IMPROVED COOK STOVE MARKET DEVELOPMENT IN RURAL NEPAL

Logo (optional)

Document Prepared by VNV Advisory Services Pte. Ltd

Contact Information

Project Title	Improved cook stove market development in rural Nepal
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Prepared By	VNV Advisory Services Pte Ltd
Contact	41/1, Church Street, Reyyan Towers, Bangalore, Karnataka -560001, India www.vnvadvisory.com email:contact@vnvadvisory.com cell:+91 9844331288 Direct: +91 80 42429933

[redacted] Fax: +91 80 42429927

CONTENTS

1 PROJECT DETAILS

1.1 Summary Description of the Project

Nepal is a mountainous country challenged by its inherent topography and socio-economic conditions. It ranks 145 on the Human Development Index (HDI) and nearly one-fourth of its population live below poverty line.

Household Air Pollution (HAP) is one of the biggest causes of premature deaths globally killing more people than a combined number of TB, Malaria and Aids. In rural especially remote and poor communities of Nepal, solid biomass fuel burning in the kitchens with inefficient cook stoves has posed threat to not just health but also the atmosphere. In this backdrop, the project has been implemented in ten districts of Nepal since October 2018 to provide easy access of clean cook stoves to people to address the problem.

Baseline Scenario:

In the baseline the household user are using traditional inefficient cookstoves for meeting their daily need viz. cooking burning non renewable biomass.

In its effort to combat with the climate change, Nepal has set-up a good policy environment to support the climate change mitigation and adaptation. Nepal's Climate Change Policy (2011) aims, among others, to reduce GHG emissions by promoting the use of clean energy such as hydro-electricity, renewable and alternative energies, and by increasing energy efficiency and encouraging the use of green technology. This policy envisions utilizing the financial resources available from national and international sources for climate adaptation, adverse impacts, mitigation and low carbon development. The policy also targets to mobilize at least 80% of the total funds available for climate change related programmes at the community level. Nepal's Nationally Determined Contribution (NDC) recognizes the "Clean Energy Development Pathways" as a crucial measure to realize the mitigation actions, which, among others, targets to equip every household in rural areas with smokeless (improved) cook stoves by 2030.

In this context, the project aims to: i) strengthen private-sector led clean cook stove marketing approach; ii) strengthen market chain of clean cook stoves; and iii) minimise respiratory health problems in rural Nepal caused by open fire cooking. Learning objectives of the project include: i) setting incentives that enable poor users to purchase and benefit push products despite their low financial means; and ii) innovative financing for clean cook-stoves through preferential loans via cooperatives as an alternative to the current approach of providing substantial subsidies for certain types of clean cookstoves.

The underlying theory of change is that once the clean cook stove and hood-stove entrepreneurs are provided with Results-based Financing (RBF) incentives over a period of five years, they will grow in capacity over the period and will be able to continue to meet the on-going demand on their own. Through their initially supported activities, they will gradually be able to achieve greater production, quality assurance, and decrease their

costs through economies of scale, so that the price of a portable cook stove will reduce over the 5 years by approximately 10 per cent.

The project is being implemented in Baglung, Argakhanchi,Bara, Chitwan,Gulmi Kaski, Makwanpur, Myagdi, Parbat, and Syangja Districts in Nepal. Most of the households from these areas use solid biomass fuel for cooking.

NMB Bank Limited is the RBF fund manager. Likewise, the project has partnership with five local NGOs while the project is working closely with District Cooperative Association, local cooperatives, cook stove manufacturers, importers, distributors and other supply chain actors.

The total estimated ICS to be deployed is 15,315 as per the small scale threshold limit.

HPN JE-01 ND	12415
Greenway Jumbo	2900
Total ICS	15315

The actual total number of ICS disseminated are 15,292 for the project.

Batch	Commissioning Start date	Commissioning End date	HPNJE-01	Greenway Jumbo
Batch 1	01-11-2018	28-02-2019	9560	2597
Batch 2	01-03-2019	21-06-2019	2855	280
		Total	12415	2877
		Grand Total	**15292**	

The non renewable biomass energy as well as fossil fuel energy displaces by project activity will result in a total emission reduction of 31,983 tonnes of CO2e/year. The total emission reduction by the project activity is estimated to be 3,19,830 tonnes of CO2e for the first crediting period, which is 01/11/2018 to 31/10/2028.

Vintage wise break-ups of emission reduction -

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
Year 2018	3916	0	0	3916
Year 2019	23433	0	0	23433

Year 2020	19581	0	0	19581
Total (01/11/2018 to 31/10/2020)				46931

1.2 Sectoral Scope and Project Type

Sectoral scope : 3

Type : II

Title : *AMS II G,* Energy efficiency measures in thermal applications of non-renewable biomass --- Version 11.1

The additionality of the project activity shall be demonstrated and assessed using the Demonstration of additionality of microscale project activities

Other tools referenced in this methodology:

- Demonstration of additionality of small-scale project activities
- Calculation of the fraction of non-renewable biomass

The project is not a grouped project.

1.3 Project Eligibility

The proposed project is not a grouped project.

The proposed cook stoves project is eligible as per VCS guidance version 4.0.

1.4 Project Design

The project is a single installation i.e. improved cook stoves project and is considered as a single installation.

The project intends to disseminate HPNJE-01ND and ,Greenway Jumbo ICS to the disadvantaged communities in the project district. The dissemination of ICS happen district wise and accordingly the ICS has been included in the project design. All the ICS are single pot rocket stoves.

1.5 Project Proponent

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Organization name	Practical Action
Contact person	Pooja Sharma
Title	PP
Address	Practical Action South Asia Regional Office Kathmandu, Nepal Phone: 977-1-4423639, 4423640
Telephone	Cell : 91 9844331288 Direct : 91 80 42429933
Email	Pooja.Sharma@practicalaction.org.np

1.6 Other Entities Involved in the Project

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Organization name	Value Network Ventures Advisory Services Pte. Ltd
Role in the project	PP representative and Consultant
Contact person	Mr. Sandeep Roy Choudhury
Title	Director
Address	41/1,Church Street, Off MG Road, Bangalore, Karnataka, India www.vnvadvisory.com Fax : 91 80 42429927
Telephone	Cell : 91 9844331288 Direct : 91 80 42429933
Email	email: contact@vnvadvisory.com

1.7 Ownership

As per VCS Program Definitions version 4, the project ownership is the legal right to control and operate the project activities. Practical Action is the parent company and also the project proponent (PP) of project activity and they have the legal right to control and operate the project activities

1.8 Project Start Date

Start date of the project activity is the earliest date of installation of ICS i.e. 01/11/2018 which is date of 1st commissioning of ICS

1.9 Project Crediting Period

Crediting Period Start date: 01/11/2018

Crediting Period End date: 31/10/2028

Total length of crediting period is 10 years , fixed

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1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Project	√
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
01/11/2018 – 31/10/2019	**31,983**
01/11/2019 – 31/10/2020	**31,983**
01/11/2020 – 31/10/2021	**31,983**
01/11/2021 – 31/10/2022	**31,983**

01/11/2022 - 31/10/2023	**31,983**
01/11/2023 - 31/10/2024	**31,983**
01/11/2024 - 31/10/2025	**31,983**
01/11/2025 - 31/10/2026	**31,983**
01/11/2026 - 31/10/2027	**31,983**
01/11/2027 - 31/10/2028	**31,983**
Total estimated ERs	3,19,830
Total number of crediting years	10 years
Average annual ERs	**31,983**

1.11 Description of the Project Activity

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

The ICS to be deployed under this project are Improved Cook Stoves which substantially reduces fuel consumption and emissions for conducting cooking and water heating tasks in homes. The ICS improve the efficiency of combustion and thermal transfer to the pot compared with a traditional pot support or three-stone fire by incorporating a number of cutting edge components like highly-insulated combustion chamber which provides a conducive environment for clean and efficient combustion of wood. It substantially reduces woodfuel consumption compared with a three-stone fire or traditional pot support. And thus in terms saves non renewable biomass and results in emission reductions.

. The project will be broadly implemented in the Nepal. This project is promoted by Practical Action group. The goal of the project activity is to disseminate improved cookstoves (ICS) to households in Nepal. There are seven provinces and 77 districts in Nepal. Districts in Nepal are second level of administrative divisions after provinces. Districts are subdivided in municipalities and rural municipalities. The Households in this region of the Nepal are characterized by the consumption of the solid biomass based fuel. More than 88% of the households in these districts use firewood for cooking

purpose. Similarly, another 10% use dung cake to meet their daily cooking energy requirements.

The majority of communities are rural and some lack direct road access. This combination of actors drives the high reliance on fuel wood as the primary source of cooking fuel. Despite high prevalence of biogas throughout Nepal, the average penetration rates of biogas and LPG throughout the project boundary is less than 2% each and access to kerosene is also very limited mostly due to high fuel prices. Project aims to reach disadvantaged people with the clean cooking solutions in form of ICS. Project implementer shall train people appropriately at the local level to cater the households with stove construction. Female stove makers will be trained to the extent possible.

Technology/Measure

The project intends to disseminate HPNJE-01ND and ,Greenway Jumbo ICS to the disadvantaged communities in the project district. The dissemination of ICS happen district wise and accordingly the ICS has been included in the project design. All the ICS are single pot rocket stoves.

Technical description of ICS deployed

Stove model	Efficiency (%)	CO (g/mJ)	PM (mg/mJ)	Fuel type	Operational Lifetime
Greenwav Jumbo Stove	29.79	8.16	118.43	Biomass	7 years
HPNJE-01ND	30.29	2.94	300.19	Biomass	7 years

Photo 1-HPNJE-01ND	*Photo 2 - Greenwav Jumbo Stove*

Once the installation completes, representatives of project developer will perform paperwork and the stove is recorded in the database. In order to ensure that the households are not distributed with multiple stoves, each household will be assigned with a unique identification number. Unique ID number will be included in the installation card and the same shall be recorded in the database. The database will be maintained in MS Excel and contains the following information.

- Name of the Household
- ID no/Citizenship no
- Address
- District
- Region
- Date of sales
- Make/Model of ICS
- Sl. no of ICS (unique ID of ICS)

1.12 Project Location

All the project activity instances in the proposed project activity would be located within geographical boundaries of Republic of Nepal. Thus geographical area of project is Nepal. The geographical boundary is delineated in the form of extreme geographic coordinates as follows:

Latitude: 28.3949° N Longitude: 84.12408762° E

Country - Nepal

Districts – Baglung, Argakhanchi,Bara, Chitwan,Gulmi Kaski, Makwanpur, Myagdi, Parbat, and Syangja,

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Fig. 1. Map of Nepal

1.13 Conditions Prior to Project Initiation

The scenario existing prior to the implementation of the project activity instances is the usage of traditional biomass and inefficient cook stoves with poor ventilation, causing excessive indoor air pollution (IAP) and has been a serious health risk for women and children who spend several hours in the kitchen. The proposed project reduces the use and demand for fossil fuels and non-renewable biomass that would have been used in the replaced stove to achieve the same output (i.e cooking daily meals and boiling hot water) with the ICS. This directly leads to reduced GHG emissions. Therefore, the project has been implemented to generated GHG emissions for the purpose of their subsequent reduction, removal or destruction.

According to national census 2011[1] almost 90% of households in Nepal rely on solid biomass to meet their cooking requirement; this inevitable creates a situation where the forests are likely to be overexploited

Below table shows Urban and Rural fuel consumptions in households -

	Total HH	HH using fuel wood	Kerosene	LPG	Cow dung	Bio gas	% of fuel wood consumption
Urban	1,045,575	268,643	20,990	707,674	15,776	19,121	26%
Rural	4,377,722	3,201,581	34,620	432,988	547,350	112,475	73%

From the above it is evident that in rural households fuel wood consumption is more than Urban households, since the rural people are poor people and cannot afford other source of energy for cooking.

Below table shows the district wise fuel consumption in households -

District	Total HH	HH using fuel wood	Kerosene	LPG	Cow dung	Bio gas	% of fuel wood consumption
Baglung	61,482	54,434	141	4,483	15	151	89%
Gulmi	64,887	59,844	197	4,394	26	244	92%

[1] https://unstats.un.org/unsd/demographic/sources/census/wphc/Nepal/Nepal-Census-2011-Vol1.pdf

Bara	108,600	73,010	1,047	5,117	24,841	2,033	67%
Makwanpur	86,045	64,613	824	16,229	116	3,521	75%
Chitawan	132,345	64,933	997	52,545	211	12,238	49%
Myagdi	27,727	23,999	81	3,360	12	190	87%
Kaski	125,459	40,787	1,686	76,676	59	5,376	33%
Syangja	68,856	56,527	261	9,758	29	1,839	82%
Parbat	35,698	30,790	141	4,483	15	151	86%
Arghakhanchi	46,826	43,760	147	2,601	45	89	93%

The above table demonstrate the household fuel wood consumptions percentage in the target areas where Practical Action is planning to disseminate the Improved Cook Stvoves.

A sample Household survey was conducted by Practical Action in Bara, Kaski, Makwanpur, Argakhanchi, Baglung, Chitwan, Myagdi, Parbat , Syangja, and Gulmi districts, Nepal. These district of Nepal is one of the poorest district and most of the poor people works in the field to meet their livelihood. A lot of the people does not own the agricultural land and they work as a daily on wage basis in these fields. A total of 213 households were surveyed for baseline estimation.

This community baseline survey constitutes an essential component of the preparation and learning process of the PA by providing information on citizen perceptions of clean energy, and various issues such as livelihood, economics and energy usages. For detail , please refer section 3.4 of report.

Thus, prior to the project initiation, the households in the projects are relying on the scarce solid biomass resource.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

There exists no mandatory law or regulation in the host country requiring the introduction of ICS in Nepal, therefore the project is a voluntary effort by the project proponent. The project is in compliance with relevant laws, statues and other regulatory frameworks which has been checked from the Nepal's environment protection rules (http://www.lawcommission.gov.np/en/archives/category/documents/prevailing-law/rules-and-regulations/environment-protection-rules-2054-1997) .The project does not violate any laws, statutes and or other regulatory frameworks in Nepal.

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1.15 Participation under Other GHG Programs

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

The project has neither been registered nor seeking registration under any other GHG programs. The project is seeking registration only in VCS program.

1.15.2 Projects Rejected by Other GHG Programs

The Project is not rejected by other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

Net GHG emission reductions or removals generated by the Project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions in any Emission Trading program or other binding limits.

1.16.2 Other Forms of Environmental Credit

The Project has no intend to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program .

1.17 Additional Information Relevant to the Project

Leakage Management

The project does not involve any transfer of equipments from outside the project boundary to the project boundary. The programme will use the stoves either built on site or manufactured by a prequalified companies in Nepal. Thus the provision on leakage associated with project boundary is not applicable.

Commercially Sensitive Information

All relevant information for the purpose of Project description is included in VCS PD. All the information disclosed to the validator has been provided in the public version of the report.

Sustainable Development

The contributions of proposed project activity towards sustainable development are explained with indicators viz. social, economical, environmental, technological well-being, legislative and temporal as follows:

Environmental well-being :-The project activity will result in the reduction of firewood consumption and emission of green house gases and thus conserve forest and biodiversity.

Social well being : -The project activity will pave the way for development and increases the social status and living conditions and the prevailing living standard in the vicinity of the project activity and thus results in empowering the nearby. Also it will contribute to a small increase in the local employment by employing skilled and un-skilled personnel for operation and maintenance of the equipment. The project will reduce the drudgery of women, time saving and the use of saved time for other productive activities.

Economic well being :- The project has created a business opportunity during construction phase for local stakeholders such as suppliers, contractors etc. contributing to economic well-being aspects. Further, the project also influences creation of employment opportunities for local people, which would enhance their social status. Sufficiently enhance indoor air quality thereby improving health of women and children and reducing incidences of smoke and fire related injuries and therefore result in saving of health related expenses.

Technological well being :-The proposed project activity will promote improved cook stoves that result in reduced fuel consumption and emissions due to cooking and heating water in homes.

Further Information

Not Applicable

2 SAFEGUARDS

2.1 No Net Harm

Since the technology i.e. cook stove under the project is very simple and easy to use and maintain. There is very less chance of the technology failure and equipment damage that may impact the applicability of the methodology. The project activity does not involve any major construction activity. It primarily requires the cookstoves which is either locally built or imported. The stoves are manufactured at the factory with proper due diligence. Thus there are no any significant impacts due to implementation of project activity on air, water, soil quality and ambience are envisaged due to the project activity. Also there is no net harm, or any potential negative environmental and socio-economic impacts.

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2.2 Local Stakeholder Consultation

A public notice was placed in the local daily newspaper inviting the local stakeholders for consultation process for this project . The advertisement was published on 22/10/2020. Local stakeholder consultation meeting was took place on 30/10/2020 at DCRDC office at village ,Baglung, Nepal. In the introductory speech, the representatives of Practical Action and DCRDC group , welcomed the gathering and given a brief about the climate mitigation project activity. The meeting was organized informally in order to encourage participants post their views on the project more openly and without hesitation of protocol. Most of the participants attending the meeting were Men & women which were local beneficiary of the project.

The introductory phase of the meeting included the opening of the meeting, self-introduction by the participants, objectives of the LSC and explanation about the project. Ms. Srijana Tamang opened the meeting and introduced herself and, Practical Action and the VNV Advisory and the major activities Practical Action has been carrying out as a part of its quest to promote clean energy solutions to the disadvantaged communities of the Nepal. The introductory session was conducted in plenary and lasted for around 15 Mins.

Subsequent to the introductory speech, Mr. Sandeep Roy Choudhury from VNV) along with Mr. Min Bikram Malla from Practical Action explained the dependency of household user especially of female members on traditional cookstoves. Mr. Sandeep Roy explain the baseline energy consumption scenario that has been dominated by traditional fuels and that more 75% of total energy consumption is supplied by traditional resources. He further added that per capita consumption of woody biomass for cooking in Nepal accounts around 4200 Kg/year. Highlighting the socio-economic situation of the project district, Mr. Sandeep further explained the urgency to transform the cooking habit such that the environment remains protected and the households get benefited socially and economically. On the social dimension he added the ill effects of using traditional biomass based cooking stoves; Mr. Sandeep highlighted that the culprit of major respiratory diseases accountable to women and children in Nepal is the indoor smoke released as a part of cooking activity. In addition, he highlighted comparative advantage of having improved cooking stoves with respect to time, drudgery, dirty pots and level of comfort of being inside kitchen. He added that the project has been initiated to provide those benefits to the users such that they will be able to reduce their cost for being healthy.

Apart from the benefits discussed on social front, Mr. Sandeep Choudhury from VNV advisory services informed the participants about contribution of using standalone clean cooking units at a household level to contribute towards global environmental problem called “Climate Change”. Mr. Choudhury proceeded with his introductory session more interactively. He sought out information on the participant’s own experience about climate change and related it to the global phenomena of global warming and climate change. He added that the firewood burnt releases smoke which contains gases that are capable of changing earth’s temperature and with the introduction of clean cooking solutions, the users would be releasing lesser smoke and therefore contributing for global cause. He added, the pollutants thus reduced by the use of clean cooking stoves can be traded internationally and that the revenue collected from such trade will benefit other households who are still using traditional stoves.

He further informed the participants, that the revenue generated shall partly be used to repair and maintenance of Cook stoves.

However, for this, he added the fact that the individual households will have to transfer the entitlement of the emission reductions accrued by their project unit to the project proponent.

After the detailed discussions, the session was open for questions from stakeholders

The question raised by the household users are summarised below -

Q: How Improved Cook stoves help climate change?

Answer: Improved cookstoves not only reduce emissions through better combustion of the fuel, but they also reduce the amount of fuel which is needed for cooking. Since deforestation contributes towards global warming, improved cookstoves help mitigate climate change due to their reduced need for firewood.

Q: We noted that the project is eligible to earn credits for 10 years. As you said earlier you will use the credits to cover project expenses related to stove production and installation. Since ICS will be installed once, is credit from entire five years required to cover the expenses

Answer: The project can earn credits for 10 years and the revenue from the sales of credit shall be largely used to cover the stove production and installation expenses. It is pertinent to clarify that despite the project is eligible to earn credit for 10 years, a stove has a lifetime of 7 years which requires the stoves to be replaced after 7 years of installation which again needs additional cost. Further there are costs involved with monitoring and verification of system. Finally, the proponent indeed intend to save something doing this project.

Q: Do you have any training component included in your project implementation?

Answer: Yes, we have training program included in the project design. The training component is targeted such that there is project representative and master trainer at the local area to troubleshoot the problems encountered in the Cookstove and support the owners in repair and maintenance of the cook stoves. The technical training is provided to them at the local office of DCRDC and also during the installation at the household level.

The Minutes of meeting with commenting sheet from LSC, attendance sheet and photographs will be submitted to the DOE.

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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 .

Economic impact: Employment creation and saving of health cost.

:Social impact : Reduces drudgery of women, time saving and the use of saved time for other productive activities

Ecological impact – There is positive ecological impact due to saving of non renewable biomass. The imporved cook stoves consume 30-40% less biomass due to which there is reduction is fuelwood consumption and thus less deforestation and greenhouse gases will happen and ecological balance will be maintained as well as forest and biodiversity conservation.

Atmosphere impact – Due to less burning of biomass, the air pollution will be reduce and have a positive impact on atmosphere. Sufficiently enhance indoor air quality thereby improving health of women and children and reducing incidences of smoke and fire related injuries

Waste water impact – No waste water will be generated while using the project technology i.e. improved cook stoves and thus no impact on water.

Noise impact – No impact on noise pollution as the devices work silently and improved cooking devices.

Solid waste impact – No solid waste will be generated due to the usage of improved cook stoves.

2.4 Public Comments

During the public commenting period from 25/11/2020 to 25/12/2020, there are no comments received for this project..

2.5 AFOLU-Specific Safeguards

Not applicable

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Title: Energy efficiency measures in thermal applications of non-renewable biomass

Type: Type II – Energy Efficiency Improved Projects Category AMS II.G - Energy efficiency measures in thermal applications of non-renewable biomass /Version 11.1

Sectoral Scope: 03

Reference: The reference has been taken from the list of the small-scale CDM project activity categories contained in Appendix B of the simplified M&P for small-scale CDM project activities. *https://cdm.unfccc.int/methodologies/DB/DCO8WRRQVTGLH1GHQBCL035F5M13R8*.

3.2 Applicability of Methodology

S. No.	AMS II.G, Version 11.1 Requirements	Project Activity Applicability
1.	This methodology comprises efficiency improvements in thermal applications of non-renewable biomass. Examples of applicable technologies and measures include the introduction of high efficiency biomass fired project devices (cookstoves or ovens or dryers) to replace the existing devices and/or energy efficiency improvements in existing biomass fired cookstoves or ovens or dryers.	This project includes the dissemination of the high efficiency biomass fired cook stoves having the efficiency >= 20% compared to traditional stoves. This project will save nonrenewable biomass which otherwise would have been consumed by less efficient cooking appliances.
2.	In the case of cookstoves, the methodology is applicable to the introduction of single pot or multi pot portable or in-situ cookstoves with rated efficiency of at least 20 per cent. Refer to the requirements indicated in "Data / Parameter table 12" which details the options for testing and certification as well as supporting documentation (e.g. certificate issued by third party or test results) that needs to be presented to the validating DOE.	The efficiency of the disseminated biomass fired forced draft cook stoves is having the efficiency > 20% compared to traditional stoves. The ICS test certificate mentioned 30.29% for HPNJE-01ND and 29.79% for Greenway Jumbo stoves.
3.	The aggregate energy saving of a single project activity shall not exceed the equivalent of 60 GWh per year or 180 GWh thermal per year in fuel input.	The project activity will remain under the limit of small-scale project activity types (annual energy savings below 180 GWhth) during every year of the crediting period, because the maximum number of households that will be disseminated with the stove under the project will be limited to 15,315..
4.	Non-renewable biomass has been in the project region since 31 December 1989, using survey methods or	The non-renewable biomass has been used in the country since 1989. This is evident from EB 67 annex 22, that has affirmed the fraction

	referring to published literature, official reports or statistics.	of non-renewable biomass for Nepal.
5	For cases where the biomass is sourced from renewable sources, the project participants should use a corresponding Type I methodology.	In the proposed project the biomass used are the non renewable biomass, thus this condition is not applicable
6	If the project device requires a specific fuel for this device (e.g. briquettes, pellets, woodchips), the consumption of the fuel should be monitored during the crediting period	The project used non renewable biomass and not any specific fuel (e.g. briquettes, pellets, woodchips), thus this condition is not applicable
7	The CDM-PDD or CDM-PoA-DD/CPA-DD 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 ICS will be disseminated through sales represetatives or distributer located at each district . Each ICS will bear a single unique serial numbers. Also PP will maintain a database of records of ICS dissemination with the end user's details viz. name, address, mobile no etc.
	The CDM-PDD or CDM-PoA-DD/CPA-DD 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 ownership of carbon credits lies with the project developer. PP has obtained signed carbon waiver from each households who has purchased the ICS who has declared that carbon credits lies with the project developer ,and this declaration was included in the sales document. Thus this allows to avoid that project stove others claim credit for emission reductions from the project devices

3.3 Project Boundary

Source		Gas	Included?	Justification/Explanation
Baseline	Source 1	CO_2	Yes	Major source of emissions
		CH_4	No	Not required by methodology, only CO2 emission factor for fossil fuels is considered. Conservative Assumption.

Source		Gas	Included?	Justification/Explanation
		N_2O	No	Not required by methodology, only CO2 emission factor for fossil fuels is considered. Conservative Assumption.
Project	Source 1	CO_2	Yes	Major source of emissions
		CH_4	No	Not required by methodology, only CO2 emission factor for fossil fuels is considered. Conservative Assumption.
		N_2O	No	Not required by methodology, only CO2 emission factor for fossil fuels is considered. Conservative Assumption.

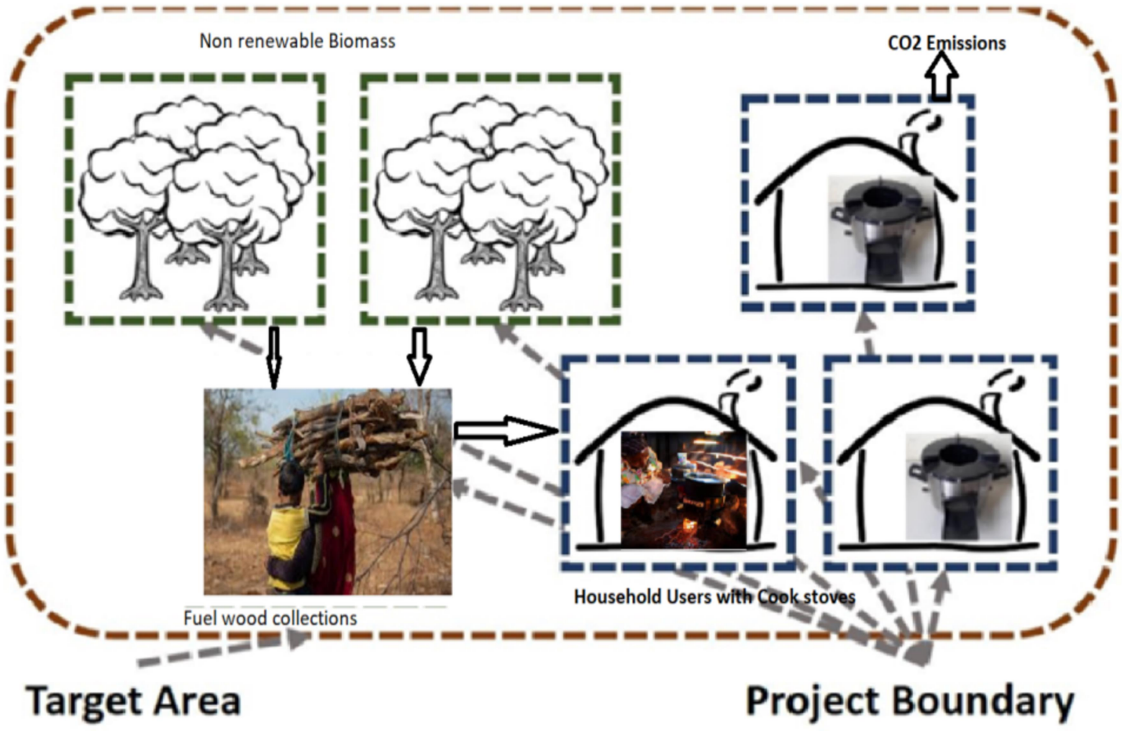


Fig 2. Project devices and project boundary diagram

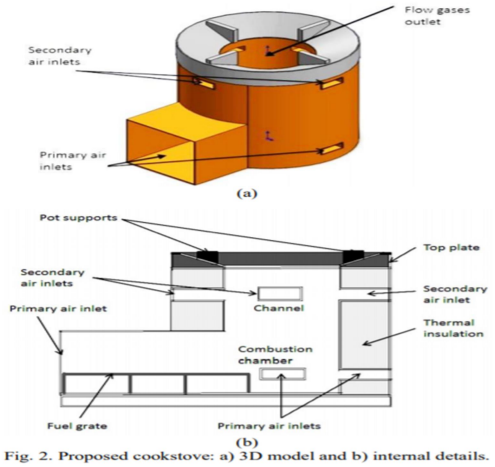
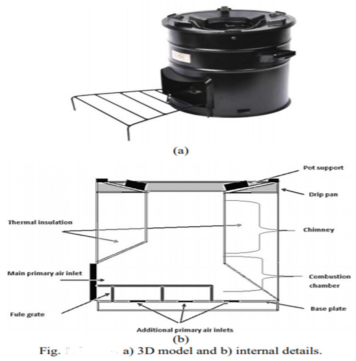
 Fig. 2. Proposed cookstove: a) 3D model and b) internal details.	 Fig. a) 3D model and b) internal details.
Photo 1-HPNJE-01ND	Photo 2 - Greenwav Jumbo Stove

Fig. 3. Drawing of the technology deployed in this project.

3.4 Baseline Scenario

The actual baseline is the use of non-renewable biomass. Methodology AMS II.G states that "in the absence of the project activity, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs". This is a conservative approach to determine the baseline emissions. In absence of the project activities, the intended beneficiaries of the project would continue using the traditional inefficient cooking stoves, consuming high quantity of non-renewable biomass.

Steps to identify baseline scenario –

Step – 1 - Baseline study through research , baseline survey records and data analysis

The baseline scenario is continued use of non renewable biomass for cooking. Majority of households in the project districts use firewood to meet their cooking needs. National Climate Change Impact Survey 2016[2] (refer page 14), conducted by the Central Bureau of Statistics, Govt. of Nepal, 88.7% households reported use of firewood for cooking..

one of the major reasons for deforestation and degradation of forest is uncontrolled use of firewood as rural households rely on access to forests for firewood for household energy

.

Some major causes of deforestation are listed below:

2 https://climate.mohp.gov.np/downloads/National_Climate_Change_Impact_Survey_Report_2016.pdf (refer to page 14)

- Population Growth
- Fuelwood as a Major Source of Energy
- Migration and Settlement in Terai
- Livestock and Grazing
- Illegal Timber Harvesting and Trade
- Developmental Activities
- Tourism and Trekking
- Political and Nonpolitical Use and Misuse of Forest
- Cultural Use of Wood

The published article by Bijay Raj Subedee et.al[3] (refer page 1) mentioned that "Uncontrolled use of firewood is a major reason of deforestation and degradation of forest . In rural areas of Nepal people are using traditional three stone cooking stoves (TCS)."

Step 2 – Relevant Policy and Strategies of Improved Cook Stove for Dissemination

Many government policies are in place to promote ICS in rural Nepal. Once such policy is National Rural and Renewable Energy program[4](Refer page 4). The program's main objective is to improve the living standards of rural and vulnerable communities, increase employment and productivity, minimize reliance on traditional energy, and attain sustainable development through integration of alternative energy with the socio-economic activities of women and men in rural communities. In 2015, the government listed approved designs of biomass cookstoves that meet national benchmarks and are eligible for subsidy. In 2016, the Renewable Energy Subsidy Policy was finalized.

Developed flexible approaches for the implementation of the programme through the NGOs, GOs, CBOSs and local NGOs.

The key to sustainable ICS dissemination is at this stage of experience believed to be the ability to create and consolidate the institutional and technical manpower with the rural communities, allowing these to continue ICS dissemination after withdrawal of external support. The local people, preferably women, would be trained as promoter who creates demand and receives the payment after installing the stoves. It is likewise crucial to promote and disseminate a range of different, affordable and culturally acceptable ICS to communities.

[3] https://lib.icimod.org/record/32838 (refer page 1)

4 http://documents1.worldbank.org/curated/en/916571494854063344/pdf/Investment-prospectus-for-clean-cooking-solutions-in-Nepal-a-roadmap-to-national-goal-of-providing-clean-cooking-solutions-for-all.pdf (Refer page 4)

Step 3- Procedure for applying baseline scenario – Citation of Baseline survey report[5]

The project developer has conducted a filed survey in-order to determine and establish the baseline scenario and baseline biomass consumption and also prepare a survey report. A sample Household survey was conducted by Practical Action in Argakhanchi, Baglung, Chitwan, Myagdi, Parbat, Bara, Makwanpur,Syangja, Kaski and Gulmi districts, of Nepal. In these districts of Nepal most of the poor people works in the field to meet their livelihood. A lot of the people does not own the agricultural land and they work as a daily on wage basis in these fields. A total of 213 households were surveyed for baseline estimation. Total 10 districts are surveyed where the ICS are to be disseminated. Practical Action caseworkers were engaged and who are trained Integrity in preparation for administering the community survey from 05 January to 10 March, 2018.

The following objectives were addressed by the baseline study.

- Baseline cooking devices
- Baseline fuel usages and types and sources
- Possibilities of Displacement of Tradition Cooking Stoves
- Assessment of reduction in drudgery in collecting firewood due to use of ICS

The baseline survey scope of work includes following –

- Review relevant documents, program, policies, etc. on ICS as well as current trends of the technology
- Finalize methodology, questionnaires and details of the study and discuss with relevant staffs
- Carry out the field data collection as per the calculated samples
- Tabulate and analyse data from the survey
- Prepare user survey report for the project

The study approach has been prepared based on four main components: planning (mobilization), field work, analysis and reporting.

Baseline survey sampling design and procedures –

The minimum sample size to determine number of Household user and displacement of tradition stoves using the procedure outlined in para 12 of appendix 1, EB 75 Annex 8, Guidelines for Sampling and Surveys for CDM Project activites and Programme of Activities Ver. 3.0.

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

[5] https://vnvadvisory.com/wp-content/uploads/2021/11/Baseline-report_-PA-Nepal.pdf

Where:

n= Sample size

N = Total number of HH user

p = expected proportion (0.9)

1.645 = represents the 90% confidence required

0.1 = represents the 10% relative precision

Substituting the values of "*N*" in equation above, the sample size will be deducted.

Considering that the Practical Action is proposing to disseminate ICS in 20,000 Households. The above equation gives a sample size of 31 Households. But the project participant has choose 213 Households for sampling.

Table 1: Number of sample drawn for the survey

S.N.	Districts	Households[6]	No of household sampled	Percentage
1	Makawanpur	86,127	11	5%
2	Bara	1,08,635	22	10%
3	Chitawan	1,32,462	24	11%
4	Kaski	1,25,673	16	8%
5	Syangja	68,881	22	10%
6	Parbat	35,719	19	9%
7	Baglung	61,522	34	16%
8	Myagdi	27,762	15	7%
9	Arghakhanchi	46,835	27	13%
10	Gulmi	64,921	23	11%
		7,58,537	213	100%

Total of 213 households were randomly selected in each enumeration area, where the adult particularly female respondent was chosen at random using a specific tool. The one-on-one interview lasted approximately 40 minutes, and rigorous quality assurance checks were put into place by the supervisors to ensure sound sampling and interview methodology. The survey was conducted in two

[6] https://data.humdata.org/dataset/nepal-census-2011-district-profiles-demography

ways: perception survey and experimental survey. In the perception survey, the Traditional Cook Stove users were interviewed about their usage pattern of the biomass for the household cooking using the traditional cooking stoves. In the experimental the interviewer also measured the actual biomass used in the traditional cooking stove for cooking the meals. The baseline survey was conducted following the General Guidelines For Sampling And Surveys For Small-Scale CDM Project Activities

Based on the baseline study objectives, the questionnaire/checklist was prepared. It mainly focused on the parameters required for the baseline identifications and usages. In addition to that, the factors in direct relation to ICS user benefits were of prime concern. A comprehensive database of the participating household has been created, including details such as family data, etc. This database will hold data and information that allow an unambiguous identification of participating household users and other relevant details.

The enumerators were mobilized in the field from 05 January to 10 March, 2018 for the project under consideration.

The surveyed household's were interviewed regarding their cooking patterns and understand their cooking behaviors. Based on the data collected from the field survey, the baseline cooking patterns as well as cooking fuels has been analyzed.

The sample survey question are viz.

- Primary cooking device (3 stone stove etc)
- Any secondary cooking device presence
- Number of meals cooked per day
- Number of persons in the households
- Quantity of biomass/ wood used by HH(Quantity in Kg)
- Type of biomass (tree branches/ agro waste etc)
- Source of biomass
- Smoke generation by the primary cooking device
- Incident of disease viz. cough, breathing issues, eye problems

Based on these questions, the baseline has been established.

From the household survey, it has been analyzed that the rural communities uses traditional three stone fuel wood fire stoves for their day to day activities viz. cooking etc.

As per the survey fire-wood consumption per household per cookstove was determined and found to be 3.8 ton/year. It is designed to install and replace only one baseline cooking device with project ICS. Therefore, baseline emissions is estimated considering one project device per household.

The baseline survey report can be access here for detailed study "https://vnvadvisory.com/wp-content/uploads/2021/11/Baseline-report_-PA-Nepal.pdf"

3.5 Additionality

The additionality of the project is demonstrated by following the criteria outlined in ", Tool 21 - "Demonstration of additionality of small--scale project activities" (Version 13.0) .The additionality of the project activity is demonstrated by a barrier analysis under TOOL21. As described in TOOL21, para 10, project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

(a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

(b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

(c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

(d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

. The PP chooses to demonstrate additionality using one of the barrier relevant to project

Investment barriers -The assessment of additionality of Project Aactivity implemented is deemed to be additional if it can establish that it is financially unviable. This shall be done by providing an analysis of any one of the following as per Guidelines on the assessment of Investment analysis, EB 62, Annex 5. The financial indicator such as IRR, NPV is identified for investment analysis and is compared to the benchmarks/discount rate which are standard market rates provided by the leading banks. Hence any one of the following two indicators would be selected for demonstrating additionality through investment barrier.

- Net Present Value of investment made by project implementer is negative

Net Present Value (NPV):

The project is deemed to be additional if it can establish that it is financially unviable. This has been done by means of calculation of the NPV for the project. The project is deemed additional if the NPV is negative without potential Carbon revenues. The project shall present the key results of the financial analysis to support project additionality. Typically, a project would assess whether the Project Activity project Net Present Value (NPV) is negative without Carbon revenues and in that case the project is additional.

Typical case of NPV calculation for project include the following parameters:

Net Cash Inflow: This shall consist of the various revenues and cash inflows if available, like sale proceeds from cook stove sales for the project implementer.

Net Cash Outflow: This shall consist of the various revenues and cash outflows, like the costs incurred by the project implementer for project implementation like stove procurement (manufacturing and/or purchase) costs, cook stove dissemination, awareness raising activities, maintenance & aftersales service, etc.

Discounting Factor: This shall consist of relevant discounting rates for estimates of the cost of financing and required return on capital (e.g. commercial lending rates and guarantees required for the country and the type of project activity concerned), based on bankers views and private equity investors/funds. required return on comparable projects.

Input values

Sl no	Parameters	Greenway Jumbo	HPN JE -01 ND	Source
1	Unit price of ICS in NPR	3000	2000	As per sales receipts
2	Discount Incentive to Users	1975	1738	As per sales receipts
3	End User Paid amount	1083	262	As per sales receipts
4	NPV Discount rate	10%	10%	http://www.impactdatasource.com/choosing-a-discount-rate

For the present project, additionality is demonstrated through the investment barrier. As discussed above, the project is deemed to be additional if it can establish that it is financially unviable. This shall be done by providing an analysis that the net present value of investments made by the project implementer is negative. As evidenced by the accompanying cashflow analysis, the NPV for this project, when applying a 10% discount rate, is projected to be – NPR 2,31,77,144. This is because the cost of manufacturing and shipping the product exceeds the cost of sale, so the gross margin for the product is negative without carbon finance. A sensitivity analysis was conducted such that the cost of goods sold and the product sale price were each altered by +/- 10%.

Sensitivity Analysis

NPV				(NPR 2,31,77,144)
SUMMARY OF SENSITIVITY ANALYSIS:				
Variation in ICS cost (Greenway)	-10%	0%	10%	
NPV without revenue	(NPR 2,24,36,987)	(NPR 2,31,77,144)	(NPR 2,39,17,301)	
Variation in Sales price(Greenway)	-10%	0%	10%	
NPV without revenue	(NPR 2,34,30,031)	(NPR 2,31,77,144)	(NPR 2,29,24,257)	
Variation in ICS cost (HPNJE-01)	-10%	0%	10%	
NPV without revenue	(NPR 2,10,70,764)	(NPR 2,31,77,144)	(NPR 2,52,83,524)	
Variation in Sales price(HPNJE-01)	-10%	0%	10%	
NPV without revenue	(NPR 2,34,53,080)	(NPR 2,31,77,144)	(NPR 2,29,01,208)	

In a worst case scenario in which the sale price was increased by 10% whereas the cost of goods sold was reduced by 10%, the NPV was still found to be negative, thus the project was still additional.

3.6 Methodology Deviations

Not Applicable

4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

In accordance with AMS.II-G version 11.1 paragraph 23, it is assumed that in the absence of the project activity, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs. The actual baseline scenario is the use of NRB. Since NRB has higher carbon intensity than the fossil fuels proposed in AMS II.G, this assumption reduces the emission reductions significantly, making the outcome more conservative. The detailed calculations are provided in section 5.2 of the VCS PD.

4.2 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 4.4.

4.3 Leakage

As per the paragraph 39 of the methodology AMS II.G/v11.1 the following leakages are to be considered: The use/diversion of non-renewable woody biomass saved under the project activity by nonproject households/users that previously used renewable energy sources. If this leakage assessment quantifies an increase in the use of non-renewable woody biomass used by the nonproject households/users that is attributable to the project activity, then Bold is adjusted to account for the quantified leakage.

Alternatively, Bold is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required. PP has opted to use the adjustment factor of 0.95 in order to account for leakage. As per the paragraph 39 of the methodology AMS II.G/v11.1, if equipment currently being utilised is transferred from outside the boundary to the project activity, leakage is to be considered. The project does not involve any transfer of equipments from outside the project boundary to the project boundary. The programme will use the stoves either built on site or manufactured by a prequalified companies in Nepal. Thus the provision on leakage associated with project boundary is not applicable

4.4 Estimated Net GHG Emission Reductions and Removals

AMS II.G/v11.1 requires that the project participants assume that in the absence of the project activity, the baseline scenario would be the projected use of fossil fuels for meeting similar thermal energy needs. The actual baseline scenario is the use of NRB. Since NRB has higher carbon intensity than the fossil fuels proposed in AMS II.G, this assumption reduces the emission reductions significantly, making the outcome more conservative. According to paragraph 24 of methodology AMS II.G/v11.1, emission reductions would be calculated as:

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

Where:

i = Indices for the situation where more than one type of project device is introduced to replace the pre-project devices[7]

[7] For example, in some instances, full replacement of the pre-project device would require the implementation of more than one project device (e.g. one stove suitable for cooking and the other stove suitable for cooking/boiling water).

j	=	Indices for the situation where there is more than one batch of project device
ER_y	=	Emission reductions during year *y* in t CO_2e
$ER_{y,i,j}$	=	Emission reductions by project device of type *i* and batch *j* during year *y* in t CO_2e
LE_y	=	Leakage emissions in the year *y*

For household cook stoves (as guided by the methodology):

$$ER_{y,i,j} = B_{y,savings,i,j} \times N_{y,i,j} \times \mu_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossil\ fuel} \quad \text{Equation (2)}$$

Where:

$B_{y,savings,i,j}$	=	Quantity of woody biomass that is saved in tonnes per cookstove device of type *i* and batch *j* during year *y*
$f_{NRB,y}$	=	Fraction of woody biomass that can be established as non-renewable biomass (fNRB) [8]
$NCV_{biomass}$	=	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.0156 TJ/tonne, based on the gross weight of the wood that is 'air-dried')
$EF_{projected\_fossilfuel}$	=	Emission factor for the fossil fuels projected to be used for substitution of non-renewable woody biomass by similar consumers. Use a value of 64.4 t CO_2/TJ[9]
$N_{y,i,j}$	=	Number of project devices of type *i* and batch *j* operating during year *y*
μ_y	=	Adjustment to account for any continued use of pre-project devices during the year *y* when applying equations 6 and 8 (fraction). Use 1.0 in other cases

Determining fNRB,y

[8] Default values endorsed by designated national authorities and approved by the Board are available at <http://cdm.unfccc.int/methodologies/standard_base/index.html>.

[9] This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. The value is calculated, based on the global average ratio of cooking fuels (the normalized ratio of kerosene and liquefied petroleum gas (LPG) excluding coal), i.e. 9 per cent for kerosene (71.5 t CO_2/TJ) and 91 per cent for LPG (63.0 t CO_2/TJ).

The applied methodology AMS-II.G version 11.1 refer to 'methodological tool: calculation of the fraction of non-renewable biomass' version 02.0 to calculate fNRB.

The fraction of woody biomass that can be established as non-renewable, is:

fNRB = NRB/(NRB+RB)

Where:

fNRB = Fraction of non-renewable biomass (fraction or %)

NRB = Quantity of non-renewable biomass (t/yr)

RB = Quantity of renewable biomass (t/yr)

NRB is calculated as below:

NRB = H-RB

Where, H is the total annual consumption of wood in the absence of the project activity which isdetermined as per paragraph 12 (a) of the tool 'Official statistics or reports or peer-reviewed literature'.

Data endorsed by Ministry of Forest and Environment, Nepal dated 25 November 2018 is considered for 'H'10.

Renewable biomass (RB) in the country/region/area is estimated using the equation below:

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

Where:

MAIforest,i = Mean Annual Increment of woody biomass growth per hectare in subcategory i of forest areas(t/ha/yr). This is calculated as per IPCC default value and considered as approved by Ministry of Forest and Environment, Nepal dated 25 November 2018

MAIother,i = Mean Annual Increment of woody biomass growth per hectare in subcategory i of other wooded land areas (t/ha/yr). This value is considered same as MAIforest,.

[10] http://data.un.org/Data.aspx?d=EDATA&f=cmID%3AFW%3BtrID%3A1231#f_1

Fforest,i = Extent of forest in sub-category i (ha). This value is considered as per Ministry of Forest and Environment, Nepal dated 25 November 2018.

Fother,i = Extent of other wooded land in sub-category i (ha). This value is considered as per Ministry of Forest and Environment, Nepal dated 25 November 2018.

Pforest = 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

Description of indicators	Units	Total quantity	Reference
Total Annual Consumption of Wood (H)	Million ton/year	128.00	Estimated and endorsed by Ministry of Forest and Environment, Government of Nepal
Extent of forest in sub-category (Fforest,i)	hectares	5962038	State of Nepal's Forest, Table 7
Extent of Other Wooded Land (Fother,i)	hectares	647892	State of Nepal's Forest, Table 8
Extent of non-accessible area within forest areas (Pforest)	hectares	1032604	State of Nepal's Forest, Table 10
Extent of non-accessible area within other wooded land area (Pother)	hectares	0	Not given, taken as 0 as conservative value
Mean Annual Increment of woody biomass growth per hectare in sub-category i of forest areas (MAIforest,i)	Ton/hactare /Year	3.19	Calculated (using IPCC guideline)

Mean Annual Increment of woody biomass growth per hectare in sub-category i of other wooded land areas (MAIother,i)	Ton/hactare /Year	3.19	Same value taken for other wooded land
Renewable Biomass (RB)	ton/year	17791669.94	
Non- Renewable Biomas (NRB)	ton/year	110208330.06	
Fraction of Non-renewable Biomass (fNRB)	Fraction	0.861	

Conservatively fNRB value is considered 86.1 % as per confirmation letter from Ministry of Forest and Environment, Nepal dated 25 November 2018.

As stipulated in the paragraph 23 of AMS II.G/v11.1, $\boldsymbol{B_{y,savings,i,j}}$ (Quantity of woody biomass that is saved) can be determined using one of the options:

PP has selected option 3 : water boiling test (WBT):11

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

Also, as per AMS II G, ver 11.1, para 37 (a), PP will monitor annually the the loss in efficiency annually from a representative sample of each batch and use the actual loss rate that is measured.

Also, during the crediting period , in case PP is unable to monitored the efficiency due to various reasons (e.g. calibration not done of WBT testing equipment's etc), then as per AMS II G ver 11.1 para 37, (a), A default schedule of linear decrease in efficiency up to the terminal efficiency assumed as 20 per cent shall be applied through the life span of the project device. i.e. the life span of project device is seven (7) years which is based on manufacturer's ICS lifetime certificate and project device has an efficiency of 30.29% (for HPNJE-01ND)and 29.79%(Greenway Jumbo) per cent at commissioning then a 1.47 & 1.39 per cent decrease in efficiency every year shall be applied for HNPJE-01ND and Greenway Jumbo stoves respectively.

Also, if any ICS got damaged after the warranty period (5 yrs) and before the lifetime (7 yrs), PP will encourage the HH user to buy a new ICS system and if they (HH) did not buy new ICS, then it will be not accounted for emission reduction calculation and ERs form this system will not be claimed.

Leakage

[11] Based on whether $\eta_{new,i,j}$ or $B_{y=1,new,ij,survey}$ is used for monitoring, either equation (6) or (7) may be used respectively.

As per the paragraph 39 of the methodology AMS II.G/v11.1, the following leakages are to be considered: The use/diversion of non-renewable woody biomass saved under the project activity by non-project households/users that previously used renewable energy sources. If this leakage assessment quantifies an increase in the use of non-renewable woody biomass used by the non-project households/users that is attributable to the project activity, then Bold is adjusted to account for the quantified leakage. Alternatively, Bold is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required. PP has opted to use the adjustment factor of 0.95 in order to account for leakage.

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)
01/11/2018 – 31/10/2019	31,983	0	0	31,983
01/11/2019 – 31/10/2020	31,983	0	0	31,983
01/11/2020 – 31/10/2021	31,983	0	0	31,983
01/11/2021 – 31/10/2022	31,983	0	0	31,983
01/11/2022 - 31/10/2023	31,983	0	0	31,983
01/11/2023 - 31/10/2024	31,983	0	0	31,983
01/11/2024 - 31/10/2025	31,983	0	0	31,983
01/11/2025 - 31/10/2026	31,983	0	0	31,983
01/11/2026 - 31/10/2027	31,983	0	0	31,983
01/11/2027 - 31/10/2028	31,983	0	0	31,983
Total	3,19,830	0	0	3,19,830

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	Bold,HH
Data unit	Tonnes/household/year
Description	Quantity of woody biomass used per ICS in the absence of the project activity
Source of data	Baseline survey
Value applied	3.8
Justification of choice of data or description of measurement methods and procedures applied	The baseline survey estimated the average (mean) biomass usage per annum across relevant districts as a 3.8 tonne/year/HH. The survey was conducted in two ways: perception survey and experimental survey. In the perception survey, the Traditional Cook Stove users were interviewed about their usage pattern of the biomass for the household cooking using the traditional cooking stoves. In the experimental the interviewer also measured the actual biomass used in the traditional cooking stove for cooking the meals. The baseline survey was conducted following the General Guidelines For Sampling And Surveys For Small-Scale CDM Project Activities..
Purpose of Data	Calculation of Quantity of woody biomass that is saved in tonnes per device
Comments	

Data / Parameter	Hold
Data unit	Percentage
Description	Efficiency of the system being replaced (Traditional Cooking Stoves)
Source of data	approved methodology AMS II.G/v11.1

Value applied	10%
Justification of choice of data or description of measurement methods and procedures applied	The default value of 0.10 is used as the replaced system is a three stone fire, or a conventional device with no improved combustion air supply or flue gas ventilation, i.e. without a grate or a chimney.
Purpose of Data	Calculation of share of non-renewable biomass
Comments	

Data / Parameter	fNRB,y
Data unit	Percentage
Description	Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass
Source of data	The value is calculated as per the tool referred in AMS-II.G version 11.1 which is duly approved by Ministry of Forest and Environment, Nepal.
Value applied	86.1%
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of Data	Baseline Emission calculation
Comments	

Data / Parameter	EFprojected_fossilfuel
Data unit	tCO2/TJ
Description	Emission factor for the substitution of non-renewable woody biomass by similar consumers.
Source of data	approved methodology AMS II.G/v11.1
Value applied	64.40
Justification of choice of data or description of measurement methods and procedures applied	

Purpose of Data	Baseline Emission calculation
Comments	

Data / Parameter	LEy
Data unit	Fraction
Description	Net to Gross adjustment factor
Source of data	approved methodology AMS II.G/v10:
Value applied	0.95
Justification of choice of data or description of measurement methods and procedures applied	Default value as prescribed by methodology applied
Purpose of Data	Baseline Emission calculation
Comments	

5.2 Data and Parameters Monitored

Data / Parameter	$N_{y,i,a}$
Data unit	Number
Description	Number of project devices of type i and age a that are operating in year *y*
Source of data	Annual ICS users' survey
Description of measurement methods and procedures to be applied	The information on the number of devices operational is determined by the ICS users' survey through monitoring of the user households drawn as random sample.
Frequency of monitoring/recording	Annually
Value applied	To be monitored

Monitoring equipment	*NA*
QA/QC procedures to be applied	During the annual users' survey, survey team will inspect representative sample households to check if the devices are operating or not. Sample for this survey will be drawn as per the "Guidelines for sampling and surveys for CDM project activities and programme of activities, version 3 (EB 75, annex 8)".
Purpose of data	Emission reduction calculation
Calculation method	NA
Comments	

Data / Parameter	ηnew,i,j
Data unit	Fraction
Description	Efficiency of the device (Stove) of each type i and batch j implemented as part of the project activity
Source of data	Default schedule of linear decrease in efficiency up to the terminal efficiency of 20% per para 32(a) of AMS II G ver 11.1
Description of measurement methods and procedures to be applied	Option 2 - Also, during the crediting period , in case PP is unable to monitored the efficiency due to various reasons (e.g. calibration not done of WBT testing equipment's etc), then as per AMS II G ver 11.1 para 37, (a), A default schedule of linear decrease in efficiency up to the terminal efficiency assumed as 20 per cent shall be applied through the life span of the project device. i.e. the life span of project device HPNJE-01ND is seven (7) years and project device has an efficiency of 30.29 per cent at commissioning then a 1.47 per cent decrease in efficiency every year shall be applied. Similarly, , the life span of project device Greenway Jumbo is seven (7) years and project device has an efficiency of 29.79 per cent at commissioning then a 1.39 per cent decrease in efficiency every year shall be applied
Frequency of monitoring/recording	Annual

Value applied	*To be monitored*
Monitoring equipment	NA
QA/QC procedures to be applied	NA
Purpose of data	The monitored value of this parameter will be used in the determination of the ex-post emission reduction.
Calculation method	NA
Comments	

Data / Parameter	NCVbiomass
Data unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass, briquettes or charcoal used in project devices
Source of data	approved methodology AMS II.G/v11.1
Description of measurement methods and procedures to be applied	As per approved methodology AMS II.G/v11.1
Frequency of monitoring/recording	Yearly
Value applied	0.0156
Monitoring equipment	*NA*
QA/QC procedures to be applied	*NA*
Purpose of data	Emission reduction calculation
Calculation method	NA
Comments	NA

Data / Parameter	μ_y
Data unit	Fraction

Description	Adjustment to account for any continued use of pre-project devices during the year y
Source of data	When applying equations 6 and 8, it is a fraction based on monitoring results. In other cases (i.e. applying equations 3, 5 and 7), use 1.0
Description of measurement methods and procedures to be applied	Surveys will be conducted since the use of data loggers to record the continued operation of baseline devices is not practical, because the baseline device is the three-stone fire.
Frequency of monitoring/recording	At least once every two years (biennial)
Value applied	To be monitored
Monitoring equipment	*NA*
QA/QC procedures to be applied	*NA*
Purpose of data	Emission reduction calculation
Calculation method	NA
Comments	NA

Data / Parameter	Life Span
Data unit	Number of years
Description	The operating lifetime of the project device. The life span should be reported in case where the PP are opting to account the efficiency loss as per paragraph 32.
Source of data	Manufacturer (certified by a national standards body or an appropriate certifying agent recognized by that body)
Description of measurement methods and procedures to be applied	*NA*
Frequency of monitoring/recording	Fixed and recorded at the time of commissioning/distribution
Value applied	*7*

Monitoring equipment	*NA*
QA/QC procedures to be applied	*NA*
Purpose of data	Emission reduction calculation if using efficiency loss as per paragraph 32.
Calculation method	NA
Comments	NA

Data / Parameter	Date of commissioning of commissioning of batch j
Data unit	Date
Description	To establish the date of commissioning, the Project Participant may opt to group the devices in “batches” and the latest date of commissioning of a device within the batch shall be used as the date of commissioning for the entire batch
Source of data	Internal records
Description of measurement methods and procedures to be applied	*NA*
Frequency of monitoring/recording	Fixed and recorded at the time of commissioning/distribution of the last project device in the batch
Value applied	To be monitored
Monitoring equipment	*NA*
QA/QC procedures to be applied	*NA*
Purpose of data	Emission reduction calculation
Calculation method	
Comments	

Data / Parameter	Date of commissioning of project device i
Data unit	Date
Description	Actual date of commissioning of the project device
Source of data	Internal records
Description of measurement methods and procedures to be applied	*NA*
Frequency of monitoring/recording	Fixed and recorded at the time of commissioning/distribution
Value applied	To be monitored
Monitoring equipment	*NA*
QA/QC procedures to be applied	*NA*
Purpose of data	Emission reduction calculation
Calculation method	
Comments	

Data / Parameter	$N_{d,HH}$
Data unit	Number
Description	Number of project devices distributed per household
Source of data	Internal records
Description of measurement methods and procedures to be applied	*NA*
Frequency of monitoring/recording	Recorded at the time of commissioning/distribution of project devices
Value applied	To be monitored
Monitoring equipment	*NA*

QA/QC procedures to be applied	*NA*
Purpose of data	Emission reduction calculation
Calculation method	NA
Comments	NA

5.3 Monitoring Plan

The monitoring plan is designed to monitor the parameters listed in Section B.5.2. above, which are required for calculation of the actual GHG emission reduction achieved by the project activity instances using ex post sampling survey. the share of operating stoves and the continued use of pre-project devices will be determined based on sampling procedures as outlined below. The project proponent will be responsible for conducting the sampling surveys and maintaining a database with all operating stoves.

No monitoring for leakage through competitive uses of biomass is required, as the parameter B old,i,j is multiplied by 95% to account for leakage.

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

(a) Sampling Approach:

i. **Objectives and reliability requirements:** The objective of the sampling plan is to achieve unbiased and reliable estimates of the proportion or the mean value of the key variables over the crediting period. As per the sampling and survey standard (EB 94 annex 2, version 7, para 10) in case "where there is no specific guidance in the applicable methodology, project proponents shall use 90/10 confidence/precision as the criteria for reliability of sampling efforts for small-scale project activities and 95/10 for large scale project activities." The methodology applied for the project (AMS.II.G version 10/para 41 requires the project proponent achieving 95 percent confidence interval and a 10 percent margin of error while for annual inspection 90 per cent confidence interval and a 10 per cent margin of error shall be achieved for the sampled parameters. Since it is small scale project and PP has opted for the annual inspection, the survey will be conducted to achieve the confidence/precision of 90/10 and this is in accordance with the requirements set out as per methodology and sampling standard. The table below provides the monitoring parameters that will be monitored annually:

1)

Parameter	Type	Description
$N_{y,i}$	Proportional parameter	Number of project devices ICS (cookstoves) of type i and operating in year y (this also

		accounts the baseline stoves that are still in use)
$\mu_{y,i,j}$	Proportional parameter	Adjustment to account for any continued use of pre-pre-project devices during the year y

ii. **Target Population:** The target population for different parameters discussed in the table above are given below:
a. For the proportional parameter; the target population is the ICS users listed in the project database.
b. For the mean value parameter; the target population is the total number of operational ICS for which the emission reductions will be accounted for the monitoring period in question. The mean value parameter, unless and otherwise required by the estimated number of samples (if it is greater than the sample estimate for the proportional parameter) will be the subset of the operational ICS as identified during the annual monitoring surveys.

iii. **Sampling frame:** All the households availed with the improved cooking stoves by the project will be the sampling frame.

iv. **Sampling Method:** A simple random sampling will be adopted for estimating the sample size for the monitoring surveys. Simple random sampling is suited to populations that are homogenous (EB 94 annex 02). From the population of ICS, the random numbers will be assigned for each ICS using excel function and the sample ICS will be extracted accordingly. The schema of the sampling method is given below:
In the project, two ICS types are identified and based on this simple random sampling will be applied on stoves. Since the two batches are homogeneous, no separate sampling will be done. There will be two set of samples derived from this method.

v. **Sample Size:** The calculation of the required sample size for each parameter will be calculated at 90/10 confidence/precision as required for the annual monitoring. The sample size is determined using the Guidelines for Sampling and Surveys for CDM Project activities and Programme of Activities Ver. 4.0 (EB86, Annex 4)[12]. As required by AMS II.G Ver 11.1, for annual surveys, the level of precision of 10% and a confidence level of 90% will be assessed for the monitoring parameters; efficiency of ICS, number of ICS in operation and displacement of traditional stoves.

The minimum sample size to determine number of ICS in operation and displacement of tradition stoves using the procedure outlined in para 12 of appendix 1, EB 86 Annex 4, Guidelines for Sampling and Surveys for CDM Project activities and Programme of Activities Ver. 4.0.

[12] Guidelines for Sampling and Surveys for CDM Project activities and Programme of Activities Ver. 4.0 (EB 86, Annex 4)

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

Where:

n= Sample size

N = Total number of ICS of type *i* installed under the project

p = expected proportion (0.9)[13]

1.645 = represents the 90% confidence required

0.1 = represents the 10% relative precision (0.1x0.5=0.09 = 9% points either side of p)

Substituting the values of "*N*" in equation above, the sample size will be calculated.

(b) **Data:**

(i) **Field Measurements:**

1. Checking of a representative sample of each type of ICS installed every year to ensure that they are still operating ($N_{y,i,a}$).
2. The survey will be conducted annually with the objective to target 10 percent precision and to achieve 90 percent confidence.

(ii) **Quality Assurance/Quality Control:**

A survey questionnaire will be prepared to seek responses of operating status (yes or no) of ICS units by ICS using households.The survey will be performed by the project developer. During the survey, in order to anticipate any low response rate and answers bias, 10% oversampling will be applied.

(iii) **Analysis:**

1. Checking of a representative sample of ICS installed every year to ensure that they are still operating ($N_{y,i}$)

2) The project developer will collect, compile and analyze the data to derive the number of ICS disseminated, the percentage of ICS in operation, displacement of traditional cooking stove&

[13]The expected proportion has been taken as 0.9 for the first monitoring period. For the successive monitoring periods, the sample size will be deducted in accordance with the monitoring results of the first monitoring period.

Kerosene lamps by ICS users. The developer will prepare "monitoring report" based on the survey report.

3) The data collected will be compiled in Excel sheets and/or other software and analyzed to derive the percentage of ICS in operation and the efficiency of the ICS installed by households. The values of efficiency of ICS disseminated are used for emission reductions calculation.

(c) Implementation:

4) The survey questionnaire will be prepared, pre-tested and field personnel will be trained in conducting the survey to ensure the quality of data collected and the survey will be carried out once a year. The schedule for implementing the sampling effort shall be defined prior to the field activity.

Parameter	Objective	Timeframe/ Frequency	Method of Data Collection	Use of Data	Target Population	Sampling Frame
$N_{y,i,a}$	Total number of ICS that are operational	Measurement taken every year	Semi Structured questionnaire survey conducted among the user households	Monitoring will ensure that the ICS implemented through the project is operational and has displaced low efficiency appliances from the project boundary.	ICS user households	List of households having ICS installed/purchased.
$\mu_{y,i,j}$	To account any continued use of pre-pre-project devices	Measurement taken every year	Semi Structured questionnaire survey conducted among the user households	Monitoring will ensure that the ICS implemented through the project is operational and has displaced low	ICS user households	List of households having ICS installed/purchased.

				efficiency appliances from the project boundary.		

Organization	Summary Record Keeping Roles
Practical Action	Direct collection of all sales and monitoring data. Management of partner organizations data collection and analysis. Reviews and cleans all datasets. Stores and maintains database records provided by project partners electronically. Calculates Emission Reductions and writes all reports for carbon crediting purposes.
Stove Manufacturing	Collection and entry of bulk sales records used to populate TSR (total sales record) via sales invoices. Collection and compilation of end-user data collected by partner resellers used to populate daily sales data. All monitoring for stove sales is completed by Paradigm.
Evidence Action	Collection and entry of all distribution and monitoring records. Paradigm and its alliance handle all distribution, community meetings, training, monitoring and basic data analysis. Paradigm uses raw data to analyze and quantify carbon outcomes.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	$N_{y,i,a}$
Data unit	Number
Description	Number of project devices of type i and age a that are operating in year *y*
Source of data	Annual ICS users' survey

Description of measurement methods and procedures to be applied	The information on the number of devices operational is determined by the ICS users' survey through monitoring of the user households drawn as random sample.
Frequency of monitoring/recording	Annually
Value applied	MP-01 - Total - 15,292 *a) 12,415 (100%) HPNJE-01 ND stove* *b) 2877(100%) Greenway Jumbo stoves* MP-02 – Total – 14,360 *a) 11,,663 (93.9%) HPNJE-01 ND stove* *b) 2697(93.7%) Greenway Jumbo stoves*
Monitoring equipment	*NA*
QA/QC procedures to be applied	During the annual users' survey, survey team has inspect representative sample households to check if the devices are operating or not. Sample for this survey will be drawn as per the "Guidelines for sampling and surveys for CDM project activities and programme of activities, version 3 (EB 75, annex 8)".
Purpose of data	Emission reduction calculation
Calculation method	NA
Comments	For 1st MP, the values are 100% since the ICS are under 1 year warranty and there are no chances that any of the newly purchased ICS will be non operational during 1st year of its service. For the 2nd MP few of ICS are found to be non operational, and thus same has been reflected in the values. The non operational ICS is due to some technical damage of ICS due to improper handling of ICS while cooking, and it can be repaired by the supplier and ICS can be operational once again.

Data / Parameter	ηnew,i,j
Data unit	Fraction
Description	Efficiency of the device (Stove) of each type i and batch j

	implemented as part of the project activity
Source of data	Default schedule of linear decrease in efficiency up to the terminal efficiency of 20% per para 32(a) of AMS II G ver 11.1
Description of measurement methods and procedures to be applied	as per AMS II G ver 11.1 para 37, (a), A default schedule of linear decrease in efficiency up to the terminal efficiency assumed as 20 per cent shall be applied through the life span of the project device. i.e. the life span of project device is seven (7) years and project device has an efficiency of 30.29(HPNJE-01ND) % & 29.79% (Greenway Jumbo) at commissioning then a 1.47 & 1.39 per cent decrease in efficiency every year shall be applied respectively.
Frequency of monitoring/recording	Annual
Value applied	*For MP 01 -01/11/2018 to 31/10/2019 (year 1)* *a)30.29 % (for HPNJE-01 ND stove)* *b)29.79 % (For Greenway Jumbo stoves)* *For MP 02 - 01/11/2019 to 31/10/2020 (Year 2)* *a)28.82 % (for HPNJE-01 ND stove)* *b)28.40 % (For Greenway Jumbo stoves)*
Monitoring equipment	NA
QA/QC procedures to be applied	NA
Purpose of data	The monitored value of this parameter will be used in the determination of the ex-post emission reduction.
Calculation method	NA
Comments	

Data / Parameter	NCVbiomass
Data unit	TJ/tonne
Description	Net calorific value of the non-renewable woody biomass, briquettes or charcoal used in project devices

Source of data	approved methodology AMS II.G/v11.1
Description of measurement methods and procedures to be applied	As per approved methodology AMS II.G/v11.1
Frequency of monitoring/recording	Yearly
Value applied	0.0156
Monitoring equipment	*NA*
QA/QC procedures to be applied	*NA*
Purpose of data	Emission reduction calculation
Calculation method	NA
Comments	NA

Data / Parameter	μ_y
Data unit	Fraction
Description	Adjustment to account for any continued use of pre-project devices during the year y
Source of data	When applying equations 6 and 8, it is a fraction based on monitoring results. In other cases (i.e. applying equations 3, 5 and 7), use 1.0
Description of measurement methods and procedures to be applied	Surveys has been conducted in October 2019 and September 2020 since the use of data loggers to record the continued operation of baseline devices is not practical, because the baseline device is the three-stone fire.
Frequency of monitoring/recording	At least once every two years (biennial)
Value applied	MP-01 HPNJE-01ND - 0.969 Greenway Jumbo - 0.984 MP-02 HPNJE-01ND – 0.955

	Greenway Jumbo – 0.969
Monitoring equipment	*NA*
QA/QC procedures to be applied	*NA*
Purpose of data	Emission reduction calculation
Calculation method	NA
Comments	The value is less than 1 since still few households uses their old traditional cook stoves, due to more food quantity and numbers of family members and sometimes due to guest visiting their house.Also in some cases, the project ICS got damaged few days before the monitoring survey period and thus the HH user are using their old stoves for cooking. However, they told the surveyor the easiness they felt in using the project cook stoves , since it is light and mobile i.e. they can cook their meal at any place in their home e.g.while watching TV programs i.e due to light weight and portable nature of ICS, it can be shifted anywhere from kitchen to other places e.g..in their TV rooms etc , and also it produces very less smoke due to which the soot problems is very minimum.

Data / Parameter	Life Span
Data unit	Number of years
Description	The operating lifetime of the project device. The life span should be reported in case where the PP are opting to account the efficiency loss as per paragraph 32.
Source of data	Manufacturer (certified by a national standards body or an appropriate certifying agent recognized by that body)
Description of measurement methods and procedures to be applied	*NA*
Frequency of monitoring/recording	Fixed and recorded at the time of commissioning/distribution
Value applied	*7*
Monitoring equipment	*NA*
QA/QC procedures to be	*NA*

applied	
Purpose of data	Emission reduction calculation if using efficiency loss as per paragraph 32.
Calculation method	NA
Comments	NA

Data / Parameter	**Date of commissioning of batch j**
Data unit	Date
Description	To establish the date of commissioning, the Project Participant may opt to group the devices in "batches" and the latest date of commissioning of a device within the batch shall be used as the date of commissioning for the entire batch
Source of data	Internal records
Description of measurement methods and procedures to be applied	*NA*
Frequency of monitoring/recording	Fixed and recorded at the time of commissioning/distribution of the last project device in the batch
Value applied	
Monitoring equipment	*NA*
QA/QC procedures to be applied	*NA*
Purpose of data	Emission reduction calculation
Calculation method	
Comments	

Batch	Start date	End date
Batch 1	01-11-2018	28-02-2019
Batch 2	01-03-2019	21-06-2019

Data / Parameter	Date of commissioning of project device i
Data unit	Date
Description	Actual date of commissioning of the project device
Source of data	Internal records
Description of measurement methods and procedures to be applied	*NA*
Frequency of monitoring/recording	Fixed and recorded at the time of commissioning/distribution
Value applied	From 01 November 2018 to 21 June 2019. .
Monitoring equipment	*NA*
QA/QC procedures to be applied	*NA*
Purpose of data	Emission reduction calculation
Calculation method	
Comments	

Data / Parameter	$N_{d,HH}$
Data unit	Number
Description	Number of project devices distributed per household
Source of data	Internal records
Description of measurement methods and procedures to be applied	*NA*

Frequency of monitoring/recording	Recorded at the time of commissioning/distribution of project devices
Value applied	15,292 ICS distributed in 15,292 households i.e. one ICS per household
Monitoring equipment	*NA*
QA/QC procedures to be applied	*NA*
Purpose of data	Emission reduction calculation
Calculation method	NA
Comments	NA

6.2 Baseline Emissions

According to methodology AMS II.G/v11.1, emission reductions is calculated as:

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

$$ER_{y,i,j} = B_{y,savings,i,j} \times N_{y,i,j} \times \mu_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossil\ fuel}$$ Equation (2)

a) For monitoring period between 01/11/2018 to 31/10/2019(MP-01)

MP01 - Batch 1

ICS commissioned in batch 1		days fraction
HPNJE-01ND	9560	0.67
Greenway Jumbo	2597	0.67

Monitoring period start	1-Nov-18
Monitoring period end	31-Oct-19

		Stove Model			
		HPN JE-01 ND	Greenway Jumbo		
Parameter	**Data ID**	**Value**	**Value**	**Units**	Source
Quantity of woody biomass used in the absence of the project activity	B_{old}	3.80	3.80	Tonnes/year	Baseline survey
Efficiency of the system being replaced	η_{old}	10%	10%	Percentage	approved methodology AMS II.G/v11.1
Efficiency of the system being deployed as part of the project activity (fraction)	η_{new}	**30.29%**	**29.79%**	**Percentage**	As per test certificate
Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass	$f_{NRB,y}$	86.10%	86.10%	Percentage	The value is calculated as per the tool referred in AMS-II.G version 11.1 which is duly approved by Ministry of Forest and Environment, Nepal.
Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)	$NCV_{biomass}$	0.0156	0.0156	TJ/tonne	approved methodology AMS II.G/v11.1
Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO2/TJ	$EF_{projected\_fossilfuel}$	64.40	64.40	tCO2/TJ	approved methodology AMS II.G/v11.1
Quantity of woody biomass that is saved in tonnes	By,savings	2.55	2.52	Tonnes/year	Calculated
Number of Improved Cooking stoves operational during year *y*	$N_{i,y}$	100.00%	100.00%	Percentage	Monitoring survey
Adjustment to account for any continued use of pre-project devices during year "y"	μ_y	0.969	0.984	Fraction	Monitoring survey
Net to gross adjustment factor	LEy	0.95	0.95	Fraction	approved methodology AMS II.G/v11.1
Baseline Emissions per ICS		2.03	2.04	tCO2	Calculated
Number of ICS disseminated	N	9560	2597	nos	Assumed based on threshold limit
Total Emission reduction	ER	**13056**	**3574**	tCO2	Calculated

Total Emission Reduction	**ER**	**16630**	**tCO2**

MP01 - Batch 2

ICS commissioned in batch 2		days fraction
HPNJE-01ND	2855	0.36
Greenway Jumbo	280	0.36

Monitoring period start	1-Nov-18
Monitoring period end	31-Oct-19

		Stove Model			
		HPN JE-01 ND	Greenway Jumbo		
Parameter	**Data ID**	**Value**	**Value**	**Units**	Source
Quantity of woody biomass used in the absence of the project activity	B_{old}	3.80	3.80	Tonnes/year	Baseline survey
Efficiency of the system being replaced	η_{old}	10%	10%	Percentage	approved methodology AMS II.G/v11.1
Efficiency of the system being deployed as part of the project activity (fraction)	η_{new}	**30.29%**	**29.79%**	**Percentage**	As per test certificate
Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass	$f_{NRB,y}$	86.10%	86.10%	Percentage	The value is calculated as per the tool referred in AMS-II.G version 11.1 which is duly approved by Ministry of Forest and Environment, Nepal.
Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)	$NCV_{biomass}$	0.0156	0.0156	TJ/tonne	approved methodology AMS II.G/v11.1
Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO2/TJ	$EF_{projected\_fossilfuel}$	64.40	64.40	tCO2/TJ	approved methodology AMS II.G/v11.1
Quantity of woody biomass that is saved in tonnes	By,savings	2.55	2.52	Tonnes/year	Calculated
Number of Improved Cooking stoves operational during year *y*	$N_{i,y}$	100.00%	100.00%	Percentage	Monitoring survey
Adjustment to account for any continued use of pre-project devices during year "y"	μ_y	0.969	0.984	Fraction	Monitoring survey
Net to gross adjustment factor	LEy	0.95	0.95	Fraction	approved methodology AMS II.G/v11.1
Baseline Emissions per ICS		2.03	2.04	tCO2	Calculated
Number of ICS disseminated	N	2855	280	nos	Assumed based on threshold limit
Total Emission reduction	ER	**2108**	**208**	tCO2	Calculated

Total Emission Reduction	**ER**	**2316**	**tCO2**

Therefore baseline emissions for ICS for the MP (01/11/2018 till 31/10/2019) for (HPNJE-01ND & Greenway Jumbo stoves)

= 18,946 tCO2/y

Similarly, for monitoring period 01/11/2019 till 31/10/2020 (MP-02),

MP02 - Batch 1	
Monitoring period start	1-Nov-19
Monitoring period end	31-Oct-20

ICS commissioned in batch 1		days fraction
HPNJE-01ND	9560	1
Greenway Jumbo	2597	1

		Stove Model			
		HPN JE-01 ND	Greenway Jumbo		
Parameter	**Data ID**	**Value**	**Value**	**Units**	Source
Quantity of woody biomass used in the absence of the project activity	B_{old}	3.80	3.80	Tonnes/year	Baseline survey
Efficiency of the system being replaced	η_{old}	10%	10%	Percentage	approved methodology AMS II.G/v11.1
Efficiency of the system being deployed as part of the project activity (fraction)	η_{new}	**28.82%**	**28.40%**	**Percentage**	Calculated,As per para 37 of AMS II G, option (a)
Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass	$f_{NRB,y}$	86.10%	86.10%	Percentage	The value is calculated as per the tool referred in AMS-II.G version 11.1 which is duly approved by Ministry of Forest and Environment, Nepal.
Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)	$NCV_{biomass}$	0.0156	0.0156	TJ/tonne	approved methodology AMS II.G/v11.1
Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO2/TJ	$EF_{projected\_fossilfuel}$	64.40	64.40	tCO2/TJ	approved methodology AMS II.G/v11.1
Quantity of woody biomass that is saved in tonnes	By,savings	2.48	2.46	Tonnes/year	Calculated
Number of Improved Cooking stoves operational during year *y*	$N_{i,y}$	93.94%	93.75%	Percentage	Monitoring survey
Adjustment to account for any continued use of pre-project devices during year "y"	μ_y	0.955	0.969	Fraction	Monitoring survey
Net to gross adjustment factor	LEy	0.95	0.95	Fraction	approved methodology AMS II.G/v11.1
Baseline Emissions per ICS		1.83	1.84	tCO2	Calculated
Number of ICS disseminated	N	9560	2597	nos	Assumed based on threshold limit
Total Emission reduction	ER	**17480**	**4771**	tCO2	Calculated

Total Emission Reduction	**ER**	**22251**	**tCO2**

MP02 - Batch 2	
Monitoring period start	1-Nov-19
Monitoring period end	31-Oct-20

ICS commissioned in batch 2		days fraction
HPNJE-01ND	2855	1
Greenway Jumbo	280	1

		Stove Model			
		HPN JE-01 ND	Greenway Jumbo		
Parameter	**Data ID**	**Value**	**Value**	**Units**	Source
Quantity of woody biomass used in the absence of the project activity	B_{old}	3.80	3.80	Tonnes/year	Baseline survey
Efficiency of the system being replaced	η_{old}	10%	10%	Percentage	approved methodology AMS II.G/v11.1
Efficiency of the system being deployed as part of the project activity (fraction)	η_{new}	**28.82%**	**28.40%**	**Percentage**	Calculated,As per para 37 of AMS II G, option (a)
Fraction of woody biomass saved by the project activity in year y that can be established as non-renewable biomass	$f_{NRB,y}$	86.10%	86.10%	Percentage	The value is calculated as per the tool referred in AMS-II.G version 11.1 which is duly approved by Ministry of Forest and Environment, Nepal.
Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)	$NCV_{biomass}$	0.0156	0.0156	TJ/tonne	approved methodology AMS II.G/v11.1
Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO2/TJ	$EF_{projected\_fossilfuel}$	64.40	64.40	tCO2/TJ	approved methodology AMS II.G/v11.1
Quantity of woody biomass that is saved in tonnes	By,savings	2.48	2.46	Tonnes/year	Calculated
Number of Improved Cooking stoves operational during year *y*	$N_{i,y}$	93.94%	93.75%	Percentage	Monitoring survey
Adjustment to account for any continued use of pre-project devices during year "y"	μ_y	0.955	0.969	Fraction	Monitoring survey
Net to gross adjustment factor	LEy	0.95	0.95	Fraction	approved methodology AMS II.G/v11.1
Baseline Emissions per ICS		1.83	1.84	tCO2	Calculated
Number of ICS disseminated	N	2855.00	280	nos	Assumed based on threshold limit
Total Emission reduction	ER	**5220**	**514**	tCO2	Calculated

Total Emission Reduction	**ER**	**5734**	**tCO2**

Therefore baseline emissions for ICS for the MP (01/11/2019 till 31/10/2020) for (HPNJE-01ND & Greenway Jumbo stoves)

= 27,985 tCO2/y

Thus total emission reduction for the period 01/11/2018 to 31/10/2020 (MP-01 + MP02) is

=46,931 tCO2.

6.3 Project Emissions

As per the applied methodology AMS II G version 11.1, there are no project emission accounted . Thus project emission is zero (0).

6.4 Leakage

As per the applied methodology AMS II G version 11.1, Bold is multiplied by a net to gross adjustment factor of 0.95 to account for leakages, so no separate leakage is to be reported and thus, its value is zero. Thus leakage emission is zero (0).

6.5 Net GHG Emission Reductions and Removals

In line with the applied methodology and PDD, PEy & LEy are 0. Therefore, the net benefit is

The emission reductions from the project are for the MP 01/11/2018 to 31/10/2020:

= BEy – PEy - LEy

= 46,931– 0 - 0

= 46,931tCO2/y

:

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
Year 2018	3916	0	0	3916
Year 2019	23433	0	0	23433
Year 2020	19581	0	0	19581
Total (01/11/2018 to 31/10/2020)				46931

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APPENDIX A:

IMPLEMENTATION OF SAMPLING PLAN DURING MONITORING PERIOD AND TRAINING AND MAINTENANCE OF ICS

(a) Sampling Approach:

i. Objectives and reliability requirements: The objective of the sampling plan is to achieve unbiased and reliable estimates of the proportion or the mean value of the key variables over the crediting period. As per the sampling and survey standard (EB 105 annex 1, version 8, para 11) in case "where there is no specific guidance in the applicable methodology, project proponents shall use 90/10 confidence/precision as the criteria for reliability of sampling efforts for small-scale project activities and 95/10 for large scale project activities."

Since it is small scale project and PP has opted for the annual inspection, the survey has been conducted to achieve the confidence/precision of 90/10 and this is in accordance with the requirements set out as per the sampling standard.

Parameter	Description	Method
"Proportion of ICS operational and	Number of units in operations	Sample survey, annually
any continued use of pre-project devices during year "y"	Number of units in operations	Sample survey, annually

ii. Target Population

The target population is the total number of households for which the emission reductions has been accounted for the monitoring period.

iii. **Sampling frame**

All beneficiaries with commissioned ICS have been in the sampling frame.

iv. **Sampling Method**

A simple random sampling has been adopted for estimating the sample size for the monitoring surveys. Simple random sampling is suited to populations that are homogenous (EB 105 annex 01). Since there are

two types of ICS are disseminated, PP has separately applied sampling on both the types of ICS and accordingly different samples have been arrived for these two types of ICS.

v. **Sample Size**

The calculation of the required sample size for each parameter has been calculated at 90/10 confidence/precision as required for the annual monitoring. The sample size is determined using the Guidelines for Sampling and Surveys for CDM Project activities and Programme of Activities Ver. 4.0 (EB86, Annex 4)

The minimum sample size is determined as follows:

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

Where,

n= sample size

N = Total number of solar DC system installed under the project

P = expected proportion (0.9) (which is based on Pilot survey done by the PP in 10 household prior to the main survey)

1.645 = represent the 90% confidence required

0.1 = represent the 10% relative precision

The value for N has been included into the equation for each monitoring period to get the sample size for the monitoring survey.

Data.

(i) Field measurements:-

1. Checking of a representative sample of ICS within the project to ensure that they are still operating (Proportion of operational systems) and also check for any continued usage of baseline cooking devices.

For MP-01 –

Sampling Constants	Values
Monitoring period start	1-Nov-18
Monitoring period end	31-Oct-19
Monitoring frequency (years)	1.00
Level of sampling	Project level
Confidence (%) (90 or 95)	90%
Margin of Error (%)	10%
Z value	1.645

Stove Model	
HPN JE-01 ND	
Monitoring Parameters	**Ny,i,a**
Sampling Frame requirement as per PDD	**Operational status of Cookstoves**
Sampling approach	Simple random sampling
Total Population (N)	12415
Expected proportion (p)	90%
Sample size (n)	31
Sample considered in actual for survey	32
Monitored operating fractions	1
Reliability Check	
Samples Monitored	32
Sample proportion	1.00
Standard Error of the proportion	0.00%
Precison associated with a proportion	0.00%
Relative precision	0.00%
Result	Ok, reliability level met

Stove Model	
Greenway Jumbo	
Monitoring Parameters	**Ny,i,a**
Sampling Frame requirement as per PDD	**Operational status of Cookstoves**
Sampling approach	Simple random sampling
Total Population (N)	2877
Expected proportion (p)	90%
Sample size (n)	31
Sample considered in actual for survey	32
Monitored operating fractions	1
Reliability Check	
Samples Monitored	32
Sample proportion	1.00
Standard Error of the proportion	0.00%
Precison associated with a proportion	0.00%
Relative precision	0.00%
Result	Ok, reliability level met

Monitoring Parameters	**µ_y**
Sampling Frame requirement as per PDD	**Any continued use of pre-project devices during year "y"**
Sampling approach	Simple random sampling
Total Population (N)	12415
Expected proportion (p)	90%
Sample size (n)	31
Sample considered in actual for survey	32
Monitored utilization fractions	0.96875
Reliability Check	
Samples Monitored	32
Sample proportion	0.97
Standard Error of the proportion	3.07%
Precison associated with a proportion	5.05%
Relative precision	5.22%
Result	Ok, reliability level met

Monitoring Parameters	**µ_y**
Sampling Frame requirement as per PDD	**Any continued use of pre-project devices during year "y"**
Sampling approach	Simple random sampling
Total Population (N)	2877
Expected proportion (p)	90%
Sample size (n)	31
Sample considered in actual for survey	32
Monitored utilization fractions	0.984
Reliability Check	
Samples Monitored	32
Sample proportion	0.98
Standard Error of the proportion	2.18%
Precison associated with a proportion	3.59%
Relative precision	3.64%
Result	Ok, reliability level met

For MP-02 –

Sampling Constants	Values
Monitoring period start	1-Nov-19
Monitoring period end	31-Oct-20
Monitoring frequency (years)	1.00
Level of sampling	Project level
Confidence (%) (90 or 95)	90%
Margin of Error (%)	10%
Z value	1.645

Stove Model	
HPN JE-01 ND	
Monitoring Parameters	**Ny,i,a**
Sampling Frame requirement as per PDD	**Operational status of Cookstoves**
Sampling approach	Simple random sampling
Total Population (N)	12415
Expected proportion (p)	90%
Sample size (n)	31
Sample considered in actual for survey	33
Monitored operating fractions	0.939393939
Reliability Check	
Samples Monitored	33
Sample proportion	0.94
Standard Error of the proportion	4.15%
Precison associated with a proportion	6.82%
Relative precision	7.26%
Result	Ok, reliability level met

Stove Model	
Greenway Jumbo	
Monitoring Parameters	**Ny,i,a**
Sampling Frame requirement as per PDD	**Operational status of Cookstoves**
Sampling approach	Simple random sampling
Total Population (N)	2877
Expected proportion (p)	90%
Sample size (n)	31
Sample considered in actual for survey	32
Monitored operating fractions	0.9375
Reliability Check	
Samples Monitored	32
Sample proportion	0.94
Standard Error of the proportion	4.26%
Precison associated with a proportion	7.00%
Relative precision	7.47%
Result	Ok, reliability level met

Monitoring Parameters	**μ_y**
Sampling Frame requirement as per PDD	**Any continued use of pre-project devices during year "y"**
Sampling approach	Simple random sampling
Total Population (N)	12415
Expected proportion (p)	90%
Sample size (n)	31
Sample considered in actual for survey	32
Monitored operating fractions	0.954545455
Reliability Check	
Samples Monitored	32
Sample proportion	0.95
Standard Error of the proportion	3.68%
Precison associated with a proportion	6.05%
Relative precision	6.34%
Result	Ok, reliability level met

Monitoring Parameters	**μ_y**
Sampling Frame requirement as per PDD	**Any continued use of pre-project devices during year "y"**
Sampling approach	Simple random sampling
Total Population (N)	2877
Expected proportion (p)	90%
Sample size (n)	31
Sample considered in actual for survey	32
Monitored operating fractions	0.96875
Reliability Check	
Samples Monitored	32
Sample proportion	0.97
Standard Error of the proportion	3.06%
Precison associated with a proportion	5.03%
Relative precision	5.19%
Result	Ok, reliability level met

The selection of households are done using online tool excel RAND() function or

'Stattrek random number' (http://stattrek.com/statistics/random-number-generator.aspx).

32 samples for HPNJE-01ND and 32 samples for Greenway Jumbo are taken for survey for MP-01.

Similarly, 33 samples for HPNJE-01ND and 33 samples for Greenway Jumbo are taken for survey for MP-02.

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2. The survey has been conducted annually with the objective to target 10 percent precision and to achieve 90 percent confidence.

vi. **Quality Assurance/Quality Control**

A survey questionnaire has been prepared to seek responses of operating status of ICS. The survey has been performed by the project developer.

The project developer has collect, compile and analyse the data to derive the number of beneficiaries, the ICS in operation, and other events. The developer has prepared monitoring report based on the survey report.

Training and capacity Development and repair and maintenance of ICS

Project developer (PA) maintain all records as per monitoring plan. In addition, a continuous complaint mechanism system is in place for the project to records any complaint whenever received and its status.

In villages/districts where the ICS are disseminated , technicians from the ICS distributer are appointed , who take any complain related to usage & operation of ICS. Also each district has DCRDC (District Community Resource Development Center), CCND, MRC etc member which includes mostly the village SHG (women self help group) who were having a very good understanding and relations with all the women's in their respective villages. They know each and every villages women personally and women HH user (ICS are primarily used by women user since it involves an ICS) share their operational & usages related issues with the SHG members easily and thus this has help maintaining a continuous grievance mechanism in place. The SHG member note down the any issues related to ICS usages & operation & maintenance and convey the information to the respective technicians deputed for respective villages. Every month, the technicians provide a monthly report on their activities related to the repairing , maintenance, etc to the PA team based in Kathmandu, where PA, is having a regional office. Ms. Pooja Sharma, Mr. Min Bikram & Mr. Upendra Shrestha who is the incharge and look after these monthly reports provided by the technicians.

The trainings were imparted to the personnel's/technicians responsible for monitoring and maintenance during the monitoring period on April 2019 & December 2019. Mr. Min Bikram from PA, is the trainers for the trainings conducted during the monitoring period.