



IMPROVED COOK STOVE MARKET DEVELOPMENT IN RURAL NEPAL

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status 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 areas, 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.

In the baseline the household users were using traditional inefficient cookstoves for meeting their daily need viz. cooking by burning *non-renewable* biomass.

In its effort to combat 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	12,415
Greenway Jumbo	2,900
Total ICS	15,315

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	9,560	2,597
Batch 2	01-03-2019	21-06-2019	2,855	280
		Total	12,415	2,877
		Grand Total	15,292	

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 with 10 years of fixed crediting period which ends on 31/10/2028. The project activity has resulted in a total emission reduction of 28,413 tonnes of CO2e for this monitoring period (01/11/2020 to 31/10/2021).

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 project is not a grouped project and is non-AFOLU type.

1.3 Project Proponent

Organization name	Practical Action
Contact person	Pooja Sharma
Title	PP

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1.4 Other Entities Involved in the Project

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, VNV Advisory
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1.5 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.

1.6 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.

1.7 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, ,



Fig. 1. Map of Nepal

1.8 Title and Reference of Methodology

Methodology: AMS II.G - Energy efficiency measures in thermal applications of non-renewable biomass

Version: Version 11.1

Reference:

<https://cdm.unfccc.int/methodologies/DB/10PELMPDW951SVSW1B2NRCQEBAX96C>

Tools:

- Tool 21: Demonstration of additionality of small-scale project activities, Version 13
- Tool 30: Calculation of the fraction of non-renewable biomass, Version 02

1.9 Participation under other GHG Programs

The project has neither been registered nor seeking registration under any other GHG programs.

1.10 Other Forms of Credit

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.

1.11 Sustainable Development Contribution

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

Environmental well-being: -The project activity results in the reduction of firewood consumption and emission of greenhouse gases and thus conserve forest and biodiversity.

Social wellbeing: -The project activity paves 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 contributes to a small increase in the local employment by employing skilled and un-skilled personnel for operation and maintenance of the equipment. The project reduces 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 project activity promotes improved cook stoves that result in reduced fuel consumption and emissions due to cooking and heating water in homes.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7.0	Access to affordable and clean energy services	Implemented activities to increase	No further changes this monitoring period.	15,292 ICS disseminated under the project activity.
2)	13.0	Tonnes of greenhouse gas emissions avoided	Implemented activities to increase	GHG emission reductions during current Monitoring period is 28,413 tCO ₂ .	Total GHG emission reductions during the 10 year crediting period is 319,830 tCO ₂ .
3)	3.0	Good Health and well Being	Implemented activities to decrease	100% Smoke reduction has occurred due to the project activity.	100% Smoke reduction has occurred due to the project activity.

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 that are envisaged due to the project activity. Also, there is no net harm, or any potential negative environmental and socio-economic impacts.

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 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 gave 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 who were local beneficiaries 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 as well as about, Practical Action and the VNV Advisory. The major activities that the Practical Action has been carrying out, is in 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 more than 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 that 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 of living 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 summarized 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.

A continuous complaint mechanism system is in place for the project to records any complaint/feedback from end users and stakeholders whenever received and its status. In villages/districts where the ICS are disseminated, technicians from the ICS distributor 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 in charge and look after these monthly reports provided by the technicians.

2.3 AFOLU-Specific Safeguards

N/A

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project *has been* implemented in Baglung, Argakhanchi, Bara, Chitwan, Gulmi Kaski, Makwanpur, Myagdi, Parbat, Tanahu and Syangja Districts in Nepal. Most of the households from these areas use solid biomass fuel for cooking. There are no changes reported in the project activity.

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	15,292	

Districts	Number of ICS distributed
Baglung	3432
Argakhanchi	270
Bara	916
Chitwan	1416
Gulmi	1418
Kaski	128
Makwanpur	1405
Myagdi	227
Parbat	2804
Syangja	530
Tanahu	2746

No such events have occurred that may have impacted the GHG emission reductions or removals and monitoring. All the ICS were operational during the current monitoring period. The non-operational ICS from previous MP were repaired and were in operational state.

The operational lifetime of the ICS is 7 years as per the manufacturer specifications. The current monitoring period is MP 2 (Year 3).

3.2 Deviations

2.3.1 Methodology Deviations

N/A

2.3.2 Project Description Deviations

N/A

3.3 Grouped Projects

N/A

4 DATA AND PARAMETERS

4.1 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	N/A

Data / Parameter	η_{old}
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	N/A

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	N/A
Purpose of Data	Baseline Emission calculation
Comments	N/A

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	N/A
Purpose of Data	Baseline Emission calculation

Comments	N/A
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	N/A

4.2 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	MP-02:- Total - 15,292 a) 12,415 (100%) HPNJE-01 ND stove b) 2,877 (100%) Greenway Jumbo stoves
Monitoring equipment	NA

QA/QC procedures to be applied	During the annual users' survey, survey team inspected representative sample households to check if the devices are operating or not. Sample for this survey is drawn as per the "Guidelines for sampling and surveys for CDM project activities and programme of activities, version 3 (EB 75, annex 8)". During the survey, the respective field person checks the ICS whether it is operational or not.
Purpose of data	Emission reduction calculation
Calculation method	N/A
Comments	N/A

Data / Parameter	$\eta_{new,i,j}$
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 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	For MP 02 - 01/11/2020 to 31/10/2021 (Year 3) a) 27.35 % (for HPNJE-01 ND stove) b) 27.01 % (For Greenway Jumbo stoves)
Monitoring equipment	N/A

QA/QC procedures to be applied	N/A
Purpose of data	The monitored value of this parameter will be used in the determination of the ex-post emission reduction.
Calculation method	N/A
Comments	N/A

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

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 September 2021 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. During the annual users' survey, survey team inspected representative sample households. Sample for this survey is drawn as per the "Guidelines for sampling and surveys for CDM project activities and programme of activities, version 3 (EB 75, annex 8)".
Frequency of monitoring/recording	At least once every two years (biennial)
Value applied	MP-02 HPNJE-01ND – 0.947 Greenway Jumbo – 0.906
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Emission reduction calculation
Calculation method	N/A
Comments	The value is less than 1 since still few households' use their old traditional cook stoves, due to more food quantity and numbers of family members and sometimes due to guest visiting their house. However, they told during the survey, 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	N/A
Frequency of monitoring/recording	Fixed and recorded at the time of commissioning/distribution
Value applied	7
Monitoring equipment	N/A
QA/QC procedures to be applied	N/A
Purpose of data	Emission reduction calculation if using efficiency loss as per paragraph 32.
Calculation method	N/A
Comments	N/A

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	N/A		
Frequency of monitoring/recording	Fixed and recorded at the time of commissioning/distribution of the last project device in the batch		
Value applied	Batch	Start date	End date
	Batch 1	01-11-2018	28-02-2019
	Batch 2	01-03-2019	21-06-2019
Monitoring equipment	N/A		

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

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

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

4.3 Monitoring Plan

The monitoring plan is designed to monitor the parameters listed in Section 4.2 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 is determined based on sampling procedures as outlined below. The project proponent is 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 *Bold_{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 11.1/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 is 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 is 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 is accounted for the monitoring period. 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) is 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 is the sampling frame.
- iv. **Sampling Method:** A simple random sampling is 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 is assigned for each ICS using excel function and the sample ICS is 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 has been 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 is 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)¹. As required by AMS II.G Ver 11.1, for annual surveys, the level of precision of 10% and a confidence level of 90% is 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.

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

Where:

n= Sample size

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

p = expected proportion (0.9)²

1.645 = represents the 90% confidence required

0.1 = represents the 10% relative precision (0.1x0.5=0.05 = 5% points either side of p)

During the last MP, the monitored operating fractions were 93-95%. Hence, to be conservative, PP has used 90% expected proportion during the current MP which is found to be in line with the registered PD.

Substituting the values of “N” in equation above, the sample size is calculated. The sample size has been calculated as 31 for each type of ICS. However, PP has selected 33 samples for greenway jumbo stove and 32 samples for HPN JE-01ND stoves.

The samples are selected by using excel random number generator function i.e. RAND function.

Screen shot of random number selection.

¹Guidelines for Sampling and Surveys for CDM Project activities and Programme of Activities Ver. 4.0 (EB 86, Annex 4)

²The expected proportion has been taken as 0.9 for the second monitoring period.

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A	B	C	D	E	F	G	H	I	J	K
Sl no	Name of the beneficiary	ID no/Citizenship No	Address	District	Region	Date of Sales	Make / Model of Stove	Serial no of Cookstoves	Random	Sample selected
1	857 Kamala Khatri	501023/10746	Putalibazar Municipality	Syangja	Western	19.11.2018	Greenway Jumbo	PA/NP/WR/ICS/VCS/00857	7.31072E-07	Sample selected
3	3088 Phulmaya Thapa	832	Kaligandaki Gaupalika	Gulmi	Western	02.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03088	7.51469E-07	Sample selected
4	3105 Mitra Kumari Chhetri	13	Kaligandaki Gaupalika	Gulmi	Western	06.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03105	1.51416E-06	Sample selected
5	3107 Surya Kala Pariyar	41-01-72-02429	Kaligandaki Gaupalika	Gulmi	Western	06.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03107	2.30278E-06	Sample selected
6	3129 Lali Pariyar	413034/429	Kaligandaki Gaupalika	Gulmi	Western	07.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03129	3.01349E-06	Sample selected
7	3130 Sita Kumari Thapa	413034/208	Kaligandaki Gaupalika	Gulmi	Western	07.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03130	4.73479E-06	Sample selected
8	3131 Aasha Shah	41-01-70-05922	Kaligandaki Gaupalika	Gulmi	Western	07.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03131	5.01751E-06	Sample selected
9	3133 Devi Thapa	413034/243	Kaligandaki Gaupalika	Gulmi	Western	07.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03133	5.35138E-06	Sample selected
10	3134 Kumari kami	413034/284	Kaligandaki Gaupalika	Gulmi	Western	07.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03134	5.85561E-06	Sample selected
11	3135 Kumari Shaha	3034/224	Kaligandaki Gaupalika	Gulmi	Western	07.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03135	6.25391E-06	Sample selected
12	3136 Sita Shah	413034/489	Kaligandaki Gaupalika	Gulmi	Western	07.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03136	6.79358E-06	Sample selected
13	3138 Bishnu Thapa	413034/214	Kaligandaki Gaupalika	Gulmi	Western	07.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03138	8.94301E-06	Sample selected
14	3141 Jamuna Shah	411028/66346	Kaligandaki Gaupalika	Gulmi	Western	07.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03141	9.46856E-06	Sample selected
15	3145 Juna Thapa	831	Kaligandaki Gaupalika	Gulmi	Western	07.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03145	9.65071E-06	Sample selected
16	3146 Manikala Tarami Magar	617	Kaligandaki Gaupalika	Gulmi	Western	07.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03146	1.01217E-05	Sample selected
17	3148 Amrita Thapa	9483	Kaligandaki Gaupalika	Gulmi	Western	07.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03148	1.06877E-05	Sample selected
18	3152 Usha Shah	413034/492	Kaligandaki Gaupalika	Gulmi	Western	07.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03152	1.16674E-05	Sample selected
19	3154 Sita Devi khatri	413034/518	Kaligandaki Gaupalika	Gulmi	Western	07.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03154	1.31553E-05	Sample selected
20	3156 Dhan Maya Kami	401034/314	Kaligandaki Gaupalika	Gulmi	Western	07.01.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/03156	1.39054E-05	Sample selected
21	6519 Yamuna pun purja	49-14-75-00279	Malika	Myagdi	Western	24.02.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/06519	1.40433E-05	Sample selected
22	6521 Til kumari Phagami	493033/460	Malika	Myagdi	Western	24.02.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/06521	1.42548E-05	Sample selected
23	6524 Juna Regmi	49917	Malika	Myagdi	Western	24.02.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/06524	1.44109E-05	Sample selected
24	6546 Hari Prasad updhy	469	Baglung municipality	Baglung	Western	25.02.2019	HPNIE-01ND	PA/NP/WR/ICS/VCS/06546	1.45514E-05	Sample selected
25	7462 Gita Kunwar	463045/396	Annapurna R M	Kaski	Western	24.03.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/07462	1.50566E-05	Sample selected
26	7463 Parbati Adhikari	102574	Annapurna R M	Kaski	Western	24.03.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/07463	1.63046E-05	Sample selected
27	7464 Sumitra Adhikari	167777	Annapurna R M	Kaski	Western	24.03.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/07464	1.63286E-05	Sample selected
28	7465 Jivan bd kunwar	164182	Annapurna R M	Kaski	Western	24.03.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/07465	1.76288E-05	Sample selected

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Sl no	Name of the beneficiary	ID no/Citizenship No	Address	District	Region	Date of Sales	Make / Model of Stove	Serial no of Cookstoves	Random	Sample selected
28	7465 Jivan bd kunwar	164182	Annapurna R M	Kaski	Western	24.03.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/07465	1.76288E-05	Sample selected
29	7466 Luxmi pariyar	46-01-69-02191	Annapurna R M	Kaski	Western	24.03.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/07466	1.80281E-05	Sample selected
30	29 Durga Dabi paudel	501032/29270	Jaimuni N.P	Baglung	Western	02.11.2018	HPNIE-01ND	PA/NP/WR/ICS/VCS/00029	1.99803E-05	Sample selected
31	7467 Parbati Basnet	240	Annapurna R M	Kaski	Western	24.03.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/07467	2.01E-05	Sample selected
32	7468 Ganga Adhikari	461045/1605	Annapurna R M	Kaski	Western	24.03.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/07468	2.07833E-05	Sample selected
33	32 Jasuda dabi Sharma	3275/867	Jaimuni N.P	Baglung	Western	02.11.2018	HPNIE-01ND	PA/NP/WR/ICS/VCS/00032	2.10783E-05	Sample selected
34	7469 Ujeli Nepali	1038/1116	Annapurna R M	Kaski	Western	24.03.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/07469	2.38018E-05	Sample selected
35	34 Bhim Kumari hamal	503032/25	Jaimuni N.P	Baglung	Western	02.11.2018	HPNIE-01ND	PA/NP/WR/ICS/VCS/00034	2.52778E-05	Sample selected
36	7470 Ambika Kunwar	668	Annapurna R M	Kaski	Western	24.03.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/07470	2.63345E-05	Sample selected
37	36 Sima Kumari thapa	503032/92	Jaimuni N.P	Baglung	Western	02.11.2018	HPNIE-01ND	PA/NP/WR/ICS/VCS/00036	2.70271E-05	Sample selected
38	7471 Buddhinaya Chamrakar	543491	Annapurna R M	Kaski	Western	24.03.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/07471	2.85927E-05	Sample selected
39	38 Bhima dabi Sharma	990	Jaimuni N.P	Baglung	Western	02.11.2018	HPNIE-01ND	PA/NP/WR/ICS/VCS/00038	2.89708E-05	Sample selected
40	39 Ila hamal	37356/2058	Jaimuni N.P	Baglung	Western	02.11.2018	HPNIE-01ND	PA/NP/WR/ICS/VCS/00039	2.97144E-05	Sample selected
41	7472 Dil bd Nepali	153348	Annapurna R M	Kaski	Western	24.03.2019	Greenway Jumbo	PA/NP/WR/ICS/VCS/07472	3.03465E-05	Sample selected
42	7623 Kamal Raj Regmi	413	Baglung Municipality	Baglung	Western	28.03.2019	HPNIE-01ND	PA/NP/WR/ICS/VCS/07623	3.17204E-05	Sample selected
43	7853 Sabitra khatri khadka	501001/36739	Baglung Municipality	Baglung	Western	09.04.2019	HPNIE-01ND	PA/NP/WR/ICS/VCS/07853	3.21216E-05	Sample selected
44	7857 Ram Prasad Bishwokarm	4145	Baglung Municipality	Baglung	Western	09.04.2019	HPNIE-01ND	PA/NP/WR/ICS/VCS/07857	3.23232E-05	Sample selected
45	44 Jamuna saplangi sarki	503032/07	Jaimini nagar palika	Baglung	Western	02.11.2018	HPNIE-01ND	PA/NP/WR/ICS/VCS/00044	3.29334E-05	Sample selected
46	7875 Ganesh bohora	501001/34765	Baglung Municipality	Baglung	Western	10.04.2019	HPNIE-01ND	PA/NP/WR/ICS/VCS/07875	3.35855E-05	Sample selected
47	46 Dabi nepali	501032/36556	Jaimini nagar palika	Baglung	Western	02.11.2018	HPNIE-01ND	PA/NP/WR/ICS/VCS/00046	3.44499E-05	Sample selected
48	7877 Sunu thapa	4684	Baglung Municipality	Baglung	Western	10.04.2019	HPNIE-01ND	PA/NP/WR/ICS/VCS/07877	3.52497E-05	Sample selected
49	7896 Partap khatri	13880/122	Baglung Municipality	Baglung	Western	11.04.2019	HPNIE-01ND	PA/NP/WR/ICS/VCS/07896	3.53779E-05	Sample selected
50	7902 Yam bahadur chhetri	3564	Baglung Municipality	Baglung	Western	11.04.2019	HPNIE-01ND	PA/NP/WR/ICS/VCS/07902	3.71839E-05	Sample selected
51	7924 Bhima Devi Sharma	501021/22399	Baglung Municipality	Baglung	Western	12.04.2019	HPNIE-01ND	PA/NP/WR/ICS/VCS/07924	3.98085E-05	Sample selected
52	7926 Bhim Kumari roka	1002/23440	Baglung Municipality	Baglung	Western	12.04.2019	HPNIE-01ND	PA/NP/WR/ICS/VCS/07926	4.04767E-05	Sample selected
53	7927 Hom Kali k c	4800	Baglung Municipality	Baglung	Western	12.04.2019	HPNIE-01ND	PA/NP/WR/ICS/VCS/07927	4.29727E-05	Sample selected
54	7928 Karisma sunar	500172/01069	Baglung Municipality	Baglung	Western	12.04.2019	HPNIE-01ND	PA/NP/WR/ICS/VCS/07928	4.4096E-05	Sample selected

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	SI no	Name of the beneficiary	ID no/Citizenship No	Address	District	Region	Date of Sales	Make / Model of Stove	Serial no of Cookstoves	Random	Sample selected
42	7623	Kamal Raj Regmi	413	Baglung Municipality	Baglung	Western	28.03.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/07623	3.17204E-05	Sample selected
43	7853	Sabitra khatri khadka	501001/36739	Baglung Municipality	Baglung	Western	09.04.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/07853	3.21164E-05	Sample selected
44	7857	Ram Prasad Bishwakarm	4145	Baglung Municipality	Baglung	Western	09.04.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/07857	3.22323E-05	Sample selected
45	44	Jamuna saplangi sarki	503032/07	Jaimini nagar palika	Baglung	Western	02.11.2018	HPNJE-01ND	PA/NP/WR/ICS/VCS/00044	3.29334E-05	Sample selected
46	7875	Ganesh bohora	501001/34765	Baglung Municipality	Baglung	Western	10.04.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/07875	3.35855E-05	Sample selected
47	46	Dabi nepali	501032/36556	Jaimini nagar palika	Baglung	Western	02.11.2018	HPNJE-01ND	PA/NP/WR/ICS/VCS/00046	3.44499E-05	Sample selected
48	7877	Sunu thapa	4684	Baglung Municipality	Baglung	Western	10.04.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/07877	3.52497E-05	Sample selected
49	7896	Partap khatri	13880/122	Baglung Municipality	Baglung	Western	11.04.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/07896	3.53779E-05	Sample selected
50	7902	Yam bahadur chhetri	3564	Baglung Municipality	Baglung	Western	11.04.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/07902	3.71839E-05	Sample selected
51	7924	Bhima Devi Sharma	501021/22399	Baglung Municipality	Baglung	Western	12.04.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/07924	3.98085E-05	Sample selected
52	7926	Bhim Kumari roka	1002/23440	Baglung Municipality	Baglung	Western	12.04.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/07926	4.04767E-05	Sample selected
53	7927	Hom Kali k c	4800	Baglung Municipality	Baglung	Western	12.04.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/07927	4.29727E-05	Sample selected
54	7928	Karlama sunar	500172/01069	Baglung Municipality	Baglung	Western	12.04.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/07928	4.40966E-05	Sample selected
55	8057	Punya Devi poudel	1372	Baglung Municipality	Baglung	Western	15.04.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/08057	4.41616E-05	Sample selected
56	8731	Ran bahadur pun	3664	Katkekhola rm	Baglung	Western	07.06.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/08731	4.49735E-05	Sample selected
57	8732	Chandra bahadur karki	3725/585	Katkekhola rm	Baglung	Western	07.06.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/08732	4.58244E-05	Sample selected
58	8734	Narayan sunar	503012/92	Katkekhola rm	Baglung	Western	07.06.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/08734	4.60434E-05	Sample selected
59	8763	Sita devi regmi	4236	Baglung Municipality	Baglung	Western	11.06.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/08763	4.8003E-05	Sample selected
60	8766	Saroj Kumar shrestha	4999/441	Baglung Municipality	Baglung	Western	11.06.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/08766	4.86214E-05	Sample selected
61	8767	Anu Gautam thapa	320274/00406	Baglung Municipality	Baglung	Western	11.06.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/08767	4.88315E-05	Sample selected
62	8771	Dhan bahadur nepali	202490	Katkekhola rm	Baglung	Western	11.06.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/08771	4.89248E-05	Sample selected
63	8773	Amrita pun	1182	Katkekhola rm	Baglung	Western	11.06.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/08773	5.00106E-05	Sample selected
64	8776	Nabin Kumari rees	3075/6257	Baglung Municipality	Baglung	Western	11.06.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/08776	5.06418E-05	Sample selected
65	8780	Shanti rijal	501021/42545	Baglung Municipality	Baglung	Western	11.06.2019	HPNJE-01ND	PA/NP/WR/ICS/VCS/08780	5.08233E-05	Sample selected
66	65	Parbati Gharti Magar	62625	Gulmidarbar Gaupalka	Gulmi	Western	02.11.2018	Greenway Jumbo	PA/NP/WR/ICS/VCS/00065	5.10734E-05	
67	66	Krishna kumari Magar	41-01-75-01052	Gulmidarbar Gaupalka	Gulmi	Western	02.11.2018	Greenway Jumbo	PA/NP/WR/ICS/VCS/00066	5.2654E-05	
68	67	Remkala Kami	413064/545	Resunga NP	Gulmi	Western	02.11.2018	Greenway Jumbo	PA/NP/WR/ICS/VCS/00067	5.51039E-05	
Project Database VCS											

Type of stove: Greenway Jumbo

District	Number of samples
Gulmi	18
Kaski	11
Myagdi	3
Syangja	1

Type of stove: HPN JE-01ND

District	Number of samples
Baglung	26
Parbat	6

(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 (Ny,i,a).
2. The survey is conducted annually with the objective to target 10 percent precision and to achieve 90 percent confidence.

(ii) Quality Assurance/Quality Control:

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

(iii) Analysis:

1. Checking of a representative sample of ICS installed every year to ensure that they are still operating (Ny,i)
- 2) The project developer collects, compiles and analyzes the data to derive the number of ICS disseminated, the percentage of ICS in operation, displacement of traditional cooking stove by ICS users. The developer prepared “monitoring report” based on the survey records. The analysis of the data is done by the field person and then reviewed by the senior management team of Practical action.
- 3) The data collected is compiled in Excel sheets and/or other software and analyzed to derive the percentage of ICS in operation. The values are used for emission reductions calculation.

(c) Implementation:

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

Parameter	Objective	Timeframe/ Frequency	Method of Data Collection	Use of Data	Target Population	Sampling Frame
Ny,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.
py,i,j	To account any continued use of pre-	Measurement taken every year	Semi Structured questionnaire survey conducted	Monitoring will ensure that the ICS implemented through the	ICS user households	List of households having ICS installed/purchased.

	pre-project devices		among the user households	project is operational and has displaced low efficiency appliances from the project boundary.		
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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 analyse and quantify carbon outcomes.

Internal Audit and non-conformities handling procedure:

During the annual users' survey, survey team inspect representative sample households to check if the devices are operating or not. Sample for this survey is drawn as per the "Guidelines for sampling and surveys for CDM project activities and programme of activities, version 3 (EB 75, annex 8)". During the survey, the respective field person checks the ICS whether it is operational or not.

The field person is fully trained and the project developer takes care of their training and capacity Development in order for them to repair and do maintenance of ICS. If any non-conformities gets witnessed, it gets dealt internally and swiftly.

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 distributor 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 in charge 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 Mr. Min Bikram from PA, is the trainers for the trainings conducted during the monitoring period.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

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

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

Where:

i	=	Indices for the situation where more than one type of project device is introduced to replace the pre-project devices ³
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 ₂ e
$ER_{y,i,j}$	=	Emission reductions by project device of type i and batch j during year y in t CO ₂ e

³ 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).

LE_y = Leakage emissions in the year y

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

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) ⁴
- $NCV_{biomass}$ = 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 CO₂/TJ⁵
- $N_{y,i,j}$ = 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

Quantity of woody biomass that is saved in tonnes per cookstove device of type i and batch j during year y is calculated using the following equation:

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

Where:

$B_{old,i,j}$ = Annual quantity of woody biomass that would have been used in the absence of the project activity to generate useful thermal energy equivalent to that provided by the project device type i and batch j

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

⁵ 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 CO₂/TJ) and 91 per cent for LPG (63.0 t CO₂/TJ).

$\eta_{old,,}$ = Efficiency of the old devices being replaced by project devices of type i and batch j

$\eta_{new,,}$ = Efficiency of the project device i and batch j

For efficiency loss: 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 has been 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 is 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 is applied.

For monitoring period between 01/11/2020 to 31/10/2021(MP-02):

MP02 - Batch 1

Monitoring period start	1-Nov-20			
Monitoring period end	31-Oct-21			
		Stove Model		
		HPN JE-01 ND	Greenway Jumbo	
Parameter	Data ID	Value	Value	Units
Quantity of woody biomass used in the absence of the project activity	B_{old}	3.80	3.80	Tonnes/year
Efficiency of the system being replaced	η_{old}	10%	10%	Percentage
Efficiency of the system being deployed as part of the project activity (fraction)	η_{new}	27.35%	27.01%	Percentage
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
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
Emission factor for the substitution of non-renewable woody biomass by	$EF_{projected_fossilfuel}$	64.40	64.40	tCO ₂ /TJ

similar consumers. Use a value of 81.6 tCO ₂ /TJ				
Quantity of woody biomass that is saved in tonnes	By,savings	2.41	2.39	Tonnes/year
Number of Improved Cooking stoves operational during year y	N _{i,y}	100.00%	100.00%	Percentage
Adjustment to account for any continued use of pre-project devices during year "y"	μ _y	0.947	0.906	Fraction
Net to gross adjustment factor	LE _y	0.95	0.95	Fraction
Baseline Emissions per ICS		1.88	1.78	tCO ₂
Number of ICS disseminated	N	9560	2597	nos
Total Emission reduction	ER	17931	4628	tCO ₂

Total Emission Reduction	ER	22559	tCO₂
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MP02 - Batch 2

Monitoring period start	1-Nov-20
Monitoring period end	31-Oct-21

		Stove Model		
		HPN JE-01 ND	Greenway Jumbo	
Parameter	Data ID	Value	Value	Units
Quantity of woody biomass used in the absence of the project activity	B _{old}	3.80	3.80	Tonnes/year
Efficiency of the system being replaced	η _{old}	10%	10%	Percentage
Efficiency of the system being deployed as part of the project activity (fraction)	η _{new}	27.35%	27.01%	Percentage
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
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

Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 81.6 tCO ₂ /TJ	EF _{projected_fossilfuel}	64.40	64.40	tCO ₂ /TJ
Quantity of woody biomass that is saved in tonnes	By,savings	2.41	2.39	Tonnes/year
Number of Improved Cooking stoves operational during year y	N _{i,y}	100.00%	100.00%	Percentage
Adjustment to account for any continued use of pre-project devices during year "y"	μ _y	0.947	0.906	Fraction
Net to gross adjustment factor	LE _y	0.95	0.95	Fraction
Baseline Emissions per ICS		1.88	1.78	tCO ₂
Number of ICS disseminated	N	2855.00	280	nos
Total Emission reduction	ER	5355	499	tCO ₂

Total Emission Reduction	ER	5854	tCO₂
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Therefore, baseline emissions for ICS for the MP (01/11/2020 till 31/10/2021) for (HPNJE-01ND & Greenway Jumbo stoves)
= 28,413 tCO₂

Thus, total emission reduction for the period 01/11/2020 to 31/10/2021 is
=28,413 tCO₂

5.2 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).

5.3 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).

5.4 Net GHG Emission Reductions and Removals

In line with the applied methodology and PDD, PE_y & LE_y are 0. Therefore, the emission reductions from the project for the MP 01/11/2020 to 31/10/2021 are:

$$= BEy - PEy - LEy$$

$$= 28,413 - 0 - 0$$

$$= 28,413 \text{ tCO}_2/\text{y}$$

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net emission reductions or removals (tCO ₂ e)	GHG
01/11/2020 to 31/12/2020	4748	0	0	4748	
01/01/2021 to 31/10/2021	23665	0	0	23665	
Total (01/11/2020 to 31/10/2021)	28413	0	0	28413	

01/11/2020 to 31/10/2021		
Estimated ERs (As per PDD)	ERs during current monitoring period	Reason
31,983	28,413	<p>The ex-post ERs are less than Ex-ante ERs due to underlying following reasons:</p> <p>1. The difference in the estimated and monitored value of emission reduction i.e. decreases in monitored emission reduction as compared to estimated value is due to the fact that the less ICS are installed as against the estimated ICS number as mentioned in the PDD. estimated and monitored value.</p>

		2. Due to decrease in the efficiency of the ICS the ERs subsequently gets reduced.
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