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

Version 1.1 – August2017

KEY PROJECT INFORMATION

Title of Project:	Biogas Support Program – Nepal (BSP-Nepal) Activity-2
Brief description of Project:	The Biogas Support Program - Nepal (BSP-Nepal) Activity-2 implemented by the Alternative Energy Promotion Centre (AEPC) aims to promote biogas digesters (biogas units) to households in the rural areas of Nepal. This Project Activity (PA) is registered as Clean Development Mechanism (CDM) Project on 27 December 2005. This project includes 9,688 biogas digesters which were implemented between 16/06/2004 and 06/04/2005. The project has already completed its 2nd crediting period and running under 3rd crediting period for CDM. The third CDM crediting period starts from 01/08/2019 to 31/07/2026.
Expected Implemetation Date: Expected duration of Project:	Implementation date: 16/06/2004 to 06/04/2005 Project duration: 20 years from the start date
Project Developer:	Alternative Energy Promotion Centre (AEPC)
Project Representative:	Alternative Energy Promotion Centre (AEPC)
Project Participants and any communities involved:	atmosfair gGmbH
Version of PDD: Date of Version:	01 10/07/2020
Host Country / Location:	Nepal
Certification Pathway (Project Certificatin/Impact Statements & Products	impact statements & products
Activity Requirements applied: (mark GS4GG if none relevant)	GS4GG (Renewable Energy Activity requirements)
Methodologies applied:	AMS I.E. version 09
Product Requirements applied:	GS-CER
Regular/Retroactive:	Retroactive registration
SDG Impacts:	1 – SDG 3 2 – SDG 7 3 – SDG 13
Estimated amount of SDG Impact Certified	SDG 3: 100% users percept reduction in health problem SDG 7: 100% users felt the reduction on firewood collection time due to clean energy access (Biogas) SDG 13: 35,357 tCO2eq

SECTION A. Description of project

A.1. Purpose and general description of project

The Biogas Support Program - Nepal (BSP-Nepal) Activity-2 implemented by the Alternative Energy Promotion Centre (AEPC) aims to promote biogas digesters (biogas units) to households in the rural areas of Nepal. The projects under the activities are distributed in different districts of Nepal which is given in table A.1 below. The project activity will reduce greenhouse gas (GHG) emissions by displacing conventionally used fuel sources for cooking, such as non-renewable woody biomass (firewood) and/or fossil fuels (kerosene and/or LPG). Although the proposed activity reduces CH4 and N2O emission reductions by introducing a proper disposal of animal waste and by producing a bio-slurry for replacing the consumption of chemical fertilizers, these emission reductions are excluded from the calculation of emission reductions, which is conservative .

The project activity is a sub-project of the BSP-Nepal umbrella biogas program that aimed to install a total of 200,000 biogas digesters all over Nepal. Since it is the first sub-activity of the umbrella biogas program, the sub-project is named BSP-Nepal Activity-1. The umbrella biogas program is the fourth phase of the Nepali government's biogas program at the national level. Under the first three phases, a total of 111,395 biogas units were installed all over Nepal.

Despite the government's past efforts to develop the biogas market with the support from international donors, namely the German Development Bank (KfW) and the Netherlands Development Agency (SNV), the investment in the biogas sector is a non-commercial activity and faces several barriers in Nepal. With the phasing out of international support for the sector, the umbrella program requires the support of CDM to sustain.

The key elements of the BSP-Nepal umbrella program's approach are:

- Financial support for end-users through micro finance institutions and cooperatives;
- Uniform technical design of biogas units;
- Thorough quality control and monitoring of the production, installation and after-sales services of the participating biogas companies;
- Continuous research & development efforts to optimize the design and operation of biogas digester units and to tailor units them to the needs of the end-users;
- Social marketing through outreach, awareness, and training programs;
- Implementation of a fertilizer extension program to maximize the benefits of bio-slurry, a by-product of the biogas;
- Support to institutions servicing various functions of the biogas sector such as financing, construction, maintenance, manufacturing, training, and marketing, and
- Installation of biogas units on a scale that demonstrates CDM application in the commercialization of the biogas sector.

As part of contributing to the overall goals of the umbrella program, the proposed project activity has installed a total of 9,688 small biogas digester units from June 16, 2004 to April 06, 2005 in a number of districts of Nepal as shown below in Table A.1. The biogas digesters are installed within the territory of Nepal.

Table A.1: Distribution of Biogas Units

Districts	Number of Plants	Districts	Number of Plants	Districts	Number of Plants
Arghakhachi	27	Kailali	550	Rasuwa	1
Baglung	9	Kanchanpur	531	Rautahat	74
Banke	125	Kapilbastu	172	Rupandehi	288
Bara	159	Kaski	562	Sankhuwasabha	78
Bardiya	233	Kathmandu	68	Saptari	11
Bhaktapur	44	Lalitpur	59	Sarlahi	170
Chitawan	717	Lamjung	292	Sindhuli	188
Dadeldhura	4	Mahottari	55	Sindhupalchowk	13
Dang	259	Makawanpur	414	Siraha	32
Darchula	6	Morang	466	Sunsari	213
Dhading	149	Myagdi	33	Surkhet	61
Dhankuta	206	Nawalparasi	395	Syangja	298
Dhanusa	11	Nuwakot	83	Tanahu	598
Dolakha	63	Okhaldhunga	1	Terathum	19
Doti	3	Palpa	204	Udayapur	123
Gorkha	141	Panchther	32	**Total**	**9688**
Gulmi	31	Parbat	21		
Ilam	140	Parsa	22		
Jhapa	849	Pyuthan	44		
Kavrepalanchowk	278	Ramechhap	63		

A biogas plant produces biogas, thermal energy for cooking. The power equivalent of the installed biogas units ranges from 1.16 KW to 2.32 KW and the total installed equivalent generation capacity of the proposed project activity totals 14.66 MW. The estimated average annual emission reduction from the project activity during this crediting period is 35,357 tCO_2e

Contribution to Sustainable Development

At the local level, the BSP-Nepal program has multiple social benefits. A major household benefit is the reduction in time and energy spent by women and children in collecting firewood for cooking. The project will attach latrines to biogas units providing better sanitation to rural households. Potential employment will add more than 15,000 people-years for skilled people in the construction, maintenance, marketing, and financing of biogas units. The use of biogas means negligible smoke, hence better family health. Moreover, the residual biological slurry from the biogas units can be used as superior organic fertilizers to enhance agricultural yields.

At the national level, the umbrella program supports the Nepali Government's sustainable energy goals as laid out in 10th Five Year Plan to improve energy access for rural poor and to reduce rural poverty by providing high quality biogas units to poor households at an affordable price. Additionally, the project will support forest conservation goals by substituting the non-renewable biomass used as firewood, with biogas, the renewable source of energy.

A.2. Eligibility of the project under Gold Standard

As the project has eligibility under Clean Development Mechanism (CDM) and is successfully implemented under CDM, this has also been eligible for GS4GG as the project activity involves dissemination of household biogas which is eligible under Gold Standard pursuant to clause 3.1.1 of the GS4GG Principles and Requirements document. The GS has published Renewable Energy Activity Requirements, therefore the proposed project falls under the automatic eligibility list of projects.

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

The technology used in this project activity is the household level biogas plants and the owner of the technology is the particular household using biogas plants. The owners of a digester signed an agreement with AEPC by transferring all legal rights, interests, credits, entitlements, benefits or allowances arising from or in connection with any greenhouse gas emissions reductions arising from the operation of the digester (Emission Reduction), and agrees to take all necessary action required to ensure the transfer of those Emission Reductions to the Alternative Energy Promotion Centre or its nominee, including executing any relevant documents. So, the ownership of the products that are generated under Gold Standard Certification is under Alternative Energy Promotion Centre.

A.4. Location of project

A.4.1. Host Country

Nepal

A.4.2. Region/State/Province etc.

The PA is distributed all over Nepal

A.4.3. City/Town/Community etc.

The PA database contains the following information for each digester: owner's name, VDC/NP, ward number or cluster, district, region, plant size, name of Installation Company, digester code and the commissioning date.

A.4.4. Physical/Geographical location

The digesters in this PA are located at various locations across Nepal. The geographical coordinates of Nepal are:

Latitude – North 26.20 degree to North 30.45 degree
Longitude – East 80.07 degree to East 88.20 degree

The PA database contains the following information for each digester: owner's name, VDC/NP, ward number or cluster, district, region, plant size, name of Installation Company, digester code and the commissioning date.

A.5. Technologies and/or measures

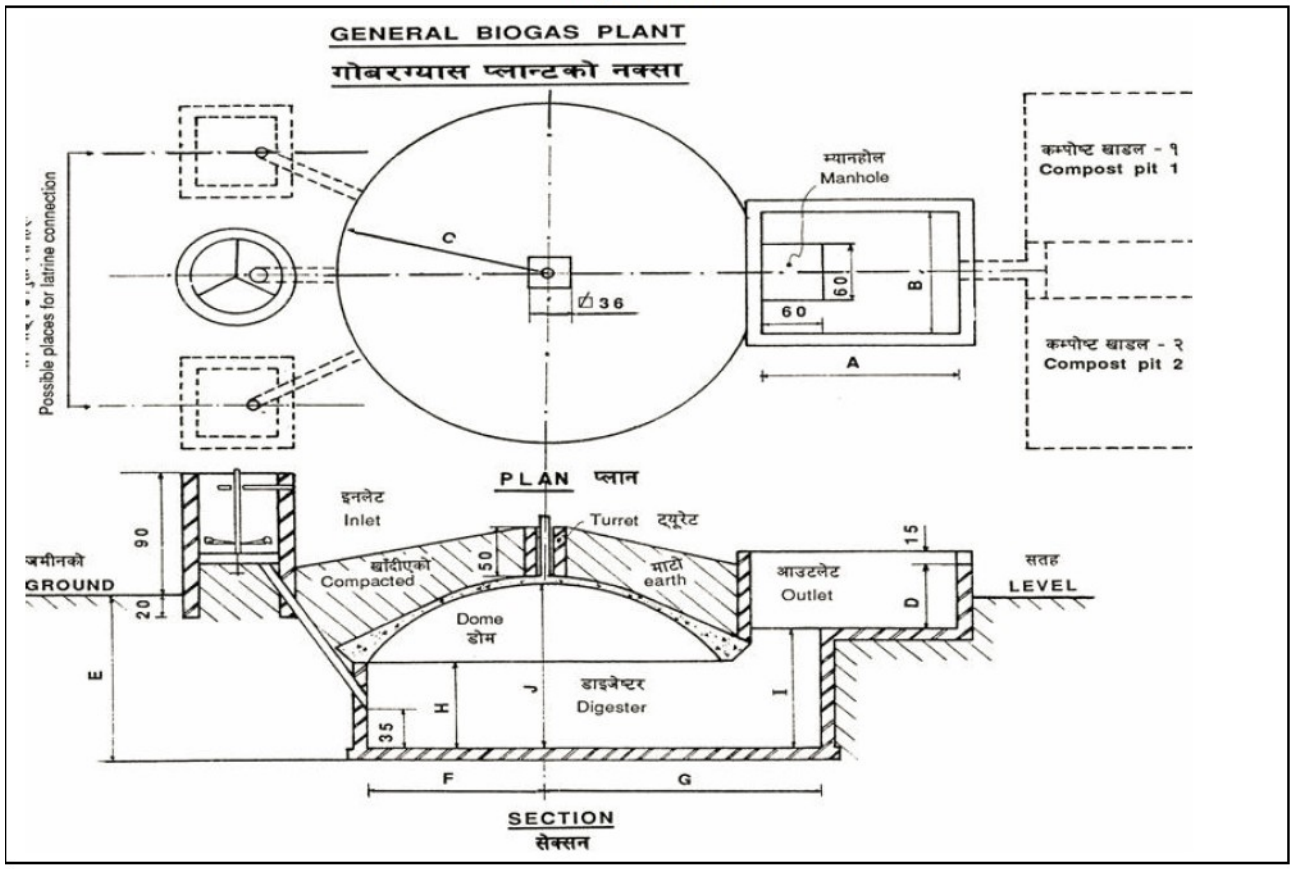
The existing traditional stoves used in the baseline are simple structures made from clay or having stone or metal tripods with poor combustion air supply or flue gas ventilation system i.e. without a grate or a chimney. These stoves use non-renewable biomass (firewood).

The household biogas digester units to be sold under this project activity will provide biogas for the thermal energy needs of households with at least 2 heads of cattle (cow or buffalo) and will displace fossil fuel and/or non-renewable biomass products

(firewood). Farming households living in villages in remote areas are the primary buyers of biogas units. The biogas units are based on a uniform technical design and are manufactured and installed following technical standards established in Nepal. The households will feed the dung of cattle (cows or buffaloes) mixed with water into the biogas plant, which through anaerobic digestion will produce biogas. The retention time of the slurry inside the tank is around 3 months. The figure below shows the technical design of the biogas plant.

Biogas household biogas digester units have been developed and produced in Nepal. Currently private companies produce biogas units. All biogas digester and appliance units except the main valve are produced locally, and are of good quality. Regarding the main valve, the limited biogas market does not justify the necessary investment for local production as yet; therefore the valves are imported from the Netherlands, Italy and/or Thailand. BSP-Nepal also provides R&D support and technical assistance to the individual companies. Over the last few years technology transfer has been facilitated, most notably through a long-term technical assistance program of the SNV (Netherlands Development Organization). The activities supported through this technical assistance have developed a large domestic knowledge base on construction, operation, and maintenance of high quality biogas units. The project activity promotes the biogas digester ranging from 2 m^3 to 10 m^3 with the operational life of 20 years. Different parts of the biogas digester are given in the Figure below.

Figure A.4.2



The target group of the BSP are households with at least two heads of cattle (generally cows or buffalos) who currently use non-renewable woody biomass (firewood) and/or fossil fuels (kerosene and/or LPG) for cooking purposes. The project aims to utilize the methane produced from household biogas digesters to replace the non-renewable energy sources that is used by households. The main feedstock for digesters is cattle manure and human excreta. Digesters are available in different sizes. The size of the

digester suitable for a given household depends on the number of people living in the house and the number of heads of cattle present.

The technology is environmentally sound. The digesters provide a decentralized source of energy and bring sustainable development benefits. The project also contributes to technology transfer since the technology is based on a Chinese design which has been tailored to the Nepalese situation with support of the Netherlands Development Organization SNV.

A.6. Scale of the project

The PA is small scale and is not a de-bundled component of a large CDM project. Each of the independent sub-systems (bio digesters) included in the PA is not greater than 1% of the threshold defined for a small scale project[1]. According to the project standard for the CDM project activity, the project activity belongs to Type I: Renewable Energy Projects as the maximum output from the project is below 45 $MW_{th.}$ There are 9688 Biogas individual units under the project activities with the estimated capacity ranges from 1.16 KW to 2.32 KW, the individual bio-digester also qualifies for the Type-I Micro-scale project which meets the limit of micro-scale of 5 MW capacity.

A.7. Funding sources of project

The project activity is a sub-project of the BSP-Nepal umbrella biogas program that received funding from Parties namely the German Development Bank (KfW) and the Directorate General for International Cooperation of the Government of the Netherlands (DGIS) through SNV as well as funding from Government of Nepal (GoN) through the Alternative Energy Promotion Center (AEPC). The providers of the public funding will not purchase any emission reductions generated by the proposed project and affirms that the funding of the project activities for the biogas program has not resulted in the diversion of ODA and that this funding is not counted towards the financial obligation of the concerned Parties. Additionally AEPC has also affirmed the same understanding regarding this funding.

A.8. Assessment that project complies with 'gender sensitive' requirements

The PA meets the mandatory gender requirements. Following three steps stipulated in the gender requirements elaborates the gender sensitiveness of the PA.

Step 1: Basic Concepts:

Does the project reflect the key issues and requirements of Gender Sensitive design and implementation as outlined in the Gender Policy? Explain how.

The project reflects the key issues and requirements of Gender Sensitive design and implementation as outlined in the Gender Policy. As the Gold Standard Gender Policy recognizes that gender relations, roles and responsibilities exercise important influence on women and men's access to and control over natural resources and the goods and services they provide, the project has given access to biogas to both men and women without inequality. Since the cooking and household chores in Nepal basically comes under the women's activity, the biogas promoted under the PA contributes multiple benefit to the women and children. The project meaningfully address attribution, generate livelihood benefits and promote approaches that enable women and men to more equitably contribute to and benefit from the project. The Biogas User Survey is being done continuously for the PA and from the regular survey, it is evidenced that the time for firewood collection and cooking has been reduced and is perceived by the users incase of men, women and children. The time saving that

[1] Guidelines on Assessment of Debundling for SSC Project Activities – Version 03, (EB 54, Annex 13)

they achieved from the biogas is being used for other income generating activities and social activities. The health of the users especially women have been improved caused by air pollution. It basically offers the drudgery reduction of women and children and also provides the leverage to the women to involve in economic activities and other social participation utilizing the time saved for the firewood collection. Considering the size of the technology and the service that it offers, it has potential to enable women economically which help reduce discrimination against women rather than deepening it.

Does the project align with existing country policies, strategies and best practices? Explain how.

Being a focal government entity to promote renewable energy in Nepal, the PD follows Renewable Energy Subsidy Policy[2] which has provisioned the additional support to construct Biogas for "targeted beneficiary group (women-led households with dependent children, earthquake victims from earthquake affected districts, endangered indigenous community identified by GoN and Dalit). PD has also developed the GESI Policy[3] which is given in Nepali language and it focuses on improving livelihood assets and capacities of women, poor and the excluded so that they can have access to different energy source. In addition, as per the Gender Equality and Social Inclusion Policy of AEPC it has mentioned that it will enhance their voice so that they can recognize their rights and influence decisions affecting them. So in every stakeholder consultation of renewable energy projects, it has to be ensure the women's participation and their comments are addressed.

The rural energy policy[4] of Nepal also ensures the implementation of the special programmes of promotional activities that emphasize on access to rural energy and role of rural energy in sustainable development, poverty reduction and positive impacts on women and children. As the rural energy is directly linked to activities traditionally carried out by the women in Nepal, the policy also emphasizes on the implementation of such technologies considering it as an integral part of the women's enabling activities. So, all the technologies are implemented under those national policies (rural energy policy and subsidy policy).

Step 2: Apply Gold Standard Safeguarding Principles

Does the project align with existing country policies, strategies and best practices? Explain how.

The project addresses questions raised in the Gold Standard Safeguarding Principles & Requirements document. It basically offers the drudgery reduction of women and children and also provides the leverage to the women to involve in economic activities and other social participation utilizing the time saved for the firewood collection. Considering the size of the technology and the service that it offers, it has potential to enable women economically which help reduce discrimination against women rather than deepening it. The detail analysis of the safeguarding principles realted to this is elaborated under component 3.2 of the safeguarding principles under section D of this PDD.

Step 3: Conduction of stakeholder consultation

[2] https://www.aepc.gov.np/uploads/docs/2018-06-19_RE%20Subsidy%20Policy,%202073%20(English).pdf

[3] https://www.aepc.gov.np/uploads/docs/l-uu-l-1542168651.pdf

[4] https://www.aepc.gov.np/uploads/docs/2018-06-24_Rural%20Energy%20Policy,%202006%20(English).pdf

Does the project apply the Gold Standard Stakeholder Consultation & Engagement Procedure, Requirements & Guidelines? Explain how.

Biogas digesters are sold to households throughout Nepal. Stakeholder consultation in the context of a consumer technology like a biogas digester is automatically built into the sales process. The consultation process involved detailed household survey of randomly selected biogas users and non-users of the selected Village Development Committees (VDCs) representing the major ethnic/caste groups of the two sample districts, focus group discussion with potential biogas users, and key informants interviews of knowledgeable persons contacted during the visits. User satisfaction and time saving for women for cooking other benefits have been monitoring regularly.

SECTION B. Application of selected approved Gold Standard methodology

B.1. Reference of approved methodology

The title and reference of the approved baseline and monitoring methodology applied to the small-scale project activity are as follows:

Title: Type I - Renewable energy project
Reference: AMS-I.E – Switch from Non-Renewable Biomass for Thermal Applications by the User, Version 09,
The detail of the methodology can be accessed from the UNFCCC website:
http://cdm.unfccc.int/methodologies/DB/IO5FJLJFWT91R6B8SO5BC7TXSK27I2

B.2. Applicability of methodology

The biogas digester represents a renewable energy intervention of the project to replace the non-renewable fuels and falls under the Type I (renewable energy) project category. The project was registered using the methodology AMS I.C. Thermal Energy for the User (Version 6). A revision (version 07) of methodology, AMS-I.C no longer included reference to projects that “displaces non-renewable biomass”. The Government of Nepal strongly advocated for the inclusion of biogas project that displaces non-renewable biomass under the CDM project and advocated for the development of new methodology. The deadlock was cleared at the thirteenth COP/MOP in 2007 due to active advocacy by the Government of Nepal with support from different stakeholders. Subsequently, the AMS I.E was approved at the 37th EB meeting. The approved methodology AMS I.E is eligible for the projects activities that displace the use of non-renewable biomass by introducing renewable energy technologies. Examples of these technologies include but are not limited to biogas stoves, solar cookers, passive solar homes, renewable energy based drinking water treatment technologies (e.g. sand filters followed by solar water disinfection; water boiling using renewable biomass).

Therefore, the methodology AMS-I.E - Switch from Non-Renewable Biomass for Thermal Applications by the User, Version 04 was used for the project during second crediting period. The project activity conforms to the Procedures for renewal of the crediting period of a registered CDM project activity, Version 06 (EB63, Annex 29). The same methodology with version 9.0 is applied for crediting period renewable for the third crediting period. The applicability of the methodology is outlined as below:

Criteria AMS-I.E.	Explanation
Small-Scale project requirement: for biomass, biofuel and biogas project activities, the maximum limit of 15 $MW_{(e)}$ is equivalent to 45 MW thermal	This project includes 9,688 small biogas digesters installed during the period June 16, 2004 to April 06, 2005. The power equivalent of the installed biogas units ranges from 1.16 kW

output of the equipment or the plant (e.g. boilers). For thermal applications of biomass, biofuels or biogas (e.g. the cookstoves), the limit of 45 MWth is the installed/rated capacity of the thermal application equipment or device/s (e.g. biogas stoves)[5]	to 2.32 kW and the total installed equivalent generation capacity of the proposed project activity totals 14.66 MW which is less than the limit of 45 MWth. Since the number of biogas units included in the project activity is fixed and did not change during the second crediting period the threshold requirement would be complied with during the third crediting period.
This category comprises activities to displace the use of non-renewable biomass by introducing renewable energy technologies. Examples of these technologies include but are not limited to biogas stoves, solar cookers, passive solar homes, renewable energy based drinking water treatment technologies (e.g. sand filters followed by solar water disinfection; water boiling using renewable biomass).	The biogas cook stoves used in the project are indeed "activities to displace the use of non-renewable biomass by introducing renewable energy technologies". AMS-I.E. even lists biogas stoves as an example of eligible end user technologies.
Project participants are able to show that non-renewable biomass has been used since 31 December 1989, using survey methods.	The biogas users survey (BUS) carried out in 2018 demonstrated that non-renewable biomass has been used since 31 December 1989. In that survey the respondents were asked to provide averages for the time needed to gather firewood, the distance travelled and the price before 28 years. The average of the estimates from all respondents, showed a clear increase on all three indicators

B.3. Project boundary

According to AMS-I.E, the project boundary is the physical, geographical site of the use of biomass or the renewable energy. At the unit level, the project boundary is defined by the individual sites and refers to the operation of the biogas digester units at the household level. Table below shows the emission sources that are under the control of the project participants and attributable to biogas digesters. Figure B.4.1 and B.4.2 show the physical relation between the emission sources and the project boundary.

[5] Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories, Version 10, paragraph 7c

Source		GHG	Included?	Justification/Explanation
Baseline	Emissions from NRB use for cooking	CO_2	Yes	Main emission source.
		CH_4	No	Excluded for simplification.
		N_2O	No	Excluded for simplification.
	Emissions from fossil fuel use for cooking	CO_2	No	Excluded for simplification.
		CH_4	No	Excluded for simplification.
		N_2O	No	Excluded for simplification.
Project activity	Emission from digester and biogas cooking stove	CO_2	No	This is not required by AMS.I.E
		CH_4	No	This is not required by AMS.I.E
		N_2O	No	This is not required by AMS.I.E

Figure B.4.1: Baseline emissions. Sources of GHG emissions and uses

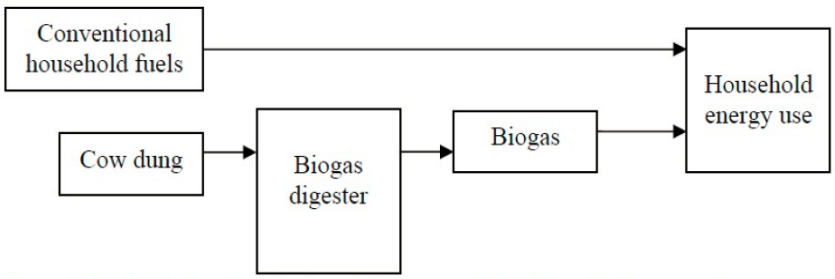


Figure B.4.2: Project emissions. Sources of GHG emissions and uses

B.4. Establishment and description of baseline scenario

As per the per the Procedures for renewal of the crediting period of a registered CDM project activity, Version 06 (EB 63, Annex 29) and as per paragraph 286 of the CDM Standard for project activities version 2, the demonstration of the validity of the original baseline or its update does not require a reassessment of the baseline scenario, but rather an assessment of the emissions which would have resulted from that scenario. For cooking, rural households use non renewable biomass as firewood, cow dung and agricultural waste. The use of fossil fuels like kerosene and LPG is insignificant. Research indicates that use of firewood has a low sensitivity to economic determinants. As the small scale project activity displaces the use of non renewable biomass by introducing a renewable energy technology, AMS-I.E, Version 09 is used to estimate the emission reductions for the third crediting period. According to AMS-I.E, Version 09, “in the absence of the project activity, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs”. As per the methodology,

the baseline scenario adopted for the project is the use of fossil fuels for thermal energy applications. This is a conservative approach to determine the baseline scenario. For the third crediting period, the Methodological tool "Assessment of validity of the original/current baseline and update of the baseline at the renewal of a crediting period" Version 03.0.1 (EB 66, Annex 47) is used to assess the continued validity of the original baseline. This tool provides a stepwise procedure to assess the continued validity of the baseline and to update the baseline at the renewal of a crediting period.

Step 1: Assess the validity of the current baseline for the next crediting period

The "Procedures for the renewal of the crediting period of a registered CDM project activity" requires assessing the impact of new relevant national and/or sectoral policies and circumstances on the baseline.

Step 1.1: Assess compliance of the current baseline with relevant mandatory national and/or sectoral policies

There are no mandatory national and/or sectoral policies that affect the baseline scenario during the renewal of the crediting period.

The fundamental elements of the baseline have not changed since the project was first registered. The relevant national and sectoral policies for the promotion of the biogas digester in the Nepal are the Rural Energy Policy, the Renewable (Rural) Energy Subsidy Policy and the Renewable (Rural) Energy Subsidy Delivery Mechanism.

The Rural Energy Policy was published in the year 2006. The Renewable (Rural) Energy Subsidy Policy was initially published in 2000 (prior to project start date) and latest revision has happened in 2016. Similarly, the Renewable (Rural) Energy Subsidy Delivery Mechanism was initially published in 2000 (prior to project start date) and latest revised in 2017.

The Renewable (Rural) Energy Subsidy Policy has made provisions of financial subsidy support for the installation of the household biogas plants. The Rural Energy Policy has put emphasis to increase efficiency, reduce cost of the household biogas production technology, and to promote it in high mountains.

The Renewable (Rural) Energy Subsidy Policy 2016 has made provisions of financial subsidy support for the installation of the household biogas plants in the range from 2, 4, 6, m^3 and above. The subsidy support is categorised based on the location of the biogas plants in the Terai (Southern Plains), Hills and Remote Hills. The subsidy support provided would cover a maximum of around 40% cost of installation of the biogas plants.

The Renewable (Rural) Energy Subsidy Delivery Mechanism, prepared based on the Subsidy Policy, has made arrangements to channel the subsidy to the biogas users through the pre-qualified biogas companies, which provide installation and after sales services related to biogas as per the standard and guidelines approved by the AEPC.

The above policies only provide the incentives for the installation of household biogas plants and do not provide any obligations or enforced targets, nor do they ban the use of fuel wood for cooking. The baseline scenario established for the project is therefore still valid.

Step 1.2: Assess the impact of circumstances

There is no impact of circumstances existing at the time of requesting renewal of the crediting period on the current baseline emissions.

As demonstrated in Step 1.1, the promotion of household biogas plants through national policies set up is on voluntary basis. The Renewable (Rural) Energy Subsidy Delivery Mechanism is part of the package design to enhance the Biogas Support Program. No other market transformation activities or circumstances outside the implementation of the BSP have influenced households shift from non-renewable biomass for cooking in rural areas or the shift to rural households biogas plants using renewable biomass. The deployment of BSP has continued during the first crediting period of the Project Activity 2. As described in Step 1.3, despite the policies, NRB continue to be the main energy source for cooking in rural areas. This is confirmed by the Biogas Users Survey 2017/18 for the Project Activity 2. The conditions used to determine the baseline emission in the previous crediting period are still valid.

Step 1.3: Assess whether the continuation of use of current baseline equipment(s) or an investment is the most likely scenario for the crediting period for which renewal is requested

This sub-step is applicable to the project activity since the baseline is the continuation of the existing practice, i.e. the households will rely on traditional cook stoves using non-renewable biomass in the absence of the project activity. The traditional stoves made from local materials are expected to continue in the absence of the project. Therefore, the continued use of baseline materials is possible.

To confirm that NRB based cook stoves continue to be used, the project participants conducted a survey to check whether the firewood replaced by the digesters is subject to the trends defined in AMS-I.E.: version 09 increasing amount of time needed or distance travelled for firewood gathering, increasing firewood prices or changes in the type of firewood used. The indicators selected to monitor the continued displacement of NRB in the project are:

1) Increase in time needed to gather firewood or increase in distance travelled to gather firewood
2) Increasing trend in fuel wood price.

The Biogas Users Survey 2017/18 reveals the following:

- Increase in time and distance travelled to gather firewood. The time required to reach the forest, collect one bundle of fire wood and return back now is 47 minutes; 99 minutes and 50 minutes respectively., whereas in 2000 it was 44 minutes, 76 minutes and 49 minutes respectively. Likewise, in 1989; it was 37 minutes, 83 minutes and 41 minutes respectively. This indicate that the sourcing biomass from forest over the years have become even more difficult.

- Increase in fuel wood price: The results reveal that the average market price of one bhari[6] of fuel wood in 1989 was NPR 37 which rose to NPR 491 in 2018. Contemporary price of fuel wood is more than 2.5 times the price in 2000 when the price was NPR 164/bhari.

If the operational lifetime of the biogas digesters is completed within this crediting period, that particular biogas digester will not be considered for the baseline emission calculation from the next consecutive monitoring period. As it can be seen that, the continuation of use of current baseline equipment, (non-renewable biomass based

[6] 1 Bhari is about 35 kg in an average

cook stove) is the most likely scenario for the crediting period for which renewal is being requested.

Step 1.4: Assessment of the validity of the data and parameters
There are some parameters such emission factors per fuel source (IPCC default values), emission reduction factor of the biogas units, which were determined at the start of the first crediting period and not monitored during the first crediting period, are not valid anymore. AMS-I.E, Version 09 provides new guidance on key parameters, different default values and emission reductions calculation formulas. So the current baseline was updated for the third crediting period according to the AMS-I.E, Version 09. Application of Steps 1.1, 1.2, 1.3 and 1.4 confirmed that the current baseline is valid for the third crediting period, but data and parameters needs to be updated. Therefore step 2 is used.

Step 2: Update the current baseline and the data and parameters
Step 2.1: Update the current baseline
The baseline emissions for the third crediting period have been assessed based on the latest approved version of the AMS-I.E (Version 09). More details on the updated baseline emissions for the third crediting period can be seen in section in B.6.

Step 2.2: Update the data and parameters
As mentioned in step 1.4 above, many default parameters have been updated and new parameters have been used (as per AMS-I.E Version 09) for this third crediting period. More details can be seen in sections B.6 and B.7 on the monitoring parameters relevant for the third crediting period.

B.5. Demonstration of additionality

The additionality of the PA is demonstrated in line with "Standard on the Demonstration of additionality, development of eligibility criteria and application of multiple methodologies for programme of activities, Version 03". If the above indicated eligibility criteria on technology and thresholds are met, additionality is complied with automatically. Thus there is no need for further assessment and demonstration of additionality.

B.6. Sustainable Development Goals (SDG) outcomes

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

Table below discusses the relevant SDG target for each three SDGs addressed by the project.

SDGs	Targets
3. Good Health and Well beings	• By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination
7. Affordable and Clean Energy	• By 2030, ensure universal access to affordable, reliable and modern energy services • By 2030, increase substantially the share of renewable energy in the global energy mix • By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support
13. Climate Action	• Improve education, awareness-raising and human and

	institutional capacity on climate change mitigation, adaptation, impact reduction and early warning • Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

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

Baseline Emission

According to AMS-I.E. version 09, para 20, the baseline emission reductions under a PA are calculated as the following:

$$BE_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossil\_fuel} \quad (1)$$

In which:

BE_y	Baseline Emissions during the year y (tCO2e)
B_y	Quantity of woody biomass that is substituted or displaced in tonnes
$f_{NRB.y}$	Fraction of woody biomass used in the absence of the project activity in year y that can be established as non renewable biomass
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel: 0.0156 TJ/tonne. The value is according to the methodology AMS I.E.
$EF_{projected.fossilfuel}$	Emission factor for substitution of non renewable woody biomass by similar consumers. Use a value of 63.7 tCO_2/TJ[7]

Following option a) of paragraph 21, B_y is "Calculated as the product of the number of households multiplied by the estimate of average annual consumption of woody biomass per household that is displaced by the project activity (tonnes/household/year)". Thus, B_y will be calculated as follows:

$$B_y = N_{HH} \times (BC_{BL,HH,y} - BC_{PJ,HH,y}) \quad \text{Equation (2)}$$

Where:

N_{HH}	=	Number of households in the project activity, number
$BC_{BL,HH,y}$	=	Average annual consumption of woody biomass per household before the start of the project activity, tonnes/household/year
$BC_{PJ,HH,y}$	=	If it is found that pre-project devices were not completely displaced but continue to be used to some extent, average annual consumption of woody biomass per household in the pre-project devices during the project activity, tonnes/household/year

B_y will be calculated multiplying with the actual household of this PA that have operational digester in year y identified through survey method. Calculations will be carried out based on Excel spread sheets using the database of PA that are already included. The database provides e.g. commissioning date.

Project Emissions

[7] This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. The value is calculated, based on the global average ratio of cooking fuels (the normalized ratio of kerosene and liquefied petroleum gas (LPG) excluding coal), i.e. 9 per cent for kerosene (71.5 t CO2/TJ) and 91 per cent for LPG (63.0 t CO2/TJ).

The AMS I.E Version 9 requires calculation of project emission using "TOOL16: Project and leakage emissions from biomass". As the fuelwood are basically sourced from the nearby and natural forest, which does not require processing of the feedstock and also does not include the cultivation, the project emissions (PE_y) is not applicable to this PA and is taken as zero.

Leakage

As per para 24 of the AMS I.E version 9, the default factor of 0.95 is used to account for any potential leakage (i.e. By is multiplied by a net to gross adjustment factor of 0.95 to account for leakages).

Thus the leakage emission under a PA is calculated as the following:

$$LE_y = 0.05 \times B_y . f_{NRB,y} . NCV_{biomass} . EF_{projected\_fossilfuel} \quad 3$$

Emission Reductions

As the methodology AMS IE version 09, para 27, the emission reductions are to be estimated based on the following equation:

$$ER_y = BE_y - PE_y - LE_y$$

Where:

ER_y = Emission reductions in year *y*, tonnes CO_2eq

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

Relevant SDG Indicator	3.9.1 Mortality rate attributed to household and ambient air pollution
Data/parameter	**$f_{NRB,y}$**
Unit	%
Description	Fraction of woody biomass saved by the project activity during year y that can be established as non-renewable biomass
Source of data	Calculated as per "TOOL30: Calculation of the fraction of non-renewable biomass"
Value(s) applied	86.1%
Choice of dataorMeasurement methods and procedures	The value is calculated as 86.1% using the national statistics and also validated by the Ministry of Forest and Environment, Government of Nepal. This value is for the national level, so will not be monitored.
Purpose of data	Calculation of baseline emission
Additional comment	This parameter shall remain fixed for the crediting period.

Relevant SDG Indicator	13.1.1 Number of countries that have communicated the establishment or operationalization of an integrated policy/strategy/plan which increases their ability to adapt to the adverse impacts of climate change, and foster climate resilience and low greenhouse gas emissions development in a manner that does not threaten food production (including a national adaptation plan, nationally determined contribution, national communication, biennial update report or other)
Data/parameter	**$EF_{projected\_fossil\ fuel}$**
Unit	tCO2/TJ

Description	Emission factor for the projected fossil fuel consumption in the baseline.
Source of data	Approved small scale methodology AMS.I.E (version 09)
Value(s) applied	63.7
Choice of dataorMeasurement methods and procedures	AMS-I.E. requires using this value.
Purpose of data	Emission Reduction calculation
Additional comment	N/A

Relevant SDG Indicator	7.1.2 Proportion of population with primary reliance on clean fuels and technology
Data/parameter	**N_{HH}**
Unit	Numbers
Description	Number of households in each PA in year y
Source of data	BSP database
Value(s) applied	9,688 digesters
Choice of dataorMeasurement methods and procedures	The registration procedure of the database avoids double counting of digesters and the registration of digesters that have not been commissioned.
Purpose of data	Calculation of baseline emission
Additional comment	During calculation of Emission Reduction, it will be based on actual number of households having the biogas operational

Relevant SDG Indicator	3.9.1 Mortality rate attributed to household and ambient air pollution
Data/parameter	**$BC_{BL,HH,y}$**
Unit	tonne/household/year
Description	Average annual consumption of woody biomass per household before the start of the project activity
Source of data	Based on survey (Biogas User Survey (BUS)) for project activity
Value(s) applied	5.02
Choice of dataorMeasurement methods and procedures	Calculated using option (b) Historical data or a sample survey conducted as per the latest version of the "Standards:Sampling and surveys for CDM project activities and programme of activities;" Biogas User Survey follows the standard sampling and surveys guidelines indicated in the PDD registered for second crediting period.
Purpose of data	Calculation of baseline emission

Additional comment	This value is used in the calculations and shall remain fixed for the crediting period.

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

The emission reduction calculation is based on data that is specified to digester size and region. This section provides explanation of calculation made.

Baseline Estimates

Baseline Emission

According to AMS-I.E (version 09), the baseline emission under a PA are calculated as the following:

$$BE_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossil\_fuel}$$

In which:

BE_y	Baseline Emissions during the year y (tCO2e)
B_y	Quantity of woody biomass that is substituted or displaced in tonnes
$f_{NRB.y}$	Fraction of woody biomass used in the absence of the project activity in year y that can be established as non renewable biomass, Use 86.1%[8]
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel: 0.0156 TJ/tonne). The value is according to the methodology AMS I.E.
$EF_{projected.fossilfuel}$	Emission factor for substitution of non renewable woody biomass by similar consumers. Use a value of 63.7 tCO_2/TJ[9]

Thus, B_y will be calculated as follows:

N_{HH}	9688
$BC_{BL,HH,y}$	5.02 tonne/household/year[10]
$BC_{PJ,HH,y}$	0.53 tonnes/household/year[11]
Operational status of Biogas	100%[12]

By = 9688*100%*(5.02-0.53) = 43,499.12 tonne/year

Considering
$f_{NRB,y}$ = 86.1% (calculated using Tool 30: calculation of the fraction of non-renewable biomass
NCV biomass = 0.0156 TJ/tonne (as per the methodology AMS I.E version 9)
$EF_{projected\_fossil\_fuel}$ = 63.7 tCO_{2e}/TJ (as per the methodology AMS I.E version 9)

Baseline Emission is calculated as BE_y = 37,217 tCO_{2e}

Baseline estimation for SDG 13: 37,217 tCO2eq

[8] The value is calculated using "TOOL 30: Calculation of the fraction of non-renewable biomass" and the value is fixed ex-ante.

[9] This value represents the emission factor of the substitution fuels likely to be used by similar users, on a weighted average basis. The value is calculated, based on the global average ratio of cooking fuels (the normalized ratio of kerosene and liquefied petroleum gas (LPG) excluding coal), i.e. 9 per cent for kerosene (71.5 t CO2/TJ) and 91 per cent for LPG (63.0 t CO2/TJ).

[10] Biogas User Survey 2017/18 for PA-2

[11] Biogas User Survey 2017/18 for PA-2

[12] For ex ante 100% is taken however actual operational status is arrived using sample survey for expost

Baseline estimation for SDG 3:

1) Users' perception on reduction in health problem: 0% houdeholds perceived in reduction of eye infection, respiratory disease, cough and fire related injury (as using biomass for cooking)

Baseline estimation for SDG 7:

1) Users' perception on time saving due to project for firewood collection: 0% houseolds for men, women and children as no biogas was used in baseline

Project Estimates
Project Emissions
$PE_y = 0$

Leakage
The default factor of 0.95 is used to account for any potential leakage, as prescribed by the methodology.
Thus the leakage emission under a PA is calculated as the following:

$LE_y = 0.05*37,214= 1,860\ tCO_{2e}$

Project estimates for SDG 13: 1,860 tCO2eq (project leakage)

Project Estimate for SDG 3:
Users' perception on reduction in health problem): 100% houdeholds perceive reduction in eye infection, respiratory disease, cough and fire related injury (As by using biogas, it is expected 100% users will perceive reduction)

Project estimation for SDG 7:
Users' perception on time saving due to project for firewood collection: 100% houseolds for men, women and children due to using biogas

Net benefit
Emission Reductions
As the methodology AMS IE version 09, para 27, the ex-ante emission reduction is estimated as below:

$$ER_y = BE_y - PE_y - LE_y$$

= 37,217 – 0 – 1,860
= 35,357 tCO_{2e} (round down value).

Please refer ER calculation spreadsheet for further details of the calculation.

Net benefit for SDG 13: 35,357 tCO2eq

Net benefit for SDG 3:
Users' perception on reduction in health problem): 100% houdeholds perceive reduction in eye infection, respiratory disease, cough and fire related injury (As by using biogas, it is expected 100% users will perceive reduction)

Net benefit for SDG 7:
Users' perception on time saving due to project for firewood collection: 100% houseolds for men, women and children due to using biogas

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

For SDG 13

Year	Baseline estimate	Project estimate	Leakage	Net benefit
Year A	37,217	0	1,860	35,357
Year B	37,217	0	1,860	35,357
Year C	37,217	0	1,860	35,357
Year D	37,217	0	1,860	35,357
Year E	37,217	0	1,860	35,357
Year F	37,217	0	1,860	35,357
Year G	37,217	0	1,860	35,357
Total	**260,519**	0	**13,020**	**247,499**
Total No of Crediting Years	7			
Annual average over the crediting period	37,217	0	1,860	35,357

For SDG 3 and SDG 7

Indicators	Baseline estimate	Project estimate	Net benefit
3.9.1 Mortality rate attributed to household and ambient air pollution (Users' perception on reduction in health problem)	0%	100%	100%
7.1.2 Proportion of population with primary reliance on clean fuels and technology (Users' perception on time saving due to project for firewood collection)	0%	100%	100%

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Relevant SDG Indicator	3.9.1 Mortality rate attributed to household and ambient air pollution
Data / Parameter	**$NCV_{biomass}$**
Unit	TJ/tonne
Description	Net calorific value of the non-renewable biomass that is substituted
Source of data	This value will be kept up to date with the IPCC guidelines.
Value(s) applied	0.0156
Measurement methods and procedures	AMS-I.E. Ver 09 requires using this value.
Monitoring frequency	N/A
QA/QC procedures	N/A

Purpose of data	Emission Reduction calculation
Additional comment	NA

Relevant SDG Indicator	3.9.1 Mortality rate attributed to household and ambient air pollution
Data / Parameter	$BC_{PJ,HH,y}$
Unit	tonnes/household/year
Description	Average annual consumption of woody biomass per household in the pre-project devices during the project activity, if it is found that pre-project devices were not completely displaced but continue to be used to some extent.
Source of data	Biogas User Survey
Value(s) applied	0.53 tonnes/household/year for the ex-ante calculation as per the Biogas User Survey for project activities. For this crediting period, this parameter will be determined using regular user survey.
Measurement methods and procedures	Biogas User Survey will be conducted on a sample of households. The sample size is determined to achieve 90% confidence interval and a 10% margin of error. During the survey, the estimates of the biogas users on the average annual consumption of woody biomass during the monitoring period will be captured.
Monitoring frequency	At least once every two years (biennial)
QA/QC procedures	Though the methodology requires sample survey biannually, PP conducts the user survey annually to ensure the number of biogas digesters operational for that particular year for PA and the consumption of the woody biomass by pre-project device if any during the project activities.
Purpose of data	Calculation of baseline emission
Additional comment	ERs will be accounted only for functional biogas in the particular monitoring period

Relevant SDG Indicator	3.9.1 Mortality rate attributed to household and ambient air pollution
Data / Parameter	By
Unit	tones/year
Description	Quantity of woody biomass that is substituted or displaced
Source of data	Biogas User Surveys
Value(s) applied	This will be calculated based on the operational status of the biogas digesters for particular monitoring period and the woody biomass consumed by pre-project devices during project activity. It ranges from zero when biogas is not in operation to 5.02 tonnes/household/year when $BC_{PJ,HH,y}$ is zero and biogas is operational.

Measurement methods and procedures	The calculation of the By depends on the operational status of the biogas units for the particular monitoring period and the operational status will be checked annually during the Biogas User Survey. From the total population of biogas units included in the project activity, statistically representative samples will be drawn for the purpose of carrying out the survey. The sample size is determined to achieve 90% confidence interval and a 10% margin of error. The percentage of biogas units found to be operational during the sample survey shall be used to calculate the weighted average operational status of the biogas which then will be used to calculate By as follows: $By = N_{HH}*(BC_{BL,HH,y} - BC_{PJ,HH,y})$ where N_{HH} will be the household with operational biogas digester for the particular monitoring period. $N_{HH} = N * P_Y$, where N is the number of bio digesters installed in the project and Py is Proportion of Bio-digesters operational estimated based on the sample survey
Monitoring frequency	At least once every two years (biennial)
QA/QC procedures	Though the methodology requires sample survey biannually, PP conducts the user survey annually to ensure the number of biogas digesters operational for that particular year for PA.
Purpose of data	Calculation of baseline emission
Additional comment	Once the biogas included in the project activity completes its operational lifetime, those biogas will not be considered for the next consecutive monitoring.

Relevant SDG Indicator	3.9.1 Mortality rate attributed to household and ambient air pollution
Data / Parameter	Users' perception on reduction in indoor air pollution
Unit	Qualitative
Description	Users' perception on reduction in indoor air pollution
Source of data	Biogas User Survey
Value(s) applied	To be monitored
Measurement methods and procedures	Air quality will be assess through users interviews during the Biogas User Survey.
Monitoring frequency	at least biennial
QA/QC procedures	The selection of households under the surveys will ensure that these percentages are met also for PA; survey will try to capture the view of the women actually involved in cooking.
Purpose of data	Sustainable Development Assessment.
Additional comment	Requirements as defined in the sampling plan shall be met.

Relevant SDG Indicator	3.9.1 Mortality rate attributed to household and ambient air pollution
Data / Parameter	Reduction in health problem

Unit	Qualitative
Description	Users' perception on reduction in health problem
Source of data	Biogas User Survey
Value(s) applied	To be monitored
Measurement methods and procedures	Reduction in health problem will be assess through users interviews during the Biogas User Survey.
Monitoring frequency	at least biennial
QA/QC procedures	The selection of households under the surveys will ensure that these percentages are met also for PA.
Purpose of data	Sustainable Development Assessment.
Additional comment	Requirements as defined in the sampling plan shall be met.

Relevant SDG Indicator	3.9.1 Mortality rate attributed to household and ambient air pollution
Data / Parameter	User's perception in Time saving for the cooking (reduce exposure to indoor air pollution)
Unit	Qualitative
Description	Users' perception on time saving for cooking due to project
Source of data	Biogas User Survey
Value(s) applied	To be monitored
Measurement methods and procedures	Assess through users interviews during the Biogas User Survey.
Monitoring frequency	at least biennial
QA/QC procedures	The selection of households under the surveys will ensure that these percentages are met also for PA; survey will try to capture the view of the women actually involved in cooking.
Purpose of data	Sustainable Development Assessment.
Additional comment	Requirements as defined in the sampling plan shall be met.

Relevant SDG Indicator	7.1.2 Proportion of population with primary reliance on clean fuels and technology
Data / Parameter	Time saving (Fuel wood collection)
Unit	Qualitative
Description	Users' perception on time saving due to project for firewood collection
Source of data	Biogas User Survey
Value(s) applied	To be monitored
Measurement methods and procedures	Assess through users interviews during the Biogas User Survey.
Monitoring frequency	at least biennial

QA/QC procedures	The selection of households under the surveys will ensure that these percentages are met also for PA.
Purpose of data	Sustainable Development Assessment.
Additional comment	Requirements as defined in the sampling plan shall be met.

Relevant SDG Indicator/Safeguarding Principle	3.9.3 Mortality rate attributed to unintentional poisoning
Data / Parameter	Users perception in reduction of chemical fertilizers
Unit	Qualitative
Description	Users' perception on reduction in use of chemical fertilizers and use of bio-slurry
Source of data	Biogas User Survey
Value(s) applied	To be monitored
Measurement methods and procedures	Assess through users interviews during the Biogas User Survey.
Monitoring frequency	at least biennial
QA/QC procedures	The selection of households under the surveys will ensure that these percentages are met also for PA.
Purpose of data	Sustainable Development Assessment.
Additional comment	Requirements as defined in the sampling plan shall be met.

Relevant SDG Indicator	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	Improved access to sanitation services
Unit	Number
Description	Users' perception on connection of toilet to biogas
Source of data	Biogas User Survey
Value(s) applied	To be monitored
Measurement methods and procedures	User Survey
Monitoring frequency	At least bi-Annual
QA/QC procedures	The selection of households under the surveys will ensure that these percentages are met also for PA.
Purpose of data	Sustainable Development Assessment.
Additional comment	Requirements as defined in the sampling plan shall be met.

Relevant SDG Indicator/Safeguarding Principle	Safeguarding Principle 4.3.8
Data / Parameter	Impact on Crop Productivity
Unit	Qualitative

Description	Users' perception on Impact on crop productivity (comparing to baseline)
Source of data	Sampling Surveys/Annual usage survey/Monitoring survey
Value(s) applied	To be monitored
Measurement methods and procedures	Assess through users interviews during the Biogas User Survey.
Monitoring frequency	at least biennial
QA/QC procedures	The selection of households under the surveys will ensure that these percentages are met also for PA.
Purpose of data	Sustainable Development Assessment.
Additional comment	Requirements as defined in the sampling plan shall be met.

B.7.2. Sampling plan

Internal monitoring activities as part of the overarching BSP programme

AEPC carries out thorough quality control activities to ensure that the biogas digesters are built according to set quality standards following the subsidy delivery mechanism and other set standard. This includes setting up random sampling, field visits, on the spot advice to biogas companies and biogas owners, collecting and analyzing data obtained through questionnaire during visits. Note that this quality control is carried out to ensure quality of the digesters but not necessarily to calculate the emission reductions.

Monitoring

1) Digester performance and average annual consumption of woody biomass

The performance of the bio-digesters and average annual consumption of woody biomass by project devices will be assessed based on the performance reports (Biogas User Survey). The corresponding survey may be conducted as part of the quality control procedures of AEPC.

The annual Biogas User Survey (BUS) will be conducted to assess the parameters given above. The survey will be conducted following statistically sound sampling procedure. The Annual Biogas User Survey will be conducted following the Standard for Sampling and Surveys for CDM Project activities and Programme of Activities Ver. 4.0 (EB86, Annex 4). As part of the survey, statistically representative sample of biogas users will be surveyed and in order to achieve 90% confidence interval and a 10% margin of error requirement for the sampled parameters. Stratified random sampling will be applied in conducting survey. The sample to be surveyed will be drawn randomly from the population of biogas digester distributed in each stratum (i.e. remote hill, hill and terai) spread within the project boundary.

The target population is the households using biogas digester units spread over in Terai, hill and Remote Hill of Nepal where a total of 9,688 biogas digesters units were installed under the Biogas Support Program - Nepal (BSP-Nepal) Activity-2. The population is distributed across Nepal.

The sample size determination is applied to the entire population of users of biogas plants (households). The total population is used for the sampling size calculation is 9,688 biogas plants. As required in AMS-I.E, Version 09, for annual survey, the sample has to be determined with 90/10 confidence/precision level.

Proportional Parameter (Biogas Performance)

The percentage of digesters operational is a proportion value for the categorical data requiring two possible answers (YES or NO). The minimum sample size is calculated using appendix 1 para 24 of Standard for Sampling and Surveys for CDM Project activities and Programme of
Activities Ver. 4.0 (EB86, Annex 4).

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

Where:
N = Total Population (9692)
n = sample size

$V = \frac{SD^2}{\bar{p}^2} = \frac{\text{overall variance}}{\bar{p}^2}$ and $\bar{p}$ is the overall proportion.

$$SD^2 = \frac{(g_a \times p_a(1-p_a)) + p_b(g_b \times (1-p_b)) + (g_c \times p_c(1-p_c)) + \cdots + (g_k \times p_k(1-p_k))}{N}$$

and

$$\bar{p} = \frac{(g_a \times p_a) + (g_b \times p_b) + (g_c \times p_c) + \ldots + (g_k \times p_k)}{N}$$

Where,
g_i is the size of the i_{th} group and p_i is the expected proportion of i_{th} group. The sample in each strata then will be calculated as below:

$$n_i = \frac{g_i}{N} \times n$$

To calculate the sample size, following parameters are considered for this project activities.

Particulars	**Symbol**	**Value**	**Remarks**
Total Number of Population	N	9688	Database
Number of Biogas in Terai	g_t	5332	Database
Expected operational Proportion of Biogas in Terai	p_t	0.82	As per Biogas User Survey 2017/18 for the project activity
Number of Biogas in Hill	g_h	4272	Database
Expected operational Proportion of Biogas in Hill	p_h	0.71	As per Biogas User Survey 2017/18 for the project activity
Number of Biogas in Remote Hill	g_{rh}	84	Database
Expected operational Proportion of Biogas in Remote Hill	p_{rh}	0.5	As per Biogas User Survey 2017/18 for the project activity

The sample size is calculated as 79. In order to anticipate any low response rate and answers bias, at least 10% oversampling has to be done with minimum sample of 87 is retained for the monitoring of operational status of the Biogas digesters.

For the first monitoring, the values as described above are applied. For the following monitoring periods, the estimates shall be adjusted taken the results of the previous monitoring period(s) into account. The project participants can use a sample size larger than the minimum calculated depending on budget availability. The actual sample size will be established for each biogas users survey.

Mean value parameter (Average annual consumption of woody biomass by pre-project device during project activity)

The minimum sample size for the monitoring parameters is determined using the equation given in para 60 of appendix 1, EB 86 Annex 4, Guidelines for Sampling and Surveys for CDM Project activities and Programme of Activities Ver. 4.0.

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

Where,

V = $(SD/Mean)^2$
n = Sample Size
N = Total number of Population
SD = Overall standard deviation
Mean = Overall mean for the average annual woody biomass consumption by pre-project device during project activity
1.645 = Represent 90% confidence required
0.1 = Represent the 10% relative precision

To calculate the sample size, following parameters are considered for this project activities.

Particulars	**Symbol**	**Value**	**Remarks**
Total Number of Population	N	9688	Database
Overall standard deviation	SD	0.26	As per Biogas User Survey 2017/18 for the project activity
Overall mean	Mean	0.53	As per Biogas User Survey 2017/18 for the project activity

The sample size is calculated as 69. Since minimum sample required for the proportional parameter is retained as 87, same samples will be taken for the mean value parameters conservatively. So, for the monitoring of this activity, minimum 87 samples will be retained to monitor all parameters.

B.7.3. Other elements of monitoring plan

The various aspects to be monitored according to the methodology are presented in the table below:

Aspects to be monitored according to Methodology	**Applicability to the Project**	**Parameter to be Monitored (YES/NO/ NA)**
Monitoring shall consist of checking of all appliances or a representative	Emission reductions is directly proportional	Yes

sample thereof, at least once every two years (biennial) to ensure that they are still operating or are replaced by an equivalent in service appliance.	to the number of appliances (digesters in case of the project) still performing. So this needs to be monitored.	(based on operation reports carried out at least biennial)
In order to assess the leakages, monitoring shall include data on the amount of woody biomass saved under the project activity that is used by non project households/users (who previously used renewable energy sources). Other data on nonrenewable woody biomass use required for leakage assessment shall also be collected	The methodology allows the use of a default factor of 0.95 to account for leakage. So this will not be monitored in the project.	No (Instead a default factor of 0.95 shall be used)
Monitoring should confirm the displacement or substitution of the non-renewable woody biomass at each location.	This shall be ensured by monitoring the number of appliances (digesters in case of the project) still performing	Yes (based on the performance reports carried out at least biennial, e.g. BUS, and in addition to eligibility criteria that also confirm use of NRB)
Sustainable development parameters and safeguarding principles to be assessed as per PDD	This shall be ensured by different parameters listed in B.7.1 above	Yes (Biogas User Survey Report conducted at least Biennial following the applicable sampling guideline for PA)

SECTION C. Duration and crediting period

C.1. Duration of project

C.1.1. Start date of project

16/06/2004
Biogas digester units were installed between 16/06/2004 and 06/04/2005.

C.1.2. Expected operational lifetime of project

20 years

C.2. Crediting period of project

C.2.1. Start date of crediting period

01/08/2019 as the second crediting is ended on 31/07/2019. This pertains to the starting date of the third CDM crediting period. The GS crediting period start date is the date before 2 years from the inclusion date (Design Certification) in GS

The length of the first CDM crediting period was from 01/08/2005 to 31/07/2012 and the second crediting period was 01/08/2012 to 31/07/2019.

C.2.2. Total length of crediting period

7 years. This pertains to the length of the third CDM crediting period

SECTION D. Safeguarding principles assessment

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

Safeguarding principle	Assessment questions	Assessment of relevance to the project (Yes/potentially/no)	Justification	Mitigation measure (if required)
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 rather it enhances the participation and inclusion. **Conclusion: the parameter will not be monitored.**	
3.2 Gender Equality and Women's Rights	1. The Project shall complete the following gender assessment questions in order to informRequirements 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	a) No b) No c) No	a) The project enhances the women's access and entitlement of benefits. Since the women will be direct user of the Biogas stoves, 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.	

	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 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	d) Yes e) No f) No g) No	**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 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.	

	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?		**Conclusion: the parameter will not be monitored as the PA is implemented already** 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 project for community that will improve the health of those communities. **Conclusion: Since the PA is registered already in CDM and all the biogas are constructed already, 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?	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**	
3.5 Corruption	1. The Project shall not involve, be complicit in or inadvertently contribute to or reinforce corruption or corrupt Projects.	No	The project implementation is guided by the government 's subsidy policy and duely followed the set quality standard. Quality assurance and quality control is an intregal part of the project impleentation ensuring the quality throughout the project cycle. **Conclusion: The parameter will not be monitored.**	
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	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 by offering the time saving, ease in cleaning the utensils, reducing health risk and indoor air pollution etc. This has no any negative economic impacts. **Conclusion: the parameter will not be monitored**	

	groups in targeted communities and that benefits are socially-inclusive and sustainable.			
4.1.1 Emissions	Will the Project increase greenhouse gas emissions over the Baseline Scenario?	No	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. **Conclusion: The parameters will be calculated based on the operational status of the project units**	
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**	
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**	
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**	

4.3.1 Landscape modification and soil	Does the Project involve the use of land and soil for production of crops or other products?	No	The project doesn't involve use of 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.**	
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.**	
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.**	
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.**	
4.3.6	Will the Project involve	Yes	The project units produces the	

Pesticides and fertilizers	the application of pesticides and/or fertilisers?		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 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.**	
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.**	
4.3.9 Animal Husbandry	Will the Project involve animal husbandry?	No	The project doesn't involve any activity that requires animal husbandry. Therefore the safeguarding principle under consideration will not be triggered by the project. **Conclusion: the parameter will not be monitored.**	

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from stakeholders

Please refer to the section E of the registered CDM-PDD (version 10 dated 14/03/2019) for the stakeholder consultation as per CDM requirement.

Biogas digesters are sold to households throughout Nepal. Stakeholder consultation in the context of a consumer technology like a biogas digester is automatically built into the sales process. The recognition of the biogas benefits by households is a key to selling of a biogas plant. By paying a considerable amount for its biogas digester (in the range of US$ 148 to 309), the household appreciates the value of the biogas plant. Households will also be required to sign a contract in which they transfer their emission reduction rights and all other rights associated with CDM participation to AEPC in exchange for aftersales support, subsidy and quality control. As part of this process, BSP-Nepal informed households about the CDM and the international climate change process.

Because of the nature of the biogas installation, no known government regulatory requirement exists concerning the consultation process. Nevertheless, consultations were undertaken with biogas users and non-users in two districts in the Terai (Dhanusha) and Hills (Baglung) regions during 17-20 and 22-25 May, 2005. The consultation process involved detailed household survey of randomly selected biogas users and non-users of the selected Village Development Committees (VDCs) representing the major ethnic/caste groups of the two sample districts, focus group discussion with potential biogas users, and key informants interviews of knowledgeable persons contacted during the visits.

User satisfaction
Since program commencement in 1992-1993 user satisfaction has been monitored via an annual household survey executed by independent external researchers. The results of the end-user surveys show a high satisfaction rate. The above findings agree with several studies carried out in the past by BSP Nepal that revealed the users' satisfaction percentage ranging from 94 to 98%. Among other factors, the users' satisfaction is dependent upon the performance of their units followed by quality of the after sales-services received by them.

As part of market development, the biogas companies informally contact and consult with local NGOs working in the areas related to biogas to help explain the benefits of the bio-gas units to the local population and mobilize their participation in the program. One such local NGO, for example, Resource Management & Rural Empowerment Center (REMREC), works in rural water and sanitation, and cooperates with the local company working in the same area to promote biogas units.

E.2. Summary of comments received

The overall perceptions of the majority of the respondents surveyed about the social, economical, and environmental benefits of the biogas units was positive and they had not perceived any negative social impacts of the BSP at both household and communities levels in both Hills and Terai regions. According to the end-user survey, a majority of the biogas households expressed high satisfaction in the performance of the biogas digester units. Additionally, other studies done on the end-user satisfaction have reached similar conclusions. The Environmental Impact Assessment of BSP-Nepal notes: User satisfaction is the most important factor to judge the successful adoption of the technology. In this regards, the results of the survey revealed that around 95% of the sampled biogas households are satisfied with the performance of their digester units. The small percentage of the unsatisfied biogas users argued that in some cases, the plant is either too big or in other cases, it is too small (BSP-Nepal, 2002; p.3-3).” It is also noted that particularly women appreciate the benefits of a biogas plant in their house through a smokeless kitchen, reduced drudgery related to fuel wood collection and improved sanitary conditions.

E.3. Report on consideration of comments received

End-user satisfaction is the ultimate goal of the BSP-Nepal to provide sustainability to the biogas sector. Key to achieving this goal is the continuous consultation with all concerned stakeholders to receive feedback that directly feeds into maintaining and improving the quality of the biogas sector.

The quality control program includes a number of mechanisms through which feedback from end-users is sought and fed into the BSP-Nepal to ensure further optimization of the program. They include:
- Quality control monitoring;
- After sales service
- Independent annual end-user survey; and

- Plant verification surveys.

After-sales service
In order to participate in the Program biogas companies are obliged to provide free-after-sales service to the end-users for certain period. This provides end-users with the guarantee that possible construction and material defects in the biogas plant will be repaired. By monitoring the after-sales activities of biogas companies BSP-Nepal gets direct feedback on the quality of systems delivered, which feed into determining the performance of the biogas companies.

Quality control monitoring
AEPC executes an extensive quality control system of biogas digesters to ensure the interests of households. The result obtained from the quality control monitoring is linked to the payment of bonuses/penalties to the participating biogas companies.

Annual end-user survey
Since 1992-1993 end-user satisfaction has been monitored via an annual household survey executed by independent external researchers. Using the findings and recommendations of the study, BSP-Nepal in conjunction with biogas companies undertake new activities or simply improve the existing ones to strengthen the quality of the biogas sector.

Plant verification studies
Plant verification studies are in-depth studies of a district in which all biogas digester units within the district are interviewed to verify their performance, assess user satisfaction and learn from end-use feedback. AEPC through third party carry out these studies.

Appendix 1. Contact information of project participants

Organization name	Alternative Energy Promotion Centre (AEPC)
Registration number with relevant authority	NA
Street/P.O. Box	Mid Baneshwor, Kathmandu
Building	
City	Kathmandu
State/Region	Bagmati
Postcode	
Country	Nepal
Telephone	+977-1-4498013
Fax	
E-mail	Madhusudhan.adhikari@aepc.gov.np
Website	www.aepc.gov.np
Contact person	Madhusudhan Adhikari
Title	Executive Director
Salutation	Mr.
Last name	Adhikari
Middle name	-
First name	Madhusudhan
Department	
Mobile	
Direct fax	
Direct tel.	+977-1-4498013
Personal e-mail	

Appendix 2. Summary of post registration design changes

N/A

Revision History

Version	Date	Remarks
1.1	24 August 2017	Updated to include section A.8 on ‘gender sensitive’ requirements
1	10 July 2017	Initial adoption
