COOKSTOVE PROGRAM (EKI PHASE 12

STEERING THE PLANET TO NET ZERO

EKI Energy Services Limited

Project Title	Global Cookstove Program (EKI Phase 12)
Version	05
Date of Issue	12-June-2024
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1 PROJECT DETAILS

1.1 Summary Description of the Project

The main purpose of the grouped project activity is distribution of fuel-efficient improved cook stoves (ICS) across rural households in Madhya Pradesh[1]. The ICS disseminated through this project activity has replaced the traditional low efficient cook stoves (three stone cookstoves) used by households in the pre project scenario. The project proponent has in addition to the distribution of ICS, also sensitized the end users about the social and health benefits of ICS usage and also trained the users regarding its proper usage of ICS. Mechanism has also been institutionalized through local team to ensure constant users' coordination and periodic check to guarantee the usage of ICS and forbid shifting to traditional cookstove usage. Not only will the use of ICS slowdown the rapidly progressing deforestation but will also reduce health hazards from indoor smoke pollution and women and children will have to spend less time in collecting firewood.

Technology

The project activity includes dissemination of single pot, natural draft improved cookstoves (Model-Agneekaa Eco Mini Stove Model No 4 SE) with operating efficiency of 36.42%[2].

Location

The location of initial project activity instances (18,000 numbers of ICS) are Chhindwara district of Madhya Pradesh in India and may expand further to other parts of India. The project proponent has distributed 18,000 numbers of ICS in Madhya Pradesh till the submission of the Joint PD & MR.

Pre-Project Scenario

Through this project, the distribution of high thermal efficient ICS is carried out across households using traditional and inefficient cookstoves for cooking in the pre-project scenario[3]. Non-renewable biomass collected from the forest/ plantation outside forest area were used in the traditional cookstoves for cooking resulting in emission of greenhouse gases. Distribution of ICS has therefore in turn substituted the currently used traditional and inefficient cookstoves by households. The baseline scenario is therefore the continued use of non-renewable biomass (fire wood) by the target population to meet similar thermal energy needs as provided by project cookstoves in absence of project activity.

Project activity resulting in emission reduction

The ICS burns fire wood more efficiently thereby improving thermal energy transfer to pots, hence results in saving of fuel wood and avoids associated emission of greenhouse gases from combustion of non-renewable biomass. As the target population are unable to afford these stoves, project promoters have distributed ICS free of cost. All the end users are informed in advance that the use of ICS generates carbon finance which in turn is used to cover the price of ICS and for recovering project implementation costs.

[1] The project locations for initial project activity instances are Chhindwara district of Madhya Pradesh in India and may expand further to other parts of India including Madhya Pradesh.

[2] Detailed technical specification is presented under section 1.11 of the revised joint PD &MR

[3]Detailed pre distribution survey was carried out by the project proponent to identify beneficiary households those are using rudimentary mud or three-stone stoves and are not using LPG or any kind of improved cookstoves and are not in plan for transition.

The project proponent has considered one improved cookstove (ICS) as one instance for the current grouped project activity. Therefore, under current grouped project activity, 18,000 project activity instances (ICS) were installed (till the date of submission of this joint PD and MR). The first Instance was implemented on 22-January-2023.

Estimate of Emission Reduction

The average annual GHG emission reduction from the group project activity is expected to be 74,807 tCO_{2e} per year for the implemented 18,000 instances (i.e., ICS) and 523,651 tCO_{2e} for the group project activity over the entire crediting period. The average annual GHG emission reduction for each project activity instance (i.e., ICS) is expected to be 4.87 tCO_{2e} per Year.

The 1st monitoring survey for the grouped project activity was conducted between 18-April-2023 to 22-April-2023 across Chhindwara district of Madhya Pradesh amongst the randomly selected target population revealing 100% usage in ICS. Based on the finding of the survey the total emission reduction for the monitoring period of 22-January-2023 to 30-April-2023 is 15,754 tCO_{2e}.

Audit Type	Period	Program	VVB Name	Number of years
Validation/	22-January-2023 -- 21-January-2030	VCS	LGAI Technological Center, S.A (Applus+ Certification)	07 years (Crediting Period)
Verification	22-January-2023 -- 30-April-2023	VCS	LGAI Technological Center, S.A (Applus+ Certification)	00 years, 99 days (Monitoring Period)
Total	-22-January-2023 -- 30-April-2023	VCS	LGAI Technological Center, S.A (Applus+ Certification)	00 years, 99 days (Monitoring Period)

1.2 Sectoral Scope and Project Type

The sectoral scope and type of project applicable are as below

Sectoral scope - 03 - Energy demand

Type: II – Energy efficiency improvement projects

The project is a grouped project

1.3 Project Eligibility

The project activity involves distribution of energy-efficient cookstove which falls under the category of efficiency improvements in the thermal application, therefore it is eligible under the scope of the VCS Program. As per VCS Standard Version 4.4, section 2.1.3, efficiency improvements in thermal applications (e.g., cook stoves) are not excluded, hence the project is eligible under VCS.

1.4 Project Design

Eligibility Criteria

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

No.	Criterion	How the new project activity instances comply
1	Meet the applicability conditions set out in the methodology (VMR0006: Methodology for Installation of High Efficiency Firewood Cookstoves) applied to the project	New project activity instances (Energy Efficient Cook Stoves) will meet the applicability conditions set out in Section 3.2 below, where the target end-user is household and the ICS deployed is at least 25% of thermal efficiency (Manufacturer's specification shall be used for establishing minimum efficiency criteria in the first year of stove installation).
2	Use the technologies or measures specified in the project description.	The technology used for the project activity is energy-efficient cookstoves. Only energy efficient cook stoves are to be adopted in the project by replacing traditional cookstoves in households (Manufacturer's specification shall be used for establishing minimum efficiency criteria in the first year of stove installation).
3	Apply the technologies or measures in the same manner as specified in the project description.	Only energy efficient cook stoves/ improved cook stoves (ICS) are to be adopted in the project by replacing traditional cook stoves in households. Every ICS distributed under the project activity will be provided with a label stating the unique serial number. The unique serial number is assigned against a particular beneficiary name and geographical location. The serial number will be a unique number which will allow for a clear distinction between the stoves. No individual serial number will be repeated, thus ensuring that each stove is counted only once in the proposed project and there won't be any double counting. Moreover, the agreement signed between the end user/beneficiary and the project proponent for each particular ICS establishes the ownership of the project activity instances.

4	Are subject to the baseline scenario determined in the project description for the specified project activity and geographic area.	The new project activity instances will be installed within India subject to the same baseline scenario determined in Section 3.4 below.
5	Have characteristics with respect to additionality that are consistent with the initial instances for the specified project activity and geographic area.	All new project activity instances will use the activity method for demonstration of additionality. Step 1: Regulatory Surplus There is no mandated government programme or policy in the host country of this project ensuring the distribution of new energy efficient cook stoves for each project activity instance. Step 2: Positive List The project activity should establish the compliance to the project activity with the applicability criteria of the methodology under section 3.2 of the project document (joint PD & MR). In addition, the project activity should also comply to the following requirement towards compliance with the positive list. 1st condition- The project activity instances should encompass ICS distributed at zero cost to the end user and the project proponent has no other source of revenue other than the sale of GHG credits[4]. 2nd condition - The project activity instances should not be implemented as part of government schemes nor are supported by multilateral funds[5]. The inclusion of new project activity instances will comply with the positive list as it satisfies criterion 1 and 2 where it meets all the applicability conditions of the methodology.

[4] All the ICS (project activity instances) are distributed at free of cost to the household

[5] The project activity instances are not implemented as part of government schemes nor are supported by multilateral funds

6	Where a capacity limit applies to a project activity included in the project, no project activity instance shall exceed such limit. Further, no single cluster of project activity instances shall exceed the capacity limit, determined as follows: Each project activity instance that exceeds one percent of the capacity limit shall be identified. Such instances shall be divided into clusters, whereby each cluster is comprised of any system of instances such that each instance is within one kilometer of at least one other instance in the cluster. Instances that are not within one kilometer of any other instance shall not be assigned to clusters. None of the clusters shall exceed the capacity limit and no further project activity instances shall be added to the project that would cause any of the clusters to exceed the capacity limit.	No project activity instance shall exceed the applicable limit of 180 GWh_{th}/y. Since the project activity instances installed to date and proposed to be installed have/will have the same model, hence expected annual energy saving for each instance is less than 0.0121 GWh_{th}/y which is less than 0.01% of the threshold limit. (Calculation sheet demonstrating adherence to this criterion to be submitted to VVB). As the annual energy saving is below 1% of the limit, therefore no project activity instance is identified and divided into clusters.

Along with the above points, the Inclusion of New Project Activity Instances follows the below criteria

Grouped projects provide for the inclusion of new project activity instances subsequent to the initial validation of the project.

No.	Criterion	How the new project activity instances comply
1	Occur within one of the designated geographic areas specified in the project description	New project activity instances (Energy Efficient Cook Stoves) will occur in the designated geographic areas specified in the project description.
2	Conform with at least one complete set of eligibility criteria for the inclusion of new project activity instances. Partial conformance with multiple sets of eligibility criteria is insufficient.	New project activity instances will comply with a complete set of eligibility criteria as mentioned above for the inclusion of new project activity instances.
3	Be included in the monitoring report with sufficient technical,	New project activity instances information to be included in the monitoring report with sufficient

No.	Criterion	How the new project activity instances comply
	financial, geographic, and other relevant information to demonstrate compliance with the applicable set of eligibility criteria and enable sampling by the validation/verification body.	technical, financial, geographic, and other relevant information to demonstrate compliance with the applicable set of eligibility criteria and enable sampling by the validation/verification body
4	Be included in an updated project description, with updated project location information (as set out in Section 3.11), which shall be validated at the time of verification against the applicable set of eligibility criteria.	New project activity instances should be included by validating eligibility criteria as mentioned in this document
5	Have evidence of project ownership, in respect of each project activity instance, held by the project proponent from the respective start date of each project activity instance (i.e., the date upon which the project activity instance began reducing or removing GHG emissions).	New project activity instances ownership needs to be evidenced from the start date of the respective project activity instance.
6	Have a start date that is the same as or later than the grouped project start date.	New project activity instances' start date should be after the start date of grouped project activity (ICS distribution/registration data recorded in project database will be used to establish the start date critieria)
7	Be eligible for crediting from the start date of the project activity instance through to the end of the project crediting period (only).	New project activity instances are eligible to claim credits from crediting period start date to the end of the project crediting period.

1.5 Project Proponent

Organization name	EKI Energy Services Limited
Contact person	Manish Dabkara
Title	Managing Director & Chief Executive Officer
Address	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India

Telephone	+91 99075 34900
Email	ramkrishna.patil@enkingint.org and registry@enkingint.org

1.6 Other Entities Involved in the Project

Aransh Agro is associated with EKI energy for ICS distribution in MP and GHG Reduction Technologies Pvt LTD is the manufacturer of the ICS deployed under the project activity to date.

Organization name	Aransh Agro Tech
Role in the project	Distributor
Contact person	Pavan Patel
Title	Owner/ Partner
Address	1782 Kripal Chouk Gupteshwar Jabalpur (MP) 482001
Telephone	8821930305
Email	aranshgroup@gmail.com

Organization name	GHG Reduction Technologies Pvt LTD
Role in the project	Manufacturing
Contact person	Mr. Soumitra Kulkarni
Title	Director
Address	A-11/2/3, Nagargoje Industries PVT LTD, SUmmet Compound Ambad, Nashik Maharashtra – 422010
Telephone	+91 982287213
Email	Soumitra.kulkarni@enkingint.org

1.7 Ownership

The project ownership is with EKI Energy Services Limited.

The ICS is distributed to end users[6] (households) free of cost. The end users are informed in advance that the use of ICS generates carbon finance which in turn will be used to cover the price of ICS and for

[6] Detailed pre distribution survey was carried out by the project proponent to identify beneficiary households those are using rudimentary mud or three-stone stoves and are not using LPG or any kind of improved cookstoves and are not in plan for transition.

recovering project implementation costs. The participating household joined the initiative voluntarily and signed a declaration (End user agreement) to transfer the ownership rights of the carbon assets generated from this project to EKI Energy Services Ltd. The detail regarding end user agreement is explained clearly to the household community. As the ICS is distributed free of cost and therefore all the households are happy with the distribution. End users are informed that their participation in this project is voluntary and the same will be mentioned in the End User Agreement also, signed by the end user. The undertaking from the manufacturer and distributor and end-user agreement will be submitted to VVB to confirm that cook stove ownership is with EKI Energy Services Limited.

1.8 Project Start Date

22-January-2023 (The earliest date of commissioning / date of distribution of first ICS (project activity instance))

Under this grouped project activity, the first project activity instance was implemented on 22-January-2023 in Rohana village in Chhindwara district of Madhya Pradesh. 18,000 project activity instances (ICS) have been implemented in Madhya Pradesh, till submission of the Joint PD & MR.

1.9 Project Crediting Period

First crediting period: 22-January-2023 to 21-January-2030, seven years renewable crediting period.

Being renewable crediting period, total crediting period of grouped project activity is 21 years

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	X
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 2023-24 (22-January-2023 – 21-January-2024)	91,527
Year 2024-25 (22-January-2024 – 21-January-2025)	85,722
Year 2025-26 (22-January-2025 – 21-January-2026)	80,058

Year 2026-27 (22-January-2026 – 21-January-2027)	74,534
Year 2027-28 (22-January-2027 – 21-January-2028)	69,146
Year 2028-29 (22-January-2028 – 21-January-2029)	63,892
Year 2029-30 (22-January-2029 – 21-January-2030)	58,772
Total estimated ERs	523,651
Total number of crediting years	7
Average annual ERs	74,807

1.11 Description of the Project Activity

The project involves distribution of fuel-efficient improved cook stoves (ICS) to replace the baseline traditional cook stoves in households.

The ICS deployed under this project activity is energy efficient and thereby substantially reduces fuel consumption and associated emissions from cooking and water heating tasks in homes. The ICS includes insulated combustion chamber around the fire which leads to a better mixing of gases, flames and air. This enhances the heat retention and maximize transfer of heat of combustion from the flame and the hot gases to the cooking pot with the consequences of improved efficiency of combustion and thermal energy transfer to the pot in compared with a traditional cookstoves or three-stone fire.

Technical Specifications of Cook Stoves for all project activity instance from Manufacturer GHG Reduction Technologies Pvt LTD.

<table>
<tr><th colspan="4">TECHNICAL DETAILS</th></tr>
<tr><td rowspan="2">A)</td><td rowspan="2">Cook Stove Type/Category</td><td colspan="2">AGNEEKAA ECO MINI STOVE MODEL4 (Manufactured by GHG Reduction Technologies Pvt LTD. an ISO 9001:2015 Certified Organization)
  </td></tr>
<tr><td colspan="2">Natural Draft</td></tr>
<tr><td>B)</td><td>Secondary Air Supply</td><td colspan="2">Through Natural Draft</td></tr>
<tr><td rowspan="2">C)</td><td rowspan="2">Stove Material Used</td><td>Body</td><td>Galvanized Iron Sheet</td></tr>
<tr><td>Body Material Thickness</td><td>0.6mm</td></tr>
</table>

TECHNICAL DETAILS			
		Combustion Chamber	Stainless Steel SS 202 grade
		Combustion Chamber Material Thickness	1 mm SS 202 grade
		Insulating Material	Thermal Wool
		Insulating Material Thickness	6 to 8mm
		Top Plate	Stainless Steel SS 202 grade
		Top Plate Material Thickness	1 mm
D)	Physical Structure	External Dimension	Length :- 260mm
			Width :- 260mm
			Height :- 248mm
		Combustion Chamber Dimension	Diameter: - 125mm
E)	Grate Thickness	2 mm Material HR sheet	
F)	Wight Of the Stove	3.8 Kg	
G)	Type of Fuel Wood	Firewood 30 to 50 mm diameter	
H)	Feeding Process	Continuous Feeding Front Loading	
I)	Expected life of stove	7 Years	
J)	Guarantee /Warranty Period	1 Years	
K)	Box Dimension	Outer Side Box Dimension	Length: - 300mm
			Width: - 300mm
			Height: - 270mm
L)	Thermal Efficiency	36.42% Thermal efficiency is determined by the Indian Institute of Technology Delhi. The thermal efficiency of the implemented cookstove was tested at the manufacturer's end as per BIS protocols IS: 13152: 2013.	

Further, continuous research and development activities are being conducted by the manufacturer to improve the efficiency, quality, and design of the stove, by incorporating feedback from end users through routine follow-ups and site visits. In this backdrop the project proponent may adopt the modified stove with improved efficiency for future distribution under the current grouped project activity and therefore the ICS model may change for future project activity instances and same will be transparently reflected during verification. The details and specifications of respective cook stoves will be considered for ER calculation of project activity instance.

Deployment

The ICS is procured by the project proponent (EKI Energy Services Limited) from the manufacturer and distributed to identified beneficiary through distribution agency. The distribution agency is entitled to distribute ICS to users, complete users' registration process (signing of end user agreement), sensitize/ train the users over ICS operational process. In addition, representative of the project proponent facilitates regular training/sensitization event for end users towards ensuring continual communication

with the local stakeholders. The users were also briefed over the process of registering complaint regarding the ICS malfunction and support to be provisioned by the project proponent/its representatives for repair/maintenance of the ICS.

Data collection of ICS end-user

Project proponent (through ICS distribution agency) as part of end user registration process has gathered the necessary information to identify households using its ICS during the course of the project. To facilitate this process, each ICS is assigned a unique serial number. This number will be recorded during the registration process together with the following information (as appropriate and as available):

- Name of ICS user or head of the household
- Address/ Village name of ICS household
- Stove model Distributed
- Date of distribution/installation
- ICS serial number
- Retailer/distributer/Manufacturer information

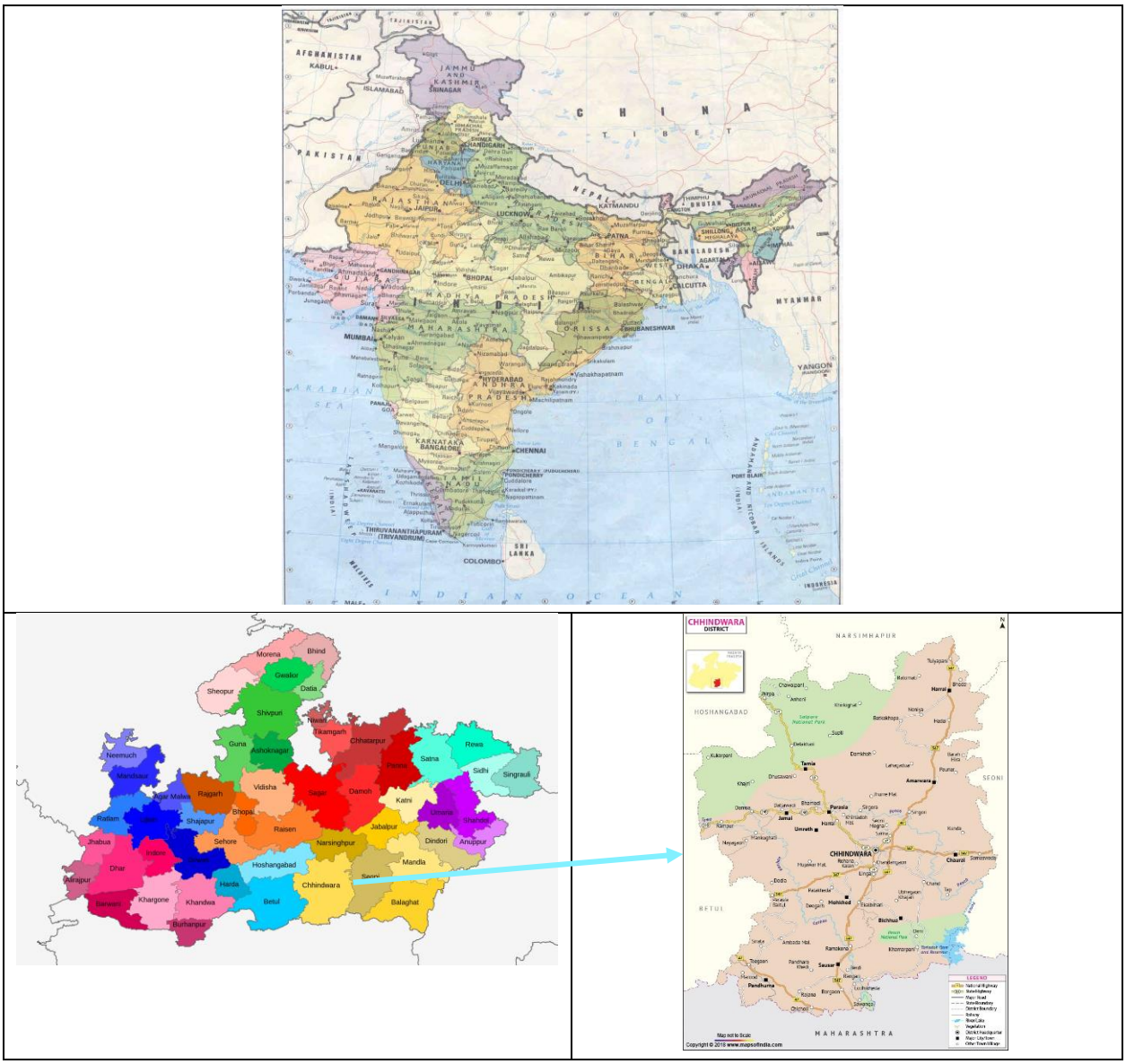
The information collected will be stored in the hard copy and/or electronic database excel sheet which will serve as project database for project monitoring and sampling purposes.

1.12 Project Location

All the project activity instances in the proposed grouped project activity is located within geographical boundaries of Indian state of Madhya Pradesh in Chhindwara district.

The geographical boundary for the current project activity instance is located in Chhindwara district of Madhya Pradesh in India is delineated in the form of extreme geographic coordinates of Chhindwara district of Madhya Pradesh in India as follows:

Longitude -78.40^0 to 79.24^0 East
Latitude - 21.28^0 to 22.49^0 North



1.13 Conditions Prior to Project Initiation

The conditions prior to project initiation are the use of non-renewable firewood in traditional inefficient cookstoves by the target population to meet thermal energy needs for cooking, which the target population would have continued to use to meet the similar thermal energy requirement as provided by project cookstoves in absence of project activity.

The baseline scenario is therefore the same as the conditions existing prior to the project initiation i,e. continued use of non-renewable biomass by the target population to meet similar thermal energy needs as provided by the project cookstoves in absence of the project activity.

These traditional mud or three-stone stoves not only have very low thermal efficiency (10% as per the methodology) but also contribute to health hazards from indoor air (smoke) pollution.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

There are no laws and regulations governing the use of improved cookstoves in India for households. The project is a voluntary effort by the project proponent.

1.15 Participation under Other GHG Programs

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

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

1.15.2 Projects Rejected by Other GHG Programs

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

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

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

1.16.2 Other Forms of Environmental Credit

The project has not sought or received another form of GHG-related environmental credit

1.16.3 Supply Chain (Scope 3) Emissions

There are no measurable Scope 3 emissions associated with the project activity.

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development Contributions Activity Description

The project includes distribution of fuel efficient improved cookstoves thereby replacing use of inefficient cookstoves. The project contributes to social, environmental, economic and technological benefits which contribute to sustainable development of the local environment and the country as follows:

Social benefits

- Reduces drudgery to women (due to reduced fuel wood use) who spend long hours and travel long distances to collect fuel wood. Hence reducing the proportion of time spent on unpaid domestic and care work (SDG 5.4.1)
- Improves overall health of women and children by reducing smoke in the kitchen, thus reducing health hazards from indoor air pollution. Therefore, contribute to a decrease in the mortality rate attributed to household and ambient air pollution (SDG 3.9.1)

- Better cooking time – the materials used in making the ICS transmit the heat effectively, cooking the food faster. Hence reducing the proportion of time spent on unpaid domestic and care work (SDG 5.4.1)
- Better cooking environment due to less smoke and carbon residue in the kitchen. Therefore, contribute to an increase in the proportion of the population with primary reliance on clean fuels and technology (SDG 7.1.2)
- Better quality of life – the rural communities get family time as the whole family can sit and eat together as the cooking on ICS is faster due to its thermal energy-based mechanism.

Environmental benefits

- Improves the local environment by reducing rate of degradation of forests and deforestation in the project area(SDG 15.2.1)
- Reduce indoor pollution – ICS emits less smoke and reduces morbidity from respiratory diseases and other health hazards, as well as the medical expenditure involved. A resource-poor household would need to spend limited available finances on medicines, further exacerbated by loss of wages from both not being able to work and having to look after the ill-person. Therefore, contribute to reducing the poverty of the participating households (SDG 1.1.1)
- Reduce global and local environmental pollution and environmental degradation by reduction in use of non-renewable biomass thus leading to reduction in GHG emissions (SDG 13.0).
- Less water and effort is needed for cleaning vessels as the cooking process is relatively smoke free.

Economic benefits

- Employment opportunities for local communities through the CDM activity (SDG 8.3).
- Reduces purchase of fuel wood and/or wage equivalent from reduced firewood collection time.

Technological benefits:

- Introduction of new technology to the rural communities

1.17.2 Sustainable Development Contributions Activity Monitoring

Evidence of the project's SD contributions shall be provided as appendices to this report.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	1.1	1.1.1 Proportion of population below the international poverty line	Implemented activities to decrease	The project activity has contributed to the employment generation for 415 persons (male and female) in the stove manufacturing company and employment of 54 persons (male and female) in the ICS distribution & monitoring agency. Employment of individual with monthly income in the range of INR 12,000 – 35,000, has helped in enhancing the daily income of individual below international poverty line and thereby improve the proportion of population living below international poverty line.	The project activity has contributed to the employment generation for 415 persons (male and female) in the stove manufacturing company and employment of 54 persons (male and female) in the ICS distribution & monitoring agency. Employment of individual with monthly income in the range of INR 12,000 – 35,000, has helped in enhancing the daily income of individual below international poverty line and thereby improve the proportion of population living below international poverty line.

2)	3.9	3.9.1 Mortality rate attributed to household and ambient air pollution	Implemented activities to decrease	Use of ICS distributed under the project activity in 18,000 households will reduce the particulate matter and other pollutants emanated from improper burning of solid biomass in the traditional cookstoves in the pre project scenario and will thereby reduce the mortality due to lower respiratory infection, chronic obstructive pulmonary disease (COPD), ischaemic heart disease and others.	Use of ICS distributed under the project activity in 18,000 households will reduce the particulate matter and other pollutants emanated from improper burning of solid biomass in the traditional cookstoves in the pre project scenario and will thereby reduce the mortality due to lower respiratory infection, chronic obstructive pulmonary disease (COPD), ischaemic heart disease and others.
3)	4.7	4.7.1 Extent to which (ii) education for sustainable development are mainstreamed in	Implemented activities to increase	All the project beneficiary households (18,000 households) were appraised/ sensitized about the impact of use of traditional cookstoves on human health, environment and gender equality and how use of ICS could foster sustainable development.	All the project beneficiary households (18,000 households) were appraised/ sensitized about the impact of use of traditional cookstoves on human health, environment and gender equality and how use of ICS could foster sustainable development.

4)	5.4	5.4.1 Proportion of time spent on unpaid domestic and care work, by sex, age and location	Implemented activities to decrease	Reduce drudgery of women and children in 18,000 households covered under the project activity. Use of ICS reduces the wood requirement in compared to the traditional cookstoves and also the cooking time due to proper heat transfer and therefore time is saved in terms of time spent for collecting of fuelwood and cooking.	Reduce drudgery of women and children in 18,000 households covered under the project activity. Use of ICS reduces the fire wood requirement in compared to the traditional cookstoves and also the cooking time due to proper heat transfer and therefore time is saved in terms of time spent for collecting of fuelwood and cooking.
5)	7.1	7.1.2 Proportion of population with primary reliance on clean fuels and technology	Implemented activities to increase	Increase access to clean cooking technology with ICS installations in 18,000 households under the project activity	Increase access to clean cooking technology with ICS installations in 18,000 households under the project activity
6)	8.5	8.5.1 Average hourly earnings of employees, by sex, age, occupation and persons with disabilities	Implemented activities to increase	The project activity has contributed to the employment generation for 415 persons (male and female) in the stove manufacturing company and employment of 54 persons (male and female) in the ICS distribution & monitoring agency. Employment of individual with monthly income in the range of INR 12,000 – 35,000, has helped in enhancing the hourly earnings of employees, by sex, age.	The project activity has contributed to the employment generation for 415 persons (male and female) in the stove manufacturing company and employment of 54 persons (male and female) in the ICS distribution & monitoring agency. Employment of individual with monthly income in the range of INR 12,000 – 35,000, has helped in enhancing the hourly earnings of employees, by sex, age.

7)	9.3	9.3.1 Proportion of small-scale industries in total industry value added.	Implemented activities to increase	The project activity has supported the promotion of small-scale industries growth through sourcing/ procurement of 18,000 improved cookstoves from the MSME unit (GHG Reduction Technologies Pvt Ltd)	The project activity has supported the promotion of small scale industries growth through sourcing/ procurement of 18,000 improved cookstoves from the MSME unit (GHG Reduction Technologies Pvt Ltd)
8)	13.2	13.2.2 Total greenhouse gas emissions per year	Implemented activities to increase	Contribute to greenhouse gas emission reduction of 15,754 tCO_2e	Contribute to greenhouse gas emission reduction of 15,754 tCO_2e
9)	15.3	15.3.1 Proportion of land that is degraded over total land area	Implemented activities to decrease	Contribute in reduction of deforestation through reduction in consumption of 8,621 tonnes of fire wood. The amount of Wood saved (8,621 tons) as presented is the actual wood savings (calculated) from use of 18,000 ICS during the monitoring period. Detailed calculation is presented in the ex-post ER estimation Sheet.	Contribute in reduction of deforestation through reduction in consumption of 8,621 tonnes of fire wood.

1.18 Additional Information Relevant to the Project

Leakage Management

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

Commercially Sensitive Information

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

Further Information

Not Applicable

2 SAFEGUARDS

2.1 No Net Harm

The project will only bring positive impacts on environmental and socio-economic aspects as elaborated in Section 1.17. No potential negative environmental or socio-economic impacts have been identified for the project, thus this section is not applicable.

2.2 Local Stakeholder Consultation

The villages were identified and village representatives like village heads and sarpanch were invited. For the proposed project activity, household owners (end users), village heads, distributors, and their representatives are relevant main local stakeholders. Public notice was placed in common places of villages and village heads were invited telephonically and personally to consult their feedback.

The details of the stakeholders meeting are outlined in the table below:

Date of invitation	Date of the Meeting	Location	District	State
22/12/2022	22/01/2023	Rohanakala	Chhindwara	Madhya Pradesh

In the introductory speech, the representative of EKI Energy Services Limited (Project Proponent), welcomed the gathering and briefed the stakeholders about the aspects of climate change and how the project activity is likely to result in climate change mitigation and contribute towards the sustainable development (social, environmental & economic benefits of ICS usage). Subsequent to the introductory speech, stakeholders were explained about the technical aspects of the ICS and purpose of distribution of highly efficient cook stoves which will burn firewood more efficiently and improve the thermal energy transfer to pots, thereby reducing the consumption of fire wood and cooking time. Stakeholders were also appraised on how the project activity will reduces the rapidly progressing deforestation, contribute in reduction of health hazards from indoor smoke pollution of women and children, and reduce the drudgery of women and children by reducing the time spent in collection of the fire wood. The stakeholders were also intimated about the carbon mechanism & its requirement for the current project. After the detailed introductory brief, the session was open for questions from stakeholders. The question raised by the villagers are summarized below:

Question	**Response by Project Proponent**
Can we get more that one cookstove per family	No, as per policy only one cookstoves to be provided per family
Does the cookstove is for free or does it require money	We arrange it for free of cost to beneficiary
How to clean the cookstoves	You have to use the cloths for cleaning purpose
What is the weight of cookstove	It is 3.80 kg in weight
What is the efficiency of the cookstove	It is 36.42%

As a part of on-going communication with local stakeholders,

1. End users were informed about grievance register and process of registering of grievance. The distributors were entitled with the responsibility of registering the grievances regarding the project activity and communicate the same to the project proponent during operation of project activity. If any concerns received during operation of project activity, same will be addressed if relevant to project activity.
2. Visits to the households -On-ground team/distribution agency are scheduled to visit each beneficiary (ICS user) at least once in a year. Usually, this follow-up visit is initiated after the ICS distribution/registration with the objective to ensure that project cookstoves are being properly used and also to sensitize the users over operational procedure, cookstove maintenance, best practices, and health benefit. Such visit and in person interaction will also addresses the grievances and also provide maintenance to cookstoves as needed.
3. Check by project proponent team – The team of EKI to make visit ICS users on a sample basis to ensure that grievance is properly registered and addressed by the end user/distribution agency.

The overall response from the local stakeholders on the project was encouraging and positive. No adverse or negative comments or response were received during the meeting. The participants of the meeting had not raised any significant concerns nor seek any clarification related to potential impacts of the project activity or any other issue. The project as a whole give's positive impression towards the issue of sustainable development of the country.

Copy of public notice, minutes of meeting and attendance register submitted for verification.

2.3 Environmental Impact

No negative environmental impacts have been identified from the project and environmental impact assessment (EIA) is not required for the project. In fact, project activity supports various positive environmental impacts such as -

1. Improves the local environment by reducing the rate of degradation of forests and deforestation in the project area.
2. Reduce indoor pollution –In accordance to WHO cook using open fires or inefficient stoves generates harmful household air pollution and was responsible for an estimated 3.2 million deaths per year in 2020, including over 237 000 deaths of children under the age of 5[7]. Household air pollution exposure leads to noncommunicable diseases including stroke, ischaemic heart disease, chronic obstructive pulmonary disease (COPD) and lung cancer. ICS [8] in comparison to traditional cookstoves emits less smoke resulting from complete/efficient combustion of biomass and thereby reduces morbidity from respiratory diseases and other health hazards, as well as the medical expenditure involved. A resource-poor household would need to spend limited available finances on medicines, further

[7] https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health
[8] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3278415/

exacerbated by the loss of wages from both not being able to work and having to look after the ill person.

3. Reduce global and local environmental pollution and environmental degradation by a reduction in the use of non-renewable biomass thus leading to a reduction in GHG emissions.
4. Less water and effort are needed for cleaning vessels as the cooking process is relatively smoke-free

2.4 Public Comments

The titled project was open for public comments at VERRA website [9] between 16/05/2022 to 15/06/2022. No public comments were received for the project activity.

2.5 AFOLU-Specific Safeguards

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

[9] https://registry.verra.org/app/projectDetail/VCS/3031

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

VCS Methodology: VMR0006: Methodology for Installation of High Efficiency Firewood Cookstoves, Version 1.1 dated 22 July 2021, Sectoral scope 3
https://verra.org/wp-content/uploads/2021/07/VMR0006-Methodology-for-Installation-of-High-Efficiency-Firewood-Cookstoves-v1.1.pdf

This methodology also refers AMS II.G version 12 - Energy efficiency measures in thermal applications of non-renewable biomass
https://cdm.unfccc.int/methodologies/DB/GNFWB3Y6GM4WPXFRR2SXKS9XR908IO

For the calculation of the fraction of non-renewable biomass, the below tool is used "TOOL30 version 4.0: Calculation of the fraction of non-renewable biomass"
https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-30-v4.0.pdf.

3.2 Applicability of Methodology

The applicability of the methodology is justified below:

Applicability criterion	How the project complies
Project activities shall be implemented in domestic premises or community-based kitchen	The proposed project involves deployment of all project activity instances /ICS in households.
The project stove shall have specified high-power thermal efficiency of at least 25% per the manufacturer's specifications and shall exclusively use woody biomass and can be single-pot or multi-pot;	Energy efficient, single-pot and portable cook stoves are deployed as part of the project activity with operational efficiency of 36.42% (higher than 25%). The specified design efficiency of the ICS is based on the third-party test report for the ICS model. For future project activity instances, the manufacturer may change, the cook stove model and in such cases ICS with operating efficiency higher than 25% as required for applicability of the methodology will be selected.
Both 'Projects' and 'Large Projects' can use the methodology	Estimated average annual emission reductions for the grouped project activity are lower than 300,000 tonnes of CO_2e per year. Therefore, the proposed project qualifies for the "Projects" criteria.
Non-renewable biomass has been used in the project region since 31 December 1989, using survey methods or referring to published literature, official reports, or statistics;	Non-renewable biomass has been used since 31 December 1989 as demonstrated by UN Data[10] and as demonstrated below by referring to published literature, official reports, or statistics;

[10] http://data.un.org/Data.aspx?d=EDATA&f=cmID%3aFW

For the specific case of biomass residues processed as a fuel (e.g. briquettes, wood chips), it shall be demonstrated that: (a) It is produced using exclusively renewable biomass (more than one type of biomass may be used) (b) The consumption of the fuel should be monitored during the crediting period (c) Energy use for renewable biomass processing (e.g. shredding and compacting in the case of briquetting) may be considered as equivalent to the upstream emissions associated with the processing of displaced fossil fuel and hence disregarded.	Not applicable, as the project activity does not use processed biomass as a fuel. The ICS is introduced as an energy efficiency measure to replace baseline stoves and reduce the use of non-renewable biomass for combustion.
The VCS PD shall explain the proposed method for the distribution of project devices including the method to avoid double counting of emission reductions such as unique identifications of product and end-user locations (e.g. programme logo) The above criteria are as per the VCS methodology requirement (Additionally, applicability criteria numbers 8 and 9 set out in Section 2.2 of AMS II.G, version 11.1 shall apply) in alignment with para 7 of the latest version of meth AMS II.G version 13 is followed.	Each ICS in this project will be identified by a unique combination of customer name and geographical location, as well as a serial number. The serial number will be a unique number which will allow for a clear distinction between the stoves. No individual serial number can be repeated within the project, thus ensuring that each stove is counted only once in the proposed project. In addition, the project has been cross-checked against other CDM project activity operating in the country using the UNFCCC, the Gold Standard, and other relevant voluntary carbon schemes to ensure that the ICS is not included in any other CDM project activity or voluntary project activity.
The VCS PD shall also explain how the proposed procedures prevent double counting of emission reductions, for example, to avoid the project stove manufacturer, wholesale providers, or others claiming credit for emission reductions from the project devices. The above criteria are as per the below VCS meth requirement and para 8 of the latest version of meth AMS II.G version 13 is followed. (Additionally, applicability criteria numbers 8 and 9 set out in Section 2.2 of AMS II.G, version 11.1 shall apply)	Manufacturers/ cook stove distributors undertaking is provided that EKI will be the owner of that carbon credits and Manufacturers/ cook stove distributors will not claim any credits for such cook stoves.

Demonstration that non-renewable biomass has been used since 31 December 1989

Justification: The use of non-renewable biomass is established through a demonstration of the gap between the demand for firewood wood and silviculturally permissible production of biomass from forests and trees outside the forest. The fact is established using published literature referring to the following studies:

Food and Agricultural Organization of United Nation[11] Regional Wood Energy Development Programme in Asia

11Regional Wood Energy Development Programme In Asia GCP/RAS/154/NET, RWEDP Report No 57, The Wood Fuel Scenario and Policy issues in India. Published by the FAO Regional Wood Energy Development Programme in Asia, Bangkok, Thailand

The literature highlights a gap in the demand and supply of fuel wood across the country. By the study, fuel wood consumption in real terms is much higher than the recorded production of about 30%; thus, leaving a wide gap leading towards unsustainable extraction of firewood. Moreover, on account of population pressure, demand for firewood has outstripped natural regeneration and planting, so much so that in some areas there is food to eat but not enough wood is available to cook it (Mathur, 1987)". The report also highlights the statistics from the Forest Survey of India (FSI1988:46) which estimated a gap of 130 million tonnes between the demand and internal production of firewood in the country in 1987.

State of Forest Report 1987[12], MoEF, Govt. of India

The report highlights a gap between the demand and production of firewood as a major cause of deforestation. The reported consumption and production across the country within silvicultural permissible limits across the following years are indicated as follows –

Year	Consumption in million tones	Recorded Production in million tones
1953-54	86.3	6.49
1960-61	99.6	8.15
1965-66	109.3	9.16
1970-71	117.9	11.62
1975-76	133.1	19 m. from the forest and 30 m. from trees outside the forest

In accordance, the gap between demand and production is met through pilferage leading to the continuous depletion of forest land.

Wood Fuel Trade in India: Food and Agricultural Organisation of United Nation:

The report outlines the demand-supply gap which has referred to the expert committee report of MoEF dated 30/01/1998 as below –

			In million cubic meters
Year	Consumption	Sustainable Production	Gap
1953-54	115.0	8.8	106.2
1965-66	163.9	13.7	150.2
1975-76	199.6	28.5	171.4
1987-88	235.0	40.0	195.0

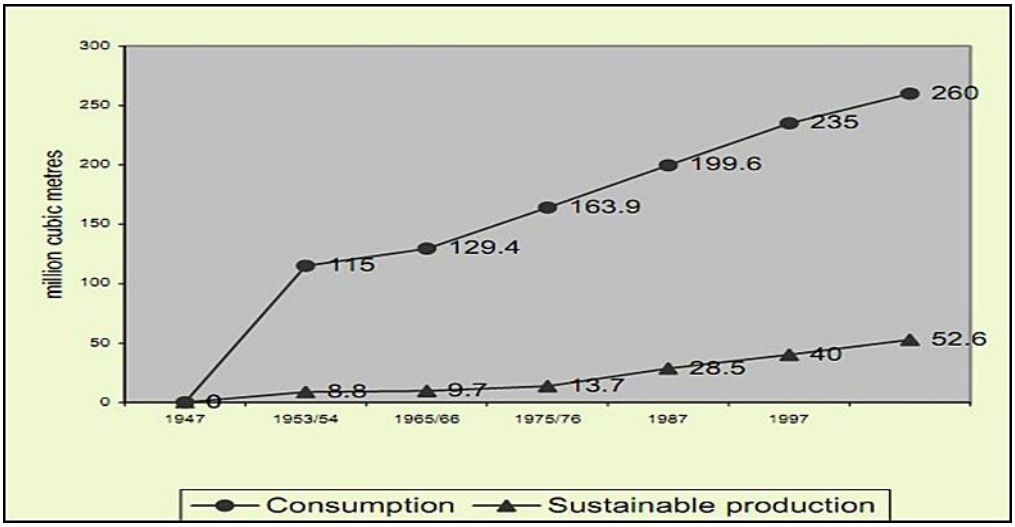
Rural Energy data sources and estimations in India – TERI[13]

The report refers to the gap between consumption and recorded production of fuel-wood has, however, increasing, indicating the seriousness of the fuel-wood scarcity in India.

Fuel wood consumption and sustainable production since 1947

12https://fsi.nic.in/documents/sfr_1987_hindi.pdf (refer page 44 of document, section 3.4 of Chapter III Demand On Forests"

13https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.581.9840&rep=rep1&type=pdf



Also, as per Forest Survey report 2011 (This is the latest survey report for India where demand and supply are determined. Due to the COVID-19 pandemic, no survey done for the year 2021), (https://fsi.nic.in/cover_2011/chapter7.pdf) has been considered for the production of fuelwood (from forests 1.232 million Tonnes (table 7.4.2) and availability of fuel wood from trees outside the forest is 19.254 million tonnes (table 7.4.3) annual fuel wood consumption is 216.421 million tonnes (table 7.4.7). This indicates that demand is more than sustainable production/availability of, thus in the present scenario, non-renewable biomass is used in the project region

Conclusion:

Therefore, it is established from the above studies that, a staggering gap exists between the demand and potential for sustainably extractable fuel wood from forest land. While the first three studies refer to the fuel wood supply scenario and the gap that was precedent before 1989; the study by TERI highlights the widening of the gap between the demand and supply of biomass after 1989. The widening of the gap has been both due to the increased population pressure as well as the conversion of dense forest to medium dense, scrub and open type forest land due to unsustainable extraction even after the government's initiative towards the promotion of afforestation. Thus, it can therefore be concluded that the gap exists from and before 1989 and continued thereafter, forcing the population in using biomass extracted in an unsustainable manner which is identified as a non-renewable component.

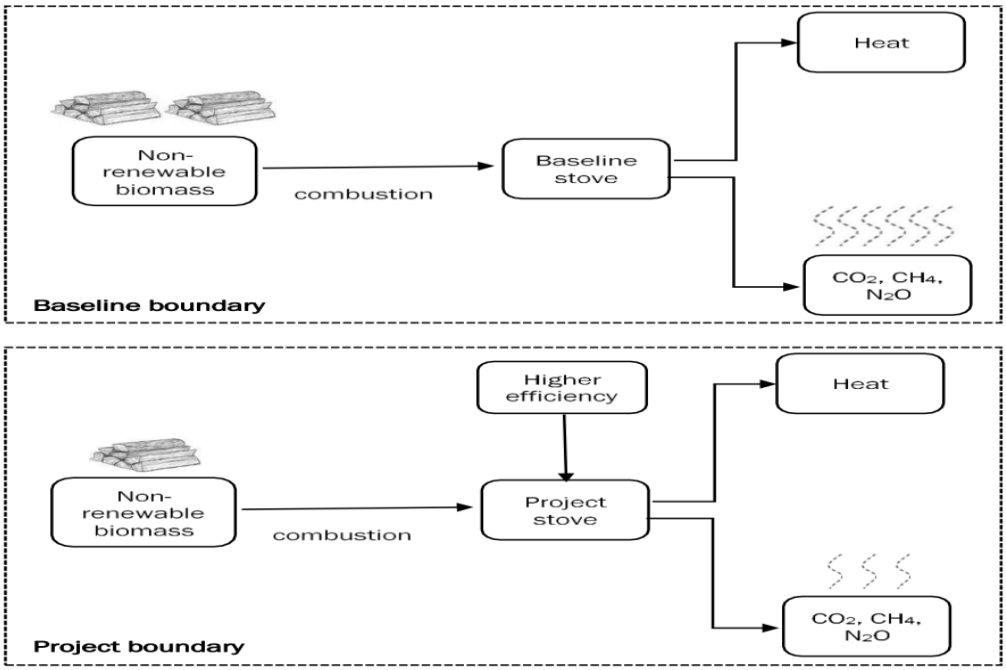
3.3 Project Boundary

The project boundary is the physical, geographical site of the improved cookstoves that utilize biomass

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

Source	Gas	Included?	Justification/Explanation
renewable biomass	N_2O	Yes	Major source
	Other	No	No other source identified

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



3.4 Baseline Scenario

In accordance to VCS Methodology: VMR0006: Methodology for Installation of High Efficiency Firewood Cookstoves, Version 1.1 is the continued use of non-renewable wood fuel (firewood) by the target population to meet similar thermal energy needs as provided by project cook stoves in absence of project activity."

For all project activity instance, the baseline scenario is the continued use of non-renewable wood fuel (firewood) by the target population to meet similar thermal energy needs as provided by project cookstoves in absence of project activity. The baseline scenario is also evident from other project implemented by the project proponent (EKI) in the same state and same geography (VCS 2473) that the baseline scenario in project location is three stone fire or traditional stove using fuelwood. Moreover, as a part of selection of beneficiary for project activity detailed assessment is being made to assess the type of fuel and cookstove being used. The ICS is only being provided/disseminated to beneficiary using traditional/three stone cookstoves and consuming biomass in similar cookstoves for the purpose of cooking clearly establishing the baseline scenario of wood fuel usage in traditional/tree stone cookstoves.

The project activity instances to be included in this grouped project activity should meet the baseline scenario as mentioned above.

3.5 Additionality

The methodology uses the activity method for the demonstration of additionality.

Step 1: Regulatory Surplus

There is no mandated government programme or policy in the host country (India) of this project ensuring the distribution of domestic fuel-efficient cookstoves. The project is not mandated by any law, statute, or another regulatory framework, or for UNFCCC non-Annex I countries, any systematically enforced law, statute, or another regulatory framework. Households' participation is voluntarily in this project. It is hereby confirmed that the proposed project is a voluntary coordinated action by EKI.

Step 2: Positive List

As per Section 3.2 (of the joint PD & MR), the project meets the applicability conditions of the methodology which represent the positive list. In addition, the project activity meets the following conditions:

1. The project activity installs/distributes the ICS at zero cost to the households (end user) and has no other source of revenue other than the sale of GHG credits.
2. The project is not implemented as part of government schemes or supported by multilateral funds.

Conclusion: As the project fulfills the conditions above, it is deemed additional.

If any project activity instance does not follow the positive list as stipulated by methodology, then additionality needs to demonstrate as per tool requirement.

3.6 Methodology Deviations

The project did not apply any methodology deviations.

4 IMPLEMENTATION STATUS

4.1 Implementation Status of the Project Activity

Till the end of the monitoring period, 18,000 project activity instances (ICS) were deployed under this grouped project. Only one stove model (AGNEEKAA ECO MINI STOVE MODEL 4 SE) was distributed in the project.

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

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

5 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The methodology does not account for baseline emissions separately but instead quantifies net emission reductions achieved by the project. Please refer to Section 5.4.

5.2 Project Emissions

The methodology does not account for project emissions separately but instead quantifies net emission reductions achieved by the project. Please refer to Section 5.4.

5.3 Leakage

In accordance to section 8.3 of the methodology, leakage shall be considered as default 0.95 in accordance with section 5.4 of AMS.II.G.

5.4 Estimated Net GHG Emission Reductions and Removals

In accordance to section 8.4 of the methodology, since the project activity replaces baseline stoves using nonrenewable biomass the emission reduction is calculated using equations 1 and 2 of the applied methodology and is as follows:

$$ER_y = \sum_i \sum_j ER_{y,i,j}$$ Equation (2)

Where:

i	=	Indices for the situation where more than one type/model of improved cookstove is introduced to replace three-stone fire
J	=	Indices for the situation where there is more than one batch of improved cookstove of type *i*
ER_y	=	Emission reductions during year *y* in tCO_2e
$ER_{y,i,j}$	=	Emission reductions by improved cookstove of type *i* and batch *j* during year *y* in tCO_2e

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

Where:

$B_{y,savings,i,j}$	=	Quantity of woody biomass (firewood) that is saved in tonnes per improved cookstove of type *i* and batch *j* during year *y*

$f_{NRB,y}$	=	Fraction of woody biomass that can be established as non-renewable biomass (f_{NRB})[14]
$NCV_{wood\ fuel}$	=	Net calorific value of the non-renewable woody biomass that is substituted or reduced (IPCC default for wood fuel, 0.0156 TJ/tonne)[15]
$EF_{wf,CO2}$	=	CO_2 emission factor for the use of wood fuel in the baseline scenario (IPCC default for wood fuel, 112 tCO_2/TJ)[16]
$EF_{wf,non\ CO2}$	=	Non-CO_2 emission factor for the use of wood fuel in the baseline scenario (IPCC default for wood fuel, 26.23 tCO_2/TJ)[17]
$N_{y,i,j}$	=	Number of improved cookstoves of type *i* and batch *j* operating during year *y*
0.95	=	Discount factor to account for leakage

The quantification of firewood saved due to the implementation of improved cookstoves to be estimated using the equation below:

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

Where:

η_{old}	=	Efficiency of baseline cookstove
$\eta_{new,y,i,j}$	=	Efficiency of the improved cookstove type *i* and batch *j* determined through water boiling test (WBT) during year *y* Alternatively, efficiency may be determined using Equation 4.
$B_{y=1,new,i,j,survey}$	=	Annual quantity of woody biomass used by improved cookstoves in tonnes per device of type *i* and batch *j*, determined in the first year of the implementation of the project through a sample survey.

$$\eta_{new,y,i,j} = \eta_p \times (DF_n)^{y-1} \times 0.94 \quad \text{Equation (4)}$$

Where:

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

[15] 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 1Introduction

[16] 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion

[17] 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion

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

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

1. The project will install up to 18,000 ICS.
2. The end date of installation of project activity instance is considered as operational date of that project activity instance.
3. The life span of ICS is 7 years; thus, the operational lifetime of each project activity instance is taken as 7 years.
4. $B_{y=1,new,i,\ survey}$,.. For Madhya Pradesh – 3.1458 kg/device/day or equal to 1.1482 tonnes/device/year. This is based on first monitoring survey results. The result of survey is being considered for ex-ante ER estimation.

Determination of efficiency of ICS during year y

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

Where

η_p = 36.42%

DF_n = 0.99

Example of calculation:

If y= 1

$\eta_{new,y,i,j}$ = 36.42% X (0.99) $^{1-1}$ X 0.94

= 34.23%

Hence the efficiency of ICS during year y is as below:

Year (y)	$\eta_{new,y,i,j}$
1	34.23%
2	33.89%
3	33.55%
4	33.22%
5	32.89%
6	32.56%
7	32.23%

Determination of the quantity of firewood that is saved in tonnes per ICS during year y

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

Estimation of quantity of biomass saved for Chhindwara district of Madhya Pradesh:

If y= 1,

$B_{y,savings,i,j}$= 1.1482 X [(0.3423/0.1) -1] = 2.7827 tonnes

The year wise quantity of biomass saved is presented in the table below:

Year (y)	$B_{y=1,new,i,survey}$	$\eta_{new,y,i,j}$	η_{old}	$B_{y,savings,i,j}$
1	1.1482	34.23%	0.1	2.7827
2	1.1482	33.89%	0.1	2.7434
3	1.1482	33.55%	0.1	2.7045
4	1.1482	33.22%	0.1	2.6659
5	1.1482	32.89%	0.1	2.6278
6	1.1482	32.56%	0.1	2.5900
7	1.1482	32.23%	0.1	2.5526

Determination of $f_{NRB,y}$

In accordance to the applied methodology the fraction of non-renewable biomass ($f_{NRB,y}$) is calculated in accordance to Tool 30: Calculation of the fraction of non-renewable biomass, Version 04.0

In accordance to paragraph 07 of the applied tool, the fraction of woody biomass that is non-renewable is estimated as:

$$fNRB = NRB/ (NRB + RB)$$

Where:

fNRB = Fraction of non-renewable biomass in the applicable area in the relevant period (fraction or %)

NRB = Quantity of non-renewable biomass consumed in the applicable area in the relevant period (tonnes)

RB = Quantity of renewable biomass that is available on a sustainable basis in the applicable area in the relevant period (tonnes)

In furtherance:

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

$$NRB = H - RB$$

Where:

H = Total consumption of woody biomass in the applicable area in the relevant period (tonnes)

NRB = Quantity of non-renewable biomass consumed in the applicable area in the relevant period (tonnes)

RB = Quantity of renewable biomass that is available on a sustainable basis in the applicable area in the relevant period (tonnes)

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

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

Where:

HW = Average consumption of wood fuel per household, including fuelwood and charcoal, in the applicable area in the relevant period (tonnes//household)

CE = Commercial woody biomass consumption for energy applications (e.g. commercial, industrial or institutional uses of woody biomass in ovens, boilers etc.) that are extracted from forests or other land areas in the applicable area in the relevant period (tonnes)

NE = Commercial woody biomass consumption for non-energy applications (e.g. construction, furniture) that are extracted from forests or other land areas in the applicable area in the relevant period (tonnes)

N = Number of households consuming wood fuel within the applicable area in the relevant period (number)

Estimation the quantity of renewable biomass available (RB)

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

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

Where:

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

Estimation of total consumption of woody biomass (H)

Fuel Wood Consumption based on secondary literature[18]	13.67 million tonnes/ yr	https://fsi.nic.in/cover_2011/chapter7.pdf
In accordance to paragraph 13 of Tool 30 household fuel wood consumption can be considered based total household wood fuel consumption based on official statistics in case disaggregated values for HW (Average consumption of wood fuel per household) and N (Number of households consuming wood fuel within the applicable area) separately. State of Forest Report 2011 published by Forest survey of India (a subsidiary of MoEFCC, GoI) is the latest published literature outlining the said information in regard to fuel wood demand, therefore the said value is considered for estimation of fNRB in accordance to paragraph 10 of the Tool that allows different vintage in case of unavailability of data/information. Although disaggregated data of HW and N were not available separately, but "Number of households consuming wood fuel within the applicable area" were estimated from different secondary literature source and methodology default of per capita firewood consumption were used to estimate the total fuel wood demand. Since the estimated value of fire wood/ firewood consumption of 19.72 million tonnes/yr is higher than the wood consumption figure represented in the secondary literature i.e 13.67 million tonnes/ yr the value obtained from the secondary statistics is being conservatively considered.		
Commercial wood consumption [19]	1.149 million tonnes	https://fsi.nic.in/cover_2011/chapter7.pdf
In accordance to paragraph 13 of Tool 30 commercial wood demand is obtained from State of Forest Report 2011 published by Forest survey of India (a subsidiary of MoEFCC, GoI). Since the said version/volume of the report is the latest published literature outlining the said information in regard to commercial fuel wood demand therefore the said value is considered for estimation of fNRB in accordance to paragraph 10 of the Tool that allows different vintage in case of unavailability of data/information.		
Total consumption of woody biomass (H)	15.1593 million tonnes	

Estimation of quantity of renewable biomass that is available on a sustainable basis

Parameters		Value	Unit	Source
Mean Annual Increment of above ground biomass of Indian Forest	$MAI_{forest,i}$ [20]	0.5	m^3/ha/yr	Publication by Forest Dept, Govt of Tamil Nadu

[18] Household firewood consumption were also estimated based on the percentage of population using fire wood, total number of rural households and methodology default of per capita firewood consumption. Since the estimated value of fire wood/ firewood consumption of 19.72 million tonnes/yr is higher than the wood consumption figure represented in the secondary literature the same is being conservatively considered.

[19] Details of category wise commercial wood consumption is presented in the fNRB estimation sheet.

[20] https://www.forests.tn.gov.in/app/webroot/img/Yield%20table%20for%20few%20tree%20species%20grown%20in%20farm%20settings.pdf

Parameters		Value	Unit	Source
Density[21]		0.64	t/m^3	Appendix 1 - List of wood densities for tree species from tropical America, Africa, and Asia. (fao.org)
Mean Annual Increment of woody biomass growth per hectare in subcategory i of forest areas in the relevant period	$MAI_{forest,i}$	0.33	t/ha/yr	Calculated
Mean Annual Increment of woody biomass growth per hectare in subcategory i of other land areas in the relevant period	$MAI_{other,i}$	0.32	t/ha/yr	Calculated
Recorded Forest Area[22]		9,468,900	ha	State of Forest Report 2021 (most recent publication)
Reserved Forest [23]		6,188,600	ha	State of Forest Report 2021 (most recent publication)
Protected Forest [24]		3,109,800	ha	State of Forest Report 2021 (most recent publication)
% of Recorded Forest Area under Reserved Forest		65.36%		Calculated
% of Recorded Forest Area under Protected Forest		32.84%		Calculated
Extent of forest[25]	$F_{forest,i}$	6,477,200	ha	State of Forest Report 2021 (most recent publication)
Area under open forest [26][27]		2,832,600	ha	State of Forest Report 2021 (most recent publication)
Extent of Non-Accessible Forest[28]	$P_{forest,i}$	3,578,997	ha	State of Forest Report 2021 (most recent publication)

[21] Appendix 1 - List of wood densities for tree species from tropical America, Africa, and Asia. (fao.org)

[22] https://fsi.nic.in/isfr-2021/chapter-1.pdf
[23] https://fsi.nic.in/isfr-2021/chapter-1.pdf
[24] https://fsi.nic.in/isfr-2021/chapter-1.pdf
[25] https://fsi.nic.in/isfr-2021/chapter-13.pdf
[26] https://fsi.nic.in/isfr-2021/chapter-13.pdf
[27] Although open forest area is classified under Recorded Forest of which 65.36% are reserve forest and 32.84% are protected forest but considering the canopy density of open forest between 10-40% it is considered that open forest is subjected to anthropogenic deforestation and therefore not considered as inaccessible
[28] https://fsi.nic.in/isfr-2021/chapter-13.pdf

Parameters		Value	Unit	Source
Extent of other land	$F_{other,i}$	2,077,500	ha	State of Forest Report 2021 (most recent publication)
Extent of non-accessible area	$P_{other,i}$	0	ha	
Quantity of renewable biomass that is available on a sustainable basis in the applicable area in the relevant period (tonnes)	RB	1,616,675	tonnes	Calculated

Regarding the Mean Annual Increment (MAI) of above-ground biomass, as per Table 5 of TOOL 30, the "Source of data" option (d) is utilized, i.e., "National studies or government data or official statistics." PP has also adhered to a QA/QC procedure in line with Table 5 of TOOL 30. A comparison of values with FAO and IPCC defaults was attempted, but the following observations were made:

The Global Forest Resources Assessment 2000 by FAO (Table 1429[29]) lists only the percentage distribution of forest types by country and does not provide sufficient data for effective conclusions about MAI, making it unsuitable for comparison. The MAI values listed for above-ground biomass growth rates in the 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories[30] (Above-ground biomass growth rates for different ecological zones) pertain to the Asia region as a whole, rather than specifically to India. Hence, a direct comparison with Indian government data was not possible.

Estimation of $F_{NRB,y}$

Total consumption of woody biomass in the applicable area in the relevant period (tonnes)	H	15.16	million tonnes
Quantity of renewable biomass that is available on a sustainable basis in the applicable area in the relevant period (tonnes)	RB	1.62	million tonnes
Quantity of non-renewable biomass consumed in the applicable area in the relevant period	NRB	13.54	million tonnes
Fraction of non-renewable biomass	FNRB	89.34%	

In accordance to Paragraph 6.b of Tool 30, the value of the estimated FNRB for the project area is required to be compared with the literature referred to in the Tool and is outlined as follows:

Comparison of the calculated value against scientific literature

Delineation of project boundary for fNRB estimation

Fraction of woody biomass that is established as non-renewable is estimated in accordance to the guidelines stipulated under Tool 30. The basis of estimation of the fraction of non-renewable biomass includes estimation of the proportion of the biomass consumed that have not been sustainably extracted/harvested. It's worthwhile to note that fuel wood consumption (Bošković, Chakravorty, Pelli, & Risch, January 2023) are the major drivers of deforestation in India and are result of unsustainable extraction/harvest. The consideration of the subnational/ state boundary for estimation of fNRB is based on the delineation of forest boundary by Government of India for the purpose of regulation and

[29] FAO Global Forest Resources Assessment 2000 by the FAO for "Distribution of total forest area by ecological zone" (Table 14)

30 https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/4_Volume4/19R_V4_Ch04_Forest%20Land.pdf

conservation of the forest. In addition, following justification are also outlined to establish the consideration of subnational boundary for estimation of fNRB.

1. The ecological conditions differ at the subnational level in India resulting in difference in the mean-annual increment/ growth of wood biomass within and outside forest area resulting in the difference of the sustainably extraction potential of woody biomass across a defined geography. This is also justified by the fact the availability of the land area under forest and for trees outside forest differs across state resulting in the difference of the sustainably extraction potential of woody biomass to cater the local demand of wood.
2. The "forest" although on Concurrent list of Indian Constitutions its delineation/ boundary is defined at a subnational level. As the regulatory provision of Forest Conservation Act 1980 and Forest Conservation Rules 2003 allowing wood harvest are supervised by the State Forest Department, it does not allow cross boundary wood extraction/harvest and therefore the state boundary is considered for estimation of the supply provision.
3. The regulatory provision as stipulated under "The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006" allows collection of NTFP including firewood for traditional forest dwellers only , thereby restricting the forest rights locally without provision of cross boundary collection.
4. Since most of the woody biomass used as fuel wood (mostly at the village and peri urban area) are collected locally therefore the state/subnational boundary is most appropriate for estimation of fuel wood demand and supply.

Also, as per para 6 b of tool 30, the selection of project area is allowed (the country/region or the project area (hereinafter referred as the applicable area)), thus consideration of state for calculation of fNRB is appropriate.

Comparison of the calculated value against scientific literature.
fNRB is estimated as ratio of the Quantity of non-renewable biomass (NRB) consumed in the applicable area and summation of the quantity of non-renewable biomass (NRB) and quantity of renewable biomass (RB). NRB as specified under the tool is estimated as difference of total consumption of woody biomass (H) and quantity of renewable biomass. In accordance to paragraph 6 of tool 30 the section below compares and analyse the calculated values against the values for fNRB reported in relevant scientific literature and justify the differences

1. Total Wood Consumption
   a. The entire rationale of fNRB is developed around the unsustainable extraction/ harvest of wood for fuels and for commercial applications. As per the relevant scientific literature (Bailis, Drigo, & Ghilardi, 2015) referred to under Tool 30, the fNRB or rather NRB (as stated in the report) is estimated based on the wood fuel demand (only) considering 2009 as base year[31]. In accordance to equation 3 of Tool 30 the total wood demand is to be estimated as sum of average consumption of wood fuel per household, including fuelwood and charcoal, commercial woody biomass consumption for energy applications and commercial woody biomass consumption for non-energy applications and not only the demand of wood fuel as has been considered in the literature. Since estimate of fNRB is directly proportional to quantity of wood consumed the consideration of wood fuel only might have resulted in lower fNRB value presented in the literature in compared to that have been estimated for the purpose of estimation of GHG emission avoidance. The table below presents wood consumption in the state of Madhya Pradesh based on secondary information.

Consumer type	Quantity	Cumulative Consumption	Percentage of total consumption

[31] Pg 2 of the relevant literature

Domestic	13.67 million tonnes	13.67 million Tonnes32	83%
Commercial Wood Consumption	1.494 million tonnes	1.78 million Tonnes33	7%

b. The total consumption of woody biomass in the state of Madhya Pradesh is conservatively considered from report published by MoEFCC (Ministry of Environment, forest and Climate Change, Government of India) in 201134 (MoEFCC, 2011) is more recent data in compared to that used in the referred literature (2009 data35 extracted from wood fuel demand available from national and sub-national studies supplemented by data from the Food and Agriculture Organization (FAO), International Energy Agency (IEA), and United Nations (UN)). Since the publication of the wood demand by MoEFCC (Official statistics) is line with the provision of Data / Parameter table 1 of Tool 30. Therefore, consideration of the information related to wood consumption is deemed to be appropriate.

c. Moreover, cross verification has been made to assess the wood fuel demand (83% of the cumulative wood demand)36 in the state Madhya Pradesh using alternate approach as specified under Equation 3 of the Tool 30 and the MoEFCC estimated value of fuel wood demand for the state of Madhya Pradesh are found to be more conservative and used for the estimation of the total consumption of woody biomass

Parameters	Value	Unit	Source	
Total Population	72626809	Nos.	Census 2011	https://censusindia.gov.in/census.website/data/census-tables
Rural Population	52557404	Nos.	Census 2011	https://censusindia.gov.in/census.website/data/census-tables
Total Household	15093256	Nos.	Census 2011	https://censusindia.gov.in/census.website/data/census-tables
Rural Household	11080278	Nos.	Census 2011	https://censusindia.gov.in/census.website/data/census-tables
Persons/household (Rural)	4.74			
Rural Household using firewood	93.8%		NSS Report No. 558: Household Consumption of Various Goods and Services in India, 2011-12	https://www.mospi.gov.in/sites/default/files/publication_reports/Report_no558_rou68_30june14.pdf
Default per capita firewood usage	0.4	ton/ capita	Tools for fNRB calculation	

[32] https://fsi.nic.in/cover_2011/chapter7.pdf

[33] https://fsi.nic.in/cover_2011/chapter7.pdf

[34] *India State of Forest Report.* https://fsi.nic.in/cover_2011/chapter7.pdf.

[35] Pg 2 of the referred literature

[36] Against wood fuel demand specified in the MoEFCC report

Parameters	Value	Unit	Source	
Default per capita firewood usage	0.4	ton/ capita	Tools for fNRB calculation	
Rural Household firewood usage	1.897	tonne/ annu m		
Total Firewood usage (rural)	19.72	million tonnes		
Total Firewood usage	19.72	million tonnes		

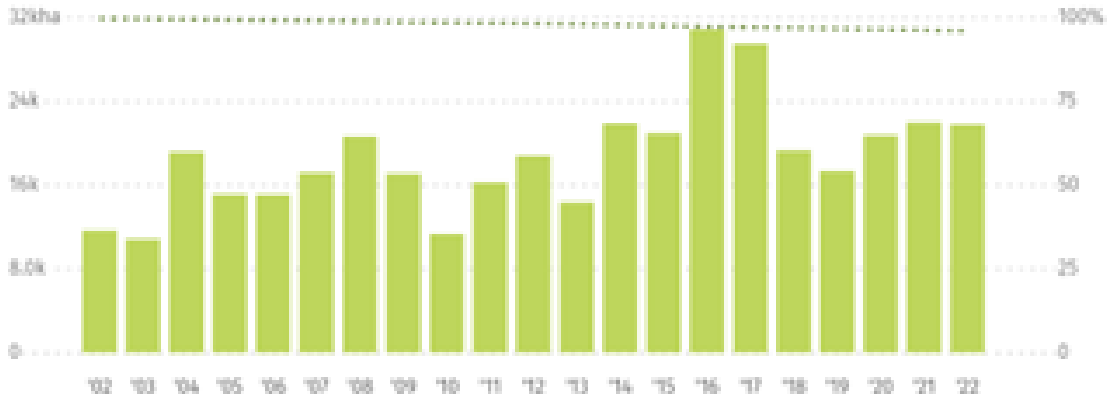
Therefore, from above it can be inferred that the value of fuel wood consumption considered for estimation of fNRB are more conservative and authentic (as published by Govt of India entitled agency).

2. Estimation of Renewable Biomass

In accordance to Paragraph 19, Equation 4 of Tool 30 renewable biomass (RB) available in the applicable area is estimated as factor of annual Increment of woody biomass in forest and non-forest area. The Renewable biomass component as estimated under the project activity considers plantation across both forest and non -forest area published by MoEFCC in 2021 and mean annual increment of different Indian forest type published for national level. On the other hand, the renewable biomass component as estimated in the referred literature is based on the satellite image of a particular locations during 2009.

The quantum of renewable biomass available in a particular geography is a factor of deforestation. The status of deforestation in India as articulated below through review of secondary literature is in contradiction to referred literature (Bailis, Drigo, & Ghilardi, 2015) that highlight the afforestation aspects of state forest in India.

In accordance to Global Forest Watch[37], India lost 393 kha of humid primary forest between 2002-2022 making up 18% of its total tree cover loss in the same time period and equivalent to decrease in total area of humid primary forest in India by 3.9%. The year wise deforestation is presented in the figure below.



The deforestation also includes loss of 2.19 Mha of tree cover, equivalent to a 5.6% decrease in tree cover since 2000. The deforestation in the country is also confirmed by report published by “Down to Earth” which outlines a deforestation of 668,400 hectares (ha), between 2015 to 2020 (2nd country after

[37] https://www.globalforestwatch.org/dashboards/country/IND/?category=undefined

Brazil)[3839]. The deforestation is inordinately high when compared to the 384,000 ha of forests between 1990 and 2000.

3. Difference in AGB

AGB/ Above Ground Biomass is the key component for estimation of Renewable biomass in the referred literature and clearly articulate the difference with the nationally published statistics

Referred Literature	India State of forest Report 2021
15067 million tones	2319 million tonnes

Since RB is inversely proportional to fNRB estimate therefore higher RB is resulting in lower fNRB as depicted in the referred literature.

State wise AGB is presented in the table below:

State wise AGB[40](Source: Chapter 13, State of Forest Report 2021, by the Forest Survey of India, an organisation under the Ministry of Environment, Forest and Climate Change (MoEFCC), Govt of India)

State/UT	AGB (million Tonnes)
Andhra Pradesh	63.951
Arunachal	340.351
Assam	87.07
Bihar	14.743
Chhattisgarh	152.714
Delhi	0.263
Goa	8.863
Gujrat	28.602
Haryana	2.326
Himachal Pradesh	114.269
Jharkhand	51.017
Karnataka	122.741
Kerala	61.802
Madhya Pradesh	171.587
Maharashtra	137.831
Manipur	47.59
Meghalaya	55.241
Mizoram	48.157
Nagaland	39.339
Odisha	131.015
Punjab	3.42
Rajasthan	26.714
Sikkim	18.024
Tamil Nadu	60.459
Telangana	44.413
Tripura	24.349

[38] https://www.downtoearth.org.in/news/wildlife-biodiversity/india-lost-668-400-ha-forests-in-5-years-2nd-highest-globally-report-88337

[39] https://indiacsr.in/india-has-lost-around-668400-hectares-of-forestry-to-deforestation-2nd-highest-in-the-world/

[40] Above Ground Biomass

State/UT	AGB (million Tonnes)
UP	32.543
Uttarakhand	159.674
WB	45.365
Andaman	47.56
Chandigarh	0.047
Dadra NH	0.558
J&K	163.897
Ladakh	13.293
Lakshadweep	0.046
Puducherry	0.076
Total AGB	2319.91

4. Approach of Estimating fNRB

In accordance to the referred literature recent maps of land cover and ecological zones are being assigned an AGB stock using three types of sources 1) AGB distribution maps, 2) geo-referenced field plots, and 3) forest inventories from known locations for specific forest types where AGB distribution was derived from different datasets. To accommodate disagreements in the datasets, woody components not typically used for woodfuels (twigs, leaves, and stumps), to build a map of "Dendro-energy" biomass (DEB) stock are subtracted. The wood fuel supply is then estimated as the "mean annual increment" (MAI) of DEB, which is modeled via a functional relationship between ~2,800 spatially explicit field observations of MAI and corresponding AGB. Land cover change is accommodated by estimating the amount of DEB produced by deforestation and afforestation processes based on data from FAO using data from Forest Monitoring for Action (FORMA). Such approach although a peer-reviewed is not in line with paragraph 19 that outlines the approach for estimation of quantity of renewable biomass.

Conclusion

The above justification clearly articulates the appropriateness of the fNRB estimate in line with the Tool 30. It is also to be noted that project proponent has used most recent data available for calculation of Fnrb which is in line with para 10 of tool 30 which says "*10. In the case of ex ante calculation of fNRB, the parameter fNRB shall be estimated using the most recent historical year for which data is available*"

Analysis with other relevant literature

Since there are no other publicly available literature outlining the value of fNRB for the state of Madhya Pradesh therefore comparison has been presented with the value of FNRB with which ICS projects are registered under VERRA .

Comparison of fNRB of the current project with other registered project activity:

Given the absence of other publicly available literature outlining the value of fNRB for the state of Madhya Pradesh, India, a comparison has been made with the fNRB values under which ICS projects are registered with VERRA in the table below.

PROJECT ID	VCS 2942	VCS 2944	VCS 2473	VCS 2754	VCS 2533
f_{NRB} for Madhya Pradesh	89.2%	89.2%	93.1%	92.87%	90.10%

The comparison of the fNRB for the current project with other registered project activities clearly shows that the value of 89.2% is more conservative. This is evidenced by its consideration by PP for the recently registered projects VCS 2942 & VCS 2944. Therefore, in line with a conservative approach, a value of 89.2% for fNRB has been chosen for this project activity instead of the calculated value of 89.34%, which was determined by PP while addressing the PRR comments.

Determination of emission reductions by ICS of year1 during year y

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

Where:

$NCV_{wood\ fuel}$ = 0.0156 TJ/tonne

$f_{NRB,y}$ = 89.20%

$EF_{wf,CO2} + EF_{wf,non\ CO2}$ = 112 + 26.23 = 138.23 tCO_2/TJ

$B_{ysaivngs,i,j}$ = 2.7827

$N_{y,i,y}$ = 18,000

1st year estimation (y=1)

$ER_{y,i,j}$ = 2.7827X 0.0156 X 89.20% X 138.23 X 18,000 X 0.95

$ER_{y,i,j}$= 91,527 tCO_2e (Round-down value)

Year	$B_{y,savings,i,j}$	$NCV_{wood\ fuel}$	$f_{NRB,y}$	$EF_{wf,CO2} + EF_{wf,non\ CO2}$	$N_{y,i,j}$	$ER_{y,i,j}$
1	2.7827	0.0156	89.20%	138.23	18,000	91,527
2	2.7434	0.0156	89.20%	138.23	18,000	85,722
3	2.7045	0.0156	89.20%	138.23	18,000	80,058
4	2.6659	0.0156	89.20%	138.23	18,000	74,534
5	2.6278	0.0156	89.20%	138.23	18,000	69,146
6	2.5900	0.0156	89.20%	138.23	18,000	63,892
7	2.5526	0.0156	89.20%	138.23	18,000	58,772

The above ER estimation for project activity instances is with consideration of 18,000 ICS quantity and is presented below.

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
Year 2023-24 (22-January-2023 – 21-January-2024)	91,527	0	0	91,527
Year 2024-25 (22-January-2024 – 21-January-2025)	85,722	0	0	85,722
Year 2025-26 (22-January-2025 – 21-January-2026)	80,058	0	0	80,058
Year 2026-27 (22-January-2026 – 21-January-2027)	74,534	0	0	74,534
Year 2027-28 (22-January-2027 – 21-January-2028)	69,146	0	0	69,146

Year 2028-29 (22-January-2028 – 21-January-2029)	63,892	0	0	63,892
Year 2029-30 (22-January-2029 – 21-January-2030)	58,772	0	0	58,772
Total	523,651	0	0	523,651
Total number of crediting years				7
Average annual ERs				74,807

6 MONITORING

6.1 Data and Parameters Available at Validation

Data / Parameter	$f_{NRB,y}$
Data unit	Fraction
Description	Fraction of woody biomass that can be established as non-renewable biomass
Source of data	Estimated in accordance to methods stipulated under Tool 30: Calculation of the fraction of non-renewable Biomass Version 04.0.
Value applied	For Madhya Pradesh – 89.20% (calculated as per meth tool)
Justification of choice of data or description of measurement methods and procedures applied	This parameter is determined ex-ante based on the calculation approach recommended under Tool 30 version 4.0. As per of methodological tool, the value is calculated as per the following Equation $f_{NRB,y}$ = NRB/(NRB+DRB)
Purpose of Data	Calculation of emission reductions
Comments	Input value used for estimation of wood usage and quantity of renewable biomass that is obtained from State of Forest report (Forest Survey of India Ministry of Environment, Forest & Climate Change, GoI,) If the future project activity instances are expanded in other parts of India, then this parameter value will be calculated during future project activity instances inclusion.

Data / Parameter	$NCV_{wood\ fuel}$
Data unit	TJ/tonne
Description	The net calorific value of the non-renewable woody biomass that is substituted or reduced
Source of data	Methodology default (2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 1 Introduction)
Value applied	0.0156
Justification of choice of data or description of measurement methods and procedures applied	Methodology default based on IPCC default value
Purpose of Data	Calculation of emission reductions

Comments	The parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{wf,CO2}$
Data unit	tCO_2/TJ
Description	CO_2 emission factor for the use of wood fuel in the baseline scenario
Source of data	Methodology default (2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion)
Value applied	112
Justification of choice of data or description of measurement methods and procedures applied	Methodology default based on IPCC default value
Purpose of Data	Calculation of emission reductions
Comments	The parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{wf,non\ CO2}$
Data unit	tCO_2/TJ
Description	Non-CO_2 emission factor for the use of wood fuel in the baseline scenario
Source of data	Methodology default (2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion)
Value applied	26.23
Justification of choice of data or description of measurement methods and procedures applied	Methodology default based on IPCC default value
Purpose of Data	Calculation of emission reductions
Comments	The parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$\eta_{old,i,j}$
Data unit	Fraction
Description	The efficiency of baseline cookstove
Source of data	Methodological default value
Value applied	0.1
Justification of choice of data or description of measurement methods and procedures applied	A default value of 0.1 shall be used if the baseline device is a three-stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney.

	During the beneficiary selection, it is observed that the baseline device was a three-stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney, hence default value of 0.1 is considered for Efficiency of the baseline cookstove.
Purpose of Data	Calculation of emission reductions
Comments	The parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	η_p
Data unit	Percentage
Description	The efficiency of the project stove at the start of the project activity.
Source of data	Manufacturer's specification
Value applied	36.42%
Justification of choice of data or description of measurement methods and procedures applied	The ICS is also tested at IIT Delhi as per BIS protocol and the tested efficiency is assed to be 36.42%
Purpose of Data	Calculation of $\eta_{new,y,i,j}$
Comments	This efficiency is for the cook stove model considered for project activity instances implemented. If the manufacturer changes the cook stove model, the respective model efficiency will be considered for ER calculations for new project activity instances.

Data / Parameter	DF_n
Data unit	Fraction
Description	Discount factor to account for efficiency loss of project cookstove per year of operation (fraction).
Source of data	As per methodology, the default value of 0.99 efficiency loss per year
Value applied	0.99
Justification of choice of data or description of measurement methods and procedures applied	The methodology default factor is used.
Purpose of Data	Calculation of $\eta_{new,y,i,j}$
Comments	The parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	Life Span
Data unit	Years

Description	Operating lifetime of project device for projects opting Equation 5 for determining project stove efficiency
Source of data	Manufacturer's specification
Value applied	7
Justification of choice of data or description of measurement methods and procedures applied	The operating lifetime is considered based on manufacturer specification.
Purpose of Data	Calculation of $\eta_{new,y,i,j}$
Comments	The parameter is fixed ex-ante for the entire crediting period

6.2 Data and Parameters Monitored

Data / Parameter	$N_{y,j,j}$
Data unit	Number
Description	Number of project devices of type I and batch j operating during year y
Source of data	Monitoring (Sample survey)
Description of measurement methods and procedures applied	Measured based on a representative sample. In accordance to section 8.4 of the methodology, since the population size is more than 1000 therefore the sample size of 100 population/beneficiary is opted for.
Frequency of monitoring/recording	At least once every two years
Value applied	18,000
Monitoring equipment	Sample survey (Sample survey was carried out using structured questionnaire)
QA/QC procedures applied	As per paragraph 8.4 of the methodology 100 sample size is being proposed however oversamples i.e 125 total samples will be selected using random sample selection procedure, considering 25% non-response.
Purpose of data	Calculation of emission reductions
Calculation method	The proportion of operational stoves obtained from the survey is multiplied by the total commissioned stoves to arrive at this value
Comments	PP has distributed one ICS per household and the same is followed for each project activity instance.

Data / Parameter	$\eta_{new,y,i,j}$
Data unit	Fraction

Description	The efficiency of the improved cook stove type i and batch j implemented as part of the project activity
Source of data	Calculated as per equation 5 of methodology during year y
Value applied	
Justification of choice of data or description of measurement methods and procedures applied	This parameter shall be determined ex-ante. The average lifetime of the cookstove is 7 years.
Purpose of Data	Calculation of emission reductions
Comments	The estimation of efficiency is carried out using the equation below: $\eta_{new,y,i,j} = \eta_p \times (DF_n)^{y-1} \times 0.94$ The project opts to determine the efficiency using equation 5 given by methodology; therefore, it is not required to monitor this parameter via a Sampling survey. However, the grouped project activity provides the option to use a different model of cookstoves for new/ future project activity instances to be included, hence this parameter value may vary based on a different model of future instances. A default value of 0.99 efficiency loss per year can be considered In case of ICS model changes for new project activity instances, the efficiency of the new ICS model should be determined during the verification and the same will be considered for that project activity instance.

Year(y)	$\eta_{new,y,i,j}$
1	34.23%
2	33.89%
3	33.55%
4	33.22%
5	32.89%
6	32.56%
7	32.23%

Data / Parameter	$B_{y=1,new,l,j,survey}$
Data unit	Tonnes
Description	Annual quantity of woody biomass used by the project device (improved cook stoves) in tonnes per device of type i and batch j,
Source of data	Monitoring survey
Description of measurement methods and procedures applied	The value of $B_{y=1,new,l,j,survey}$ is determined in the first year of the implementation of the project through a sample survey. The sample size was selected in line with the guidelines provided in methodology Section 8.4 option (b).

	Determined in the first year of the introduction of the devices (e.g., during the first year of the crediting period, y=1) through measurement campaigns at representative households and/or sample surveys. Measurement of fuel wood consumption was carried out across all 111 randomly selected samples surveyed during the 1st monitoring period. The quantum of daily wood consumed by the households for all 111 beneficiaries are averaged to estimate the daily fire wood consumption. Since all the household were assessed to be using ICS for all meals throughout therefore the average daily consumption of firewood is used to estimate the annual firewood consumption.
Frequency of monitoring/recording	Determined in the first year of project implementation
Value applied	3.1458 kg/device/day or equal to 1.1482 tonnes/device/year.
Monitoring equipment	Weighing Scale **Details of the Weighing Scale-Serial No.**: EKI-01679 **Type**: Digital **Accuracy class**: 5 g (0-10 Kg), 10 g (10-50 Kg) **Latest Calibration**: 08-April-2023
QA/QC procedures applied	Calibrated weighing scale are used for the purpose of measurement.
Purpose of data	Calculation of emission reductions
Calculation method	This is monitored value
Comments	The monitored value will be archived for 2 years post issuance.

6.3 Monitoring Plan

Monitoring Approach

Monitoring under the project activity includes assessment of number of project device (ICS) operating during a particular monitoring period and quantity of firewood used by project devices will be estimated based on representative sample survey of the target population, in accordance to the simplified approach proposed in option (b) under Section 8.4 of the methodology. The entire responsibility of planning of the monitoring survey including deciding the sample size and identifying samples, rests on the PP.

Target Population

The target population includes beneficiary households provided with the ICS under the project activity.

Sampling Method

The project involves the distribution of ICS throughout the project area thereby replacing traditional cooking devices. The population is homogeneous in nature i.e., common technology with similar operating characteristics and dispersed in the same state and country. Since the characteristics of the population (for example quantity of biomass consumed) are more or less similar, therefore, a simple random sampling technique will be used to calculate the biomass consumption amongst the samples. Samples will be drawn by using the random number generator.

To determine the parameters, sampling will involve the following approaches

Parameter	Approach	Outcome
$N_{y,j,j}$	Visual inspection of the premises to see if ICS is operational and in use. Interview with the end user to verify that ICS is still in use	Yes/No
$B_{y=1,new,l,j,survey}$	Interview with the end user and estimate the daily consumption of woody biomass of ICS	Daily consumption of firewood

Sample Size

A simplified approach will be used for determining the minimum sample size for parameters listed under Section 9.2 of the methodology in which case it is not requisite for the sample size to meet confidence/precision requirements.

The project proponent has choose to use the same sample to monitor both parameters. According to the Standard for sampling and surveys for VCS project activities and programme of activities, if there is more than one parameter to be estimated, then a sample size calculation should be done for each of them. Then either the largest number for the sample size is chosen as a sampling effort with one common survey, or separate sampling efforts and surveys are undertaken for each parameter. Therefore the project proponent will sample a combination of two parameters i.e. $N_{y,j,j}$ and $B_{y=1,new,l,j,survey}$ in the same sample.

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

Sampling Frame

The sampling frames shall be defined below. Overall, ICS will have the same group of end users which is household users, thus it is expected that the geographical locations do not influence the parameter of interest. Therefore, all monitoring parameters can be assumed to be highly homogeneous for each ICS model regardless of how the end user group and distribution/installation location are defined.

Parameters to be Monitored

The monitoring under the project activity will include following assessment:

No.	Monitoring Parameters	Sampling parameters	Parameter type	Monitoring frequency	Methods to be applied

1	$N_{y,j,k}$ Number of project devices operating during year	The proportion of ICS is still in operation.	Proportion	Biennially (at least once in two years) - Monitoring will likely occur every 12 to 24 months	Visits to the premises, visual inspection, and interview with ICS end-user.
2	$B_{y=1,new,l,j,survey}$ Quantity of woody biomass used by project devices during year	Daily consumption of woody biomass per ICS	Mean value	In the first year of project implementation	Interview with the end user for determining the average quantity of firewood used in the project stove per week/day.

Soft copies of the surveys will be kept, and the database will have a backup. The original survey questionnaires filled by the survey team and signed by the users will be stored in the project office. A backup of the survey results will also be stored on an electric medium. All data monitored and required for verification and issuance will be kept for two years after the end of the crediting period or the last issuance of credits for the project activity, whichever is later.

Data collection and management methods

The methods for Distribution, Monitoring, and reporting data and parameters are described below.

1. Each distributed ICS is equipped with a label stating the unique serial number which is used for references and monitoring. The unique serial numbers provide the basis for monitoring activities and prevent instances of double counting.
2. The ICS is transported by the distributing entity around the Project site. Users receive the ICS through distributing entities. The ICS data management and collection procedure uses a safe, data storage system.

Quality Assurance/Quality Control

The project proponent will consider the non-response and the possible removal of outliers from the sample, as part of a Quality Control/Quality Assurance system. The choice of measure applied to each parameter will depend on the cost of each data collection approach and the logistics required. The project proponent will determine the most effective measure for each parameter from the following list:

- Oversampling: Randomly draw a sample more than the calculated number (say 25%) and collect data for each parameter
- Buffer Group: Randomly draw additional samples (say 25%) and collect data from only minimum numbers of ICS as per sample size calculation. If this would not result in the required sample size data would be collected from the additional ICS that were selected in the sample.

The sampling plan has the following procedures in place to ensure good-quality data. The project proponent will ensure that field personnel have reviewed, understand, and agreed to follow the monitoring plan procedures, including provisions for maximizing response rates and documenting out-of-

population cases, refusals, and other sources of non-response. A quality control and assurance strategy will be documented. Quality control and assurance strategies include addressing non-sampling errors, such as non-response or bias from the interviewer. The project proponent or a competent third party designated by the project proponent with the proper skills will train the monitoring personnel on how to properly survey households to prevent bias from the interviewer. In the case a household refuses to participate, another household will be chosen at random. To reduce interviewer bias, a good questionnaire design and well-tested questionnaires will be used. The surveyor at the site will get training from EKI for the monitoring survey, which includes interviewing the beneficiaries and weighing the wood to use with weighing equipment. Additionally, give weighing machine calibration instructions.

The sample data for the mean value parameter is continuous and therefore the presence of outliers is possible. To identify and address outliers for the parameter, outliers will be defined as those data points with values greater than three standard deviations from the mean of the sample. Data points identified as outliers will be examined further to correct for possible transcription and data entry errors but will be omitted from the analysis if no such administrative errors exist.

Monitoring questionnaires

The distributing entities record each sample ICS user's contact information and pertinent data on standardized monitoring questionnaires concerning the corresponding serial number of the ICS that was distributed.

For the first monitoring survey, the interviewer filled out the monitoring questionnaire manually. Further, for consecutive monitoring surveys, EKI will plan to collect the survey data using an app-based electronic device (e.g., mobile phone) at each sample household. Data recorded through a manual process will be recorded and transferred into the electronic database.

Stoves Users will be requested to provide the required information to the interviewer. Users can share their background information in several ways, including by speaking directly with designated focal points who may reside in their communities. This includes:

- Stove Serial No. /Unique ID, Date of ICS Receipt/onset of usage, Address, Beneficiary Name, etc.
- Improved Cookstove Specific Information such as the functioning of ICS, benefits observed from the use of improved cook stoves
- Traditional Cookstove Specific uses information
- Other Cooking fuel-specific information – LPG, Kerosene, etc.
- Fuel use pattern of your household – Purpose of fuel use
- Fuel Details – Quantity, sources, Cost, Quantity, Problem in collecting fuel, etc.

Analysis

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

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

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

Implementation

The project participant followed the simple random sampling approach and the minimum sample size was determined as per the following guidelines:

- Project target population < 300: Minimum sample size 30
- Project target population 300 – 1000: Minimum sample size 10% of group size
- Project target population > 1000: Minimum sample size 100

The simplified approach was used to determine the minimum sample size for parameters to be monitored so that for the sample compliance with 90/10 confidence precision is not obligatory.

As per the requirement of applied VCS methodology VMR0006, a minimum sample size of 100 is required to be surveyed for the project population greater than 1000. However, to get more accurate and reliable results, the project proponent selected 125 samples for Madhya Pradesh to conduct the 1st monitoring survey[41].

Sampling for emission reduction calculation and elaboration of the monitoring report occurred at the end of the monitoring period. This sampling was conducted by trained personnel from the project proponent. The credentials and/or training materials for the sampling personnel will be provided to the VVB at verification. The maximum length of one monitoring period will be two years (duration, not calendar years), with an option for annual or biennial monitoring. However, the project proponent will plan to conduct the monitoring survey annually, The project proponent is responsible for managing household data collection and entry into the project database. Field personnel received training on how to properly deal with surveying techniques and reduce errors and checked that there is no conflict of interest among those involved in data collection and analysis. The project proponent will record the start and end dates of each monitoring period and calculate the emission reductions attributable to each monitoring period.

The operation team of project proponent selected the survey samples randomly using excel/online software. To get more reliable results, the project proponent has selected 125 samples for Madhya Pradesh) instead of considering the minimum sample size of 100. Furthermore, 25% of oversamples were selected considering non-response.

[41] Survey was carried out across 111 households

The training to understand the survey process, for awareness of the questions to be asked, and for the measurement of fuelwood consumption on the project stove, was conducted for the survey team before starting the monitoring survey. The survey team visited the sample households in person and collected the required information as per the questionnaire with the person using the cookstove. For the assessment of fuelwood consumption on the project cookstove, the surveyor asked to end user to make a bundle of fuelwood required in a day for the project stove and then weighed the same using the weighing scale. The survey team was equipped with a pre-calibrated weighing scale for weighing the fuelwood

Survey results:

The following parameters were obtained through sampling:

1. $N_{y,i,j}$: Number of stoves in operation
2. $B_{y=1,new,i,j,survey}$: Quantity of woody biomass used by improved cookstoves

125 samples were selected (considering 25% non-response) from Madhya Pradesh for all monitoring parameters by section 8.4 option (b) of the applied methodology VMR0006. The survey team has surveyed 111 samples each on the ground from the 125 selected samples. The objective was to obtain reliable and unbiased estimates of the monitoring parameters.

A single homogeneous population was considered for both parameters.

The following table summarizes the sample sizes and results.

Monitored Parameter	Number of beneficiary /ICs surveyed (Sample size)	Beneficiary observed to be using ICS	Survey Result
Number of stoves in operation ($N_{y,i,j}$)	111	111	100% of the beneficiary were observed to be using ICS
Quantity of woody biomass used by improved cookstoves ($B_{y=1,new,i,j,survey}$)	111	Average wood consumption is estimated based on the monitoring of wood consumption for each beneficiary of the monitored sample	3.15 Kg/day/stove

Appropriate record-keeping procedures have been implemented to ensure that each monitoring period data set can be transparently attributed to its corresponding project, preventing any occurrences of double counting. An internal review of the project database was conducted to determine the current status of each device — the duration of previous monitoring periods, the households delivering monitoring data, and current verification activities.

Assessment for Leakage

The methodology provides a net-to-gross adjustment factor of 0.95 to account for leakages, hence the surveys are not required to determine leakage.

The other source of leakage occurs if equipment currently being utilized is transferred from outside the boundary to the project activity. All ICSs in the project are newly manufactured/assembled or newly installed, thus no leakage is applicable.

Monitoring and Reporting

The project proponent will assess all monitoring data and produce a monitoring record for the VVB to verify the corresponding to the preceding monitoring period. This record will present the data relating to the survey results conducted for the respective monitoring period.

The purpose of the monitoring plan is to ensure successful monitoring of the emission reductions of the proposed project during its crediting period. The overall monitoring will be managed by the project implementer EKI Energy Services Ltd. (EKIESL)

Activities and performance related to emissions reduction are monitored by EKIESL. The PP proposed the following roles and responsibilities for data monitoring, collection, data archiving, and calibration of equipment for these project activity instances.

The monitoring activities will involve data collection during distribution as well as usage information post-distribution. The data collected during distribution also involves information about the stove, the end user, and the location to enable one to uniquely identify each ICS unit and avoid double counting.

Repair and Maintenance

EKIESL/its representative will plan to establish a service center at the project location where end users can repair the cookstoves and can use them further. In case, the end user experiences any issues with the ICS, he or she can call the service center with the help of the customer service number available on the box ICS, to report the issues. After receiving a complaint, the maintenance team will take the necessary action immediately to resolve the issue. The repair and maintenance will be followed as per the manufacturer's recommendation. This will ensure that the cookstove will operate for a longer period.

Replacement

After 7 years of lifetime, a report from the manufacturer/maintenance agency will be provided to confirm the extended life of the cookstove. The project will claim credits beyond 7 years only for a balanced year

till the cookstove is replaced by new cookstoves. The cook stove may also be replaced during its lifetime in case if the devices become nonoperational and the devices can't be repaired.

Monitoring of Improved cook stove operation

EKIESL/its representative will distribute the stoves, as well as carry out the monitoring activities that occur during the distribution of stoves. EKIESL or through their associates will ensure that the distributor is trained on how to capture the end-user data. The project activity implementer is fully responsible to ensure the correct distribution process and data gathering is followed.

EKIESL team will also plan to visit the site regularly to ensure proper use of stoves, take feedback and make the end user aware of their health and environmental sustainability as well as the benefits of saving time and money with the use of ICS. The team will also check the grievances of the local stakeholders from the project activity and will try to resolve those issues on the ground.

The following information will be recorded at the time of distribution of ICS to the user:

- Name of the User
- Total Family Members
- Location/Address
- Installation Date
- Unique ID

Once ICS is distributed, monitoring activities will involve selecting a sample of the stove from the distribution record and visiting the premises where these stoves are located to monitor key parameters pertinent to ER Calculation. The individuals carrying out the monitoring activities will follow instructions provided during training, to check and record the following key parameters:

- Check if project stoves are operational and in use
- Check if there is any ongoing use of replaced stoves.

Check biomass consumption of new cookstove Data collecting & handling are conducted in a transparent way to secure the high quality of recording and storing of data. Data collected and monitored are stored electronically in a secure and retrievable manner for at least two years after the end of the project crediting period. Uncertainty related to data handling (if any) would be rectified, if necessary, by revising monitoring procedures. The changes would be approved by a verifier (e.g., VVB)

The roles and responsibilities of different participators are proposed to be as follows:

Entity/Person	Roles & Responsibilities
EKIESL	• VCS documentation development • Communicate with VERRA for all VCS related matters • Communicate with VVBs for validation & verification • Identify local partners for local representation and support • Identity suitable ICS manufacturers • Design the distribution plan for on-ground implementation of ICS • Design the monitoring system (including data collection in an electronic database)

	• Training and development of local resources (as may be required) • Regular Monitoring and quality assurance of data • Monitor & supervise on-ground distribution, etc. • Annual Review meeting with Local Teams and other associated entities to ensure continuous improvements in the project activity
Distributor / Operational Team (Local Representative)	• To support & assist EKIESL in achieving the stated goal of the project activity • Assist and facilitate EKIESL in baseline data collection, efficiency testing, data of biomass consumption for new ICS through sampling survey, etc. • To be the local representative and communicate, act, and engage in implementation activities of project activity • To identify and deploy suitable local teams and resources for ICS distribution, data collection, regular spot-checks at households, etc. • Assist and facilitate EKIESL during the training of the Operational Team and capacity building across the end users. • To bridge any gap between end users of ICS and EKIESL to ensure the smooth operation of the program to achieve the overall objective of the project activity • ICS Distributor(s)–who will be responsible for deploying the ICS at the household and registering the end user in the digital tool. They will also be responsible for giving demonstrations of ICS use, discussing with the end users on its benefits, and educating them on the continued use of ICS and discontinuation of the use of conventional/traditional open firing practice. They will also conduct periodic check at households to gather feedback, address any technical concerns, collect necessary data, and transmit the information.
ICS Manufacturer or Supplier	• To design and develop ICS as per the required standard • To provide technical parameters and manufacturer's efficiency etc. at the time of supply • To educate and train the EKIESL team on the installation (delivery), uses, handling, etc. of the ICS in households.

7 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

7.1 Data and Parameters Monitored

Data / Parameter	$N_{y,i,j}$
Data unit	Number
Description	Number of project devices of type I and batch j operating during year y
Value applied:	

Number of ICS distributed	The proportion of ICS operational (based on sample survey)	Number of ICS operational during the monitoring period
18,000	100%	18,000

Comments	The proportion of operational stoves obtained from the survey is multiplied by the total commissioned stoves to arrive at this value. The survey will be conducted at least once every two years basis after the implementation of the project activity instance.

Data / Parameter	$\eta_{(new,y,i,j)}$
Data unit	Fraction
Description	The efficiency of the improved cookstove type i and batch j determined using equation 5 of applied methodology during year y
Value applied:	34.23%
Comments	No comments

Data / Parameter	$B_{y=1,new,i,j,survey}$
Data unit	Tonnes

Description	Annual quantity of firewood used by improved cookstoves in tonnes per device of type i and batch j, determined in the first year of the implementation of the project through a sample survey
Value applied:	For Madhya Pradesh – 3.1458 kg/device/day or equal to 1.1482 tonnes/device/year. Estimated based on the survey result
Comments	The survey was conducted to determine this value in the first year of project implementation.

7.2 Baseline Emissions

The methodology does not account for baseline emissions separately but instead quantifies net emission reductions achieved by the project. Please refer to Section 7.5 below.

7.3 Project Emissions

The methodology does not account for project emissions separately but instead quantifies net emission reductions achieved by the project. Please refer to Section 7.5 below.

7.4 Leakage

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

7.5 Net GHG Emission Reductions and Removals

PP has calculated the emission reduction for each ICS installed under the project activity separately.

In this section example of ER calculation of 1st project activity instances (stove serial number GHG-23/L4/0057353) is provided:

Date of installation: 22-January-2023
Location: Madhya Pradesh
For the year 2022, vintage for the stove: Vintage 1
No. of days for vintage 1: 99 (22-January-2023 to 30-April-2023)
Year fraction: 99/365 = 0.271

Determination of efficiency of ICS during 1st Year

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

Where

η_p = 36.42%
DF_n = 0.99

$\eta_{new,y,i,j}$ = 36.42% X (0.99)1$^{(1-1)}$ X 0.94

$\eta_{new,y,i,j}$ = 34.23%

Determination of the quantity of firewood that is saved in tonnes per ICS during 1st year

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

$B_{y=1,ew,i,j,survey}$ = 1.1482 tonnes/device/year

$B_{y,savings,i,j}$ = 1.1482 X [(0.3423/0.1) -1]
= 2.7827 tonnes/device/year

Period	$B_{y=1,new,i,survey}$	$\eta_{new,y,i,j}$	η_{old}	$B_{y,savings,i,j}$
22-January-2023 to 30-April-2023	1.1482	34.23%	0.1	2.7827

Determination of emission reductions

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

Where,

$NCV_{wood\ fuel}$ = 0.0156 TJ/tonne

$f_{NRB,y}$ = 89.20%

$EF_{wf,CO2} + EF_{wf,non\ CO2}$ = 112 + 26.23 = 138.23 tCO$_2$/TJ

Emission reduction per cookstove for year

$ER_{y,i,j}$ = 2.7827 X 0.0156 X 89.20%x 138.23 X 1 X 0.95
=4.9771

Emission reduction for the monitoring period for 1st project activity instances distributed on 22-January-2023

$ER_{y,i,j}$ = 2.7827 X 0.0156 X 89.20%x 138.23 X 1 X 0.95 X 0.271

$ER_{y,i,j}$= 1.379 tCO2

The total emission reductions for all the project activity instances are as below

Year	Baseline emissions or removals (tCO$_2$e)	Project emissions or removals (tCO$_2$e)	Leakage emissions (tCO$_2$e)	Net GHG emission reductions or removals (tCO$_2$e)
22-January-2023 to 30-April-2023	15,754	0	0	15,754
Total	15,754	0	0	15,754

Ex-ante emissions reductions/removals	Achieved emissions reductions/removals	Percent difference	Justification for the difference
23,251	15,754	-32.24%	All the project ICS were not installed/ commissioned on one date i.e on the first date of crediting period hence the emission reduction achieved during the monitoring period is lower than the emission reduction estimated ex-ante for the same period.

APPENDIX 1: CERTIFICATE OF ICS EFFICIENCY

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INDIAN INSTITUTE OF TECHNOLOGY DELHI
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Dr. S. K. TYAGI
Associate Professor

Ref. No: IITD/ IRD/RP04288N/2022/01
Date: 09.07.2022

To

Mr. Soumitra Kulkarni,
Director,
Swami Samarth Electronics Pvt. Ltd.
Plot No. M-63, MIDC, Ambad, Nashik,
Maharashtra, India

Subject: Testing results of solid biomass cookstove as per revised BIS protocols

Dear Mr. Kulkarni,

Plese find the below results of solid biomass cookstove Angeekaa Eco Mini Model 4 SE as per revised BIS protocols IS:13152: 2013.

Model No.	Type of Fuel	Efficiency (%)	$PM_{2.5}$ (mg/MJd)	CO (g/MJd)
Angeekaa Eco Mini Model 4 SE	Dry Wood*	36.42	285.25	4.02

* Provided by the cookstove manufacturer

The above results are the average values, obtained following the revised BIS testing protocols, mentioned above.

Thanking you,

Yours Sincerely,

S. K. Tyagi 9/7/22

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भारतीय प्रौद्योगिकी संस्थान दिल्ली
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