

TEMPLATE

MONITORING REPORT

PUBLICATION DATE **14.10.2020**

VERSION **v. 1.1**

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

This document contains the following Sections

Key Project Information

SECTION A - Description of project

SECTION B - Implementation of project

SECTION C - Description of monitoring system applied by the project

SECTION D - Data and parameters

SECTION E - Calculation of SDG Impacts

SECTION F - Safeguards Reporting

SECTION G - Stakeholder inputs and legal disputes

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	2.2
Completion date of the monitoring report	27/10/2025
Date of project design certification	27/07/2021
Date of Last Annual Report	02/12/2024
Monitoring period number	2 nd
Duration of this monitoring period	01/03/2023 – 04/07/2024 (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 ¹
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	42,273	tCO _{2e}

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

7 Affordable and clean Energy	Number of Households (HHs) got access to clean and affordable energy	8,292 ²	No. of HHs
15 Life on Land	Tonnes of firewood saved by project stove as compared to traditional stove.	30,194	Tons of wood saved

Table 2 – Product Vintages

		Amount Achieved
Start Dates	End Dates	VERs
		(SDG 13) (tCO _{2e})
01/03/2023	31/12/2023	23,580
01/01/2024	04/07/2024	18,693

² As explained in section B.1 & C of MR below, 11054 stoves were deployed until the current MP. However, the monitoring procedure adopted during the current monitoring period satisfies only level A - mandatory requirements in line with the REQUIREMENTS AND GUIDELINES: USAGE RATE MONITORING guidance therefore usage rate is capped to 75% conservatively irrespective of survey results of 100% usage rate.

SECTION A. DESCRIPTION OF PROJECT

A.1. General description of project

>>

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, benefited women's health & environment, take the edge of deforestation, thus contributing 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 populations 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 types of stoves (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 from 01/03/2023 – 04/07/2024 (both days included), total 11,054 HRS stoves are installed which results in reduction of 42,273 tCO_{2e} during the current (2nd) monitoring period.

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 3.1⁴

Tools & guidelines:

Tool 30⁵: Calculation of the fraction of non-renewable biomass (Version 03.0)

Guideline on Sampling and surveys for CDM project activities and programmes of activities Version⁶ 4.0

REQUIREMENTS AND GUIDELINES: USAGE RATE MONITORING⁷

A.4. Crediting period of project

>>

Project start date & crediting period start date: 05/07/2019.

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

SECTION B. IMPLEMENTATION OF PROJECT

B.1. Description of implemented project

>>

05/07/2019 is considered as 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, a total of 11,054 stoves were installed, the details of which are given in table 1 below.

Table 1: Number of Stoves Distributed.

Vintage wise	Plant Count					
	Eco Mini	Eco 1	Eco 2	Eco 3	Total	Total (post applying usage rate @75%)
05-07-2019 to 31-12-2019	0	253	59	21	333	250
01-01-2020 to 31-12-2020	298	885	353	77	1613	1210
01-01-2021 to 31-12-2021	758	918	377	49	2102	1577

⁴https://globalgoals.goldstandard.org/standards/407_V3.1_EE_ICS_Technologies-and-Practices-to-Displace-Decentralized-Thermal-Energy-TPDDTECConsumption-.pdf

⁵<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-30-v3.0.pdf>

⁶https://cdm.unfccc.int/sunsetcms/storage/contents/stored-file-20151023152925068/Meth_GC48_%28ver04.0%29.pdf

⁷<https://globalgoals.goldstandard.org/407g-ee-ics-tpddtec-usage-guidelines/>

01-01-2022 to 31-12-2022	2619	687	144	27	3477	2608
01-01-2023 to 31-12-2023	2763	493	107	12	3375	2531
01-01-2024 to 04-07-2024	94	42	15	3	154	116
Total	6532	3278	1055	189	11054	8292

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

Note:

1. The stoves are implemented mainly in Himalayan region and are operational during peak winters only (Oct to Mar), which means two periods in a calendar year: January-March (Period I) and October-December (Period II) and ER has been calculated based on their operationality period (operational days) only. Please refer to ER sheet for detailed calculation.
2. Project stoves are unique in operation as serving the dual purpose of cooking & 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.
3. There is no use of ODA (Official Development Assistance) funds from Annex1 (Developed) countries involved in the project.
4. Project is neither participated nor rejected by any other GHG program domestically or internationally.
5. 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

>>Not applicable

B.2. Post-Design Certification changes

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

>> No temporary deviation from the approved monitoring & reporting plan, methodology or standardized baseline has been opted during the current monitoring period. Hence, the same is not applicable.

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. 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 the energy saving per year.⁸

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

⁸ Please refer to the section E & the Tab "Master Sheet" within the ER Sheet.

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 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: USAGE RATE MONITORING" version 2.0 for carrying out usage surveys for projects implementing improved cooking devices." The survey is carried out as per Level A, Mandatory Requirements:

- Define use and nonuse
- In person household usage survey
- Verification of accuracy of results

Thus, in-person HH survey to define usage & non usage has been followed and the verification results showed usage rate of 100%. KPT field test to verify the accuracy of results, follow up call to validate the same has been followed. Also, the documents of usage survey & KPT test and the follow-up call records have been submitted along with the sample photos as evidence to the VVB. However, the monitoring procedure adopted during the current monitoring period satisfies only mandatory requirements in line with the guidance therefore usage rate is capped to 75% conservatively irrespective of survey results of 100% usage rate.

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	$EF_{b, fuel, CO_2}$
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						
	Equivalent Bukhari Stove HH		2023		Conservative average value of past year KPT (including 2023)		
	Eco Mini		38.83		38.83		
	Eco 1		39.11		39.11		
	Eco 2		53.81		53.81		
	Eco 3		68.17		68.17		
	(Being Conservative minimum wood consumption is considered among KPT & Usage Survey to calculate fuel wood savings and subsequent emission reduction calculation.) Please refer to the ER sheet for further information.						
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.						
	The calibration details of the equipment are provided below.						
	Equipme nt	Make	Model Number	Instrum ent I.D. Number	Date of calibration	Due date for next calibration ⁹	
	Digital Wood Moisture Meter	ACETQ	WM-101	DWMOM -01	09/07/2022	08/07/2023	
					08/07/2023	07/07/2024	
					17/09/2024	16/09/2025	
	Digital Weighing Balance	Samso n	SNBK-500	DWB-01	11/07/2022	10/07/2023	
					03/07/2023	02/07/2024	
					05/07/2024	04/07/2025	
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

⁹ Since PP has done the readings during the winter months, therefore, the delay in the calibration will not have any effect in the calculations.

Value(s) applied	Average (Mean) Wood Consumption (kg/day) for all the HRS stove models' year wise					
	Project Stove Model	2023	Wood Consumption (kg/day/HH)			
	Eco Mini	21.10	21.77			
	Eco 1	21.20	21.94			
	Eco 2	30.00	30.30			
	Eco 3	31.60	37.38			
	(Being Conservative maximum wood consumption is considered among KPT & Usage Survey to calculate fuel wood savings and subsequent emission reduction calculation.) Please refer to the 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. The calibration details of the equipment are provided below.					
	Equipment	Make	Model Number	Instrument I.D. Number	Date of calibration	Due date for next calibration ¹¹
	Digital Wood Moisture Meter	ACETQ	WM-101	DWMOM-01	09/07/2022	08/07/2023
					08/07/2023	07/07/2024
					17/09/2024	16/09/2025
	Digital Weighing Balance	Samson	SNBK-500	DWB-01	11/07/2022	10/07/2023
					03/07/2023	02/07/2024
					05/07/2024	04/07/2025
Purpose of data	Calculation of Project emissions					

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

¹¹ Since PP has done the readings during the winter months, therefore, the delay in the calibration will not have any effect in the calculations.

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	$U_{p,y}$
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% ¹²
Measurement methods and procedures	NA
Monitoring frequency	Annually
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	N _{p,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 ¹³	N _{p,y}					
	Vintage	Eco Mini	Eco 1	Eco 2	Eco 3	Total
	01-03-2023 to 31-12-2023	739,095	363,579	120,808	22,240	1,245,722
	01-01-2024 to 04-07-2024	588,716	296,373	95,083	16,980	997,152
	Total	1,327,811	659,952	215,891	39,220	2,242,874
Measurement methods and procedures	Monitoring consists of checking of representative sample, to ensure the stove’s operating					
Monitoring frequency	Continuous					

¹² 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 ($U_{p,y}$). 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%.

¹³ For details, please refer ER Spreadsheet- Master Sheet Tab

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 ¹⁴ monitoring Survey
Value(s) applied	5%
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	Total (post applying usage rate @75%)
	01-03-2023 to 31-12-2023	12,607	6,242	2,839	684	22,732	16,779
	01-01-2024 to 04-07-2024	10,041	5,089	2,235	522	17,887	13,415
	Total	22,648	11,331	5,074	1,206	40,259	30,194

¹⁴ The project proponent has conducted a leakage investigation combined with project monitoring surveys as is applicable in line with the methodological requirement.

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 ¹⁵	<table><tr><th colspan="7">Plant Count</th></tr><tr><th>Vintage wise</th><th>Eco Mini</th><th>Eco 1</th><th>Eco 2</th><th>ECO 3</th><th>Total</th><th>Total (post applying usage rate @75%)</th></tr><tr><td>05-07-2019 to 31-12-2019</td><td>0</td><td>253</td><td>59</td><td>21</td><td>333</td><td>250</td></tr><tr><td>01-01-2020 to 31-12-2020</td><td>298</td><td>885</td><td>353</td><td>77</td><td>1613</td><td>1210</td></tr><tr><td>01-01-2021 to 31-12-2021</td><td>758</td><td>918</td><td>377</td><td>49</td><td>2102</td><td>1577</td></tr><tr><td>01-01-2022 to 31-12-2022</td><td>2619</td><td>687</td><td>144</td><td>27</td><td>3477</td><td>2608</td></tr><tr><td>01-01-2023 to 31-12-2023</td><td>2763</td><td>493</td><td>107</td><td>12</td><td>3375</td><td>2531</td></tr><tr><td>01-01-2024 to 04-07-2024</td><td>94</td><td>42</td><td>15</td><td>3</td><td>154</td><td>116</td></tr><tr><td>Total</td><td>6532</td><td>3278</td><td>1055</td><td>189</td><td>11054</td><td>8292</td></tr></table>							Plant Count							Vintage wise	Eco Mini	Eco 1	Eco 2	ECO 3	Total	Total (post applying usage rate @75%)	05-07-2019 to 31-12-2019	0	253	59	21	333	250	01-01-2020 to 31-12-2020	298	885	353	77	1613	1210	01-01-2021 to 31-12-2021	758	918	377	49	2102	1577	01-01-2022 to 31-12-2022	2619	687	144	27	3477	2608	01-01-2023 to 31-12-2023	2763	493	107	12	3375	2531	01-01-2024 to 04-07-2024	94	42	15	3	154	116	Total	6532	3278	1055	189	11054	8292
	Plant Count																																																																					
	Vintage wise	Eco Mini	Eco 1	Eco 2	ECO 3	Total	Total (post applying usage rate @75%)																																																															
	05-07-2019 to 31-12-2019	0	253	59	21	333	250																																																															
	01-01-2020 to 31-12-2020	298	885	353	77	1613	1210																																																															
	01-01-2021 to 31-12-2021	758	918	377	49	2102	1577																																																															
	01-01-2022 to 31-12-2022	2619	687	144	27	3477	2608																																																															
	01-01-2023 to 31-12-2023	2763	493	107	12	3375	2531																																																															
	01-01-2024 to 04-07-2024	94	42	15	3	154	116																																																															
	Total	6532	3278	1055	189	11054	8292																																																															
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
----------------	--	---------------------------------------

¹⁵ For details, please refer the ER spreadsheet- Master Sheet Tab

SDG 13 (tCO _{2e})	2023 – 23,580 2024 – 18,693	2021 – 1,467 2022 – 10,680 2023 – 6,485
SDG 7 (No. of HHs)	2023 – 8,176 ¹⁶ 2024 – 116	2021 – 1,353 2022 – 3,477 2023 – 1,741
SDG 15 (Tonnes of wood saved)	2023 – 16,779 2024 – 13,415	2021 – 1,393 2022 – 9,994 2023 – 6,170

D.4. Implementation of sampling plan

>>

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 the required reliability is not achieved, and additional sampling efforts would be required. Further details of the sampling approach have already been described in the section C above.

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 Sample Size as per simple random sampling equation ¹⁷	Oversampling Considered ¹⁸
Mar 2023	68	176

Similarly,

¹⁶ This is the cumulative count till the year 2023. Please refer to the ER sheet (sum of cell H4:H8).

¹⁷ Please refer MR section C and ER sheet for the details and Simple Random Sampling equation-based calculation.

¹⁸ Over sampling has been considered as a good practice to avoid any later add-ons 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.

Baseline Sampling during the current MP	Annual Survey	Baseline simple equation	Sample random	Size as per sampling	Oversampling Considered
March 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 based on the detailed steps given under section C and explained above in March 2023 (1 March to 31 March) through the survey form, based on the project user population the sample size in 2023 was calculated using the equation given in section C which was found to be 68. However, *over sampling has been considered as a good practice to avoid any later addons or resampling and to ensure 30 samples from each age group being credited has been covered appropriately.* Further, online random number generator is used to draw samples from the project population.

Around 176 samples from the project users were surveyed for the year 2023 for this monitoring period. This gives a relative precision of 0.062 (6.20%) which is well below the prescribed level of precision required i.e. 10% as per the 90/10 rule followed.

Similarly, for baseline stoves around 150 samples are surveyed for the year 2023.

The same process has been followed for the year 2024 and the survey was undertaken during the period (14 Jan to 27 Feb 2024).

Project Annual Survey Sampling during the current MP	Project simple equation ¹⁹	Sample random	Size as per sampling	Oversampling Considered ²⁰
2024	68			205

Baseline Sampling during the current MP	Annual Survey	Baseline simple equation	Sample random	Size as per sampling	Oversampling Considered
2024		68			130

Around 205 samples from the project users were surveyed for the year 2024 for this monitoring period and the samples were drawn using the online random number generator. This gives a relative precision of 0.0574 (5.74%) which is well below the prescribed level of precision required i.e. 10% as per the 90/10 rule followed.

¹⁹ Please refer MR section C and ER sheet for the details and Simple Random Sampling equation-based calculation.

²⁰ 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.

All interviews in a monitoring survey are conducted in person, KPT and include expert²¹ observation by the interviewer within the kitchen in question. 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 "PA vs BA Weighted Average Region" 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 for the baseline bukari stove and maximum value for the project stove.

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 applied²².

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

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

²¹ 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.

²² Please refer ER spreadsheet for calculation.

$f_{NRB,b,y}$	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 tCO ₂ /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 (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
01-03-2023 to 31-12-2023	33,846	16,769	7,667	1,788	60,070
01-01-2024 to 04-07-2024	26,959	13,670	6,034	1,365	48,028
Total	60,805	30,439	13,701	3,153	108,098

Please refer to section E.4 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 Bukhari 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
01-03-2023 to 31-12-2023	28,699	14,219	6,500	1,516	50,394
01-01-2024 to 04-07-2024	22,859	11,591	5,116	1,157	40,723
Total	51,558	25,810	11,616	2,673	91,657

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 applied²³.

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

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
01-03-2023 to 31-12-2023	18,798	9,407	4,317	981	33,683
01-01-2024 to 04-07-2024	15,117	7,668	3,398	749	26,932
Total	34,095	17,075	7,715	1,730	60,615

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.

²³ Please refer ER spreadsheet for calculation.

SDG 7

Plant Count						
Vintage wise	Eco Mini	Eco 1	Eco 2	ECO 3	Total	Total (post applying usage rate @75%)
05-07-2019 to 31-12-2019	0	253	59	21	333	250
01-01-2020 to 31-12-2020	298	885	353	77	1613	1210
01-01-2021 to 31-12-2021	758	918	377	49	2102	1577
01-01-2022 to 31-12-2022	2619	687	144	27	3477	2608
01-01-2023 to 31-12-2023	2763	493	107	12	3375	2531
01-01-2024 to 04-07-2024	94	42	15	3	154	116
Total	6532	3278	1055	189	11054	8292

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
01-03-2023 to 31-12-2023	16,092	7,977	3,661	832	28,562
01-01-2024 to 04-07-2024	12,818	6,502	2,881	635	22,836
Total	28,910	14,479	6,542	1,467	51,398

E.3. Calculation of leakage

>>

It is calculated as 5% of baseline emission as per the registered PDD²⁴. 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
01-03-2023 to 31-12-2023	1,693	641	384	89	2,807
01-01-2024 to 04-07-2024	1,348	684	302	69	2,403
Total	3,041	1,325	686	158	5,210

²⁴ 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 ²⁵	108,098 tCO ₂ e	60,615 tCO ₂ e	5,210 tCO ₂ e	42,273 tCO ₂ e
7	Affordable and Clean energy ²⁶	0	8,292 Stoves	0	8,292 Stoves
15	Life on Land ²⁷	0 tonnes	30,194 tonnes	0	30,194 tonnes

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 ²⁸ achieved during this monitoring period
13	262,560 tCO ₂ e	42,273 tCO ₂ e
7	170,278 Stoves	8,292 Stoves
15	254,922 tonnes	30,194 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 01/03/2023 to 04/07/2024 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 calculate on 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.

Particular	SDG 13	SDG 7	SDG 15
	tCO ₂ e	Nos.	tonnes of wood
Values estimated in ex ante calculation of approved PDD (Annual Average)	213,712	138,598	207,495

²⁵ This is for complete monitoring period. Please refer ER spreadsheet for details

²⁶ This is for complete monitoring period. Please refer ER spreadsheet for details

²⁷ This is for complete monitoring period. Please refer ER spreadsheet for details

²⁸ Whenever emission reductions are capped, both the original and capped values used for calculations must be transparently reported. Use brackets to denote original values.

Values estimated in ex ante calculation of approved PDD for this monitoring period ²⁹	262,560	170,278	254,922
--	---------	---------	---------

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: -83.90%, SDG 7: -95.13% and SDG 15: -88.16%) less than estimated SDG impact in the registered PDD due to the fact that a smaller³⁰ 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.

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 grievance³¹ was received during the current monitoring period.

²⁹ Since the project is operational only for the winter season (175 days), the ex-ante calculation for the current monitoring period has been done accordingly.

³⁰ Please refer to the ER sheet tab "Master sheet" - *Energy Saving (GWh) - the maximum energy saving per year is less than 180 GWh(th).

³¹ 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.

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.

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.

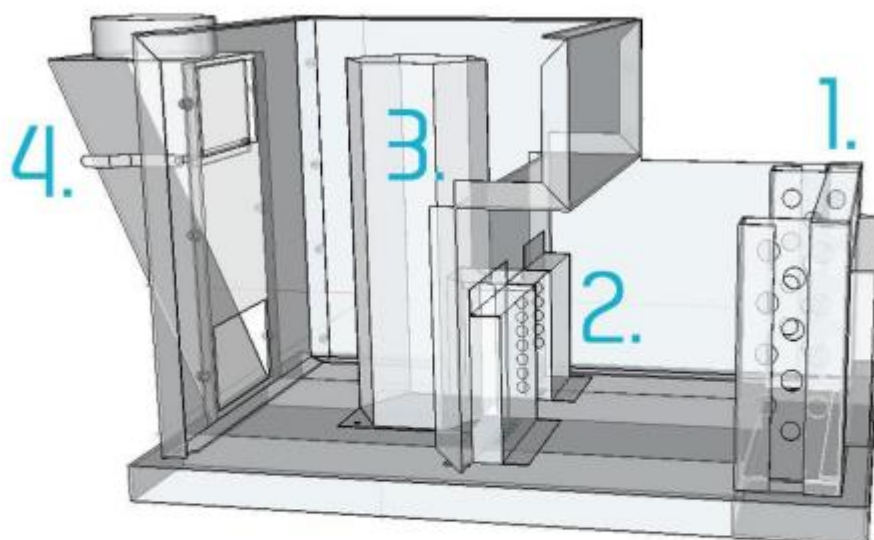
Elaborating on the design and material a little more, the body of the stove is made of stainless steel.

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

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