CHITETEZO MBAULA PROJECT – MALAWI

Document Prepared by CO2Logic SA

Project Title	Chitetezo Mbaula Project - Malawi
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Prepared By	CO2Logic SA
Contact	Cantersteen 47, 1000 Brussels, Belgium +32 (0) 478 41 30 07 https://www.co2logic.com

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1 PROJECT DETAILS

1.1 Summary Description of the Project

Summary of technologies/ measures

The present project promotes the distribution and utilization of locally made Chitetezo Mbaula (CM) stoves in Malawi. The CM stove is significantly more efficient than the traditional three stone open fire and therefore contributes to reducing wood consumption, preserving local forests and reducing greenhouse gas (GHG) emissions resulting from unsustainably sourced wood. The CM stove also has further health and social benefits such as reduction of smoke produced during cooking or reduction of time required to collect wood.

Project implementation is coordinated by United Purpose while all carbon related aspects are managed by CO2Logic SA. The project is developed as a grouped project where every CM stove is a project activity instance.

Location of the project

The project will be implemented in Malawi. Details are provided in section 1.12.

Generation of GHG emission reductions/ removals

The CM stove substitutes the widespread households traditional fires used for cooking. The improved thermal efficiency translates into fuel savings and reduction of GHG emissions.

Scenario existing prior to project implementation

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.

Annual average and total GHG emission reductions and removals estimates

The project aims at distributing 125'000 stoves from 2021 until 2026. It is estimated that the project will reduce an average 144,360 tCO2e per year. Over the 7 year life span of the project, this project is expected to reduce a total of 1,010,518 tCO2e.

Audit history

Audit Type	Period	Program	VVB Name	Number of years
Joint validation and verification	08-05-2023 – 12-05-2023	Field visit in Malawi, interviews	Carboncheck (CCIPL)	1 year, 6 months and 15 days
Total	-	-	-	-

1.2 Sectoral Scope and Project Type

The project is categorized under type/category as below:

a) Sectoral scope : 03 Energy demand

b) Type: II Energy efficiency improvement projects

The project is a grouped project.

1.3 Project Eligibility

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

1.4 Project Design

The project is implemented in multiple locations. The project is a grouped project. Each CM stove is a project activity instance as per VCS Standard v4.4 and VCS Program Definitions v4.2[1].

- ### Eligibility Criteria

The below eligibility criteria's – as per VCS Standard version 4.4[1] section 3.6.16 - apply to new project activity instances :

[1] VCS standard v4.4, 21-12-2022, https://verra.org/project/vcs-program/rules-and-requirements/

n°	Criterion	Requirement	Comment
3.6.16 New Project Activity Instance Eligibility Criteria[1]			
1.1	Meet the applicability conditions set out in the methodology applied to the project.	The methodology applied is the one specified in section 3.1 "Title and Reference of Methodology"	-
1.2	Use the technologies or measures specified in the project description.	The project technology used is the one specified in section 1.11 "Description of the Project Activity".	-
1.3	Apply the technologies or measures in the same manner as specified in the project description.	All project measures are described in the Project Description document.	-
1.4	Are subject to the baseline scenario determined in the project description for the specified project activity and geographic area.	All project activity instances will be installed within Malawi 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.	-
1.5	Have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area. For example, the new project activity instances have financial, technical and/or other parameters (such as the size/scale of the instances) consistent with the initial instances, or face the same investment, technological and/or other barriers as the initial instances.	As per "CDM tool for the demonstration and assessment of additionality" V07.0" : 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: The inclusion of new project activity instances shall have to comply with positive list that is the ICS	All new project activity instances are subject to additionality analysis: 1. There is no mandated government program or policy in Malawi which intends to mandate for distribution of project activity instances. 2. The additionality of the SCTP and third category beneficiaries where project stoves are distributed free of

		are installed/ distributed at zero cost to end user and the project activity instance has no other source of revenue but GHG credits.	charge (see section 1.11) falls under the positive list 3. The additionality of the commercial model where stoves are sold at 1500MK (see section 1.11) is proved by the Project Method – Investment Analysis option b from the "CDM tool for the demonstration and assessment of additionality" V07.0". Since all project activity instances are implemented according to the same modalities, the conclusion of the Investment Analysis conducted for the commercial model is replicable to any new project activity instance of the commercial model.
3.6.17 Inclusion of New Project Activity Instances[1]			
2.1	Occur within one of the designated geographic areas specified in the project description.	All project activity instances will be installed within Malawi only.	-
2.2	Conform with at least one complete set of eligibility criteria for the inclusion of new project activity instances. Partial conformance with multiple sets of eligibility criteria is insufficient.	All project activity instances will conform with the complete set of eligibility criteria.	-
2.3	Be included in the monitoring report with sufficient technical, financial, geographic, and other relevant information to demonstrate conformance with the applicable set of eligibility criteria and enable evidence gathering by the validation/verification body.	All project activity instances will demonstrate conformance with the complete set of eligibility criteria.	-

2.4	Be included in an updated project description, with updated project location information (as set out in Section 3.11), which shall be validated at the time of verification against the applicable set of eligibility criteria.	All project activity instances will be included in an updated project document and demonstrate conformance with the complete set of eligibility criteria.	-
2.5	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 (i.e., the date upon which the project activity instance began reducing or removing GHG emissions).	All project activity instances will be accompanied by carbon waivers transferring the ownership rights of the carbon assets generated.	-
2.6	Have a start date that is the same as or later than the grouped project start date.	All project activity instances have evidence (receipts at customer and promoters level) clearly showing that the implementation date respects the project start date. This evidence is recorded in the project database.	-
2.7	Be eligible for crediting from the start date of the project activity instance through to the end of the project crediting period (only).	All project activity instances have evidence showing their eligibility from the start date of the project activity instance through to the end of the project crediting period (only).	-
2.8	Only eligible for crediting from the start of the verification period in which they were added to the grouped project.	All project activity instances will be eligible for crediting from the start of the verification period in which they were added to the grouped project.	-
2.9	Not be or have been enrolled in another VCS project.	No project activity instance will be enrolled in another VCS project.	-

2.10	Adhere to the clustering and capacity limit requirements for multiple project activity instances set out in 3.6.8 - 3.6.9.	See below.	-
3.6.8 Multiple Project Activity Instances[1]			
3.1	The project proponent shall include in a singular project all project activity instances within ten kilometers of another instance of the same project activity and with the same project proponent (i.e., instances of the same project activity may not be spread across more than one project if they are within ten kilometers of each other).	All project activity instances located within ten kilometers of another instance of the project activity and with the same project proponent will be included in the present project.	
3.6.9 Capacity Limits[1]			
4.1	Where a capacity limit applies to a project activity included in the project, no project activity instance shall exceed such limit. Further, no single cluster of project activity instances shall exceed the capacity limit, determined as follows: 1) Each project activity instance that exceeds one percent of the capacity limit shall be identified. 2) Such instances shall be divided into clusters, whereby	1) As per "VMR0006: Methodology for Installation of High Efficiency Firewood Cookstoves V1.1"[2] section 1, referring to "AMS-II.G. Energy efficiency measures in thermal applications of non-renewable biomass"[3]: "The aggregate energy savings of a single project activity shall not exceed the equivalent of	-

[2] VMR0006 Methodology for Installation of High Efficiency Firewood Cookstoves, https://verra.org/methodology/vmr0006-methodology-for-installation-of-high-efficiency-firewood-cookstoves/

[3] AMS-II.G. Energy efficiency measures in thermal applications of non-renewable biomass version 13.0, https://cdm.unfccc.int/UserManagement/FileStorage/6TOUCX21D0BHNVIRZFWMEKALY94GS7

	each cluster is comprised any system of such 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) None of the clusters shall exceed the capacity limit and no further project activity instances shall be added to the project that would cause any of the clusters to exceed the capacity limit.	60 GWh per year or 180 GWh thermal per year in fuel input." The estimated energy saving of a single stove in Malawi is in the order of magnitude of 1.5 to 2.5 $tons_{firewood}$/year, corresponding to $6.678*10^{-3}$ $GWh_{thermal}$/year.stove. Therefore, no project activity instance is expected to exceed one percent of the capacity limit of 180 $GWh_{thermal}$/year.stove 2) The expected annual energy saving for each project activity instance being $6.678*10^{-3}$ $GWh_{thermal}$/year.stove, well below 1% of the capacity limit, the project activity instances under this grouped project activity shall not be assigned to clusters. 3) N/A	
Additional criterions			
5.1	The distributed stoves shall be traceable and uniquely identifiable	All new project activity instances are identified with a serial number on the stove. A receipt is issued to customers	-

		and a duplicate is kept in the project's records. Every stove is attributed to the commercial, SCYP or third category model. All the information is recorded in the project database	

1.5 Project Proponent

Organization name	CO2logic SA
Contact person	Herman Noppen
Title	Climate Projects Director
Address	Cantersteen 47, 1000 Brussels, Belgium
Telephone	+ 32 (0) 497 05 31 36
Email	herman@CO2logic.com https://www.co2logic.com/en

1.6 Other Entities Involved in the Project

Organization name	United Purpose
Role in the project	Project implementation
Contact person	Will Coley
Title	Energy Program Manager
Address	Mwai House, City Centre, Area 13, PO Box 159, Lilongwe, Malawi
Telephone	+265 982 111 478
Email	will.coley@united-purpose.org https://united-purpose.org/

1.7 Ownership

CO2Logic SA owns the project. As per clause 5 section 3.7.1 of VCS Standard version 4.4, during the registration of the ICS the participating household will sign a carbon waiver transferring the ownership rights of the carbon assets generated from this project to United Purpose, the agency responsible for implementation in the field. United Purpose then transfers its rights on carbon assets to the project proponent (CO2Logic SA) through a separate agreement.

1.8 Project Start Date

01-08-2021 (Date of commissioning first ICS)[4].

1.9 Project Crediting Period

01-08-2021 to 31-07-2028, seven years crediting period, twice renewable, totaling 21 years.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The estimated annual GHG emission reductions/removals of the project are:

☐ <20,000 tCO_2e/year

☐ 20,000 – 100,000 tCO_2e/year

☒ 100,001 – 1,000,000 tCO_2e/year

☐ >1,000,000 tCO_2e/year

Project Scale	
Project	x
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
2021	8,567
2022	69,428
2023	147,230
2024	177,570
2025	187,819
2026	184,378
2027	235,526
Total estimated ERs	**1,010,518**
Total number of crediting years	**7**
Average annual ERs	**144,360**

[4] See file "03. Carbon_waiver_1st_stove_VCS4144.pdf"

1.11 Description of the Project Activity

The Chitetezo Mbaula (CM) stove is a portable cookstove that is produced locally mostly by women. It is made of clay with a hole fashioned in the side to allow air and fuel entry and has fixed pot rests on the top. It is designed to burn fuelwood and crop residues. The technical characteristics of the Chitetezo Mbaula stove are resumed in the table below.

Characteristics of the Chitetezo Mbaula stove	
Average Thermal Efficiency	29%[5]
Fuel	Wood/Crop residues
Stove Technology	Combustion
Materials	Clay
Single pot/multi pot	Single Pot
Portable/fixed model	Portable
Dimensions	300/300/265 mm
Weight	8.0 kg
Lifespan	5 years[6]

These cookstoves are more efficient than the traditional cooking fires due to their improved thermal efficiency. They also reduce indoor air pollution, are safer since there is no open flame and they greatly benefit women and children since they can reduce their time collecting firewood by half.

[5] Average value of WBT results publicly available in the Catalog of Clean Cookstoves: http://catalog.cleancookstoves.org/stove_details.html?stove_id=stove_VROU4NT see "Additional Details"

[6] See "11. EnDev Malawi-Lifespan survey report for Chitetezo Mbaula.pdf"

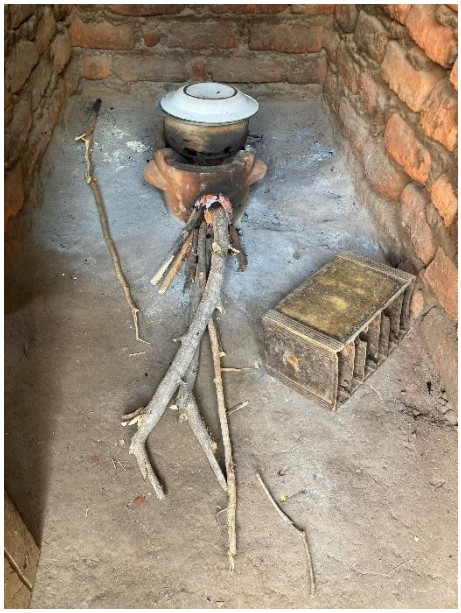

Figure 1 - A CM stove in use

To date, the CM stoves have had the most success in rural Malawi due to its affordability, accessibility and appropriateness considering local preferences for energy needs. The stove is now in its third decade and has evolved from its embryonic start incorporating feedbacks from its many users. The optimal design has been agreed and is standardized. The project does not consist of a fuel switch as locally available wood is still being used.

The project is implemented using two approaches:

- The first approach involves targeting existing beneficiaries of the Social Cash Transfer Program (SCTP) by distributing the stove for free in order to prioritize the most vulnerable households. For this purpose, the project uses SCTP beneficiaries lists for targeting, although the project is not linked to the SCTP program itself. The SCTP is a bi-monthly, unconditional cash transfers from the Government to 10% of Malawian households identified as ultra-poor and labour-constrained across each of the 28 Districts. Currently, the project's average transfer value per household amounts to MWK 9,000 per month from the Government[7].
- The second approach, called the commercial model, seeks to reach out to people who are outside the SCTP by selling the CM at a - subsidized - market price of MWK 1,500 (raised from 1, 000MK in October 2022), or 1,000 MK for a replacement. Various marketing activities have been lined up in this model to activate demand for the stoves, including cooking demonstrations, roadshows as well as school campaigns. Before launching the commercial model, community meetings were held with local leaders in order to get their buy in and leverage their position of influence.

[7] SCTP webpage, Ministry of Gender, Children and Community Development, https://mtukula.com/index.php

Adoption of the technology will be ensured by a number of activities during the project. First, promoters will be trained to raise awareness on the benefits and proper usage of the stove. At the time of sale, the person responsible for the sale hands out an information leaflet in the local language and records all necessary data in a database. Through promoters as well as other mass awareness campaigns through local radio, road shows and other methods, customers and beneficiaries are also trained on proper stove usage to maximize their lifespan. This includes storing them indoors, not using water to put out the fire, handling them with care and using metal wire to extend the lifespan if cracks appear.

Community benefits projects will be designed based on community needs through consultation with community members, local governance structures and experts. This is to ensure that they are as appropriate to community needs, as impactful and as effective as possible.

During the first year of the project, all stove production groups will have an environmental assessment which will inform the implementation of appropriate trainings and activities to mitigate the impacts of clay mining.

1.12 Project Location

The project boundary is the Republic of Malawi.

Latitude	Longitude
-13.9627	33.7739

A kml with geodetic polygons is provided separately[8].

[8] See file "04. Malawi_with_regions.kml"

Figure 2 - The Republic of Malawi

1.13 Conditions Prior to Project Initiation

The fraction of nonrenewable biomass (f_{NRB}) in Malawi is currently at 95.49%[9]. The 2018 census of the Malawian population[10] demonstrated that 95% of the population uses woodfuels as their main fuel for cooking: 77.4% in the form of firewood and 18% in the form of charcoal. The energy sources for cooking are presented in the graph below and shows a constant percentage of use of woodfuels across rural regions:

[9] See "06. Malawi_fNRB Report_v1.0 20.02.2023.pdf " and "07. Malawi_fNRB Calculation Sheet_v1.0 20.02.2023.xlsx "

[10] See "08. 2018 Malawi Population and Housing Census Main Report.pdf "

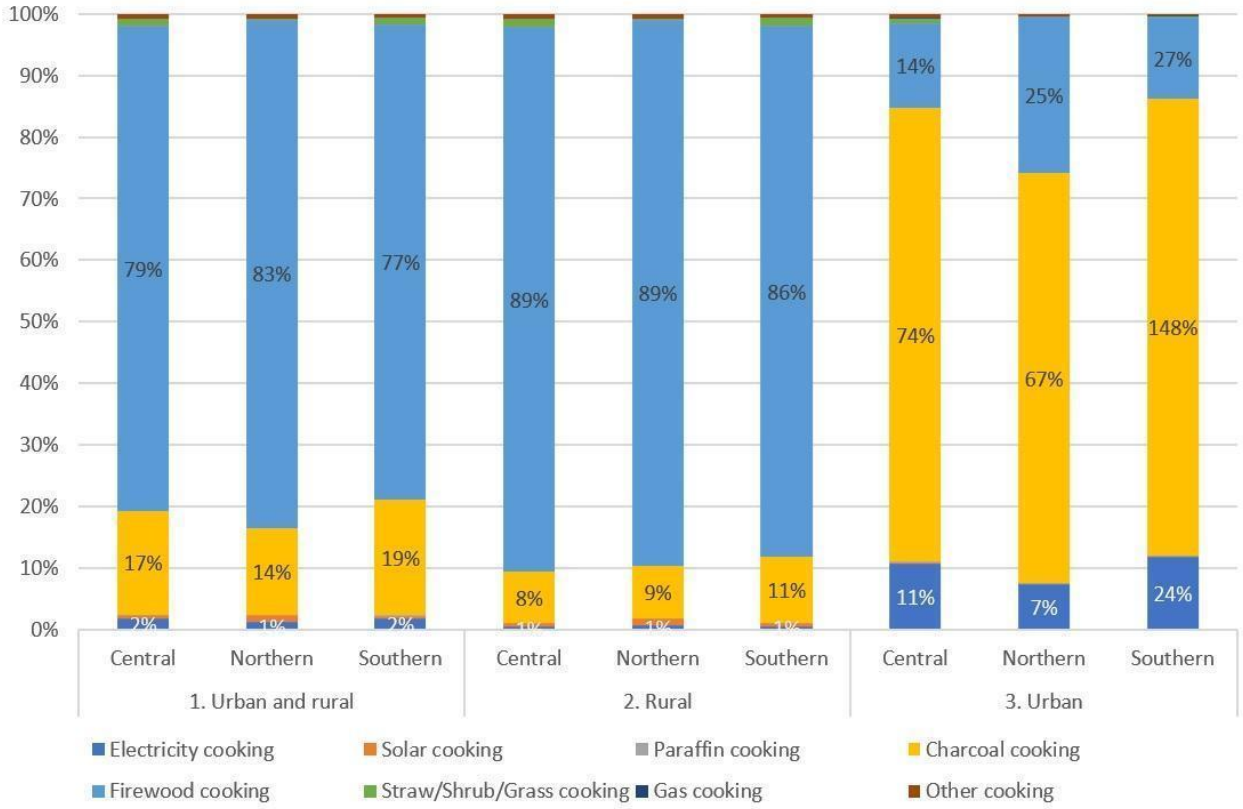

Figure 3 - Population by main Source of Energy for Cooking and Heating, Region and District[10]

While Malawi has distributed 2 million Chitetezo Mbaula cookstoves between 2013 and 2020[11], people in rural area tend to still use traditional three-stone stoves/open fires, charcoal stoves and other traditional stoves when no improved stove is available.

The conditions prior to project initiation is therefore the use of non-renewable wood fuel (firewood) by the target population to meet similar thermal energy needs as provided by project cookstoves.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

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

1.15 Participation under Other GHG Programs

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

The project has not been registered under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

[11] Ireland congratulates Malawi on meeting 2 million clean cookstoves (2020), https://www.dfa.ie/irish-embassy/malawi/news-and-events/news-archive/ireland-congratulates-malawi-on-meeting-2-million-clean-cookstoves.html

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

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

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

1.16.2 Other Forms of Environmental Credit

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

☐ Yes ☒ No

The project will seek SD Vista certification.

1.16.3 Supply Chain (Scope 3) Emissions

As per VCS Website[12] tab "Introduction of requirements for VCS projects to help avoid double claiming in Scope 3 emissions inventories", "*Public statement requirements apply to GHG emission reductions or removals achieved on or after 1 July 2023*", therefore no public statement or email is provided.

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development Contributions Activity Description

The project will contribute to the following SDG's :

- SDG 1 – No Poverty

Poverty is fought by reducing households' expenses for wood fuel provision, both in terms of time necessary for wood collection or in terms of financial means necessary for purchase. The project also provides job creation and an extra source of income to the stove producer groups and the stove promoters.

- SDG 3 – Good Health and Well-Being

An improvement in health outcomes is accomplished since the improved cookstoves reduce the amount of harmful smoke emitted during cooking and other stove-related activities. It also reduces risks for small children since there is no open flame.

- SDG 5 – Gender Equality

[12] https://verra.org/verra-releases-updates-to-verified-carbon-standard-program/

Gender equality is promoted by reducing the time spent collecting firewood and cooking, freeing up time for other activities.

- SDG 7 – Affordable and Clean Energy

By providing families with more efficient cookstoves, energy needs can be fulfilled in a more affordable and sustainable way.

- SDG 13 – Climate Action

By reducing the amount of non-renewable firewood burned, this project significantly reduces the amount of GHG's emitted.

- SDG 15 – Life on Land

This project promotes the sustainable use of forests by reducing the amount of firewood needed and raising awareness on the consequences of deforestation, protecting natural forest eco-systems and wildlife habitats.

1.17.2 Sustainable Development Contributions Activity Monitoring

Here below is the table presenting the Sustainable Development Goals contributions, which are equal for the current project contributions and the contributions over project lifetime since the Monitoring Period under consideration is the first one :

Table 1: Sustainable Development Contributions[13]

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	1.1	1.1.1 Proportion of population below the international poverty line	Reducing household expenses for wood fuel purchase	According to the monitoring survey, 17% of respondents buy their fuelwood partially or completely. The average expenditure reduction is estimated to be 16%. The saved money is then spent primarily on family (58%), income generating activities (37%) and education (5%)	According to the monitoring survey, 17% of respondents buy their fuelwood partially or completely. The average expenditure reduction is estimated to be 16%. The saved money is then spent primarily on family (58%), income generating activities (37%) and education (5%)
2)	1.1	1.1.1 Proportion of population below the international poverty line	Additional revenue generating activities for both the stove producer groups and the stove promotors	150 stove promotor jobs were created, earning 150 MWK per SCT commission and 350 MWK per commercial stove. Additionally, 11 stove production groups, each employing 20-30 members, are contracted to produce the project stoves, earning 750 MWK per stove.	150 stove promotor jobs were created, earning 150 MWK per SCT commission and 350 MWK per commercial stove. Additionally, 11 stove production groups, each employing 20-30 members, are contracted to produce the project stoves, earning 750 MWK per stove.

[13] See file "09. MS1_analysis_VCS4144_v1.0.xlsx", tab "3. Analysis"

5)	3.4	3.4.1 Mortality rate attributed to chronic respiratory disease	By providing improved cookstoves, exposure to harmful smoke emitted during cooking and other stove-related activities is reduced	97% of respondents indicate they experience less smoke with the CM stove. 95% of the 97 persons having a CM stove also indicate they experience other health benefits like less coughing, less eye irritation, less headaches or generally improved health.	97% of respondents indicate they experience less smoke with the CM stove. 95% of the 97 persons having a CM stove also indicate they experience other health benefits like less coughing, less eye irritation, less headaches or generally improved health.
6)	5.4	5.4.1 Time spent on unpaid domestic and care work	Because a reduced quantity of firewood is necessary to light the cookstoves, women need to spend less time collecting wood.	91% of surveyed households that collect wood indicate they now spend less time on such task, spending the gained time on the following activities: Household tasks: 51% Field work: 49% Income generating activities: 20% Relaxation: 21% Religious activities: 33% Education: 5%	91% of surveyed households that collect wood indicate they now spend less time on such task, spending the gained time on the following activities: Household tasks: 51% Field work: 49% Income generating activities: 20% Relaxation: 21% Religious activities: 33% Education: 5%
8)	7.A	7.A.1 Access and investments in clean energy	The provision of improved cookstoves decreases the use of non-renewable wood	The project has distributed 20,698 stoves to households in Nkhotakota, Mzimba North and Mzimba South.	The project has distributed 20,698 stoves to households in Nkhotakota, Mzimba North and Mzimba South.

9)	13	Climate action	By reducing the quantity of non-renewable firewood burned, carbon dioxide emissions are reduced	By reducing the amount of non-renewable firewood, this project has reduced 43,550 tonnes of CO_{2e} during the first monitoring period.	By reducing the amount of non-renewable firewood, this project has reduced 43,550 tonnes of CO_{2e} during the first monitoring period.
10)	15	15.2.1 Sustainable forest management	By reducing the amount of firewood required for cooking, forest degradation is reduced	This project has reduced the use of 22,262 tonnes of wood during this monitoring period.	This project has reduced the use of 22,262 tonnes of wood during this monitoring period.

1.18 Additional Information Relevant to the Project

▪ Leakage Management

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

▪ Commercially Sensitive Information

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

▪ Further Information

No further information is required to be mentioned in this section.

2 SAFEGUARDS

2.1 No Net Harm

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

2.2 Local Stakeholder Consultation

Three local stakeholder consultation meetings were held as follows:

- 13/12/2022 in Sandton Conference Hall in Mzimba.
- 15/12/2022 in Nkhotakota District Council Chamber in Nkhotakota.
- 01/03/2023 in Lilongwe District.

76 attendees came to the meeting in Mzimba[14], 51 to the meeting in Nkhotakota[15] and 19 to the meeting in Lilongwe[16].

Invitations

The invitation list is provided in a separate document[17]. Invitation methods were adapted according to the type of stakeholder. International NGO's, local authorities, local NGO's and DNAs of Malawi were

[14] See file "27. Attendance Sheet_Mzimba.pdf"

[15] See file "28. Attendance Sheet_Nkhotakota.pdf"

[16] See file "29. Attendance Sheet_Lilongwe.pdf"

[17] See file "36. Invitation list_all.xlsx"

invited by email[18,19,20] before the stakeholder consultation took place. Beneficiaries of the project - i.e. stove producers, local leaders, community social support committee members and stove promoters - were invited by means of a public invitation (a banner placed in the town of the two districts as well as posters at the two district councils), mobile phones and word of mouth. The chiefs were informed by word of mouth since it is deemed the most appropriate way to traditionally communicate about the meeting.

People who were unable to come to the stakeholder consultation were invited to send their comments or queries on the non-technical summary by email to the project proponents. No such queries were received.

2.2.1 Mzimba & Nkhotakota, Minutes of physical meetings

Opening of the meeting

On 13th and 15th of December 2022, Local Stakeholders Consultation meetings were held in Mzimba and Nkhotakota respectively with the aim of giving an overview of the project as well as soliciting stakeholder's views. The meeting was attended by Local leaders such as area development committee (ADC) chairs, group village headmen (GVH), and councillors. In addition, stove promoters, project beneficiaries, district executive committee members (DEC), civil society representatives, village natural Resource management Committee members, the private sector, media, partners from other NGOs, and representatives from government departments, Social Welfare, Forest, and Agriculture also attended.

Figure 4 - The LSC meeting in Mzimba

[18] See file "37. Invitation Letter-Chichewa.docx"

[19] See file "38. Invitation Letter-English.docx"

[20] See file "39. Invitation Letter-English.docx"

Figure 5 - The LSC meeting in Nkhotakota

Figure 6 - Group photo of LSC in Nkhotakota.

The meetings started with the opening prayer followed by introductions. In Mzimba, opening remarks were made by the director of administrations called Mr. Lovis Moyo. In his speech, he recommended UP/SHA for introducing Chitetezo Mbaula which has more benefits to human health and environment. He insisted that the stove conserves the environment and minimizes climate change impacts. He encouraged everyone to provide full support towards the project to make it a success while developing Mzimba district at large. In Nkhotakota the opening remarks were made by Mr Moses Kafukule from the district council who encouraged participants to fully participate and make contributions to the meeting.

Presentation of the project and partnership

The Project Coordinator gave an overview of the project. He began his presentation with the partners involved in the project. UP/SHA-Malawi is an international NGO which merged in 2021 and is implementing poverty eradication projects in 17 countries, mainly in sub-Saharan Africa through more than 100 development Programmes designed to improve food systems, facilitate access to markets and financial services, combat climate change, gender inequality, and improve access to clean water, sanitation, and hygiene. Malawi is the largest office and is one of the most active players in Malawi's rural energy sector. The major role of UP/SHA is to implement the project. South pole is also a partner

who is an investor. The investor develops and implements comprehensive emission reduction projects and strategies that turn climate action into long-term business opportunities for companies, governments, and organizations around the world. South Pole has over 700 climate action projects including biodiversity, clean water, nature-based solutions, renewable energy, sustainable supply chains, waste-to-energy, and plastics solutions. Lastly, CO2Logic was introduced as a carbon consultant. CO2Logic is a Belgian consulting firm specialized in corporate carbon footprints and climate projects. They support and facilitate the carbon crediting component of the project.

He continued with giving the background of the project which started as Accelerating Commercial and Community Energy Supply Sustainably (ACCESS) project and later it was succeeded by Sustainable Production, Economic Growth, Accountability and Resilience (SPEAR) Programme. Through these projects, which began in 2021, over 20,000 stoves were delivered to both SCT beneficiaries and non-SCT beneficiaries. The South Pole's funded Chitetezo Mbaula project was proposed to provide access to cleaner cooking technologies for over a minimum of 50,000 households, maintain usage through continued monitoring and reduce over 900,000 tonnes of CO2 emissions. The project was proposed based on the statistical background of people (82%) who over rely on biomass materials (firewood), predominantly use 3 stone fire, high deforestation rates, indoor air pollution and 10% of the households are considered ultra-poor. The project will run for 10 years in Mzimba and Nkhotakota with possibility of expansion to other neighboring districts.

The following activities were completed under ACCESS/SPEAR project: 1) distributed stoves (8929 MZ, 7914 KK) to SCT beneficiaries in Mzimba South and Nkhotakota, 2) trained promoters (92 MZ, 72 KK) across both districts for SCT distributions and commercial sales and 3) conducted marketing activities including road shows and radio adverts. The South Pole's funded Chitetezo Mbaula plans to expand SCT distributions into Mzimba North. It will train Mzimba North promoters in SCT distribution and commercial sales, support all stove promoters to sell stoves to reach a minimum of 50,000 households, monitor all stoves for breakages and replace/sell replacement stoves for the next 10 years. This project brings the opportunity to continue to grow the commercial market to reach more households across the two districts and expand into neighbouring districts. Finally, the annual activity work plan was shared with the audience.

The Technology-Chitetezo Mbaula

The stove is one of the fuel efficient cookstoves being promoted in Malawi. Chitetezo Mbaula is affordable (only costs K1500), reliable/durable, fuel efficient (uses less firewood when compared to three stone fire), fast cooking (saves time) and portable (can easily be moved to a convenient place for cooking).

Carbon Financing

The Carbon Finance Manager presented on how carbon dioxide emissions contribute to the thickening of the insulating layer in the atmosphere which brings about climate change impacts. He also explained the role of vegetation in the reduction of carbon dioxide from the atmosphere. He further presented on carbon financing procedures/protocols including the transfer of Carbon Rights. A company in industrialized country purchases carbon credits to offset its residual emissions. Participants were briefed that funds realized from Carbon Credits will be channelled into activities that promote adaptation to

Climate Change. Using the Chitetezo Mbaula reduces carbon emission into the air due to more efficient combustion resulting in the need for less firewood to prepare meals. The percentage of reduction or tonnage is calculated per each stove to arrive at how much tonnes carbon reduced from entering the atmosphere in the project duration. The tonnes of carbon credits which are certified are sold to companies from industrialised countries to help offset their carbon emission reduction targets.

Questions and Clarifications about Project Explanation

At the end of the presentations, participants expressed comments and asked questions to seek clarifications.

Presentation of safeguard principles and grievance collection mechanism

Safeguarding was defined as do no harm or any form of abuse to any person. Safeguarding principles were presented with the aim of soliciting ideas from the participants on potential risks the project may have on the project participants. Principles discussed included Human rights, Gender equality and Women's Rights, Community Health, safety and working conditions cultural heritage Indigenous Peoples, Displacement and Resettlement, and corruption.

The participants explained that under the Social and Economic Safeguarding Principles and Requirements, the project may affect some principles. They said, "safety of the promoters may be at risk because some stove promoters may be hurt by the stove upon carrying it, if happens to accidentally fall". Some of the participants were of the view that, there may be a possibility for promoters to be demanding some bribes/money from the SCT beneficiaries in exchange of a free stove.

Grievance Mechanisms

On top of a presentation on safeguarding, participants were informed about how their grievances regarding the project would be presented and addressed. Necessary mechanisms were presented as shown in the table below.

	Method Chosen	Justification
Continuous Input / Grievance Expression Process Book	We proposed the following: to ensure that there is continuous input and grievance expression process, a book for recording grievances was placed at the reception of each district council's offices in the districts.	It can be easily accessed by all relevant stakeholders who usually visits the offices. They may record all their grievances and comments without limitations
Telephone access	Project hotline numbers: Nkhotakota: 0880 663 436 / 0985 714 568 Mzimba: 0881 29 93 98/0992 89 90 13	Most stakeholders have access to phones including those in rural communities who may be directly involved
Internet / Email Access	Email addresses: UP / SHA: uplilongwe@united-purpose.org infomalawi@selfhelpafrica.org VCS/Verra: info@verra.org	It is not necessarily ideal for all stakeholders but is suitable for part of it.

Closing of the Meeting.

Participants were provided with evaluation forms to evaluate the project at the end of the session[21,22]. One of the local leaders was allowed to give closing remarks in both Mzimba and Nkhotakota. In their remarks, they encouraged all participants to cooperate for the success of the project. They were generally grateful for the project. At the end of the meetings a group photo was taken (see below for Nkhotakota district).

2.2.2 Lilongwe, Minutes of physical meeting

Opening of the meeting

On 1st March 2023, Local Stakeholders Consultation meeting was held in Lilongwe with the aim of giving an overview of the project as well as soliciting stakeholder's views. The meeting was attended by private sector, partners from other NGOs, and representatives from government departments.

The meetings started with an opening prayer followed by introductions. Opening remarks were made by an energy officer from the ministry of energy called Mr. Gabriel Chikomeni. In his speech, he welcomed everybody to the meeting and encouraged everyone to fully participate in the meeting. Mr. Chikomeni said that the energy crisis that the country is facing needs urgent solution. The country needs projects that provide solutions to the energy crisis such as this project.

Figure 7 - The LSC meeting in Lilongwe

[21] See file "30. Evaluation Forms _ Mzimba.pdf"

[22] See file "31. Evaluation Forms _ Nkhotakota.pdf"

Figure 8 - The LSC meeting in Lilongwe

Presentation of the project and partnership

The Project Coordinator gave an overview of the project. He began his presentation with the partners involved in the project. UP/SHA-Malawi is an international NGO which merged in 2021 and is implementing poverty eradication projects in 17 countries, mainly in sub-Saharan Africa through more than 100 development Programmes designed to improve food systems, facilitate access to markets and financial services, combat climate change, gender inequality, and improve access to clean water, sanitation, and hygiene. Malawi is the largest office and is one of the most active players in Malawi's rural energy sector. The major role of UP/SHA is to implement the project.

South pole is also a partner who is an investor. The investor develops and implements comprehensive emission reduction projects and strategies that turn climate action into long-term business opportunities for companies, governments, and organizations around the world. South Pole has over 700 climate action projects including biodiversity, clean water, nature-based solutions, renewable energy, sustainable supply chains, waste-to-energy, and plastics solutions.

Lastly, CO2Logic was introduced as a carbon consultant. CO2Logic is a Belgian consulting firm specialized in corporate carbon footprints and climate projects. They support and facilitate the carbon crediting component of the project.

He continued with giving the background of the project which started as Accelerating Commercial and Community Energy Supply Sustainably (ACCESS) project and later it was succeeded by Sustainable Production, Economic Growth, Accountability and Resilience (SPEAR) Programme. Through these projects, which began in 2021, over 20,000 stoves were delivered to both SCT beneficiaries and non-SCT beneficiaries. The South Pole's funded Chitetezo Mbaula project was proposed to provide access to cleaner cooking technologies for over a minimum of 50,000 households, maintain usage through continued monitoring and reduce over 900,000 tonnes of CO2 emissions. The project was proposed based on the statistical background of people (82%) who over rely on biomass materials (firewood), predominantly use 3 stone fire, high deforestation rates, indoor air pollution and 10% of the households

are considered ultra-poor. The project will run for 10 years in Mzimba and Nkhotakota with possibility of expansion to other neighbouring districts.

The following activities were completed under ACCESS/SPEAR project: 1) distributed stoves (8929 MZ, 7914 KK) to SCT beneficiaries in Mzimba South and Nkhotakota, 2) trained promoters (92 MZ, 72 KK) across both districts for SCT distributions and commercial sales and 3) conducted marketing activities including road shows and radio adverts. The South Pole's funded Chitetezo Mbaula plans to expand SCT distributions into Mzimba North. It will train 58 stove promoters on SCT distribution and commercial sales in Mzimba North, support all stove promoters to sell stoves to reach a minimum of 50,000 households, monitor all stoves for breakages and replace/sell replacement stoves for the next 10 years. This project brings the opportunity to continue to grow the commercial market to reach more households across the two districts and expand into neighbouring districts. Finally, the annual activity work plan was shared with the audience.

The Technology-Chitetezo Mbaula

The stove is one of the fuel efficient cookstoves being promoted in Malawi. Chitetezo Mbaula is affordable (only costs K1500), reliable/durable, fuel efficient (uses less firewood when compared to three stone fire), fast cooking (saves time) and portable (can easily be moved to a convenient place for cooking).

Carbon Financing

The Carbon Finance Manager presented on how carbon dioxide emissions contribute to the thickening of the insulating layer in the atmosphere which brings about climate change impacts. He also explained the role of vegetation in the reduction of carbon dioxide from the atmosphere. He further presented on carbon financing procedures/protocols including the transfer of Carbon Rights. A company in industrialized country purchases carbon credits to offset its residual emissions. Participants were briefed that funds realized from Carbon Credits will be channelled into activities that promote adaptation to Climate Change. Using the Chitetezo Mbaula reduces carbon emission into the air due to more efficient combustion resulting in the need for less firewood to prepare meals. The percentage of reduction or tonnage is calculated per stove to arrive at how much tonnes of carbon have been reduced from entering the atmosphere in the project duration. The tonnes of carbon credits which are certified are sold to companies from industrialised countries to help offset their carbon emission reduction targets.

Questions and Clarifications about Project Explanation

At the end of the presentations, participants expressed comments and asked questions to seek clarifications.

Discussions on Sustainable Development Goals

During the meeting the participants were given assessment forms[23] to assess how the Chitetezo Mbaula project will contribute to Sustainable Development Goals (SDGs). The discussion centred around all 17 SDGs. Below is a summary of discussions:

[23] See file "35. SDG Assessment Forms.pdf"

Presentation on Safeguard Principles and Grievance Collection Mechanisms

Safeguarding was defined as do no harm or any form of abuse to any person. Safeguarding principles were presented with the aim of soliciting ideas from the participants on potential risks the project may have on the project participants. Principles discussed included Human rights, Gender equality and Women's Rights, Community Health, safety and working conditions cultural heritage indigenous peoples, displacement and resettlement, and corruption.

The participants explained that under the safety and working conditions, there is possibility of the risk of overworking due to the distance that will be covered to transport the stove to the end user. On gender equality, the project should consider involving men in the stove production groups, as of now there are more women involved than men.

Grievance Mechanisms

Participants were informed about how their grievances regarding the project would be presented and addressed.

	Method Chosen	Justification
Telephone access	Project hotline numbers: Nkhotakota: 0880 663 436 / 0985 714 568 Mzimba: 0881 29 93 98/0992 89 90 13	All stakeholders have access to phones
Internet / Email Access	Email addresses: UP / SHA: uplilongwe@united-purpose.org infomalawi@selfhelpafrica.org VCS/Verra: info@verra.org	Almost all stakeholders have access to internet

Closing of the Local Stakeholders Meeting.

Participants were provided with evaluation forms to evaluate the project at the end of the session[24]. Mr Gabriel Chikomeni was given a floor to give final remarks. He generally thanked members for their participation and contributions during the meeting. He assured members that their contributions were of paramount importance to the project and the nation at large. Finally, Lisa Banda closed the meeting with a prayer.

The meeting was opened by the Director of administrations, Mr Lovis Moyo in Mzimba, the ADC Chair for Mwadzama, Mr Brian Chafuwa in Nhkotatkota and Mr. Gabriel Chikomenu, an energy officer from the ministry of Energy, in Lilongwe. After introducing the topics of the cookstoves and their benefits to the local community, the project was presented by the project manager. This included an explanation about the carbon transfer process and how ICS buyers will be asked to sign a waiver when buying the stove, transferring their carbon rights to United Purpose/Self Help Africa.

2.2.3 Outcomes of the consultation process

[24] See file "32. Evaluation Forms _ Lilongwe.pdf"

Mzimba questions and answers

Name of stakeholder	Gender	Comment	Comment was taken into account	Explanation/Justification
Ephraim Njikho	M	There are some people who are considered as vulnerable under climate smart public works programs here in Mzimba South, is there any opportunity to target these people for free stoves just like you will do in Mzimba North?	Yes	Patrick Banda explained that those people may be considered to access stoves on a subsidised price not for free. They are considered capable of working and earn a little something that is why they should buy at a subsidised price.
Paul Chondo	M	May you clarify on the water sanitation initiative under the Carbon financing project? Since there is high demand for portable water in Mzimba South	Yes	The community will decide on the type of development they need after a need assessment survey is done. If the community decides that it need clean water source (e.g. borehole), the project will consider (By Isaac Malekano)
Andrew Malinga	M	As Mzimba South, we are discouraging use of firewood as a source of fire. Don't you think Chitetezo Mbaula is contradicting our objectives since it's using firewood for its functionality?	Yes	No, actually Chitetezo Mbaula is helping to reduce the consumption of fuelwood by about 50% if compared to three stone open-fire which uses more firewood. This is one of the efforts being encouraged as we are looking

				for a more suitable and reliable technology to traditionally provide an alternative source of energy to fuelwood.
Agness Nyirenda	F	How effective is Chitetezo Mbaula when it comes to accident prevention?		It is very safe than three stone open fire, (evidently, a beneficiary said "I have never had accident since she started using the stove, I feel safer when using the stove than any other stove in terms of accidents")
Agness Nyirenda	F	How do you replace the breakage of stoves and for how long?		If the broken stove was purchased, the beneficiary will pay K1,000.00 to get a new stove for replacement but if the broken stove was given for free to an SCT beneficiary, it will also be replaced free of charge.
Thokozani Skinner	M	Do you have other interventions that support community forests like planting of trees or provision of seedlings knowing the stove uses trees?	Yes	Now, there is none. This will be considered

Thokozani Skinner	M	How are you promoting forests in terms of afforestation and reforestation.	Yes	By working closely with forest department
Name not captured	M	For sustainability's sake are you training promoters on how to make stoves and how do they get materials for such a production?	Yes	Currently, we are not training them how to make stoves. We purchase stove outside the district, but we have started considering identifying locations to establish stove production groups within the districtCurrently, we are not training them how to make stoves. We purchase stoves outside the district, but we have started considering identifying locations to establish stove production groups within the district.
Antony Dewa	M	What's the budget for the project?	Yes	Only the activity budget for one year was shared with the audience
Name was not captured	M	Is it not possible to give everyone here a free stove?	No	No, but you are allowed to buy for you to lead by example to your subordinates as local leaders.
Ngiyezeni Sibande	M	You have said this project is for both Mzimba South and	Yes	This is just a representation of community

		North, why do we have a selected local leader present instead of everyone?		leaders to speak on behalf of others
Name was not captured	M	May you provide us free T-shirts for visibility sake?	Yes	Not now
Mapifa Shaba	M	By selling carbon credits is it not a way of promoting wanton cutting down of trees?	Yes	No, there is no correlation. This will help to reduce the wanton cutting down of trees because carbon credits are claimed based on carbon emission saved from firewood use
Lovis Moyo	M	We are so grateful to UP/SHA for bringing this project in both Mzimba South and North and believe its going to change our community	Yes	UP/SHA appreciated the applauding comment

Nkhotakota questions and answers

Name of stakeholder	Gender	Comment	Comment was taken into account	Explanation/Justification
Wanangqa Harawa	M	Wanted to find out if there is any transport arrangement for Promoters in terms of a bicycle	Yes	Answered that currently there is no transport arrangement but in future the Organization will consider that
Wanangqa Harawa	M	Wanted to find out of is possible to reduce the cost of	Yes	Patrick answered that the price of a stove can not be

		a stove so that more beneficiaries are able to buy		reduced because of the transport costs incurred when transporting stoves from the producers to the warehouse and to the beneficiaries
Wanangwa Harawa	M	Wanted to find out if there are plans to reach out to all VDCs with Road shows so that people are sensitised about the importance of using cook stoves	Yes	It was answered that all places will be reached out with Road shows including hard to reach areas
Geofry Mambo	M	Wanted to know about the Target for beneficiaries for South Pole Project	Yes	It was answered that the target for next year is 10,000 beneficiaries and this include both Districts
Limbani Msokera	M	Wanted to find out if there plans to establish stove Production Groups in Nkhotakota	Yes	It was answered currently there are no plans to establish stove production groups but the organisation will consider that in the near future
MC Donald Mzumala	M	Wanted to know about the total budget for South Pole Project	Yes	It was answered that the total budget is 102,985 Euros for both Districts
Alex Katola	M	Commented about the breakage of stoves and wanted to know if there plans to	Yes	It was answered that through the SPEAR Project , they discussed with the stove Production groups to follow

		address the concerns		procedures and not jump steps to ensure that the stoves produced are of high quality

Lilongwe questions and answers

Name of stakeholder	Gender	Comment	Comment was taken into account	Explanation/Justification
Yamikani Banda	M	Wanted to find out if the issues of reforestation and Regeneration are included in the project	Yes	Response is that issues are not included in the project yet
Yamikani Banda	M	Questioned whether one promoter per cluster is enough for the promoter to reach out to all communities	Yes	Feedback given is that it is not necessary for the Promoter to reach out to all households but to only 50,000 households thus is both Districts
Madalitso Salimu	M	Enquired about the cost per stove and the durability of a stove if used properly	Yes	Response is that the cost per stove is 1,500 and if used properly that stove can last for 3 years on average or more
Charles Jumbe	M	Are there any challenges regarding adoption of Chitetezo Mbaula in the areas that we have worked and also wanted to know the sustainability of the interventions and mechanisms	Yes	Response is that the major challenge is to convince people to use the stove and once they use it they don't want to leave it because they realise the benefits. Another challenge is the

		that have been put in place to customers to continue using the stoves beyond project period		breakage of stoves.
Charles Jumbe	M	Questioned if there are tradeoffs regarding stove production sites because the digging of the clay can eventually damage the environment	Yes	It was answered that currently all production groups are trained on how to backfill after digging the clay
Charles Jumbe	M	Enquired why customers are paying for a stove since it's a carbon project	Yes	Buying comes along with willingness and commitment to use the technology unlike free delivery which compromises sustainability due to lack of willingness and commitment by the end user. Note that the project does not make profits in any way. The income realised from stove sales is reinvested into the project (as a revolving fund).
Charles Jumbe	M	Enquired if there are other players promoting other stoves in the project sites	Yes	It was answered that "Yes, there are other players promoting different stoves in the project site such as Total Land Care)

Lisa Banda	F	Enquired whether the Project has benefited from Africa Climate Fund that Government of Switzerland signed with Government of Malawi	Yes	It was answered that the Project is not part of it

Consolidated Grievance Mechanism

Following LSC consultations, the below measures are adopted as grievance mechanisms for the project.

Methods	Method Chosen	Justification of choice (Best practise)
Grievance Expression Process Book	To ensure that there is continuous input and grievance expression process, a book for recording grievances was placed at the reception of each district council's offices in the districts.	It can be easily accessed by all relevant stakeholders who usually visits the offices. They may record all their grievances and comments without limitations.
Telephone access	Hotline phone numbers were shared. Project hotline numbers: • Nkhotakota; 0880 663 436 & 0985 714 568 • Mzimba; 0881 299 398 & 0992 899 013	Most stakeholders have access to phones including those in rural communities who may be directly involved.
Internet/email address	Email addresses: • UP / SHA: uplilongwe@united-purpose.org infomalawi@selfhelpafrica.org • VCS/Verra: info@verra.org	It is not necessarily ideal for people in category A and B but it may be suitable/ideal for categories C, D, E and F.

No comments or requests for change in the project have been received from stakeholders in the frame of the grievance mechanism during the period covered by the joint PD/MR.

Ongoing communications with Local Stakeholders

The grievance book, email addresses and hotlines are kept open for comments with stakeholders. No specific comments are registered on the hotlines apart from the questions related to the points of sale and availability of stoves. The project engages with district stakeholders in a variety of ways:

1. District Social Support Committee meeting : inception meeting which approves the project prior to District Executive Committee Meetings – conducted in 2021
2. District Executive Committee meeting : project inception meeting where the participants approves the project to start implementing its activities in the district – conducted in 2021 and 2022
3. Area Development Committee meetings : meetings done at TA level before implementation of project activities – conducted in 2021, 2022 and 2023
4. Review meetings : progress reviews - Held annually

The following mechanisms are also in place to ensure fluid communication with stakeholders and customers:

- United Purpose has a dedicated channels to collect concerns - anonymously if necessary - available in Chichewa and English :

Figure 9 – Communication channels

- Ads are available at the promoters' locations and contact numbers are widely advertised (radio, promoters shirts, signposts)

Figure 10 – Communication material

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.

2.4 Public Comments

The project was open for public comments from 19/04/2023 until the 19/05/2023 and no comments were received.

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 V1.1[25]

TOOL01. Tool for the demonstration and assessment of additionality V07.0.0[26]

Tool 30 Calculation of the fraction of non-renewable biomass EB 108 Annex 11 v4.0[27]

[25] VMR0006 Methodology for Installation of High Efficiency Firewood Cookstoves, https://verra.org/methodology/vmr0006-methodology-for-installation-of-high-efficiency-firewood-cookstoves/

[26] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf

[27] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-30-v4.0.pdf

3.2 Applicability of Methodology

VMR0006: Methodology for Installation of High Efficiency Firewood Cookstoves V1.1

Applicability criterion	How the project complies
Project activities shall be implemented in domestic premises or in community based kitchen	The proposed project involves deployment of ICS only in households
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;	The CM stoves that are distributed under this project are single pot wood cookstoves that have an efficiency of 29% as per the Catalog of Clean Cookstoves http://catalog.cleancookstoves.org/stove_details.html?stove_id=stove_VROU4NT
Both 'Projects' and 'Large Projects' can use the methodology	This project will generate 144,360 credits per year, making this a "Project".
Non-renewable biomass has been used in the project region since 31 December 1989, using survey methods or referring to published literature, official reports or statistics;	Non-renewable biomass has been used since 31 December 1989 in Malawi as demonstrated below.
For the specific case of biomass residues processed as a fuel (e.g. briquettes, wood chips), it shall be demonstrated that: (a) It is produced using exclusively renewable biomass (more than one type of biomass may be used). (b) The consumption of the fuel should be monitored during the crediting period and (c) Energy use for renewable biomass processing (e.g. shredding and compacting in the case of briquetting) may be considered as equivalent to the upstream emissions associated with the processing of the displaced fossil fuel and hence disregarded.	Not applicable. The ICS is introduced as energy efficiency measure to replace baseline stoves and reduce the use of non-renewable biomass for combustion.
The project 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)	To avoid double counting of cookstoves within the projects and possible other cookstoves outside of the current project, each stove receives a stove identification code that is stamped on the stove when it is produced. The code consists of a three letters indicating the stove producer group, followed by the year and month in which was produced and a serial number, eg. KAL/2202/00001, where KAL stands for the Kalata SPG, 2202 refers to the

Applicability criterion	How the project complies
	year (2022) and month (February) and 00001 is the stove count. Whenever any stove sale or distribution occurs, it occurs only through the network of promoters which then record that serial number on the sales receipt. These serial numbers, along with the receipt number are stored in the database and linked to the household information (=customer ID) that bought the stove. The same process occurs during whenever a replacement occurs. That procedure ensures that no double counting occurs on the stoves that are sold. It also ensure that only stoves belonging to the project (stoves sold through the distribution network) are counted in the project database. All project stakeholders along the stoves value chain (promoters, SPG's, transporters) are informed of United Purpose's ownership of the carbon rights, and do not intend on claiming them. Signature of that commitment is attested in a signed form.
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	All end users sign a carbon waiver, declaring that they relinquish their carbon rights to the project. All relevant stakeholders involved in the manufacturing, distribution or commercialization of the improved cookstoves will be communicated by contract or clear written assertion in the transaction paperwork about the entity claiming ownership rights on the credits and that they themselves cannot claim for emission reductions from the project.

TOOL01. Tool for the demonstration and assessment of additionality V07.0.0

Applicability criterion	How the project complies
The use of the "Tool for the demonstration and assessment of additionality" is not mandatory for project participants when proposing new methodologies. Project participants may propose alternative methods to demonstrate additionality for consideration by the Executive Board. They	N/A

Applicability criterion	How the project complies
may also submit revisions to approved methodologies using the additionality tool.	
Once the additionally tool is included in an approved methodology, its application by project participants using this methodology is mandatory.	The tool is mentioned in VMR0006 in "step 3 project method" and is therefore applicable.

Tool 30 Calculation of the fraction of non-renewable biomass EB 108 Annex 11 v4.0

Applicability criterion	How the project complies
This tool may be used by: (a) DNAs to submit region- or country-specific default fNRB values, following the procedures for development, revision, clarification and update of standardized baselines (SB procedures); or (b) project participants[1] to calculate project- or PoA-specific fNRB values.	As a project participant, the use of this tool is permitted.

Evidence that the non-renewable biomass has been in use since 1989

Non-renewable biomass has been in use since December 31, 1989 as evidenced by various FAO statistical data. The Global Forest Resources Assessment 2020[28] (FAO) indicates that forest areas decline yearly, and that the total forest area declined by 36% from 1990 to 2020, as summarized in the following table :

Area (1000 hectares)				
	1990	2000	2010	2020
Forest	3,501	3,081	2,661	2,241

A recent study in 2023 done by the Seed Ecology and the Cape Climate Collective calculated a current f_{NRB} of 95.49%[9].

[28] FAO, Global Forest Resources Assessment 2020, Country Reports, Malawi p7 (see 'ForestReport_Malawi.pdf') https://www.fao.org/3/cb0032en/cb0032en.pdf

In view of the combined evidence of declining forested areas since 1990 and presently such a high fraction of non-renewable biomass, it may be deducted that the majority of fuelwood used across Malawi since December 31, 1989 was from non-renewable sources.

3.3 Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Emission from use of nonrenewable biomass/Fossil fuel	CO_2	Yes	Major Source
		CH_4	Yes	Major source
		N_2O	Yes	Major source
		Other	No	No other source identified
Project	Emission from use of nonrenewable biomass	CO_2	Yes	Major source
		CH_4	Yes	Major source
		N_2O	Yes	Major source
		Other	No	No other source identified

The physical location of the project is described in section 1.12.

The following diagram from the CDM Methodology Booklet[29] illustrates the equipment, systems and flows of mass and energy considered :

29 CDM Methodology Booklet, 13th Edition, December 2021, https://cdm.unfccc.int/methodologies/documentation/meth_booklet.pdf

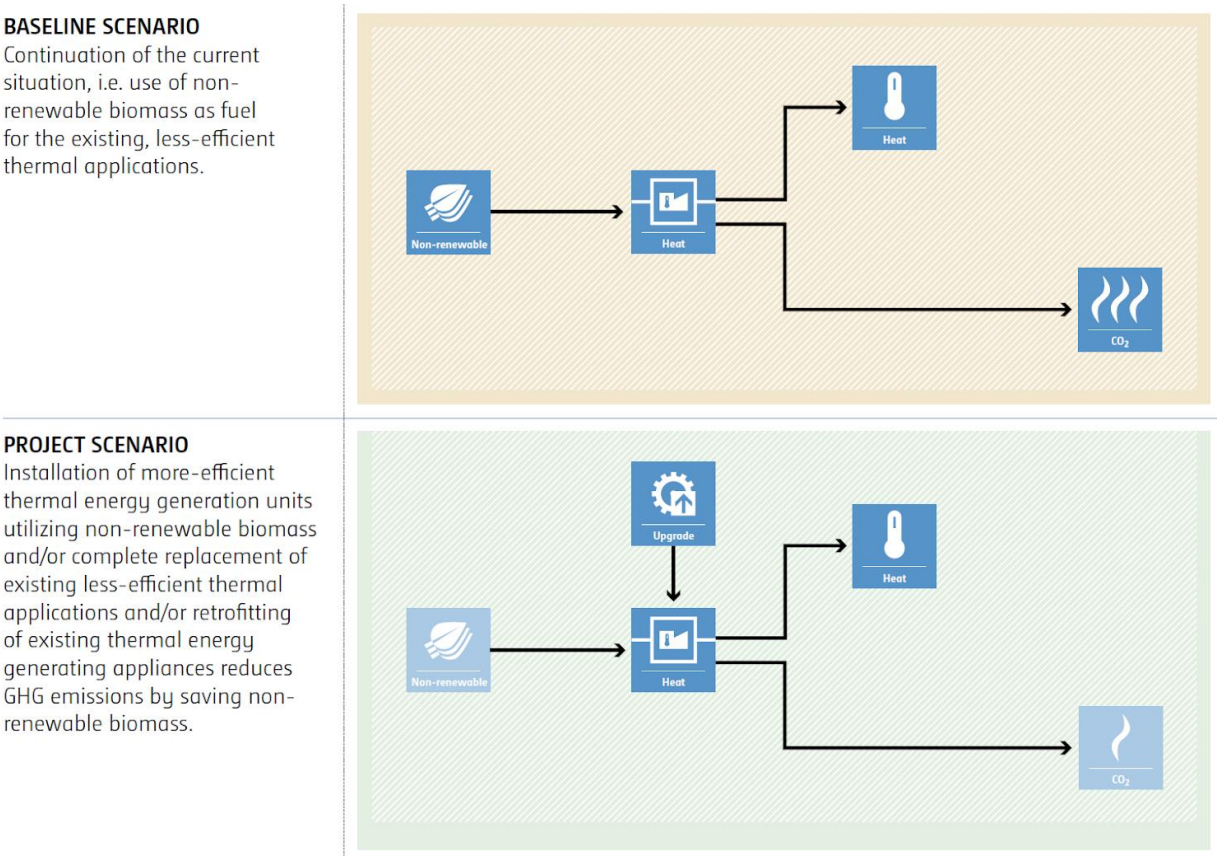

Figure 11 – Equipment/systems/flows of mass and energy considered

3.4 Baseline Scenario

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

3.5 Additionality

As defined by VMR0006 section 7, the activity method is used to demonstrate additionality.

Step 1: Regulatory Surplus

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

Households may only participate voluntarily in this project. It is hereby confirmed that the proposed project is a voluntary coordinated action by CO2Logic SA.

Step 2: Positive list

As per Section 3.2, the project meets the applicability conditions of the methodology which represent the positive list. In addition, the project is not implemented as part of a government scheme or supported by multilateral funds.

In order to continue assessing additionality, the cookstoves are divided in the SCTP approach, the commercial approach and the third category as detailed in section 1.11.

- SCTP beneficiaries cookstoves are distributed to existing beneficiaries of the SCTP at zero cost and therefore fall under the positive list since no other source of revenue exist other than the sale of GHG credits. Therefore, additionality is proved for cookstoves distributed in the SCTP approach
- Third category cookstoves are distributed to existing beneficiaries at zero cost and therefore fall under the positive list since no other source of revenue exist other than the sale of GHG credits. Therefore, additionality is proved for cookstoves distributed in the SCTP approach
- Commercial approach cookstoves are sold at a subsidized rate, step 3 and investment analysis is therefore further required to demonstrate additionality.

Step 3: Project method – Investment Analysis "CDM tool for the demonstration and assessment of additionality" V07.0.0[30]

VMR0006 requires to conduct an investment analysis to "Determine whether the proposed project activity is not:

- *(a) The most economically or financially attractive; or*
- *(b) Economically or financially feasible, without the revenue from the sale of certified emission reductions (CERs)."*

The PP selects option (b) to demonstrate that the proposed project activity is not economically or financially feasible without the revenue from the sale of certified emission reductions (CER's). Reference is made to applicable sections of the CDM tool for the demonstration and assessment of additionality V07.0.0 in italic.

4.3 Step 2: Investment analysis

31. To conduct the investment analysis, use the following sub-steps :

4.3.1 Sub-step 2a: Determine appropriate analysis method

32. Determine whether to apply simple cost analysis, investment comparison analysis or benchmark analysis (Sub-step 2b). If the CDM project activity and the alternatives identified in

[30] TOOL01. Tool for the demonstration and assessment of additionality V07.0.0, Clean Development Mechanism (see 'CDM_Tool01') https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf

Step 1 generate no financial or economic benefits other than CDM related income, then apply the simple cost analysis (Option I). Otherwise, use the investment comparison analysis (Option II) or the benchmark analysis (Option III).

Since the project activity for commercial approach generates revenues other than CDM related income, the PP can select either "option 2 Investment Comparison Analysis" or "option 3 Benchmark Analysis".

4.3.3. Sub-step 2b: Option II. Apply investment comparison analysis

35. Identify the financial indicator, such as IRR, NPV, cost benefit ratio, or unit cost of service (e.g. levelized cost of electricity production in $/kWh or levelized cost of delivered heat in $/GJ) most suitable for the project type and decision-making context.

The PP selects option 2, Investment Comparison Analysis with NPV as the financial indicator. The NPV is chosen since it is a direct assessment of the profitability – and therefore a direct assessment of the financial and economic feasibility – of the project. Since VMR0006 only requests the application of the Investment analysis (step 2), no identification and comparison with alternatives to the project activity is produced (step 1).

The NPV is calculated on a period of 10 years and in the absence of revenues from carbon finance to demonstrates that the project is not financially and economically viable in those conditions (NPV<<<0). The investment decision having been made in September 2022, NPV calculation parameters are related to that date. The NPV is calculated with the following main parameters :

- A discount rate set at 12%, which represents the usual cost of capital to finance this type of project in 2021, as demonstrated in the paper "Higher cost of finance exacerbates a climate investment trap in developing economies" [31]
- A conservative EUR/MK exchange rate of 1100 (September 2022 EUR/MK = ≈1020)[32], higher than at the investment decision time
- An estimated share of 50% of stoves following the commercial model. The project will be implemented using two approaches it is estimated that the stove distribution will be shared equally among the two approaches.
- An estimated share of replacement stoves of 15% yearly
- Project expenses (staff, operations, admin costs) :
    - Various activities have been provisioned in an estimated budget for which aggregated amounts are presented in the NPV

[31] "*For Africa, we use an average WACC of approximately 12% for the whole continent, while Steffen19 reports a solar WACC of 7.8%, 6.6%, 4.2% in Uganda, South Africa and in Zambia, respectively; however, in sharp contrast, Sweerts et al.27 find that WACC values vary between 8 and 32% across a sample of 46 African countries. The TIAM model has Africa as one region, and in the face of such diverse estimates, we chose a continent-wide average of 12%*" https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8245630/

[32] https://www.xe.com/currencycharts/?from=EUR&to=MWK&view=2Y

- Community interventions:
    - An estimated budget starting from year 4 is booked for community interventions, the nature of which will be identified through participatory process with communities
- No residual value is assumed in the NPV analysis since :
    - The project's nature is about cookstoves made locally by SPG's, to which all equipment is donated, equipment which anyway has a negligible residual value
    - No valuable asset remains after project completion, and especially no valuable equipment financed by the project remains in the ownership of the project proponent at the completion of the project
- Project values used in the NPV analysis :
    - 750 MK/stove for stove production : purchase price from SPG, adopted by the project (see stove value chain document for the commercial model)
    - 350 MK/stove (commercial model) and 150 MK/stove (SCTP model and 3rd category) commission : commission for stoves promoters, adopted by the project (see stove value chain document for the commercial model)
    - 400 MK per stove for transport and warehousing, calculated on the basis of expected transport/warehousing (see stove value chain document for the commercial model):
        - Long distance transport = 150 MK/stove
        - Local transport = 150 MK/stove
        - Storage = 150MK/stove
        - Total = 450 MK/stove rounded to 400 MK/stove (conservative)
    - 1'500 MK/stove sales price (commercial model) and 0 MK/stove (SCTP model and 3rd category)
        - Adopted by project, see sample invoices and stove value chain document for the commercial model
    - 1000 MK/stove replacement price (commercial model) and 0 MK/stove replacement price (SCTP model and 3rd category)
        - Adopted by project, see sample invoices and stove value chain document for the commercial model

Category	Input values	Value	Comment
Outflows	Stove production -SPGs	MK 750/stove	This is the purchase price of the stove from SPGs adopted by the project
	Stove transport and warehousing	MK 400/stove	calculated on the basis of expected transport/warehousing (see stove value chain document for the commercial model): • Long distance transport = 150 MK/stove • Local transport = 150 MK/stove • Storage = 150MK/stove • Total = 450 MK/stove rounded to 400 MK/stove (conservative)
	Promoters commission	350 MK/stove (commercial model) 150 MK/stove (SCTP model and 3rd category)	The value of the commission for stoves promoters is adopted by the project (see stove value chain document for the commercial model)
	Community intervention costs	See NPV sheet	An estimated budget starting from year 4 is booked for community interventions, the nature of which will be identified through participatory process with communities
	Project expenses: staff, operations, admin costs,	See NPV sheet	These are costs budgeted for the project
Inflows	Stove sale price	1,500 MK/stove (commercial model) 0 MK/stove (SCTP model and 3rd category)	Adopted by project, see sample invoices and stove value chain document for the commercial model

Category	Input values	Value	Comment
	Discount rate	12%	A discount rate set at 12%, which represents the usual cost of capital to finance this type of project in 2021, as demonstrated in the paper "Higher cost of finance exacerbates a climate investment trap in developing economies" [33]
	Exchange rate	1,100	A conservative EUR/MK exchange rate of 1100 (September 2022 EUR/MK = ≈1020)[34] higher than at the investment decision time
	Share of stoves under the commercial model	50%	An estimated share of 50% of stoves following the commercial model. The project will be implemented using two approaches it is estimated that the stove distribution will be shared equally among the two approaches.
	Share of replacement stoves	15%	The project has adopted this estimate in its budget for stove production.
	Residual value	0	No residual value is assumed in the NPV analysis since : ● The project's nature is about cookstoves made locally by SPG's, to which all equipment is donated, equipment which anyway has a negligible residual value ● No valuable asset remains after project completion, and especially no valuable equipment financed by the

[33] "*For Africa, we use an average WACC of approximately 12% for the whole continent, while Steffen19 reports a solar WACC of 7.8%, 6.6%, 4.2% in Uganda, South Africa and in Zambia, respectively; however, in sharp contrast, Sweerts et al.27 find that WACC values vary between 8 and 32% across a sample of 46 African countries. The TIAM model has Africa as one region, and in the face of such diverse estimates, we chose a continent-wide average of 12%*" https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8245630/

[34] https://www.xe.com/currencycharts/?from=EUR&to=MWK&view=2Y

Category	Input values	Value	Comment
			project remains in the ownership of the project proponent at the completion of the project.

The NPV calculated is equal to -1,881,791EUR[35], clearly demonstrating economic unfeasibility without inflows from carbon revenues (see calculation table below). An NPV analysis considering all expense sources excluded for simplicity purpose would show a project further unfeasible from a financial and economic point of view.

4.3.6. Sub-step 2d: Sensitivity analysis (only applicable to Options II and III)

43. Include a sensitivity analysis that shows whether the conclusion regarding the financial/economic attractiveness is robust to reasonable variations in the critical assumptions. The investment analysis provides a valid argument in favour of additionality only if it consistently supports (for a realistic range of assumptions) the conclusion that the project activity is unlikely to be the most financially/economically attractive (as per Step 2c) or is unlikely to be financially/economically attractive (as per Step 2c).

The below table presents the NPV calculated for different sets of discount rates, exchange rates, % of sales on the commercial model, sales price and replacement price in order to prove the robustness of the conclusion :

Discount rate	Exchange rate	% Commercial model	Sales prices (MK)	Replacement price (MK)	NPV
12%	1100	50%	1500	1000	-1,881,791
14%	1100	50%	1500	1000	-1,710,137
16%	1100	50%	1500	1000	-1,560,236
18%	1100	50%	1500	1000	-1,428,801
20%	1100	50%	1500	1000	-1,313,107
20%	1200	50%	1500	1000	-1,308,476
20%	1300	50%	1500	1000	-1,304,558

[35] See file "10. NPV_analysis_VCS4144_v7.0.xlsx"

Discount rate	Exchange rate	% Commercial model	Sales prices (MK)	Replacement price (MK)	NPV
20%	1400	50%	1500	1000	-1,301,199
20%	1500	50%	1500	1000	-1,298,288
20%	1500	75%	1500	1000	-1,278,812
20%	1500	100%	1500	1000	-1,259,335
20%	1500	100%	2000	1000	-1,238,337
20%	1500	100%	2500	1000	-1,217,339
20%	1500	100%	3000	1000	-1,196,341
20%	1500	100%	3000	1500	-1,182,898
20%	1500	100%	3000	2000	-1,169,455
12%	1100	1396.462%	1500	1000	0
12%	1100	50%	31,140.18	31,140.18	0

To achieve a positive NPV, very extreme variations are needed in the % of commercial sales (~1396% increase) or the sale price (~1976% increase) .

For extreme and cumulated variations in discount rate, exchange rate, % of commercial sales, sales price and replacement price the NPV clearly remains negative and therefore in favor of the above conclusion.

Description	Unit cost MK	Unit cost EUR	Data source	year 1 qty	year 1 MK	year 1 EUR	year 1 tot	year 2 qty	year 2 MK	year 2 EUR	year 2 tot	year 3 qty	year 3 MK	year 3 EUR	year 3 tot	year 4 qty	year 4 MK	year 4 EUR	year 4 tot	year 5 qty	year 5 MK	year 5 EUR	year 5 tot	year 6 qty	year 6 MK	year 6 EUR	year 6 tot	year 7 qty	year 7 MK	year 7 EUR	year 7 tot	year 8 qty	year 8 MK	year 8 EUR	year 8 tot	year 9 qty	year 9 MK	year 9 EUR	year 9 tot	year 10 qty	year 10 MK	year 10 EUR	year 10 tot
OUTFLOW (EUR)							**214,445**				**221,082**				**210,190**				**415,542**				**403,989**				**422,418**				**433,648**				**440,582**				**467,960**				**498,881**
Stoves - Commercial approach							14,830				23,011				12,784				18,580				12,102				2,898				0				0				0				0
Stoves production - SPG's	750		National agreement for the clean cooking sector in Malawi (see PDD)																																							
Stoves transport and warehousing	400		Project estimate based on expected transport/warehousing costs (see FOD)																																							
Promoters commission	350		National agreement for the clean cooking sector in Malawi (see PDD)																																							
Stoves - SCTP beneficiaries							12,852				19,943				11,080				16,102				10,489				2,511				0				0				0				0
Stoves production - SPG's	750		National agreement for the clean cooking sector in Malawi (see PDD)																																							
Stoves transport and warehousing	400		Project estimate based on expected transport/warehousing costs (see FOD)																																							
Promoters commission	150		National agreement for the clean cooking sector in Malawi (see PDD)																																							
Stoves - Third category							295				295				295				295				295				295				0				0				0				0
Stoves production - SPG's	750		National agreement for the clean cooking sector in Malawi (see PDD)																																							
Stoves transport and warehousing	400		Project estimate based on expected transport/warehousing costs (see FOD)																																							
Promoters commission	150		National agreement for the clean cooking sector in Malawi (see PDD)																																							
Project expenses - staff							117,607				129,720				135,021				203,536				208,766				228,128				229,996				240,037				256,906				263,495
Staff costs - stoves related		1	Project budget																																							
Staff costs - co-benefits		1	Project budget																																							
Staff costs - support		1	Project budget																																							
Project expenses - operations							45,832				33,600				35,280				47,568				38,896				40,841				55,066				45,027				47,279				63,745
Offices/warehousing		1	Project budget																																							
Visibility / M+E development		1	Project budget																																							
Vehicle (maintenance + fuel)		1	Project budget																																							
Promoters bicycles		100	Average bicycles purchase price																																							
Project expenses - Admin costs							22,979				14,512				15,730				29,461				28,440				37,494				32,824				33,957				36,147				37,630
Admin 7%		1																																									
Community interventions							0				0				0				100,000				105,000				110,250				115,763				121,551				127,628				134,010
Community interventions		1	Booked budget, exact nature of interventions to be defined through community participation																																							
INFLOW (EUR)							**14,088**				**21,861**				**12,145**				**17,651**				**11,497**				**2,753**				**0**				**0**				**0**				**0**
Commercial approach							12,605				19,560				10,866				15,793				10,287				2,463				0				0				0				0
Stoves sales	1,500		Project sales price - Commercial model																																							
SCTP beneficiaries							0				0				0				0				0				0				0				0				0				0
Stoves sales	0		Project sales price - SCTP model																																							
Third category							0				0				0				0				0				0				0				0				0				0
Stoves sales	0		Project sales price - 3rd category model																																							
Stove replacement							1,483				2,301				1,278				1,858				1,210				290				0				0				0				0
Commercial approach	1,000		Project replacement price - Commercial model																																							
SCTP beneficiaries	0		Project replacement price - SCTP model																																							
Third category	0		Project replacement price - 3rd category model																																							
CASHFLOW (EUR)							**-200,357**				**-199,221**				**-198,045**				**-397,891**				**-392,491**				**-419,665**				**-433,648**				**-440,582**				**-467,960**				**-498,881**
NPV (EUR)							**-178,890**				**-158,818**				**-140,965**				**-252,867**				**-222,710**				**-212,615**				**-196,160**				**-177,944**				**-168,751**				**-160,626**

Parameters		Source
discount rate	12%	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8245630/
EUR/MK	1,100	https://www.xe.com/currencycharts/?from=EUR&to=MWK&view=2Y
% Commercial Model (50% = initial plc	50%	
Sale price	1,500	
Replacement price	1,000	
Estimated replacement	15%	
NPV	**-1,870,347**	

Sensitivity analysis
See PDD

Figure 12 - Screenshot of NPV calculation tool

Additionality conclusion

The investment analysis was conducted with conservative hypothesis and clearly showed impracticability from an economical and financial point of view. It also resisted the sensitivity test. It is therefore concluded that the project activities for both SCTP, commercial and third category approaches are additional.

3.6 Methodology Deviations

This project did not apply any methodology deviations.

4 IMPLEMENTATION STATUS

4.1 Implementation Status of the Project Activity

The project started operating on the 01.08.2021, date of first stove sale. Since then, the implementation of the project is continuous, as reflected in the project database which contains 20,698 instances. The stoves have been distributed and sold between the different modalities as follows :

- SCTP beneficiaries : 12,882 stoves
- Commercial model : 7,816 stoves

The main tasks being continuously conducted are :

- Negotiating contracts for stoves purchase from SPG's
- Transporting stoves from SPG's to the promoters' network
- Training and review meetings with promoters on stove marketing and usage
- Identifying proper storage facilities for promoters
- Conducting engagement meetings with local leaders
- Conducting promotional events and managing project marketing
- Collecting, entering and cleaning data in the project database
- Conducting field trips to project zones
- Administrative management of the project
    - HR management
    - Finances management

The first VVB visit took place from the 08/05/2023 until the 12/05/2023 to audit the monitoring period covering the 01/08/2021 until the 16/02/2023.

5 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The methodology does not account for baseline emissions separately, but instead quantifies net emission reductions achieved by the project. Please refer to Section 3.4.

5.2 Project Emissions

The methodology does not account for project emissions separately, but instead quantifies net emission reductions achieved by the project. Please refer to Section 3.4.

5.3 Leakage

Leakage shall be considered as default 0.95 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.

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

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 cookstoves of type i
ER_y	Emission reductions during year y in t CO2e
$ER_{y,i,j}$	Emission reductions by improved cookstove of type i and batch j during year y in t CO2e

$$ER_{y,i,j} = B_{y,savings,i,j} \times f_{NRB,y} \times NCV_{wood\ fuel} \times \left(EF_{wf,CO2} + EF_{wf,non\ CO2}\right) \times N_{y,i,j} \times 0.95 \qquad \text{Equation (2)}$$

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 (fNRB)[36]
$NCV_{wood\ fuel}$	Net calorific value of the non-renewable woody biomass that is substituted or reduced (IPCC default for wood fuel, 0.0156 TJ/tonne)[37]
$EF_{wf,CO2}$	CO2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO2/TJ)[38]
$EF_{wf,non\ CO2}$	Non-CO2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO2/TJ)[39]
$N_{y,i,j}$	Number of improved cookstoves of type I and batch j operating during year y
0.95	Discount factor to account for leakage

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

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

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

[36] Default values endorsed by designated national authorities and approved by the Board are available at https://cdm.unfccc.int/DNA/fNRB/index.html

[37] 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 1 Introduction (https://www.ipcc-nggip.iges.or.jp/public/2006gl/)

[38] 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion (https://www.ipcc-nggip.iges.or.jp/public/2006gl/)

[39] 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion (https://www.ipcc-nggip.iges.or.jp/public/2006gl/)

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. Bold is based on a baseline survey.
η_{old}	Efficiency of baseline cookstove
$\eta_{new,i,y}$	Efficiency of the improved cook stove type i and batch j determined using Equation 5 of the methodology.

B_{old} is adjusted to account for continued baseline stove usage using the following equation:

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

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

Since the methodology uses different energy efficiencies and therefore emission reductions depending on the age of the stoves, this project uses the concept of "age groups" (AG) to differentiate between stoves that are distributed during different monitoring periods. Contrary to the batches, the installation date of each individual stove is used to calculate $N_{y,i,j}$ instead of the installation date of the last stove.

All stoves that are in use for less than one year at the time of monitoring are considered "AG 0-1". For this age group, $N_{y,i,}$will then be less than the number of operational stoves since these have not yet been in operation for a full year. Stoves that have been in operation for more than 365 days but less than 730 days (2 years), are in AG 1-2 and so on.

Different age groups have, as defined in the methodology, different stove efficiencies, and are also expected to have different user drop-off rates, since older cookstoves will function less and will therefore have higher loss rates (see ex-ante calculation below).

Ex-ante calculation

For ex-ante calculation purpose[40], the assumptions below are applied for the 7 years of the first crediting period:

1. The project will install up to 125,000 ICS, ICS installation will be implemented in the first six years: 22,000 in year 1, 34,000 in year 2, 19,000 in year 3, 27,500 in year 4, 18,000 in year 5 and 4,500 in year 6
2. The project will replace up to 56, 000 ICS : 22, 000 in year 6 and 34, 000 in year 7
3. The life span of the ICS is 5 years. For conservative estimate of ER, the annual stove usage rate is estimated at a progressively higher rate as the years progress (cumulative application of usage rates), values are taken from[6] and converted to annual stove loss rates :

Age group	Stove loss rate ($U_{y,j}$)
0-1	5%
1-2	9.5%
2-3	35%
3-4	39.3%
4-5	53%

4. According to the kitchen performance test, B_{old} is calculated to be 3.18. A baseline stove usage rate (μ_y) of 10% is assumed, so $B_{old,adjusted}$ is calculated at 2.86 as described by equation 6 of the methodology
5. In the month of distribution, stoves are only accounted by half to account for the distribution happening along the month, resulting in half ER's generated on average

Determination of number of ICS operating during month y

The ex-ante calculation takes yearly distributions as input and spreads them proportionally in each month of the year. This is made to take into account the gradual distribution of stoves throughout the year.

The monthly number of stoves active (i.e. stoves within their lifespan, taking into account the annual loss rates) is then transformed in stove equivalent (i.e. the number of corresponding stoves active for a full year). The yearly ER's are then proportionally applied to the stoves according to their corresponding age

[40] See file "01. ER's_ex_ante_VCS4144_v1.0.xlsx"

group. ER's of the first month of each stove are divided by two to account for the gradual distribution within the month itself.

Year	Number of cookstoves distributed	Number of stove equivalent
Year 1	22'000	2,628
Year 2	34,000	21,329
Year 3	19,000	45,390
Year 4	27,500	54,887
Year 5	18,000	58,164
Year 6	26,500	57,146
Year 7	34,000	72,747

Determination of efficiency of ICS during year y

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

Where η_p = 29% and DF_n = 0.99

Age group	Stove efficiency ($\eta_{new,y,i,j}$)
0-1	27.26%
1-2	26.99%
2-3	26.72%
3-4	26.45%
4-5	26.19%

Determination of f_{NRB}

All details related to the fNRB evaluation are available in the files "Calculation of the fraction of non renewable biomass (fNRB), Malawi, CDM Tool 30 EB 108 Annex 22 v4.0 2022" from which the below is extracted. The file "Malawi_fNRB Calculation Sheet_v1.0 20.02.2023.xlsx" presents all details of the calculations.

The estimation of woody biomass consumption was originally derived from national average per capita woody biomass consumption, disaggregated by fuel type (charcoal and fuelwood), and residential area

(urban and rural). Charcoal consumption converted to the equivalent wood biomass by the default factor recommended in CDM Tools 30 and 33[41,42]. The domestic woody biomass consumption was estimated by multiplying the per capita consumption of fuelwood and charcoal by the 2020 population1, disaggregated by urban and rural residential areas.

Commercial energy and non-energy consumption estimates from the United Nations Statistics Division22,23 were applied in this this study but likely underestimate the true consumption for Malawi, given the lack of governance capacity, as they are reliant on national self-reporting. The consumption estimates, conversion factors and results of the calculations are presented in the following table :

Variable	Unit	Value	Source
N: Population			
Urban	number	3,519,490	UN Statistics Division (2023 a)[1]
Rural	number	16,370,252	UN Statistics Division (2023 a)[1]
HW: Per capita consumption			
Urban charcoal	t/capita/year	-	Conservatively excluded
Urban wood	t/capita/year	0.5	CDM default for AMS-II.G.
Rural charcoal	t/capita/year	-	Conservatively excluded
Rural wood	t/capita/year	0.5	CDM default for AMS-II.G.
NE+CE: Commercial woody biomass consumption			
Fuelwood	m^3/year	-	UN Statistics Division (2023 b)[22]
Charcoal	t/year	604,000	UN Statistics Division (2023 c)[23]
Conversion factors			
Wood density	t/m^3	0.725	FAO (2017)[24]
Wood-to-charcoal biomass factor	-	4.00	CDM Tool 33 v2.0 (2022)[21]
Wood-equivalent consumption			
Urban domestic	t/year	1,759,745	Calculated
Rural domestic	t/year	8,185,126	Calculated
Commercial	t/year	2,416,000	Calculated
H: Total woody biomass consumption	**t/year**	**12,360,871**	**Calculated**

Figure 13 - Figures used to calculate woody biomass consumption and the calculation result

41 CDM. Methodological Tool 30: Calculation of the Fraction of Non-Renewable Biomass. Version 04.0 . https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-30-v4.0.pdf (2022).

42 CDM. Methodological Tool 33: Default Values for Common Parameters. Version 02.0 . https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-33-v2.0.pdf (2022).

Estimation of total woody cover (F) was undertaken by analysis of Hansen/UMD/Google/USGS/NASA[43] spatial data in R[44,45,46,47] to determine the percentage woody cover at 30 m resolution. The method of analysis provided the proportion of cover for each 30 x 30 m grid cell and all woody cover including forest and sparse woody cover was accounted for (see below figure).

Application of the three FAO woody cover classes ('Forest' — >10%; 'Other Wooded Land' — 5–10%; and 'other land' - <5%) was not required as the proportion of woody cover derived was continuous[48]. The extent (in ha) of cover was calculated by multiplying the proportion of cover for each grid cell by the extent of cover (0.09 ha).

[43] Hansen/UMD/Google/USGS/NASA. Global Forest Change 2000–2021. Version 1.9. https://glad.earthengine.app/view/global-forest-change (2022).

[44] Pebesma, E. J. & Bivand, R. S. Classes and methods for spatial data in R. https://cran.rproject. org/package=sp (2005).

[45] Hijmans, R. J. raster: Geographic data analysis and modeling. https://cran.rproject.org/package=raster (2016).

[46] Pebesma, E. Simple features for R: Standardized support for spatial vector data. R J 10, 439–446 (2018).

[47] R Core Team. R: A language and environment for statistical computing. https://www.rproject.org/ (2022).

[48] Hansen, M. C. C. et al. High-resolution global maps of 21st-century forest cover change. Science (1979) 342, 850–854 (2013).

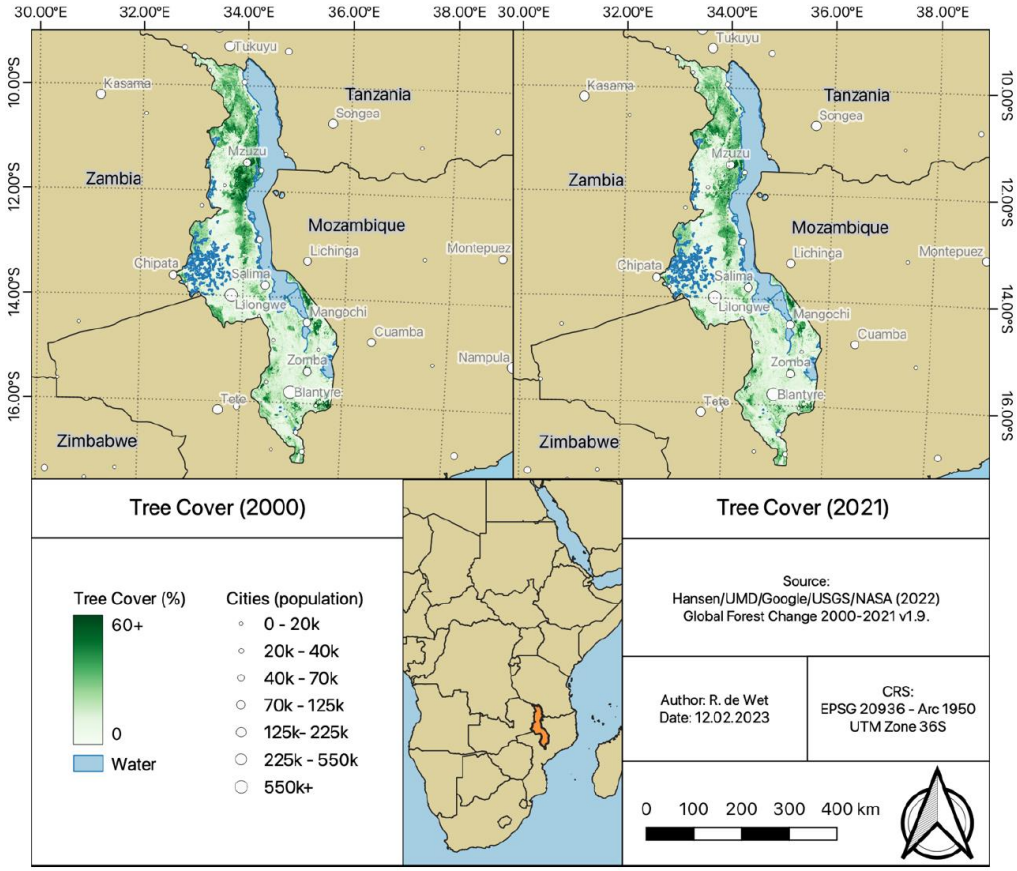

Figure 14 - Total woody cover for Malawi (2000-2021)[49]

[49] Hansen/UMD/Google/USGS/NASA. Global Forest Change 2000–2021. Version 1.9. https://glad.earthengine.app/view/global-forest-change (2022).

The dataset was then disaggregated into the FAO global ecological zones (GEZ)[50] (figure below) for which MAI (tonnes/ha/year) has been estimated by the IPCC[51]. These zones were further disaggregated into protected areas, geographically remote areas and geographically accessible areas to determine the total extent of forest accessible for harvesting.

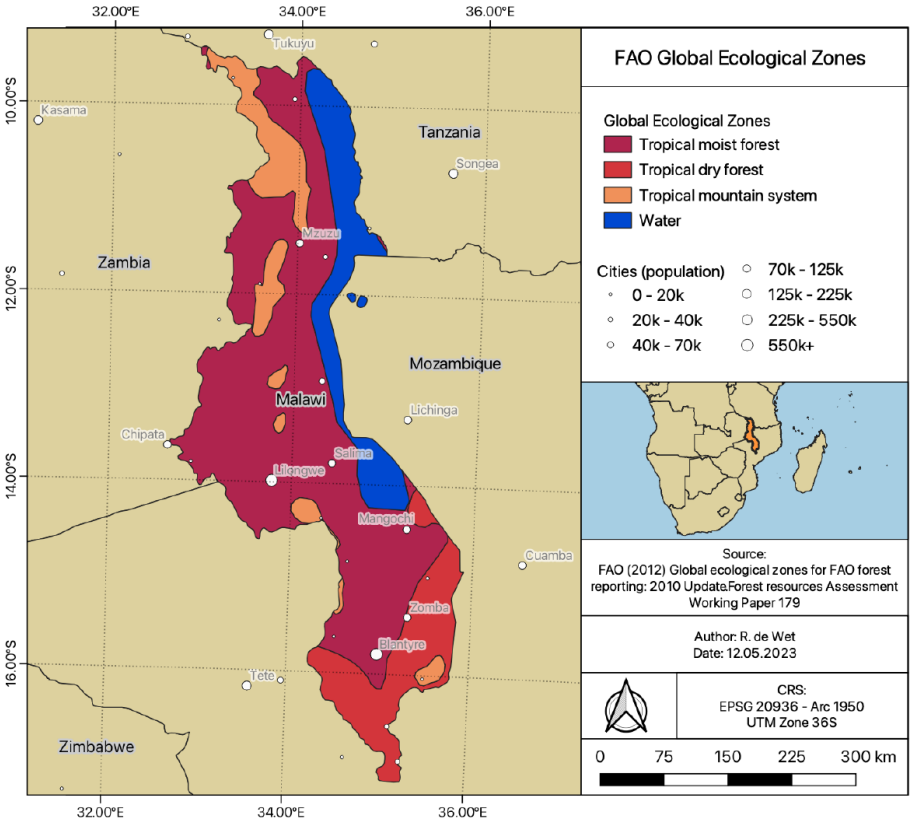

Figure 15 - FAO Global Ecological Zones within Malawi[52]

No standard threshold for fuelwood harvesting accessibility exists and a conservative estimate based on the findings of several studies in the literature was therefore made. Jumbe et al.[53] conducted a household survey on Miombo fuelwood harvesting that indicated a mean harvesting distance of 0.95 km. Banks et

[50] FAO. Global ecological zones for FAO forest reporting: 2010 Update. Forest resources Assessment Working Paper 179 42 (2012).

[51] IPCC. Forest Land. in Refinement to 2006 IPCC Guidelines National Greenhouse Gas Inventories Vol. 4 Agriculture Forestry and Other Land Use vol. 4 (2019).

[52] Karekezi, S. & Majoro, L. Improving modern energy services for Africa's urban poor. Energy Policy 30, 1015–1028 (2002).

[53] Jumbe, C. B. L. & Angelsen, A. Modeling choice of fuelwood source among rural households in Malawi: A multinomial probit analysis. Energy Econ 33, 732–738 (2011).

al.[54] found 450 m to be a critical distance where woody biomass increased from 2.1 to 16.6 t/ha. McCauley et al.[55] found through key stakeholder interviews that wood harvesting time and distance has increased with greater deforestation impacts from being less than an hour to 1-2 hours per day, equivalent to 1-2 km from the nearest settlement. Bandyopadhyay et al.35 used remote sensing in combination with household survey data and determined that both poor and non-poor households walked 0.6 hours on average to collect fuelwood. At a pace of 4 km/hr, this equates to a distance that is well within 2.5 km from the nearest settlement. The latter distance from any settlement, road or track, regardless of the remote nature of such a settlement, road or track, has therefore been taken as a conservative threshold for defining remote and accessible wood resources.

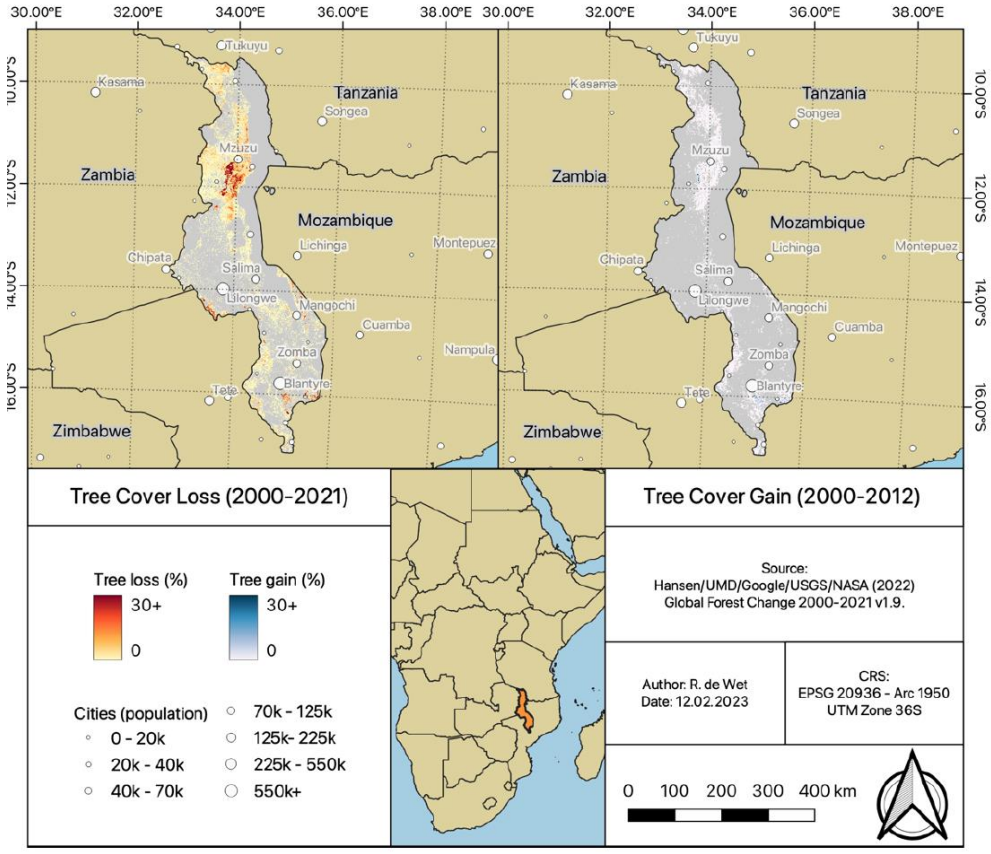

Figure 16 - Woody cover loss (left) and gain (right) for Malawi[47]

The extent of woody cover was determined for each accessibility category within each GEZ by summing the extent of woody cover for each grid cell therein to determine the total extent of woody cover (F) and

[54] Banks, D. I., Griffin, N. J., Shackleton, C. M., Shackleton, S. E. & Mavrandonis, J. M. Wood supply and demand around two rural settlements in a semi-arid Savanna, South Africa. Biomass Bioenergy 11, 319–331 (1996).

[55] McCauley, D., Grant, R. & Mwathunga, E. Achieving energy justice in Malawi: from key challenges to policy recommendations. Clim Change 170, (2022).

the extent of inaccessible (protected or remote) woody cover (P). The MAI was multiplied by the number of hectares of cover in each GEZ to produce an annual growth rate or renewable biomass (RB) production (Table below). Some of the wooded land was categorised as being in a "water" zone. This is due to inaccuracies in the GEZ database. Trees categorized as being in water where therefore assumed to have the growth rate of the adjacent ecological zone (tropical moist forest). Where primary forest growth rates are available, they were applied based on the primary forest extent data published by Turubanova et al.[56].

FAO Global Ecological Zone (GEZ)	Total forest cover (F – ha)	Inaccessible cover (P – ha)	Mean annual increment (MAI – t/ha/year)	Renewable biomass (RB – t/year)
Tropical dry forest	262,383	183,823	1.64	128,876
Tropical moist forest	1,108,910	809,094	0.91	273,699
Tropical mountain system	275,846	197,623	1.88	146,773
"Water"	34,016	25,624	0.91	7,607
Total	1,681,155	1,216,165	-	556,955

Figure 17 - Products of the F, P, MAI and RB determinations

Renewable biomass (RB), non-renewable biomass (NRB) and the fraction of non-renewable biomass (fNRB) were derived from H, F, P and MAI. A summary of equations applied to calculate these values is provided in the box below.

[56] Turubanova, S., Potapov, P. V., Tyukavina, A. & Hansen, M. C. Ongoing primary forest loss in Brazil, Democratic Republic of the Congo, and Indonesia. Environmental Research Letters 13, (2018).

Step 1 – Renewable Biomass (RB)

RB is the product of total extent of accessible forest cover (ha) and the mean annual increment (MAI – t/ha/year) of woody biomass, as per the following equation:

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

Where:
MAI = Mean annual increment of woody biomass (t/ha/year)
F_{forest} = Extent of forest in the relevant period (ha)
F_{other} = Extent of other land in the relevant period (ha)
P_{forest} = Extent of non-accessible area within forest areas (ha)
P_{other} = Extent of non-accessible area within other land areas (ha)
i = Sub-category i of forest areas and other land areas.

Step 2 – Non-renewable Biomass (NRB)

NRB is the difference between the RB and the total annual biomass consumption (H) in accordance with the following equation:

$$NRB = H - RB$$

Step 3 – Fraction of Non-renewable Biomass (f_{NRB})

Fraction of Non-renewable Biomass (f_{NRB}) is the proportion of the harvested biomass that exceeds sustainable supply. The f_{NRB} ranges between 0 and 1 with 0 indicating that all harvested biomass is renewable and 1 indicating that all harvested biomass is non-renewable. f_{NRB} is calculated as follows:

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

Figure 18 - Summary of the equations provided in the CDM Tool 30 Version 04.0[55]

A cross-check was conducted, as required under in Paragraph 13 of CDM Tool 30[57], in which NRB (11,803,916 t/year) was compared to the product of estimated annual deforestation rate (42,000 ha/year)[58] and the average above-ground forest biomass density (78.70 t/ha)[56] reported by FAO to produce a rate of biomass loss of 3,305,400 (t/year).

This indicates that total forest impact has been grossly underestimated by the FAO, which may be because their deforestation rate reflects only the biomass lost due to a complete transition from a forest to a non-

[57] CDM. Methodological Tool 30: Calculation of the Fraction of Non-Renewable Biomass. Version 04.0 . https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-30-v4.0.pdf (2022).

[58] FAO. Global Forest Resource Assessment: Malawi. https://fradata.fao.org/MWI/fra2020/home/ (2020).

forest state and not due to harvesting within areas that remain forested, but at a lower density[59]. Furthermore, the estimated deforestation rate by the FAO has remained at precisely 42,000 ha/year every year since 1990. This unrealistically consistent deforestation rate raises important questions about its reliability, and this concern is echoed in the FAO Forest Resources Assessment introductory text for Malawi[56]. It is noted that the "extrapolated and deduced figures in the report might not give a true picture of what is happening on the ground since the last Forest resources Mapping and Biomass Assessment for Malawi was done in 1990" and that the "government strongly feels that it is high time to undertake, with an external support, another study that will assist it properly plan and manage the resources". In contrast, the deforestation rates calculated in this study by application of the latest CDM Tool 30[55] are based on peer-reviewed literature forest data and CDM default consumption rates.

The literature on the state of forest resources in Malawi provides further support for the conclusion that the FAO database underestimates the national deforestation impacts. Malawi has been identified as having one of the highest rates of deforestation in the region, having lost almost a quarter of 1975 forests by 2005 (47% to 36%)[60]. Unsustainable use of biomass for cooking and heating has been identified as one of the primary drivers for this deforestation[61], given that biomass accounts for 88% of total energy demand[62,63]. Furthermore, the annualized rate of deforestation reported between 1991-2008 (0.471%/year)[64] and 1991-2017 (0.770%)[65] are both greater than that of 1975-2005 (0.367/year)[58], indicating an increasing (not a stable) deforestation rate. This is further supported by the Global Forest Watch dashboard for Malawi, based on the same sources[66,67] as this study, which reports a steady increase in the annual rate of deforestation from 2001 (0.16%) and 2023 (1.5%)[68].

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[59] FAO. Terms and Definitions. Forest Resources Assessment Working Paper 188 . (2018).

[60] Mauambeta, D., Chitedze, D. & Mumba, R. Status of Forests and Tree Management in Malawi: A Position Paper Prepared for the Coordination Union for Rehabilitation of the Environment (CURE) . https://www.researchgate.net/publication/264410475 (2010) doi:10.13140/2.1.3497.7926.

[61] Gowela, J. P. & Masamba, C. R. State of Forest and Tree Genetic Resources in Malawi . https://www.fao.org/3/AC468E/ac468e00.htm (2002).

[62] Taulo, J. L., Gondwe, K. J. & Sebitosi, A. Ben. Energy supply in Malawi: Options and Issues. Journal of Energy in Southern Africa 26, 19–32 (2015).

[63] Kambewa, P. & Chiwaula, L. Biomass Energy Use in Malawi . (2010).

[64] Owen, M., Openshaw, K., van der Plas, R., Matly, M. & Hankins, M. Malawi Biomass Energy Strategy . http://conrema.org/wp-content/uploads/2019/01/Biomass-Strategy- 2009.compressed.pdf (2009).

[65] Ngwira, S. & Watanabe, T. An analysis of the causes of deforestation in Malawi: A case of Mwazisi. Land (Basel) 8, (2019).

[66] Hansen, M. C. C. et al. High-resolution global maps of 21st-century forest cover change. Science (1979) 342, 850–854 (2013).

[67] Turubanova, S., Potapov, P. V., Tyukavina, A. & Hansen, M. C. Ongoing primary forest loss in Brazil, Democratic Republic of the Congo, and Indonesia. Environmental Research Letters 13, (2018).

[68] Global Forest Watch. Malawi National Forest Dashboard. https://gfw.global/461OXMz (2024).

As required under Paragraph 6(b) of CDM Tool 3020, an additional comparison was made between the fNRB value calculated using Tool 30 and the fNRB values reported in the literature. Bailis et al.[69] estimated the national fNRB value for Malawi to be 41.4%. Numerous assumptions by Bailis et al. diverge from the CDM Tool 30 methodology, and that explains the difference in fNRB estimates. These assumptions are described in the Supplementary Information* to the original article[67] and include: (i) a significant under-estimation of wood consumption based on 2013 reports (pg. 12, Table 1); (ii) a different definition of mean annual increment (MAI) that has been updated under CDM Tool 30 since v1.0 and that differs from the default IPCC growth rates (pg. 22, Figure 5), resulting in an overestimation of renewable biomass (RB); (iii) an overly-generous definition of accessibility that assumes that wood is evenly harvested within a 12-hour travel distance (24-hour round trip) and therefore assumes an average of 89% of the country is accessible (pg. 31, Figure 10); and (iv) making adjustments and assumptions about plantations and the fraction of the country's forested area under formal management that is incongruent with the latest CDM Tool 30 version (pg. 32).

In addition, a review of the registered cookstoves on the Verra registry demonstrates that the calculated fNRB estimate from this study aligns with other validated studies that range from 91%[70] to 98%[71].

Variable	Unit	Value
Total woody biomass consumption (H)	t/year	12,360,871
Renewable biomass (RB)	t/year	556,955
Non-renewable biomass (NRB)	t/year	11,803,916
Fraction of non-renewable biomass (f_{NRB})	%	95.49%

Figure 19 - Summary of the fraction of non-renewable biomass (f_{NRB}) calculation

The calculated fNRB of 95% indicates that the consumption of woody biomass within Malawi is nonrenewable with only 5% being replaced by new growth annually. This finding is validated by the rate of deforestation observed and reported in the literature.

Fuelwood savings and emission reductions

As per the calculation sheet :

[69] Bailis, R., Drigo, R., Ghilardi, A. & Masera, O. The carbon footprint of traditional woodfuels. Nat Clim Chang 5, 266–272 (2015).

[70] C-Quest Capital. Verra Project ID 2886: Installation of high efficiency wood burning cookstoves in Malawi – Project 3. https://registry.verra.org/app/projectDetail/VCS/2886 (2023).

[71] Livelihoods Fund. Verra Project ID 3262: Livelihoods Chitetezo Mbaula Project. https://registry.verra.org/app/projectDetail/VCS/3262 (2023).

Year	Estimated baseline emissions or removals (tCO2e)	Estimated project emissions or removals (tCO2e)	Estimated leakage emissions (tCO2e)	Estimated net GHG emission reductions or removals (tCO2e)
Year 1	8,567	0	0	8,567
Year 2	69,428	0	0	69,428
Year 3	147,230	0	0	147,230
Year 4	177,570	0	0	177,570
Year 5	187,819	0	0	187,819
Year 6	184,378	0	0	184,378
Year 7	235,526	0	0	235,526
Total	**1,010,518**	**0**	**0**	**1,010,518**

6 MONITORING

6.1 Data and Parameters Available at Validation

Data / Parameter	B_{old}
Data unit	Tonnes/year
Description	Annual quantity of woody biomass that would have been used in the household in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project devices
Source of data	VMR0006, section 8.4 option b : baseline survey of local usage
Value applied	3.18[72,73,74]

[72] See file "13. KPT_Consolidated result_VCS4144_v1.0.xlsx"

[73] See file "14. KPT_Analysis_3-stones only_VCS4144_v1.0.xlsx"

[74] See file "15. KPT_Analysis_3-stones and charcoal stoves_VCS4144_v1.0.xlsx"

Justification of choice of data or description of measurement methods and procedures applied	The kitchen performance test as promoted by the clean cooking alliance was used to calculate this value.
Purpose of Data	Calculation of emission reductions
Comments	-

Data / Parameter	η_p
Data unit	Fraction
Description	Efficiency of project stove at the start of project activity
Source of data	Clean Cookstoves catalogue: http://catalog.cleancookstoves.org/stove_details.html?stove_id=stove_VROU4NT
Value applied	29%
Justification of choice of data or description of measurement methods and procedures applied	The adopted efficiency is the minimum of the test results' range.
Purpose of Data	Calculation of emission reductions
Comments	-

Data / Parameter	$\eta_{new,i}$
Data unit	Fraction
Description	Efficiency of the device of age group i implemented as part of the project activity
Source of data	VMR0006 v1.1, section 8.4
Value applied	

	$\eta_{new,AG0-1}$ 27.26% $\eta_{new,AG1-2}$ 26.99% $\eta_{new,AG2-3}$ 26.72% $\eta_{new,AG3-4}$ 26.45% $\eta_{new,AG4-5}$ 26.19%
Justification of choice of data or description of measurement methods and procedures applied	Equation 5 : $\eta_{new,i,y} = \eta_p \times (DF)^{y-1} \times 0.94$
Purpose of Data	Calculation of emission reductions
Comments	Since all devices are the same type, there is no distinction based on stove type. However, since $\eta_{new,i}$ depends on the age of the project device, there will be made a distinction between stove age groups.

Data / Parameter	$f_{NRB,y}$
Data unit	Fraction
Description	Fraction of non-renewable biomass
Source of data	Calculation of f_{NRB} based on CDM Tool 30 EB 108 Annex 11 v3.0 2020
Value applied	95.49%
Justification of choice of data or description of measurement methods and procedures applied	Seed Ecology and the Cape Climate Collective was appointed as third party to estimate the fNRB value for Malawi[75]
Purpose of Data	Calculation of emission reductions
Comments	-

[75] See fil "06. Malawi_fNRB Report_v1.0 20.02.2023.pdf"

Data / Parameter	$NCV_{biomass}$
Data unit	TJ/t
Description	Net calorific value of the non-renewable woody biomass that is substituted or reduced
Source of data	IPCC default for wood fuel
Value applied	0.0156 TJ/tonne
Justification of choice of data or description of measurement methods and procedures applied	Default value provided in VMR0006, version 1.1, section 9.2
Purpose of Data	Calculation of emission reductions
Comments	-

Data / Parameter	$EF_{wf,CO2}$
Data unit	tCO2/TJ
Description	CO2 emission factor for the use of wood fuel in baseline scenario
Source of data	IPCC default for wood fuel
Value applied	112 tCO2/TJ
Justification of choice of data or description of measurement methods and procedures applied	Default value provided in VMR0006, version 1.1, section 8.4
Purpose of Data	Calculation of emission reductions
Comments	-

Data / Parameter	$EF_{wf,non\ CO2}$
Data unit	tCO2/TJ
Description	Non-CO2 emission factor for the use of wood fuel in baseline scenario
Source of data	IPCC default for wood fuel
Value applied	26.23 tCO2/TJ
Justification of choice of data or description of measurement methods and procedures applied	Default value provided in VMR0006, version 1.1, section 8.4
Purpose of Data	Calculation of emission reductions
Comments	-

Data / Parameter	L
Data unit	Fraction
Description	Discount factor to account for leakage
Source of data	VMR0006, version 1.1, section 8.3
Value applied	0.95
Justification of choice of data or description of measurement methods and procedures applied	A net to gross adjustment factor (0.95 default) is applied in order to adjust Bold to account for leakages as per paragraph 8.3 of the VMR 0006, version 1.1 methodology.
Purpose of Data	Calculation of emission reductions
Comments	-

Data / Parameter	Life span

Data unit	Number of years
Description	The maximum operating lifetime of the project device
Source of data	Lifespan Survey for Chitetezo Mbaula Stoves, Lilongwe, Malawi, December 2020, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Energising Development
Value applied	5
Justification of choice of data or description of measurement methods and procedures applied	Cookstoves beyond their theoretical lifespan (5 years) are automatically excluded from the project database for ER calculations. Cookstoves out of order during the monitoring surveys are counted as not generating ER's, therefore ensuring that the actual lifespan of each device from each age group is a reflection of the real lifespan happening in the field.
Purpose of data	Calculation of emission reductions
Comments	-

6.2 Data and Parameters Monitored

Data / Parameter	$N_{y,i}$
Data unit	Number
Description	Number of project devices of age group i, operating during year y.
Source of data	VMR0006, section 8.4 option b, baseline survey of local usage : project database and monitoring surveys
Description of measurement methods and procedures to be applied	The project database (recorded continuously) detailing per stove distributed the beneficiary with their current living location, telephone number and sales date and the monitoring survey to determine usage rate and number of stoves used per household.
Frequency of monitoring/recording	Biennially
Value applied	The project database shows a total of 20,698 stoves sold during the MR. For ER's calculation purposes, those sales are

	transformed into stove equivalent to account for the period in which they are actually operating. For instance, 1 stove sold on the 01/07/2022 would only be active for 6 months in 2022 (from 01/07/2022 until 31/12/2022). Therefore, while reported as 1 stove in the database, it would correspond to only 0.5 stove equivalent for the calculation of ER's. Ex-ante estimations of stove equivalents[38]: Year N 1 2,628 2 21,329 3 45,390 4 54,887 5 58,164 6 57,146 7 72,747 Ex-post calculations[76] : the project database indicates the installation date of every individual stove. Based on this information and on the start and end date of the monitoring period, the number of days for which each stove has been active during the monitoring period is calculated and then split between calendar years. In addition, the number of days on a certain year is split between days related to age group 0-1 (AG0-1) and to age group 1-2 (AG1-2) to be able to apply the correct efficiency in the calculation of ER's. Details of calculation are available in the file
Monitoring equipment	Project database
QA/QC procedures to be applied	Data crosschecking will occur to ensure consistency of the data collected.

[76] See file "02. ER's_ex_post_VCS4144_v1.0.xlsx"

Purpose of data	Calculation of emission reductions
Calculation method	The following formula is applied: $N_{y,i,}= n_{y,i,j} * U_y / DF_{stoves/HH,y}$ where $n_{y,i,j}$ is the number of stove equivalents (number of days the stove was in use during the monitoring period divided by a year, 365) for year y and age group i. U_y is the usage rate, or the percentage of households that use their project device according to the monitoring survey. $DF_{stoves/HH,y}$ is a correction factor for the usage of multiple stoves by the same household. It is the average number of stoves per household as determined by the monitoring survey.
Comments	Since all cookstoves are the same cookstove type, there is no differentiation between cookstove types. The project does not work with batches, but does make a difference in age groups (stoves less than a year old, between 1-2 years old etc.) since $\eta_{new,i}$ is dependent on age.

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	VMR0006, section 8.4 option b, baseline survey of local usage : monitoring surveys
Description of measurement methods and procedures to be applied	The sampling plan is developed proportionally to age groups distribution to ensure representativity. Households included in the sampling plan will be interviewed with a questionnaire designed to capture information on the simultaneous use of pre project or other cooking devices.
Frequency of monitoring/recording	At least once every two years
Value applied	Ex-Ante estimation[38] : 10% Ex Post value[74] : 18.56%
Monitoring equipment	Monitoring surveys

QA/QC procedures to be applied	Data crosschecking will occur to ensure consistency of the data collected : consistency check of answers along the questionnaire, pictures cross check, visual inspection and narrative cross check. Data for this parameter will be collected using the same survey for the fraction of $N_{y,j}$.
Purpose of data	Calculation of emission reductions
Calculation method	The adjustment factor for baseline stove usage shall be determined based on the number of meals cooked using the baseline/ pre-project stove divided by the total number of meals cooked. The impact of seasonal variation on the use of the baseline stove is also taken into account. The required information shall be captured through sample surveys carried out following a random sampling approach. The number of households for each age-group will be proportionate to the fraction of stoves from that age-group compared to the total amount of stoves.
Comments	-

Data / Parameter	η_{old}
Data unit	Fraction
Description	Efficiency of baseline stove
Source of data	VMR0006 v1.1, section 9.2
Description of measurement methods and procedures to be applied	Weighted average of default values for conventional open fire and charcoal stoves as per KPT results: • Baseline stove efficiency for three stone fire = 10% • Baseline stove efficiency for charcoal stove = 20% • 140 households exclusively using wood • 4 households using a mix of wood and charcoal, conservatively assumed as entirely using charcoal Therefore : • η_{old} = 10% * (140/144) + 20% * (4/144) = 10.28%
Frequency of monitoring/recording	Fixed for each individual household at the time of project implementation.

Value applied	10.28%
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of emission reductions
Calculation method	-
Comments	-

Data / Parameter	$B_{old,adjusted}$
Data unit	Tonnes/year
Description	Adjusted baseline fuel use to account for any continued use of pre-project devices during the year y
Source of data	Ex-ante: based on assumed μ_y Ex-post: Based on μ_y from monitoring survey
Description of measurement methods and procedures to be applied	Application of equation 6
Frequency of monitoring/recording	Once per monitoring period
Value applied	Ex-ante[38] : 2.86 Ex-post[74] : 2.59
Monitoring equipment	-
QA/QC procedures to be applied	See QA/QC for μ_y
Purpose of data	Calculation of emission reductions
Calculation method	Application of equation 6
Comments	-

6.3 Monitoring Plan

The monitoring plan is designed to monitor the parameters listed in the section above. The share of operating stoves and the continued use of pre-project devices will be determined based on sampling procedures as outlined below. United Purpose will be responsible for conducting the sampling surveys and maintaining a database with all operating stoves.

Baseline survey and baseline fuel consumption[77,78,79,80,81,82,83]

Baseline surveys were conducted from 19/01/2023 until 12/02/2023 (few surveys conducted 11/10/2022). For the baseline survey, the sampling frame[84] consists of households living within the 215 clusters where project stoves will be disseminated across the 3 districts of Mzimba North, Mzimba South and Nkhotakota. 16 clusters are randomly selected and for each cluster up to 8 households are randomly selected for surveying. Surveyors are advised to walk from center of the cluster in different directions of the cluster and ask the first householder they meet with if he/she is willing to participate in the survey. If the householder is not willing, surveyors should talk to the subsequent householder they meet with. After a successful first survey, surveyors walk to the next household/person (randomly selected) and ask for their willingness to participate and so on. Following the aforementioned procedure allows random sampling of households and avoid any bias.

Important guidelines were given to the surveyors on how to sample households randomly, as described above, and perform a proper data collection. They were also given a training. The baseline surveyed a total of 155 households[85].

[77] See file "17. Baseline Survey Guidelines and Instructions_UP_Malawi_v1.0.pdf"

[78] See file "18. Baseline KPT protocol_v.1.0_English.pdf"

[79] See file "21. BASELINE SURVEY_FORM-1000560968"

[80] See file "22. KPT day 0 SURVEY_FORM-1008321051.xls"

[81] See file "23. KPT day 1 SURVEY_FORM-1029201020.xls"

[82] See file "24. KPT day 2 SURVEY_FORM-1012080925.xls"

[83] See file "25. KPT day 3 SURVEY_FORM-970351263.xls"

[84] See file "12. BS_sampling_nkhotakota_VCS4144_v1.0.xlsx"

[85] See file "Baseline Results V1.0.xlsx"

Figure 20 - Survey team administering the baseline survey

Based on the results of the baseline survey, baseline scenarios were identified. Scenarios that appeared in more than 5% of the cases were deemed significant, which were households cooking with only a three-stone stove/open fire and households using a combination of a three-stone stove/ open fire and a traditional stove. For these two scenarios, a baseline fuel consumption test was organized to determine the B_{old}. The Baseline Kitchen Performance Test (BKPT) protocol was used for this. The same clusters were visited as in the baseline survey and BFCT and where possible, the same households were visited. Significant differences we noted between the KPT results and the Baseline results where KPT results indicated a higher average woody biomass consumption per household compared to the Baseline results as shown below:

Baseline Results[86]:

	Tonnes/HH/Yr
Three-stone stove/open fire	**2.8**
Three-stone stove/open fire|Charcoal stove	**1.6**
AVERAGE	**2.2**

[86] See file "Baseline Results V1.0.xlsx"

KPT Results[87]:

	Tonnes/HH/Yr
Three-stone stove/open fire	**3.17**
Three-stone stove/open fire | Charcoal stove	**3.6**
AVERAGE	**3.18**

Figure 21 - Survey team conducting KPT's

[87] See file "13. KPT_Consolidated result_VCS4144_v1.0.xlsx"

Monitoring survey[88,89]

Monitoring surveys were conducted from 13/01/2023 until 08/02/2023 (few surveys conducted on 10/10/2022). No monitoring for leakage through competitive use of biomass is required, as the parameter wood usage is multiplied by 95% to account for leakage.

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

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 will be undertaken in line with the requirements of section 8.4 option b of the VMR0006 methodology.

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 (as per applied methodology VMR0006 V1.1).

Parameter	Description of parameter	Frequency
$N_{y,i,j}$	Number of project devices of type i and batch j operating during year y	Biennial
μ_y	Adjustment to account for any continued use of pre-project devices during the year y	Biennial

Target populations

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

Sampling frame

It is expected that the geographical locations do not have influence on the parameters of interest that are $N_{y,i,j}$ and μ_y. Therefore, these parameters can be assumed to be 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. Since all stoves are of the same type, all stoves can be grouped into a homogeneous sampling frame.

[88] See file "19. MS guidelines and instructions v1.0.pdf"

[89] See file "26. MONITORING SURVEY_FORM-1021462227.xls"

When sampling to determine $N_{y,i,}$ and μ_y, a simple random sampling approach shall be followed as described in VMR0006. Since the project target population is bigger than 1000 households, the minimum sample size will be 100. Oversampling is encouraged to compensate for attrition, outliers or non-response. Therefore, a sample of 150 households was taken.

The fraction of each age-group in the sample will be the same as the proportion of that age-group in the total number of households of the project database.

Sampling method

The sampling method for monitored parameters $N_{y,I}$ and μ_y is simple random sampling. After determining the proportion of households in age group 0-1 and 1-2 at the moment of sampling, the number of households necessary for each age group is determined and accordingly randomly selected using a random number generator[90].

Data

Surveys

The majority of interviews will be conducted in person by the local team of United Purpose in Malawi or by hired externals trained beforehand. Data quality control will be performed by the consultant.

Figure 22 - Survey teams administering the survey

The survey is done biennially to assess the required parameters mentioned below. Questions will be asked about the usage of the ICS as well as baseline technology use, fuel consumption and seasonal variations.

[90] See file "16. MS1_sampling_VCS4144_v1.0.xlsx"

All of the aforementioned surveys/tests are intended to be carried out with smartphones (by using AKVO Flow) and as soon as the user is online all the captured data are transferred to a centralized database. The team of United Purpose and the external carbon consultant carries out further data analysis based on these data.

Monitoring of cookstove database

United Purpose keeps records of all distributed ICS in an electronic database. As a minimum the following information will be recorded in the database:

- Unique serial number of the ICS
- Date of sales or distribution
- End-user contact details (name, state, mobile number, or national ID number)
- Name of stove promoter
- Quantity of ICS distributed or sold
- Model type of the ICS

The USN of each ICS entered into the distribution database will be linked to a distribution date (recorded during distribution). Thus, for any monitoring period it is possible to calculate the period of time for which the stoves included in the emissions reduction calculations are deemed operating. If e.g. a stove has been operating for 100 days, then the full-year operating fraction is 0.274 (=100/365 days). A stove will be counted as operational (= start crediting) from the next day following the stove distribution. The sum of the operating fractions of all appliances determines the equivalent full-time appliances for the monitoring period.

The database will be continuously checked for possible double-entries or implausible data entries. Though a household may own more than one ICS at the same time, only one ICS with serial number and being within the age of 5 years per household can claim carbon credits.

To monitor the number of stoves that continue to be in use ($N_{y,i,}$), the data collected will be a representative number of households from the database. The method of collecting data will be field surveys of the required sample size of ICS users in the database. Data will be collected from the field surveys, entered in the database and included in the monitoring report.

Monitoring of μ_y

During the same field surveys, μ_y, the proportion of users still using their baseline stove, will also be determined. This method is preferred over using data loggers, since installing data loggers is not considered practical. Occasional usage of a pre-project stove is deemed insignificant, so μ_y is only calculated if baseline stoves are used on a weekly basis.

This survey will be part of the above mentioned $n_{y,i,j}$ survey and will therefore be conducted with the same households.

The surveys should capture the number of meals cooked using the baseline stove in the dry and wet season. There will be three situations:

1. Project ICS are completely discarded
6. Baseline stove(s) are completely discarded
7. Baseline stove(s) used along with project ICS.

The first scenario will not be taken into account for μ, since this proportion of operational stoves is already used to calculate $N_{y,i,j}$. The second scenario gives a μ of 0% for that household. For the third case, the number of meals cooked in the dry and wet season using the baseline stove will be divided by the number of meals cooked in the dry or wet season respectively. Then, a weighted average of the two will be taken to determine the baseline stove use percentage. The obtained percentages of all households in the second and third scenario will be averaged to obtain μ_y.

Monitoring of $N_{y,i}$

A visual inspection of the premises will be done to see if the ICS is operational and in use. Additionally, an interview with the end user will be held to ascertain that the stove is used on a regular basis. This will determine of the stove is in use or not (Yes/No).

Additionally, the household will be asked how many project stoves they currently have (not counting replacement stoves as an old stove and its replacement stove are accounted as one stove in the database) (number of stoves).

The project database will be used to determine the number of stove equivalents (days stove in use during monitoring period/ 365). Since the database only records the sale date, the monitoring survey will also ask how many days after the purchase of the project stove the device has been taken in use and this will be taken into account when calculating the stove equivalents.

7 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

7.1 Data and Parameters Monitored

Data / Parameter	Ny,i,j
Data unit	Number
Description	Number of project devices of type i and batch j operating during year y.

Value applied	The number of stoves operating during the monitoring period (as described in the file 02. ER's_ex_post_VCS4144_v1.2.xlsx tab 2. Analysis) are :

	2021	2022	2023
Total stoves per year	13'583	6'976	139
Total stoves	20'698		

In order to account for the actual number of days of operation and be able to compute ER's associated with those stoves, those are transformed to stove equivalent (one stove equivalent representing one stove operating for one full year) and segregated according to age groups, :

	2021	2022	2023
AG 0-1	1,221	9,672	510
AG 1-2	0	1,221	1,187
Total	1,221	10,892	1,696

Comments	For the calculation of ny,i,j, see file "02. ER's_ex_post_VCS4144_v1.0"[74], tab "2. Analysis". For the calculation of Uy and $DF_{stoves/HH,y}$, see document "09. MS1_analysis_VCS4144_v1.0.xlsx"[13], tab "3. Analysis". For the calculation of Ny,i, see file "02. ER's_ex_post_VCS4144_v1.0"[74], tab "2. Analysis".

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	18.56%
Comments	For the calculation of μ_y, see document "09. MS1_analysis_VCS4144_v1.0.xlsx"[13], tab "3. Analysis".

Data / Parameter	$B_{old,adjusted}$
Data unit	Tonnes/year
Description	Adjusted baseline fuel use to account for any continued use of pre-project devices during the year y
Value applied	2.59
Comments	For the calculation of $B_{old\_adjusted}$, see file "02. ER's_ex_post_VCS4144_v1.0"[74], tab "3. ER Ex Post".

Data / Parameter	Date of commissioning of project device i
Data unit	Date
Description	Actual date of commissioning of the project devices
Value applied	-
Comments	For the records of sales dates, see file "02. ER's_ex_post_VCS4144_v1.0"[74], tab "1. Project Database".

7.2 Baseline Emissions

The methodology does not account for baseline emissions separately, but instead quantifies net emission reductions achieved by the project. Please refer to Section 3.4.

7.3 Project Emissions

The methodology does not account for baseline emissions separately, but instead quantifies net emission reductions achieved by the project. Please refer to Section 3.4.

7.4 Leakage

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

7.5 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.

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

Where:

i = Indices for the situation where more than one type/model of improved cookstove is introduced to replace there 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 tCO2e

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

$$ER_{y,i,j} = B_{y,savings,i,j} \times NCV_{wood\ fuel} \times f_{NRB,y} \times (EF_{wf,CO2} + EF_{wf,non\ CO2}) \times N_{y,i,j} \times 0.95$$ Equation (2)

Where

savings,i,j	uantity of woody biomass that is saved in tonnes per improved cookstove of type i and batch j during year y	30-1 1.7016 & AG1-2: 1.6926
RB,y	action of woody biomass that can be established as non-renewable biomass	9546
CV wood	et calorific value of the non-renewable woody biomass that is substituted or reduced(IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried')	0156

$_{wf,CO2}$	O_2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO2/TJ)	2
$_{wf,non-CO2}$	on-CO2 emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO2/TJ)	3.23
$_{i,j}$	umber of improved cookstoves of type i and batch j operating during year y	e section 7.1
95	scount factor to account for leakage	95

To calculate $B_{y,savings}$, we use ooption 1 of the applied methodology[91]

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

Where

ld	uantity of wood fuel used in the absence of the project activity in tonnes per household per year	18
d	weighted average value of 10.28% is used	.28%
ew,i,j	ficiency of the system being deployed as part of the project activity, as determined by water boiling test protocol.	0-1: 27.26% 1-2: 26.99%

$$\eta_{new,i,y} = \eta_p \times (DF_n)^{y-1} \times 0.94$$

Where

	ficiency of project stove (fraction) at the start of project activity	0%
$F_n)^{y-1}$	scount 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	99

[91] Equation 3 of methodology VMR 0006

	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.	
94	ljustment factor to account for uncertainty related to project cookstove efficiency test.	94

As some of the project households continue to use baseline cookstoves along with improved cookstoves, Bold has been adjusted ex-post based on the percentage of project households found to continue such practice according to the Equation 6 of applied methodology as follows:

$$B_{old,adjusted} = B_{old} \times (1 - \mu_y)$$

Where

ld,adjusted	ljusted Bold to account the ex-post usage of firewood in baseline cookstove(s) by project households in addition to improved cookstove (in tonnes per device per year)	59
	ıseline stove usage factor to account for use of baseline cookstoves along with improved cookstoves	.56%

This leads to the following ER savings for the first monitoring period:

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
Year 1 01-08-2021 - 31-12-2021	0	3,854	0	3,854
Year 2 01-01-2022 - 31-12-2022	0	34,364	0	34,364

Year 3 01-01-2023 – 16-02-2023	0	5,332	0	5,332
Total	0	43,550	0	43,550

Ex ante estimations for 2023 are made to the prorate of the number of days on MP1:

- 2023 : (47 days/365 days) * 147,230 = 18,958 tCO2e

Ex-ante emissions reductions/removals	**Achieved emissions reductions/removals**	**Percent difference**	**Justification for the difference**
8,567	3,854	-55%	Year 2021 : The project planned to distribute 22,000 stoves[92] whereas it actually implemented 13,583. Implementation is so far slower than expected.
69,428	34,364	-51%	Year 2022 : The project planned to distribute 34,000 stoves[87] whereas it actually implemented 6,976. Implementation is so far slower than expected.
18,958	5,332	-72%	Year 2023 : The project planned to distribute – to the yearly pro rate - 2,446 stoves[87] whereas it actually implemented 139. Implementation is so far slower than expected.

[92] See file "01. ER's_ex_ante_VCS4144_v1.0.xlsx", tab "3. Distribution Plan"