



**Verified Carbon
Standard**

DISTRIBUTION OF ENERGY EFFICIENT COOKSTOVE IN INDIA- 2

Document Prepared by

Greneity Infocom Service Pvt Ltd

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1 PROJECT DETAILS

1.1 Summary Description of the Project

A summary description of the technologies/measures to be implemented by the project.

The grouped project activity aims to replace the commonly used inefficient wood fired mud stove technology, with energy efficient cook stove, which is clean and sustainable. The project activity involves distribution of energy efficient cookstove to the rural population in India. The project will distribute ICS will be undertaken for households. It is intended that under this project high thermal efficient cook stoves will be distributed. The ICS distributed will burn wood more efficiently thereby improving thermal transfer to pots, hence saving fuel wood. This project will also halt the rapidly progressing deforestation in India but will also reduce health hazards from indoor smoke pollution and women and children will have to spend less time collecting firewood.

The target population is the rural population of India, those uses three stone fires cook stove and cannot afford these stoves, project participant has to heavily subsidize it or give it off free of cost. The end user will be 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.

The location of the project.

The project location will be various districts of Chhattisgarh, Bihar, West Bengal, Kerala, Karnataka & Odisha states of India. The planned project implementation schedule provided below. The project location details, KML files for various states in India, will be provided in VCS MR at the time of project activity instance inclusion during verification of project activity

Year State	2021	2022	2023	2024	2025
Chhattisgarh	10,000	10,000	10,000	10,000	10,000
Bihar	10,000	10,000	10,000	10,000	10,000
West Bengal			10,000	10,000	10,000
Odisha			10,000	10,000	10,000
Karnataka				10,000	10,000

Kerala					10,000
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An explanation of how the project is expected to generate GHG emission reductions or removals.

The ICS will additional the presently common cooking on open fire. The ICS burns wood more efficiently thereby improving thermal transfer to pots, hence saving fuel and lowering greenhouse gas emissions.

A brief description of the scenario existing prior to the implementation of the project.

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

In this monitoring period, 15,000 ICS Dattu Challah are disseminated in each Chhattisgarh and Bihar.

An estimate of annual average and total GHG emission reductions and removals.

The ICS number will vary during actual implementation and same will update during registration and verification of project activity. The average annual GHG emission reduction is 201,800 tCO₂e and total 2,018,006 tCO₂e for the group project activity over the entire crediting period.

1.2 Sectoral Scope and Project Type

The project is categorised under type/category 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 involves energy efficient cookstove distribution which falls under the category of efficiency improvements in thermal applications, therefore it is eligible under the scope of VCS Program. As per VCS Standard Version 4.3, efficiency improvements in thermal applications (e.g., cook stoves) are not excluded, hence project is eligible under VCS.

1.4 Project Design

☐ The project includes a single location or installation only

- ☐ The project includes multiple locations or project activity instances, but is not being developed as a grouped project
- ☒ The project is a grouped project

Eligibility Criteria

For grouped projects, the eligibility criteria for the inclusion of new project activity instances

No.	Criterion	How the new project activity instances to comply
1	Meet the applicability conditions set out in the methodology applied to the project	New project activity instances (will meet the applicability conditions set out in Section 3.2 where the target of the end-user is household and the ICS deployed is at least 25% of thermal efficiency.
2	Use the technologies or measures specified in the project description.	The technology used for project activity is energy efficient cook stoves. Only energy efficient cook stoves to be adopted in the project by replacing traditional cook stoves in rural household.
3	Apply the technologies or measures in the same manner as specified in the project description.	Only energy efficient cook stoves to be adopted in the project by replacing traditional cook stoves in rural households.
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 and subject to 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 host country of this project ensuring the distribution of new project activity instances. Step 2: Positive List

		The inclusion of new project activity instances will comply with positive list as it satisfies criterion 1 where it meets all the applicability conditions of the methodology.
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: 1) Each project activity instance that exceeds one percent of the capacity limit shall be identified. 2) Such instances shall be divided into clusters, whereby each cluster is comprised of any system of instances such that each instance is within one kilometer of at least one other instance in the cluster. Instances that are not within one kilometer of any other instance shall not be assigned to clusters. 3) 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, which is 180 GWh_{th}/y. The expected annual energy saving for each project activity instance is approximately 0.01 GWh_{th}/y As the annual energy saving is below 1% of the limit, therefore no project activity instance is identified and divided into clusters.

1.5 Project Proponent

Organization name	Greneity Infocom Service Pvt Ltd
Contact person	Shivani Garg
Title	Managing Director

Address	Dilshad Garden, 137-B, Pocket-A, Delhi 110095
Telephone	+91-9886252062
Email	Shivani.garg@greeneity.com

1.6 Other Entities Involved in the Project

Organization name	N/A
Role in the project	N/A
Contact person	N/A
Title	N/A
Address	N/A
Telephone	N/A
Email	N/A

1.7 Ownership

The project ownership is with Greeneity Infocom Service Pvt Ltd.

The ICS are distributed to end uses (Housholds) at free of cost. The end user 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. The participating households have signed declaration to transfer the ownership rights of the carbon assets generated from this project to the Greeneity Infocom Service Pvt Ltd, also undertaking is provided by Greeneity Infocom Service Pvt Ltd for projects ownership. The undertaking from manufacturer and distributor and end user agreement has been submitted to confirm that cook stove ownership is with Greeneity Infocom Service Pvt Ltd.

1.8 Project Start Date

01-04-2021 (The earliest date of commissioning date of ICS under this group project).

1.9 Project Crediting Period

First crediting period: 01-04-2021 to 31/03/2031, 10 years fixed crediting period.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

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

- ☐ <20,000 tCO₂e/year
- ☐ 20,000 – 100,000 tCO₂e/year
- ☒ 100,001 – 1,000,000 tCO₂e/year
- ☐ >1,000,000 tCO₂e/year

Project Scale	
Project	X
Large project	

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
Year 1	142111
Year 2	125979
Year 3	251657
Year 4	220358
Year 5	258382
Year 6	289497
Year 7	245450
Year 8	202663

Year 9	161116
Year 10	120791
Total estimated ERs	2018006
Total number of crediting years	10
Average annual ERs	201800

The above ER estimation is with consideration of 10,000 cook stoves and with 365 days per year with conservative 10% annual loss or non- operation of ICS assumption.

1.11 Description of the Project Activity

The project activity aims to replace the commonly used inefficient wood fired mud stove technology, with energy efficient cook stove, which is clean and sustainable. The project activity involves distribution of energy efficient cookstove to the rural population various districts of Chhattisgarh, Bihar, West Bengal, Kerala, Karnataka & Odisha, states, India. The project will distribute ICS will be undertaken for households. It is intended that under this project high thermal efficient cook stoves will be distributed. The ICS distributed will burn wood more efficiently thereby improving thermal transfer to pots, hence saving fuel wood. This project will also halt the rapidly progressing deforestation in India but will also reduce health hazards from indoor smoke pollution and women and children will have to spend less time collecting firewood.

The target population is the rural population of India, those uses three stone fires cook stove and cannot afford these stoves, project participant has to heavily subsidize it or give it off free of cost. The end user will be 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.

The project activity cook stoves are with same manufacturers and specifications of cook stoves will be provided during validation/verification or during inclusion of project activity instances. .

Technical Specifications of Cook Stoves

TECHNICAL DETAILS	
Cook Stove Type/Category	ICS -Dattu Chulah
	Natural Draft mechanism
Expected life of stove	5 Years
Thermal Efficiency	31.81%

S No	Part / Inputs	Materials used	Thickness (in mm)	Details of electric appliances/others*
1	Top Plate	Mild Steel	1.6 mm thick	*****
2	Grate	Cast iron	8 mm thick	*****
3	Pot Stand	Mild Steel	2 mm thick	*****
3	Barrel/Combustion Chamber Mild steel, ceramics, Pottery/Clay etc.)	Outer Barrel Inner Chamber Outer Cone Inner Cone (All material) Mild Steel	1.6 mm thick 1.6 mm thick 1.2 mm thick 2 mm thick 5 mm hole	Ours is a seven layer technology - • Air Curtain Insulation – 1.6 mm thick • Outer Shell MS Sheet – 1.6 mm thick • Ceramic Blanket – 12 mm thick • Inner shell MS – 1.6 mm thick • Hot Air Chamber – 36 mm • Outer cone Mild Steel - 1.6 mm thick • Inner cone Mild Steel (Perforated Sheet) - 2.0 mm thick (Burning Chamber)
4	Bottom Plate	Mild Steel	1.6 mm	
5	Perforated Sleeve Mild Steel	Inner cone Burning Chamber	2 mm thick 5 mm hole	
6	Insulation	Ceramic Blanket (1800 degree)	12 mm thick	
7	Long Handles	Insulated		
8	Height			290 mm
9	Diameter			240 mm
10	Weight of Stove			~ 8 - 10 KG
11	Accessories			Ash Tray, Cleaning Stick, operating knob, Operating Manuals and Warranty Card

Note*- PP has signed agreement with the manufacturer that after 5 years, all the cookstoves will be replaced with new cookstoves and recycling of the old cookstoves shall be borne by the manufacturer as per the recycling norms.

The details and specifications of respective cook stoves will be considered for ER calculation of project activity instance.

Data collection of ICS end-user

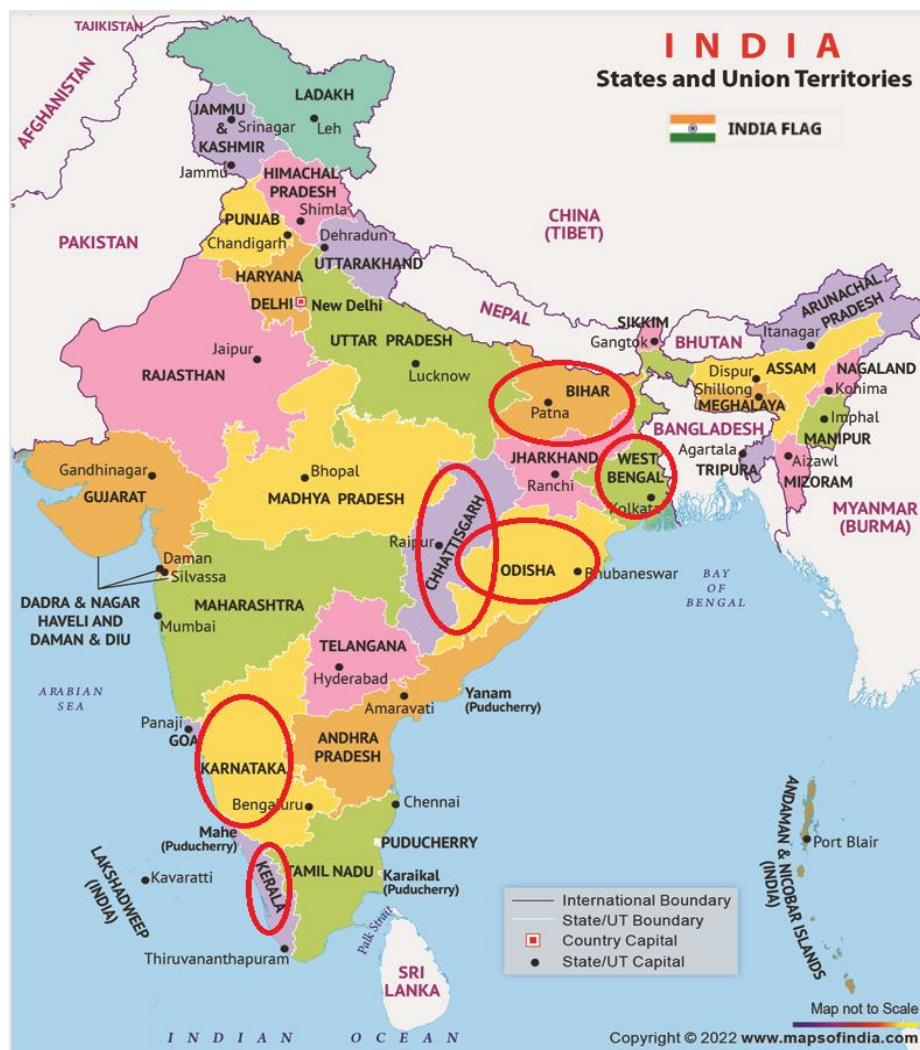
Each ICS will be assigned a unique serial number. This number will be recorded during the registration/installation process together with the following information (as appropriate and as available):

- Name of ICS user
- Address of the ICS household
- Stove model Distributed
- Date of distribution/installation
- ICS serial number

The information collected will be stored in the electronic database excel sheet which will serve as project database for project monitoring and sampling purposes. The traditional cook stoves were operational and this was the scenario prior to the implementation of project.

1.12 Project Location

All the project activity instances in the proposed grouped project activity would be located within geographical boundaries of India;



1.13 Conditions Prior to Project Initiation

The conditions prior to project initiation is the continued use of non-renewable wood fuel (firewood) by the target population to meet similar thermal energy needs as provided by project cookstoves in absence of project activity. The project aims to reduce the environmental and social burdens caused by inefficient biomass cooking by introducing energy efficient wood stoves to low- income households.

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. Though, the government of India promotes use of clean fuel e.g. LPG, however due to the initial capital cost and operating cost, the usage levels are low and most of the rural households still use traditional stoves for

cooking. There is no specific concern made on improved cookstoves project from the above laws and regulations.

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

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

☐ Yes

☒ No

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

1.16.2 Other Forms of Environmental Credit

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

☐ Yes

☒ No

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development Contributions Activity Description

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.

- Improves overall health of women and children by reducing smoke in the kitchen, thus reducing health hazards from indoor air pollution.
- Better cooking time – the materials used in making the ICS transmit the heat effectively, cooking the food faster.
- Better cooking environment due to less smoke and carbon residue in the kitchen.
- Better quality of life – the rural communities get family time as the whole family can sit and eat together.

Environmental benefits

- Improves the local environment by reducing rate of degradation of forests and deforestation in the project area.
- Reduce indoor pollution – ICS emits less smoke and reduces morbidity from respiratory diseases and other health hazards.
- Reduce global and local environmental pollution and environmental degradation by reduction in use of non-renewable biomass thus leading to reduction in GHG emissions.
- Less water and effort is needed for cleaning vessels as the cooking process is relatively smoke free.

Economic benefits

- Employment opportunities for local communities.
- Reduces purchase of fuel wood and/or wage equivalent from reduced firewood collection time.

1.17.2 Sustainable Development Contributions Activity Monitoring

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
Sequential row number	SDG Target number	Number and text of SDG indicator or, if no official SDG indicator is applicable, user-defined indicator	Indicate the project's contribution to the SDG Indicator (implemented activities to increase or decrease)	Brief description of the quantifiable impact of the project's activities related to the SDG indicator, during the monitoring period.	Brief description of the cumulative quantifiable impact of the project's activities related to the SDG indicator, over the project lifetime.
1)	13.0	Quantity of emission reductions achieved from the project activity.	Emission reductions	The project activity involves distribution of energy efficient cookstove to the rural population. The ICS distributed will burn wood more efficiently thereby improving thermal transfer to pots, hence saving fuel wood. The average annual GHG emission reduction is 201,800 tCO ₂ e	The average annual GHG emission reduction is 201,800tCO ₂ e and total 2018006tCO ₂ e for the group project activity over the entire crediting period.

2)	7.1	7.1- By 2030, ensure universal access to affordable, reliable and modern energy services	7.1.2-Proportion of population with primary reliance on clean fuels and technology	Number of ICS operational under the project activity. PP will ensure that the cook stoves are operational and all the plants owners have the access to clean energy.	Number of ICS operational under the project activity. PP will ensure that the ICS are operational and all the ICS owners have the access to clean energy.
3)	8.5	8.5.2- Quality of Employment; and Quantitative employment and income generation.	Number of Training Programmes provided to the employees and the Maintenance & Service staff. Number of Employees for Maintenance & Service.	Provided training for improving employability. Thereby improving Quality of Employment. 2 training per year; minimum 10 employments.	A total of 20 training in project lifetime and maintaining minimum 10 employments throughout life time of the project activity.

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

Greneity invited all the relevant stakeholders and the villagers for this meeting. The local stake holder consultation meeting was successfully held on 30/06/2021 at Bithra village, Arwal District, Bihar and Korja village, Sarguja district, Chhattisgarh.

The project idea and its components were thoroughly discussed, feedback from the participants has been documented and sustainable development aspects were discussed during the proceedings. Participants got clarification on many of the project aspects including carbon credit rights transfer.

Mr. Arjun Sharma, Greneity- explained about the programme and its implementation style. He stated that the present project is much useful to the local community in general and women in particular. Further, the positive impact on the women health by using the clean fuel technology is also explained.

Mr. R.P. Singh, Bihar, Supervisor, introduced the present project to the participants and clarified about carbon credit transfer rights. He explained about the Carbon credits generated from the project activity. Further, explained how this Project activity is supporting the distribution of ICS plants to rural households and provide participating households with

clean, convenient and efficient means for cooking and heating purposes. Also provided insights on how the monitoring of ICS could lead to positive sustainable development goals.

Mr. Sitaram Bias, Chhattisgarh Supervisor, also presented project to the local stakeholders, basic working of cook stove and its importance especially in livelihood improvement of women and children. Also, explained about importance of carbon credits generated from the project activity will help in recovering the cost and operation and maintenance of the cookstoves, since all the households will be getting ICS without any costs.

They had distributed feedback forms among the participants and collected once they were duly filled.

The participants overwhelmingly supported the project and No negative comments were raised. As a part of on-going communication with local stakeholders and end users were informed about grievance register which is in the office of Supervisor. Thus, ongoing communication of stakeholders will be followed through grievance mechanism. If any concerns received during operation of project activity, same will be addressed if relevant to project activity.

Grievance Redressal mechanism.

PP follows a proper Feedback and Grievance Redress Policy and Procedure, which ensures that project-affected communities and individual stakeholders' grievances are properly prioritized and addressed. These measures are taken to enhance PP's accountability and transparency and to support the project initiatives that can help the communities to identify adverse effects to them, or their environment which had not previously been identified and mitigated by PP.

The Grievance Policy and Procedure is accessible as a phone number of the PP/ground teams in project area is available to each household, which is the most accessible manner to provide feedback. PP policy and procedure outline the process to evaluate and respond to complaints; the procedure details when a serious level complaint should be communicated to PP/ground teams and when it would be best addressed by the PP.

Grievance received for the monitoring period.

Grievance Received	Action Taken
Need to become field officer.	End user wanted to be a part of the ground team. Resolution: A training has started for the end user to enrol and the volunteer for the programme.
Need two cook stoves.	End user wanted two stove to quickly prepare meal for large gathering. Resolution: As of now PP has planned to distribute only one stove per household. The same was explained to the end user.

Need training for the better usage of the cook stove.	End user need one more training for the cook stove. Resolution: End user training was provided to the user at the time of installation of the ICS. As per request, again field staff visited the user premises and explained the process again and user was very much satisfied.
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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 positive environmental impacts.

2.4 Public Comments

No comments were received on this project during public commenting period.

2.5 AFOLU-Specific Safeguards

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

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

- VCS Methodology: VMR0006: Methodology for Installation of High Efficiency Firewood Cookstoves, Version 1.1,
<https://verra.org/methodology/vmr0006-methodology-for-installation-of-high-efficiency-firewood-cookstoves/>
- For calculation of fraction of non-renewable biomass, the below tool is used
"TOOL30: Calculation of the fraction of non-renewable biomass"- Version 03.0
<https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-30-v3.0.pdf>

3.2 Applicability of Methodology

The applicability of methodology is justified as below

Applicability criterion	How the project complies
Project activities shall be implemented in domestic premises or in community-based kitchen	The proposed project involves deployment of ICS only in households i.e., domestic premises.
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 stoves planned to be installed under this project are single pot wood based cook stoves that have an efficiency of 31.81% as per the Manufacturer's specification.
Both 'Projects' and 'Large Projects' can use the methodology	Estimated average annual emission reductions for the grouped project activity are lesser than 300,000 tonnes CO ₂ e per year. Therefore, proposed project qualifies 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;	Proof that biomass has been used in the project region, i.e., in the host country India since 31 December 1989 is available through widespread documentation. Report by National sample survey organization (NSSO), department of statistics, Government of India reveals that 79% of the rural households in India were dependent of firewood and chips in the year 1987-88¹. The same article reported 78% of rural households to be dependent on firewood and chips in the year 1993-94. National sample survey organization, Government of India reveals that 75% of the rural households in rural India were primarily dependent of fuelwood and chips². Fuel wood is the main source of energy in rural areas. Wood energy is mainly used as fuel for cooking at household. The above clearly shows that the rural areas in the host country are dependent on biomass since and before 1989 with not much change in the trend which clearly depicts the dependence

¹ http://mospi.nic.in/sites/default/files/publication_reports/410_2_part2_final.pdf

² http://mospi.nic.in/sites/default/files/publication_reports/511_final.pdf

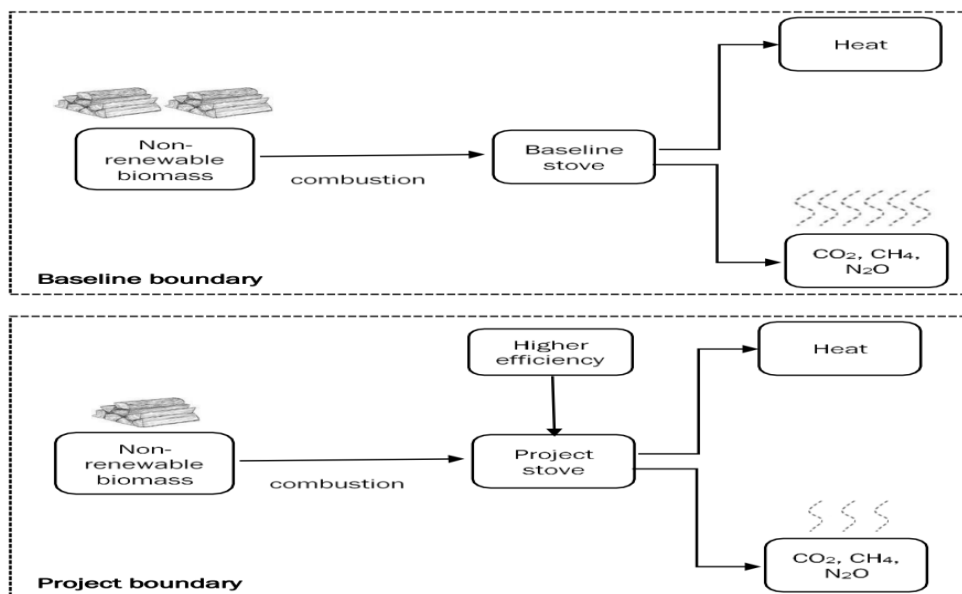
	of the people of the host country on woody biomass as fuel for meeting thermal energy requirement for cooking at households.
For the specific case of biomass residues processed as a fuel (e.g. briquettes, wood chips), it shall be demonstrated that: a. It is produced using exclusively renewable biomass (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)	Not applicable as project activity uses non-renewable biomass as a fuel. The ICS is introduced as 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 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 is as per below VCS meth requirement and para 7 of latest version of meth AMS II.G version 12 is followed. (Additionally, applicability criteria numbers 8 and 9 set out in Section 2.2 of AMS II.G, version 11.1 shall apply)	Each ICS in this project will be identified by a unique combination of state, district and Unique identification number (UID). The UID will be a unique number which will allow for a clear distinction between the stoves. No individual UID can be repeated within the project, thus ensuring that each stove is counted only once in the proposed project. The Project Owner have provided the undertaking that no double counting of emission reductions occurred due to unique identifications of product and end-user location.
The VCS PD shall also explain how the proposed procedures prevent double counting of emission reductions, for example to avoid that project stove manufacturers, wholesale providers or others claim credit for emission reductions from the project devices. The above criteria is as per below VCS meth	Manufacturers/ cook stove distributors undertaking to be provided that there is no any double accounting for carbon emissions associated with ICS supplied to households under the project activity having Project Owner (Greneity Infocom Service Pvt Ltd.) . Greneity will be owner of that carbon credits and

requirement and para 8 of latest version of meth AMS II.G version 12 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 will not claim any credits for such cook stoves.
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3.3 Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Emission from use of non-renewable biomass/Fossil fuel	CO ₂	Yes	Major source
		CH ₄	Yes	Major source
		N ₂ O	Yes	Major source
		Other	No	No other source identified
Project	Emission from use of non-renewable biomass	CO ₂	Yes	Major source
		CH ₄	Yes	Major source
		N ₂ O	Yes	Major source
Source		Gas	Included?	Justification/Explanation
		Other	No	No other source identified

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



3.4 Baseline Scenario

As per methodology “The baseline scenario is the continued use of non-renewable wood fuel (firewood/charcoal) or fossil fuel (coal/kerosene) by the target population to meet similar thermal energy needs as provided by project cook stoves in absence of project activity.”

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

Baseline Scenario:

The improved cookstoves under the project activity are distributed to selected households (at free of cost) who are only relying on traditional cookstoves without any improved combustion air supply or flue gas ventilation, and without a grate or a chimney and using biomass as a fuel for cooking. Households using fuel other than biomass or using improved cookstoves/ cook stoves with chimney, flue gas ventilation system and grate are not selected under the project activity in accordance to beneficiary selection criteria. The information pertaining to existing cookstoves used and fuel usage as intimated by the beneficiary are also physically verified during the cookstove (ICS) handover process. The handover of improved cookstoves is facilitate only upon physical inspection of the existing cookstoves and signing of end user agreement. Since all the beneficiary selected under the project activity complies to the baseline requirement of use of non-renewable wood fuel (firewood) in traditional cookstoves to meet the thermal energy requirement therefore 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.

For this project the efficiency of the baseline three-stone cookstove has been considered as 10% which is VMR0006 default for efficiency of baseline stove³

3.5 Additionality

The methodology uses activity method for the demonstration of additionality.

Activity Method

³ <https://verra.org/wp-content/uploads/2021/07/VMR0006-Methodology-for-Installation-of-High-Efficiency-Firewood-Cookstoves-v1.1.pdf>

Step 1: Regulatory Surplus

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

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

Step 2: Positive List

As per Section 3.2, the project meets the applicability conditions of the methodology which represent the positive list. The project must demonstrate that it meets all of the applicability conditions of the methodology as well as the below condition. In so doing, it the project is deemed as complying with the positive list:

1st Condition: Where the project activity installs or distributes stoves at zero cost to the end-user and has no other source of revenue other than the sale of GHG credits, the project activity shall be deemed additional.

Project meets the criterion above as:

The project installs the ICS at zero cost to the household and has no other source of revenue other than the sale of GHG credits.

2nd Condition: Project activities that are implemented as part of government schemes or are supported by multilateral funds cannot be considered additional even if the stoves are distributed free of cost or at a highly subsidized rate and hence are not eligible to use this methodology

Project meets the criterion above as:

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.

3.6 Methodology Deviations

The project did not apply any methodology deviations

4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 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 4.4.

4.2 Project Emissions

The methodology does not account for baseline emissions separately, but instead quantifies net emission reductions achieved by the project. Please refer to Section 4.4.

4.3 Leakage

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

4.4 Estimated Net GHG Emission Reductions and Removals

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

$$ER_y = \sum_i \sum_j ER_{y,i,j}$$

Where:

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

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

Where:

$B_{y,savings,i,j}$	=	Quantity of woody biomass that is saved in tonnes per improved cookstove of type i and batch j during year y
$f_{NRB,y}$	=	Fraction of woody biomass that can be established as non-renewable biomass (f_{NRB}) ⁴
$NCV_{wood\ fuel}$	=	Net calorific value of the non-renewable woody biomass that is substituted or reduced (IPCC default for wood fuel, 0.0156 TJ/tonne) ⁵
$EF_{wf,CO2}$	=	CO ₂ emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO ₂ /TJ) ⁶
$EF_{wf,non\ CO2}$	=	Non-CO ₂ emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO ₂ /TJ) ⁷
$N_{y,i,j}$	=	Number of improved cookstoves of type i and batch j operating during year y
0.95	=	Discount factor to account for leakage

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

$$B_{y,savings,i,j} = B_{y=1,new,i,survey} \times \left(\frac{\eta_{new,y,i,j}}{\eta_{old}} - 1 \right) \quad \text{Equation (4)}$$

Where,

η_{old}	=	Efficiency of baseline cookstove
$\eta_{new,y,i,j}$	=	Efficiency of the improved cookstove type i and batch j determined through using Equation 5.
$B_{y=1,new,i,j,survey}$	=	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.

⁴ Default values endorsed by designated national authorities and approved by the Board are available at <https://cdm.unfccc.int/DNA/fNRB/index.html>

⁵ 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 1 Introduction

⁶ 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion

⁷ 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion

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

Equation (5)

Where,

- η_p = Efficiency of project stove (fraction) at the start of project activity.
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.**
- $(DF_n)^{y-1}$ =
- 0.94 = Adjustment factor to account for uncertainty related to project cookstove efficiency test.

PP has chosen equation (5) to determine the Efficiency of the improved cookstove at the start of project activity where default value of 0.99 efficiency loss per year is applied

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

1. Total 290,000 ICS will be installed in 6 states over period of 5 years, 10,000 ICS/ state/year

Cookstoves will be installed as per the implementation schedule below:

States	2021	2022	2023	2024	2025
Chhattisgarh,	10,000	10,000	10,000	10,000	10,000
Bihar	10,000	10,000	10,000	10,000	10,000
West Bengal			10,000	10,000	10,000
Odisha			10,000	10,000	10,000
Karnataka				10,000	10,000
Kerala					10,000

2. The life span of ICS is 5 years; thus, the operational lifetime of each project activity instance staken as 5 years. **After 5 years, cookstoves will be replaced with the new cookstoves of either same/higher efficiency. Same will be verified during verification phase**

3. Each ICS will be considered as project activity instances as per the VCS standard with Annual stove loss rate is estimated at 10% for conservative ER calculation.
4. $B_{y=1,new,i,j,survey}$ is taken from 1st monitoring survey 1.8250 tonnes / device / year

Determination of 10,000 ICS/location operating during year y

$$N_{y,i,j} = 10,000 \times [1 - (y-1) \times 10\%]$$

Example of calculation:

If $y = 2$,

$$N_{y,i,j} = 10,000 \times [1 - (2-1) \times 10\%]$$

$$= 10,000 \times 90\%$$

$$= 9000$$

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

Year (y)	$N_{y,i,j}$
1	10,000
2	9000
3	8000
4	7000
5	6000
6	5000
7	4000
8	3000
9	2000
10	1000

Determination of efficiency of ICS during year y

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

Where

$$\eta p = 31.81\%$$

$$DF_n = 0.99$$

Example of calculation:

If $y = 2$

$$\begin{aligned}\eta_{new,y,i,j} &= 31.81\% \times (0.99)^{2-1} \times 0.94 \\ &= 29.90\%\end{aligned}$$

Hence the efficiency of ICS during y is as below:

Year (y)	$\eta_{new,y,i,j}$
1	29.90%
2	29.60%
3	29.31%
4	29.01%
5	28.72%
6	28.44%
7	28.15%
8	27.87%
9	27.59%
10	27.32%

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

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

Example of calculation: If $y = 2$,

$B_{y,savings,i,j}$ for different states are as follows:

Year (y)	$B_{y=1,new,i,survey}$	$\eta_{new,y,i,j}$	η_{old}	$B_{y,savings,i,j}$
--------------	------------------------	--------------------	--------------	---------------------

1	1.83	29.90%	0.1	3.6320
2	1.83	29.60%	0.1	3.5774
3	1.83	29.31%	0.1	3.5234
4	1.83	29.01%	0.1	3.4699
5	1.83	28.72%	0.1	3.4170
6	1.83	28.44%	0.1	3.3646
7	1.83	28.15%	0.1	3.3127
8	1.83	27.87%	0.1	3.2613
9	1.83	27.59%	0.1	3.2104
10	1.83	27.32%	0.1	3.1601

Determination of emission reductions

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

Where

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

$$f_{NRB,y} \text{ Chattisgarh} = 0.92$$

$$f_{NRB,y} \text{ Bihar} = 0.99$$

$$f_{NRB,y} \text{ West Bengal} = 0.99$$

$$f_{NRB,y} \text{ Odisha} = 0.95$$

$$f_{NRB,y} \text{ Kerala} = 0.92$$

$$f_{NRB,y} \text{ Karnataka} = 0.92$$

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

Example of calculation:

If $y=2$,

Year	$B_{y,savings,i,j}$	$NCV_{wood\ fuel}$	$EF_{wf,CO2} + EF_{wf,non\ CO2}$	$N_{y,i,j}$
1	4.35	0.0156	138.23	10000

2	4.29	0.0156	138.23	9000
3	4.2	0.0156	138.23	8000
4	4.16	0.0156	138.23	7000
5	4.10	0.0156	138.23	6000
6	4.03	0.0156	138.23	5000
7	3.97	0.0156	138.23	4000
8	3.91	0.0156	138.23	3000
9	3.85	0.0156	138.23	2000
10	3.79	0.0156	138.23	1000

Year	$B_{y,savings,i,j}$	$NCV_{wood fuel}$	$f_{NRB,y}$ Bengal	$f_{NRB,y}$ Odisha	$f_{NRB,y}$ Chhattisgarh	$f_{NRB,y}$ Bihar	$f_{NRB,y}$ Kerala	$f_{NRB,y}$ Karnataka	$EF_{wf,CO2} + EF_{wf,non CO2}$	$N_{y,i,j}$	$ER_{y,i,j}$ Bengal	$ER_{y,i,j}$ Odisha	$ER_{y,i,j}$ Chhattisgarh	$ER_{y,i,j}$ Bihar	$ER_{y,i,j}$ Kerala	$ER_{y,i,j}$ Karnataka
1	3.6320	0.0156	0.99	0.95	0.9288	0.99	0.92	0.92	138.23	10000	73,660	67,707	82,142	88,392,65,908	68,451	66,963
2	3.5774	0.0156	0.99	0.95	0.920.88	0.99	0.92	0.92	138.23	9000	65,298	60,021	72,817	78,358,58,428	60,681	59,362
3	3.5234	0.0156	0.99	0.95	0.920.88	0.99	0.92	0.92	138.23	8000	57,166	52,547	63,749	68,599,51,154	53,124	51,969
4	3.4699	0.0156	0.99	0.95	0.920.88	0.99	0.92	0.92	138.23	7000	49,261	45,280	54,934	59,113,44,082	45,778	44,783
5	3.4170	0.0156	0.99	0.95	0.920.88	0.99	0.92	0.92	138.23	6000	41,579	38,220	46,367	49,895,37,209	38,640	37,800
6	3.3646	0.0156	0.99	0.95	0.920.88	0.99	0.92	0.92	138.23	5000	34,118	31,361	38,047	40,942,30,533	31,706	31,016
7	3.3127	0.0156	0.99	0.95	0.920.88	0.99	0.92	0.92	138.23	4000	26,873	24,702	29,968	32,248,24,051	24,973	24,430
8	3.2613	0.0156	0.99	0.95	0.920.88	0.99	0.92	0.92	138.23	3000	19,842	18,239	22,127	23,811,17,759	18,439	18,039
9	3.2104	0.0156	0.99	0.95	0.920.88	0.99	0.92	0.92	138.23	2000	13,022	11,970	14,522	15,626,11,655	12,101	11,838
10	3.1601	0.0156	0.99	0.95	0.920.88	0.99	0.92	0.92	138.23	1000	6,409	5,891	7,147	7,691,5,736	5,956	5,826

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
Year 1	142111	0	0	142111

Year 2	125979	0	0	125979
Year 3	251657	0	0	251657
Year 4	220358	0	0	220358
Year 5	258382	0	0	258382
Year 6	289497	0	0	289497
Year 7	245450	0	0	245450
Year 8	202663	0	0	202663
Year 9	161116	0	0	161116
Year 10	120791	0	0	120791
Total	201800	0	0	201800

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$f_{NRB,y}$
Data unit	Fraction
Description	Fraction of woody biomass saved by the project activity during year y that can be established as non-renewable biomass
Source of data	Tool 30 - Calculation of the fraction of non-renewable biomass.
Value applied:	States wise: ⁸

⁸ Detailed calculation provided in the ER spreadsheet

	Chhatisgarh:92% Bihar: 99% Bengal: 99% Odisha: 91% Karnataka: 92% Kerala:92%
Justification of choice of data or description of measurement methods and procedures applied	This parameter shall be determined ex-ante. Default value as per Methodological tool : Calculation of the fraction of non-renewable biomass. As per of methodological tool, value is calculated as per following Equation (1), $fNRBy = NRB/(NRB+DRB)$ fNRB = Fraction of non-renewable biomass (fraction or %) NRB = Quantity of non-renewable biomass (t/yr) RB = Quantity of renewable biomass (t/yr) Procedure to estimate RB: Renewable biomass (RB) in the country/region/area is estimated using the equation below: $RB = \sum (MAI_{forest,i} \times (F_{forest,i} - P_{forest})) + \sum (MAI_{other,i} \times (F_{other,i} - P_{other}))$ Where: MAI_{forest,i} = Mean Annual Increment of woody biomass growth per hectare in subcategory i of forest areas (t/ha/yr). MAI_{other,i} = Mean Annual Increment of woody biomass growth per hectare in subcategory i of other wooded land areas (t/ha/yr). This value is not considered due to non-availability of data. F_{forest,i} = Extent of forest in sub-category i (ha). India state of forest report, 2019 has been referred for this parameter. F_{other,i} = Extent of other wooded land in sub-category i (ha). This is not used following footnote 4 of the tool. P_{forest} = Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area)

	within forest areas (ha). This parameter is optional and not considered. Pother = Extent of non-accessible area (e.g. protected area where extraction of wood is prohibited, geographically remote area) within other wooded land areas (ha). This parameter is optional and not considered . I = Sub-category i of forest areas and other wooded land areas The fraction of woody biomass that can be established as non-renewable, is: $f_{NRB} = (NRB) / (NRB + RB)$
Purpose of Data	Calculation of baseline emission
Comments	Detailed calculation is given in ER spreadsheet for each state.

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

Data / Parameter	$EF_{wf,CO2}$
Data unit	tCO ₂ /TJ
Description	CO ₂ emission factor for the use of wood fuel in baseline scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion
Value applied:	112
Justification of choice of data or description of measurement methods and procedures applied	IPCC default value
Purpose of Data	Calculation of emission reductions
Comments	-

Data / Parameter	$EF_{wf,non\ CO2}$
Data unit	tCO ₂ /TJ
Description	Non-CO ₂ emission factor for the use of wood fuel in baseline scenario
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion
Value applied	26.3
Justification of choice of data or description of measurement methods and procedures applied	IPCC default value
Purpose of Data	<i>Calculation of emission reductions</i>
Comments	-

Data / Parameter	η_{old}
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Data unit	Fraction
Description	Efficiency of baseline cookstove
Source of data	Methodological default value
Value applied	0.1
Justification of choice of data or description of measurement methods and procedures applied	A default value of 0.1 shall be used if baseline device is a three-stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney
Purpose of Data	Calculation of emission reductions
Comments	The baseline stove is three stone fired stone using firewood. Hence, efficiency of stove is used 10% which is VMR0006 default. The value is fixed ex-ante.

Data / Parameter	η_p
Data unit	Fraction
Description	Efficiency of project stove at the start of project activity.
Source of data	Manufacturer's specification
Value applied	0.3181
Justification of choice of data or description of measurement methods and procedures applied	This parameter shall be determined ex-ante
Purpose of Data	Calculation of $\eta_{new,y,i,j}$
Comments	-

Data / Parameter	$(DF_n)^{y-1}$
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, 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	This parameter shall be determined ex-ante
Purpose of Data	<i>Calculation of $\eta_{new,y,i,j}$</i>
Comments	-

Data / Parameter	Life Span
Data unit	Number of years
Description	The operating lifetime of the project device. The life span should be reported if the methodology equation 5 is adopted to determine the project stove efficiency
Source of data	Manufacturer's specification
Value applied	5
Justification of choice of data or description of measurement methods and procedures applied	This parameter shall be determined ex-ante
Purpose of data	Calculation of emission reductions
Comments	-

5.2 Data and Parameters Monitored

Data / Parameter	$N_{y,i,j}$
Data unit	Number

Description	Number of project devices of type i and batch j operating during year y
Source of data	Monitoring
Description of measurement methods and procedures to be applied	Measured directly or based on a representative sample. Sampling standard shall be used for determining the sample size to achieve 90/10 confidence precision according to the latest version of Standard for sampling and surveys for CDM project activities and programme of activities.
Frequency of monitoring/recording	At least once every two years
Value applied	For ex-ante emission reduction calculation, it is assumed that the project will distribute up to 10,000 ICS each state.
Monitoring equipment	Monitoring survey
QA/QC procedures to be applied	-
Purpose of data	Calculation of emission reductions
Calculation method	Proportion of operational stoves obtained from the survey is multiplied by the total commissioned stoves to arrive at this value
Comments	-

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

Frequency of monitoring/recording	Annually																						
Value applied	For ex-ante calculation, the value below is applied. <table> <tr> <th>Year (y)</th><th>$\eta_{new,y,i,j}$</th></tr> <tr><td>1</td><td>29.90%</td></tr> <tr><td>2</td><td>29.60%</td></tr> <tr><td>3</td><td>29.31%</td></tr> <tr><td>4</td><td>29.01%</td></tr> <tr><td>5</td><td>28.72%</td></tr> <tr><td>6</td><td>28.44%</td></tr> <tr><td>7</td><td>28.15%</td></tr> <tr><td>8</td><td>27.87%</td></tr> <tr><td>9</td><td>27.59%</td></tr> <tr><td>10</td><td>27.32%</td></tr> </table>	Year (y)	$\eta_{new,y,i,j}$	1	29.90%	2	29.60%	3	29.31%	4	29.01%	5	28.72%	6	28.44%	7	28.15%	8	27.87%	9	27.59%	10	27.32%
Year (y)	$\eta_{new,y,i,j}$																						
1	29.90%																						
2	29.60%																						
3	29.31%																						
4	29.01%																						
5	28.72%																						
6	28.44%																						
7	28.15%																						
8	27.87%																						
9	27.59%																						
10	27.32%																						
Monitoring equipment	-																						
QA/QC procedures to be applied	-																						
Purpose of data	Calculation of emission reductions																						
Calculation method	Calculation to be performed using equation below: $\eta_{new,y,i,j} = \eta_p \times (DF_n)^{y-1} \times 0.94$																						
Comments	-																						

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

Source of data	Monitoring survey
Description of measurement methods and procedures to be applied	Minimum sample size of each type i and batch j should be in line with the latest version of Standard for sampling and surveys for CDM project activities and programme of activities or guidelines provided in methodology Section 8.4 option (b). 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 survey. Sample surveys to estimate this parameter, that are solely based on questionnaires or interviews (i.e. that do not implement measurement campaigns) may only be used if the following conditions are satisfied. (i) Baseline cookstoves have been completely decommissioned and only improved cookstoves are exclusively used in the project households; (ii) If multiple devices are used in the project, it is possible from the results of the survey questions to clearly differentiate the quantity of firewood being used by each device. In other words, if more than one device, or another device that consumes firewood, are in use in project households, then the sample survey needs to distinguish the quantity of firewood used by the project device and the other devices that use firewood.
Frequency of monitoring/recording	Determined in the first year of project implementation and same will be used for rest of monitoring period.
Value applied	1.83/tonnes/household/year
Monitoring equipment	Monitoring survey
QA/QC procedures to be applied	-
Purpose of data	Calculation of emission reductions
Calculation method	-
Comments	-
Data / Parameter	Life Span
Data unit	Number of years

Description	The operating lifetime of the project device. The life span should be reported if the methodology equation 5 is adopted to determine the project stove efficiency
Source of data	Manufacturer's specification
Description of measurement methods and procedures to be applied	PP will conduct periodic audits and surveillance of the stoves that will be distributed under the project activity to ensure their proper functioning throughout the project lifetime. This along with spot audits and after installation maintenance services, will ensure that the project stoves continue to work at efficiencies as specified by the manufacturer.
Frequency of monitoring/recording	Once at the time of project stove installation
Value applied	5
Monitoring equipment	-
QA/QC procedures to be applied	-
Purpose of data	Calculation of emission reductions
Calculation method	-
Comments	After 5 years of lifetime, old cookstoves will be replaced with new cookstoves with the same manufacturer.

5.3 Monitoring Plan

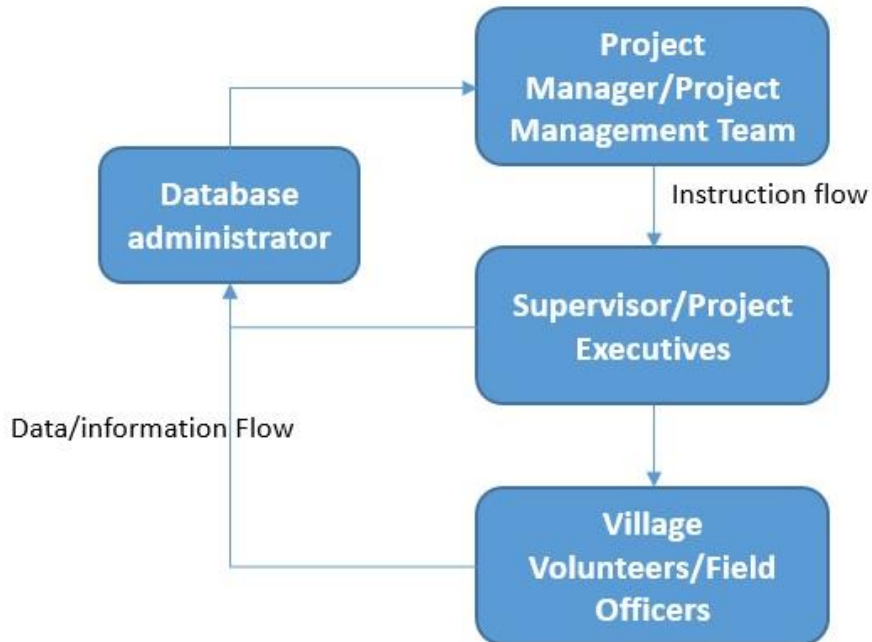
The Monitoring Plan applied in this project involves several key elements that ensure that the PP and/or CPA-Implementer have high-quality, unbiased, and reliable information regarding the performance of the project in terms of implementation and outcomes, and for the purposes of calculating Verified Carbon Units (VCUs) following VMR 0006 version 1.1 on the basis of the amount of non-renewable biomass saved by the ICS in the project activity. The key elements are the following:

- Data collection procedures
- Distribution and Monitoring Database
- Spot Checking of ICS (ongoing)
- Sample Plan for the Monitoring Survey

- Data Quality, Consistency and Duplication Checks
- Monitoring Reporting

ICS Project Management

Organizational Structure and Information Flow



A dedicated team is set up within Greneity for management and monitoring of the ICS Projects. This Project Management & Monitoring Unit consist of the following staff:

ICS Field Officers/Village volunteers	ICS field Officers/Village volunteers oversee the operation & maintenance of ICS units. Each field worker is in-charge of approximately 500 units. They report to the respective supervisors and their tasks are to: • Inspect the ICS in periodic intervals to ensure proper functioning • Record the working of ICS in specially designed formats and handover the data to Supervisors on a regular basis
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	• Assist in selection of Volunteers, train and support them • Contact Distributor in case of any major problem • Management system at village level: Village level Volunteers maintain the Monitoring log Books/surprise visit record. Every participating village have a Volunteer to monitor usage of ICS units. Volunteer(s) will be responsible for monitoring of operation and is the first to identify dysfunctional units. The Volunteer either prompts the End User to set right a problem or bring it to the notice of the Supervisor
Supervisor/ Project Executives	The Supervisor/ Project Executives will be reporting to Project Manager/ Project Management Team. They are responsible to conduct the user interviews and check the operational status of Cookstoves (ICS) in Households during the periodic sampling and reports the results to the database administrator. They are responsible to handle the 1st level of enquiry related to feedback, complaints and grievance. They have to perform an initial root cause analysis, related to the complaints and grievance. Responsible to give instruction related to complaint resolution. Further, in charge of distribution too as per the advice of Project management team.
PP database administrator	The database administrator is responsible for updating and maintaining all electronic databases. Required competencies include experience with data management systems.
Project Management Team	Project Management team is overall in-charge of the project implementation and monitoring. Project management team is responsible to prepare VCS documentation development, coordinating with various stakeholders including implementation partners, regulatory bodies, VERRA, Consultants, VVBs etc. The following are some of the main responsibilities; • Communicate with VERRA for all VCS related matters • Communicate with DOEs 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) • 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 • Entity in order to ensure continuous improvements of the project activity
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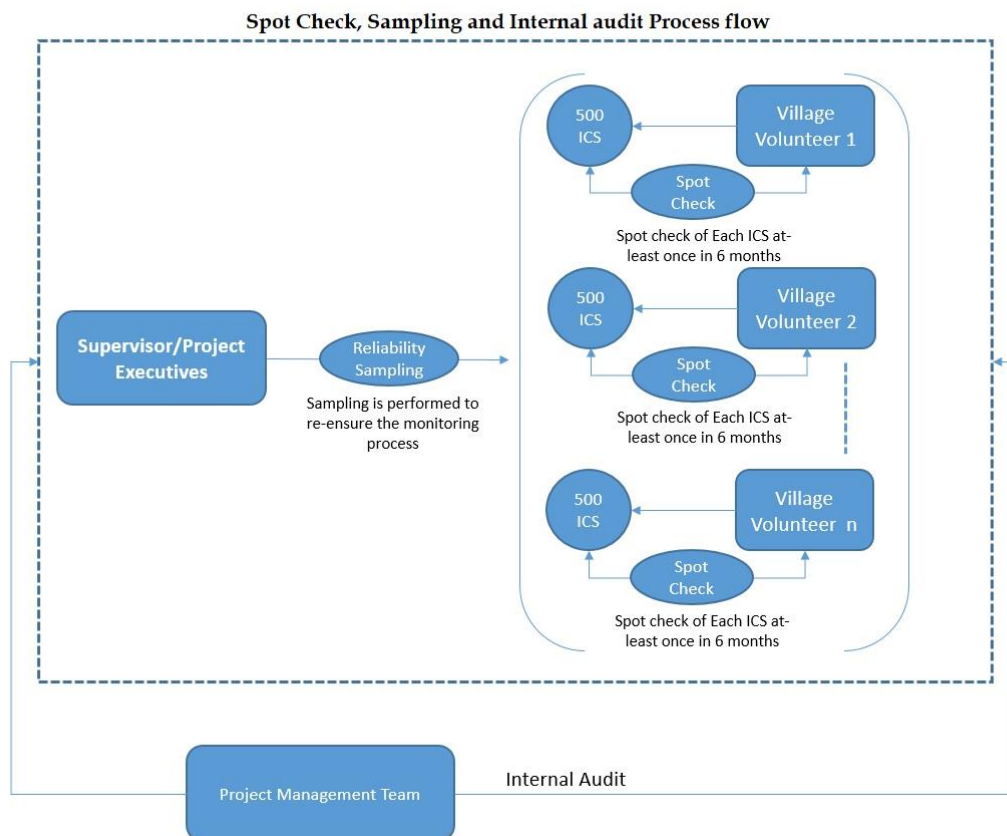
Each ICS Unit is marked with a unique Identification Number

A Monitoring log Book is maintained for the project activity. If any ICS Unit is faulty or not functional, or any behavioral problem with the households, problem report is automatically passed on to Volunteer(s) and then to Supervisors. There is a continuous database maintained of all the ICS Units not operational on a regular basis where number of non-operational days, and the reasons of non-operation are recorded. In case of major issues, Supervisors are informed to handle the situation.

To ensure proper monitoring following procedure is followed:

- 1: Registration of ICS:** Supervisor collected/received the necessary information required for the Registration process from the user. Supervisor staff double checks the accuracy of information provided, and request for field staff/volunteer additional clarifications if needed;
- 2. Imp: Data logged into database:** Registered data by the staff of the project implementer uploads in the database automatically. PP shall double check the information included on the database and check for duplications. Any duplicate information if investigated, checked for the errors, gets corrected or excluded from the database if it is a true duplicate entry.
- 3. Surprise visits:** Field staffs randomly select units included in the database and visit or contact the stove users to cross-check the information on the database with the factual evidence in the field. Any inconsistencies found (e.g., change in the address of a user) gets updated on the database, and in the case, ICS are found to be no longer in use, they got clearly marked as such and excluded from emission reductions calculations.
- 4. Monitoring:** PP follows the requirements as per VCS-PD to collect the necessary information for a monitoring report.

The PP will coordinate and manage each Supervisor and assist them in implementing each element of the monitoring plan. The monitoring plan shall be elaborated in accordance with the Sampling Plan below. Also, regular audits conducted which ensure each ICS is spot checked at least once in 6 months throughout the project lifetime ensures proper functioning of stoves and determination of the lifespan of the same.



Data measuring, recording Method and Implementation of Sampling Approaches

Steps 1, 2 and 3 captured end user information and populated the database, as well as provided database quality control.

Step 4 involves creating sampling surveys to capture data on number of project devices operating during year y ($N_{y,j,j}$) and quantity of woody biomass used by improved cookstoves ($B_{y=1,new,i,j,survey}$) as described in the table below.

Parameter	Description of Parameter	Sampling approach (outcome in brackets)
$N_{y,j,j}$	Number of project devices operating during year y	Regular surprise visits of the premises to see if ICS is operational and in use. Interview with end user if required to verify that ICS is still in use [Yes/No]
$B_{y=1,new,i,j,survey}$	Quantity of woody biomass used by improved cookstoves	Interview with end user and measurement of wood fuel used for project stove [Weight of fuel wood]

Since, PP has robust monitoring plan in place since the beginning of the project, which ensures all the devices installed are spot checked at least once in 6 months and same is maintained in the monitoring records. In addition to the regular spot checks, to meet the applicable methodological requirement, annual sampling is conducted through representative sampling that is designed in line with the requirements of the Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities version 09.0.

Type of Sampling choosen:

Simple random sampling was used for all monitoring parameters since targeted population is homogenous. objective was to obtain reliable and unbiased estimates of the monitoring parameters. Reliability levels were set at 90% confidence and 10% precision as per VMR 0006 version 1.1.

(a) Sampling

Design:

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

(i) Objective and Reliability Requirements:

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

Monitored Parameters:

Sr. no	Parameter	Description of Parameter	Frequency
1	$N_{y,i,j}$	Number of project devices of type i and batch j operating during year y	Annual/biennial
2	$B_{y=1,new,i,survey}$	Quantity of woody biomass used by project devices in tonnes per device of type i . and batch j	Determined in the first year of project implementation

(ii) Target Populations:

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

Sample Size:

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

The procedure to determine the sample of households will ensure that they adequately represent the broader project population, minimizing sampling error. Using a 90 per cent confidence level, and a 10 per cent margin of error, random samples will be selected from each Primary Sampling Unit. The parameter number of stoves still in operation during the monitoring period as determined by the monitoring survey ($N_{y,j}$) will be estimated through sampling biennially and the parameter Quantity of woody biomass used by project devices in tonnes per device $B_{y=1,new,i, survey}$ shall be estimated through sampling within the first year of project installation. $B_{y=1,new,i, survey}$ can be coupled with $N_{y,j}$ for the first year. Of the two parameters to be monitored, $N_{y,i,j}$ is proportion/percentage parameter and $B_{y=1,new,i, survey}$ is a mean value parameter.

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

Parameter $N_{y,i,j}$:

To estimate the sample size for the parameter $N_{y,i,j}$ the following equation is used:

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

Where:

n	= Sample size
N	= Population size (Total number of households/ICS)
p	= Expected proportion
1.645	= Represents the 90% confidence required
0.1	= Represents the 10% relative precision

Sample size calculation:

The calculation of the required sample size for each parameter in the first monitoring period(01/04/2021-15-09-2022) is illustrated below. In all cases a conservative approach is taken, however if for any parameter the required confidence/precision is not met then the PP will randomly select an additional sample and collect further data from this sample to ensure the pooled data meet or exceed the required thresholds.

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

$$n \geq \frac{1.645^2 \times 30,000 \times 0.9(1 - 0.9)}{(30,000 - 1) \times 0.1^2 \times 0.9^2 + 1.645^2 \times 0.9(1 - 0.9)} = 30.04$$

Therefore, in this case a sample size of 31(rounded value) is to be sampled from each primary sampling unit.

Parameter $B_{y=1, \text{new}, i, \text{survey}}$:

For the purposes of determining sample size in the first monitoring period (01-04-2021 to 15-09-2022), the performance of ICS is characterized by the range of likely mean wood consumption and the likely values of SD relative to the mean, according to the type of ICS. The ICS models that are manufactured in modern factories tend to be very highly efficient (30-50% thermal efficiency) and have been designed to meet stringent efficiency specifications, so the standard deviation is expected to be relatively low.

To estimate the sample size for parameter $B_{y=1, \text{new}, i, \text{survey}}$ the following equation is used:

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

Where:

$$V = \left(\frac{SD}{mean} \right)^2$$

n	= Sample size
N	= Population size (Total number of households/ICS)
$mean$	= Expected mean of ICS thermal efficiency
SD	= Expected standard deviation
1.645	= Represents the 90% confidence required
0.1	= Represents the 10% relative precision

Based on the above assumptions, the sample size calculation would be

$$n \geq \frac{1.645^2 \times 30000 \times \left(\frac{0.6}{5.0} \right)^2}{(30000 - 1) \times 0.1^2 + 1.645^2 \times \left(\frac{0.6}{5.0} \right)^2} = 3.90$$

The resulting sample size based on the above equation is smaller than 30, since $B_{y=1, \text{new}, i, \text{survey}}$ is a numeric mean value (i.e. not a proportion or percentage) the Student's t-distribution shall be used as per paragraph 14 of "Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities, version 09.0.

The sample size for parameter $B_{y=1, \text{new}, i, \text{survey}}$ under t-distribution is referred to the equation below:

$$n = \left(\frac{t_{n-1} \times SD}{0.1 \times \text{mean}} \right)^2$$

Where t_{n-1} is the value of the t-distribution for 90% confidence when the sample size is n. Since the sample size is not known yet, the first step is to use the value for 90% confidence when the sample is large, i.e., 1.645 and then redefine the calculation.

$$n = \left(\frac{1.645 \times 0.6}{0.1 \times 5.0} \right)^2 = 3.90$$

Thus n is rounded up to 4.

The calculation now needs to repeat using t-value for 90% confidence and $n = 4$

And n is rounded to 8

The calculation now need to repeat using t_{n-1} value for $n = 8$ The process should be iterated until there is no change to the value of n.

t_{15-1}	1.895
$n=$	5.17
Round up	6

t_{7-1}	2.01
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⁹ For CPAs not qualifying the conditions under paragraph 12 of Tool 19, the requirements of the applied methodology shall apply.

$n=$	5.85
Round up	6

The repeated calculation shows that $n = 6$. Thus, the sample size to be sampled from each sampling unit is 6

Since parameters $N_{y,j,j}$, and $B_{y=1,new,i, survey}$ share the same sampling units, PP may choose to have one common survey for these two parameters with largest number of sample size between these two parameters being chosen. Sampling more than one parameter within the same sample (household) helps reduce travel needs for monitoring and the associated costs. At the same time this approach ensures the random selection of samples for every parameter.

Thus, for both parameters, sample size 31 is chosen and 45 in case of 30% non -response

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, PP shall determine the appropriate non-responses rate based on previous experience.

(b) Data:

(i) Field Measurements:

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

For monitoring $B_{y=1,new,i, survey}$, the data collected was representative number of stoves in the database that were distributed. The method of collecting data was field survey and frequency will be once during the entire crediting period.

The table below summarizes field measurement data requirements

Parameter	Timing (indicative)	Frequency (required by AMS II.G –Version 11.1)	Methods to be applied	Comments on seasonal fluctuation

$N_{y,i,j}$	Biennial	annual/biennial	Visits to the premises, visual inspection and interview with ICS end-user	Unlikely to be due to any seasonal fluctuation.
$B_{y=1,new,i, survey}$	Within 1 st year from the starting date of implementation	Once. The value will be fixed for entire crediting period	Visits to the premises, visual inspection, measurement and interview with ICS end-user.	unlikely

(ii) Quality Assurance/Quality Control

The PP will apply measures to ensure the required confidence/precision for each sampled parameter is met, allowing for non-response and the possible removal of outliers from the sample, as part of a Quality Control/Quality Assurance system. The choice of measure applied to each parameter will depend on the cost of each data collection approach and logistics required. In the case a household refuses to participate, another household will be chosen at random.

Internal Audit

- Project Participant has constituted the team for internal audit as a part of quality control and quality assurance mechanism towards ensuring data completeness in conformance with monitoring and reporting guidelines as well as maintenance of data to avoid any risk of error in estimation of emission reduction.
- This purpose of internal audit includes
- Cross verification of the information obtained as part of sample survey to identify outliers /erroneous data if any
- Random review of data transfer between beneficiary database and end user agreement
- Random review of data transfer between survey schedule/ structured questionnaire and monitoring excel spreadsheet (used for emission reduction estimation)
- Cross check of improved cookstoves usage through various means of contacting the beneficiaries in addition to periodic survey
- Internal audit of emission reduction estimation
- Internal audit of the record of training undertaken this internal audit to be conducted at periodic interval (minimum once a year) which will identify discrepancies/ nonconformities if any and if identified, will be included in the audit findings and appropriate measures are undertaken immediately. Report on internal audits done, discrepancies/ nonconformities identified and corrective action taken is maintained and kept for external auditing (verification)

Data Archiving:

Hard copies of the surveys will be kept and the registration database will have back up. Original stove purchase contracts or other means of acceptance by the users will be stored in the main office for the coordinating entity. A back-up of the registration database will also be stored on an electronic medium by the PP. 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 VCUs for the project activity, whichever is later.

Assessment for Leakage

According to methodology VMR 0006, version 1.1, section 8.3; Leakage shall be considered as default 0.95 in accordance with Section 5.4 of AMS-II.G. therefore default value of leakage as 0.95 will be applied.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	$N_{y,i,j}$
Data unit	Number
Description	For this monitoring Period:
Value applied:	In Chattisgarh : 15,000 ICS working (100%) In Bihar : 15,000 ICS working (100%)
Comments	The first ICS in Chattisgarh and Bihar was installed on 01st April,2021. Till the end of monitoring period, a total of 15,000 in Chattisgarh and 15,000 in Bihar has been installed under the project. All the data recorded during stove registration process was captured in the project database. Proportion of operational stoves obtained from the survey which was conducted between 10th March 2022 to 28th March 2022, where in it was found 100% of the ICS in both states were in

	functional state. Proportion of operational stoves obtained from the survey is multiplied by the total commissioned stoves to arrive at this value. Proportion of operational stoves: 100% $N_{y,i,j} = 100\% * 30000 = 30000$ Total commissioned stoves till the latest monitoring period (1-04-2021 to 15-09-2022).
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Data / Parameter	$B_{y=1,new,i,j,survey}$
Data unit	Tonnes per device per year
Description	Sampling standard “sampling and surveys for CDM project activities and programme of activities” version 9 was used for determining the sample size This value was determined within the first year of the introduction of the devices through sample surveys.
Value applied:	Based on survey result, the value was calculated. It was found during survey firewood usage in Chattisgarh was around 6kg/day whereas in Bihar it was 5kg/day. To be conservative: 5kg/device/day is chosen which is equal to 1.825 tonnes/device/year (Only these states are covered in this monitoring period, 01-04-2021 to 15-09-2022)
Comments	The survey was conducted between 10 th March, 2022 to 28 th March, 2022.

6.2 Baseline Emissions

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

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

Where:

i = Indices for the situation where more than one type/model of improved cookstove is introduced to replace three-stone fire

J	=	Indices for the situation where there is more than one batch of improved cookstove of type i
ER _y	=	Emission reductions during year y in t CO ₂ e
ER _{y,i,j}	=	Emission reductions by improved cookstove of type i and batch j during year y in t CO ₂ e

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

Where:

B _{y,savings,i,j}	=	Quantity of woody biomass that is saved in tonnes per improved cookstove of type i and batch j during year y
f _{NRB,y}	=	Fraction of woody biomass that can be established as non-renewable biomass (f _{NRB})
NCV _{wood fuel}	=	Net calorific value of the non-renewable woody biomass that is substituted or reduced (IPCC default for wood fuel, 0.0156 TJ/tonne) ¹⁰
EF _{wf,CO₂}	=	CO ₂ emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO ₂ /TJ) ¹¹
EF _{wf,non CO₂}	=	Non-CO ₂ emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO ₂ /TJ) ¹²
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

To calculate B_{y,savings,i,j}, we use equation 4 of the applied methodology¹³

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

Where:

¹⁰ 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 1 Introduction

¹¹ 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion

¹² 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion

¹³ Equation 3 of methodology VMR 0006

$B_{y=1,new,i,survey}$	Annual quantity of woody biomass used by improved cook stoves in tonnes, determined in the first year of the implementation of the project through a sample survey
η_{old}	Efficiency of baseline cookstove. A default value of 0.10 has been used as the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e., without a grate or a chimney.
$\eta_{new,l,j}$	Efficiency of the improved cook stove determined using Equation 5 of the methodology.

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

Where:

η_p	Efficiency of project stove (fraction) at the start of project activity
$(DF_n)^{y-1}$	Discount factor to account for efficiency loss of project cookstove per year of operation (fraction). default value of 0.99 efficiency loss per year has considered for the project activity
0.94	Adjustment factor to account for uncertainty related to project cookstove efficiency test

The full set of emission reductions calculation for each cookstove per HH is provided in separate Excel spread sheets.

6.3 Project Emissions

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

6.4 Leakage

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

6.5 Net GHG Emission Reductions and Removals

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

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

Where:

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

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

Where:

B _{y,savings,i,j}	=	Quantity of woody biomass that is saved in tonnes per improved cookstove of type i and batch j during year y
f _{NRB,y}	=	Fraction of woody biomass that can be established as non-renewable biomass (f _{NRB})
NCV _{wood fuel}	=	Net calorific value of the non-renewable woody biomass that is substituted or reduced (IPCC default for wood fuel, 0.0156 TJ/tonne) ¹⁴
EF _{wf,CO₂}	=	CO ₂ emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 112 tCO ₂ /TJ) ¹⁵
EF _{wf,non CO₂}	=	Non-CO ₂ emission factor for the use of wood fuel in baseline scenario (IPCC default for wood fuel, 26.23 tCO ₂ /TJ) ¹⁶
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

¹⁴ 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 1 Introduction

¹⁵ 2006 IPCC Guidelines for National Greenhouse Gas Inventories; Volume 2 Energy, Chapter 2 Stationary Combustion

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

To calculate $B_{y,savings,i,j}$, we use equation 4 of the applied methodology¹⁷

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

Where:

$B_{y=1,new,i,survey}$	Annual quantity of woody biomass used by improved cook stoves in tonnes, determined in the first year of the implementation of the project through a sample survey
η_{old}	Efficiency of baseline cookstove. A default value of 0.10 has been used as the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e., without a grate or a chimney.
$\eta_{new,i,j}$	Efficiency of the improved cook stove determined using Equation 5 of the methodology.

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

Where:

η_p	Efficiency of project stove (fraction) at the start of project activity
$(DF_n)^{y-1}$	Discount factor to account for efficiency loss of project cookstove per year of operation (fraction). default value of 0.99 efficiency loss per year has considered for the project activity
0.94	Adjustment factor to account for uncertainty related to project cookstove efficiency test

For emission reduction calculation purpose, the below data is applied for first project activity instance.

- 1) The first project activity instance includes installation of 1 numbers of ICS.
- 2) The life span of ICS is 5 years; thus, the operational lifetime of each project activity instance is taken as 5 years. After 5 years, cookstoves will be replaced with the new cookstoves of either same/higher efficiency.
- 3) The expected operational lifetime of each project activity instance will determine based on end date of commissioning of last ICS. If project activity includes, project activity instance wise installation, then ER should be estimated project activity instance wise.
- 4) Each ICS will be considered as project activity instances as per the VCS standard with Annual stove loss rate is estimated at 10% for conservative ER calculation.

¹⁷ Equation 3 of methodology VMR 0006

5) $B_{y=1,new,i,j,survey}$ is taken from survey result

Operational Stoves in this monitoring period:

The first ICS in Chhattisgarh and Bihar was installed on 01st April, 2021. Till the end of monitoring period, a total of 15,000 in Chhattisgarh and 15,000 in Bihar has been installed under the project. All the data recorded during stove registration process was captured in the project database.

Proportion of operational stoves obtained from the survey which was conducted between 10th March 2022 to 28th March 2022, where in it was found 100% of the ICS in both states were in functional state.

Proportion of operational stoves obtained from the survey is multiplied by the total commissioned stoves to arrive at this value.

Proportion of operational stoves: 100%

$$N_{y,i,j} = 100\% \times 30000 = 30000$$

Total commissioned stoves till the latest monitoring period (1-04-2021 to 15-09-2022). Each ICS installed in this monitoring period was appropriately factored as per the number of days it was functional.

The Actual ER calculations for sample first project activity instance is as below.

Determination of number of ICS operating during year y
 $N_{y,i,j} = 1 \times [1 - (y-1) \times 10\%]$

Example of calculation:

$$\begin{aligned} \text{If } y &= 2, \\ N_{y,i,j} &= 1 \times [1 - (2-1) \times 10\%] \\ &= 0.9 \end{aligned}$$

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

Year (y)	$N_{y,i,j}$
1	1
2	0.9
3	0.8
4	0.7
5	0.6

6	0.5
7	0.4
8	0.3
9	0.2
10	0.1

Determination of efficiency of ICS during year y

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

Where

$$\eta_p = 31.81\%$$

$$DF_n = 0.99$$

Example of calculation:

If y= 2

$$\eta_{new,y,i,j} = 31.81\% \times (0.99)^{2-1} \times 0.94$$

$$= 29.90\%$$

Hence the efficiency of ICS during y is as below:

Year (y)	$\eta_{new,y,i,j}$
1	29.90%
2	29.60%
3	29.31%
4	29.01%
5	28.72%
6	28.44%
7	28.15%
8	27.87%
9	27.59%
10	27.32%

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

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

Example of calculation: If y= 1,
 $B_{y,savings,i,j} = 1.8250 \times [(0.2990/0.1) - 1]$
 = 3.6320 tonnes per improved cook stove

Period	$B_{y=1,new,i,survey}$	$\eta_{new,y,i,j}$	η_{old}	$B_{y,savings,i,j}$
01/04/2021 to 31/12/2021	1.8250	29.90%	0.1	3.632
01/01/2022 to 15/09/2022	1.8250	29.60%	0.1	3.577

During the monitoring period 30,000 ICS were operational in the states of Chhattisgarh and Bihar (i.e., 15,000 ICS in each state).

Period from	Period to	Number of Day during period of Y Year	Efficiency of ICS during year y	Quantify of woody biomass saved	Emission reductions by ICS
			$\eta_{new,y,i,j}$	$B_{y,savings,i,j}$	
01/04/2021	31/12/2021	275	29.90%	3.6320	97,394
01/01/2022	15/09/2022	258	29.60%	3.5774	145,710

The Vintage wise summary for all 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)
2021	97,394	0	0	97,394
2022	145,710	0	0	145,710
Total	243,104	0	0	243,104

APPENDIX 1: STAKEHOLDER CONSULTATION DOCUMENTS

- ICS STAKEHOLDER MEETING - BINAR - 30/6/2022

- | | | |
|-----|------------------------|------------------|
| 1. | Balrup Singh, Sarpanch | Balrup Singh |
| 2. | Devdeep, Thakur | Devdeep |
| 3. | Ajay Kumar | Ajay Kumar |
| 4. | Vimlesh Kumar, Teacher | Vimlesh Kumar |
| 5. | Vipin Kumar | Vipin Kumar |
| 6. | Krishna Singh | Krishna Singh |
| 7. | Dharmendra Singh | Dharmendra Singh |
| 8. | Vijay Sharma | Vijay Sharma |
| 9. | Upendra Singh | Upendra Singh |
| 10. | Ravinder Singh | Ravinder Singh |
| 11. | Ramrup Singh | Ramrup Singh |
| 12. | Jagdish Singh | Jagdish Singh |
| 13. | Baijnath Thakur | Baijnath Thakur |
| 14. | Rambant Sharma | Rambant Sharma |

GCS Stakeholder Meeting - Chhattisgarh

30-06-2022

1. Lakshman Ram, Sarpanch

Lakshman

2. Dinesh Sahu, Teacher

Dinesh

3. Lalit Yadav.

Lalit Yadav.

4. Ram Pratap

Ram Pratap

5. Jeevan Ram

Jeevan Ram

6. Shankar Singh

शंकर सिंह

7. Loknath Singh

लोकनाथ सिंह.

8. Dashrath Ram

दशरथ

9. Dharamjeet

Dharamjeet

10. Kedar Singh

कुमार सिंह

11. Basant Lal

Basant Lal

12. Jagannath

जगन्नाथ

13. Baljeet

Baljeet

14. Hari Prasad

हरि प्रसाद

15. Mangal Singh

मंगल सिंह

मूल्यांकन प्रपत्र

नाम	श्री २।नरूप सिंह	लिंग	पुरुष	महिला
			✓	

1. परियोजना गतिविधि का क्या प्रभाव है?	खाना जल्दी पकाता है।
2. इस परियोजना गतिविधि के बारे में आपको क्या पसंद आया?	सब पसंद आया।
3. आपको इस परियोजना गतिविधि के बारे में क्या पसंद नहीं आया?	—
4. क्या आप समझते हैं कि आपके लाभ के लिए कार्बन अधिकारों का उपयोग कैसे किया जाएगा?	हाँ।
हस्ताक्षर	२।नरूप.

मूल्यांकन प्रपत्र

नाम	श्री लोकनाथ सिंह	लिंग	पुरुष	महिला
			✓	

1. परियोजना गतिविधि का क्या प्रभाव है?	संतुष्ट हूँ।
2. इस परियोजना गतिविधि के बारे में आपको क्या पसंद आया?	खाना पकाने में कम लकड़ी लगता है।
3. आपको इस परियोजना गतिविधि के बारे में क्या पसंद नहीं आया?	-
4. क्या आप समझते हैं कि आपके लाभ के लिए कार्बन अधिकारों का उपयोग कैसे किया जाएगा?	हाँ।
हस्ताक्षर	लोकनाथ सिंह