Gold Standard

Gold Standard for the Global Goals
Key Project Information & VPA Design Document (PDD)

July 2017, Version 1

Gold Standard

KEY PROJECT INFORMATION

Title of Project:	**GS VPA ID: 6887;** **Community Level Green Energy Promotion in Nepal VPA-01**
Title of the PoA:	**GS PoA ID: GS 6886; COMMUNITY LEVEL GREEN ENERGY PROMOTION IN NEPAL**
Brief description of Project:	The VPA-01 is implementation of the three technologies – Biogas, ICS and water filters in the districts of Udayapur, Makwanpur and Sindhuli of Nepal for rural households.
Expected Implementation Date: Expected duration of Project:	01/01/2020 PoA: 20 Years VPA: 15 Years
Project Developer:	SAHAS FOUNDATION
Project Representative:	Surendra Shreshtha
Project Participants and any communities involved:	SAHAS FOUNDATION
Version of PDD: Date of Version:	03 Dated: 19/11/2019
Host Country / Location:	Nepal
Certification Pathway (Project Certification/Impact Statements & Products	Impact Statements and Products – GS VERs
Activity Requirements applied: (mark GS4GG if none relevant)	GS4GG Community Services Activity Requirements
Methodologies applied:	Technologies and Practices to Displace Decentralized Thermal Energy Consumption, Version 3.1
Product Requirements applied:	Not Applicable
Regular/Retroactive:	Regular
SDG Impacts:	SDG 3. Good Health and well being SDG 4. Quality education SDG 7. Affordable and clean energy SDG 8. Decent work and economic growth SDG 13. Climate action
Estimated amount of SDG Impact Certified	115,052 tCO_2e

SECTION A. Description of project

A.1. Purpose and general description of project

>> *(Provide a brief description of the project including the description of scenario existing prior to the implementation of the project.)*

The purpose of the programme is to implement renewable energy systems, energy efficient and safe drinking water devices for the rural communities of Nepal. SAHAS FOUNDATION will implement this project largely with the aid of carbon revenue. The three technologies to be implemented are biogas from cattle dung, improved cook stoves and safe drinking water devices.

For VPA-01, 10,000 biogas units, 20,000 Improved Cook stoves and 15,000 safe drinking water devices will be implemented in three districts - Udayapur, Makwanpur and Sindhuli Districts of Nepal.

Biogas: Biogas plant using cattle dung with fixed dome will be implemented as the choice of technology with a digesting chamber where cattle dung ferments to provide biogas, through the release of methane will be implemented that will replace the traditional cook stoves. The biogas model GGC 2047 model of 6 cum will be implemented at household level. The individual size would be of 6 cum, where it is less than 600 MWh x 3 = 1800 MWh_{th} thermal energy savings per year as per Annex B of GS4GG Community Services Activity Requirements for domestic, commercial and institutional level. Biogas also avoids methane emissions as the cattle dung in the baseline scenario releases methane to the atmosphere, which in the project scenario methane recovered from anaerobic digestion of cattle dung will be used completely for various purposes, such as for cooking, heating water, lighting, etc. with sustainable development benefits to the communities.

Improved Cook stove: Improve Cook Stoves that have efficiencies greater than 20% will be installed. The chosen models for the VPA-01 is Greenway Jumbo and Greenway Smart Stove, Mathrubhumi Model and Envirofit PCS single pot stove. The use of Improved Cook Stoves will save fuel wood by reducing consumption, which will thereby reduce Greenhouse gas emissions. The per unit annual thermal energy savings will be of less than 1800 MWh_{th} (600 MWh x 3 = 1800 MWh_{th}).

Safe Drinking Water Devices: The project will provide safe drinking water devices such as bio-sand filters, ceramic filters, etc. which otherwise is achieved in the baseline through boiling water on traditional cook stoves using fuel wood or is consumed without any treatment, as water is sourced from streams, wells, bore wells and other sources which are not potable. The chosen water filter for the VPA-01 is Silver coated candle water filter of 20 litre capacity. Each of the independent filters will have thermal energy savings of less than 1800 MWh_{th} (600 MWh x 3 = 1800 MWh_{th}), as per Annex B of GS4GG Community Services Activity Requirement.

The technology models and the technology providers is identified by the local Project proponents, i.e. NGOs/CBOs/producer company in consultation with the communities and technology experts in the region of implementation.

The CME and VPA for the project is SAHAS FOUNDATION. The CME will implement or facilitate implementation of the programme by providing capacities to staff of SAHAS FOUNDATION and local partners - SAHAS Nepal for implementation of the project.

The implementation of the project will be by SAHAS-FOUNDATION. Hence the VPA Implementer is SAHAS FOUNDATION.

The start date of the project will likely be from 01/01/2020 based on the likely start date of construction of biogas/distribution of Improved Cookstove or safe drinking water. The project will be implemented largely with carbon revenue.

The project will be implemented over a 5-year period. The year-wise implementation plan is as follows:

Implementation Plan of Biogas		
Year	No. to be constructed and commissioned	Cumulative number of biogas units that will be commissioned
1	1,000	1,000

2	1,800	2,800
3	2,100	4,900
4	2,400	7,300
5	2,700	10,000
Implementation plan of Improved Cook Stove		
Year	No. to be implemented	Cumulative number of ICS units implemented
1	4,000	4,000
2	8,000	12,000
3	8,000	20,000
4	0	20,000
5	0	20,000
Implementation Plan of Water filters		
Year	No. to be distributed	Cumulative number of water filter units that will be commissioned
Year 1	2,000	3,000
Year 2	4,000	6,000
Year 3	4,500	10,500
Year 4	4,500	15,000
Year 5	0	15,000

The CME/VPA Implementer SAHAS FOUNDATION confirms that the technologies considered under the PoA will be following Host Country's legal, environmental, ecological and social regulations.

The eligibility of the project under the GS4GG eligibility criteria is provided below:

A.2. Eligibility of the project under approved PoA

>> *(Demonstrate how each VPA meets the eligibility criteria as defined in approved PoA)*

#	**Eligibility Criteria**	**Criteria**	**Means of Verification/Documentary evidence**
1	The geographical boundary of the VPA including any time-induced boundary consistent with the geographical boundary set in the PoA;	The geographical boundary of the VPA is within the geographical boundary of the PoA, i.e. Nepal	The VPA will be implemented in Udayapur, Makwanpur and Sindhuli Districts of Nepal, which is within the geographical boundary of the PoA, Nepal. SAHAS FOUNDATION has provided documentation of the geographic boundary of the VPA within which the project will be implemented.
2.	Conditions that avoid double counting of emission reductions like unique identifications of product and end-user locations (e.g. programme logo);	The VPA has not yet been included in another PoA or has not yet been registered as a single CDM/VER project activity.	This is a greenfield project and is not part of any UNFCCC, VCS and GS project cycle. The VPA is not a part of any other PoA or will not be registered as individual project activity. SAHAS FOUNDATION has provided an Undertaking confirming that project activity is not an individual CDM/VER project or part of any other PoA

3	Conditions that avoid double counting of emission reductions like unique identifications of product and end-user locations (e.g. programme logo);	The VPA is uniquely identified and defined by way of unique identification number attached to each unit and the location of each unit is recorded in the VPA database and in the central database of the CME.	Monitoring Solution Database of the VPA and the central database of the CME will provide the end user details and unique identifications of biogas, ICS and water filters distributed to the households. Unique Identification of products i.e. SAHAS FOUNDATION logo will be provided for the technologies
4	The specifications of technology/measure including the level and type of service, performance specifications including compliance with testing/certifications;	Biogas: The Biogas units will be of 1 to 10 cum in capacity Improved Cook stoves – The ICS will have a minimum thermal efficiency of 20% Safe drinking Devices – The water filters will provide safe potable water meeting the water specific performance conditions as specified by Nepal drinking water quality standards, 2062.	The models that will be implemented are the GGC 2047 Model Biogas Plant, Greenway Jumbo and Greenway Smart Stove, Mathrubhumi Model and Envirofit PCS single pot stove and Silver coated candle filter. The VPA Implementer has provided the Technical specifications of the technologies that will be implemented, which includes details of the level and type of service provided, performance specifications and compliance with testing/certifications
6.	Where applicable, the requirements for the debundling check, in case the VPAs belongs to small-scale or microscale project categories.	GS PoA and VPAs are excluded from debundling check	Not applicable to GS4GG projects
7.	The conditions that ensure that the VPA meets the requirements pertaining to the demonstration of additionality according to GS4GG Community services activity requirements Version 1.1 with regard to thresholds of energy savings and emission reductions per year.	The VPA involves the installation of individual units within the range of the threshold as described in GS4GG Community Services Activity Requirements Annex B, i.e. unit results in <= 600 MWh of energy savings per year (600 MWh x 3 = 1800 MWh_{th}) or <=600 tonnes of emission reductions per year.	The Energy Savings of each the technologies is as follows: Biogas – 11.28 MWh/year ICS - 8.22-8.99 MWh/year Water Filter - 2.43 MWh/year Technical specification document with approved technology and declaration by CME/PIP of the project technologies with technical specifications that individual biogas, improved cook stoves and water filters results in less than 1800 MWh_{th} energy savings per year individually is provided by SAHAS FOUNDATION
8.	The conditions that ensure that the VPA meets the requirements pertaining to the demonstration of additionality according to GS4GG Community services activity requirements Version 1.1 Where applicable, target group are households or communities or institutions	The technologies are solely implemented for households, communities or institutions.	Name of the beneficiary, location details and verifiable document of the beneficiary (End User Agreement) to prove that the technologies are being implemented for households, communities and institutions will be provided once the project is implemented.

9.	Where applicable, the conditions that ensure that every VPA (in aggregate if it comprises of independent sub units) meets the small-scale threshold and remains within those thresholds throughout the crediting period of the VPA;	The VPA includes one of more of the said mentioned technologies i.e. biogas, improved cook stoves and safe drinking water devices and is within the Small Scale threshold i.e. 45 MW_{th} for biogas; 180 GWh_{th} for ICS and 60,000 tCO_2/annum for safe drinking water devices.	The total energy output/savings/emission reductions from the technologies is as follows: Biogas – 17.25 MW_{th} Energy Output Improved Cook Stove – 172.49 GWh_{th} Energy Savings Water Filters – 58,502 tCO2/year for 15,000 units Declaration by CME/PIP that VPA will remain within those thresholds throughout the crediting period of the VPA is provided by SAHAS FOUNDATION.
10.	Conditions to check the start date of the VPA through documentary evidence;	The start of the VPA occurs after the start date of the PoA. The start date will be defined as the date on the first technology has been implemented.	The likely start date is 01/01/2020, which is after 08/10/2018, the start date of the PoA. Document proof, i.e. end user agreement, invoice, signed statement by end user, etc.for the earliest date of technology implemented and also from the Monitoring Solution Database for the VPA will be provided once the activity is initiated.
11.	The PoA-specific requirements stipulated by the CME including any conditions related to undertaking local stakeholder consultations and environmental impact analysis;	The VPA has carried out a local stakeholder consultation.	Local Stakeholders Consultation Report for the VPA is provided to the GS and the DOE.
12.	Conditions to provide an affirmation that funding from Annex I Parties, if any, does not result in a diversion of official development assistance;	The VPA has not received funding from Annex I countries that results in a diversion of Official Development Assistance	Signed ODA Declaration form by SAHAS FOUNDATION of GS4GG is provided
13.	Specific requirement to be part of the PoA by the CME and the GS methodology	All households within the VPA transfer their right of VER ownership to the PIP	Agreement between VPA Implementer and beneficiary for transfer of issued credits to SAHAS FOUNDATION.
14.	Specific requirement to be part of the PoA	To be included in the PoA, Project Implementing Partner (PIPs) have to sign an agreement with the CME under which they acknowledge that they have signed up to the PoA and are aware of all its duties and tasks within the programme and project level including its eligibility criteria.	Signed Agreement by SAHAS FOUNDATION
15	Where applicable, the conditions related to sampling requirements	The sampling requirements is as per the GS	The VPA DD describes the sampling plan for each of the technology and

	for the PoA in accordance with the methodology	methodology for the particular technology of a small-scale project. List of parameters that will be determined through sampling for each of the technology. 1. The sample size for qualitative parameters meet 90/10 confidence/precision levels; 2. The parameter of interest is within 90/10 precision/confidence levels, if not the lower/upper bound as applicable is chosen 3. The frequency of sampling i.e. annual or biennial is followed for each of the parameter of the technology implemented	the parameters to be monitored through sampling in section B.7.2 and B.7.3. It is also ensured that 1) The sample size for qualitative parameters meet 90/10 confidence/precision levels; 2) The parameter of interest is within 90/10 precision/confidence levels, if not the lower/upper bound as applicable is chosen 3) The frequency of sampling i.e. annual or biennial is followed for each of the parameter of the technology implemented as given in Section B.3
16.	SD Inclusion Criteria	A minimum of the following five SDGs are included: 1. SDG 13: Climate Action 2. SDG 7: Affordable and Clean Energy 3. SDG 4: Quality Education 4. SDG 3: Good health and well being 5. SDG 8. Decent work and economic growth	VPA Document has inclusion of the following five SDGs 1. SDG 3: Good health and well being 2. SDG 4: Quality Education 3. SDG 7: Affordable and Clean Energy 4. SDG 8. Decent work and economic growth 5. SDG 13: Climate Action

A.3. Legal ownership of products generated by the project and legal rights to alter use of resources required to service the project

>> *(Justify that project owner has full and uncontested legal ownership of the products that are generated under Gold Standard Certification and has legal rights concerning changes in use of resources required to service the Project for e.g water rights, where applicable.*)

An end user agreement will be signed by the end-user after implementation of the technology, whereby it is clearly mentioned that the end user is aware and is willing to give up the rights to the verified emission reduction and transfer it to the PIP. Further, the end user agreement will also have the details of the technology, the unique ID and the location to irrefutably identify the implementation of the units. Copies of these signed contracts will be kept by the PIP.

A sample draft copy of the end user agreement will be as follows:

Model End User Agreement for providing Biogas/Improved Cookstoves/Safe Drinking water

End User Agreement between PIP and Participating Family for VPA-01
under the
PoA COMMUNITY LEVEL GREEN ENERGY PROMOTION IN NEPAL

Name of the PoA: Community Level Green Energy Promotion in Nepal

Name of the VPA: Community Level Green Energy Promotion in Nepal; VPA-01

Name of the Project Implementing Partner (PIP): SAHAS FOUNDATION

This end user agreement is executed on this _____day of _____ (Month) _____ Year between:

_____ [PIP]

AND

_____ [hereby called the END USER]

WHEREAS

The END USER residing at _____ _____ has agreed on the following conditions.

1. The SAHAS FOUNDATION situated at _____ has developed a Programme of Activity under the Gold Standard to provide _____ [insert the technology implemented] unit to the END USER under this VPA-01.
2. Under the VPA-01, _____ [insert the technology implemented] has been provided that was commissioned on _____ day of _____[month] _____ [Year].
3. The unique ID of the _____ [insert the technology] unit is _____.
4. This provides the rural women and the family with clean fuel for cooking/energy efficient cookstove/safe drinking water. At the same time the technology provides social, environmental and economic benefits.
5. As determined by SAHAS FOUNDATION and the PIP, the beneficiary has to contribute - _____ towards the project.
6. _____[insert the name of the PIP] builds/distributes the _____[insert the name of the technology unit(s) that is being provided]; trains the END USER to use the technology, monitor and maintain the units.
7. SAHAS FOUNDATION has provided the funding through carbon benefits and own all the carbon credits produced out of the project.
8. The END USER acknowledges that all the carbon credits (Verified Emission Reductions – VERs) produced by the project will automatically by the exclusive ownership of SAHAS FOUNDATION.
9. The units will be owned by the women of the house, run by her and the income if any shall go to her.
10. The END USER shall maintain and run the units properly and regularly.
11. Under no circumstances will the END USER permit any other person or agency, government, non-governmental organization, promote to take credit for this unit or the VERs that accrue from its operation.
12. The end user broadly understands the concept of GS VER projects, carbon generation and carbon trading.
13. The Agreement has been read out and explained to the END USER in her mother tongue.

IN WITNESS WHEREOF, both parties have put their signatures on this _____day of _____ [month] _____[Year].

Signature of the PIP Signature of the END USER

A.4. Location of project

A.4.1. Host Country

>>
Nepal

A.4.2. Region/State/Province etc.

>>
Districts of Udayapur, Makwanpur and Sindhuli

A.4.3. City/Town/Community etc.

>>

All villages and towns of the districts of Udayapur, Makwanpur and Sindhuli districts

A.4.4. Physical/Geographical location

>> (*Include information allowing the unique identification of this project.*)

Udayapur: Udayapur district is situated in Province No. 1 of eastern Nepal. Previously, Udayapur was part of the Sagarmatha zone, one of the 14 former administrative divisions and 5 Development Regions of Nepal. However, as per Schedule – 4 of the new Constitution of Nepal, 7 new provinces/states were established in September 2015[1]. Udayapur district borders Sunsari and Dhankuta districts to the east, Sindhuli and Dhanusha to the west, Bhojpur, Khotang and Okhaldhunga to the north and, Siraha and Saptari districts to the south. The district is surrounded by Mahabharat hills in the north and Shiwalik hills in the south. Udayapur covers an area of 2,063 km^2. According to the National Census 2011, the population of Udayapur is 317,532[2]. The district headquarters is Triyuga and it is situated between the Mahabharat hills in the north and the Churia hills in the south.

Makawanpur : Makawanpur is located in Province No. 3 of Nepal. Makawanpur was earlier a part of the Narayani administrative zone. The district is located on the south of Kathmandu district. Makawanpur district is surrounded by Kathmandu and Dhading districts in the north, Chitwan district in the west, Lalitpur, Kavre and Sindhuli districts in the east and Bara, Parsa and Rautahat districts in the south. The district encompasses 2,418 sq. Km. both hills and plains. As per the national census 2011, the total population of the Makawanpur is 420,477 comprising 206,664 males and 213,812 females[3]. The city of Hetauda is the headquarters of the district.

Sindhuli: Sindhuli is a mountainous district located in Province No. 3 of Nepal. The district was previously part of the Janakpur administrative zone. The district is situated between the Mahabharat hills in the north and the Churia hills in the south. Sindhuli district is surrounded by Okhaldhunga and Ramechhap districts in the north, Kavrepalanchok and Makawanpur in the west, Khotang and Udayapur in the east and Sarlahi, Mahottari and Dhanusha districts in the south. The total area of Sindhuli district is 2,491 km^2. According to the National Census 2011, the population of Sindhuli is 296,192[4]. Kamalamai is its district headquarters.

The coordinates of the districts are as follows:

Udayapur	26° 55′ 0″ N, 86° 40′ 0″ E
Makawanpur	27° 25′ 0″ N, 85° 2′ 0″ E
Sindhuli	27° 15′ 7.2″ N, 85° 58′ 12″ E

[1] The Constitution of Nepal, 2015, *Nepal Gazette*, accessed at http://www.lawcommission.gov.np/en/wp-content/uploads/2018/09/constitution-of-nepal-2-2.pdf

[2] Office of District Coordination Committee, Udayapur, 'Comprehensive introduction of Udayapur district', accessed at http://ddcudayapur.gov.np/ne-brief-introduction/

[3] Office of District Coordination Committee, Makwanpur, 'Comprehensive introduction of Makwanpur district', accessed at http://ddcmakwanpur.gov.np/en/brief-introduction/

[4] Office of District Coordination Committee, Sindhuli, 'Comprehensive introduction of Sindhuli district', accessed at http://ddcsindhuli.gov.np/ne-brief-introduction/

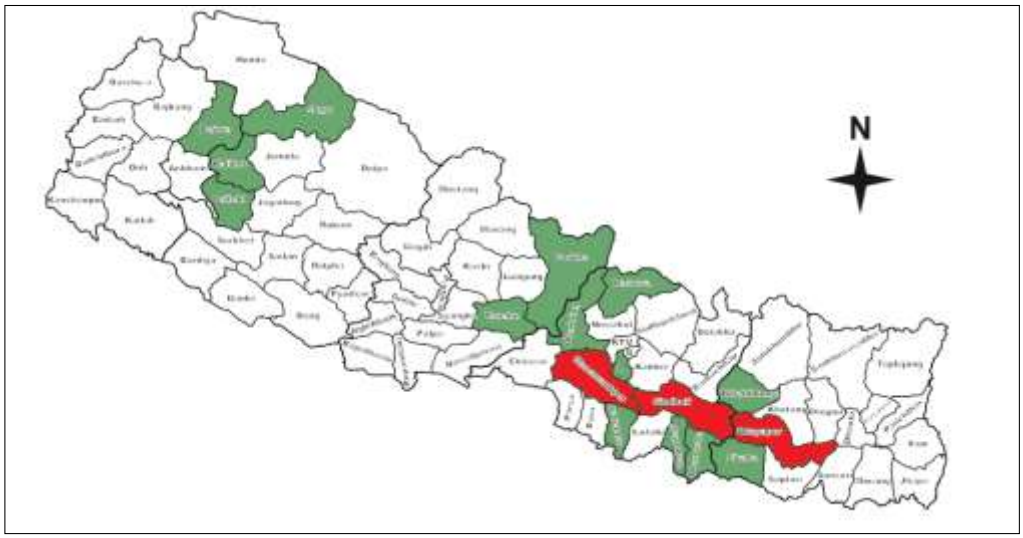


Figure 1: Location of the project area (Marked in Red)

A.5. Technologies and/or measures

>> *(Describe the technologies and measures to be employed and/or implemented by the project, including a list of the facilities, systems and equipment that will be installed and/or modified by the project. Include information essential to understand the purpose of the project and how it will contribute positively to three SDGs.)*

The proposed project activities fall under Renewable Energy type and Waste management Activities (Biogas) and End-Use Energy efficiency (Improved Cook Stove and Safe Drinking Water Devices) based on GS4GG Community Services Activity Requirements. The relevant and selected baseline and monitoring methodology for the project activities is the Gold Standard Methodology: Technologies and Practices to Displace Decentralized Thermal Energy Consumption Version 3.1.

Eligible Project Types as 3.1.1

As per 3.1.1.1, it is automatically eligible for Gold Standard Certification as the Gold Standard Approved methodology, Technologies and Practices to Displace Decentralized Thermal Energy Consumption, Version 3.1 is applied.

3.1.1.3 The Project types applying for Gold Standard approval are Renewable Energy (Biogas), Energy Efficiency (Improved Cookstove) and Others (Safe drinking water devices).

3.1.1.4 No new Project type is submitted for approval.

3.1.1.5 The projects does not fall under geo-engineering or energy generated from fossil fuel or nuclear, fossil fuel switch, or any project that supports, enhances or prolongs such energy generation.

GENERAL ELIGIBILITY CRITERIA under Community Services Activity Requirement

Eligible Project Types & Scope: It leads to climate change mitigation by providing and improving access to services/resources at household, community and institution level, which includes eligible services of thermal energy, waste management and handling, End Use energy efficiency and WASH for safe water.

Project Area, Boundary and Scale: The project boundary, and scale is described in line with the methodology TPDDTEC, Version 3.1. The scale of the project is a small scale project

Legal ownership of the project will be through end user agreements that will be signed by the end user and the VPA implementer SAHAS FOUNDATION for transfer of the generated carbon credits to SAHAS FOUNDATION. The proofs that end users are aware of and willing to give up their rights on products will be the end user agreements that will be signed once the project is implemented. The transfer of Product ownership was discussed during local stakeholder consultations.

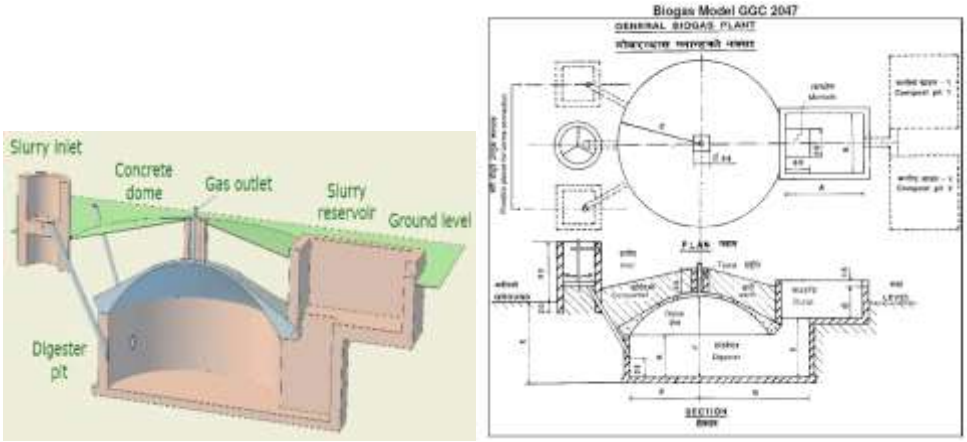
The purpose of the project is to implement renewable energy systems, energy efficient and safe drinking water devices for the rural communities of Nepal. Most of the rural communities in Nepal still rely on biomass for cooking and heating water. Also, water sources are not potable and are used without any filtration mechanism. Through this project, SAHAS FOUNDATION will implement these three technologies and contribute to social, economic, environmental and technological sustainability in the region.

The three technologies/measures that will be implemented by the VPA in the PoA are biogas from cattle dung, improved cook stoves and safe drinking water devices. The total number of units for each of the technology that will be implemented is as follows:

Technology	Model	Number of Units	Total
Biogas	GGC2047 6 cum biogas units	10,000	10,000
Improved cook stoves*	Mathrubhumi (M-ICS-06	5,000	20,000
	Envirofit PCS1	5,000	
	Greenway Smart Stove	5,000	
	Greenway Jumbo Stove	5,000	
Water Filters	Swachha Filter - Silver Coated candle filter	15,000	15,000

* Tentatively, the cook stoves are distributed evenly to the 4 identified models of ICS for ER calculation purposes. During actual implementation, the number is dependent on the choice of the women for a stove model.

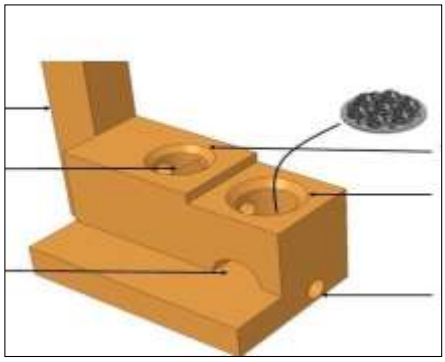
Biogas: Biogas plant which would include fixed dome model using cattle dung with a digesting chamber where cattle dung ferments to provide biogas through the release of methane. The biogas units will replace the traditional cook stoves. The size of the household level bio-digesters will be 6 cum and per unit annual thermal energy savings will be of less than 600 MWh x 3 = 1800 MWh_{th} of energy savings per year as per Annex B of GS4GG Community Services Activity Requirements. Biogas also avoids methane emissions as the cattle dung in the baseline scenario releases methane to the atmosphere, while in the project scenario methane recovered from anaerobic digestion of cattle dung will be used completely as thermal energy for various purposes, such as for cooking, heating water, etc. with sustainable development benefits to the communities. Biogas units will displace traditional cook stoves which is used in the baseline scenario for cooking and heating water.



Technical Specifications of the biogas model

The GGC 2047 biogas digester consists of five parts: the inlet, outlet, digester, dome and the compost pits. The required quantity of dung and water is mixed in the inlet tank and this mix in the form of slurry is allowed to be digested inside the digester. The gas produced in the digester is collected in the dome, called as the gas holder. The digested slurry flows to the outlet tank from the digester through the manhole. The slurry then flows through the overflow opening to the compost pit where it is collected and composted. The gas is supplied to the point of application through a tube. The point of application is a stove. The biogas is extracted from the digester and transported to the stove. The digester has an overpressure which creates a stable flow of gas for use in the cooking stoves. The biogas consumption capacity of each biogas stove is 450 litre/hour. With an estimated methane content of 60%, this gives an annual natural gas capacity of maximum 1.73 kW_{th} per biogas unit. 6 cubic meter biogas plant requires 36 kg dung and 36 L water per day for its operation. Lavatory with human faeces may or may not be connected to the biogas unit. But emission reductions from human faeces will not be considered. The GGC 2047 model is approved by AEPC of Nepal[5]

Improved Cook stove: Improve Cook Stoves that have thermal efficiencies greater than 20% will be installed. The use of Improved Cook Stoves will save fuel wood by reducing consumption, which will thereby reduce Greenhouse gas emissions. The per unit annual thermal energy savings will be less than 600 MWh x 3 = 1800 MWh_{th} of energy savings per year as per Annex B of GS4GG Community Services Activity Requirements. The thermal energy savings is determined based on the ICS specifications.
Mathrubhumi Model (M-ICS-06) with Air Supply Disk : It is a 2-pot mud stove with chimney built locally in Kathmandu and has a thermal efficiency of 25.5%. It is an improved mud stove with the air supply disk having holes for supplying the air from bottom to top. It saves nearly 60% of firewood and is easy to use. It has an opening of 8 inch which can rest different sized household kitchen ware and uses 7-inch Air Supply Disc Burner. The air supply disc burner) has numerous holes that suck natural air through conical channel and maintains air flow around the burning zone without having to install additional electric fans. 'Matribhumi Air Supply Disc Burner (ASDB)', a patented product of Matribhumi Urja has been tested in the Renewable Energy Testing Station (RETS) is the most efficient mud cook stove in the market with high thermal efficiency, less indoor pollutants and saves 60% fire wood. It has two pot with chimney that prevent the smoke inside. Users preferred this model of ICS due to feature of air supply disc that helped cooking faster than previous ICS. As this model of ICS is not much different than traditional type, users found it convenient to use. Based on the test report, it has an output of 4.17 kW



Mathribhumi Model

Envirofit PCS1: This is a Biomass/Natural Draft/Metallic/ Single Pot improved cook stove that has a thermal efficiency of 25.8%. This is portable metallic ICS that has single pot and firewood saver. This stove is referred by users because of its firewood efficiency and fast cooking. Due to its portability, it is used in different places of house and farm. The stove has a life span of 5 years and has a output of 3 kW.

[5] http://energyefficiency.gov.np/downloadthis/nibp_overall_report_final.pdf

Envirofit PCS1

Greenway Smart and Jumbo Stove: This is an efficient Metallic cook stove that works on the principle of Natural draft rocket. The thermal efficiency of Greenway Smart is 32.098% and of Greenway Jumbo is 31.17%. This is a portable metallic ICS that has single pot and firewood saver in two models. This stove is preferred by users because of its firewood efficiency and fast cooking. Due to its portability, it is used in different places of house and farm. The stoves have a output capacity of 1.21±0.01 and 1.64±0.5 kW for Smart and Jumbo greenway stove respectively.[6]

Fig 2: Greenway smart stove and Green way Jumbo stove

All the proposed models are approved by Nepal Government and tested by RETS, Nepal.[7]

[6] http://www.phytojournal.com/archives/2018/vol7issue3/PartAF/7-3-322-648.pdf

[7] http://www.retsnepal.org/uploads/file/71NIBC%202016%20approved%20Cookstoves.pdf

Safe Drinking Water Devices: The project will provide safe drinking water devices such as bio-sand filters, ceramic filters, etc. which otherwise is achieved in the baseline through boiling water or is consumed without any treatment, as water is sourced from streams, wells, bore wells and other sources which are not potable. Each of the independent filters will have an annual emission reduction of less than 600 tCO_2, as per Annex B of GS4GG Community Services Activity Requirements. The Swachha Filter is a colloidal Silver coated candle filter that has a capacity of 20 litres and filters at a rate of 4 litres/hour. It is easy to handle and more effective filter to remove turbidity and bacteria because of its candle that is prepared by dipping into silver. This filter has two layers i.e. upper and lower parts. For the filtration process, the silver coated candle is fitted in the upper part and the water that needs to be filtered is poured in the same layer. The filtered water is collected in the lower part. The filter is lighter and can be shifted from one place to another too. Laboratory tests show that the filters completely removes bacterial contamination.

Silver coated candle filter and its candle

The technology models and the technology providers are identified by SAHAS FOUNDATION in consultation with the communities and technology experts in the region of implementation. Various models of stoves were provided upfront to a few representative families so that they can provide their inputs on the best model for implementation.

The project will contribute to the following SDGs
SDG 3. Good Health and well being
SDG 4. Quality Education
SDG 7. Affordable and clean energy
SDG 8. Decent work and economic growth
SDG 13. Climate action

A.6. Scale of the project

>> (Define whether project is micro scale, small scale or others. Justify the scale referring to relevant activity requirement.)

Based on GS4GG guidelines, small scale project are renewable energy projects within 45 MW_{th} and End-use Energy efficiency Project improvement of <= 180 GWh_{th} and less than 60,000 tCO_2

It is a small-scale project.

Biogas

→ The project activity is biogas units designed for purposes of thermal energy. Thus it is isolated energy generation units, which produces thermal energy at the individual household/SME level for 10,000 units.

→ Each of the independent 6 cum biogas unit in the project activity has installed energy capacity of 1.73 kW_{th}.

→ Total installed capacity of 10,000 biogas units is 17.25 MW_{th}. This is less than 45 MW_{th} and hence is a small scale project activity.

Thus the condition of small scale project activity is satisfied i.e. activities is solely composed of isolated units where the users of the technology/measure are households/SMEs and the total installed capacity is 17.25 MW_{th}. The calculations are included in the ER Calculations Sheet and included in Section B.2.

Improved Cook Stove

→ Each of the independent ICS unit is for individual household in the project activity. The stove models has energy savings ranging from 8.22 to 8.99 MWh/year. The calculations are included in the ER Calculations Sheet and included in Section B.2. Each of the stove is has less than 1800 MWh energy savings per year (kindly see section B.2 for energy savings calculations.

→ The total energy savings from installation of 20,000 stoves is 172.49 GWh_{th}/year. Even if all the stoves distributed are of highest energy savings (Greenway Smart Stove), the total energy savings is 179.85 GWh_{th}, which is still lesser than 180 GWh_{th}. Hence ICS is a small scale project activity.

Activity Data	Envirofit	Greenway Smart Stove	Greenway Jumbo Stove	Matribhumi
Energy savings (MWh/family/yr)	8.2837	8.9941	8.9925	8.2281
Number of Households	5000	5000	5000	5000
Energy Savings (GWh/year)	41.42	44.97	44.96	41.14
Total Energy Savings (GWh/year)				**172.49**

Thus the condition of small scale project activity is satisfied i.e. the total energy savings is 172.49 GWh/yr, i.e. less than 180 GWh_{th}.

Safe Drinking Water Devices

→ The project activity is water filter unit designed for purposes of providing safe drinking water to the rural communities. Thus it is isolated technology/measure, which provides safe drinking water to individual household/SME level for 15,000 units. Each of the units has energy savings of 3.90 tCO_2/yr.

→ The total emission reductions from installation of 15,000 water filters is 58,502 tCO_2, which is still lesser than 60,000 tCO_2. Hence safe drinking water filters is a small scale project activity.

Thus the condition of small scale project activity is satisfied i.e. the total emission reductions per year is less than 60,000 tCO_2.

A.7. Funding sources of project

>> (Provide the public and private funding sources for the project. Confidential information need not be provided.)

Funding sources will not be from ODA. The funding sources will be upfront carbon revenue that will be procured after the project is registered as a GS VER project. Additional funding may be from government subsidies, if available and community contribution through either kind or money. This will be determined after the project gets registered as a GS VER project and carbon finance is secured for implementation.

SECTION B. Application of selected approved Gold Standard methodology

B.1. Reference of approved methodology

>>

- Technologies and Practices to Displace Decentralized Thermal Energy Consumption, Version 3.1
- GS4GG Community Services Activity Requirements

B.2. Applicability of methodology

>> (Justify the choice of the selected methodology(ies) by demonstrating that the project meets each applicability condition of the applied methodology(ies))

1. This small Scale VPA-01 under PoA meets the applicability conditions of the approved baseline and monitoring methodology, 'Technologies and Practices to Displace Decentralized Thermal Energy Consumption' (Version 3.1) as described below:

The applicability of the methodology is as follows:

According to the GS methodology Section I, "Source and Applicability" *it is applicable to activities introducing technologies and/or practices that reduce or displace greenhouse gas (GHG) emissions from the thermal energy consumption of households and non-domestic premises.*

- The project is implementation of biogas units and improved cook stoves providing renewable thermal energy to replace the existing traditional cooking devices of low efficiency at 10%.
- Also, the project is distribution of safe drinking water devices, which reduces use of non-renewable biomass or fossil fuel to boil water to make it safe for drinking. Thus it reduces GHG emissions from the thermal energy consumption of households and non-domestic premises.

The following conditions of the methodology are met as shown for each of them:

a) *"The project boundary can be clearly identified, and the technologies counted in the project are not included in another voluntary market or CDM project activity (i.e. no double counting takes place). Project proponents must have a survey mechanism in place together with appropriate mitigation measures so as to prevent double-counting in case of another similar activity with some of the target area in common."*

- **Biogas:** The project boundary is the physical, geographical site of the methane recovery and combustion systems for biogas units. The projects boundary will therefore encompass the sum of the 10,000 physical geographical sites of all individual biogas plants (digester system, pipe leading to the stove and the stove itself) realized by the project activity. The project boundary is inclusive of three districts namely, Udayapur, Makwanpur and Sindhuli districts. Each of the biogas unit will have a unique ID and the monitoring database will have all the details of the location and end users with the unique ID of the system. Hence, no double counting will take place.

  All the units implemented/constructed under the project will be clearly identified with unique IDs on the units and SAHAS FONDATION Logo on the product. The unique identification number is recorded in the project monitoring database of VPA and CME.

- **Improved cook stoves:** The project boundary is the physical, geographical site of the ICS. The projects boundary will therefore encompass the sum of the 20,000 physical geographical sites of all individual ICS realized by the project activity. The project boundary is inclusive of three district namely, Udayapur, Makwanpur and Sindhuli districts. Each of the ICS will have a unique ID and the monitoring database will have all the details of the location and end users with the unique ID and SAHAS FOUNDATION logo of the system. Hence, no double counting will take place.

- Safe Drinking Water Devices: The project boundary is the physical, geographical site of safe drinking water units. The projects boundary will therefore encompass the sum of the 15,000

physical geographical sites of all individual safe drinking water units realized by the project activity. The project boundary is inclusive of 3 districts namely, Udayapur, Makwanpur and Sindhuli. Each of the safe drinking water unit will have a unique ID and SAHAS FOUNDATION logo and the monitoring database will have all the details of the location and end users with the unique ID of the system. Hence, no double counting will take place.

b) *The technologies each have continuous useful energy outputs of less than 150kW per unit (defined as total energy delivered usefully from start to end of operation of a unit divided by time of operation). For technologies or practices that do not deliver thermal energy in the project scenario but only displace thermal energy supplied in the baseline scenario, the 150kW threshold applies to the displaced baseline technology.*

- **Biogas:** Each of the independent biogas unit is having a continuous energy output of 1.73 $kW_{th,}$ which is less than 150 kW per unit. The calculation for the installed capacity is as follows.

Biogas Energy Savings			
$E = \eta . H_b . V_b$			
Activity Data	Value	Unit	Reference
Where: E = Energy available from a biogas digester			
n= combustion efficiency of burners	60%		
Hb = heat of combustion per unit volume of biogas	23	MJ/m3	Energypedia, 2014[8];
Vb = Volume of the biogas	6	m3/day	Fixed Dome Model
E =	82.8	MJ/day	Calculated ($E = \eta$ x H_b x V_b)
E =	23.00	kWh/day	Calculated @ 1 megajoule = 0.277 777 777 78 kilowatt hour
E =	1.73	kW_{th}	Quantity of gas consumed for a household burner is 450 l/hr = 0.450 m3/hr[8]
Number of Biogas Units	10,000		
E =	17.25	MW_{th}	Calculated for 10,000 biogas units

- **Improved Cook Stove:** Each of the independent Improved Cook Stove will have a continuous energy output of 0.93 to 1.02 kW_{th}, which is less than 150 kW. Thus, the maximum energy output of the ICS implemented in the project activities is below the indicated 150 kW_{th} limit per unit.

Energy Savings					
Activity Data	Envirofit	Greenway Smart Stove	Greenway Jumbo Stove	Matribhumi	Source of data
Fuelwood Consumption (t/family/yr)	3.25	3.25	3.25	3.25	Baseline survey
Energy savings (MWh/family/yr)	8.2837	8.9941	8.9925	8.2281	Calculated
Continuous Energy Output (kW)	0.9456	1.0267	1.0265	0.9393	Calculated
Number of Households	5000	5000	5000	5000	
Energy Savings (GWh/year)	41.42	44.97	44.96	41.14	Calculated
Total energy savings (GWh/year)	172.49				

[8] https://energypedia.info/images/0/0a/EN_Biogas_Course_Reader_2014.pdf

- **Safe Drinking Water:** Specific energy consumption required to boil one litre of water is calculated as follows:

$$SEC = \left[WH \times \left(T_f - T_i\right) + 0.01 \times WHE\right] / n_{wb}$$

Where:

WH	=	Specific heat of water (kJ/L oC). Use a default value of 4.186 kJ/L oC
T_f	=	Final temperature (oC). Use a default value of 100 °C9
T_i	=	Initial temperature of water (°C). Use annual average ambient temperature;10 or use a default value of 20 °C
WHE	=	Latent heat of water evaporation (kJ/L). Use a default value of 2260 kJ/L. The latent heat required to boil one litre of water for five minutes is assumed to be equivalent to latent heat for the evaporation of 1% of the water volume (WHO recommends a minimum duration of five minutes of water boiling)11
n_{wb}	=	Efficiency of the water boiling systems being replaced, estimated ex-ante using any of the default values given in paragraph 26 of the UNFCCC methodology, Data/Parameter table 4.

Applying the above equation,

SEC = [4.186 X (100 – 20) + 0.01 X 2260] / 0.1

= 3575 kJ/L

The project technology purifies 4 litres/hour. Hence the continuous useful energy output of an equivalent service taking higher value is

Useful Energy Output = 4 litres/hour X 3575 kJ/L
= 14299 kJ/hour

Converting kJ/hour is done through the conversion rate @1 kJ/hr = 0.0002777 kW

= 14299 x 0.0002777= 3.97 kW

It follows that the useful energy output of the filter will be below 150 kW continuous useful energy output limit.

c) *The use of the baseline technology as a backup or auxiliary technology in parallel with the improved technology introduced by the project activity is permitted as long as a mechanism is put into place to encourage the removal of the old technology (e.g discounted price for the improved technology) and the definitive discontinuity of its use. The project documentation must provide a clear description of the approach chosen and the monitoring plan must allow for a good understanding of the extent to which the baseline technology is still in use after the introduction of the improved technology, whether the existing baseline technology is not surrendered at the time of the introduction of the improved technology, or whether a new baseline technology is acquired and put to use by targeted end users during the project crediting period – see section III. The success of the mechanism put into place must therefore be*

[9] Boiling point of water at standard conditions

[10] Ambient temperature data must be from globally accepted data sources, for example data published by the National Aeronautics and Space Administration (NASA) or the National Renewable Energy Laboratory (NREL). Data can be used only if they are for a location that can be demonstrated to be representative of the project location.

[11] WHO guidelines for emergency treatment of drinking water at point of the use <http://www.searo.who.int/LinkFiles/List_of_Guidelines_for_Health_Emergency_Emergency_treatment_of_drinking_water.pdf>.

monitored, and the approach must be adjusted if proven unsuccessful. If an old technology remains in use in parallel with the improved technology, corresponding emissions must of course be accounted for as part of the project emissions – see section II.5.

- **Biogas:** The project activity is total replacement of the baseline stoves with biogas. After implementation, the project activity will be monitored. Awareness campaigns will be conducted for complete replacement of baseline technology by the project technology. Village level volunteers will be appointed to monitor the use of biogas. In addition, parallel use of traditional cook stoves will also be monitored.
- **Improved Cook Stove:** The project activity is total replacement of the baseline stoves with ICS. After implementation, the project activity will be monitored. Village level volunteers will be appointed to monitor the use of ICS. In addition, parallel use of traditional cook stoves will also be monitored to accordingly deduce the percent of emission reductions of its use.
- **Safe Drinking Water Devices:** After implementation, the project activity will be monitored. Village level volunteers will be appointed to monitor the use of the safe drinking water devices. For non-use of filters or the use of parallel use of traditional stoves for heating water, emission reductions will not be calculated.

d) *The project proponent must clearly communicate to all project participants the entity that is claiming ownership rights of and selling the emission reductions resulting from the project activity. This must be communicated to the technology producers and the retailers of the improved technology or the renewable fuel in use in the project situation by contract or clear written assertions in the transaction paperwork, If the claimants are not the project technology end users, the end users should be notified that they cannot claim for emission reductions from the project.*

- An end user agreement will be signed by the PIP and the end-user after implementation of the technology, whereby it is clearly mentioned that the end user is aware and is willing to give up the rights to the verified emission reduction and transfer it to the CME. Further, the end user agreement will also have the details of the technology, the unique ID and the location to irrefutably identify the implementation of the units. Copies of these signed contracts will be kept by the CME.

e) *Project activities making use of a new biomass feedstock in the project situation (e.g. shift from non-renewable to green charcoal, plant oil or renewable biomass briquettes) must comply with relevant Gold Standard specific requirements for biomass related project activities, as defined in the latest version of the Gold Standard rules. If the biomass feedstock is sourced from a dedicated plantation, these criteria must apply to both plantations established for the project activity AND existing plantations that were established in the context of other activities but will supply biomass feedstock.*

- Biogas: The project activity does not involve use of new biomass stock in the project situation. The feedstock is dung for biogas. Hence not applicable.
- Improved Cook stove: The project activity does not involve use of new biomass stock in the project situation. Hence not applicable.
- Safe Drinking Water Devices: The project activity does not involve use of new biomass stock in the project situation. Hence not applicable.

Furthermore, the following conditions apply:

a) *Adequate evidence is supplied to demonstrate that indoor air pollution (IAP) levels are not worsened compared to the baseline, and greenhouse gases (as listed in section II.1) emitted by the project fuel/stove combination are estimated with adequate precision. The project fuel/stove combination may include instances in which the project stove is a baseline stove.*

- **Biogas:** Based on literature, the indoor air pollution levels are not worsened compared to baseline with the implementation of biogas. As the traditional stoves will be completely replaced by biogas, which does not emit any smoke, indoor air pollution will improve compared to baseline situation. The indoor air pollution is one monitoring parameter among the SD parameters which are monitored through sample surveys discussed in monitoring plan section of the VPA-DD.
- **Improved Cook stove:** The levels are not worsened compared to baseline as the source of fuel is the same, but the stove combination is not the same and decreases the indoor air pollution. This is further substantiated by test reports of the stoves, which shows that it meets the regulations of Nepal Interim Benchmark for Solid Biomass Cookstoves (NIBC, 2016) in reducing CO and PM2.5 emissions as shown in the test reports of the stoves.

Hence these stoves are approved by the Government of Nepal based on NIBC, 2016 guidelines[12].

- **Water Filters:** The project scenario is safe drinking water devices and hence not applicable. The indoor air pollution will not worsten as no new device is being introduced that burns fuel and contributes to indoor air pollution.

b) *Records of renewable fuel sales may not be used as sole parameters for emission reduction calculation, but may be used as data informing the equations in section II of this methodology if correlated to data on distribution and results of field tests and surveys confirming (a) actual use of the renewable fuel and usage patterns such as average fraction of non-renewable fuels used in mixed combustion or seasonal variation of fuel types, (b) GHG emissions, (c) evidence of CO levels not deteriorating (d) any further factors effecting emission reductions significantly.*

- Fuel sales will not be used for ER calculations for the three technologies.

f) *According to Annex 6, applicable for bio-digesters, additional applicability conditions need to be met which is "If more than one climate zone is included in the project activity, a distinction per climate zone must be considered. The distinct geographical boundary of each project area i must be clearly documented in the project documentation using representative GPS data".*

- Based on climate zones of Nepal (Fig 3), the project area (the 3 districts) falls under climate zone of Temperate climate with dry winter and hot summer.

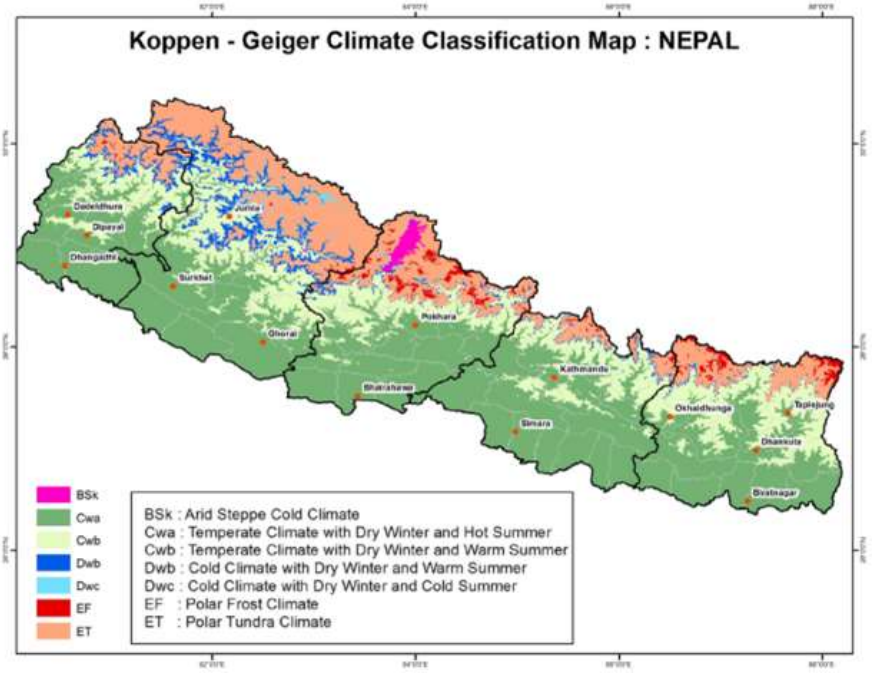


Fig 3: Climate zones of Nepal[13]

Thus the project activity meets all the applicability conditions of the applied methodology.

[12] http://www.retsnepal.org/uploads/file/71NIBC%202016%20approved%20Cookstoves.pdf

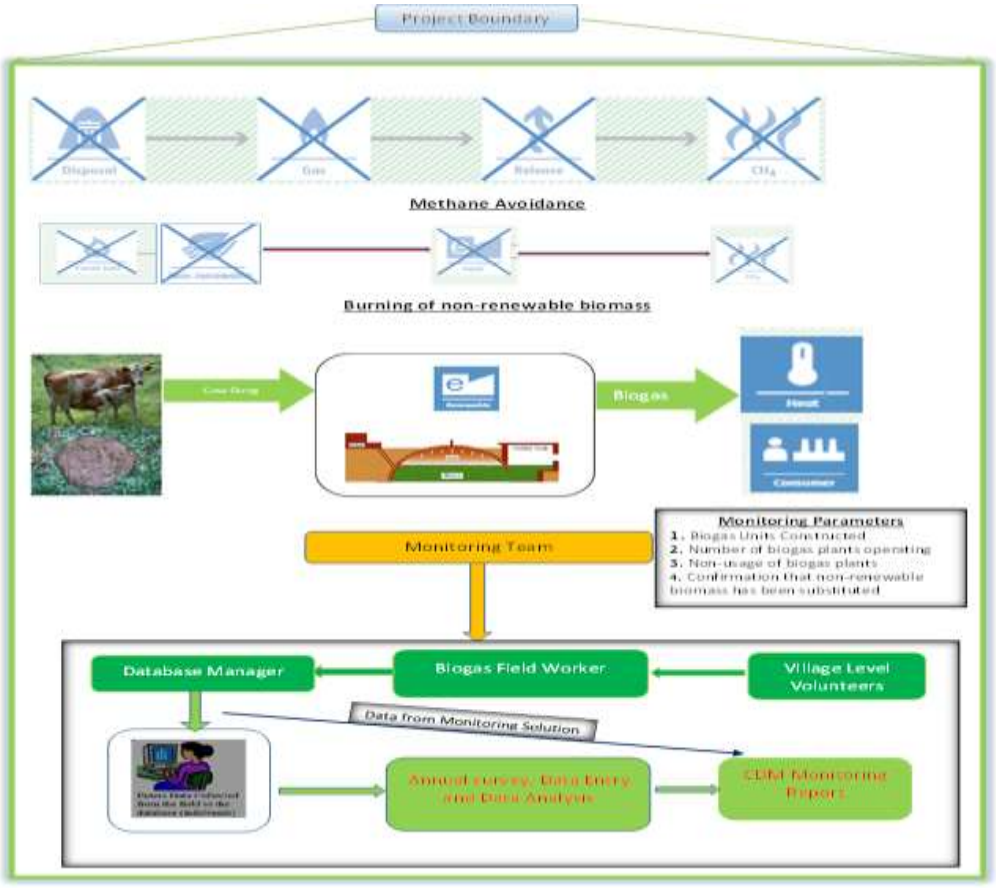
[13] https://www.researchgate.net/publication/280034906_New_climatic_classification_of_Nepal

B.3. Project boundary

>> (Present a flow diagram of the project boundary, physically delineating the project, based on the description provided in section A.5 above.)

Biogas

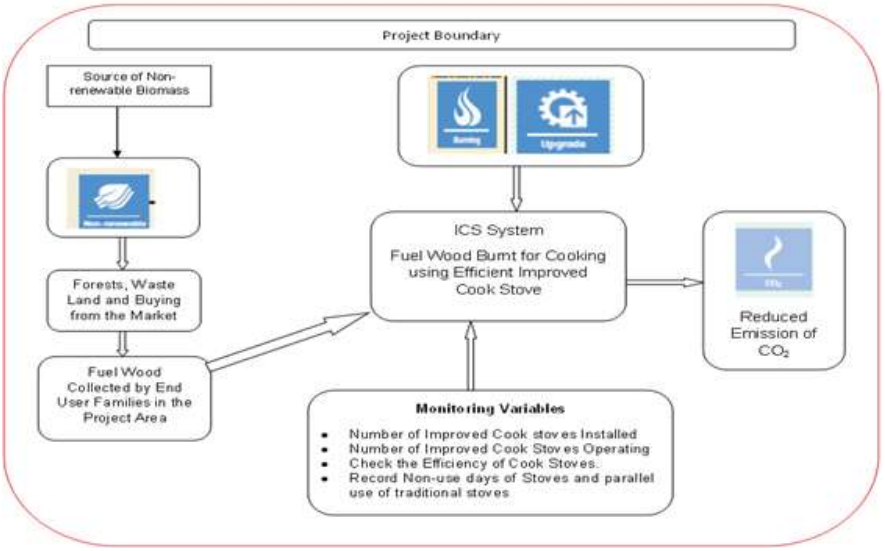
Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Heat delivery of fuel and transport of fuel and animal waste management	CO_2	Yes	Important source of emission
		CH_4	Yes	Important source of emission
		N_2O	Yes	Can be significant for some fuels
Project scenario	Heat delivery of fuel and transport of fuel and animal waste management	CO_2	Yes	Important source of emission
		CH_4	Yes	Important source of emission
		N_2O	Yes	Can be significant for some fuels



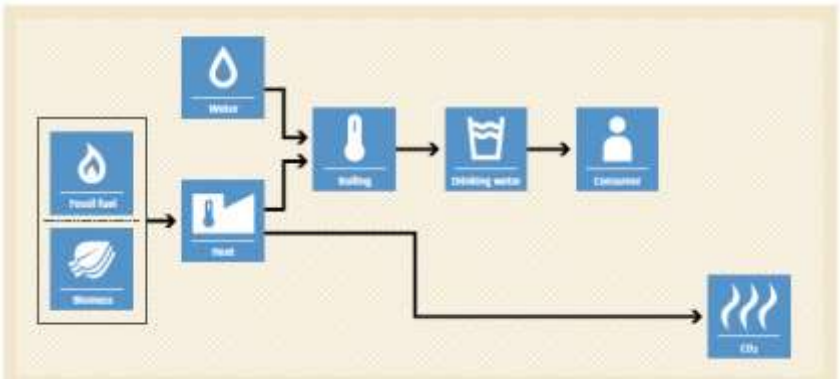
Improved Cook Stove

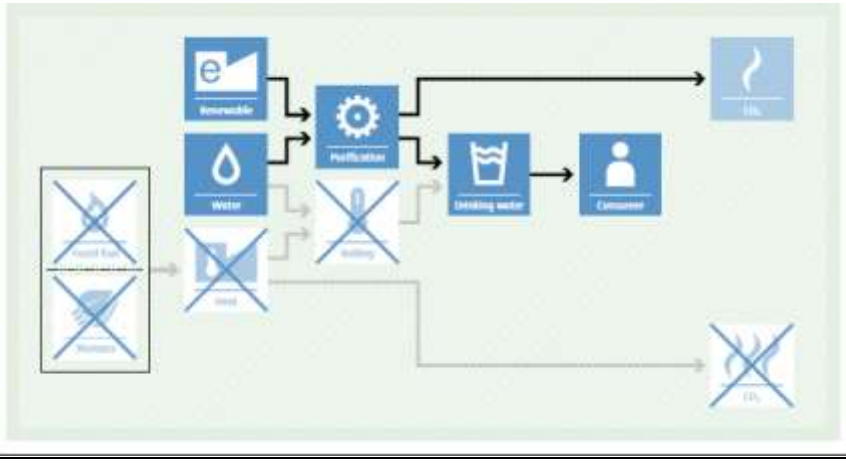
Source		GHGs	Included?	Justification/Explanation
Baseline	Heat delivery of fuel	CO_2	Yes	Important source of emission

	and transport of fuel	CH_4	Yes	Important source of emission
		N_2O	Yes	Can be significant for some fuels
Project scenario	Heat delivery of fuel and transport of fuel	CO_2	Yes	Important source of emission
		CH_4	Yes	Important source of emission
		N_2O	Yes	Can be significant for some fuels



Safe Drinking Water Devices

Baseline Scenario	

Project Scenario	

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Heat delivery of fuel	CO_2	Yes	Important source of emission
		CH_4	Yes	Important source of emission from burning of fuelwood for boiling water
		N_2O	Yes	Can be significant for some fuels from burning of fuelwood for boiling water
Project scenario	Heat delivery of fuel and transport of fuel	CO_2	Yes	Important source of emission
		CH_4	Yes	Important source of emission from fuel burnt in the project scenario for boiling water
		N_2O	Yes	Can be significant for some fuels burnt in the project scenario for boiling water

B.4. Establishment and description of baseline scenario

>> (Explain how the baseline scenario is established in accordance with guidelines provided in GS4GG Principles & Requirements and the selected methodology(ies). In case suppressed demand baseline is used then same should be explained and justified.)

Biogas and Improved Cookstove

A baseline scenario is defined by the typical baseline fuel consumption patterns in a population that is targeted for adopting the new project technology. Hence, this "target population" is a representative baseline for the project activity.

A baseline survey was conducted to identify the baseline scenario applicable to the project activity. The baseline report for the project activity gives the details of the survey conducted. Accordingly, the baseline scenario is 96% rural communities use inefficiency mud/clay wood stoves that do not have chimney and grate and hence has an efficiency of 10% according to the methodology. The methodology states 10% thermal efficiency for primitive stoves (those without chimney and grate). According to census data, fire wood is still a major source of fuel in Nepal for cooking as more than half (60.9%) are using it. By quintile groups firewood

is highly used for cooking by first second and third quantile whose dependency proportion is 77.0%, 77.0% and 78.4% respectively. Firewood is used by 76.5% rural households[14].

In project activities where all units are installed at the start or in project activities targeting non-industrial applications, the baseline is considered by - default fixed in time during the considered crediting period. It therefore does not require continuous monitoring.

The various baseline scenarios for each of the conditions is as follows:

1. All the 3 technologies implemented in isolation in each household. This is the scenario where only one technology is distributed/constructed for a household
   - Biogas: A household in which only biogas will be provided, the baseline scenario as determined i.e. traditional stove will be applied.
   - Improved cook stove: A household in which only improved cook stove will be provided the baseline scenario as determined, i.e. traditional stove will be applied.
   - Safe drinking water filters: The fuelwood required for boiling a litre of water with fuelwood will be applied as the baseline scenario for these households where only water filters are distributed.

2. Biogas with safe drinking water: The fuelwood requirement for boiling water to make water safe for drinking which is the baseline for water filters will be deducted and applied for biogas as the baseline fuelwood use.

3. Improved cook stove with safe drinking water device: Biogas with safe drinking water: The fuelwood requirement for boiling water to make water safe for drinking which is the baseline for water filters will be deducted and applied for ICS as the baseline fuelwood use.

Safe Drinking Water Devices

According to the GS methodology, "A baseline scenario is defined by the typical fuel consumption patterns in a population that is targeted for adoption of the project technology. Hence this target population is a representative baseline for the project activity. As mentioned above, based on baseline survey, 96% rural communities use inefficiency mud/clay wood stoves that do not have chimney and grate and hence has an efficiency of 10% according to the methodology. The methodology states 10% thermal efficiency for primitive stoves (those without chimney and grate). According to census data, fire wood is still a major source of fuel in Nepal for cooking as more than half (60.9%) are using it. By quintile groups firewood is highly used for cooking by first second and third quantile whose dependency proportion is 77.0%, 77.0% and 78.4% respectively. Firewood is used by 76.5% rural households[15].

Determining Non-renewable biomass (f_{NRB})

Determining f_{NRB}

The f_{NRB} is calculated based on CDM TOOL30, Methodological Tool for calculation of the fraction of non-renewable biomass. Version 2. The fraction of woody biomass that can be established as non-renewable is

[14] Annual Household Survey 2015/16. Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, and UNDP. 2016. http://neksap.org.np/uploaded/resources/Publications-and-Research/Reports/Annual%20Household%20Survey%202015_16_Major%20findings.pdf, Page 11.

[15] Annual Household Survey 2015/16. Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, and UNDP. 2016.

$$fNRB = \frac{NRB}{NRB + RB}$$

Where
f_{NRB} = Fraction of non-renewable biomass in the country/region or project area
NRB = Quantity of non-renewable biomas (t/yr) in the country/region or project area
RB = Quantity of renewable biomass in the country/region or project area

Parameter	Notation	Value	Source of data
Fraction of Non-renewable Biomass	f_{NRB}	**0.86**	Calculated NRB/NRB-RB
Quanity of non-renewable biomass in the country (m^2/yr)	NRB	22421681.9	= H - RB
Quanity of renewable biomass in the country (m^3/yr)	RB	3758318	$=MAI_{forest}$ x (F_{forest}-P_{forest})+MAI_{other} x (F_{other} - P_{other})
Total annual consumptionn of wood (m^3/yr)	H	26180000	Sum of wood removal and woodfuel removal (FRA, 2015)
Mean Annual Increment (t/ha/yr) for forest region	MAI_{forest}	1.2	Ministry of Forests and Soil Conservation, Nepal
Extent of forest area (ha)	F_{forest}	3636000	FRA, 2015, Table 1, Page 6
Extent of non-accessable area (protected area)	P_{forest}	814864	Assuming proportionally in forest and other wooded areas
Mean Annual Increment (t/ha/yr) for other region	MAI_{other}	0.6	Ministry of Forests and Soil Conservation, Nepal
Extent of other area (ha)	F_{other}	1897000	FRA, 2015, Table 1, Page 6
Extent of non-accessable area	P_{other}	425136	Assuming proportionally in forest and other wooded areas
Extent of non-accessable area (protected area)		1240000	FRA, 2015, Table 28, Page 152 and Table 30, Page 164
Wood Removal (m^3)		13720000	FRA, 2015, Table 24, Page 129
Woodfuel Removal (m^3)		12460000	FRA, 2015, Table 25, Page 136

The f_{NRB} considered for Nepal is 0.86. This is based on the latest available data on Nepal[16]. The value has not changed to that determined by the National CDM Authority, Nepal though expired at the time of submission of this VPA-DD.

Hence the fraction of non-renewable woody biomass used in the absence of the project activity considered for the VPA-01 is 0.86.

Baseline fuelwood use and safe drinking water practices

The baseline scenario is the existing practice of boiling water using high emission fuels including non-renewable biomass to treat it for consumption. According to baseline survey conducted in the project area, 96% of rural communities use inefficiency mud/clay wood stoves, which have an efficiency of 10% as these do not have chimney and grate. According to census data, fire wood is still a major source of fuel in Nepal for cooking as more than half (60.9%) are using it. By quintile groups firewood is highly used for cooking by first second and third quantile whose dependency proportion is 77.0%, 77.0% and 78.4% respectively. Firewood is used by 76.5% rural households[17].

Quantities of fuel consumed in the baseline and project scenarios, $B_{b,y}$ and $B_{p,y}$ are calculated as shown below. Fuel consumption is calculated (or back calculated in the case of the baseline scenario by multiplying the safe

[16] Based on calculations from the latest available reports for Nepal and https://cdm.unfccc.int/DNA/fNRB/index.html

[17] Annual Household Survey 2015/16. Government of Nepal, National Planning Commission Secretariat, Central Bureau of Statistics, and UNDP. 2016.

water consumption of end users observed in the project scenario by the amount of fuel required to boil a specific quantity of water[18].

Baseline and Project Scenario Emissions Calculations

Quantities of fuel consumed in the baseline and project scenarios, $B_{b,y}$ and $B_{p,y}$ are calculated as done below. Fuel consumption is calculated by multiplying the safe water consumption of end users observed in the project scenario by the amount of fuel required to boil a specific quantity of water.

Baseline Scenario Fuel Consumption Calculations

The total safe water consumed in the project scenario is the amount of safe water supplied by the project technology and consumed in the project scenario, plus the amount of raw water boiled after introducing the project technology (respectively represented below as Qp,y + Qp,rawboil,y). This total is assumed to be equivalent to water boiled in the baseline or consumed without any treatment. *If the total of these two volumes exceed the cap stipulated in the table located in the section on suppressed demand below, the project proponent's claim for emission reductions may not exceed the cap.*

$B_{b,y}$ = Number of person - days x Baseline Fuel used to Treat Water (T/L) x Total Safe Water consumed in project scenario (L/p/d)

$$B_{b,y} = (1 - X_{boil}) * (1 - C_j) * N_{i,y} * W_{b,y} * (Q_{p,y} + Q_{p,rawboil,y})$$

Where:

$B_{b,y}$	*Quantity of fuel consumed in baseline scenario b during the year y in tons*
X_{boil}	*Percentage of premises that would have used other non - GHG emitting technologies like chlorine treatment techniques, if available, in the absence of the project activity. These premises must be located in the project boundary. This parameter can be determined ex - ante using a survey. This parameter is to be applied for premises that are under suppressed demand situation.*
$N_{i,y}$	*Number of person days consuming water supplied by project scenario p through year y*
C_j	*Expressed as a percentage, this is the portion of users of the project technology j who in the baseline were already consuming safe water without boiling it. Premises with a piped water supply can be excluded from the Cj factor when it can be clearly demonstrated that the piped water supply is not a clean water source. Prior to registration, the water quality of the piped water supply should be established as unsafe by carrying out water quality testing over a representative period of time or by referring to relevant third party studies for the target area. Premises with a piped water supply that boil water or would have boiled water (suppressed demand situation) in the baseline situation are in such cases eligible and can be included in the calculation of baseline emissions from boiling water. PP shall carry out baseline surveys to demonstrate that premises do actually boil water or would indeed have boiled water to make it safe for use.*
$Q_{p,y}$	*Quantity of safe water in litres consumed in the project scenario p and supplied by project technology per person per day*
$Q_{p,rawboil,y}$	*Quantity of raw water boiled in the project scenario p per person per day*
$W_{b,y}$	*Quantity of fuel in tons required to treat 1 litre of water using technologies representative of baseline scenario b during project year y, as per Baseline Water Boiling Test.*

Determining X_{boil}:

Based on baseline survey, nearly 90% of the households do not treat water before drinking. Only about 1% of the houses boil water before drinking and only during monsoon when the water is murky. About 8% of households use water filters with candles and less than 0.5% use chlorine tablets for purifying the water before drinking[19]. Based on the survey, nearly 10% of the households either boil water, use filters or chlorine tablets. Hence 10% is X_{boil}, as determined by the baseline survey.

[18] Water consumption is typically measured as volume per person per day. Other metrics will be applied as is applicable in a given project scenario, such as volume per unit per day. Consumption is determined by clustered random sampling surveys representative of the considered scenario.

[19]Baseline Survey, 2018.

Determining $N_{i,y}$:

The number of person days consuming water supplied by project scenario is 365 days.

Based on the baseline survey conducted in the region, the average number of persons per family is 5. Hence for the ex-ante calculations, 5 is the number of persons considered. This will be determined ex-post after implementation of the project activity for each and every family through year y.

The number of person days is 15,000 x 5 x 365 = 27,375,000

Determining C_j:

The determination of families who are consuming safe water without boiling will not be chosen for the project activity. This project is for the rural poor, who are consuming water after boiling or those who are not treating or boiling water before consumption.

Based on Government of Nepal, 60% of the households get water from community tap. But the community tap water from the source of rivers or streams is not potable. Tests done of water from the community tap show that water is not potable and has bacterial contamination. This is either at the source or during its flow through pipes from the source to the community tap. This is also seen from many of the studies conducted[20]. An assessment in mid-western Nepal found that 70 to 80 percent of the taps do not deliver safe drinking water. A UNICEF study found that 71 per cent of all water sources and 91 per cent of those used by the poorest quintile are contaminated with Escherichia coli bacteria, beyond the World Health Organization standard. The only source, which is considered safe for drinking is Tubewell/hand pump, which is directly from the bore well to the hand pump. Though many reports show that water from these tube wells too are contaminated, as a conservative approach it is assumed as safe. The water test done from tubewell too showed contamination. Based on the survey in the project region, water from borewell accounts for 10% of the households. As a conservative approach, the government of Nepal data, which shows that this accounts for 15% of water distribution in the three districts is considered. Hence Cj is considered as 15%.

Drinking water source: The following are the main source of drinking water facility (ies) in the districts of the project activity[21].

District	Community Tap / Piped water	Tubewell / hand pump	Covered well / kuwa	Uncovered well / kuwa	Spout water	River / stream	Others	Not Stated
Makwanpur	63,206	4,300	2,106	11,443	3,539	791	444	216
Sindhuli	33,424	3,681	1,535	13,946	2,144	2,418	168	228
Udayapur	28,893	22,943	910	10,648	878	1,468	567	207
Total HHs	125,523	30,924	4,551	36,037	6,561	4,677	1,179	651
% of HHs	60%	15%	2%	17%	3%	2%	1%	0%

Sources of drinking water based on district statistics by the Government of Nepal

[20] https://borgenproject.org/water-quality-in-nepal/; https://bohs.biology.utah.edu/PDFs/Frank/Warner%20etal%202007.pdf; https://www.unicef.org/nepal/media/191/file/CPAP%202018-2022.pdf

[21] Statistics by Government of Nepal.

Fig 3: The water source in villages of the project area.

Hence Cj is 15% for the project activity.

Determining $Q_{p,y}$

The quantity of safe water for drinking in litres consumed in the project scenario p and supplied by the project technology is the default factor of 5 litres/person/day. According to the Nepal WaSH Sector Development Plan (SDP), Recommended basic drinking water requirement is 5 litres/day/per person and a total of 65 litres/day/per person for all human needs[22].

$Q_{p,y}$ is 5 litres/person/day

$Q_{p,rawboil,y}$ is considered zero.

Determining $W_{b,y}$

A baseline water boiling test was conducted to calculate the quantity of fuel required to purify by boiling one liter of water for 10 minutes using traditional stoves and local fuelwood representative of the baseline scenario (Wb,y). The fuelwood requirement is 0.000355±0.00002 t/litre of water with a reliability of 5.97% at 90/30 confidence/precision level.

If the water boiling technologies change in the project scenario, the BWBT will be updated. Otherwise the same BWBT will be used if the same technology prevails in the project scenario too. A total of 33 tests were

[22] Ministry of Water Supply and Sanitation Sector Efficiency Improvement Unit (SEIU), Nepal Water Supply, Sanitation and Hygiene Sector Development Plan (2016 – 2030), pp.67 https://www.seiu.gov.np/index.php/documents/download-file?path=SDP%2B-%2BFinal-%2BEng.pdf

conducted in various districts of the project area, which is more than required to determine the mean of fuelwood to boil a litre of water. A requirement of the sample size based on the mean and standard deviation shows that the sample size required is just 1 at 90/30 confidence/prevision level.

$W_{b,y}$ = 0.000355 t/litre of water

The quantity of fuelwood in the baseline is calculated as

$B_{b,y} = (1 - X_{boil}) * (1 - C_j) * N_{j,y} * W_{b,y} * (Q_{p,y} + Q_{p,rawboil,y})$

Calculations of Baseline Fuelwood use		
$B_{b,y} = (1 - X_{boil}) * (1 - C_j) * N_{j,y} * W_{b,y} * (Q_{p,y} + Q_{p,rawboil,y})$		
X_{boil} (Percentage)	***10%***	*Percentage of premises that would have used other non - GHG emitting technologies.*
$N_{j,y}$ (Number)	***27,375,000***	*Number of person days consuming water supplied by project scenario p through year y for 15,000 families*
C_j (Percentage)	***15%***	*Expressed as a percentage, this is the portion of users of the project technology j who in the baseline were already consuming safe water without boiling it*
$W_{b,y}$ (t/litre)	***0.000355***	*Quantity of fuel in tons required to treat 1 litre of water using technologies representative of baseline scenario b during project year y, as per Baseline Water Boiling Test (@0.015 TJ/t calorific value of wood (IPCC Value))*
$Q_{p,y}$	***5***	*Quantity of safe water in litres consumed in the project scenario p and supplied by project technology per person per day*
$Q_{p,rawboil,y}$	***0***	*Quantity of raw water boiled in the project scenario p per person per day*
$B_{b,y}$ (t/year)	***37,140.10***	*Quantity of fuel consumed in baseline scenario b during the year y in tons for 11000 households*

Project Scenario Fuel Consumption Calculation

$B_{p,y}$ = Number of person days x Project Fuel used to boil water (T/L) x Total volume of water boiled in project scenario (L/p/d)

$B_{p,y} = (1 - C_j) * N_{p,y} * W_{b,y} * (Q_{p,rawboil,y} + Q_{p,cleanboil,y})$

Where:

$N_{p,y}$	*Number of person days consuming water supplied by project scenario p through year y*
C_j	*Expressed as a percentage, this is the portion of users of the project technology j or who in the baseline were already consuming safe water without boiling it. Premises with a piped water supply can be excluded from the Cj factor when it can be clearly demonstrated that the piped water supply is not a clean water source. Prior to registration, the water quality of the piped water supply should be established as unsafe by carrying out water quality testing over a representative period of time or by referring to relevant third party studies for the target area. Premises with a piped water supply that boil water or would have boiled water (suppressed demand situation) in the baseline situation are in such cases eligible and can be included in the calculation of baseline emissions from boiling of water. PP shall carry out baseline surveys to demonstrate that premises do actually boil water or would indeed have boiled water to make it safe for use.*
$B_{p,y}$	*Quantity of fuel consumed in project scenario p during the year y in tons*
$Q_{p,rawboil,y}$	*Quantity of raw water boiled in the project scenario p per person per day*
$Q_{p,cleanboil,y}$	*Quantity of safe water boiled in the project scenario p per person per day*
Wp,y	*Quantity of wood fuel or fossil fuel in tons required to treat 1 litre of water using technologies representative of the project scenario p during project year*

$N_{p,y}$	*27,375,000*	*Kindly see above section for calculations*

C_j	*15%*	*Based on Government of Nepal Statistics.*
$Q_{p,rawboil,y}$	*0*	*Not considered*
$Q_{p,cleanboil,y}$	*0*	*Water filters will remove the bacteria and will be clean for consumption*
$W_{p,y}$	*0.000355*	*Kindly see the above section for calculations*
$\boldsymbol{B_{p,y}}$	***0***	***Calculated***

B.5. Demonstration of additionality

>> (If the proposed project is not a type of project that is deemed additional, as stated below, then follow guidelines in section 3.5.1 of GS4GG Principles & Requirements to demonstrate additionality.)

The table below is only applicable if the proposed project is deemed additional, as defined by the applied approved methodology or activity requirement or product requirement.

Specify the methodology or activity requirement or product requirement that establish deemed additionality for the proposed project (including the version number and the specific paragraph, if applicable).	**GS4GG Community Services Activity Requirements, Version 1, Annex B, Clause 3, Page 7.**

Specify the methodology or activity requirement or product requirement that establish deemed additionality for the proposed project (including the version number and the specific paragraph, if applicable).	**GS4GG Community Services Activity Requirements, Version 1, Annex B, Clause 3, Page 7.**
Describe how the proposed project meets the criteria for deemed additionality.	According to GS4GG community services Activity requirements, project activities solely composed of isolated units where the users of the technology/measure are households or communities or institutions and where each unit results in <= 600 MWh of energy savings per year or <=600 tonnes of emission reductions per year are considered deemed additional.1. Biogas: The project activity is biogas units designed for purposes of thermal energy at the household level. Thus it is isolated energy generation units, which produces thermal energy at the individual household or communities or institutions of 10,000 units. Each of the biogas unit of 6 cum results in energy savings of 11.28 MWh per year for 10,000 households or communities or institutions. 2. ICS: The project activity is implementation of energy efficient ICS. Thus it is isolated energy efficient units at individual household level for 20,000 units. Each of the independent ICS unit in the project activity has energy savings of 8.22-8.99 MWh/year for 20,000 households or communities or institutions. 3. Safe Drinking Water Devices: The project activity is water filter unit designed for purposes of providing safe drinking water to the rural households, communities or institutions. Thus it is isolated technology/measure, which provides safe drinking water to individual household/SME level for 15,000 units. Each of the water filter has energy savings of 2.43 MWh/year. Thus the condition of additionality is satisfied i.e. activities is solely composed of isolated units where the users of the technology/measure are households or communities or institutions and the per unit energy savings is less than 1800 MWh_{th}.

B.6. Sustainable Development Goals (SDG) outcomes

B.6.1. Relevant target for each of the three SDGs

>> (Specify the relevant SDG target for each of three SDGs addressed by the project. Refer most recent version of targets here .)

SDG	SDG Target

SDG 3. Good Health and well being	3.9. By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
SDG 4. Quality education	4.3.1: Participation rate of youth and adults in formal and non-formal education and training in the previous 12 months, by sex
SDG 7. Affordable and clean energy	7.1. By 2030, ensure universal access to affordable, reliable and modern energy services.
SDG 8. Decent work and economic growth	8.5. By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value.
SDG 13. Climate action	Emission Reductions

B.6.2. Explanation of methodological choices/approaches for estimating the SDG outcome

>> (Explain how the methodological steps in the selected methodology(ies) or proposed approach for calculating baseline and project outcomes are applied. Clearly state which equations will be used in calculating net benefit.)

SDG	Baseline Scenario	Project Scenario
SDG 3. Good Health and well being	Due to use of traditional stoves and drinking unsafe water, health impacts in the number of houses where the project technology is implemented	Improvement in indoor air quality and water quality due to which there is good health in the number of households where the project technology is implemented
SDG 4. Quality education	No trainings	Trainings conducted for implementation and maintenance of the project activity
SDG 7. Affordable and clean energy	Traditional stoves for cooking and drinking unsafe water/boiling water	Number of project households with either Biogas/Improved Cook Stoves/safe drinking water devices
SDG 8. Decent work and economic growth	No project related jobs created	Project related temporary or permanent jobs created for men and women
SDG 13. Climate action	Emissions due to baseline inefficient stoves used for cooking and boiling water for drinking	Emissions avoided due to implementation of the project as emissions in project scenario is negligible.

SDG 13: Biogas

Emission Reduction Calculations

Emission reductions are verified and credited by comparing the emissions for a given project scenario to the emissions for the applicable baseline scenario. Multiple project scenarios can be credited in comparison to different baseline scenarios, and multiple project scenarios can be credited in comparison to the same baseline scenario, as is applicable.

The overall GHG reduction achieved by the project activity is then calculated as follows:

$$ER_y = \Sigma BE_{b,y} - \Sigma PE_{p,y} - \Sigma LE_{py}$$

Where,

ER_y Emission reduction for total project activity in year y (tCO_{2e}/yr)

$BE_{b,y}$ Baseline emissions for baseline scenario b in year y (tCO_{2e}/yr)
$PE_{p,y}$ Project emissions for project scenario p in year y (tCO_{2e}/yr)
LE_{py} Leakage for project scenario p in year y (tCO_{2e}/yr)

As given in the methodology, emission reductions in the VPA-DD can be done prior to validation using conservative assumptions for baseline and project scenario variables such as fuel consumption, NRB, default or project specific emission factors, typical lifetimes for the improved technologies and project size and duration. The project scenario fuel consumption and fuel savings can be estimated from pertinent literature, lab testing and appropriate discounting factors, manufacturing specification or other viable sources of information on the project technology in relation to the baseline fuel consumption estimate from the baseline studies.

Emission from Baseline Scenario

$$BE_{b,y} = B_{b,y} * ((f_{NRB} * EF_{b,fuel,Co2}) + EF_{b,fuel,non\ Co2}) * NCV_{b,fuel}$$

$$And\ \ B_{b,y} = N_{p,y} * P_{b,y}$$

Where

$BE_{b,y}$	*Emission for baseline scenario b during year y in tCO_{2e}*
$B_{b,y}$	*Quantity of fuel consumed in baseline scenario b during year y in tons, as per by default factors*
$N_{P,Y}$	*Project technology-days in the project database for project scenario p through year y*
$f_{NRB,B,y}$	*Fraction of biomass used during year y for the considered scenario that can be established as non-renewable biomass (drop this term from the equation when using a fossil fuel baseline scenario)*
$NCV_{b,fuel}$	*Net Calorific value of the fuel that is substituted or reduced (IPCC default value for wood, 0.015 TJ/ton)*
$EF_{b,fuel,co2}$	*CO_2 emission factor of the fuel that is substituted or reduced. 112 tCO_2/TJ for Wood/Wood Waste, or the IPCC default value of other relevant fuel*
$EF_{b,fuel,non-co2}$	*Non-CO_2 emission factor of the fuel that is substituted or reduced*
$P_{b,y}$	*Specific fuel consumption for an individual technology in baseline scenario b during year y converted to tons/day*

Determining $B_{b,y}$

The quantity of fuelwood consumed in the baseline has been described in the Baseline Survey Report, 2018. The fuelwood consumption per capita/day is 0.00178 t. For the average family size of 5 the fuelwood consumption is 3.25 t/HH/yr.

Thus $B_{b,y}$ is 3.25 t/HH/yr.

Determining f_{NRB}

The f_{NRB} is calculated based on CDM TOOL30, Methodological Tool for calculation of the fraction of non-renewable biomass. Version 2. The fraction of woody biomass that can be established as non-renewable is

$$fNRB = \frac{NRB}{NRB + RB}$$

Where
f_{NRB} = Fraction of non-renewable biomass in the country/region or project area
NRB = Quantity of non-renewable biomas (t/yr) in the country/region or project area
RB = Quantity of renewable biomass in the country/region or project area

Parameter	Notation	Value	Source of data
Fraction of Non-renewable Biomass	f_{NRB}	**0.86**	Calculated NRB/NRB-RB
Quanity of non-renewable biomass in the country (m^2/yr)	NRB	22421681.9	= H - RB
Quanity of renewable biomass in the country (m^3/yr)	RB	3758318	$=MAI_{forest}$ x $(F_{forest}-P_{forest})+MAI_{other}$ x $(F_{other} - P_{other})$
Total annual consumptionn of wood (m^3/yr)	H	26180000	Sum of wood removal and woodfuel removal (FRA, 2015)
Mean Annual Increment (t/ha/yr) for forest region	MAI_{forest}	1.2	Ministry of Forests and Soil Conservation, Nepal
Extent of forest area (ha)	F_{forest}	3636000	FRA, 2015, Table 1, Page 6
Extent of non-accessable area (protected area)	P_{forest}	814864	Assuming proportionally in forest and other wooded areas
Mean Annual Increment (t/ha/yr) for other region	MAI_{other}	0.6	Ministry of Forests and Soil Conservation, Nepal
Extent of other area (ha)	F_{other}	1897000	FRA, 2015, Table 1, Page 6
Extent of non-accessable area	P_{other}	425136	Assuming proportionally in forest and other wooded areas
Extent of non-accessable area (protected area)		1240000	FRA, 2015, Table 28, Page 152 and Table 30, Page 164
Wood Removal (m^3)		13720000	FRA, 2015, Table 24, Page 129
Woodfuel Removal (m^3)		12460000	FRA, 2015, Table 25, Page 136

The f_{NRB} considered for Nepal is 0.86. This is based on the latest available data on Nepal[23]. The value has not changed to that determined by the National CDM Authority, Nepal though expired at the time of submission of this VPA-DD.

The f_{NRB} considered for Nepal is 0.86[24]. This is the value prescribed by the Government of Nepal.

Hence the fraction of non-renewable woody biomass used in the absence of the project activity considered for the VPA-01 is 0.86.

Data Variables, Parameters to determine baseline emissions

The variables, parameters, data source to determine the baseline emission for the project activity is as follows:

Baseline Emissions as per GS Methodology			**Source**
$B_{b,y}$	*Quantity of fuel consumed in baseline scenario b during year y in tons*	3.25	Baseline Survey
$N_{p,y}$	*Project technology-days I the project database for project scenario p through year y*	365	Assumed
$P_{b,y}$	*Specific fuel consumption for an individual technology in baseline scenario during year y converted to tons/day*	0.0089	$B_{b,y}/N_{p,y}$

[23] Based on calculations from the latest available reports for Nepal and https://cdm.unfccc.int/DNA/fNRB/index.html

[24] https://cdm.unfccc.int/DNA/fNRB/index.html

$f_{NRB,B,y}$	*Fraction of NRB biomass*	0.86	Nepal DNA
$EF_{fuel, Co2}$	CO_2 emission factor of the fuel that is substituted or reduced. tCO_2/TJ for wood /wood waste	112	Methodology
$EF_{fuel, non Co2}$	Non CO_2 emission factor (tCO_2/TJ)	8.6920	Calculated
$NCV_{b, fuel}$	Net Calorific Value 0.015 TJ/ton	0.015	Methodology

The $EF_{fuel, non CO2}$ was determined as follows:

Activity Data	**IPCC Values**	**Source of data**	**Units**
Emission Factor (CH_4)	300	Table 2.5.,Vol 2; Energy, GPG, IPCC 2006	$kgCH_4/TJ$ NCV
Emission Factor (N_2O)	4	Table 2.5.,Vol 2; Energy, GPG, IPCC 2006	kgN_2O/TJ NCV
Emission Factor (CH_4)	7.5000	Calculated (300*25)/1000 (GWP = 25)	tCO_2eq/TJ NCV
Emission Factor (N_2O)	1.1920	Calculated (4*298)/1000 (GWP = 298)	tCO_2eq/TJ NCV
Emission Factor (non-CO_2/TJ)	**8.6920**	**Calculated (Total Emission factor – CH_4 and N_2O)**	**tCO_2eq/TJ NCV**

Emissions from Project Scenario

A project scenario is defined by the fuel consumption of end users within a target population that adopt a project technology. The emission reductions are credited by comparing fuel consumption in the project scenario to the applicable baseline scenario.

Project Studies: A project scenario is defined by the end users within a target population that have adopted project technologies that cause specific emission reductions in the project area.

The following project studies will be conducted for each project scenario according to the schedule set out in Annex 6 of the methodology:

- Project non - renewable biomass (NRB) assessment, if biomass is one of the project fuels
- Project survey (PS) of target population characteristics[25]
- Project performance field test (PFT) of fuel consumption – based on section 7 and Annex 4 of the methodology

These three project studies have the same requirements as the baseline studies, but the project survey and PFT are conducted with end users representative of the project scenario target population and currently using the project technology.

Findings of the PFT will be submitted post - registration, on time for the verification and prior to the request for issuance. For ex-ante calculations, complete replacement of fuelwood consumption is considered and hence fuelwood consumption is considered as zero.

Project Emissions for biogas

Project emission calculations are conducted as follows:

$$PE_{p,y} = B_{p,y} * ((f_{NRB,y} * EF_{p,fuel,CO2} + EF_{p,fuel, nonCO2}) * NCV_{p,fuel}$$

and

[25] In cases where renewable fuels are disseminated by the project for use in baseline technology (such as traditional stoves), the project study must establish the degree to which the new fuel displaces GHG from the baseline fuel, such that quantities of new fuel sold can be conservatively and reliably converted to quantities of GHG avoided.

$B_{p,y} = N_{p,y} * ((P_{p,y} * U_{p,y}) + (P_{b,y} * (1 - U_{p,y})))$

Where,

$PE_{p,y}$	Emissions for project scenario p during year y in tCO_{2e}
$B_{p,y}$	Quantity of fuel consumed in project scenario p during year y,in tons, and as derived from the statistical analysis conducted on the data collected during the project performance field tests (cases when no baseline performance field test are performed, e.g.by-default baseline factors)
$f_{NRB,y}$	Fraction of biomass used during year y that can be established as non-renewable biomass
$NCV_{p.fuel}$	Net calorific value of the project fuel (IPCC default for wood fuel, 0.015 TJ/ton)
$EF_{fuel, CO2}$	CO_2 emission factor of the project fuel. 112 tCO_2/TJ for wood /wood waste.
$EF_{fuel, non\ CO2}$	Non CO_2 emission factor (tCO_2/TJ)
$N_{P,Y}$	Project technology-days in the project database for project scenario p during year y
$P_{P,y}$	Specific fuel consumption for an individual technology in project scenario p during year y converted to tons/day
$P_{b,y}$	Specific fuel consumption for an individual technology in baseline scenario b during year y converted to tons/day
U_{py}	Cumulative usage rate for technologies in project scenario j during year y, based on cumulative rate and drop-off rate.

For ex-ante calculations, the following data is used:

$PE_{b,y}$ Baseline Emissions of the biogas project/household		
$N_{P,Y}$	Project technology-days in the project database for project scenario p during year y	365
$P_{P,y}$	Specific fuel consumption for an individual technology in project scenario p during year y converted to tons/day	0
$P_{b,y}$	Specific fuel consumption for an individual technology in baseline scenario b during year y converted to tons/day	0.0089
U_{py}	Cumulative usage rate for technologies in project scenario j during year y, based on cumulative rate and drop-off rate.	1

$B_{p,y}$	Quantity of fuelwood consumed in project scenario p during year y, in tons, as derived from the statistical analysis conducted on the data collected during the project performance field tests (cases when no baseline field test are performed, e.g. by-default baseline factors)	0.00
$f_{NRB,B,y}$	Fraction of biomass used during year y for the considered scenario that can be established as non-renewable biomass	0.86
$ER_{brfuel,CO2}$	CO_2 emission factor of the fuel that is substituted or reduced. 112 tCO_2/TJ for wood/wood waste or the IPCC default value of other relevant fuel.	112
$EF_{byfuel, non\ Co2}$	Non-CO_2 emission factor of the fuel that is substituted or reduced.	8.6920
NCV	Net Calorific value of the fuel that is substituted or reduced (IPCC default for wood fuel, 0.015 TJ/ton)	0.015

Emission reduction from including animal waste management for biogas

Based on Annex 6 of the methodology for application of the methodology to bio - digesters, including animal waste management and applying IPCC Tier 1 approach,

Baseline emissions

$$BE_{awms,h} = GWP_{CH4} \sum_{T} (EF_{awms(T)} * N_{(T),h}$$

Where

$BE_{awms,h}$ The baseline emission from handling of animal waste in for premise h (tCO_2 per year)
GWP_{CH4} GWP of methane (tCO_{2e} per tCH_4) 25
$EF_{awms,T}$ Emission factor for the defined livestock category T (ton_{CH4} per animal per year
$N_{(T)h}$ Number of animals of livestock category in premise

	Dairy cow	Buffalo	Other cattle	Source
Number of animals of livestock category in premise **N(T)h**	0.03	0.67	3.23	Survey in the project area
Emission factor for the defined livestock category T ($tonCH_4$ per animal per year **$EF_{awms,T}$**	0.005	0.005	0.002	Table 10.14, Chapter 10, Page 10.39, IPCC, 2006
GWP of methane (tCO_{2e} per tCH_4) **GWPch4**			25	Methdology
The baseline emission from handling of animal waste in for premise h (tCO_2 per year) $BE_{awms,h}$			**0.249**	Calculated

Project Emissions

Project emissions are estimated as follows:

$$PE_{awms,h,y} = GWP_{CH4} * \sum (N_{(T),h,y} * EF_{awmsT}) * PLy + \sum (N_{(T),h,y} * EF_{awms,T}) * (1 - \eta_{biogasstove}) * (1 - PL_y)$$

N(T),h,y Number of animals of livestock category T in year y in premise h
EF_{awmsT} Emission factor for the defined livestock category T, ($tonCH_4$ per animal per year). Estimated using the IPCC TIER 2 approach. Formula (3) needs to be applied for the situation of the bio-- - digester in the project situation.
PL_y The physical leakage of the bio - digester system. Estimated using IPCC guidelines, i.e. 10% of total methane production or project - specific data. Where project participants use lower values or percentage of physical leakage, they should provide measurements proving that this lower value is appropriate for the project activity.
GWP_{CH4} Global Warming Potential (GWP) of methane (tCO_{2e} per tCH_4): 21 for the first 25 for the second commitment period. It shall be updated according to any future COP/MOP decisions.
$\eta_{biogastove}$ Combustion efficiency of the used type of biogas stove to account for incomplete combustion resulting in emission of methane post - combustion.

The Emission factor EF_{awms} for tier 2 approach is calculated as follows:

$$EF_{awms(T)} = VS_{(T)} * 365 * \left[B_{o(T)} * D_{CH4} * \sum_{k} \frac{MCF_{(P,S,K)}}{100} * MS_{(P,S,K)} \right]$$

$EF_{awms(T)}$ CH_4 emission factor for livestock category T, (tCH_4 per animal per year)
$VS_{(T)}$ Daily volatile solid excreted for livestock category T, (kg dry matter per animal per day)
365 Basis for calculating annual VS production, (days per year)
$B_{O(T)}$ Maximum methane production capacity for manure produced by livestock category T, (m^3CH_4 per kg of VS excreted)
D_{CH4} CH_4 Density (0.00067 t per m^3 at room temperature (20°C) and 1 atm pressure
$MCF_{(BL,K)}$ Methane conversion factors for the animal waste handling system in the baseline situation by climate zone k, (%)
$MS_{(P,S,K)}$ Fraction of livestock category T's manure treated in the animal waste management

system, in climate region k (dimensionless)

EFawms is calculated as follows:

	Dairy Cow	Other Cattle	Buffalo	Source of data
$VS_{(T)}$ (kg/hd/day)	2.8	2.3	3.9	2006, IPCC guidelines for National Greenhouse Gas Inventories; Table 10A-4, 10A-5 and 10A-6 for dairy cow, other cattle and buffalo respectively
$B_{O(T)}$ (m^3CH_4 per kg of VS)	0.13	0.1	0.1	
$MCF_{(T,S,K)}$ (%)	100%	100%	100%	2006, IPCC guidelines for National Greenhouse Gas Inventories; Table 10.12,
MS(BL,K)	0.75	0.75	0.75	Based on the dung production and reqquirement for the 6 cum unit (@12 kgs/animal dung production and a total of 36 kg requirement for biogas)
EFawms (tCH4 per animal per year)	0.000668	0.000422	0.000715	

Number of animals of livestock category in premise **N(T)h**	0.03	0.67	3.23	Survey in the project area
Emission factor for the defined livestock category T (tonCH_4 per animal per year **$EF_{awms,T}$**	0.000668	0.000422	0.000715	Calculated
GWP of methane (tCO_2e per tCH_4) 25 **GWP_{CH4}**			25	IPCC, 2006
The physical leakage of the biodigestor system **PLy**			10%	Default (Methodology)
Combustion efficiency of biogas stove **$\eta_{biogasstove}$**			60.0%	http://www.theijes.com/papers/v3-i1/Version-1/B030101007010.pdf
Project Emissions from Bio digester			0.0301	

Project emissions from the animal waste not treated in the bio-digester in project scenario shall be calculated using the following equation and with the following changed definition of parameters:

This will be applied ex-post after implementation and monitoring in the project area.
Project Emissions of dung not treated

Calculations of EFawms

EF_{awms} (tCH4 per animal per year) Calculations

	Dairy Cow	Other Cattle	Buffalo	Source of data
$VS_{(T)}$ (kg/hd/day)	2.8	2.3	3.9	2006, IPCC guidelines for National Greenhouse Gas Inventories; Table 10A-4, 10A-5 and 10A-6 for dairy cow, other cattle and buffalo respectively
$B_{O(T)}$ (m^3CH_4 per kg of VS)	0.13	0.1	0.1	
$MCF_{(P,S,K)}$ (%)	12.63%	12.63%	12.63%	2006, IPCC guidelines for National Greenhouse Gas Inventories; Table 10.12,
MS(P,S,K)	0.25	0.25	0.25	Remaining of the dung not treated by biodigester
EF_{awms} (tCH4 per animal per year)	0.000028	0.000018	0.000030	

Project Emissions from Dung not treated by digestor

	Dairy Cow	Other Cattle	Buffalo	Source of data
Number of animals of livestock category in premise **N(T)h**	0.03	0.67	3.23	Survey in the project area
Emission factor for the defined livestock category T (tonCH4 per animal per year **$EF_{awms,T}$**	0.000028	0.000018	0.000030	Table 10.14, Chapter 10, Page 10.39, IPCC, 2006
GWP of methane (tCO2e per tCH4) 25 **GWPch4**			25	Methodology
Project emissions PEawms,h,y			**0.00275**	Calculated

The total project emissions are 0.0301 + 0.00275 = 0.0033

Estimation of Leakage

The methodology states that the following potential sources of leakage for both Improved cook stove and biogas are to be considered:

a) *The displaced baseline cook stoves- are reused outside the project boundary in place of lower emitting technology or in a manner suggesting more usage than would have occurred in the absence of the project;*

b) *Non-project users who previously used lower emitting energy sources use the non-renewable biomass or fossil fuels saved under the project activity.;*

c) *The project significantly impacts the NRB fraction within an area where other CDM or VER project activities account for NRB fraction in their baseline scenario;*

d) *The project population compensates for loss of the space heating effect of inefficient technology by adopting some other form of heating or by retaining some use of inefficient technology;*

e) *By virtue of promotion and marketing of a new technology with high efficiency, the project stimulates substitution within users who commonly used a technology with relatively lower emissions, in cases where such a trend is not eligible as an evolving baseline.*

A leakage investigation will be conducted every two years using relevant survey methods that can be combined with monitoring surveys as is applicable. Leakage risks deemed very low will be ignored where the case for their insignificance can be substantiated.

a) The baseline technologies are not reused outside the project boundary. Traditional stoves cannot be moved as they are fixed to the floor of the kitchen or three stone stoves. New biogas unit will be built and also ICS will be built after removing the old traditional stoves.

b) As per the demographic survey conducted by PP, most of the families are using the either 3 stone or mud/clay traditional stoves. This project is implemented to those families who are using traditional stoves. Hence there will be no diversion of non-renewable biomass or fossil fuels saved under the project activity are used by non-project users who previously used lower emitting energy sources.

c) This is first GS VER project by PP and there are no projects registered under as CDM or VER project activities so far in the project area. It is therefore not likely that the NRB fraction is impacted significantly.

f) Space Heating: Survey will be done to see if other forms of heating is being adopted or is done by retaining some use of inefficient technology.

d) This project is implemented to those families who are using traditional inefficient stoves in the baseline. This project will not stimulate substitution within users who commonly used a technology with relatively lower emissions

Emission Reduction Calculations

The overall GHG reduction achieved by the project activity is then calculated as follows:

$$\mathbf{ER_y = \Sigma BE_{b,y} - \Sigma PE_{p,y} - \Sigma LE_{py}}$$

Where,

$\mathbf{ER_y}$	Emission reduction for total project activity in year y (tCO_{2e}/yr)
$\mathbf{BE_{b,y}}$	Baseline emissions for baseline scenario b in year y (tCO_{2e}/yr)
$\mathbf{PE_{p,y}}$	Project emissions for project scenario p in year y (tCO_{2e}/yr)
$\mathbf{LE_{py}}$	Leakage for project scenario p in year y (tCO_{2e}/yr)

SDG 13: Improved Cook Stove

Emission Reduction Calculations

Emission reductions are verified and credited by comparing the emissions for a given project scenario to the emissions for the applicable baseline scenario. Multiple project scenarios can be credited in comparison to different baseline scenarios, and multiple project scenarios can be credited in comparison to the same baseline scenario, as is applicable.

In the project activity for ICS that will be distributed, the baseline fuel and the project fuel are the same and hence the baseline emission factor and project emission are considered the same and the overall GHG reductions achieved by the project activity in year y are calculated as follows:

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

Where,

$\Sigma_{b,p}$	*Sum over all relevant (baseline b/project p) couples*
$N_{P,Y}$	*Cumulative number of project technology-days included in the project database for project scenario p against baseline scenario b in year y*
$U_{p,y}$	*Cumulative usage rate for technologies in project scenario p in year y, based on cumulative adoption rate and drop off rate revealed by usage surveys (fraction)*
$P_{P,b,y}$	*Specific fuel savings for an individual technology of project p against an individual technology of baseline b in year y, in tons/day, as derived from the statistical analysis of the data collected from the field tests (tons/day)*
$f_{NRB,b,y}$	*Fraction of biomass used in year y for baseline scenario b that can be established as non-renewable biomass.*
$NCV_{b,fuel}$	*Net Calorific Value of the fuel that is substituted or reduced. IPCC default value for wood fuel, 0.015 TJ/ton*
$EF_{b,fuel,CO2}$	*CO_2 emission factor of the fuel that is substituted or reduced. 112 tCO_2/TJ for wood/wood waste*
$EF_{fuel,nonCO2}$	*Non CO_2 emission factor of the fuel that is reduced (tCO_2/TJ)*
$LE_{P,Y}$	*Leakage for project scenario p in year y (tCO_{2e}/yr)*

EF will not include emission factors from fuel production and transport.

Emission Reductions/Household/year from implementation of Improved cookstove			**Source of Data**
$\mathbf{N_{PY}}$	Cumulative number of project technology-days included in the	**365**	Ex-ante Value

	project database for project scenario p against baseline scenario b in year y					
U py	Cumulative usage rate for technologies in project scenario p in year y, based on cumulative adoption rate and drop off rate revealed by usage surveys (fraction)				**1**	Ex-ante Value
P $_{Pby}$	Specific fuel savings for an individual technology of project p against an individual technology of baseline b in year y, in tons/day, as derived from the statistical analysis of the data collected from the field tests (tons/day)	**Envirofit stove**	**Greenway Smart Stove**	**Greenway Jumbo stove**	**Matrib humi**	Calculated based on thermal efficiency of stove
		0.0054	**0.0059**	**0.0059**	**0.0054**	
NCV$_{b,fuel}$	Net calorific value of wood				**0.015**	Methodology
F$_{NRB,B,y}$	Fraction of NRB biomass				**0.86**	Calculated
EF $_{fuel, Co2}$	CO_2 emission factor of the fuel that is substituted or reduced. tCO_2/TJ, the IPCC default value of other relevant fuel				**112**	IPCC Value
EF $_{fuel, non\ Co2}$	non-CO_2 emission factor of the fuel that is substituted or reduced. tCO_2/TJ, the IPCC default value of other relevant fuel				**8.6920**	IPCC Value

Adjustment factors

Adjustment factors will be applied during emission reduction crediting to allow for realistic comparisons of project technologies to the baseline scenarios. Adjustment factors will fine tune the baseline and project scenarios to account for variability in fuel savings due to differences in project technology type, size, usage pattern, and other pertinent variables, without requiring to independently monitor new baseline and project scenarios. Appropriate adjustment factors will be developed through quantitative assessment and analysis of baseline and project monitoring studies, as well as through additional targeted lab and field monitoring. For example, for fuel consumption in the baseline and project scenario would be adjusted to credit similar improved stove models of different sizes based on a ratio of the difference in fuel chamber volumes as long as clear correlations between stove size and standard adult - meals are identified and demonstrated. Similarly, the same wood stove may be used by some end users for domestic cooking and others for commercial cooking. Fuel consumption in the baseline and project scenario could be measured for the domestic users who comprise the large majority of customers, then adjusted based on measurements of cooking frequency and fuel use differences from usage surveys and monitoring surveys that capture information sufficient to compare domestic and commercial end users. Adjustment factors will not be used to estimate the consumption of one type of fuel based on the observed consumption for a different fuel. Representative sampling with appropriate weighting will be conducted in pertinent monitoring studies to ensure adjustments within scenarios and across scenarios are realistic.

Determining $\Sigma_{b,p}$ (Sum over all relevant (baseline b/project p) couples)

The sum of all relevant (baseline b/project p) couples that will be implemented as the project activity.

- The couple used in the project activity is traditional cookstove (baseline) with 10% thermal efficiency/the 4 models of ICS of greater than 20% thermal efficiency, and using the same type of fuel i.e. woody biomass in the baseline and project scenario.

Determining $N_{p,y}$ (Cumulative number of project technology-days included in the project database for project scenario p against baseline scenario b in year y)

- The cumulative number of project technology-days considered for calculating *ex-ante* emission reductions is considered as 365. The actual number of project technology-days will be monitored.

Determining $U_{p,y}$ (Cumulative usage rate for technologies in project scenario p in year y, based on cumulative adoption rate and drop off rate revealed by usage surveys (fraction))

The cumulative usage rate for technologies in project scenario is considered as 1 for ex-ante calculations.

This parameter will be monitored and accordingly $U_{p,y}$ will be applied for ex-post emission reduction calculations.

Applying $NCV_{b,fuel}$ (Net calorific value of the fuel that is substituted or reduced (IPCC default for wood fuel, 0.015 TJ/ton))

Determining $f_{NRB,y}$

The f_{NRB} considered for Nepal is 0.86. This is the value as determined in Section B.4[23~~24~~].

Hence the fraction of non-renewable woody biomass used in the absence of the project activity considered for the VPA-01 is 0.86.

The $EF_{fuel, non\ Co2}$ is determined as follows

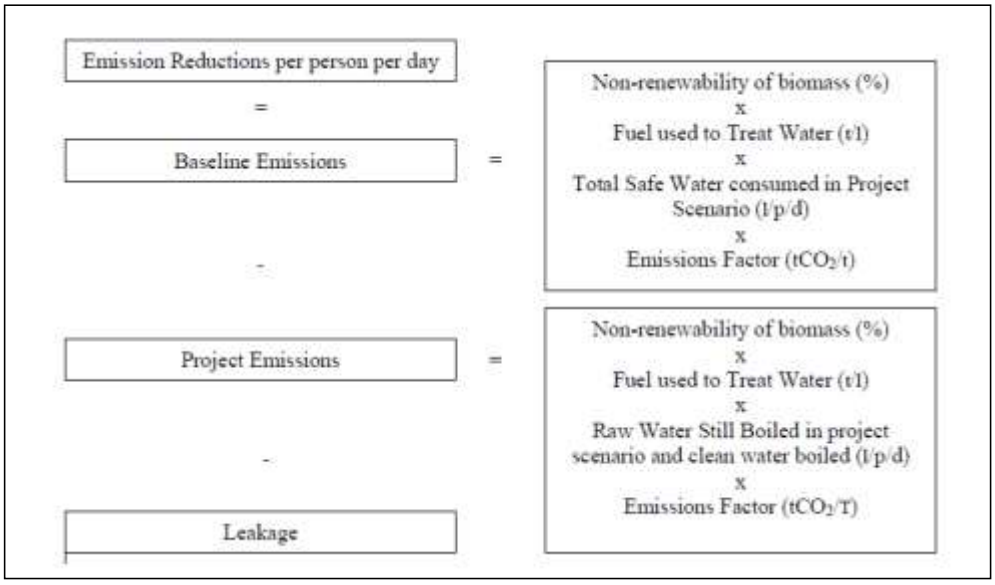
Activity Data	IPCC Values	Source of data	Units
Emission Factor (CH_4)	300	Table 2.5.,Vol 2; Energy, GPG, IPCC 2006	$kgCH_4/TJ$ NCV
Emission Factor (N_2O)	4	Table 2.5.,Vol 2; Energy, GPG, IPCC 2006	kgN_2O/TJ NCV
Emission Factor (CH_4)	7.5000	Calculated (300*25)/1000 (GWP = 25)	tCO_2eq/TJ NCV
Emission Factor (N_2O)	1.1920	Calculated (4*298)/1000 (GWP = 298)	tCO_2eq/TJ NCV
Emission Factor (non-CO_2/TJ)	8.6920	Calculated (Total Emission factor – CH_4 and N_2O)	tCO_2eq/TJ NCV

SDG 13: Safe Drinking Water

The methodology & tools which are applicable for explanation of methodological choices in this section includes:
Gold Standard methodology "Technologies and Practices to Displace Decentralized Thermal Energy Consumption' (Version 3.1.)".

Emission Reduction calculations for Safe Drinking Water Devices

Based on the methodology, the emission reduction calculation per person per day is as follows:



Baseline Scenario Fuel Consumption Calculation

The total safe water consumed in the project scenario is the amount of safe water supplied by the project technology and consumed in the project scenario, plus the amount of raw water boiled after introducing the project technology (respectively represented below as Qp,y + Qp,rawboil,y). This total is assumed to be equivalent to water boiled in the baseline. *If the total of these two volumes exceed the cap stipulated in the table located in the section on suppressed demand below, the project proponent's claim for emission reductions may not exceed the cap*

$B_{p,y}$ = Number of person - days x Baseline Fuel used to Treat Water (T/L) x Total Safe Water consumed in project scenario (L/p/d)

$B_{p,y} = (1 - X_{boil}) * (1 - C_i) * N_{i,y} * W_{b,y} * (Q_{p,y} + Q_{p,rawboil,y})$

Where:

X_{boil} *Percentage of premises that would have used other non - GHG emitting technologies like chlorine treatment techniques, if available, in the absence of the project activity. These premises must be located in the project boundary. This parameter can be determined ex - ante using a survey. This parameter is to be applied for premises that are under suppressed demand situation.*

$N_{i,y}$ *Number of person.days consuming water supplied by project scenario p through year y*

C_i *Expressed as a percentage, this is the portion of users of the project technology j who in the baseline were already consuming safe water without boiling it. Premises with a piped water supply can be excluded from the Cj factor when it can be clearly demonstrated that the piped water supply is not a clean water source. Prior to registration, the water quality of the piped water supply should be established as unsafe by carrying out water quality testing over a representative period of time or by referring to relevant third party studies for the target area. Premises with a piped water supply that boil water or would have boiled water (suppressed demand situation) in the baseline situation are in such cases eligible and can be included in the calculation of baseline emissions from boiling water. PP shall carry out baseline surveys to demonstrate that premises do actually boil water or would indeed have boiled water to make it safe for use.*

$B_{b,y}$ *Quantity of fuel consumed in baseline scenario b during the year y in tons*

$Q_{p,y}$ *Quantity of safe water in litres consumed in the project scenario p and supplied by project technology per person per day*

$Q_{p,rawboil,y}$ *Quantity of raw water boiled in the project scenario p per person per day*

$W_{b,y}$ *Quantity of fuel in tons required to treat 1 litre of water using technologies representative of*

baseline scenario b during project year y, as per Baseline Water Boiling Test. 46

Project Scenario Fuel Consumption Calculation

$B_{p,y}$ = Number of person days x Project Fuel used to boil water (T/L) x Total volume of water boiled in project scenario (L/p/d)

$B_{p,y} = (1 - C_j) * N_{p,y} * W_{b,y} * (Q_{p,rawboil,y} + Q_{p,cleanboil,y})$

Where:

$N_{p,y}$	*Number of person days consuming water supplied by project scenario p through year y*
C_j	*Expressed as a percentage, this is the portion of users of the project technology j or who in the baseline were already consuming safe water without boiling it. Premises with a piped water supply can be excluded from the Cj factor when it can be clearly demonstrated that the piped water supply is not a clean water source. Prior to registration, the water quality of the piped water supply should be established as unsafe by carrying out water quality testing over a representative period of time or by referring to relevant third party studies for the target area. Premises with a piped water supply that boil water or would have boiled water (suppressed demand situation) in the baseline situation are in such cases eligible and can be included in the calculation of baseline emissions from boiling of water. PP shall carry out baseline surveys to demonstrate that premises do actually boil water or would indeed have boiled water to make it safe for use.*
$B_{p,y}$	*Quantity of fuel consumed in project scenario p during the year y in tons*
$Q_{p,rawboil,y}$	*Quantity of raw water boiled in the project scenario p per person per day*
$Q_{p,cleanboil,y}$	*Quantity of safe water boiled in the project scenario p per person per day Wp,y Quantity of wood fuel or fossil fuel in tons required to treat 1 litre of water using technologies representative of the project scenario p during project year*

Emission Reductions

$BE_{b,y} = B_{b,y} * ((f_{NRB,b,y} * EF_{b,fuel\ CO2}) + EF_{b,fuel,nonCO2}) * NCV_{b,fuel}$

$PE_{p,y} = B_{p,y} * ((f_{NRB,p,y} * EF_{p,fuel,CO2}) + EF_{p,fuel,\ nonCO2}) * NCV_{p,fuel}$

Where the parameters are defined as in section II above.

The overall GHG reductions are calculated as follows: $ER_y = (\Sigma\ BE_{b,y} - \Sigma\ PE_{p,y}) * U_{p,y} - \Sigma\ LE_{p,y}$

Where:

$U_{p,y}$ Cumulative usage rate for technologies in project scenario p during year y, based on cumulative installation rate and drop off rate.

Leakage

Potential sources of leakage that is considered for the following according to the methodology:

a) The displaced baseline technologies are reused outside the project boundary in place of lower emitting technology or in a manner suggesting more usage than would have occurred in the absence of the project.
b) Non-project users who previously used lower emitting energy sources use the non-renewable biomass or fossil fuels saved under the project activity.
c) The project significantly impacts the NRB fraction within an area where other CDM or VER project activities account for NRB fraction in their baseline scenario.
d) The project population compensates for loss of the space heating effect of inefficient technology by adopting some other form of heating or by retaining some use of inefficient technology.
e) By virtue of promotion and marketing of a new technology with high efficiency, the project stimulates substitution within households who commonly used a technology with relatively lower emissions, in cases where such a trend is not eligible as an evolving baseline.

Based on a sample survey, if the leakage assessment quantifies an increase in fuel consumption by the non-project households/users attributable to the project activity, then calculations will be adjusted to account for the quantified leakage.

For ex-ante calculations, leakage is considered as zero. This is based on the fact that project activity will displace the baseline technology and will not be reused outside the project boundary. It will be ensured that the baseline stoves are demolished and their use is minimized. The three stone and clay/mud stove cannot be removed and taken for reuse as these are built *in-situ* in the kitchen. The number of families that is being reached is only 20,000 and the impact is insignificant compared to the potential of displacement of traditional baseline stoves. It will not have an impact of the f_{NRB} fraction at the national level. There is cost involved for substitution of the baseline technology. This is being facilitated by the Carbon revenue in the project region. The communities do not have the wherewithal to buy this technology and implement them. Hence automatic stimulation to substitute with households is not a likely scenario.

The leakage survey will be conducted to assess the fuelwood used to compensate for the loss of space heating effect of in-efficient technology by adopting some other form of heating or by retaining some use of inefficient technology. A leakage investigation will be conducted every two years using relevant survey methods that will be combined with monitoring surveys.

B.6.3. Data and parameters fixed ex ante for monitoring contribution to each of the three SDGs

(Include a compilation of information on the data and parameters that are not monitored during the crediting period but are determined before the design certification and remain fixed throughout the crediting period like IPCC defaults and other methodology defaults. Copy this table for each piece of data and parameter.)

Biogas

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	B_{by}
Unit	t/family/yr
Description	Quantity of fuel consumed in baseline scenario
Source of data	Baseline Survey Report for the project area, 2018
Value(s) applied	3.25
Choice of data or Measurement methods and procedures	A baseline survey was conducted in the project region in 2018 to estimate the fuelwood use. Kitchen test was done in 120 households for 7 days to assess the fuel wood use at households level. Weighted amount of fuelwood was given to the households from which they used it for cooking and other activities. The start and end weight was taken for each day to assess the fuelwood used per day. A mean of the value is considered as the baseline fuelwood use in the project area.
Purpose of data	To estimate Emission Reductions
Additional comment	This parameter is fixed for the entire crediting period.

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	NCV_b, NCV_P
Unit	TJ/ton
Description	Net calorific value of fuelwood in the baseline scenario Net calorific value of fuelwood in the project scenario
Source of data	IPCC default value
Value(s) applied	0.015 TJ/ton
Choice of data or Measurement methods and procedures	Default value
Purpose of data	Determine emission reductions

Additional comment	

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	$EF_{fuel, Co2;}$ $EF_{p,CO2}$
Unit	tCO_{2-e}/TJ
Description	CO_2Emission factor of the woody biomass used in baseline scenario CO_2 emission factor arising from use of fuels in project scenario
Source of data	As specified in the GS Methodology, Technologies and Practices to Displace Decentralized Thermal Energy Consumption, Version 3.1
Value(s) applied	112 tCO_2/TJ
Choice of data or Measurement methods and procedures	Based on the methodology guidelines
Purpose of data	To estimate Emission Reduction
Additional comment	This parameter is fixed for the entire crediting period

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter:	**$EF_{b,non-CO2}$ and $EF_{p,non-CO2}$**
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor arising from use of fuel in the baseline scenario
Source of data:	IPCC 2006 guidelines for National Greenhouse Gas Inventories, Volume 2:Energy, Table 1.4
Value(s) applied:	Wood: 8.6920 tCO_2/TJ Kerosene: 0.4288 tCO_2/TJ LPG: 0.1548 tCO_2/TJ
Choice of data or Measurement methods and procedures:	The values applied are from IPCC for non-CO_2 emissions from stationary combustion, and multiplied by equivalent CO_2 global warming potentials (GWWP) for CH_4 and N_2O of 25 and 298, respectively, which yields the following non-CO_2 emission factors:

Activity Data	**IPCC Values**			**Source of data**
	Wood	**Kerosene**	**LPG**	
Emission Factor (CH_4) $kgCH_4/TJ$ NCV	300	10	5	Table 2.5.,Vol 2; Energy, GPG, IPCC 2006
Emission Factor (N_2O) kgN_2O/TJ NCV	4	0.6	0.1	
NCV TJ/Gg	15.6	44.1	47.3	Table 1.2, Chapter 1, Volume 2, GPG, IPCC 2006
Emission Factor (tCH_4/TJ) tCO_2eq/TJ	7.5000	0.2500	0.1250	Calculated (GWP = 25)
Emission Factor (N_2O/TJ) tCO_2eq/TJ	1.1920	0.1788	0.0298	Calculated (GWP = 298)
Emission Factor (tCO_2eq/TJ)	**8.6920**	**0.4288**	**0.1548**	**Calculated**

Purpose of data	Determination of baseline emissions
Additional comment:	

Improved Cook Stove

Relevant SDG Indicator	SDG 13.B.1
Data / Parameter:	**$EF_{b,CO2}$ and $EF_{p,CO2}$**
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor arising from use of fuel in the baseline scenario
Source of data:	IPCC 2006 guidelines for National Greenhouse Gas Inventories, Volume 2:Energy, Table 1.4
Value(s) applied:	Wood: 112 tCO_2/TJ Kerosene: 71.5 tCO_2/TJ LPG: 63.1 tCO_2/TJ
Choice of data or Measurement methods and procedures:	Default emission factors
Purpose of data	Determination of baseline emissions
Additional comment:	

Relevant SDG Indicator	SDG 13.B.1
Data / Parameter:	**$EF_{b,non-CO2}$ and $EF_{p,non-CO2}$**
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor arising from use of fuel in the baseline scenario
Source of data:	IPCC 2006 guidelines for National Greenhouse Gas Inventories, Volume 2:Energy, Table 1.4
Value(s) applied:	Wood: 8.6920 tCO_2/TJ Kerosene: 0.4288 tCO_2/TJ LPG: 0.1548 tCO_2/TJ
Choice of data or Measurement methods and procedures:	The values applied are from IPCC for non-CO_2 emissions from stationary combustion, and multiplied by equivalent CO_2 global warming potentials (GWWP) for CH4 and N_2O of 25 and 298, respectively, which yields the following non-CO_2 emission factors:

Activity Data	**IPCC Values**			**Source of data**
	Wood	**Kerosene**	**LPG**	
Emission Factor (CH_4) $kgCH_4/TJ$ NCV	300	10	5	Table 2.5.,Vol 2; Energy, GPG, IPCC 2006
Emission Factor (N_2O) kgN_2O/TJ NCV	4	0.6	0.1	
NCV TJ/Gg	15.6	44.1	47.3	Table 1.2, Chapter 1, Volume 2, GPG, IPCC 2006
Emission Factor (tCH_4/TJ) tCO_2eq/TJ	7.5000	0.2500	0.1250	Calculated (GWP = 25)
Emission Factor (N_2O/TJ) tCO_2eq/TJ	1.1920	0.1788	0.0298	Calculated (GWP = 298)
Emission Factor (tCO_2eq/TJ)	**8.6920**	**0.4288**	**0.1548**	**Calculated**

Purpose of data	Determination of baseline emissions
Additional comment:	

Relevant SDG Indicator	SDG 13.B.1

Data / Parameter:	NCV_b
Data unit:	TJ/ton
Description:	Net calorific value of biomass fuels in the baseline
Source of data:	IPCC defaults, project-relevant measurement reports, or project-specific testing
Value(s) applied:	0.015 TJ/ton
Choice of data or Measurement methods and procedures:	Default value
Purpose of data	Determine emission reductions
Additional comment:	If EF is in units of tCO_2/t_fuel, remove NCV term from emission calculations.

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter:	NCV_p
Data unit:	TJ/ton
Description:	Net calorific value of fuels in the project
Source of data:	IPCC defaults, project-relevant measurement reports, or project-specific testing
Value(s) applied:	0.015 TJ/ton
Choice of data or Measurement methods and procedures:	Default value
Purpose of data	Determine emission reductions
Additional comment:	If EF is in units of tCO_2/t_fuel, remove NCV term from emission calculations. This has same value as $NCV_{baseline}$ in projects which reduce use of the same fuel.

Safe Drinking Water

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter:	**$EF_{b,CO2}$**
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor arising from use of fuel in the baseline scenario
Source of data:	IPCC 2006 guidelines for National Greenhouse Gas Inventories, Volume 2:Energy, Table 1.4
Value(s) applied:	Wood: 112 tCO_2/TJ Kerosene: 71.5 tCO_2/TJ LPG: 63.1 tCO_2/TJ
Choice of data or Measurement methods and procedures:	Default emission factors
Purpose of data	Determination of baseline emissions
Additional comment:	

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter:	**$EF_{b,non\text{-}CO2}$ and $EF_{p,non\text{-}CO2}$**
Data unit:	tCO_2/TJ
Description:	CO_2 emission factor arising from use of fuel in the baseline scenario
Source of data:	IPCC 2006 guidelines for National Greenhouse Gas Inventories, Volume 2:Energy, Table 1.4

Value(s) applied:	Wood: 8.6920 tCO_2/TJ Kerosene: 0.4288 tCO_2/TJ LPG: 0.1548 tCO_2/TJ
Choice of data or Measurement methods and procedures:	The values applied are from IPCC for non-CO_2 emissions from stationary combustion, and multiplied by equivalent CO_2 global warming potentials (GWWP) for CH_4 and N_2O of 25 and 298, respectively, which yields the following non-CO_2 emission factors:

Activity Data	**IPCC Values**			**Source of data**
	Wood	**Kerosene**	**LPG**	
Emission Factor (CH_4) $kgCH_4/TJ$ NCV	300	10	5	Table 2.5.,Vol 2; Energy, GPG, IPCC 2006
Emission Factor (N_2O) kgN_2O/TJ NCV	4	0.6	0.1	
NCV TJ/Gg	15.6	44.1	47.3	Table 1.2, Chapter 1, Volume 2, GPG, IPCC 2006
Emission Factor (tCH_4/TJ) tCO_2eq/TJ	7.5000	0.2500	0.1250	Calculated (GWP = 25)
Emission Factor (N_2O/TJ) tCO_2eq/TJ	1.1920	0.1788	0.0298	Calculated (GWP = 298)
Emission Factor (tCO_2eq/TJ)	**8.6920**	**0.4288**	**0.1548**	**Calculated**

Purpose of data	Determination of baseline emissions
Additional comment:	

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter:	C_i
Data unit:	Percentage
Description:	Portion of users of project safe water supply who are already in baseline using a non-boiling safe water supply
Source of data:	Baseline study. Credible literature, studies, survey, reports relevant to the project target area
Value(s) applied:	15%
Choice of data or Measurement methods and procedures:	Based on Government of Nepal Statistics
Purpose of data	Estimation of emission reduction
Additional comment:	

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter:	X_{boil}
Data unit:	Percentage
Description:	Percentage of premises that in the absence of the project activity would have used non-GHG emitting technologies like chlorine treatment techniques (if available) in the project boundary
Source of data:	Survey

Value(s) applied:	10%
Choice of data or Measurement methods and procedures:	Based on the baseline survey
Purpose of data	Estimation of emission reduction
Additional comment:	

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter:	**$W_{b,y}$ and $W_{p,y}$**
Data unit:	Kilograms/Litre
Description:	Quantity of wood fuel or fossil fuel required to boil 1 litre of water using technologies representative of baseline scenario b during project year y
Source of data:	This is based on Water Boiling Test conducted in the project area. A baseline water boiling test was conducted to calculate the quantity of fuel required to purify by boiling one liter of water for 10 minutes using traditional stoves and local fuelwood representative of the baseline scenario ($W_{b,y}$).
Value(s) applied:	The fuelwood requirement is 0.000355±0.00002 t/litre of water with a reliability of 5.97% at 90/30 confidence/precision level.
Choice of data or Measurement methods and procedures:	Based on the GS TPDDTEC Methodology, Version 3.1, a total of 33 tests were conducted in various districts of the project area, which is more than required to determine the mean of fuelwood to boil a litre of water. A requirement of the sample size based on the mean and standard deviation shows that the sample size required is just 1 at 90/30 confidence/prevision level. If the water boiling technologies change in the project scenario, the BWBT will be updated. Otherwise the same BWBT will be used if the same technology prevails in the project scenario too.
Purpose of data	Estimation of baseline and project emissions
Additional comment:	

B.6.4. Ex ante estimation of outcomes linked to each of the three SDGs

>> (Provide a transparent ex ante calculation of baseline and project outcomes (or, where applicable, direct calculation of net benefit) during the crediting period, applying all relevant equations provided in the selected methodology(ies) or as per proposed approach. For data or parameters available before design certification, use values contained in the table in section B.6.3 above. For data/parameters not available before design certification and monitored during the crediting period, use estimates contained in the table in section B.7.1 below)

SDG 13

Biogas

Baseline Emission reductions

Emission reductions are calculated here for a single family where the Biogas implemented.

$BE_{b,y} = B_{b,y} * ((f_{NRB} * EF_{b,fuel,Co2}) + E_{b,fuel,non\ Co2}) * NCV_{b,fuel}$

and

$B_{b,y} = N_{p,y} * P_{b,y}$

$BE_{b,y}$ = (365*0.0089)*((0.86*112) +8.6920) *0.015

= 5.119 tCO_2/family/yr

Project Emissions

$PE_{b,y} = B_{b,y} * ((f_{NRB} * EF_{b,fuel,CO2} + E_{b,fuel, non\ CO2}) * NCV_{p,fuel}$

and

$B_{b,y} = N_{p,y} * ((P_{p,y} * U_{p,y}) + (P_{b,y} * (1 - U_{p,y})))$

$B_{b,y}$ = 365*(0*0)+(0.0121*(1-1) = 0.00 t/year

$PE_{b,y}$ = 0.00*((0.86*112)+8.6920)*0.015

= 0.00 (tCO_{2e}/family/year)

Based on ex-post field studies, the fuelwood use will be determined and applied for project emissions.

Emission reductions for replacement of non-renewable biomass from Biogas implementation is as follows:

$ER_y = BE_{b,y} - PE_{p,y} - LE_{py}$

$ER_y =$ 5.119 - 0.000 – 0

ER_y = 5.119 tCO_{2e}/family/year

Emission reduction from including animal waste management for implementation of Biogas

Based on Annex 6 of the methodology for application of the methodology to biodigesters, including animal waste management and applying IPCC Tier 1 approach,

$$BE_{awms,h} = GWP_{CH4} * \sum_{T} (EF_{awms(T)} * N_{(T),h})$$

	Dairy cow	Buffalo	Other cattle	Source
Number of animals of livestock category in premise	0.03	0.67	3.23	Survey in the project area
Emission factor for the defined livestock category T (tonCH_4 per animal per year	0.005	0.005	0.002	IPCC, 2006
GWP of methane (tCO_2e per tCH_4)			25	IPCC, 2006
The baseline emission from handling of animal waste in for premise h (tCO_2 per year)			0.249	Calculated

$BE_{awms,h} =$ 25* (0.005*0.03$_{dairy\ cow}$+0.005*0.67$_{Buffalo}$+0.002*3.23$_{other\ cattle}$)

$BE_{awms,h}$ = 0.249 tCO_2/family/yr

$$PE_{awms,h,y} = GWP_{CH4} * \sum (N_{(T),h,y} * EF_{awmsT}) * PLy + \sum (N_{(T),h,y} * EF_{awms,T}) * (1 - \eta_{biogasstove} * (1 - PL_y)$$

	Dairy cow	Buffalo	Other cattle	Source
Number of animals of livestock category in premise ($N_{(T),h,y}$	0.03	0.67	3.23	Survey in the project area

Emission factor for the defined livestock category T (tonCH_4 per animal per year (EF_{awmsT})	0.000668	0.000422	0.000715	Calculated based on Tier 2 approach
GWP of methane (tCO_{2e} per tCH_4)	25	IPCC, 2006		
The physical leakage of the biodigester system (PL_y)	10%	Default (Methodology)		
Combustion efficiency of biogas stove ($\eta_{biogastove}$)	60%	Domestic Biogas Technology and mass dissemination 2014 https://energypedia.info/images/0/0a/EN_Biogas_Course_Reader_2014.pdf		
Project emissions	**0.0301**	**Calculated**		

$PE_{awms,h,s}$ = 25*(0.000668*0.03$_{dairy-cow}$+0.000422*0.67$_{Buffalo}$+0.000715*3.23$_{other-cattle}$)*10% + (0.000668*0.03$_{dairy\ cow}$+0.000422*0.67$_{Buffalo}$+0.000715*3.23$_{other\ cattle}$) * (1-60%)(1-10%)

$PE_{awms,h,s}$ = 0.0301 tCO_2/family/year

Project emissions from the animal waste not treated in the bio-digester in project scenario shall be calculated using the following equation and with the following changed definition of parameters:

PEawms,h,s = GWP_{CH4} * (EF_{awms}) * $N_{(T),h)}$

EF_{awms} (tCH4 per animal per year) Calculations

	Dairy Cow	Other Cattle	Buffalo	Source of data
$VS_{(T)}$ (kg/hd/day)	2.8	2.3	3.9	2006, IPCC guidelines for National Greenhouse Gas Inventories; Table 10A-4, 10A-5 and 10A-6 for dairy cow, other cattle and buffalo respectively
$B_{O(T)}$ (m^3CH_4 per kg of VS)	0.13	0.1	0.1	
$MCF_{(P,S,K)}$ (%)	12.63%	12.63%	12.63%	2006, IPCC guidelines for National Greenhouse Gas Inventories; Table 10.12,
MS(P,S,K)	0.25	0.25	0.25	Remaining of the dung not treated by biodigester
EF_{awms} (tCH4 per animal per year)	0.000028	0.000018	0.000030	

Project Emissions from Dung not treated by digestor

	Dairy Cow	Other Cattle	Buffalo	Source of data
Number of animals of livestock category in premise **N(T)h**	0.03	0.67	3.23	Survey in the project area
Emission factor for the defined livestock category T (tonCH4 per animal per year **$EF_{awms,T}$**	0.000028	0.000018	0.000030	Table 10.14, Chapter 10, Page 10.39, IPCC, 2006
GWP of methane (tCO2e per tCH4) 25 **GWPch4**			25	Methodology
Project emissions PEawms,h,y			**0.00275**	Calculated

The total project emissions are 0.0301 + 0.00275 = 0.0033

Total Emission reductions from the project activity of Biogas implementation is as follows.

ER_y = $BE_{b,y}$ -$PE_{p,y}$ - LE $_{py}$

ER_y = 0.249 – 0.0033 – 0

ER_y = 0.216

Emission Reduction for a single biogas unit for replacement of non-renewable biomass and animal waste managements is as follows:

5.119 + 0.216 = 5.336 $tCO_2/HH/yr$

Thus, total emission reduction per family is 5.336 **tCO_{2e}/family/yr** and overall emission reductions of 10,000 families is 53,355 **tCO_{2e}/year**.

Improved Cook Stove

Emission reductions are calculated here for a single family where the ICS is implemented.

$ERy = \Sigma_{b,p} (Np,y * Up,y * P_{p,b,y} * NCV_{b,fuel} * (f\ NRB_{b\ y} * EF_{fuel,CO2} + EF_{fuel,nonCO2})) - \Sigma\ LE_{p,y}$

Fuelwood/Capita/day		
Fuelwood/Capita/Day (t)	**0.00178**	**t/capita/day**
Family Size	**5**	**Family size based on demographic data in the project area**
Fuelwood Consumption (t/HH/yr)	**3.25**	**t/HH/yr**

Biomass Savings ($B_{y,\ savings}$)					
Activity Data	**Value**				**Source of data**
	Envirofit	**Greenway Smart Stove**	**Greenway Jumbo Stove**	**Matribhumi**	
Baseline Fuelwood use (t/day)	0.0089	0.0089	0.0089	0.0089	Baseline data
η_{old}	0.10	0.10	0.10	0.10	Default Value
η_{new}	0.2577	0.2980	0.2979	0.2550	Manufacturer's Test Report
$By.(1-\frac{\eta_{old}}{\eta_{new}}).$ **$B_{y,savings}$ (t/day)**	**0.0054**	**0.0059**	**0.0059**	**0.0054**	**Calculated**

Emission Reductions/Household/year from implementation of Improved cookstove						
Activity Data		Envirofit	Greenway Smart Stove	Greenway Jumbo Stove	Matribhumi	**Source of Data**
N_{PY}	Cumulative number of project technology-days included in the project database for project scenario p against baseline scenario b in year y	**365**	**365**	**365**	**365**	Ex-ante Value
U py	Cumulative usage rate for technologies in project scenario p in year y, based on cumulative adoption rate and drop off rate revealed by usage surveys (fraction)	**1**	**1**	**1**	**1**	Ex-ante Value

P_{Pby}	Specific fuel savings for an individual technology of project p against an individual technology of baseline b in year y, in tons/day, as derived from the statistical analysis of the data collected from the field tests (tons/day)	**0.0054**	**0.0059**	**0.0059**	**0.0054**	Calculated based on thermal efficiency of stove
$NCV_{b,fuel}$	Net calorific value of wood	**0.015**	**0.015**	**0.015**	**0.015**	Methodology
$F_{NRB,B,y}$	Fraction of NRB biomass	**0.86**	**0.86**	**0.86**	**0.86**	Calculated
$EF_{fuel, Co2}$	CO_2 emission factor of the fuel that is substituted or reduced. tCO_2/TJ, the IPCC default value of other relevant fuel	**112**	**112**	**112**	**112**	IPCC Value
$EF_{fuel, non\ Co2}$	non-CO_2 emission factor of the fuel that is substituted or reduced. tCO_2/TJ, the IPCC default value of other relevant fuel	**8.6920**	**8.6920**	**8.6920**	**8.6920**	IPCC Value
LE_{py}	Leakage for project(tCO_{2e}/yr)	**0**	**0**	**0**	**0**	
ER_y	**Emission Reductions tCO_2/HH**	**3.13**	**3.39**	**3.39**	**3.11**	
	Number of Households	**5,000**	**5,000**	**5,000**	**5,000**	Assuming equal distribution of 5000 each. Will be determined ex-post after implementation

Here project technology days taken as whole year i.e. 365 days/family and cumulative usage rate as 1.

Here LE is assessed two years once only after the project is implemented. For the calculations, LE is considered as **0 t CO_2/family.**

ER_y = 3.11 to 3.39 tCO_2/family/yr based on the type of Stove distributed

Thus, total emission reduction is 65,100 **tCO_{2e}/ year for** 20,000 families based on 5,000 stoves distributed of each of the stove model. Actual ex-post calculations will depend on the number of stove models distributed to number of families.

Safe Drinking Water Devices

Baseline Emissions

$BE_{b,y} = B_{b,y} * ((f_{NRB,b,y} * EF_{b,fuel\ CO2}) + EF_{b,fuel,nonCO2}) * NCV_{b,fuel}$

The fuel used in the baseline scenario $B_{b,y}$ is calculated as follows:

$B_{b,y} = (1 - X_{boil}) * (1 - C_i) * N_{i,y} * W_{b,y} * (Q_{p,y} + Q_{p,rawboil,y})$

Where:

X_{boil} *Percentage of premises that would have used other non - GHG emitting technologies like chlorine treatment techniques, if available, in the absence of the project activity. These premises must be located in the project boundary. This parameter can be determined ex - ante using a survey. This parameter is to be applied for premises that are under suppressed demand situation.*

$N_{i,y}$ *Number of person.days consuming water supplied by project scenario p through year y*

C_j	*Expressed as a percentage, this is the portion of users of the project technology j who in the baseline were already consuming safe water without boiling it. Premises with a piped water supply can be excluded from the Cj factor when it can be clearly demonstrated that the piped water supply is not a clean water source. Prior to registration, the water quality of the piped water supply should be established as unsafe by carrying out water quality testing over a representative period of time or by referring to relevant third party studies for the target area. Premises with a piped water supply that boil water or would have boiled water (suppressed demand situation) in the baseline situation are in such cases eligible and can be included in the calculation of baseline emissions from boiling water. PP shall carry out baseline surveys to demonstrate that premises do actually boil water or would indeed have boiled water to make it safe for use.*
$B_{b,y}$	*Quantity of fuel consumed in baseline scenario b during the year y in tons*
$Q_{p,y}$	*Quantity of safe water in litres consumed in the project scenario p and supplied by project technology per person per day*
$Q_{p,rawboil,y}$	*Quantity of raw water boiled in the project scenario p per person per day*
$W_{b,y}$	*Quantity of fuel in tons required to treat 1 litre of water using technologies representative of baseline scenario b during project year y, as per Baseline Water Boiling Test. 46*

Calculations of Baseline Fuelwood use		
$B_{b,y} = (1 - X_{boil}) * (1 - C_j) * N_{j,y} * W_{b,y} * (Q_{p,y} + Q_{p,rawboil,y})$		
X_{boil} (Percentage)	***10%***	*Percentage of premises that would have used other non - GHG emitting technologies.*
$N_{j,y}$ (Number)	***20,075,000***	*Number of person days consuming water supplied by project scenario p through year y for 15,000 families*
C_j (Percentage)	***15%***	*Expressed as a percentage, this is the portion of users of the project technology j who in the baseline were already consuming safe water without boiling it*
$W_{b,y}$ (t/litre of wood)	***0.000355***	*Quantity of fuel in tons required to treat 1 litre of water using technologies representative of baseline scenario b during project year y, as per Baseline Water Boiling Test (@0.015 TJ/t calorific value of wood (IPCC Value))*
$Q_{p,y}$	***5***	*Quantity of safe water in litres consumed in the project scenario p and supplied by project technology per person per day*
$Q_{p,rawboil,y}$	***0***	*Quantity of raw water boiled in the project scenario p per person per day*
$B_{b,y}$ (t/year)	***27,236.07***	*Quantity of fuel consumed in baseline scenario b during the year y in tons for 15,000 households*

Calculations of Baseline Emissions		
$BE_{b,y} = B_{b,y} * ((f_{NRB,b,y} * EF_{b,fuel\ CO2}) + EF_{b,fuel,nonCO2}) * NCV_{b,fuel}$		
$B_{b,y}$ (t/year)	***27,236.07***	*Quantity of fuel consumed in baseline scenario b during the year y in tons for 15,000 households*
$f_{NRB,b,y}$	***0.86***	*Fraction of Non Renewable Biomass for Nepal*[16~~15~~]
$EF_{b,fuel\ CO2}$	***112***	*Table 2.5.,Vol 2; Energy, GPG, IPCC 2006*
$EF_{b,fuel,nonCO2}$	***8.6920***	*Calculated*
$NCV_{b,fuel}$	***0.015***	*TJ/t of wood; IPCC Value*
$BE_{b,y}$	***42,901***	*Calculated*

Project Emissions

$PE_{p,y} = B_{p,y} * ((f_{NRB,p,y} * EF_{p,fuel,CO2}) + EF_{p,fuel,\ nonCO2}) * NCV_{p,fuel}$

Project Scenario Fuel Consumption Calculation

$B_{p,y}$ = Number of person days x Project Fuel used to boil water (T/L) x Total volume of water boiled in project scenario (L/p/d)

$B_{p,y} = (1 - C_j) * N_{p,y} * W_{b,y} * (Q_{p,rawboil,y} + Q_{p,cleanboil,y})$

Where:

$N_{p,y}$	*Number of person days consuming water supplied by project scenario p through year y*
C_j	*Expressed as a percentage, this is the portion of users of the project technology j or who in the baseline were already consuming safe water without boiling it. Premises with a piped water supply can be excluded from the Cj factor when it can be clearly demonstrated that the piped water supply is not a clean water source. Prior to registration, the water quality of the piped water supply should be established as unsafe by carrying out water quality testing over a representative period of time or by referring to relevant third party studies for the target area. Premises with a piped water supply that boil water or would have boiled water (suppressed demand situation) in the baseline situation are in such cases eligible and can be included in the calculation of baseline emissions from boiling of water. PP shall carry out baseline surveys to demonstrate that premises do actually boil water or would indeed have boiled water to make it safe for use.*
$B_{p,y}$	*Quantity of fuel consumed in project scenario p during the year y in tons*
$Q_{p,rawboil,y}$	*Quantity of raw water boiled in the project scenario p per person per day*
$Q_{p,cleanboil,y}$	*Quantity of safe water boiled in the project scenario p per person per day*
Wp,y	*Quantity of wood fuel or fossil fuel in tons required to treat 1 litre of water using technologies representative of the project scenario p during project year*

Calculations of Project Scenario Fuel Use		
$B_{p,y} = (1 - C_j) * N_{p,y} * W_{p,y} * (Q_{p,rawboil,y} + Q_{p,cleanboil,y})$		
$N_{j,y}$ **(Number)**	**20,075,000**	*Number of person days consuming water supplied by project scenario p through year*
C_j **(Percentage)**	*15%*	*Expressed as a percentage, this is the portion of users of the project technology j or who in the baseline were already consuming safe water without boiling it.*
$W_{p,y}$ **(t/litre of wood)**	**0.000355**	*Quantity of fuel in tons required to treat 1 litre of water using technologies representative of project scenario b during project year y, as per Baseline Water Boiling Test (@0.015 TJ/t calorific value of wood*
$Q_{p,rawboil,y}$	*0*	*Quantity of raw water boiled in the project scenario p per person per day*
$Q_{p,cleanboil,y}$	*0*	*Quantity of safe water boiled in the project scenario p per person per day*
$B_{p,y}$ **(t/year)**	**0.00**	*Quantity of fuel consumed in project scenario b during the year y in tons*

Calculations of Project Emissions		
$PE_{p,y} = B_{p,y} * ((f_{NRB,p,y} * EF_{p,fuel,CO2}) + EF_{p,fuel,\ nonCO2}) * NCV_{p,fuel}$		
$B_{p,y}$ **(t/year)**	**0.00**	*Quantity of fuel consumed in project scenario b during the year y in tons*
$fNRB_{b,y}$	**0.86**	*Fraction of Non Renewable Biomass for Uttarakhand*
$EF_{b,fuel\ CO2}$	**112**	*Table 2.5.,Vol 2; Energy, GPG, IPCC 2006*
$EF_{b,fuel,nonCO2}$	**8.692**	*Calculated*
$NCV_{b,fuel}$	**0.015**	*TJ/t of wood; IPCC Value*
$PE_{p,y}$	**0**	*Calculated*

Leakage

Leakage for the project activity is zero.

Emission Reductions

The overall GHG reductions are calculated as follows

$ER_y = (\Sigma BE_{b,y} - \Sigma PE_{p,y}) * U_{p,y} - \Sigma LE_{p,y}$

Where:

$U_{p,y}$ Cumulative usage rate for technologies in project scenario p during year y, based on cumulative installation rate and drop off rate.

The cumulative usage rate for technologies in the project scenario will be monitored and applied ex-post. For ex-ante calculations, it is assumed as 100%

Calculations of Emission Reductions		
$ER_y = (\Sigma BE_{b,y} - \Sigma PE_{p,y}) * U_{p,y} - \Sigma LE_{p,y}$		
$BE_{b,y}$	***58,502***	*Calculated*
$PE_{p,y}$	***0***	*Calculated*
$U_{p,y}$	***1.00***	*Cumulative usage rate for technologies*
$LE_{p,y}$	***0***	*Leakage*
ERy for project activity for 15,000 households	***58,502***	*Emission Reductions for 15,000 families*
ERy for 1 household	***3.90***	*Emission Reductions for 1 household*

The emission reduction for 15,000 households is 58,502 tCO_2/year and for a household is 3.90 tCO_2/year.

B.6.5. Summary of ex ante estimates of each SDG outcome

Biogas

Year	Baseline estimate	Project estimate	Net benefit
2020 (starting 01-01-2020)	5,368	32	5,336
2021	15,031	91	14,940
2022	26,304	160	26,144
2023	39,188	239	38,949
2024	53,683	328	53,355
Total	139,574	850	138,724
Total number of crediting years			*5*
Annual average over the crediting period	27,915	170	27,745

Improved cook stove

Year	**Baseline estimate**	**Project estimate**	**Net benefit**
2020(starting 01-01-2020)	13,020		13,020
2021	39,060		39,060
2022	65,100		65,100
2023	65,100		65,100
2024	65,100		65,100
Total	**247,380**		**247,380**

Total number of crediting years			**5**
Annual average over the crediting period	**49,476**	**-**	**49,476**

Safe Drinking Water Devices

Year	Baseline estimate	Project estimate	Net benefit
2020 (starting 01-01-2020)	7,800	-	7,800
2021	23,401	-	23,401
2022	40,952	-	40,952
2023	58,502	-	58,502
2024	58,502	-	58,502
Total	**189,158**	**-**	**189,158**
Total number of crediting years			**5**
Annual average over the crediting period	**37,832**		**37,832**

Aggregate of all technologies

Year	**Baseline estimate**	**Project estimate**	**Net benefit**
2020 (starting 01-01-2020)	26,188	32	26,156
2021	77,491	91	77,400
2022	132,355	160	132,195
2023	162,790	239	162,551
2024	177,285	328	176,957
Total	576,109	850	575,259
Total number of crediting years			*5*
Annual average over the crediting period	115,222	170	115,052

SDG	Baseline Scenario	Project Scenario	Net Benefit
SDG 3. Good Health and well being	Due to use of traditional stoves and drinking unsafe water, health impacts in the number of houses where the project technology is implemented 10,000 families cooking on traditional stove and 15,000 families drinking unsafe water having health issues	10,000 families with biogas and 15,000 families with safe drinking water devices resulting in improvement in indoor air quality and water quality due to which there is good health in the number of households where the project technology is implemented	100% improvement in health issues of families where the biogas and safe drinking water devices have been implemented.
SDG 4. Quality education	No trainings	At least 2 trainings will be conducted for implementation and maintenance of the project activity for staff and end users annually	A minimum of 2 annual trainings each to end users and staff

SDG 7. Affordable and clean energy	Traditional stoves for cooking and drinking unsafe water/boiling water	Implementationo of 10,000 biogas, 20,000 ICS and 15,000 safe drinking water devices and periodic maintenance and repairs of implemented units.	100% functionality of implemented devices
SDG 8. Decent work and economic growth	No project related jobs created	Project related temporary or permanent jobs created for men and women	Number of permanent and temporary jobs created ex-post of implementation of the project
SDG 13. Climate action	Emissions due to baseline inefficient stoves used for cooking and boiling water for drinking	Emissions avoided due to implementation of the project as emissions in project scenario is negligible.	Annual average of 115,052 tCO_2

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

(Include specific information on how the data and parameters that need to be monitored in the selected methodology(ies) or proposed approaches or as per mitigation measures from safeguarding principles assessment or as per feedback from stakeholder consultations would actually be collected during monitoring. Copy this table for each piece of data and parameter.)

Relevant SDG Indicator	SDG 3: Good health and well being 3.9.1: Mortality rate attributed to household and ambient air pollution 3.9.2: Mortality rate attributed to unsafe water, unsafe sanitation and lack of hygiene (exposure to unsafe Water, Sanitation and Hygiene for All (WASH) services)
Data / Parameter	Improve indoor air quality as perceived by the community after using Biogas and Improved Cook Stoves; Test Report of emissions of the stove In case of drinking water devices decrease in water borne diseases
Unit	Percent of respondents
Description	Of the sample surveys conducted, the percentage of respondents who respond to improvement in good health and well being
Source of data	Sample surveys
Value(s) applied	• Biogas and ICS –% of houses reporting improvement in indoor air quality and health of women • Safe drinking water devices - % of houses reporting improvement in quality of water, thereby decreasing water borne diseases
Measurement methods and procedures	• Biogas and ICS and safe drinking water devices – sample surveys will be conducted once in 2 years to assess community perspective on improvement in indoor air quality and their health. • Safe drinking water devices – laboratory reports
Monitoring frequency	2 years once
QA/QC procedures	A household level questionnaire will be developed, field tested and administered to get the perspective of the communities.
Purpose of data	To contribute to SDG 3, Good Health and Well Being
Additional comment	

Relevant SDG Indicator	SDG 4: Quality Education 4.3.1: Participation rate of youth and adults in formal and non-formal education and training in the previous 12 months, by sex
Data / Parameter	Number and type of training sessions, workshops and seminars.
Unit	Number
Description	Trainings to end users and staff for various technologies and implementation of the project activity
Source of data	Records maintained and Minutes of the meeting
Value(s) applied	At least 2 sessions annually will be conducted for the project activity
Measurement methods and procedures	Records/minutes of the meeting will be maintained for the meetings, workshops or seminars conducted for the project activity.
Monitoring frequency	As and when the sessions are held
QA/QC procedures	Trainings will be held in native language and recorded too in local language
Purpose of data	To contribute to SDG 4, Quality Education
Additional comment	

Relevant SDG Indicator	SDG 7: Access to affordable and clean energy services 7.1.2: Proportion of population with primary reliance on clean fuels and technology
Data / Parameter	Number of technologies implemented and percent of usage households
Unit	Number and Percent of households
Description	Number of biogas, improved cook stoves and safe drinking water devices implemented for the project activity and percent of usage households for the technologies
Source of data	Monitoring solution, invoices for the materials, payment vouchers and end user agreements
Value(s) applied	10,000 biogas, 20,000 ICS and 15,000 safe drinking water devices
Measurement methods and procedures	As and when the devices are implemented, the monitoring solution will be updated, which gives the details of the project implemented. Also, the financials transactions for procurement of materials and devices from vendors will provide additional proof along with end user agreements with the households
Monitoring frequency	Continuous
QA/QC procedures	
Purpose of data	To contribute to SDG 7, Access to affordable and clean energy services
Additional comment	

Relevant SDG Indicator	SDG 8: Decent work and economic growth 8.5.1. Average hourly earnings of female and male employees, by occupation, age and persons with disabilities
Data / Parameter	Number of jobs created and number of men and women employed due to the project activity
Unit	Number
Description	Number of permanent and temporary jobs created for men and women due to the project activity, which could include vendors, manufacturers, implementation and monitoring project personnel for the project activity
Source of data	Database of the project activity
Value(s) applied	Post implementation, the number of personnel employed
Measurement methods and procedures	The project database will provide details along with payment vouchers and pay slips.

Monitoring frequency	Continuous
QA/QC procedures	It can be triangulated with the audit statements for the project activity
Purpose of data	To contribute to SDG 8, Decent work and economic growth
Additional comment	

Biogas

All the below parameters to assess the contribution to SDG 13 is to achieve the SDG Indicator, 13.B.1 Number of least developed countries and small island developing States that are receiving specialized support, and amount of support, including finance, technology and capacity-building, for mechanisms for raising capacities for effective climate change-related planning and management, including focusing on women, youth and local and marginalized communities

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	$U_{p,y}$
Unit	Percentage
Description	Usage rate for technologies in project scenario p in year y
Source of data	Data collected through the annual Usage Survey.
Value(s) applied	100%
Measurement methods and procedures	An assessment of the drop-off rate of usage requires that biogas of different age groups are assessed. Monitoring shall be carried out on a random sample of digesters of different ages. The minimum total sample size is 100, with at least 30 samples each age bracket (measured in annual increments) being surveyed. For example, if technologies of age 1-5 are credited, the usage survey will include 30 representative samples from each age for a total of 150 samples. The resulting usage parameter would be weighted based on the proportion of technologies commissioned for each age for biogas and ICS. The usage rate of thermal applications will be monitored annually using survey methods to satisfy the requirements put forth by the methodology 'Technologies and practices to displace decentralized thermal energy consumption' (Version 3.1).
Monitoring frequency	Annual usage survey
QA/QC procedures	Samples will be selected randomly for sample selection.
Purpose of data	Estimation of emission reduction
Additional comment	The operational days of biogas units will be calculated based on this data and the emission reductions estimated accordingly.

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	$N_{rP,y}$
Unit	Number
Description	Cumulative number of project technologies included in the project database for project scenario p n year y
Source of data	Project Database
Value(s) applied	10,000
Measurement methods and procedures	-The biogas systems of the End Users will be recorded in monitoring database. -The End User will sign an End User Agreement with PIP, in which the date of dissemination/biogas operation, the name of the user, Village, District, etc. where the user is residing is noted, to irrefutably identify the user. -The biogas has an identification number which is also noted in the End User Agreement. The information from the End User Agreement will also be recorded in the monitoring database designed for monitoring of the project activity. This will be maintained by PIP throughout the crediting period.
Monitoring frequency	Continuous

QA/QC procedures	- Database. These entries will be supervised by the project Coordinator. -The database records and copies of the End User Agreement will be maintained at the PIPs office. -The project Coordinator will check on the End User Agreements. In case of inconsistencies, appropriate corrective actions will be undertaken.
Purpose of data	This parameter is used directly to estimate the emission reductions for the project activity
Additional comment	

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	$f_{NRB,y}$
Unit	Fraction non renewability
Description	Non renewability status of woody biomass fuel in scenario i during year
Source of data	Based on the latest available data on Nepal[26]. The value has not changed to that determined by the National CDM Authority, Nepal though expired at the time of submission of this VPA-DD.
Value(s) applied	0.86
Measurement methods and procedures	Calculated based on CDM TOOL30, Methodological Tool for calculation of the fraction of non-renewable biomass. Version 2 using the latest available data. The calculations is provided in section B.4.
Monitoring frequency	As and when the monitoring report will be submitted for crediting
QA/QC procedures	Transparent data analysis and reporting
Purpose of data	Estimation of Emission Reduction
Additional comment	As applicable, NRB assessment may be used for multiple scenarios.

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	$LE_{p,y}$
Unit	t_CO_{2e}/year
Description	Leakage in project scenario p during year y
Source of data	Monitoring surveys collected through the biennial User Survey.
Value(s) applied	0
Measurement methods and procedures	Surveys of non-usage households will be undertaken to investigate potential sources of leakage.
Monitoring frequency	Every two years
QA/QC procedures	The leakage will be monitored using survey methods to satisfy the requirements put forth by the methodology 'Technologies and practices to displace decentralized thermal energy consumption, Version 3.1.
Purpose of data	Calculation of leakage
Additional comment	Aggregate leakage will be assessed within the project area.

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	$P_{b,y}$
Unit	tonnes/family/year
Description	Amount of woody biomass used in the baseline scenario b during year y
Source of data	A single baseline fuel consumption parameter will considered and applied for the crediting period.
Value(s) applied	3.25
Measurement methods and procedures	A Baseline FT or default baseline fuelwood consumption, conducted during 2018 before the implementation of the project is considered. The baseline Report describes the measurement method adopted to conduct the survey.

[26] Based on calculations from the latest available reports for Nepal and https://cdm.unfccc.int/DNA/fNRB/index.html

Monitoring frequency	Updated every two years, or more frequently (if applicable).
QA/QC procedures	Transparent data analysis and reporting
Purpose of data	This parameter is used to estimate the emission reductions from the project activity
Additional comment	A single baseline fuel consumption parameter will be considered and applied for the entire crediting period.

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	$P_{p,y}$
Unit	tonnes/family/year
Description	Quantity of fuel that is consumed in project scenario p during year y
Source of data	Database from monitoring solution; and other adjustment factors as applicable
Value(s) applied	0
Measurement methods and procedures	Based on field observations after implementation of the project. A questionnaire survey will be conducted to assess the quantity of fuel that is consumed at household level for houses with biogas units. The selection of households will be on stratified random basis. The number of households will be based on statistically determined sample numbers with 90/10 precision levels as described in Section B.7.2.
Monitoring frequency	Updated every two years or more frequently
QA/QC procedures	Transparent data analysis and reporting
Purpose of data	Estimation of emission reduction
Additional comment	

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	$MS_{(T,S,K)}$
Unit	%
Description	Fraction of livestock category T's manure fed into the bio-digester, S in climate region k
Source of data	Survey
Value(s) applied	100%
Measurement methods and procedures	The number of households for which data will be collected will be based on statistically significant number as described in Section B.7.2.. Household survey will be conducted to estimate the fraction of manure fed into the digester.
Monitoring frequency	Annual
QA/QC procedures	
Purpose of data	To calculate avoidance of methane emissions from animal waste
Additional comment	

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	$MS_{(P,S,K)}$
Unit	%
Description	Fraction of livestock category T's manure not fed into the bio-digester, S in climate region k
Source of data	Survey
Value(s) applied	0%
Measurement methods and procedures	Based on the sample survey as described in Section B.7.2. conducted to estimate the fraction of livestock category T's manure fed into the bio-digester, S in climate region k, the fraction not fed will be determined.
Monitoring frequency	Annual
QA/QC procedures	

Purpose of data	Calculate avoidance of methane emissions from animal waste
Additional comment	

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	N(T)
Unit	Number
Description	Number of animals of livestock category T
Source of data	Survey
Value(s) applied	<table><tr><th></th><th>Dairy cow</th><th>Buffalo</th><th>Other cattle</th><th>Source</th></tr><tr><td>Number of animals of livestock category in premise</td><td>0.03</td><td>0.67</td><td>3.23</td><td>Survey in the project area</td></tr></table>
Measurement methods and procedures	This will be collected during the time of construction of the units and eventually will be collected annually once in a calendar year for statistically determined sample number at 90/10 precision levels as described in Section B.7.2.
Monitoring frequency	Annual
QA/QC procedures	The data applied now is based on the baseline survey conducted in the project boundary. The parameter will be determined ex-post for the project households.
Purpose of data	To calculate avoidance of methane emissions from animal waste
Additional comment	Surveys will be conducted for households with biogas on an annual basis. Village level volunteers will collect data on these parameters and enter it into the monitoring solution.

Improved Cook Stove

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	$f_{NRB,y}$
Unit	Fraction non renewability
Description	Non renewability status of woody biomass fuel in scenario I during year
Source of data	Calculated based on CDM TOOL30, Methodological Tool for calculation of the fraction of non-renewable biomass. Version 2 and latest available data for Nepal.
Value(s) applied	0.86
Measurement methods and procedures	Calculated based on CDM TOOL30, Methodological Tool for calculation of the fraction of non-renewable biomass. Version 2 and latest available data for Nepal
Monitoring frequency	As and when the monitoring report will be submitted for crediting
QA/QC procedures	Transparent data analysis and reporting
Purpose of data	Estimation of Emission Reduction
Additional comment	As applicable, NRB assessment may be used for multiple scenarios.

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	$P_{b,y}$
Unit	tonnes/family/year
Description	Amount of woody biomass used in the baseline scenario b during year y

Source of data	A single baseline fuel consumption parameter will considered and applied for the crediting period.
Value(s) applied	3.25
Measurement methods and procedures	A Baseline FT or default baseline fuelwood consumption, conducted during 2018 before the implementation of the project is considered. The baseline Report describes the measurement method adopted to conduct the survey.
Monitoring frequency	Updated every two years, or more frequently (if applicable).
QA/QC procedures	Transparent data analysis and reporting
Purpose of data	This parameter is used to estimate the emission reductions from the project activity
Additional comment	A single baseline fuel consumption parameter will be considered and applied for the entire crediting period.

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	$P_{p,y}$
Unit	tonnes/family/year
Description	Quantity of fuel that is consumed in project scenario p during year y
Source of data	Database from monitoring solution; and other adjustment factors as applicable
Value(s) applied	0
Measurement methods and procedures	Based on field observations after implementation of the project. A PFT will be conducted for significant number of households determined statistically using the formula as described in Section B.7.2.
Monitoring frequency	Updated every two years or more frequently
QA/QC procedures	Transparent data analysis and reporting
Purpose of data	Estimation of emission reduction
Additional comment	

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	$\mathbf{U_{p,y}}$
Unit	Percentage
Description	Usage rate in project scenario p during year y
Source of data	Annual Usage Survey.
Value(s) applied	100%
Measurement methods and procedures	An assessment of the drop-off rate of usage requires that ICS of different age groups are assessed. Monitoring shall be carried out on a random sample of improved cook stoves of different ages. The minimum total sample size is 100, with at least 30 samples each for ICS of each age bracket (measured in annual increments) being surveyed. For example, if technologies of age 1-5 are credited, the usage survey will include 30 representative samples from each age for a total of 150 samples. The resulting usage parameter would be weighted based on the proportion of technologies commissioned for each age of ICS. The usage rate of thermal applications will be monitored annually using survey methods to satisfy the requirements put forth by the methodology 'Technologies and practices to displace decentralized thermal energy consumption' (Version 3.1). The usage survey requirements and guidelines provided by the GS as stated in Annex 10 of the methodology and guidelines dated 23/08/2017 will be carried out. Level B, Good Practice will be carried out. The steps that will be followed are mentioned in section B.7.2
Monitoring frequency	Annual usage survey

QA/QC procedures	Transparent date analysis and reporting
Purpose of data	Estimation of emission reduction
Additional comment	A single usage parameter is weighted to be representative of the quantity of project technologies of each age being credited in a given project scenario

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	$N_{rP,y}$
Unit	Project technologies credited (units)
Description	Technologies in the project database for project scenario p through year y
Source of data	Total units disseminated
Value(s) applied	20,000
Measurement methods and procedures	-The ICS systems given to the End Users will be recorded in monitoring database. -The End User will sign an End User Agreement with PP, in which the date of dissemination, operation, the name of the user, Village, District, etc. where the user is residing is noted, to irrefutably identify the user. -The ICS has an identification number which is also noted in the End User Agreement. The information from the End User Agreement will also be recorded in the monitoring database designed for monitoring of the project activity. This will be maintained by PP throughout the crediting period.
Monitoring frequency	Continuous
QA/QC procedures	-The database entries are made by the village volunteers. These entries will be supervised by the project Coordinator. -The database records and copies of the End User Agreement will be maintained at the PIPs office. -The project Coordinator will check on the End User Agreements. In case of inconsistencies, appropriate corrective actions will be undertaken.
Purpose of data	Emission Reduction Calculations
Additional comment	

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	$LE_{P,y}$
Unit	t_CO_{2e}/year
Description	Leakage in project scenario p during year y
Source of data	Baseline and monitoring surveys
Value(s) applied	0
Measurement methods and procedures	Non Usage of ICS will be surveyed through a questionnaire to determine whether leakage has occurred.
Monitoring frequency	Every two years
QA/QC procedures	The leakage will be monitored using survey methods to satisfy the requirements put forth by the methodology 'Technologies and practices to displace decentralized thermal energy consumption, Version 3.1.
Purpose of data	Calculation of leakage
Additional comment	

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter	η_{new}
Unit	%
Description	Efficiency of ICS (average of the stoves considered for ex-ante calculations)
Source of data	Based on Annex 8 of the methodology, Version 3.1.
Value(s) applied	

Measurement methods and procedures	The guidance as given in Annex 8, Aging Test for project fuel updates will be followed. The steps that will be followed is described in Section B.7.3.
Monitoring frequency	Annually
QA/QC procedures	The η_{new} value will comply with 90/10 rule
Purpose of data	This parameter is used directly to estimate the emission reductions from the project activity.
Additional comment	The tests will be carried out in the field or laboratory by an idependent expert or entity.

Safe Drinking Water Devices

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter:	**$Q_{p,y}$**
Data unit:	Litres per person per day
Description:	Quantity of safe water supplied in the project scenario p during the year y using the zero or low emissions clean water supply technology
Source of data:	Water consumption field test WCFT
Value(s) applied	*5*
Measurement methods and procedures:	As per FT Updates of the methodology. The water consumption field test (WCFT) will be done as given for FT in the methodology, except project-supplied clean water consumption volumes and boiling is measured rather than fuel consumption. The WCFT will be conducted with end users representative of the project scenario target population and currently using the project technology. Guidance from section II.4.C on FT representativeness, sample sizing, and variability in the methodology will be applied.
Monitoring frequency:	Annual WCFT as described in section B.7.3 will be followed
QA/QC procedures:	Transparent data analysis and reporting
Purpose of data	Emission Reduction Estimation
Additional comment:	

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter:	**$Q_{p,rawboil,y}$**
Data unit:	Litres per person per day
Description:	The raw or unsafe water that is still boiled after installation of the water treatment technology
Source of data:	Water consumption field test WCFT
Value(s) applied	0
Measurement methods and procedures:	As per FT updates detailed in section B.7.3 will be followed
Monitoring frequency:	Annual WCFT detailed in section B.7.3 will be followed
QA/QC procedures:	Transparent data analysis and reporting
Purpose of data	Emission Reduction Estimation
Additional comment:	

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter:	**$Q_{p,cleanboil,y}$**
Data unit:	Litres per person per day

Description:	Quantity of safe (treated or from safe supply) water boiled in the project scenario p, after installation of project technology
Source of data:	Water consumption field test WCFT
Value(s) applied	0
Measurement methods and procedures:	As per FT updates of the methodology
Monitoring frequency:	Annual Survey
QA/QC procedures:	Transparent data analysis and reporting
Purpose of data	Emission reduction calculations
Additional comment:	

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter:	**Quality of the treated water**
Data unit:	As appropriate in alignment with QA/QC procedures
Description:	Performance of the treatment – Maximum Concentration Limits of 0 MPN[27] of E.Coli/100 ml and 0 MPN of total Coli/100 ml in 95% of sample water based on Nepal's Drinking Water Quality Standards, Government of Nepal Standards[28]
Source of data:	Water quality test
Value(s) applied	No Value applied. It has to meet the standards
Measurement methods and procedures:	Water quality test conducted by scientific lab
Monitoring frequency:	Quarterly
QA/QC procedures:	Transparent data analysis and reporting
Purpose of data	To ensure health benefits to the households
Additional comment:	This is not used for ER calculations. This is to ensure that health benefits are attained from the project.

Relevant SDG Indicator	**SDG 13.B.1**
Data / Parameter:	**$U_{p,y}$**
Data unit:	Percentage
Description:	Usage rate in project scenario p during year y
Source of data:	Annual usage survey
Value(s) applied	100%
Measurement methods and procedures:	Based on Annex 9 of the TPDDTEC methodology, 3.1 and briefed in Section B.7.3.
Monitoring frequency:	Annually or more frequently in all cases on time for any request for issuance
QA/QC procedures:	Transparent data analysis and reporting
Purpose of data	Emission reduction calculations
Additional comment:	The guidelines by GS for carrying out usage surveys for projects implementing household water filtration technologies will be used

[27] Most Probable Numbers (MPN)

[28] https://www.humanitarianresponse.info/sites/www.humanitarianresponse.info/files/documents/files/nationa_drinking_water_standard-2005-eng.pdf; http://www.wepa-db.net/policies/law/nepal/st01.htm

Relevant SDG Indicator	SDG 13.B.1
Data / Parameter:	**$N_{p,y}$**
Data unit:	Person days
Description:	Number of persons consuming water supplied by project scenario p through year y
Source of data:	Water consumption field test WCFT
Value(s) applied	5 persons/family
Measurement methods and procedures:	As per FT updates
Monitoring frequency:	Annual Survey
QA/QC procedures:	Transparent data analysis and reporting
Purpose of data	Emission reduction calculations
Additional comment:	

Relevant SDG Indicator	SDG 13.B.1
Data / Parameter:	**Hygiene campaigns**
Data unit:	
Description:	Hygiene campaigns carried out among technology users
Source of data:	Annual hygiene campaigns results
Value(s) applied	Annual hygiene campaigns
Measurement methods and procedures:	Hygiene campaign as given in section D.7.2.
Monitoring frequency:	Annually
QA/QC procedures:	A Standard Operating Procedure to conduct hygiene campaigns will be prepared and followed.
Purpose of data	To ensure that the project helps in decreasing diseases due to drinking unsafe water.
Additional comment:	

Relevant SDG Indicator	SDG 13.B.1
Data / Parameter:	**Treatment Capacity**
Data unit:	Litres per day
Description:	Treatment capacity of the project technology
Source of data:	Manufacturer specification/design specification
Value(s) applied	4 litres/hour flow rate based on manufacturer's design specification
Measurement methods and procedures:	As given by the manufacturers.
Monitoring frequency:	Once at the time of registration or at inclusion of new technology
QA/QC procedures:	The water volumes used in the calculations of emission reductions will be justified in terms of capacity of the project technology.
Purpose of data	To estimate emission reductions
Additional comment:	This will be triangulated with the usage survey conducted.

B.7.2. Sampling plan

>> (If data and parameters monitored in section B.7.1 above are to be determined by a sampling approach, provide a description of the sampling plan.)

Biogas

Sampling Plan

The sampling plan to monitor the parameters after project implementation is described here based on CDM-EB67-A06-GUID, "Guidelines for sampling and surveys for CDM project activities and programme of activities", Version 4, which details information relating to: (a) sampling design; (b) data that will be collected; and (c) implementation plan.

(a) Sampling Design

(i) Objectives and Reliability Requirements: The objective of the sampling effort is to determine the mean yearly value of the parameters with 90/10 confidence/precision during the crediting period. The parameters that will be monitoring are as follows:
- $U_{p,y}$ Usage rate for biogas
- $P_{p,y}$ Quantity of fuel that is consumed in project scenario p during year y
- $MS_{(T,S,K)}$ and N(T) number of animals of livestock category T

(ii) Target Population: The target population will be the rural households for which biogas will be constructed and operational in the project area. The target population is from the rural region predominantly using fuel wood in the baseline scenario. The target population is homogeneous in nature with a low per capita income of less than 1 dollar/day[29], similar socio-economic status, food habits and demographic details.

(iii) Sampling Method: The sampling method will be chosen for the project area based on the climatic zones given in Section B.2. Accordingly as it only one climate zone of Temperate climate with dry winter and hot summer, a clustered stratified random sampling will done with regard to vintage year of installation. Otherwise, as the population is homogeneous in nature, no other criteria is required. Villages will be selected randomly and families will be selected randomly from these villages for further sampling. The sample-based estimate is an unbiased estimate of the population parameter. It will also be easy to implement as the sampling frame (household details for which biogas has been implemented) will be collected and stored in the monitoring database.

(iv) Sample Size: The sample size will be as given in the Gold Standard Methodology in section III Monitoring Methodology and described above. The sample will be drawn at random from the sampling frame.

The sample size will be determined, when the parameter of interest is proportion is as follows:

$$c \geq \frac{1.645^2 MV}{(M-1) \times 0.1^2 + 1.645^2 V}$$

Where:

$$V = \left(\frac{SD_B}{\bar{p}^2}\right)^2 = \frac{variance\ bewteen\ clusters\ (villages)}{average\ proportion}$$

c	number of clusters to be sampled (villages)
N	Total number of clusters (villages), which encompasses the entire population
1.645	Represents the 90% confidence required
0.1	Represents the 10% relative precision

For parameters with mean and standard deviation values, the sample size for will be determined as follows

$$c \geq \frac{1.645^2 MV}{(M-1) \times 0.1^2 + 1.645^2 V}$$

[29]Based on demographic survey

Where:

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

c	number of clusters to be sampled (villages)
N	Total number of clusters (villages), which encompasses the entire population
1.645	Represents the 90% confidence required
0.1	Represents the 10% relative precision

Group size <300: Minimum sample size 30 or population size, whichever is smaller
Group size 300 to 1000: Minimum sample size 10% of group size
Group size > 1000 Minimum sample size 100

(***v) Sampling Frame:*** The sampling frame to be used is the complete listing of all the rural households for which biogas has been built under the project activity. Each of the household will have a unique identify number with all the required details of the family. The details will be drawn from the monitoring solution for the project activity.

(b) Data to be collected:

(i) Field Measurements: The field measurements that will be collected are listed in section B.7.2.

(ii) Quality Assurance/Quality Control: The QA/QC procedure will be to achieve good quality data through field measurements. The household level questionnaire will be designed and field tested before administering the actual questionnaire survey. The questionnaire will be translated into local language for easy understanding of households and village level volunteers. The village level volunteers will be trained to administer the questionnaire at the household level. The households will be trained to collect and fill in the questionnaire. The village level volunteers will be trained to conduct and supervise data collection at the household level. This will reduce non-response from the households. Oversampling will be done to replace non-respondents, if any.

The data collected will be entered by the field staff, which will be checked and verified further for any typographic mistakes. A valuator will further cross-check each entry with the physical form for any typographic mistakes or to clarify any sort of confusion in the data. The field staff, the data entry staff and the valuators will be literate to collect good quality data. Outliers if any will be defined and excluded and/or replaced.

(iii) Analysis: The data entry will be done in Microsoft excel sheet. The data will be cross checked with the filled in questionnaire by Valuators as QA/QC procedure. The data will be analyzed for the mean annual value of the parameter.

(c) Implementation: The implementation of sampling effort will be done by the CME/PIP in consultation with CDM Experts, who have the skill and resources to implement the sampling procedure. The team shall have experience with rural energy CDM projects implemented for the rural poor for more than 5 years. The team will train the village level volunteers to conduct the survey along with the randomly selected households. The village level volunteers will also be literate and would already be involved in monitoring of biogas units at the village level for their operation and maintenance. The collected data will be analysed by the CDM Expert for inclusion in the monitoring report.

Improved Cook Stove

The sampling plan to monitor the parameters after project implementation is described here based on CDM-EB67-A06-GUID, "Guidelines for sampling and surveys for CDM project activities and programme of activities", Version 4, which details information relating to: (a) sampling design; (b) data that will be collected; and (c) implementation plan.

(a) Sampling Design

(i) Objectives and Reliability Requirements: The objective of the sampling effort is to determine the mean yearly value of the parameters with 90/10 confidence/precision during the crediting period. The parameters that will be monitoring are as follows:

- $U_{p,y}$ Usage rate for improved cook stoves
- $P_{p,y}$ Quantity of fuel that is consumed in project scenario p during year y

3 ICS stoves will be sampled to attain a 90/10 confidence/precision level of the thermal efficiency of stoves. If not further stoves will be tested until it is attained.

(ii) Target Population: The target population is the rural households/community/SMEs for which ICS will be distributed and operational in the project area. The target population is from rural areas predominantly using fuel wood in the baseline scenario. The target population is homogeneous in nature with a low per capita income of less than 1 dollar/day[30], similar socio-economic status, food habits and demographic details.

(iii) Sampling Method: The sampling method chosen for the project area will be clustered stratified random sampling with regard to stove model, vintage year and type of user if there is any variation. As the target population is homogeneous in nature other criteria is not required. But if any variations are noticed, further stratification will be considered especially with regard to variations in the heterogeneity of population. The sample-based estimate of mean is an unbiased estimate of the population parameter. It will also be easy to implement as the sampling frame (household details for which ICS has been implemented) will be collected and stored in the monitoring database.

(iv) Sample Size: The sample size will be as given in the Gold Standard Methodology in section III Monitoring Methodology and described above. The sample will be drawn at random from the sampling frame.

For Proportion the following equation will be applied:
The sample size will be determined, when the parameter of interest is proportion is as follows:

$$c \geq \frac{1.645^2 MV}{(M-1) \times 0.1^2 + 1.645^2 V}$$

Where:

$$V = \left(\frac{SD_B}{\overline{p}^2}\right)^2 = \frac{variance\ bewteen\ clusters\ (villages)}{average\ proportion}$$

c	number of clusters to be sampled (villages)
N	Total number of clusters (villages), which encompasses the entire population
1.645	Represents the 90% confidence required
0.1	Represents the 10% relative precision

For parameters with mean and standard deviation values, the sample size for will be determined as follows

$$c \geq \frac{1.645^2 MV}{(M-1) \times 0.1^2 + 1.645^2 V}$$

Where:

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

[30]Based on demographic survey

c	number of clusters to be sampled (villages)
N	Total number of clusters (villages), which encompasses the entire population
1.645	Represents the 90% confidence required
0.1	Represents the 10% relative precision

At a minimum, Group size <300: Minimum sample size 30 or population size, whichever is smaller
Group size 300 to 1000: Minimum sample size 10% of group size
Group size > 1000 Minimum sample size 100

(***v) Sampling Frame:*** The sampling frame to be used is the complete listing of all the rural households for which ICS has been distributed. Each of the household will have a unique identify number with all the required details of the family. The details will be drawn from the monitoring solution for the project activity.

(b) Data to be collected:

(i) Field Measurements: The field measurements that will be collected are listed in section B.7.2.

(ii) Quality Assurance/Quality Control: The QA/QC procedure will be to achieve good quality data through field measurements. The household level questionnaire will be designed and field tested before administering the actual questionnaire survey. The questionnaire will be translated into local language for easy understanding of households and village level volunteers, if required. The village level volunteers will be trained to administer the questionnaire at the household level. The households will be trained to collect and fill in the questionnaire. The village level volunteers will be trained to conduct and supervise data collection at the household level. This will reduce non-response from the households. Oversampling will be done to replace non-respondents, if any.

The data collected will be entered by the field staff, which will be checked and verified further for any typographic mistakes. A valuator will further cross-check each entry with the physical form for any typographic mistakes or to clarify any sort of confusion in the data. The field staff, the data entry staff and the valuators will be literate to collect good quality data. Outliers if any will be defined and excluded and/or replaced.

(iii) Analysis: The data entry will be done in Microsoft excel sheet. The data will be cross checked with the filled in questionnaire by Valuators as QA/QC procedure. The data will be analyzed for the mean annual value of the parameter.

(c) Implementation: The implementation of sampling effort will be done by the CME/PIP in consultation with CDM Experts, who have the skill and resources to implement the sampling procedure. The team shall have experience with rural energy CDM projects implemented for the rural poor for more than 5 years. The team will train the village level volunteers to conduct the survey along with the randomly selected households. The village level volunteers will also be literate and would already be involved in monitoring of cook stoves at the village level for their operation and maintenance. The collected data will be analyzed by the CDM consultant for inclusion in the monitoring report.

Safe Drinking Water

The sampling plan as specified for ICS and Biogas will also be followed for safe drinking water devices.

The sampling plan to monitor the parameters after project implementation is described here based on CDM-EB67-A06-GUID, "Guidelines for sampling and surveys for CDM project activities and programme of activities", Version 4, which details information relating to: (a) sampling design; (b) data that will be collected; and (c) implementation plan.

(a) Sampling Design

(i) Objectives and Reliability Requirements: The objective of the sampling effort is to determine the mean yearly value of the parameters with 90/10 confidence/precision during the crediting period. The parameters that will be monitoring are as follows:

(ii) Target Population: The target population is the rural households for which safe drinking water devices will be distributed and operational in the project area. The target population is from rural areas predominantly using fuel wood in the baseline scenario. The target population is homogeneous in nature with a low per capita income of less than 1 dollar/day[31], similar socio-economic status, food habits and demographic details.

(iii) Sampling Method: The sampling method chosen for the project area will be clustered stratified random sampling with regard to vintage year. As the target population is homogeneous in nature other criteria is not required. But if any variations are noticed, further stratification will be considered especially with regard to variations in the heterogeneity of population. The sample-based estimate of mean is an unbiased estimate of the population parameter. It will also be easy to implement as the sampling frame (household details for which water filters has been implemented) will be collected and stored in the monitoring database.

(iv) Sample Size: The sample size will be as given in the Gold Standard Methodology in section III Monitoring Methodology and described above. The sample will be drawn at random from the sampling frame.

The sample size will be determined, when the parameter of interest is proportion is as follows:

$$c \geq \frac{1.645^2 MV}{(M-1) \times 0.1^2 + 1.645^2 V}$$

Where:

$$V = \left(\frac{SD_B}{\overline{p}^2}\right)^2 = \frac{variance\ bewteen\ clusters\ (villages)}{average\ proportion}$$

c	number of clusters to be sampled (villages)
N	Total number of clusters (villages), which encompasses the entire population
1.645	Represents the 90% confidence required
0.1	Represents the 10% relative precision

For parameters with mean and standard deviation values, the sample size for will be determined as follows

$$c \geq \frac{1.645^2 MV}{(M-1) \times 0.1^2 + 1.645^2 V}$$

Where:

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

c	number of clusters to be sampled (villages)
N	Total number of clusters (villages), which encompasses the entire population
1.645	Represents the 90% confidence required
0.1	Represents the 10% relative precision

At a minimum, Group size <300: Minimum sample size 30 or population size, whichever is smaller
Group size 300 to 1000: Minimum sample size 10% of group size
Group size > 1000 Minimum sample size 100

Further sampling plan for safe drinking water is given in section B.7.3.

[31]Based on demographic survey

B.7.3. Other elements of monitoring plan

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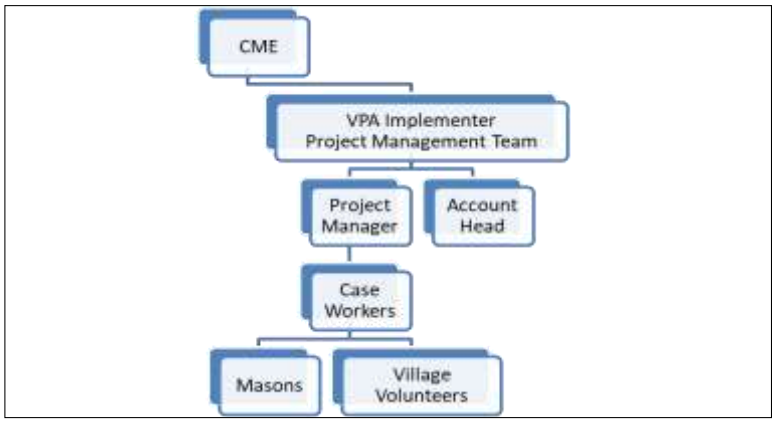
1. **Implementation Plan**

The project will be implemented over a 5-year period. The year-wise implementation plan is as follows:

Implementation Plan of Biogas		
Year	No. to be constructed and commissioned	Cumulative number of biogas units that will be commissioned
1	1,000	1,000
2	1,800	2,800
3	2,100	4,900
4	2,400	7,300
5	2,700	10,000
Implementation plan of Improved Cook Stove		
Year	No. to be implemented	Cumulative number of ICS units implemented
1	4,000	4,000
2	8,000	12,000
3	8,000	20,000
4	0	20,000
5	0	20,000
Implementation Plan of Water filters		
Year	No. to be distributed	Cumulative number of water filter units that will be commissioned
Year 1	2,000	2,000
Year 2	4,000	6,000
Year 3	4,500	10,500
Year 4	4,500	15,000
Year 5	0	15,000

2. **Project Team**

In general, the structure of the project team will be as follows:



Based on the structure of the PIP, it will be institutionalized.

- A monitoring solution will be installed by the CME to maintain data continuously for the project activity.
- For implementation of the technology a monitoring survey and usage survey will be conducted annually while a leakage assessment will be conducted every two years once to update monitoring parameters over time.
- If a fixed baseline scenario for biogas and ICS, BFT will not be conducted, while PFT will be updated every two years once respectively.

3. **Implementation Record**
    - The PIP will maintain an accurate and complete record of the biogas and ICS units that will be installed on the monitoring solution. These will be backed up electronically periodically. The data recorded will as follows
        i. Date of installation
        ii. Geographic region - District, Block, Village in which the technology is installed
        iii. Model/type of the project technology
        iv. Name of the head of the household who signs the End User Agreement
        v. Mobile number/telephone number if available
        vi. Mode of Use; domestic or commercial

4. **Project Database**

The project database will be exported from the monitoring solution which has the data of installations of biogas according to which the emission reductions will be calculated.

5. **On-going monitoring studies for Biogas and Improved Cook Stoves**

The following on-going monitoring studies will be conducted for each project scenario following the verification of the associated initial project studies. These monitoring studies investigate and define parameters that could not be determined at the time of the initial project studies or that change with time.

a) Monitoring Survey

The monitoring survey will be completed annually, beginning 1 year after project implementation.

The monitoring survey will investigate changes over time in a project scenario, and in a baseline scenario for renewal of crediting period, by surveying end users with project technologies on an annual basis. This survey will provide critical information on year-to-year trends in end user characteristics such as technology use, fuel consumption and seasonal variations.

Monitoring Survey Representativeness: End users from a given project scenario are selected using representative sampling techniques to ensure an adequate representation of users with technologies of different ages. Common sampling approaches such as clustered random sampling will be followed with geographic distribution factored into selection criteria.

End users will be surveyed at any time(s) throughout the year with care taken to collect information pertaining to seasonal variations in technology and fuel use patterns.

Monitoring Survey sample sizing and data collection:

b) Usage Survey

The usage survey will be completed annually, or more frequently, and in all cases on time for any request of issuance.

The usage survey will provide a single usage parameter that is weighted based on drop off rates that are representative of the age distribution for project technologies in the total implemented households. A usage

parameter will be established to account for drop off rates as project technologies age and are replaced. Prior to a verification, a usage parameter will be done that is weighted to be representative of the quantity of project technologies of each age being credited in a given project scenario.

1. For example, if only technologies in the first year of use (age0 - 1) are being credited, a usage parameter will be established through a usage survey for technologies age0 - 1.
2. If an equal number of technologies in the first year of use (age0 - 1) and second year of use (age1 - 2) are credited, a usage parameter is required that is weighted to be equally representative of drop off rates for technologies age0 - 1 and age1 - 2.

The minimum total sample size will be 100, with at least 30 samples for project technologies of each age being credited.

The majority of interviews in a usage survey will be conducted in person and include expert observation by the interviewer within the kitchen in question, while the remainder may be conducted via telephone by the same interviewers on condition that in-kitchen observational interviews are first concluded and analyzed such that typical circumstances are well understood by the telephone interviewers.

The usage parameter will be applied when calculating the quantity of fuel consumed in project scenario p during year y (Bp,y). Unless proven otherwise, it will be assumed that any drop off in the use of the project technology is replaced by fuel consumption in the applicable baseline scenario. The usage survey will establish a useful lifetime for technologies after which they are removed from the project database and no longer credited.

A. Mandatory Monitoring Requirements:

The mandatory requirements are applicable to all project activities that involve distribution of improved cooking devices applying the applicable methodology. The developer can claim up to a maximum 75% usage rate by meeting the mandatory monitoring requirements. These requirements include;

Step 1. Defining stove use and non-use*:*
The project developer shall define project stove use versus non-use (i.e. the continued use of traditional technology) to understand who should be considered eligible for crediting. It shall include criteria such as time since last used, frequency of use, duration of the project stove's use, extent to which the traditional technology is displaced, etc. The developer shall refer to baseline survey, project survey and KPTs to determine the representative cooking practice in the project boundary and to define the use and non-use of project stove.

Step 2. Household Usage Survey:

The project developer shall carry out an in person usage survey to determine stove use. The minimum sample size for the usage survey shall meet the requirements mentioned in the applicable methodology (e.g. section 3.1.C.b Usage Survey of the TPDDTEC methodology). The usage survey shall include the following key elements.
i. *Kitchen observation* – The surveyor shall visit the household to gather objective information to support the usage survey findings (e.g. if the stove is warm to the touch, ashes present etc). This is to counter against survey bias from the respondent answering questions in a way that they think the interviewer wants to hear.
ii. *Interview with the primary cook* - The surveyor shall interview the primary cook of the household to gather information on stove use patterns including information on duration and frequency of use, as well as information on multiple stove use ('stove stacking') and seasonal trends.

iii. *Photos of the cooking area(s)* - The surveyor shall take photographs of the project stoves to gather visual data on the status of the stove; whether the stove is abandoned, damaged, or being actively used shall all be shown using clear photographs. A photo should show the whole kitchen, including all the stoves in use. The photos should be clear and in good light. Photos also serve to provide confirmation that the household was visited. Consent should be taken from primary cook prior to taking photos in the kitchen.

iv. *GPS coordinates* - The surveyor shall record the GPS coordinates of the household as they provide verification that the household was visited. Alternatively, date stamped and location specific photos of the

household shall be taken as a verification of the household visit. Photographs taken under iii. above may also be used to meet this requirement.

Step 3. Verification checks:
The verification checks shall be performed by the project developer prior to verification by the VVB. At the conclusion of the data collection phase of the survey, the project developer representative shall telephone a randomly selected 5-10% of the surveyed households to verify that homes were visited by surveyors and the recorded responses are correct. The project developer shall record the details of the households and responses provided that have been reached via telephone.

B. Good Practice Monitoring Requirements:
The project developer can claim up to maximum 90% usage rate with Level A mandatory monitoring requirements i.e., step 1-3 and the following additional monitoring requirements.
Field team training and supervision:
The project developer shall provide training and supervision necessary to ensure field teams have the capacity required to complete usage survey successfully. The training of the field team is key to obtain a complete and accurate stove use dataset. The training workshop shall be conducted immediately before the fieldwork commences. The aim of the training workshop is to ensure that all team members have the knowledge and skills to carry out the required work with confidence and to a high standard. The team members need to understand the usage survey objectives and be proficient with the recruitment procedures, data collection and management processes, and protocols for troubleshooting. Detailed written guidelines and instructions for all procedures shall be provided and updated as necessary. There should be close supervision, including direct observations, of the field team members, particularly at the onset of the usage survey. Regular review of the collected data should be carried out, especially in the first days of data collection, to assess enumerator performance and re-train/supervise those that fall below the expected standard. In some cultures, it may be imperative to have female field workers. To demonstrate compliance with this requirement, the project developer shall keep records of all trainings including the details of the staff trained.
End-User Training and follow up visits:
The project developer shall provide locally appropriate end-user training on project stove use via demonstrations and follow-up visits. It includes demonstrations, training at the point-of-sale and post-sale follow-up visits. These visits are critical to ensure correct and sustained use of the project stove. To demonstrate compliance with this requirement, the project developer shall keep records of all demonstrations, training and follow up visits.
Awareness campaign:
The developers shall organise the campaign to make end-user aware about the benefits of continuous use of project stove and key product attributes. The awareness campaigns can be carried out together with the sales promotions and end-user training. To demonstrate compliance with this requirement, the project developer shall keep records of all training and follow up visits.

According to Annex 8 of the methodology, 3.1, Aging Test approach for project fuel updates will be followed:
The degradation in the performance of cookstove efficiency will be followed using the Water Boiling Test and accordingly adjust the project fuel consumption level. To apply the Ageing Test approach, the following steps shall be followed;
a. Determine the efficiency of the project cookstove: Water Boiling Test will be carried out to determine the thermal efficiency of the project cookstove along with the project KPTs prior to 1st issuance. The efficiency of the project cookstove shall be determined in the field or laboratory, following the latest version of Water Boling Test protocol, by an independent expert or entity.
b. Monitor the degradation in the efficiency of project cookstove: The degradation in the efficiency of the project cookstove shall be monitored annually by carrying out the WBT in the field or laboratory by an independent expert or entity.
c. Update the project fuel consumption level: To update project fuel consumption, the fuel consumption level determined under step a i.e., result of project KPTs prior to 1st issuance, shall be adjusted with the ratio of efficiency level determined under step a. and the efficiency level determined under step b. It would imply adjusting the project fuel consumption value for efficiency degradation.

Monitoring requirements: The following table summarises the monitoring requirements and guidance that should be followed for Ageing Test approach:

Monitoring Parameters	Requirements
Frequency for WBTs	Annual
Timing of WBTs	In last three months of the monitoring period
Sample size for WBTs	Annual WBTs on a representative sample of each age group The minimum sample size of each age group shall comply with the 90/10 rule
Sample selection for annual efficiency monitoring	Sample selection following the guidelines for sampling an surveys for CDM project activities For progressive installation, stratified random sampling approach will be followed It will be stratified random sampling (each stove type and vintage year) and the sample size will be determined by applying the following equation: $n \geq \frac{1.645^2\, NV}{(N-1)\times 0.1^2 + 1.645^2 \times V}$ where $V = \left(\frac{SD}{mean}\right)^2$ n = Sample size N = Total number of households Mean = Expected Mean SD = Expected standard deviation 1.645 = Represents the 90% confidence required 0.1 = Represents the 10% relative precision
Parallel use of baseline stove in the project scenario	Monitoring surveys to capture cooking habits and stove usage of households in the region including quantification of use of baseline devices by formulating questions and or collecting evidences to determine the frequency of usage of both the project devices and baseline devices

Comment [A1]: It will be stratified random samplings

c) Project FT Update

The Project performance field test of fuel consumption (PFT) will be done every other year, or more frequently.

The PFT update is an extension of the project PFT and provides a fuel consumption assessment representative of project technologies currently in use every two years. Hence the PFT update accounts for changes in the project scenario over time as project technologies age and new customers are added, also as new models and designs are introduced. An age test will be applied instead of a PFT, to project technologies which remain materially the same year after year.

d) Baseline FT Update

Completed every other year or more frequently, except in cases where a fixed baseline is adopted. The BFT requirements are the same as for the PFT update.

e) Leakage Assessment

The leakage assessment will be completed every other year, starting on time for the first verification following the guidance provided in section II.6 of the methodology V.3.1. Leakage risks is deemed to be insignificant or very low in the project area, as the project will be implemented over a large geographic area, but to a limited number of families. Nevertheless, it will be assessed and presented every two years once.

f) Non-Renewable Biomass Assessment Update

The non-renewable biomass fraction is fixed based on the results of the NRB assessment conducted with the latest data available for Nepal. Over the course of a project activity it will be re-examined by conducting a new NRB assessment if data from is published on the CDM website or new data is available for Nepal at the time of Verification. In case of a renewal of the crediting period and as per Gold Standard rules, the NRB fraction will be reassessed as any other baseline parameters and updated in line with most recent data available.

g) Adding a New Baseline or Project Scenario

New baseline and project scenarios can be added to a project activity at any time during the project period upon approval of a request for design changes, as per Gold Standard rules. Emission reductions cannot be credited for a new project scenario, or in relation to a new baseline scenario, until the respective project studies or baseline studies have been conducted. Hence if new project scenarios will be added, based on approval of design changes, a new baseline or project scenario will be created and the baseline or project studies, respectively, will be conducted prior to verification and crediting with respect to the new scenario.

h) Quality Assurance and Quality Control

Accurate and transparent record keeping, monitoring and evaluation will be done for the project activity. All supporting documentation and records for the project will be easily accessible for spot checking and cross referencing by a third party. Contact information in the monitoring solution will allow a project auditor to easily contact and visit end users. The purchase orders, material purchases, internal logs of the stoves and biogas units will be maintained for an auditor to be able to verify.

Safe Drinking Water Devices

6. **Water filters maintenance Strategy**

The project will ensure the following maintenance strategy to ensure that the safe drinking water devices are used and maintained well.

a. Regular trainings will be held for end-users for maintenance of water filters. In these trainings, demonstrations will be held on how to clean and maintain the water filters. Any questions by the beneficiaries will be answered.

b. Village volunteers and field mobilizers will be trained and supported to help the beneficiaries maintain the water filters distributed to the beneficiaries. As and when the water filters are not functioning properly due to any issue, the beneficiaries will contact the village volunteers/field mobilizers for repair or maintenance of the water filters.

c. If required, spare candles to the filters and other parts will be organized for replacement. When a village volunteer finds a water filter not dispensing clean water during household visit, steps will be taken to understand the reason and take corrective active. This will ensure that a household's safe water requirements are met on a day-to-day basis, which is the main objective of the project.

d. The water filters repaired and candles replaced will be recorded in the monitoring database. When a component has been replaced, the details will be recorded. All replacements of components will be undertaken without costs during the warranty period.

e. When the water filters have filtered at the maximum limit prescribed by the manufacturer, the candles will be replaced. If the water filters crack or break, they will be replaced. If they are not replaced or the family ceases to use the water filter, emission reductions will not be claimed for the beneficiary family. Need be, it will be replaced by another needy family in the project region. The end-users will be made aware of the maintenance strategy during implementation.

7. **Monitoring Survey for Water filters**

Application of the Monitoring Methodology for Water Treatment Project Scenarios

Project Studies for a Water Treatment Project Scenario

Project studies will be conducted for each clean water project scenario prior to verifying emission reductions associated with the given project scenario using ex - post project studies from which fuel consumption in the baseline scenario is back calculated.

The following project studies will be conducted for each project scenario:

A. Project non - renewable biomass (NRB) assessment, if biomass is one of the fuels consumed[32]
B. Project survey (PS) of end user characteristics
C. Baseline water boiling test (BWBT)
D. Water consumption field test (WCFT) of safe water provision by project technologies and of water boiled in project scenario
E. On - going Monitoring Studies: Usage rates, leakage, water quality
F. Hygiene surveys The baseline living standard is captured in the project survey and reflected in the water consumption field test.

A. Project Non - Renewable Biomass Assessment

The non-renewable biomass component has been assessed ex-ante and included in Appendix 04 of the PoA-DD. The non-renewable biomass fraction is fixed based on the results of the NRB assessment. Over the course of a project activity it may at any time choose to reexamine renewability by conducting a new NRB assessment. In case of a renewal of the crediting period the NRB fraction will be reassessed as any other baseline parameters and updated in line with most recent data available.

B. Project Survey

The safe water project survey will be conducted with end users representative of the project scenario target population and currently using the safe water project technology. The survey will be carried out for using representative and clustered random sampling, following these guidelines for minimum sample size as follows:
Group size <300: Minimum sample size 30 or population size, whichever is smaller
Group size 300 to 1000: Minimum sample size 10% of group size
Group size > 1000 Minimum sample size 100

In the guidance on data collected, questions about end user characteristics and baseline technology and fuels will be treated as specific to safe water supply and boiling. These questions will be asked twice, first in regards to the baseline scenario water supply and water treatment, including boiling technologies, and second in regards to the project scenario clean water supply, including treatment and boiling technologies.

C. Baseline Water Boiling Test

The baseline water boiling test (BWBT) to calculate the quantity of fuel required to purify by boiling one litre of water for 10 minutes using technologies and fuels representative of the baseline scenario ($W_{b,y}$) was conducted using traditional stoves and local fuelwood representative of the baseline scenario (Wb,y). The fuelwood requirement is 0.000355±0.00002 t/litre of water with a reliability of 5.97% at 90/30 confidence/precision level. If the water boiling technologies change in the project scenario, the BWBT will be updated. Otherwise the same BWBT will be used if the same technology prevails in the project scenario too. A total of 33 tests were conducted in various districts of the project area, which is more than required to determine the mean of fuelwood to boil a litre of water. A requirement of the sample size based on the mean and standard deviation shows that the sample size required is just 1 at 90/30 confidence/prevision level.

[32] As appropriate, multiple project scenarios may use the same NRB baseline, which may be the same as that used in the baseline scenario.

If the monitoring surveys reveal that the same water boiling technologies are prevalent in the baseline and project scenarios, Wb,y and Wp,y are equal. The BWBT will be updated if monitoring surveys show that baseline water boiling technologies change over time.

D. Water Consumption Field Test

The water consumption field test (WCFT) will be conducted with end users representative of the project scenario target population and currently using the project technology. Guidance from section II.4.C on FT representativeness, sample sizing, and variability will be applied, which is as follows:

Water consumption will be determined using the following options:

1. Default value: PP may use the default minimum service level figure of 4 lcpd without carrying out the performance field test. This scenario will be treated as a "Case of Single Sample Test" and will follow the relevant guidelines provided in section 7 of the GS methodology.
2. Alternatively, specific FT will be carried out for determining the drinking water consumption. The household size will be determined using surveys carried out within the target area. The survey will be conducted following a clustered random sampling approach and the minimum sample size will be determined as per the guidelines provided in Section 4.B of the methodology. As per methodology, for an update of the baseline at anytime during the crediting period, the following options will be applied:
    a. For a project activity with progressive installation of water filters the FT will be carried out in those households where the devices have not yet been disseminated and where baseline technology is still in use in the project area. In addition, it will be shown that the selected sample households exhibit the same socio - economic circumstances as the households that have already received the technology in the project activity.
    b. For a project activity that does not involve progressive installation of water filters - the households in the vicinity of the project target area will be identified that exhibit the same socio - economic circumstances as the households that have already received the water filters in the project target area. The FT will be carried out in households that are representative of project households. It will be insured that these representative households are operating devices that are similar to the baseline technology in the project activity.

Field Test: To prepare and conduct a KPT, the following steps will be followed:

- Estimate the sample size assuming a typical COVs are in the range 0.5 - 1.0. The tables in Annex 4 of the methodology will be used for a provisional minimum sample size estimate. A minimum sample size of 30 will be selected adding sample size attrition.
- The households will be sampled using a RANDOM selection method. Applicable common sampling approaches as outlined in Section III, will be followed.
- A statistical analysis on the test results will be run to estimate the mean. Before beginning the analysis, it will be checked for "outliers", i.e. values which are very different to the majority of the sample. Outliers will be examined to check for mistakes with data recording, or investigated to ascertain if there were unusual circumstances which led to that result. If so, then the observation will be removed or corrected before the analysis. The distribution of sample values will also be checked for skewness. If there are extreme outliers or skewness, or the data was not collected by a simple random sample, then methods of analysis which are more complicated than the approaches suggested here may be required. A 90/30 option will be used to calculate the mean value.

Three different volumetric variables are measured, as indicated by the equations above:

Qp,y	Quantity of safe water in litres consumed in the project scenario p and supplied by project technology per person per day
Qp,rawboil,y	Quantity of raw or unsafe water boiled in the project scenario p per person per day
Qp,cleanboil,y	Quantity of safe (treated, or from safe supply) water boiled in the project scenario p per person per day

The quantity of safe water consumed in the project scenario will be cross checked with the mmanufacturer specification/design specification to ensure that the technology is able to supply the claimed quantity of safe water.

E. On - going Monitoring Studies: Usage rates, leakage, water quality

The on - going monitoring requirements are as prescribed in section III of the methodology for monitoring surveys, usage surveys, leakage assessment, and updating baseline scenarios and NRB baselines. Monitored parameters include the three volumetric parameters listed above, as well as parameters to ensure the water quality delivered by the project activity.

Water quality testing: Water quality will be tested every quarter, with the first test within 6 months of the stated project start date. In addition, it will be ensured that water quality is tested at least once during seasons where there is a high chance of contamination, i.e., the rainy season. Local non - accredited laboratories can do the quarterly water quality testing. However, at least once every two years, tests will be done at accredited laboratories for water quality testing. If accredited laboratory results differ materially from non - accredited laboratory results, testing with the aberrant non - accredited laboratory will be discontinued. The national laws on water quality testing will be used. The testing protocol is provided to the DOE for validation.

Water quality standard: The project will meet host country standards. The 90/10 precision rule will be followed in calculating the sample size required for testing water quality. As it for 'point of use' technology, the quality testing will be done for samples taken at the water outlet. Also, the monitoring of hygienic use of water at the user end shall further complement the testing process.

The drinking water quality specification is given by the Government of Nepal, Ministry of Physical Planning and Works, National Drinking Water Quality Standards, 2062[33], according to which the water quality standard is as follows:

[33] http://mowss.gov.np/assets/uploads/files/NDWQS_2005_Nepal.pdf

(A) National Drinking Water Quality Standard

S.N.	Category	Parameters	Units	Concentration Limits	Remark
1	Physical	Turbidity	NTU	5 (10)	
2		pH		6.5-8.5*	
3		Color	TCU	5 (15)	
4		Taste and Odor		Non-objectionable	
5		TDS	mg/L	1000	
6		Electrical conductivity (EC)	µs/cm	1500	
7	Chemical	Iron	mg/L	0.3 (3)	
8		Manganese	mg/L	0.2	
9		Arsenic	mg/L	0.05	
10		Cadmium	mg/L	0.003	
11		Chromium	mg/L	0.05	
12		Cyanide	mg/L	0.07	
13		Fluoride	mg/L	0.5 -1.5*	
14		Lead	mg/L	0.01	
15		Ammonia	mg/L	1.5	
16		Chloride	mg/L	250	
17		Sulphate	mg/L	250	
18		Nitrate	mg/L	50	
19		Copper	mg/L	1	
20		Total Hardness	mg/L as $CaCo_3$	500	
21		Calcium	mg/l	200	
22		Zinc	mg/L	3	
23		Mercury	mg/L	0.001	
24		Aluminum	mg/L	0.2	
25		Residual Chlorine	mg/L	0.1-0.2*	in systems using chlorination
26	Microbiological	E. Coli	MPN/100 ml	0	
27		Total Coliform	MPN/100 ml	0 in 95% samples	

* These values show lower and upper limits

( ) Values in parenthesis refers the acceptable values only when alternative is not available.

National Drinking Water Quality Standards and Directives, 2005

F. Hygiene campaign

The following will be adopted for conducting hygiene campaigns.

- Hygiene refers to access to sanitation amenities, equipment and infrastructure, as well as to the behavior in respect to regular and correct use of such amenities. It also refers to behavior that prevents infections from water - related diseases.
- The activities conducted each year for hygiene campaigns will be reported in the annual monitoring report. Any major changes in the health status of the water users as a result of contaminated water (e.g. an outbreak of water related disease) will be reported and, if relevant, a strategy put in place to address it through the hygiene campaign.
- The detailed method used to assess hygienic handling of clean water is described below.
- The details of the method will be adjusted to suit the circumstances of the project and also to suit learning year on year after implementation.

Objective: The objective of the campaign is to trigger positive behavioral changes among households with respect to hygiene and use of safe drinking water. This requires enhancing knowledge regarding safe drinking water and hygiene by preparing, involving and empowering the rural community to actively shoulder the responsibility. The objectives of the campaign would be as follows:

i.) create awareness and motivate people to take affirmative action for protection of drinking water and safe handling of drinking water;
ii.) trigger behavior change among individuals, families and communities to adopt improved health and hygiene practices;
iii.) create awareness and enhance community participation;
iv.) create an enabling environment through strengthened coordination, effective networking with critical stakeholders; and
v.) promote personal accountability and responsibility for ensuring provision of safe drinking water to all in the household.

The target groups for the campaign would be primary target groups that include rural community, school going children and youth, local governing members and village elders/ community leaders and secondary target group of other important stakeholders and influencers such as Government, Project Staff, etc.

Planning: While planning the campaign, the following will be considered:

- it is necessary to understand whose behavior (target group) needs to be changed; which behavior pattern needs to be changed and in what direction; - specific messages would be given to specific groups;
    - hence it is necessary to know:
        - what do people already know and do in terms of water facilities;
        - their perception regarding health and hygiene aspects;
        - how do they define safe water, sustainability, health and hygiene;
        - how much importance do they attach to safe drinking water sustainability;
- it is essential to establish in people's mind the relationship between safe drinking water, sustainability, clean environment and health and that these are not possible without participation of all family members; and
- a sense of ownership, accountability and responsibility to use and maintain the filters would be inculcated.

Involvement of different stakeholders will be considered required in order to motivate the users in planning and implementing of the project and campaign.

Suggested List of activities: While developing any of the communication activity, it will be kept in mind the requirement of the target audience in terms of information needed and the manner in which it has to be disseminated. Multiple channels are essential to harness optimum results.

- The following suggested activities would be considered
    - Audio-Visual clippings and Audio Spots/Jingles
    - Traditional cultural activities to promote desirable behavior through street plays, folk songs etc.
    - Coverage of events, success stories
    - Development and supply of brochures, pamphlets, leaflets, flip charts, etc.
    - FAQs booklet
    - Activities at School level with involvement of students:
    - Development of School Kit that includes behavior posters, leaflet for children and parents, leaflet for teachers and handwashing poster;
    - Organizing essay and elocution competitions on health and hygiene among school children;
    - Partnership with other government department programmes
    - Exposure visits to other villages with good practices;
    - Conducting focus group discussions and community level and door to door;
    - Health-talk especially for women and children.
    - Calling women meeting to discuss issues on health, hygiene, water

Following key points will be considered while implementing the campaign:

i.) Baseline survey to understand basic information about the target audience and their felt needs, problems and services available;
ii.) Preparation of district specific strategy and modules for carrying out the campaign;
iii.) Pre-test of material developed before implementation;

iv.) Use of inter community communication and behavior change communication strategy while implementing the programme;
v.) Using interpersonal communication would be an integral part of strategy;
vi.) Conducting focus group discussion to understand needs, challenges and perception of the community about the programmes

Impact assessment through third party agency to assess the effectiveness of the communication activities in terms of quality and quantity will be planned.

The monitoring survey will be completed annually, beginning 1 year after project registration.

The monitoring survey will investigate changes over time in a project scenario, and in a baseline scenario in case of renewal of crediting period, by surveying end users with project technologies on an annual basis. This survey will provide critical information on year-to-year trends in end user characteristics such as technology use, fuel consumption and seasonal variations.

Guidelines for carrying out usage surveys for projects implementing household water filtration technologies

The guidelines given by the Gold Standard rule update will be followed for surveys to determine the usage rate of Household Water Treatment (HWT) technologies. This guidance is applicable as it is for point of use HWT filtration technologies (e.g. sand filters, clay filters, ceramic filters, hollow fiber filters, bio - sand filters etc.) and not to safe water supply projects such as chlorine treatment, solar disinfection, bore wells, piped water supply etc.

The following will be compulsorily covered for the usage survey.

Action	**Type (reported/observed) And Expected Result**	**Reason**	**Examples of questions that can be used in the survey**
1. Introductory question and water treatment			
Ask if the respondent does anything to their water to make it safe (w/o reading out options)	Reported It should be first established if the household purifies water. And if it does, does it do so using the HWT.	This is to clarify if the respondent purifies water and does not consume raw/untreated water in the project scenario	Q. Did you do anything to make your water safer to drink
Ask what the respondent uses to make water safe (w/o reading out options)		This question will address if the project specific HWT technology is used	How did you make this water safer to drink
Ask if the person being interviewed is the primary user of HWT unit in the household		This ensures that the user related questions are directed to the person who is aware of how to use the filter	Are you the main user/operator of the filter in the household?
2.Rate of usage			

Ask how often the respondent uses the water treatment technology?	Reported This will rule out users who report low frequency usage of the project HWT unit. This will be recorded by the village volunteers and entered into the monitoring solution.	This question checks the previous question by quantifying it and obtains additional information on the frequency of use	Q: How often do you filter water? Q: When was the last time you filtered water using HWT device? Q: Have you used the HWT device in the last week? (the PP should decide appropriate frequency of water treatment to be considered as usage based on local practices and circumstances)
3.Water Storage			
Ask and observe whether and how the respondent stores the filtered water	Reported and observed This will rule out the project HWT unit that do not store filtered water	This question will inform whether filtered water can be or is being stored	Q: Is there a safe storage container that contains filtered water in it? Q: If no, when was the last time there was filtered water in it?
4.Physical signs of usage			
Observe to see if the HWT unit shows signs of usage, e.g. wet filter, water in storage receptacle, dust on filter, hanging properly, etc.	Observed	This may give an indication of where the unit has been in use recently	
5.Demonstration and knowledge			
As the individual responsible for filtering to demonstrate use either directly or by asking for water	Observed Inability to use the project HWT unit would rule the respondent as a non-user	A user will need to be capable of using the HWT unit	Q: Can you please show us how you filter water? Q: Can you please give us a cup of drinking water?
6.Functionality			
Observe whether the HWT unit is currently functional, e.g. tap and filter element are functional	Observed This would rule out users with a non-functional unit	This is to ensure that the unit is functional	

If all six topics outlined above are successfully completed the survey respondent will be classed as a user. If failure occurs in one or more of the topics, the reason for will be assessed and only the period of use will be considered. For example, if the family is not at home for long duration, then the period of absence will not be considered for usage and calculation of emission reductions, but will not be classified as a non - user. But if the family has completely stopped using the water filter, it is considered as a non-user.

These guidelines will be used in the survey to determine usage rates and the survey template is provided in Appendix 5.

Quality Assurance and Quality Control

Accurate and transparent record keeping, monitoring and evaluation will be done for the project activity. All supporting documentation and records for the project will be easily accessible for spot checking and cross referencing by a third party. Contact information in the monitoring solution will allow a project auditor to

easily contact and visit end users. The purchase orders, material purchases, internal logs of the water filter units will be maintained for an auditor to be able to verify.

SECTION C. Duration and crediting period

C.1. Duration of project

C.1.1. Start date of project

>> (Specify start date of the project, in the format of DD/MM/YYYY. Describe how this date has been determined as per the definition of start date provided in section 3.4.3 of GS4GG Principles & Requirements document and provide evidence to support this date.)

01/01/2020 (expected date of start of any of the 3 project technologies, start construction of biogas/ distribute Improved cook stove or water filters)

C.1.2. Expected operational lifetime of project

>> (Specify in years)

Biogas – 20 Years[34]
Improved cook stoves – 5 Years[35]
Water Filters – 5 Years[36]

C.2. Crediting period of project

C.2.1. Start date of crediting period

>> (Specify in dd/mm/yyyy. This can be start of project operation or two years prior to the date of Project Design Certification, whichever is later.)

01/01/2020

C.2.2. Total length of crediting period

>> (Specify the total length of crediting period sought in line with GS4GG Principles & Requirements or relevant activity requirements.)

5 Years; 0 months – First Crediting Period
Twice renewable
Total 15 Years, 0 Months

SECTION D. Safeguarding principles assessment

D.1. Analysis of social, economic and environmental impacts

>> (Refer the GS4GG Safeguarding Principles and Requirements document for detailed guidance on carrying out this assessment.)

[34] http://siteresources.worldbank.org/INTENERGY/Publications/20918309/NepalBiogasSupportProgram.pdf

[35] https://d2ouvy59p0dg6k.cloudfront.net/downloads/analysis_of_available_models_of_improved_cook_stoves__ics__and_their_suitability_in_diff.pdf

[36] With frequent change in cartridges, the filter will last for 5 years. https://bestpurification.com/long-water-filters-last-facts/

Safeguarding principles	Assessment questions	Assessment of relevance to the project	Justification	Mitigation measure
3.1. Human Right	a. The Project Developer and the Project shall respect internationally proclaimed human rights and shall not be complicit in violence or human rights abuses of any kind as defined in the Universal Declaration of Human Rights b. The Project shall not discriminate with regards to participation and inclusion.	a. No b. No	**a.** The project doesn't involve any activity that affects human right but promotes the human rights to have access to clean energy and environment. **Conclusion: the parameter will not be monitored.** b. The project shall not discriminate any people to have biogas plants, Improved cook stoves or water filtering devices rather it enhances the participation and inclusion. **Conclusion: the parameter will not be monitored.**	N/A
3.2 Gender Equality and Women's Rights	1. The Project shall complete the following gender assessment questions in order to inform Requirements 2-4, below: a) Is there a possibility that the Project might reduce or put at risk women's access to or control of resources, entitlements and benefits? b) Is there a possibility that the Project can adversely affect men and women in marginalised or vulnerable communities (e.g., potential increased burden on women or social isolation of men)? c) Is there a possibility that the Project might not take into account gender roles and the abilities of women or men to participate in the decisions/designs of the project's activities (such as lack of time, child care duties, low literacy or educational levels, or societal discrimination)? d) Does the Project take into account gender roles and the abilities of women or men to benefit from the	a) No b) No c) No d) Yes e) No f) No	a) The project enhances the women's access and entitlement of benefits. Since the women will be direct user of the technologies, it will benefit women by reducing their exposure to the indoor air pollution thereby improving their health. In addition, the replacement of firewood after the installation of Biogas will reduce workload of women for the collection of firewood. Reduced workload for firewood collection results in time saving that the women can use for other productive activities. **Conclusion: the parameter will not be monitored** b) The project will not adversely affect men and women in marginalized or vulnerable communities. Implementation of the project will contribute towards preservation of common resources in form of "firewood". Households duties related to firewood collection, cooking and cleaning utensils remain with women. The project therefore tends to decrease burden on women and won't result in social isolation of men. **Conclusion: the parameter will not be monitored** c) The project duly accounts the gender roles. Time saving is one of the key benefits from the project which the beneficiary can	N/A

Safeguarding principles	Assessment questions	Assessment of relevance to the project	Justification	Mitigation measure
	Project's activities (e.g., Does the project criteria ensure that it includes minority groups or landless peoples)? e) Does the Project design contribute to an increase in women's workload that adds to their care responsibilities or that prevents them from engaging in other activities? f) Would the Project potentially reproduce or further deepen discrimination against women based on gender, for instance, regarding their full participation in design and implementation or access to opportunities and benefits? g) Would the Project potentially limit women's ability to use, develop and protect natural resources, taking into account different roles and priorities of women and men in accessing and managing environmental goods and services? **h)** Is there likelihood that the proposed Project would expose women and girls to further risksor hazards?	g) No	utilize to fulfill their gender roles. With the saved time, one can perform the respective gender role more effectively. **Conclusion: the parameter will not be monitored** d) The project shall make every effort to include landless people in its design. Benefits from the project is expected to culminate in form of creation of entrepreneurial opportunities. While the focus is on capacitating women to take advantage of the entrepreneurial opportunity, the project shall not deprive men from the families of minority groups or the landless people to take advantage of the capacity building activities. **Conclusion: the parameter will not be monitored** e) No, the project is not designed such that it increased workload of women and their care responsibilities. By introducing Biogas , the overall performance of women in kitchen will be more efficient. This will enable them engage in other activities. **Conclusion: the parameter will not be monitored** f) The project will enhance social participation and decision making role of women. Moreover, the women are expected to develop entrepreneurial skills which will enable them economically to deal with the household problems. The potential of the project to enable women economically will help reduce discrimination against women rather than deepening it. **Conclusion: The parameter will not be monitored**	
3.3 Community Health, Safety and Working Conditions	1. The Project shall avoid community exposure to increased health risks and shall not adversely affect the health of the workers and the community	Yes	The Project shall make every effort to avoid health risks of worker during construction of biogas . Emission reduction and reduction on indoor air pollution is one of the key benefits of the	N/A

Safeguarding principles	Assessment questions	Assessment of relevance to the project	Justification	Mitigation measure
			project for community that will improve the health of those communities. **Conclusion: health risk of the worker will not be monitored but the emission reduction and improve in health condition will be monitored.**	
3.4.3 Land Tenure and Other Rights	a. Does the Project require any change to land tenure arrangements and/or other rights? b. c.	No	The project units are simple and small in dimension. This will not involve anything related to removal of sites, objects or structures of cultural significance. Therefore the safeguarding principle under discussion will not be triggered by the project. **Conclusion: the parameter will not be monitored**	N/A
3.5 Corruption	1. The Project shall not involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects.	No	Willing households will be part of the project activity. Upfront carbon revenue will be provided to implement the project and those families who are able to contribute to some extent to the project. Financial audit will be conducted to ensure that the carbon revenue is contributing to implementation of the project. **Conclusion: The parameter will not be monitored.**	N/A
3.6.2 Negative Economic Consequences	a. The Project Developer shall demonstrate the financial sustainability of the Projects implemented, also including those that will occur beyond the Project Certification period. b. The Projects shall consider economic impacts and demonstrate a consideration of potential risks to the local economy and how these have been taken into account in Project design, implementation, operation and after the Project. Particular focus shall be given to vulnerable and marginalised social groups in targeted communities and that benefits are socially-	No	The project units are simple and have less moving parts. So, it requires less repair and maintenance. Hence the operational cost is less in comparision to the energy access and the additional benefits that it offers. So, the project implemented is sustainable financially and has positive economic impacts. **Conclusion: the parameter will not be monitored**	N/A

Safeguarding principles	Assessment questions	Assessment of relevance to the project	Justification	Mitigation measure
	inclusive and sustainable.			
4.1.1 Emissions	Will the Project increase greenhouse gas emissions over the Baseline Scenario?	Yes	The project will replace the use of non-renewable biomass. The baseline of the project is the use of firewood for cooking. So, this project will reduce the GHG over the baseline scenario. The project will not increase GHG emissions over the baseline. Any emissions due to the project activity is accounted as project emissions and leakage. These are not above the baseline scenario as shown in the sections above. **Conclusion: The parameters will be monitored and calculated based on the operational status of the project units and accounted as mentioned in the above sections.**	N/A
4.1.2 Energy Supply	Will the Project use energy from a local grid or power supply (i.e., not connected to a national or regional grid) or fuel resource (such as wood, biomass) that provides for other local users?	No	The project will not use any fuel resources that provides for other local users. It uses the animal dung. Therefore the safeguarding principle under discussion will not be triggered by the project. **Conclusion: the parameter will not be monitored**	N/A
4.2.1 Impact on natural water patterns and flow	Will the Project affect the natural or pre-existing pattern of watercourses, ground-water and/or the watershed(s) such as high seasonal flow variability, flooding potential, lack of aquatic connectivity or water scarcity?	No	The project requires very less water to make the slurry that can be fetched at household level itself. Therefore the safeguarding principle under discussion will not be triggered by the project. **Conclusion: the parameter will not be monitored**	N/A
4.2.2 Erosion and/or water body stability	Could the Project directly or indirectly cause additional erosion and/or water body instability or disrupt the natural pattern of erosion?	No	The project units are installed at household level which will not directly or indirectly cause additional erosion or disrupt the water body. Therefore the safeguarding principle under discussion will not be triggered by the project. **Conclusion: the parameter will not be monitored**	N/A
4.3.1	Does the Project involve the	No	The project doesn't involve use of	N/A

Safeguarding principles	Assessment questions	Assessment of relevance to the project	Justification	Mitigation measure
Landscapte modification and soil	use of land and soil for production of crops or other products?		land and soil for production or crops or other products. Therefore the safeguarding principle under consideration will not be triggered by the project. **Conclusion: the parameter will not be monitored.**	
4.3.2 Vulnerability to Natural Disaster	Will the Project be susceptible to or lead to increased vulnerability to wind, earthquakes, subsidence, landslides, erosion, flooding, drought or other extreme climatic conditions?	No	The project units are household based units and are less succesptible to the natural disasters. Therefore the safeguarding principle under consideration will not be triggered by the project. **Conclusion: the parameter will not be monitored.**	N/A
4.3.3 Genetic Resources	Could the Project be negatively impacted by the use of genetically modified organisms or GMOs (e.g., contamination, collection and/or harvesting, commercial development)?	No	The project doesn't involve any activity related to GMOs. Therefore the safeguarding principle under consideration will not be triggered by the project. **Conclusion: the parameter will not be monitored.**	N/A
4.3.4 Release of pollutants	Could the Project potentially result in the release of pollutants to the environment?	No	The project units generally yields the Biogas and Bio-slurry. The biogas is used for the cooking purposes whereas the bioslurry is used as nutrients (manure) in the agriculture field. Therefore the safeguarding principle under consideration will not be triggered by the project. **Conclusion: the parameter will not be monitored.**	N/A
4.3.5 Hazardous and Non-hazardous Waste	Will the Project involve the manufacture, trade, release, and/ or use of hazardous and non-hazardous chemicals and/or materials?	No	The project unit does not require or releases any hazardous and non-hazardous chemicals. Therefore the safeguarding principle under consideration will not be triggered by the project. **Conclusion: the parameter will not be monitored.**	N/A
4.3.6 Pesticides and fertilizers	Will the Project involve the application of pesticides and/or fertilisers?	Yes	The project units produces the bioslurry that potentially displaces the chemical fertilizers. Basically due to good content of nitrogen in the fertilizer the bio-slurry is a potent replacer of the Urea . **Conclusion: the parameter will be monitored through the perception**	N/A

Safeguarding principles	Assessment questions	Assessment of relevance to the project	Justification	Mitigation measure
			survey with the users.	
4.3.7 Harvesting of forests	Will the Project involve the harvesting of forests?	No	The project doesn't involve any activity that requires harvesting of forest products. Therefore the safeguarding principle under consideration will not be triggered by the project. **Conclusion: the parameter will not be monitored.**	N/A
4.3.8 Food	Does the Project modify the quantity or nutritional quality of food available such as through crop regime alteration or export or economic incentives?	Yes	The project units produces the bioslurry that potentially increases the productivity of crop as it has good content of nitrogen. **Conclusion: the parameter will be monitored through the perception survey with the users.**	N/A
4.3.9 Animal Husbandry	Will the Project involve animal husbandry?	No	The project doesn't involve any activity that requires animal husbandry. The only activity involved with cattle is, existing cattle dung will be used as substrate for generation of thermal energy. Therefore the safeguarding principle under consideration will not be triggered by the project. **Conclusion: the parameter will not be monitored.**	N/A

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from stakeholders

>> (Describe how stakeholder consultation was conducted in accordance with GS4GG Stakeholder Procedure Requirements and Guidelines.)

Stakeholder consultation is conducted at VPA level for the PoA. As per the procedures of GS4GG stakeholder Procedure Requirements and Guidelines, four live local stakeholder consultation meetings were organized with a call for public comments on the project activity. The details of the meeting are as follows:

District	Date	Venue
Udayapur	08-10-2018	Udayaour Udhyog Banijyeh Sangh, Katari
Kathmandu	11-10-2018	Yaalamaya, Dhoaima Café, Patan Dhoka, Lalitpur.
Makwanpur	28-10-2018	Oshin Rest House, Hetauda, Makwanpur
Sindhuli	02-11-2018	Hotel Valley View, Sindhuli

The reason for having multiple location meetings is to reach out to as many stakeholders are possible. The invited stakeholders were government officials, especially Ward Chief, Government Department officials, local NGOs and local Communities. International GS supporting NGOs , Nepal DNA, Other project proponents implementing CDM/VER projects – PoA and individual projects, were invited to attend the meeting. Especially the meeting conducted in Kathmandu was to facilitate the involvement of these stakeholders as they would not be able to attend district level meetings and could not provide their inputs during design consultation phase.

District level meetings were conducted for 2 days, first day was for all of them and on the second day it was only of women. This was to get a good feedback from women, as they were not forthcoming in the presence of men.

The Stakeholder Feedback Round (SFR) will be conducted for the VPA too.

E.2. Summary of comments received

>> (Provide a summary of key comments received during the consultation process.)

Stakeholder comment	Was comment taken into account (Yes/ No)?	Explanation (Why? How?)
Local Level Stakeholder Meeting Udayapur Udhyog Banijye Sangh, Katari, Nepal 2018.10.08		
What is the major benefit that end users can get from this project other than environmental aspects?	Clarification	This project covers the social and economic aspects as well. In case of social aspects, it contributes in the empowerment of women, health safety as it reduces the indoor air pollution along with reduction on GHGs emission and increased the knowledge of community on climate change and its coping mechanism. Likewise, in case of economic aspects, this project helps to uplift the economic status of people as they can save their time on fodder collection and invest it on other income generating activities. Moreover, due to the reduction on consumption of the fuelwood through the intervention of our project, it saves the yearly income of household which is invested on fuelwood.
What is your strategy to implement this project? Does Project bear complete cost?	Clarification	In order to build the ownership, local need to contribute during the implementation. Contribution can be in different forms i.e. their time, effort, labor cost and minimum cost can depend upon the types of technology. For example: In case of Bio- gas, labor cost should be borne by the end user for excavating pit. In case of ICS, if the final selection is of Matribhumi Chulo, we will ask the end user for labor cost. But if other types of portable stoves get selected they will be certain amount of contribution from end user in monetary form. Same applies in case of Water Filtration Techniques, the contribution will be in monetary form from end users.
Several NGOs/INGOs had tried implementing similar kind of technology i.e. ICS and Bio-gas in previous years but we have seen the failure rate. How you are planning to address those things in your project?	Clarification	We truly acknowledged your question and for the same we have conducted this stakeholders meeting to get inputs from all of you. Likewise, we had conducted a baseline survey to know the status and possibilities of these technologies in three districts of Nepal. The baseline feasibility survey revealed the socio-economic status

Stakeholder comment	Was comment taken into account (Yes/ No)?	Explanation (Why? How?)
		of the community along with feasibility for different types of RET. Correspondingly, we had conducted more than 131 sensitization programs in different places of Udayapur, Makwanpur and Sindhuli in order to aware the community about climate change and its impact. Also, we had conducted the Pre-Test of different model of ICS prior this meeting to get their views on the suitable type of ICS technology for them, which might reduce the chances of failure as we are incorporating their choice of model for Implementation.
Does this project cover every individual?	Clarification	It is limited as we will be covering those household who are dependent upon the traditional stove for cooking, who are drinking water without boiling it, and those who have cattle and cows in their house. It doesn't include the population who are using LPG gas.
Are you planning to co-ordinate with local bodies during it implementation phase?	Clarification	Without the co-ordination with local bodies it is not possible to implement this project. We had coordinated and took permission from our VDC during the survey phase. Likewise, we had coordinated with ward, while conducting our sensitization program. In going upcoming days also, we will be coordinating with different government bodies at local level.
What is your plan regarding implementation? Are you going with all three technologies simultaneously?	Clarification	Initially, we are planning for five years for three districts namely Udayapur, Makwanpur and Sindhuli, where we will be implementing total of 25,000 technologies – 10,000 biogas, 20,000 ICS and 15,000 water filtration technology respectively. We will be going with all three technologies simultaneously depending upon the needs of community.
Are you planning to implement it at a time in all wards?	Clarification	We will go on one by one approach starting from single community. Upon completion on one community we will start it on another. According to our plan, it is not limited in one District we will be implementing it simultaneously in other communities of other districts (Say: Makwanpur and Udayapur). Therefore, it is challenging to go simultaneously on different communities of same districts.
Under your project is it possible to keep both technologies say, Water filtration schemes and improved cooking stove in one household?	Clarification	Yes depending on the need, we can provide more than one technology.
What is the cost of all three ICS stoves?	Clarification	Excluding transportation cost, Matribhumi Chulo, Envirofit and Greenways stove cost

Stakeholder comment	Was comment taken into account (Yes/ No)?	Explanation (Why? How?)
		3000, 3700 and 3500 respectively.
Local Level Stakeholder Meeting (Women's Only) Udayapur Udhyog Banijye Sangh, Katari, Nepal 2018.10.09 (10am-12pm)		
Does this project allow one household to keep more than two technology?	Clarification	Yes
How much does this stove cost?	Clarification	It cost around 3,500
Why don't this project give us LPG gas?	Clarification	As we want to reduce the carbon emission this project doesn't promote LPG
How filtration will help improve our health?	Clarification	It helps to reduce the water bore disease like diarrhea, cholera etc. Also, while boiling water we might get prone to the respiratory disease due to indoor air pollution. This project is not just limited to health aspects as well as it helps to reduce the Green House Gas emission.
Can you bring Prakti Stove with Chimney as this stove doesn't have any chimney?	Clarification	We will decide based on the requirements of the community and the efficiency of the stove.
How much money we need to bear and how much project is bearing?	Clarification	Project is bearing the construction and material cost in case of biogas. While labor cost may have to be covered by the end user. In case of ICS and water filtration techniques to be end user must bear a minimum cost depending upon our implementation plan which is yet to be developed.
How long is the life span of this ICS?	Clarification	The lifespan of the ICS is about 6 years
How long is the project?	Clarification	The project is of 15 years
National level Stakeholder Meeting Yalamaya Dhokaima Café, Patan Dhoka, Lalitpur, Nepal 2018.10.011 (8am-12am)		
Which Methodology will be used?	Clarification	The GS methodology will be used to make emission reduction calculations for all the three technologies. In case of emission reduction, we can take gases i.e CO_2, CH_4, N_2O into consideration. The methodology is robust as water quality need to tested to be eligible to get selected for the implementation. This result into the less uncertainty on the emission calculation. More challenging can be on the monitoring part as it has lots of parameters to be considered.
How Project is planning to involve DNA of Nepal?	Clarification	Project will share its VPA upon finalization and take the DNA inputs in order to avoid duplication. As well, we invited DNA for their inputs for National Level Stakeholder Meeting.
Which model of ICS you will promoted?	Clarification	For our first VPA we are planning for the three model of ICS namely, Envirofit, Greenways and Matribhumi Chulo
Rather than focusing on the three technology why don't you	Clarification	As for our VAP-01, we are not covering the landscape level. We are more

Stakeholder comment	Was comment taken into account (Yes/ No)?	Explanation (Why? How?)
take one technology and cover the landscape part to calculate the carbon sequestration mechanism on Biogas and stick to it?		concerned on three RET (Energy-Component)
Will the project be at household, community or commercial level?	Clarification	For now we are limiting it to household level
How you are planning for biogas market for upcoming 5 year?	Clarification	Let not forget the realistic side of the Hilly reason where people are still depended on the livestock for their living where it can be a best option
Poorest of the poor cannot buy the biogas as it is a costly technology	Clarification	That is why we are covering the construction and material charge and the labor cost will be bear by the end user
Even in time of blockade people were depended on the LPG, how you are seeing this situation?	Clarification	Stacking will always be an issue as they want to use LPG occasionally due to cost issue. But our earlier stakeholder meeting at local level local women states that in the rural areas they are still depended on the traditional stove.
The changing scenario of Nepal as we are importing more excavators to construct road and villages are turning into urban areas. How you are considering this shift in paradigm of the Nepalese market?	Clarification	Yes, this is the reality of the developing nation as we all are shift into the urban areas. Looking into ground reality, as the women demand, we can do. As might be CERs and VERs can be less, but still it can't be failure. Also, stacking of LGP can be seen in village that is true.
Shifting of rural area to urban, less manpower in villages as biogas requires more force and stacking can be a problem. What do you think about it?	Clarification	Stacking is always there and it is true. Emission reduction will be accounted only for replacement of fuelwood.
As in one of our projects where we worked on the induction cooker but it turned out to be a failure. Latter people shifted into the traditional cook stoves. And the living standard of the people did not change.	Clarification	Yes, it has been shifted but it is not an isolated idea. We can incorporate it in our development projects, as we have been working in the rural areas.
Nowadays market is very volatile, it is very hard to maintain cost/ benefit analysis. Is there is any strategy if market price goes down?	Clarification	If market go slow, as GS has other alternative products upon which we can look at
There are only few stakeholders, why there is no Alternative Energy Promotion Center (AEPC)?	Clarification	We have tried to contact them several times and even invited them for the National level meeting. As it being the government agency to handle all the RET in Nepal, it is very difficult to get time from them. We plan to meet and take inputs meeting them at their office.
What you are thinking about the co ordinating with Government agencies?	Clarification	We will be coordinating with government agencies without it we cannot go. Also, at ward level, municipality level we are coordinating with them.

Stakeholder comment	Was comment taken into account (Yes/ No)?	Explanation (Why? How?)
How the technology is being transferred? How you are going to report or convinced local government?	Clarification	There is a software called "Tristle Monitoring Solution" where it tracks everything on very transparent way. For example: How many days it has been working? How many VERs has been generated? We have website where one can access it easily. Even SAHAS FOUNDATION can also use the same online monitoring solution to maintain transparency.
How you will incorporate private sector at local level?	Clarification	Material will go to the local Vendors and from where it can be easily accessible to people in case of Bio-gas except for the ICS as we need to import it on bulk.
Rather than Grievance mechanism, other means of communication and semi-annual hearing session from end user could be beneficial.	Yes	As we have already developed our way of taking inputs and grievance mechanism but even it can be a good option to add on the project. Also, SAHAS -Nepal is practicing other mechanism like social audit and joint monitoring for getting feedbacks and suggestion on its other projects.
As Bio-Gas requires water availability so people are shifting more into LPG, how you are considering this matter in your project?	Clarification	This is a true statement. As, we do feasibility study prior to the implementation of our project in any project sites.
Does your project involve the septic tank in case of Bio-gas? As there will be chemical involved in the land how will you address that?	Clarification	We are based only on cow and buffalo dung.
Local level Stakeholder Meeting Oshin Rest House,Hetauda, Makwanpur, Nepal 2018.10.28 (8am-12am)		
Instead of importing Greenways and Envirofit, can't we produce the likewise portable stove with higher efficiency in Nepal?	Clarification	As the efficiency of these stove are high, we have the stove design of less efficiency in Nepal
Can we modify the Matribhumi-chulo and make it in a portable design?	Clarification	As the model itself is fixed and cannot be portable but we can keep the same query with the Matribhumi's scientist
Does this project involve community septic tank for the Bio-gas?	Clarification	We are based on cow dung for now
Can't we design the system of water filtration on the municipal or community level water storage/distribution tank, so that one can directly consume safe drinking water from tap?	Clarification	It will not be covered by our project and the main focus was on the household level. At community level water tank, pollution is not just limited to storage tank as water might be infected due to water-supply system, which will be a big challenge.
How this project will finance the Bio-gas units?	Clarification	It will cover few thousands more than the Government Subsidy
Local level Stakeholder Meeting (Women's Only) Oshin Rest House,Hetauda, Makwanpur, Nepal 2018.10.29 (10am-12am)		

Stakeholder comment	Was comment taken into account (Yes/ No)?	Explanation (Why? How?)
What is the cost of the ICS?	Clarification	Excluding transportation cost, Matribhumi Chulo, Envirofit and Greenways stove cost 3000, 3700 and 3500 respectively.
Does your project give everything for free?	Clarification	It is based on the financial model where in order to maintain the ownership certain percentage should be beard by end users
Why you have chosen these three models of ICS in your project? Why not any other models?	Clarification	We can choose any model of ICS with efficiency higher than 20%. As all these stoves have efficiency more than 24% so we find them appropriate.
After implementation if we face any technical problems, who will help us?	Clarification	For the very purpose, we have designed our project where we will train the local person on it
Do you help us in solving our water crisis problem by constructing water storage tank for us?	Clarification	We are more focused on safe drinking water and purification of water at household level.
Local level Stakeholder Meeting Hotel Valley View Sindhuli, Nepal 2018.11.02 (8am-12am)		
Have you co-ordinated with the central level government bodies regarding the RET?	Clarification	Yes, we have been approaching the AEPC and still we are trying our best to get their time for further discussion on the matter
How you select the Teenpatan Rular municipality for its implementation? Why not other?	Clarification	All the municipalities and rural municipalities were selected on the basis of our baseline survey on the feasibility of RET on Sindhuli. As we cannot proceed the implementation simultaneously in all the places so it has been chosen to start up, upon its completion we will cover the other areas as well.
The financial mechanism of the project doesn't include the detail explanation of how the subsidy will be given?	Clarification	As of now we shared you regarding the Bio gas on how it will cover few thousands more than the subsidy given by the government. But for ICS and water filters 500-800 must be bear by the end user itself.
There are only stakeholders of Teenpatan Rural municipalities, why there is not the representative of other rural municipalities?	Clarification	We send an invitation letters to the representatives of other rural municipalities as well but they couldn't attend due to their busy schedule and geographical challenges to attend it
Why the calculation of the carbon emission was not shown in the presentation?	Clarification	As our PDD is not completed yet, we will share the information on our upcoming review meetings.
How many units of carbon is emitted from a single plant?	Clarification	We will disclose the details upon the completion of our PDD.
What is your yearly target for Sindhuli?	Clarification	1000- ICS, 300 Bio-gas plant and 200 safe drinking water devices
Local level Stakeholder Meeting (Women's Only) Lampantar Madhyemik Bidhyalaye,Lampantar, Teenpatan, Sindhuli Nepal 2018.11.03 (10am-12am)		
Can't we get everything on free?	Clarification	It is subsidy based
Can we get these stoves in the	Clarification	Green ways are seen on few places at it

Stakeholder comment	Was comment taken into account (Yes/ No)?	Explanation (Why? How?)
Sindhuli Market?		was distributed by cooperatives, but we cannot get the one directly on Sindhuli market
Does these ICS can be distributed by reaching door to door?	Clarification	Yes, for households which comes under projects
What is the cost of these ICS in market?	Clarification	Excluding transportation cost, Matribhumi Chulo, Envirofit and Greenways stove cost 3000, 3700 and 3500 respectively.

E.3. Report on consideration of comments received

>> (Describe how the comments have been addressed by providing a clarification to the stakeholder or by altering the design of the project or by proposing to monitor any anticipated negative impacts etc.)

The questions from the stakeholders were clarifications regarding project implementation for biogas improved cook stove and filters, construction of biogas units, service and maintenance. All the clarifications requested by the communities were provided during the stakeholder's meeting. There were no comments from the meeting which requires revisiting the sustainable development assessment. One of the suggestions that would be included is the communication and semi-annual hearing session from end user for hearing to grievance mechanism, which will be incorporated.

No aspect of the project was modified. No alterations were made. There were no comments or suggestions from the meeting which required modification of the project activity.

Appendix 1. Contact information of project participants

Organization name	SAHAS FOUNDATION
Registration number with relevant authority	558/A-1
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Appendix 2. Summary of post registration design changes