

TEMPLATE

MONITORING REPORT

PUBLICATION DATE **14.10.2020**

VERSION **v. 1.1**

RELATED SUPPORT - **TEMPLATE GUIDE Monitoring Report v. 1.1**

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KEY PROJECT INFORMATION

Key Project Information

GS ID (s) of Project (s)	GS10797
Title of the project (s) covered by monitoring report	Himalayan Rocket Stove Project in India
Version number of the PDD/VPA-DD (s) applicable to this monitoring report	6
Version number of the monitoring report	5.1
Completion date of the monitoring report	19/02/2025
Date of project design certification	27/07/2021
Date of Last Annual Report	08/11/2023
Monitoring period number	1 st
Duration of this monitoring period	08/06/2021 ¹ - 28/02/2023 (Inclusive of both the dates)
Project Representative	Swiss Carbon Value Ltd.
Host Country	India
Activity Requirements applied	☒ Community Services Activities ☐ Renewable Energy Activities ☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Methodology (ies) applied and version number	Technologies and Practices to Displace Decentralized Thermal Energy Consumption, Version 3.1 ²
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☐ Renewable Energy Label ☐ N/A

Table 1 - Sustainable Development Contributions Achieved

Sustainable Development Goals Targeted	SDG Impact	Amount Achieved	Units/ Products
13 Climate Action	Emissions Reductions	18,632	tCO _{2e}

¹ Monitoring Period start date has been revised in line with approved deviation DEV_772. Please refer section B.2.1 below for the details.

² https://globalgoals.goldstandard.org/standards/407_V3.1_EE_ICS_Technologies-and-Practices-to-Displace-Decentralized-Thermal-Energy-TPDDTECCconsumption-.pdf

7 Affordable and clean Energy	Number of Households (HHs) got access to clean and affordable energy	6,571	No. of HHs
15 Life on Land	Tonnes of firewood saved by project stove as compared to traditional stove.	17,557	Tons of wood saved

Table 2 – Product Vintages

		Amount Achieved
Start Dates	End Dates	VERs
		(SDG 13) (tCO _{2e})
08/06/2021	31/12/2021	1,467
01/01/2022	31/12/2022	10,680
01/01/2023	28/02/2023	6,485

SECTION A. DESCRIPTION OF PROJECT

A.1. General description of project

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The aim of the project is to provide a wide range of social, economic, and environmental benefits for families and communities in India by installation of Himalayan Rocket Stove. The stoves are available in varying capacities, Eco mini, Eco1, Eco2 and Eco3 respectively³. The installation of the highly efficient stoves significantly reduces the firewood consumption of households and/or homestays. This leads to a reduction of greenhouse gas emissions because of reduced firewood consumption. In addition, these stoves have reduced indoor air pollution, benefitted women's health & environment, take the edge of deforestation, thus contribute towards sustainable development of the nation.

Baseline Scenario:

A user survey was conducted to assess the usage of baseline fuel and its quantity. As per the survey, firewood was the main fuel used for heating spaces and cooking. Inefficient usage of firewood leads to indoor pollution along with decrease in forest land cover and increase in degraded land. Growing pressure from human and livestock population coupled with indiscriminate and illegal exploitation of forest resources are among factors that have further led to intensification of this problem. Prolonged degradation of country's forest land will eventually impact adversely on the productivity of the nation. Hence there is a dire need to maintain adequate forest cover in the country to mitigate the effects of climate change.

Project Scenario:

Project activity involves adoption of Himalayan Rocket Stove by the households and homestays, constructed and maintained by Himalayan Rocket stove. The stove is compatible to run on wood. The reduced consumption of firewood has led to GHG emission reduction. It is imperative here to mention that HRS is a unique stove, performs a dual-purpose of both space heating and cooking simultaneously. The project will also provide other social, economic and health benefits to its users. The dimensions of the stove vary for all 4 type of stove (ECO Mini, ECO 1, ECO 2 & ECO 3), depending on the area and the number of people in an HH decides the choice of stove installation. The stove increases the room temperature steeply after an hour's heating. Beyond this point, the stove consumed far less firewood as compared to the initial feeding.

³ Himalayan Rocket Stove is a finely designed technology which mixes air and burning gases together inside a vertical insulated combustion chamber that allows temperatures to rise to a point where near-complete combustion occurs. This causes the smoke to be oxidized and converted to heat energy, which makes the stove both very efficient and clean burning. The hottest gases are carefully trapped inside the box in a way that maximizes the efficiency of the heating aspect of the stoves which then transmits to the room through the metal casing. By the time, the hot gases exhaust from the flue pipe, there is little heat left in them. Please refer section A.3 and Appendix 4 of the Registered PDD for detailed technical specification and efficiency. <https://registry.goldstandard.org/projects/details/2754>

During this monitoring period, total 6,571 HRS stoves are installed which results in reduction of 18,632 tCO_{2e} during the current (1st) monitoring period dated 08/06/2021 to 28/02/2023 (Inclusive of both the dates).

Vintage wise distribution of SDGs are chalked out in table 2 above and HRS stove model wise distribution is given under section B.1 (Table 3).

A.2. Location of project

>> Host Country: India

The Himalayan Rocket stoves are installed throughout India wherever conditions of dual purpose of space heating and cooking are met. The project units are and will be installed in the Himalayan states, the northern states, parts of eastern India and South India as well.

	Coordinates
Latitude	20°35'37.32"N
Longitude	78°57'46.44"E



Figure 1: Map of India

A.3. Reference of applied methodology

>>>GS Technologies and Practices to Displace Decentralized Thermal Energy Consumption Version 3.1

https://globalgoals.goldstandard.org/standards/407_V3.1_EE_ICS_Technologies-and-Practices-to-Displace-Decentrilized-Thermal-Energy-TPDDTECConsumption-.pdf

Tools & guidelines:

Tool 30⁴: Calculation of the fraction of non-renewable biomass (Version 03.0)

Guideline on Sampling and surveys for CDM project activities and programmes of activities Version⁵ 4.0

REQUIREMENTS AND GUIDELINES: USAGE RATE MONITORING⁶

A.4. Crediting period of project

>> Project start date & crediting period start date: 05/07/2019⁷.

Length of crediting period: 05/07/2019 to 04/07/2024 (Inclusive of both the dates) (5 years renewable)

4 <https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-30-v3.0.pdf>

5 https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20151023152925068/Meth_GC48_%28ver04.0%29.pdf

6 <https://globalgoals.goldstandard.org/407g-ee-ics-tpddtec-usage-guidelines/>

7 Monitoring Period Start date is 08/06/2021, please refer section B.2.1 for further details.

SECTION B. IMPLEMENTATION OF PROJECT

B.1. Description of implemented project

>> 05/07/2019 is considered as the start date of the project. The date represents the first day when the first Himalayan Rocket stove was installed within the project activity. During this monitoring period (from 08/06/2021 to 28/02/2023), a total of 6,571⁸ stoves are considered out of total stoves installed 9266 during the 1st crediting period, the details of which are given in table 1 below.

Table 3: Number of Stoves considered in the in first monitoring period.

Vintage wise	HRS Stove Count				
	Eco Mini	Eco 1	Eco 2	Eco 3	Total
08-06-2021 to 31-12-2021	236	776	297	44	1353
01-01-2022 to 31-12-2022	2619	687	144	27	3477
01-01-2023 to 28-02-2023	1717	21	2	1	1741
Total	4572	1484	443	72	6571

Please refer to Annexure 1 for the details of the technology implemented in line with the registered PDD.

Note: Project stoves are unique in operation as serving the dual purpose of cooking & space heating as explained in section A.1 above within the host country boundaries. Thus, PP hereby confirms that there is no double accounting that has happened during the current Monitoring Period.

- There is no use of ODA (Official Development Assistance) funds from Annex1 (Developed) countries involved in the project.
- Project is neither participated nor rejected by any other GHG program domestically or internationally.
- Project owner hereby confirms that there is no double counting of emission reductions achieved by the project activity in any other GHG program.

B.1.1 Forward Action Requests

>>To ensure transparency of sampling process, the PP shall use the online number generator or other traceable techniques. The PP shall maintain the screenshots of random number generation/evidence for the random selection of households for

⁸ Please refer section B.1 for capping the stove count and revising the start date of 1st monitoring period to 08/06/2021.

monitoring surveys. All evidence shall be submitted together with the following request for issuances.

Response: Screenshot is submitted for Online random number generator for project stoves for each year has been submitted to VVB along with the other sampling survey data.

>>To conduct the KPT tests prior to the next verification for each of the baseline scenarios and project scenarios. For homestay users' group, the tourism seasons must be considered for KPT design.

Response: Period considered for stove operation is peak winter season (inclusive of tourism season) last for 6 months only (from Oct to Mar) and KPTs are submitted to VVB which include wood consumption for project and baseline scenario for both homestays and households. It is established that there is no significant difference in wood consumption between household and homestays. Furthermore, number of homestays are very less below 2% in the database and no major variation identified as per the random survey sampling results. This is due to the fact that stoves are designed to cater the primary need of space heating during the peak winters (Oct to Mar) in the Himalayan region with additional provision of cooking and based on the room size the wood consumption does not vary much and accordingly stove model is chosen. Nevertheless, PP has followed the conservative approach by considering the lower baseline and higher project wood consumption from the survey results. Please refer to the ER sheet for detailed approach followed for the calculation.

Hence, the FARs have been addressed.

B.2. Post-Design Certification changes

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B.2.1. Temporary deviations from the approved Monitoring & Reporting Plan, methodology or standardized baseline

>> Monitoring Period Start date has been revised in line with the approved #DEV_772, which considers the "Rule Update - Applicability of minimum site visit requirements by VVB Sec 2.2.2 (para ii.b.) over and above the COVID-19 interim measure guideline used during the validation of the project activity and states that the start date of the crediting period is before the project registration date and the delay were due to non-force **Gold Standard**

majeure therefore start date of Monitoring Period should be revised for a maximum up to two years from the VVB physical site visit date.

VVB site visit date: 08/06/2023, (documented in FVR)

MP start date revised to: 08/06/2021 (2 years prior)

The Monitoring Period start date has been revised in line with the approved deviation as it was not in direct control of PP to arrange the VVB site visit in between due to the fact that design certification got completed in February 2023 with COVID 19 interim measure guideline and VVB site visit conducted in June 2023 during the first Monitoring Period. This results in further reduction of SDG Impacts drastically due to the revised monitoring period start date 08/06/2021, falling before two-year of the site visit date 08/06/2023.

B.2.2. Corrections

>> No corrections have been made during the current monitoring period. Hence, the same is not applicable.

B.2.3. Changes to start date of crediting period

>> No changes have been made to the start date of the crediting period during the current monitoring period. However, in line with section B.2.1, the monitoring period start date has now been revised to 08/06/2021.

Hence, the same is not applicable.

B.2.4. Permanent changes from the Design Certified monitoring plan, applied methodology or applied standardized baseline

>> No permanent changes from the design certified monitoring plan, applied methodology or applied standardized baseline during the current monitoring period. Hence, the same is not applicable.

B.2.5. Changes to project design of approved project

>> As explained in Section E, due to the reduction in HRS stove deployment rate during the crediting period in comparison to the estimated deployment rate given under the PDD, energy saving per year is also got decreased below 180GWh_{th}. This is a small scale project in actual based on energy saving per year.⁹

⁹ Please refer to the section E & the Tab "Master Sheet" within the ER Sheet.

SECTION C. DESCRIPTION OF MONITORING SYSTEM APPLIED BY THE PROJECT

>> The monitoring system followed for the project activity about data collection procedures including data collection, aggregation, recording, calculation and reporting is as per the monitoring section of the registered Project Design Document (PDD).

Data from the monitoring procedures is being recorded in the electronic project database and summarized in an annual Monitoring Report. Data collection in the project scenario is in accordance with the Standard on "Sampling and surveys for CDM project activities and programme of activities (Version 04)".

Objectives and reliability requirements

The objective of the sampling effort is to meet the monitoring requirements set forth in the methodology 'Technologies and Practices to Displace Decentralized Thermal Energy Consumption' (Version 3.1). An annual monitoring system is set up for most monitoring parameters. However, parameters which can be tracked on a biennial basis are monitored once every two years.

Target population

The monitoring procedure is targeted to be applied on the households and homestays installed with HRS stoves and non-users in the project area, as identified through the Project Database managed by Himalayan Rocket Stove

Sampling method

A simple random sampling based on guidelines on "Sampling and surveys for CDM project activities and programme of activities Version 04" is adopted for estimating the sample size for the monitoring surveys.

Sample Size: The minimum total sample size with at least 30 samples for project technologies of each age being credited in the project scenario which is monitored at the time of monitoring. Most interviews in a usage survey are conducted in person and include expert observation by the interviewer, while the remainder may be conducted via telephone. For the rest of the monitoring parameters, the following simple random sampling equation is used to get the sample size taking 90/10 confidence level.

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

Where:

n = Sample Size,

N = Total number of Households,

P = Our expected proportion,

1.645 = Represents the 90% confidence required and

0.1 = Represents the 10% relative precision.

Sampling frame: All the households, homestays with Himalayan Rocket stoves (project technology users) and non-users (Baseline technology fuel consumption) within the project boundary will be the sampling frame.

Quality Assurance/Quality Control: Annual surveys are conducted by the PP. In order to avoid the possibility of low response and answer bias oversampling has been applied by the PP.

Analysis: The survey data is then analyzed by the project developer to derive the working status of each stove and the consumption of firewood at the project site. The analysis will form the basis of the monitoring report to be prepared by the developer.

Implementation: Preparation and pre-testing of the survey questionnaire is done. Field personnel have been trained to conduct the surveys so as to ensure the quality of data collected is high. The schedule for implementing the sampling effort shall be defined prior to the field activity.

KPT is conducted in accordance with the Annex 4 guidelines provided in GSTPDDTEC, version 3.1 and in accordance with section B7.1. For this purpose, the baseline has not been fixed in the PDD and has been updated based on the KPT results at the time of monitoring.

Also, a usage survey (inclusive in Project Monitoring Survey) is carried out in accordance with "Requirements and Guidelines for carrying out usage surveys for projects implementing improved cooking devices." The survey is carried out as per Level A, Mandatory Requirements.

Parameters	Purpose	How
Operational status of Himalayan rocket stove in the winter season covered in the project activity carried out in the monitoring period	To Calculate the project emission	Project Monitoring Survey is done applying sampling plan as per monitoring plan. Survey results are applied conservatively for the entire population.
Fuelwood consumption in baseline stoves	To calculate baseline emission	Baseline monitoring Survey is done along with KPTs applying sampling plan as per monitoring plan. Survey results are applied conservatively for the entire population.
Fuelwood consumption in project stoves	To calculate project emission	Project Monitoring Survey is done along with KPTs applying sampling plan as per monitoring plan. Survey/KPT results are applied conservatively for the entire population.
Life on Land	Biomass saving achieved (SDG 15)	KPT was done. Test results are applied conservatively to the entire population.
Affordable and clean energy	Number of Himalayan Rocket Stoves installed under the project activity (SDG 7)	No specific calculations are needed to be made for the parameter "Number of Stove system operational under the project activity"

SECTION D. DATA AND PARAMETERS

D.1. Data and parameters fixed ex ante or at renewal of crediting period

>>

SDG 13

Data/parameter	f _{NRB,y}
Unit	%
Description	Fraction of biomass used in the absence of the project activity in year y that can be established as non-renewable biomass using nationally approved methods
Source of data	Calculated
Value(s) applied	90%

Choice of data or Measurement methods and procedures	Calculated using TOOL 30: Calculation of the fraction of non-renewable biomass, Version 03.0 https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-30-v3.0.pdf
Purpose of data	Calculation of baseline emissions
Additional comment	NA

Data/parameter	EF_{b, fuel, CO2}
Unit	tCO ₂ /TJ
Description	CO ₂ emission factor of the fuel that is substituted or reduced
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf
Value(s) applied	Wood= 112
Choice of data or Measurement methods and procedures	As per requirement of the methodology and Table 2.2 and 2.3, Chapter 2, Volume 2 of the 2006 IPCC Guidelines. The IPCC is a standard, credible source of emissions factors.
Purpose of data	Calculation of baseline emissions
Additional comment	NA

Data/parameter	EF_{b, fuel, non CO2}
Unit	tCO ₂ /TJ
Description	Non-CO ₂ emission factor of the fuel that is substituted or reduced
Source of data	NA
Value(s) applied	0
Choice of data or Measurement methods and procedures	NA
Purpose of data	Calculation of baseline emissions
Additional comment	NA

Data/parameter	NCV_{b, fuel}
Unit	TJ/tonne
Description	Net calorific value of fossil fuels used in the baseline scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_1_Ch1_Introduction.pdf
Value(s) applied	Wood= 0.0156
Choice of data or Measurement methods and procedures	As per requirement of the methodology and Table 1.2, Chapter 1, Volume 2 of the 2006 IPCC Guidelines. The IPCC is a standard, credible source of emissions factors.

Purpose of data	Calculation of baseline emissions
Additional comment	NA

D.2 Data and parameters monitored

>>

Data/parameter	P _{b,y}					
Unit	Kg/household-Day					
Description	Quantity of fuel that is consumed in baseline scenario (stove serving dual purpose) during year y					
Source of data	KPT					
Value(s) applied	Average (Mean) Wood Consumption (kg/day/HH) for all the baseline Bukhari stove models year wise					kg/day
	Equivalent Bukhari Stove HH	2021	2022	2023	Wood Consumption	
	Eco Mini	40.9	42.3	43.8	39.88	
	Eco 1	41	42.5	43.6	41.00	
	Eco 2	56.2	60.5	60.4	56.20	
	Eco 3	69.2	76.3	77.8	69.20	
Measurement methods and procedures	NA					
Monitoring frequency	Updated every two years, or more frequently (if applicable) (Annual frequency is maintained for the current MP)					
QA/QC procedures	Random samples of non-project technology users shall be considered from the same region to conduct the baseline survey and KPT is conducted throughout the operational season (Oct to Mar) of the project stove Please refer section D.4 below for details.					
Purpose of data	Calculation of Baseline emissions					
Additional comment	N/A					

Data/parameter	$P_{p,y}$
Unit	Kg/household-Day
Description	Quantity of fuel that is consumed by project stoves in project scenario p during year y
Source of data	KPT

Value(s) applied	Average (Mean) Wood Consumption (kg/day) for all the HRS stove models' year wise				kg/day/HH
	Project Stove Model	2021	2022	2023	Wood Consumption
	Eco Mini	21.05	21.10	21.10	21.66
	Eco 1	21.20	21.10	21.20	22.21
	Eco 2	29.10	29.10	30.00	30.00
	Eco 3	35.90	36.20	31.60	37.19
Please refer ER sheet for further information.					
Measurement methods and procedures	NA				
Monitoring frequency	Updated every two years, or more frequently (if applicable). However, annual frequency is followed throughout the monitoring period.				
QA/QC procedures	The sample size for the annual survey would be estimated based on simple random sampling ¹⁰ . Random samples from the mixed population (household and homestays) shall be chosen from project database. Usage rate, baseline and KPT survey are conducted throughout the operational season (Oct to Mar) of the project stove. Please refer section D.4 below for details.				
Purpose of data	Calculation of Project emissions				
Additional comment	A single project fuel consumption parameter is weighted to be representative of the quantity of project technologies of each age being credited in each scenario.				

Data/parameter	Up,y
Unit	%
Description	Usage rate in project scenario p during year y
Source of data	Based on https://globalgoals.goldstandard.org/407g-ee-ics-tpddtec-usage-guidelines/
Value(s) applied	75% ¹¹
Measurement methods and procedures	NA
Monitoring frequency	Annually

¹⁰ Guideline on Sampling and surveys for CDM project activities and programs of activities Version 4.0

¹¹ The requirements and guidelines presented in this referenced source guideline document shall be followed when carrying out usage surveys (inclusive in project monitoring survey) to determine the parameter usage rate (Up,y). In case of any conflict with the TPDDTEC methodology, the requirements outlined in this document shall be followed. In person HH survey to define usage & non usage has been followed and the verification results showed usage rate of above 90%. However, the monitoring procedure adopted during the current monitoring period satisfy only mandatory requirements in line with the guidance therefore usage rate is capped to 75% conservatively irrespective of survey results above 90%.

QA/QC procedures	The sample size for the annual survey is estimated based on simple random sampling. Usage rate (Project monitoring survey), baseline monitoring survey and KPT field tests are conducted throughout the operational season (Oct to Mar) of the project stove. Please refer section D.4 below for details and ER sheet.
Purpose of data	Baseline emissions
Additional comment	A single usage parameter is weighted to be representative of the quantity of project technologies of each age being credited in a given project scenario.

Data/parameter	Np,y					
Unit	Project technology days					
Description	Project technology-days in the project database for project scenario p through year y					
Source of data	Internal Survey					
Value(s) applied ¹²						
	Np.y					
	Vintage	Eco Mini	Eco 1	Eco 2	Eco 3	Total
	08-06-2021 to 31-12-2021	9801	41069	14343	2253	67466
	01-01-2022 to 31-12-2022	245700	183675	66324	10447	506146
	01-01-2023 to 28-02-2023	204030	87256	26104	4184	321574
	Total	459531	312000	106771	16884	895186
Measurement methods and procedures	Monitoring consists of checking of representative sample, to ensure the stove’s operating					
Monitoring frequency	Continuous					
QA/QC procedures	Transparent data analysis and reporting. Annual Training Program is implemented for sampling & survey to maintain the QA/QC for the same. Also, review of the data is conducted for data quality control by the PD. Sampling & survey records, analysis sheets has been submitted to VVB as a supporting document.					
Purpose of data	Baseline emissions					
Additional comment	NA					

Data/parameter	LE_{p,y}
Unit	tCO _{2e} per year
Description	Leakage in project scenario p during year y
Source of data	Leakage ¹³ monitoring Survey
Value(s) applied	5%

¹² For details, please refer ER Spreadsheet- Master Sheet Tab

¹³ The project proponent has conducted a leakage investigation combined with project monitoring surveys as is applicable in line with the methodological requirement.

Choice of data or Measurement methods and procedures	Usage of old technologies outside the project boundary is monitored via surveys
Monitoring frequency	Biennial or frequently. However, annual frequency is followed throughout the monitoring period.
QA/QC procedures	The sample size for the annual survey is estimated based on simple random sampling as per the guideline. Annual Training Program is implemented for sampling & survey to maintain the QA/QC for the same. Please refer to section D.4 for details.
Purpose of data	Leakage emissions
Additional comment	NA

SDG 15

Data/parameter	Biomass Saved					
Unit	Tonnes/year					
Description	Amount of biomass saved in year y					
Source of data	Sampling Survey					
Value(s) applied						
		Wood Saving* (tonnes)				
	Vintage	Eco Mini	Eco 1	Eco 2	Eco 3	Total
	08-06-2021 to 31-12-2021	177	770	375	71	1393
	01-01-2022 to 31-12-2022	4474	3450	1737	333	9994
	01-01-2023 to 28-02-2023	3716	1638	683	133	6170
	Total	8367	5858	2795	537	17557
Measurement methods and procedures	KPT has been performed as per Annex 4 of TPDDTEC V. 3.1. Also, Sampling survey has been performed as per the GS guideline. Please refer section D.4 & ER sheet for the details.					
Monitoring frequency	Annually					
QA/QC procedures	Actual results based on KPT and baseline & monitoring survey have been used for the current monitoring period. Annual Training Program is implemented for sampling & survey to maintain the QA/QC for the same.					
Purpose of data	Sustainable development assessment					
Additional comment	NA					

SDG 7

Data/parameter	Access to affordable and clean energy services
Unit	Numbers
Description	Number of Himalayan rocket stoves operational under the project activity
Source of data	Project Participant/Project proponent

Value(s) applied ¹⁴	HRS Stove Count					
	Vintage wise	Eco Mini	Eco 1	Eco 2	ECO 3	Total
	08-06-2021 to 31-12-2021	236	776	297	44	1353
	01-01-2022 to 31-12-2022	2619	687	144	27	3477
	01-01-2023 to 28-02-2023	1717	21	2	1	1741
	Total	4572	1484	443	72	6571
Choice of data or Measurement methods and procedures	Sample survey to confirm if HRS stoves are operational. Operational status confirms that the users are accessed to affordable and clean energy and proportion of user's reliance on clean fuel and technology.					
Monitoring frequency	Annually					
QA/QC procedures	Required sample size is determined following UNFCCC sampling standard					
Purpose of data	Sustainable development assessment					
Additional comment	NA					

D.3. Comparison of monitored parameters with last monitoring period

Data/Parameter	Value obtained in this monitoring period	Value obtained last monitoring period
SDG 13 (tCO _{2e})	2021 – 1,467 2022 – 10,680 2023 – 6,485	NA
SDG 7 (No. of HHs)	2021 – 1,353 2022 – 3,477 2023 – 1,741	NA
SDG 15 (Tonnes of wood saved)	2021 – 1,393 2022 – 9,994 2023 – 6,170	NA

D.4. Implementation of sampling plan

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In line with registered PDD, Sampling & Survey guideline has been followed and "Simple Random Survey" (Proportion based) has been applied to calculate the "Sample Size" annually for carrying out project "Usage Rate" survey. The minimum total sample size should contain at least 30 samples for project technologies of each age being credited in the project scenario. Good practice of oversampling has also been adopted appropriately not only to compensate for any attrition, outliers or non-response associated with the sample, but also to prevent a situation at the analysis stage where

¹⁴ For details, please refer the ER spreadsheet- Master Sheet Tab

the required reliability is not achieved, and additional sampling efforts would be required.

Sampling frame: All the households, homestays with Himalayan Rocket stoves (project technology users) and non-users (Baseline technology fuel consumption) within the project boundary is the sampling frame. The baseline was not fixed in the PDD and therefore has been updated based on the KPT results at the time of monitoring.

To evaluate the monitoring parameters, the simple random sampling equation given under section C have been used to get the sample size taking 90% confidence level.

Project Annual Survey Sampling during the current MP	Project simple random Size as per sampling equation ¹⁵	Oversampling Considered ¹⁶
2021	67	110
2022	68	152
2023	68	176

Similarly,

Baseline Annual Survey Sampling during the current MP	Baseline simple random Size as per sampling equation	Oversampling Considered
2021	67	90
2022	68	120
2023	68	150

The baseline & project monitoring survey was performed by the representatives of Himalayan Rocket Stove during the month of October to March (Peak Season). Project monitoring surveys were conducted as follows; (January- February) 2021, (January-February) 2022, and March 2023 through the survey form. The sample size in 2021 was 67, in 2022 was 68, in 2023 was 68. However, oversampling has been considered as a good practice to avoid any later addons or resampling. Around 110 samples are surveyed for the year 2021, 152 samples are surveyed for the year 2022, 176 samples are surveyed for the year 2023 i.e. 438 total of for this monitoring period were sampled and surveyed. Similarly, for baseline stoves around 90 samples are surveyed for the year 2021, 120 samples are surveyed for the year 2022, 150 samples are surveyed for the year 2023 i.e. 360 total baseline survey for this monitoring period were sampled and surveyed. Most interviews in a monitoring survey are conducted in person, KPT

¹⁵ Please refer MR section C and ER sheet for the details and Simple Random Sampling equation-based calculation.

¹⁶ Over sampling has been considered as a good practice to avoid any later addons or resampling and the minimum total sample size should contain at least 30 samples for project technologies of each age being credited in the project scenario following the usage rate guideline.

and include expert¹⁷ observation by the interviewer within the kitchen in question, while the remainder were conducted via telephone by the same interviewers on condition that in-kitchen observational interviews are first concluded and analyzed such that typical circumstances are well understood by the telephone interviewers. No significant difference in wood consumption was recorded for households and homestays.

Furthermore, a minimum sample size of 30 HH has been considered to perform KPT from the random sample survey results considering the guidance given under Annex 4 of the GS TPDTEC and distribution of sample values has also been checked for skewness. Please refer ER excel sheet tab "Detailed Sampling" for witnessing the approach found suitable in line with the guidance. Being conservative, PP has chosen the lower value instead of mean (Average) value of the analysis.

SECTION E. CALCULATION OF SDG IMPACTS

E.1. Calculation of baseline value or estimation of baseline situation of each SDG Impact

>>

SDG 13

In the project scenario, baseline fuel and the project fuel are the same and the baseline emission factor and project emission are considered the same, the overall GHG reductions achieved by the project activity in year y are calculated as follows:

Therefore, equation 1 of the methodology is applied¹⁸.

$$ER_y = \sum_{b,p} (N_{p,y} * U_{p,y} * P_{p,b,y} * NCV_{b, fuel} * (f_{NRB,b,y} * EF_{fuel, CO2} + EF_{fuel, nonCO2})) - \sum LE_{p,y}$$

Where,

$\sum_{b,p}$	Sum over all relevant (baseline b/project p) couples
$N_{p,y}$	Cumulative number of project technology-days included in the project database for project scenario p against baseline scenario b in year y
$U_{p,y}$	Cumulative usage rate for technologies in project scenario p in year y, based on cumulative adoption rate and drop off rate revealed by usage surveys (fraction)

¹⁷ The monitoring surveys are performed by in house team of HRS. HRS team had received trainings from South Pole for survey, KPT guidelines and methodological requirement and imparted the internal training SOP on annual basis for maintaining the quality control of survey data. The records of the same are submitted to VVB. Therefore, team is competent to conduct project surveys.

¹⁸ Please refer ER spreadsheet for calculation.

$P_{p,b,y}$	Specific fuel savings for an individual technology of project p against an individual technology of baseline b in year y, in tons/day, as derived from the statistical analysis of the data collected from the field tests
$f_{NRB,b,y}$	Fraction of biomass used in year y for baseline scenario b that can be established as non-renewable biomass (drop this term from the equation when using a fossil fuel baseline scenario)
$NCV_{b,fuel}$	Net calorific value of the fuel that is substituted or reduced (IPCC default for wood fuel, 0.015 TJ/ton)
$EF_{b,fuel,CO_2}$	CO ₂ emission factor of the fuel that is substituted or reduced. 112 tCO ₂ /TJ for Wood/Wood Waste, or the IPCC default value of other relevant fuel
$EF_{b,fuel,nonCO_2}$	Non-CO ₂ emission factor of the fuel that is reduced
$LE_{p,y}$	Leakage for project scenario p in year y (tCO ₂ e/yr)

Further,

$$P_{p,b,y} = (P_{b,y} - P_{p,y})$$

$P_{b,y}$ is the baseline fuel consumption defined by the KPTs across the project boundary.

	Baseline (tCO ₂ e)				
Vintage	Eco Mini	Eco 1	Eco 2	Eco 3	Total
08-06-2021 to 31-12-2021	461	1985	950	184	3580
01-01-2022 to 31-12-2022	11555	8881	4395	852	25683
01-01-2023 to 28-02-2023	9595	4219	1730	341	15885
Total	21611	15085	7075	1377	45148

Please refer to section E.3 for the SDG 13 value as the formulae considers the difference in baseline fuelwood consumption and project fuelwood consumption to calculate the emission reductions.

SDG 7

In baseline households used Bukhari stoves to meet dual purpose of space heating and cooking hence this SDG = 0.

SDG 15

It is based on KPT conducted for Kg/Day wood consumption.

Wood consumed in Baseline Bhukari Stoves (tonnes) equivalent to project stoves classified based on room space requirement during surveys					
Vintage	Eq Eco Mini	Eq Eco 1	Eq Eco 2	Eq Eco 3	Total
08-06-2021 to 31-12-2021	390	1683	806	155	3034
01-01-2022 to 31-12-2022	9797	7530	3727	722	21776

01-01-2023 to 28-02-2023	8136	3577	1467	289	13469
Total	18323	12790	6000	1166	38279

E.2. Calculation of project value or estimation of project situation of each SDG Impact

>>

SDG 13

In the project scenario, baseline fuel and the project fuel are the same and the baseline emission factor and project emission are considered the same, the overall GHG reductions achieved by the project activity in year y are calculated as follows: Therefore, equation 1 of the methodology is applied¹⁹.

$$ER_y = \sum_{b,p} (N_{p,y} * U_{p,y} * P_{p,b,y} * NCV_{b, fuel} * (f_{NRB,b, y} * EF_{fuel, CO2} + EF_{fuel, nonCO2})) - \sum LE_{p,y}$$

Where,

$\sum_{b,p}$	Sum over all relevant (baseline b/project p) couples
$N_{p,y}$	Cumulative number of project technology-days included in the project database for project scenario p against baseline scenario b in year y
$U_{p,y}$	Cumulative usage rate for technologies in project scenario p in year y, based on cumulative adoption rate and drop off rate revealed by usage surveys (fraction)
$P_{p,b,y}$	Specific fuel savings for an individual technology of project p against an individual technology of baseline b in year y, in tons/day, as derived from the statistical analysis of the data collected from the field tests
$f_{NRB,b, y}$	Fraction of biomass used in year y for baseline scenario b that can be established as non-renewable biomass (drop this term from the equation when using a fossil fuel baseline scenario)
$NCV_{b,fuel}$	Net calorific value of the fuel that is substituted or reduced (IPCC default for wood fuel, 0.015 TJ/ton)
$EF_{b,fuel,CO2}$	CO2 emission factor of the fuel that is substituted or reduced. 112 tCO2/TJ for Wood/Wood Waste, or the IPCC default value of other relevant fuel
$EF_{b,fuel,nonCO2}$	Non-CO2 emission factor of the fuel that is reduced
$LE_{p,y}$	Leakage for project scenario p in year y (tCO2e/yr)

It is based on KPT conducted for project stoves.

	Project (tCO _{2e})				
Vintage	Eco Mini	Eco 1	Eco 2	Eco 3	Total
08-06-2021 to 31-12-2021	250	1076	507	99	1932
01-01-2022 to 31-12-2022	6277	4811	2346	458	13892
01-01-2023 to 28-02-2023	5213	2286	923	183	8605

¹⁹ Please refer ER spreadsheet for calculation.

Total	11740	8173	3776	740	24429
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Please refer section E.3 for the SDG 13 value as the formulae considers the difference in baseline fuelwood consumption and project fuelwood consumption to calculate the emission reductions.

SDG 7

	HRS Stove Count (numbers)				
Vintage wise	Eco Mini	Eco 1	Eco 2	Eco 3	Total
08-06-2021 to 31-12-2021	236	776	297	44	1353
01-01-2022 to 31-12-2022	2619	687	144	27	3477
01-01-2023 to 28-02-2023	1717	21	2	1	1741
Total	4572	1484	443	72	6571

SDG 15

It is based on KPT conducted for Kg/Day wood consumption.

	Wood consumed in Project (tonnes)				
Vintage	Eco Mini	Eco 1	Eco 2	Eco 3	Total
08-06-2021 to 31-12-2021	213	913	431	84	1641
01-01-2022 to 31-12-2022	5323	4080	1990	389	11782
01-01-2023 to 28-02-2023	4420	1939	784	156	7299
Total	9956	6932	3205	629	20722

E.3. Calculation of leakage

>>

It is calculated as 5% of baseline emission as per the registered PDD²⁰. This is considered conservatively as during the leakage monitoring survey it is found that the baseline technology was neither reused nor usage of baseline technology increased due to the project activity.

	Leakage (tCO _{2e})				
Vintage	Eco Mini	Eco 1	Eco 2	Eco 3	Total
08-06-2021 to 31-12-2021	23	99	48	10	180
01-01-2022 to 31-12-2022	578	270	220	43	1111
01-01-2023 to 28-02-2023	480	211	87	18	796
Total	1081	580	355	71	2087

²⁰ Please see ER spreadsheet for calculations

E.4. Calculation of net benefits or direct calculation for each SDG Impact

SDG	SDG Impact	Baseline estimate	Project estimate	Leakage	Net benefit
13	Climate Action ²¹	45,148 tCO _{2e}	24,429 tCO _{2e}	2,087 tCO _{2e}	18,632 tCO _{2e}
7	Affordable and Clean energy ²²	0	6,571 Stoves	0	6,571 Stoves
15	Life on Land ²³	38,279 tonnes	20,722 tonnes	0	17,557 tonnes

Vintage wise net Benefits for each SDG impact:

Vintage	SDG 13(tCO _{2e})	SDG 7 (HH No.)	SDG 15 (Wood Saving in ton)
08-06-2021 to 31-12-2021	1468.00	1353.00	1393.00
01-01-2022 to 31-12-2022	10680.00	3477.00	9994.00
01-01-2023 to 28-02-2023	6484.00	1741.00	6170.00
Total	18632.00	6571.00	17557.00

E.5. Comparison of actual SDG Impacts with estimates in approved PDD

SDG	Values estimated in ex ante calculation of approved PDD for this monitoring period	Actual values ²⁴ achieved during this monitoring period
13	770,584 tCO _{2e}	18,632 tCO _{2e}
7	99,950 Stoves	6,571 Stoves
15	748,168 tonnes	17,557 tonnes

E.5.1. Explanation of calculation of value estimated ex ante calculation of approved PDD for this monitoring period

>>

This monitoring period starts from 08/06/2021 to 28/02/2023, (631 days) and the ex-ante estimate given under registered PDD is for annual average. Therefore, all the annual ex-ante estimate given for 3 SDGs are calculated per day to extrapolate the same for the current monitoring period for basis to compare it with the actual SDG outcome for the current monitoring period.

²¹ This is for complete monitoring period. Please refer ER spreadsheet for details

²² This is for complete monitoring period. Please refer ER spreadsheet for details

²³ This is for complete monitoring period. Please refer ER spreadsheet for details

²⁴ Whenever emission reductions are capped, both the original and capped values used for calculations must be transparently reported. Use brackets to denote original values.

Particular	SDG 13	SDG 7	SDG 15
	tCO _{2e}	Nos.	tonnes of wood
Values estimated in ex ante calculation of approved PDD (Annual Average)	213,712	27,720	207,495
Values estimated in ex ante calculation of approved PDD for this monitoring period	= 213,712/175 * 631 = 770,584	= 27,720/175 * 631 = 99,950	= 207,495/175 = 748,168

Please refer to the ER sheet for the detailed calculation.

E.6. Remarks on increase in achieved SDG Impacts from estimated value in approved PDD

>>

Achieved SDG Impacts of the current monitoring period are (SDG 13: -97.58%, SDG 7: -93.43% and SDG 15: -97.65%) less than estimated SDG impact in the registered PDD due to the fact that a smaller²⁵ number of HRS stoves have been deployed during the current monitoring period due to the absence of the sufficient funds for further subsidizing the cost of efficient technology for the end users.

SECTION F. SAFEGUARDS REPORTING

>>

There are no risks perceived by Stakeholders and the project developer. In fact, Rocket Stove technology is being highly appreciated by the users due to higher efficiency and much lesser smoke but the cost of the same is not affordable to all in the absence of the additional revenue to subsidize the same.

²⁵Please refer to the ER sheet tab "Master sheet" - *Energy Saving (GWh) - the maximum energy saving per year is less than 180 GWh(th).

SECTION G. STAKEHOLDER INPUTS AND LEGAL DISPUTES

G.1. List all Inputs and Grievances which have been received via the Continuous Input and Grievance Mechanism together with their respective responses/mitigations.

>> No grievance²⁶ was received during the current monitoring period. However, the generic maintenance queries were received and resolved during the crediting period. Please refer Annexure 2.

The best possible means²⁷ has been employed to maintain anonymity /confidentiality when the stakeholder demands so two-way communication is established via telephone, email and in person as per the accessibility of the stakeholders to reach out and register & receive their feedback if any directly or indirectly. The database is maintained centrally at the head office in Parwanoo, Himachal Pradesh. Grievance/contact details have been provided at the website as well as in the warranty cards and also shared during the community engagements programs.

G.2. Report on any stakeholder mitigations that were agreed to be monitored.

>> There are no input/grievance to follow up action, so no stakeholder mitigations to be monitored.

G.3. Provide details of any legal contest that has arisen with the project during the monitoring period

>> No legal contest or dispute has arisen with the project during the monitoring period.

²⁶ PP has maintained the SOP for continuous input and grievance mechanism and grievance record book/data sheet is submitted to VVB for crosscheck. The best possible method has been employed to maintain anonymity /confidentiality when the stakeholder demands so and two-way communication is established via email, telephone and in person as per the accessibility of the stakeholders to reach out and register & receive their feedback if any.

²⁷ <https://himalayanrocketstove.com/contact/>

Annexure 1

Project Technology details:

In line with the registered PDD section A.3: Himalayan Rocket Stove is a finely designed technology which mixes air and burning gases together inside a vertical insulated combustion chamber that allows temperatures to rise to a point where near-complete combustion occurs. This causes the smoke to be oxidized and converted to heat energy, which makes the stove both very efficient and clean burning. The hottest gases are carefully trapped inside the box in a way that maximizes the efficiency of the heating aspect of the stoves which then transmits to the room through the metal casing. By the time, the hot gases exhaust from the flue pipe, there is little heat left in them. HRS is similar to the traditional bukhari heating style of heating stoves. However, Height is a primary factor in the design, and this is where the main innovation occurs, as it is relatively easy to make an efficient rocket stove over 3 ft high, and much harder to make one less than 2 ft high. The Himalayan Rocket Stove achieves this through innovative use of various design tweaks to optimize performance in a smaller sized format. It is pertinent here to mention that the stove increases the room temperature steeply after an hour's heating after which it consumes far less firewood as compared to the initial feeding.

The innovative design of the Himalayan Rocket Stove makes it stand out from the simple rocket stove. Figure 1 below provides a detailed description of the design along with the key innovations that allow for the dual benefits of heating and cooking.

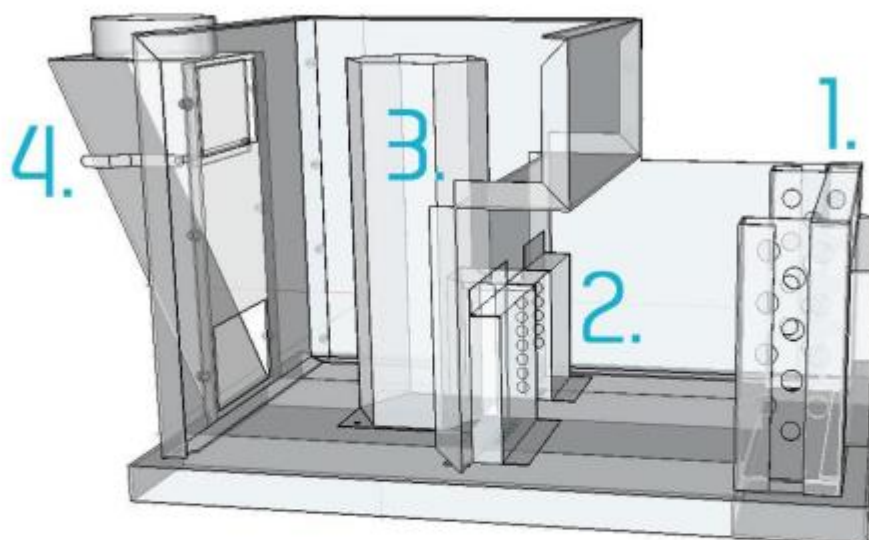
Elaborating on the design and material a little more, the body of the stove is made of stainless steel.

1. The Pre-heat primary air towers feed hot air into the primary combustion chamber for more efficient burn periods.

2. The Pre-heat secondary air vents feed hot air into the vortex riser tube for improved combustion of wood gases (smoke) that are released in the primary combustion. This dramatically improved efficiency as well as cleaning the output gases of the dirty long chain hydrocarbons that pollute the air.

3. The Vortex riser tube is shaped so as to spin the gases which serve a dual purpose first is improved mixing of wood gas and the introduced pre-heated air, second us to extend the duration of the gases in the riser tune to allow for complete combustion in a low height box. 4. Using the 'Bell Effect', we trap the hottest gases in the top of the box while only allowing the less hot gases to the vent from the lower value in the exhaust hood. This again improves the efficiency of the heat transmission into the room.

Himalayan Rocket Stove Design



1. Incorporating underfloor airflow for Pre-heated Air to Primary Combustion Chamber
2. Incorporating underfloor airflow for Pre-heated Air to Secondary Combustion Tube, (both of which increase the temperature for improved combustion).
3. Vortex Combustion Chamber for increased turbulence (mixing of gases) to improve combustion
4. Exhaust Gas Valve to trap the hot gases from escaping, improving heat transmission into the room.

Figure 2: Himalayan Rocket Stove design

The dimensions of each type of HRS stove are as follows:

ECO mini	: Height: 460mm, Width: 330mm, Length: 600mm
ECO 1	: Height: 500mm, Width: 450mm, Length: 840mm
ECO 2	: Height: 625mm, Width: 450mm, Length: 840mm
ECO 3	: Height: 825mm, Width: 450mm, Length: 840mm



Figure 4: ECO1, ECO2, ECO3 and Eco mini

Annexure 2

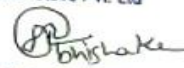
Grievance Logbook

Himalayan Rocket Stove Pvt. Ltd.
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Sr.No.	Customer Name	Unique Id	Stove Model	Location	State	Date of Approach	Concern Raised	Resolution Summary	Resolution	Handled By
1	Dhiraj Rana	1292	ECO1	Siliguri	West Bengal	03.12.2019	Stove maintenance queries	Talked over phone call, guided with proper instructions	03.12.2019	Sahil
2	Anita Gurung	854	ECO1	Sikkim	Sikkim	26.08.2019	Smoke Issue due wrong pipe Installation	Service team visited and issue resolved	27.08.2019	Sahil
3	Ajay	145	ECO-2	Rishikesh	Uttarakhand	30.10.2019	Stove lighting problem	Talked over phone call, guided with proper instructions	30.10.2019	Sahil
4	Sonam Wangchok	1789	ECO1	Leh	Ladakh	20.07.2020	Need help in pipe installation.	Talked over phone call, guided with proper instructions	20.07.2020	Sahil
5	Tashi	1892	ECO-2	Leh	Ladakh	02.09.2020	Back smoke issue and lighting problem.	pipe at vertical section and service team visited and issue	02.09.2020	Sahil
6	P.S Negi	2563	Eco-Mini	Kinnaur (Chagaon)	HP	22.07.2021	General Service required	Service team visited and issue resolved	24.07.2021	Sahil/Ajay
7	Ratti Mehta Negi	4189	Eco-1	Kinnaur (Tapri)	HP	22.07.2021	Smoke Issue due wrong pipe Installation	Service team visited and issue resolved	23.07.2021	Sahil/Ajay
8	Rampur	2546	Eco-Mini	Rampur	HP	15.10.2021	Stove Lighting & Handling issue	Service team visited and issue resolved	15.10.2021	Sahil/Ajay
9	Padam Thakur	3712	Eco-1	Rampur (Dimni)	HP	20.07.2021	Stove lighting and general servicing needed	Service team visited and issue resolved	21.07.2021	Sahil/Ajay
10	Shimla (Fagu)	2488	Eco-Mini	Shimla (Fagu)	HP	11.05.2022	Rounds Lids Replacement	Talked to customer and new lid dispatched to their address	12.05.2022	Sahil

For Himalayan Rocket Stove Pvt. Ltd


 Authorized Signatory

Himalayan Rocket Stove Private Limited
 High efficiency heating for the Himalayas

Revision History

Version	Date	Remarks
1.1	14 October 2020	Hyperlinked section summary to enable quick access to key sections Improved clarity on Key Project Information Section for POA monitoring Forward action request section Improved Clarity on SDG contribution/SDG Impact term used throughout Clarity on safeguard reporting Clarity on design changes Leakage section added for VER/CER projects Addition of Comparison of monitored parameters with last monitoring period Provision of an accompanying Guide to help the user understand detailed rules and requirements
1.0	10 July 2017	Initial adoption