Measurements

To monitor the number of stoves that continue to be in use ($N_{y,i,j}$) and continuous usage rate of baseline stove (μ_y) the data collected are representative number of stoves in the database that are in use for the monitoring period. The method of collecting data was field surveys of required sample size of ICS users in the database. Data collected from the field surveys, entered in the database and included in the monitoring report.

The table below summarizes field measurement data requirements

Parameter	Timing (indicative)	Monitoring Frequency (required by AMS II.G –Version 11.1)	Methods to be applied	Comments on seasonal fluctuation
$N_{y,i,j}$	Monitoring will likely occur at least once every 2 years	annual/biennial	Visits to the premises, visual inspection and interview with ICS end-user	Unlikely to be due to any seasonal fluctuation.
μ_y	Monitoring will likely occur at least once every 2 years	annual/biennial	Visits to the premises and interview with ICS end-user.	Unlikely to be due to any seasonal fluctuation.

(2.2) Quality Assurance/Quality Control

The PPapplied measures to ensure the required confidence/precision for each sampled parameter is met, allowing for non-response and the possible removal of outliers from the sample, as part of a Quality Control/Quality Assurance system. The choice of measure applied to each parameter depend on the cost of each data collection approach and logistics required. The PP determined the most effective measure for each parameter from the following list (illustrated using a required sample size of 20 and an effect of non-response of 2 to 4 ICS):

- Oversampling: Randomly draw a sample of minimum 24 ICS and collect data from each
- Buffer Group: Randomly draw a sample of at minimum 24 ICS and collect data from only 22 ICS. If this would not result in the required sample size data would be collected from the additional 2 ICS that were selected in the sample.
- Draw an additional sample: Randomly draw a sample of 22 ICS and collect data from these. If the required sample size is not achieved, an additional sample of 2 elements will be drawn and included in the sample.

- Use lower confidence bound (of $N_{y,i,j}$, μ_y) or, with a conservative approach according to the parameter definitions,

The PP choose to stop monitoring a particular parameter once the required level of confidence/precision has been reached, as long as the calculated minimum number of samples has been achieved. As an example, the following steps could logically be followed for the case of applying a 30% buffer:

1. Visit first 10% of premises required for the 30% buffer. If the number of responses is sufficient to achieve the required reliability level, then stop sampling.
2. If step 1 is not sufficient to achieve the required reliability level, then visit the next 10% of premises (increases the additional sampling to 20% of the 30% buffer). If this additional sampling is sufficient, then stop sampling.
3. If step 2 is not sufficient to achieve the required reliability level, then complete the final 10% of the additional sampling buffer (bringing the total to 30%).

The sampling plan has the following procedures in place to ensure good quality data. The PP ensure that field personnel have reviewed, understand and have signed the monitoring plan, including provisions for maximizing response rates, documenting out-of-population cases, refusals and other sources of non-response. A quality control and assurance strategy documented. Quality control and assurance strategies include addressing non-sampling errors, such as non-response or bias from interviewer. The monitoring plan explain how to properly survey households to prevent bias from interviewer. In the case a household refuses to participate, another household chosen at random. To reduce interviewer bias, good questionnaire design and well-tested questionnaires used.

The calculation of the sample size carried out using estimates for parameter proportions, mean values and standard deviations, as the actual characteristics of the population/sampling frame are unknown. In order to ensure the quality of the sampling results, the PP can draw on the provisions for reliability calculations as provided by the Guidelines for Sampling and Surveys in CDM Project Activities and Programme of Activities (version 04). In the event that the sampling results do not fulfil the required level of confidence and precision, the PP can undertake additional samples. If the reliability is still not sufficient after additional samples or other measures, the sampling may be repeated with an increased sample size. Alternatively, the PP may choose to apply the lower bound or higher bound according to the more conservative approach.

(2.3) Data archiving

Hard copies of the surveys kept and the registration database have back up. Original stove purchase contracts or other means of acceptance by the users stored in the main office for the coordinating entity. A back-up of the registration database also be stored on an electronic medium by the PP. All data monitored and required for verification and issuance kept for two

years after the end of the crediting period or the last issuance of VCUs for the project activity, whichever is later.

(2.4) Analysis

The PP manage a project database that includes the following data that can be directly attributable to the project activity, thereby allowing unambiguous determination of the emission reductions attributable the project:

- A list of households participating in project activity, including name, community/location, distribution date and unique serial number;
- Where replacements are made, assurance that the efficiency of the new ICS is similar to the specified.

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

(3) Implementation

Sampling for the purpose of emission reduction calculation and elaboration of the monitoring report occur at the end of each monitoring period. This sampling conducted by trained personnel either part of the CPA Implementer or PP team, or an experienced third-party entity. The maximum length of one monitoring period will be two years (duration, not calendar years). The CPA Implementer responsible for managing household data collection and entry into the project database. Field personnel receive training on how to properly deal with surveying techniques and reduce errors and sign a document certifying that there is no conflict of interest of those involved in data collection and analysis. If there is conflict of interest, the personnel are not allowed to participate in data collection and analysis. The project database records the start and end dates of each monitoring period and record the emission reductions attributable to each monitoring period. Appropriate record keeping procedures implemented to ensure that each monitoring period data set can be transparently attributed to its corresponding CPA, preventing any occurrences of double counting. An internal review of the project database able to determine the status of project—the duration of previous monitoring periods, the households delivering monitoring data, and current verification activities.

(4) Monitoring Reporting

The PP assess all monitoring data and produce one or two monitoring reports for the project for the VVB to verify corresponding to the preceding monitoring period the project. This report presents the data relating to the emission reductions generated by the project at the time of the monitoring period.

(5) Results

The following parameter was obtained through sampling during the current monitoring period –

S. No.	Parameter	Description of Parameter
1	$N_{y,i,j}$	Number of project devices of type i and batch j operating during year y
2	μ_y	Adjustment to account for any continued use of pre-project devices during the year y

The following table summarizes the sample sizes and results –

Monitored Parameter	Sample size	Survey Results	Precision achieved
Number of project devices of type i and batch j operating during year y ($N_{y,i,j}$)	48	100%	0.00%
Adjustment to account for any continued use of pre-project devices during the year y (μ_y)	48	4.18%	1.30%

As per the current MP survey 100% of stoves were found to be operational. However, as per the latest stove champion follow up survey conducted, stoves in operation was 98.36%¹⁰ (**precision achieved 0.86%**) and as per the secondary data of other projects, stoves in operation percentage was 98.90%. PP has considered as minimum number of stoves in operation 90%. Hence, PP has considered the lowest value of stoves in operation 90% on a conservative basis.

7 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

7.1 Data and Parameters Monitored

Data / Parameter	$N_{y,i,j}$
Data unit	Number
Description	Number of project devices of type i and batch j operating during year y
Value applied:	135,000
Comments	No comments As per the current MP survey 100% of stoves were found to be operational. However, as per the stove champion follow up survey conducted in latest MP, stoves in operation was 98.36%, and as per the secondary data of other projects, stoves in operation

¹⁰ File 1: 44.03.06 Privileged & Confidential - Stove champion data (26 August 2024)

File 2: 44.03.05 Stoves in Operation - Verified Secondary Data (2024-08-05).

	percentage was 98.90%. PP has considered as minimum number of stoves in operation 90%. Hence, PP has considered the lowest value of stoves in operation 90% on a conservative basis. Stoves in operation are $N_{y,i,j} = (0.90 * 150,000) = 135,000$
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Data / Parameter	$\eta_{new,y,i,j}$										
Data unit	Fraction										
Description	Efficiency of the improved cookstove type										
Value applied:	The values applied for the current monitoring period are as follows: <table border="1"> <thead> <tr> <th>Vintage</th><th>$\eta_{new,y,i,j}$</th></tr> </thead> <tbody> <tr> <td>1</td><td>32.43%</td></tr> <tr> <td>2</td><td>32.11%</td></tr> <tr> <td>3</td><td>31.78%</td></tr> <tr> <td>4</td><td>31.47%</td></tr> </tbody> </table>	Vintage	$\eta_{new,y,i,j}$	1	32.43%	2	32.11%	3	31.78%	4	31.47%
Vintage	$\eta_{new,y,i,j}$										
1	32.43%										
2	32.11%										
3	31.78%										
4	31.47%										
Comments	This parameter has been calculated based on option (v.) of the “Description of measurement methods and procedures to be applied” for this parameter described on page 16-17 of the methodology. The calculation has been provided in the Emission Reduction Excel sheet tab “Estimated ERs Calculations”.										

Data / Parameter	μ_y
Data unit	Fraction
Description	Adjustment to account for any continued use of pre-project devices during the year y
Value applied:	0.0418
Comments	No comments

Data / Parameter	Life Span
Data unit	Number of years
Description	The operating lifetime of the project device. The life span should be reported if the methodology equation 5 is adopted to determine the project stove efficiency
Value applied:	10
Comments	The life of TLC-CQC Rocket stove is at least 10 years owing to it being a clay and brick stove which can be easily repaired using a mixture of local clay, cow dung/ash, sand and water etc. on a regular basis. The metal parts used in the stoves are under extended warranty from PP/manufacturer side throughout the projected life span and will be replaced in case of request received from the stove owner for replacement. PP has confirmed the life span of 10 years through the above measures

7.2 Baseline Emissions

The methodology does not account for baseline emissions separately. It quantifies net emission reductions achieved by the project which has been described in Section 5.4 of this document. The emission reductions calculations have been provided in an excel spreadsheet.

7.3 Project Emissions

The methodology does not account for project emissions separately. It quantifies net emission reductions achieved by the project which has been described in Section 5.4 of this document. The emission reductions calculations have been provided in an excel spreadsheet.

7.4 Leakage

Default leakage adjustment factor of 0.95 has been considered in accordance with methodology.

7.5 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
Year 2021 (1-January-2021 to 31-December-2021)		-	-	760,605
Year 2022 (1-January-2022 to 31-December-2022)		-	-	837,995
Total		-	-	1,598,600

Comparison of Ex-ante emission reductions and achieved emissions reductions -

<u>Ex-ante emissions reductions /removals</u>	<u>Achieved emissions reductions /removals</u>	<u>Percent difference</u>	<u>Justification for the difference</u>
1,422,650	1,598,600	+12.37%	There is an increase in emission reduction value compared to estimate in validation. This is because PP has considered a linear loss rate of 5% stoves every year during ER estimation (Ex ante). However, the actual stoves in operation was 90% during this verification.

APPENDIX 1: SCOPE 3 EMISSION STATEMENT

Public Notice for VCS Project 2713

“Distribution of Improved Cook Stoves in Sub-Saharan Africa-Zambia-CPA-007”

This is to bring to your kind notice that C-Quest Capital Malaysia Global Stoves Limited is implementing a grouped project titled “Distribution of Improved Cook Stoves in Sub-Saharan Africa-Zambia-CPA-007” (VCS ID 2713). It involves distribution of improved cook stoves (ICS) to households in Zambia. For this purpose, Single pot TLC CQC Rocket stove were distributed to households. Stove Metal parts procured from local suppliers. We involved various local implementation partners for installation of these fixed project stoves in Zambia.

Verified Carbon Units (VCUs) may be issued for the greenhouse gas emission reductions and removals for which C-Quest Capital Malaysia Global Stoves Limited and ECOEYE Co., Ltd. will be claiming carbon credits under VERRA. The ownership of these credits lies exclusively with C-Quest Capital Malaysia Global Stoves Limited and ECOEYE Co., Ltd..

This notice intends to apprise you about the project, to avoid any potential risk of double claiming of Scope 3 emissions under this grouped project.