Programme of activities design document form
(Version 09.0)

Complete this form in accordance with the instructions attached at the end of this form.

BASIC INFORMATION	
Title of the PoA	SKG Sangha Biodigester PoA
Version number of the PoA-DD	5.6
Completion date of the PoA-DD	06/01/2020
Coordinating/managing entity	SKG Sangha
Host Parties	India
Applied methodologies and standardized baselines	AMS-I.C “Thermal energy production with or without electricity” ver. 21. AMS-I.E “Switch from non-renewable biomass for thermal applications by the user” ver. 10. AMS-III.R “Methane recovery in agricultural activities household/small farm level” ver. 3.
Sectoral scopes	Scope 1: Energy industries (renewable - / non-renewable sources) Scope 15: Agriculture

PART I. Programme of activities (PoA)

SECTION A. Description of PoA

A.1. Purpose and general description of PoA

>>

The objective of the small-scale programme of activities (hereafter referred to as "the PoA") is to install biogas digesters in rural households in India. The size of biogas plant will be between 2-15m^3 with production capacity of up to 6m_3 gas per day depending upon the size of the family and the cattle they own.

The programme will reduce the amount of fuel wood and kerosene used for cooking and heating water and will replace inefficient traditional cooking stoves with cleaner biogas stoves. The programme will also reduce methane emissions from cattle manure and will contribute strongly to the sustainable development of the rural households involved in the programme.

The Coordinating Managing Entity (CME) of this PoA is SKG Sangha, an NGO based in Kolar, Karnataka State which is working over 20 years working experience in the field of Biodigester implementation. SKG Sangha is responsible for the overall management of the PoA and for the coordination and the inclusion of all the CPAs under this PoA.

Further, the CME acts as a coordinator between the different stakeholders involved in the PoA, which are

- The households willing to implement a biodigester
- The Project Implementing Partners (PIP), organising the Project activities and installing the biodigesters

The project will result in greenhouse gas (GHG) emission savings in the following ways:

- The biogas will displace GHG emissions from kerosene and fuel wood that are currently used for cooking and water heating. The biogas produced from cattle manure is a renewable source of energy as the CO2 that is absorbed during the growth of the organic matter in the dung equals the CO2 emitted when the biogas is burnt (see the introduction in chapter 10.1, Volume 4 of the Revised IPCC Guidelines 2006). In accordance with approved methodology AMS-I.E, emission reductions are calculated for the non-renewable part of the fuel wood that would be used for cooking and water heating without the proposed project activity.
- The biogas will displace GHG emissions from cattle manure that is currently dumped in the pit near the household. The cattle manure is dumped along with other waste such as straw from the cow shed, some kitchen waste, crop residues and other organic matter and liquids in the pit. This material in the pit is never completely dry and does not get turned therefore animal waste is decaying anaerobically and emitting methane. When cattle manure is fed to the biogas reactor, the emissions from the amount of manure that is added to the bioreactor will be avoided.

The PoA aims to implement about 20 CPAs within its lifetime and each CPA is expected to generate up to 60,000 tCO2 of emission reductions per year.

The project will have multiple sustainable development benefits in addition to the reduction in GHG emissions:

- Efficient cooking stoves fired with biogas will reduce indoor air pollution and respiratory problems currently caused by smoke from inefficient cook stoves burning fuel wood and kerosene;
- Currently the majority of the collected fuel wood used for cooking and heating water represents non-renewable biomass. The installation of a biogas unit will reduce the

consumption of fuel wood by participating households and will therefore reduce the pressure on scarce forest resources in the project area;

- Women and children can use time that was otherwise required for collecting fuel wood for education and generating income;
- Biogas provides a more convenient, dependable energy source that is renewable and that reduces cooking time as there is no longer a need to set a fire and get it going;
- Cleaning of the kitchen and pots used for cooking is easier as biogas is a clean burning fuel and does not produce the levels of soot and other particulate matter that is produced by burning fuel wood and kerosene; and
- The slurry produced from the biogas units is a valuable organic fertiliser that can be applied directly to the fields or composted with other organic material to improve crop yields and reduce the use of chemical fertilisers.

The government of India is promoting biogas plants with subsidies through the Ministry of New and Renewable Energy[1]. The installation of biogas plants is a thrust programme under 20 point programme of Government of India. Yet, the installation of biogas plants is not mandatory by any law or any programme of the Government in India. As the reach of the Government programme is limited to few numbers of units per districts, SKG Sangha is developing the PoA to provide more households with clean energy than are covered by the government programme. The PoA activity is a purely voluntary action by SKG Sangha.

A.2. Physical/geographical boundary of PoA

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Location: Republic of India

The geographical boundary for the PoA is the Republic of India. See the map below:

Source of the map: https://www.mapsofindia.com/maps/india/india-political-map.htm

[1] https://mnre.gov.in/biogas

The mainland of the India Republic extends between:

Latitude	8° 4' 32'' and 37° 6' 44''N
Longitude	68° 7' 23'' and 97° 25' 18''E

A.3. Technologies/measures

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Description of biodigester

Each biodigester will be an anaerobic digester system. As the PoA is going to be implemented through CPAs in a vast area of India having different agro climatic conditions the model of the digester will be area and climate specific. Depending upon the demand, climatic conditions and area a suitable model will decided at CPA level. In majority of the areas a fixed model digester is suitable. The capacity size range of the biodigesters will be between 2-15 m^3. The biogas unit size for a particular household will be chosen based on the number and type of cattle owned by the household and the numbers of people in the household, both are inclusive. The PIP will build the systems with the help of people from the households.

Depending on the chosen capacity of biodigester to be installed the number of installed biodigester in each CPA will be limited to the amount that the microscale and small-scale additionality thresholds are still complied with.

The process

Cow dung is mixed with equal amount of water and fed into the biodigester on daily basis. The volatile solids (VS) in the feed material will be hydrolyzed in the first state. The facultative bacteria will convert the hydrolyzed VS into simple farm of sugar, glucose. Another type of bacteria will convert these sugars into organic acids like butanic acid, acetic acid. Carbon dioxide will also be released.

The methonogenic bacteria which convert the organic acids into methane will only survive in anaerobic condition. So, the generated biogas is a combination of methane (CH_4) and carbon dioxide (CO_2). The methane content in the generated biogas depends upon the feed material and its stage. A typical cow dung based biodigester generates biogas with a methane content of 60-70%. Volatile Solids (VS) conversion into biogas depends upon many factors like solids concentration, carbon / nitrogen ratio, temperature.

Increased temperatures will expedite the process and material retention time (HRT) in the digester will be reduced with higher temperatures.

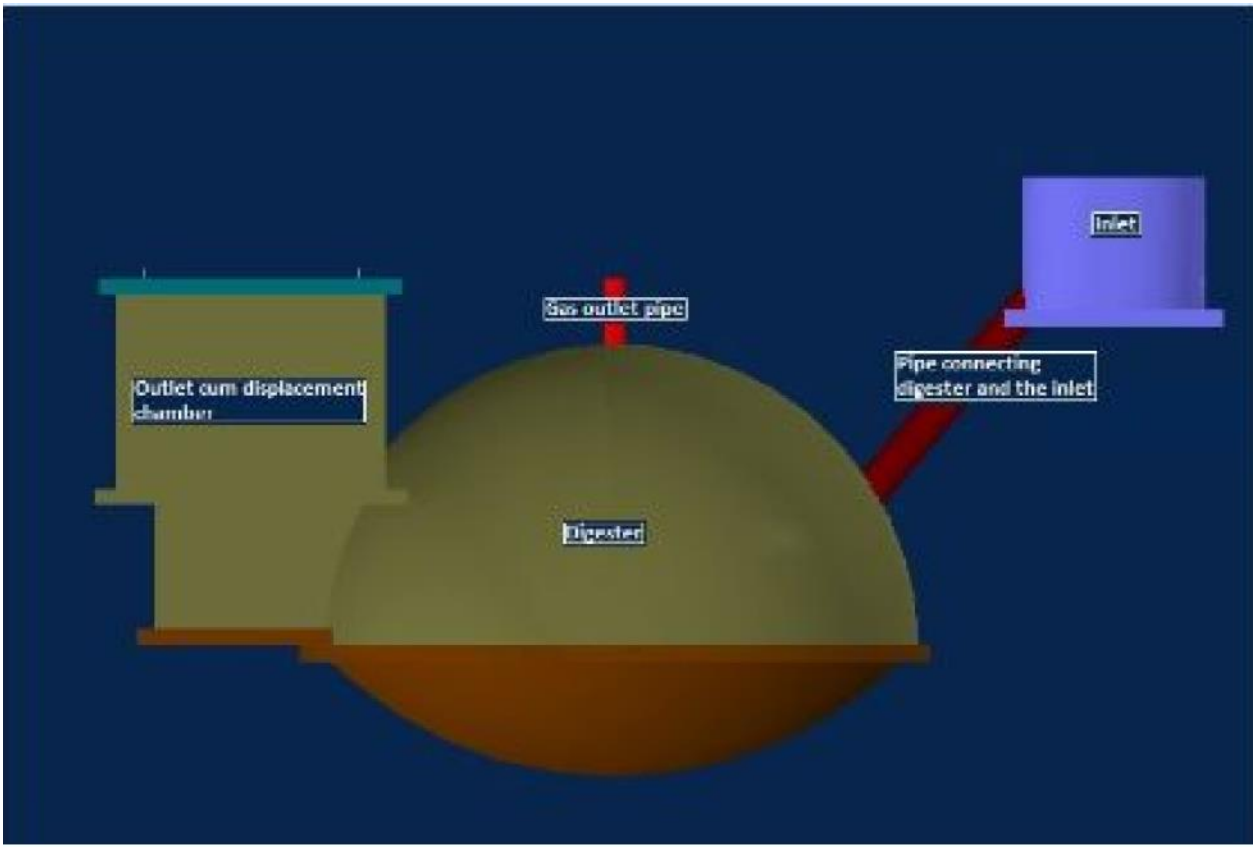
The dung slurry remains in the chamber for approximately 40 days and breaks down anaerobically producing biogas. This biogas builds up above the slurry and remains in the chamber until it is released through the gas outlet pipe at the top of the dome when the gas burner in the household is turned on (the pipe at the top of the biodigester leads to the cooking stove in the household). The biodigester also produces slurry which is pushed into the outlet tank cum displacement chamber as the biogas builds up in the digester and finally exits through the slurry discharge hole. The technology has been tested and widely used in India.

Biodigester model

The prototype of biodigester model for this PoA will be the Deenbandu fixed model biodigester. Since India is a vast nation and having different climatic and geographical conditions it is possible to take up different models within the PoA to suite the need of the people. Also over a period of time the Deenbandhu model may be technically obsolete and new models may emerge which better suit the needs of the people. Thus, there will be no restriction about the biodigester model within this PoA.

However in case a CPA is taking up a different digester model other than the Deenbandu fixed model, the PIP has to explain why the chosen model is the most appropriate one.

The Deenbandu fixed model biodigester drawing, which is one of the possible digester models under the PoA, has been given below:



A fixed model biogas plant (Deenbandu Design)

Description of biogas stove:
Biogas stove to be used in the project is having 2 burners. Each burner is having a capacity to burn 450 litres of biogas per hour (Biogas technology by BT Nijaguna). The maximum size of the biogas unit to be installed in the project is having a capacity to generate 6 cubic meters of biogas per day. This bigger size unit will be installed for the households having more than 12 people and having more than 150 kilograms of animal dung generation per day. Plant size will be decided on the basis of demand for energy. If the household requires more energy than a 6 cubic meter biogas gives, then only a 6 cubic meter biogas generation/day unit will be installed. This applies to all the biogas plant sizes. PP will decide the unit size based on the demand of the household to assure the complete burning of generated biogas.

The thermal efficiency of biogas stove is 55% and the lifetime of the biogas plant is more than 20 years.

Description of baseline stoves:
There are two types of cook stoves in use in the households of the project area. One stove is meant for cooking and the other one is meant for water heating. Fire wood is used in the cook stoves and fire wood and/or loose biomass and/or agricultural residues and/or a combination of these three are used in the water heating stoves as fuel. Replacement of these stoves does not involve any transportation or energy as they are made with mud and bricks. The cook stove is a basic model mud stove without a grate and chimney whereas the water heating stove is having a grate and chimney. The life time of these stoves is low as they are basic mud stoves and always under renovation with mud and bricks. The efficiency of these stoves is low and CDM EB provided

default efficiency values for these stoves in SSC methodology AMS I E, Data/parameter table 15, Data unit (i) Default 0.1 or 0.2: Efficiency of pre - project device, which is a three-stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney; for other types of devices, a default value of 0.2 may be optionally used.

A.4. Coordinating/managing entity

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The Indian non- profit organisation SKG Sangha is the Coordinating/Managing Entity (CME) of the PoA.

A.5. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host)	M/s SKG Sangha	No
Switzerland	Foundation myclimate – The Climate Protection Partnership	No

A.6. Public funding of PoA

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No public funding is involved in the PoA.

The participating households will make a small in kind contribution of materials and labour but otherwise no other funding or assistance will be available to implement the project. The project will be funded solely from the sale of the offsets created from the project's GHG emission reductions. Some or all of the CPAs may approach the Government of India for incentives/assistance provided through Ministry of new and Renewable Energy as an additional investment for that CPA.

SECTION B. Management system

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(i) Record keeping system

SKG Sangha is the CME for this programme and will be responsible for the overall operation, management and monitoring of the PoA. For a new CPA to be included in the PoA it will be verified at all stages. Starting from project conception, stakeholder consultation meetings, validation and installation of new units, a CPA will be supervised by the managing entity, SKG Sangha.

In general, each CPA is uniquely identified and defined by way of the unique identification numbers attached to units to, ensure that all CPAs under its PoA and not developed under a different VPA/CPA or different project.

The CME will keep a record for each CPA in the central database where the following information is stored:

1. Name of the CPA
2. Geographical coordinates of the CPA
3. Physical location of the CPA
4. Date of inclusion
5. Start date
6. Renewal date
7. Crediting period
8. Crediting date
9. Monitoring plan
10. Name of the CPA in-charge
11. Name of the DOE used for validation

12. Name of the DOE for verification
13. Name and details of the PIP

Every individual CPA will maintain a record keeping system as in applied Baseline and Monitoring Methodology and detailed in Section E below. SKG Sangha as the managing entity will ensure that each CPA will maintain standard records documenting, will archive the monitoring data in a secure database and will keep the records during the entire crediting period and two years after for each CPA. Data (paper & electronic) will be transmitted semi-annually to SKG Sangha who is responsible for the record keeping relating to production of the Monitoring Reports. SKG Sangha will conduct a data audit and compliance with the Monitoring Plan at least 2 times per year for each CPA.

(ii) System/procedure to avoid double accounting

Only units which have been named as part of the CPA will be included in the programme. Based on the CPA database it is possible to unambiguously identify the CPAs of the programme. Prior to including a new CPA within the proposed PoA, the CME will check the UNFCCC CDM -and GS project database to verify that the proposed CPA has not been already registered as a CDM/VER project activity or as an CPA/VPA of another PoA/VPoA.
Further, all beneficiaries of a CPA will have to sign an agreement with the CME stating all required information about the carbon money and about the rights of carbon savings to be handed over to the CME. Each biodigester included in a CPA under this PoA will have a unique identification number as a reference. To avoid double counting, each biodigester with its reference number will be linked with geographic coordinates marked by GPS for each specific biodigester location.

(iii) De-bundling

SKG Sangha will follow the Methodological tool “Assessment of debundling for small-scale project activities v04.0” section 5.3. Determining the occurrence of debundling under a programme of activities (PoA) to ensure that the proposed CPA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity. According to paragraph 17, for cases where each of the independent subsystems/measures (e.g., biogas digester, residential solar home systems, kerosene or incandescent lighting replacements) included in the CPA of a PoA is no larger than 1% of the small-scale thresholds defined by the methodology applied, then that CPA of PoA is exempted from performing de-bundling check i.e., considering as not being a de-bundled component of a large scale activity. The CPA specific calculation to proof compliance with the de-bundling rules will be provided for each CPA –DD.

(iv) PoA subscription

The CME is responsible for identifying, registering and managing all CPAs included in the proposed PoA. This means that those operating the CPA are aware and have agreed that their activity is subscribed to the proposed PoA.

Prior to the inclusion of a CPA in the proposed PoA, agreements for CER ownership will be signed between SKG Sangha and each CPA project participant. The individual CPA also has to issue an authorization letter to SKG Sangha informing that they are aware of and have agreed that their activity is being subscribed to this proposed PoA and to confirm that they are not registered either as a CDM project activity or as a CPA of another PoA.

A model End User agreement between PIP and beneficiary regarding the ownership of CERs is attached in Appendix 8.

SECTION C. Demonstration of additionality of PoA

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This section has not been updated. According Project Standard CDM project standard for programmes of activities v02.0 para 285 “For renewal of the PoA period of a registered CDM PoA, the coordinating/managing entity is not required to reassess the additionality of the PoA nor update the section of the PoA-DD relating to additionality”.

(i) The proposed PoA is a voluntary coordinated action;

The proposed PoA is a voluntary coordinated action and it cannot be implemented in large scale in the absence of the PoA. There is no mandatory law, policy or regulation enforcing the introduction of biodigester systems to local households.

(ii) If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;

The proposed PoA has been developed as a voluntary GS CDM project. Biodigester units are sold at subsidised prices to make them affordable to rural households. Carbon finance is essential to maintain a sales price affordable to rural households and eventually expand the programme to reach more rural villages. All external funding will stem from CDM, other external funding is not available. Therefore, the program would not have been implemented in the absence of CDM.

Additionality will be demonstrated in section E.5 for each individual CPA at CPA level
According to EB 68, Annex 27 para 2 “Documentation of barriers, as per paragraph 1 above, is not required for the positive list of technologies and project activity types that are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds (e.g. installed capacity up to 15 MW). The positive list comprises of:” sub Para (c) says “Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size of each unit is no larger than 5% of the small-scale CDM thresholds;

The PoA is meant for installing isolated biogas plants where the users are the individual households.

Further the foot note 1 elaborated the capacity as “That is the size of each unit under 750 kW installed capacity or under 3000 MWh of energy savings per year or 3000 tonnes of emission reductions per year.

EB 68 further elaborated this automatic additionality in its repan 26 Para 2 says “Project activities up to five megawatts that employ renewable energy technology are additional if any one of the conditions below is satisfied:

Sub Para (c) says “The project activity is designed for distributed energy generation (not connected to a national or regional grid) with both conditions (i) and (ii) satisfied;

(i) Each of the independent subsystems/measures in the project activity is smaller than or equal to 1500kW electrical installed capacity;
(ii) End users of the subsystems or measures are households/communities/small and medium enterprises (SMEs).

PoA is planned to install the biogas plants of 1 to 6 cubic meter biogas generation per day capacity with the digester volumes of 2-15 cubic meters. The maximum unit is having 6 cubic meter biogas generation per day capacity. Each CPA will demonstrate that:

1. Each unit is no larger than the 5% of the small scale CDM thresholds.
2. Each of the independent subsystem in the project activity is smaller than or equal to 1500 kW electrical installed capacity.
3. End user of the subsystem, biogas plant is a household

(iii) If the PoA is implementing a mandatory policy/regulation, this would/is not enforced;

Not applicable

(iv) If mandatory a policy/regulation are enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.

Not applicable

SECTION D. Start date and duration of PoA

D.1. Start date of PoA

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The starting date is the date on which PoA was webhosted for global stakeholder comments 14th February 2012.

The starting date of the first crediting period is 28 Jan 13 - 27 Jan 20.
The starting date of the second crediting period is 28 Jan 20 - 27 Jan 27.

D.2. Duration of PoA

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The duration of the PoA is 28 years.

SECTION E. Environmental impacts

E.1. Level at which environmental impacts analysis is undertaken

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Environmental analysis as per requirements of the CDM modalities and procedures is undertaken at the PoA level, since the technology used in all the CPAs is will be identical or at least very similar and therefore the environmental impacts of all CPAs will be similar.

1. Environmental Analysis is done at PoA level √
2. Environmental Analysis is done at SSC-CPA level x

During the Local Stakeholder Consultation (LSC) meetings, impacts on Environment and other elements of the Sustainable Development Matrix were intensively discussed. All the participants' opinion is that the project is meant for environmental protection and assures many of the sustainable development aspects.

E.2. Analysis of environmental impacts

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There are no significant anticipated negative impacts on the environment and/or on people through this programme. The Programme reduces the consumption of non-renewable natural resources, such as wood and further reduces the GHG emissions which cause air quality problems. The installations will take place in existing infrastructure. Hence, the environmental effects gained from the project implementation are of a positive nature.

The project will have the following positive environmental impacts in addition to the reduction in CO2 and CH4 emissions:

- The project will reduce consumption of fuel wood reducing pressure on scarce forest resources.
  Currently the major part of collected fuel wood represents non-renewable biomass;
- Efficient cooking stoves will reduce indoor air pollution;
- Soil quality and its water retention capacity are expected to improve after replacing indiscriminate use of chemical fertilisers with application of high-quality compost; and
- The risk of water pollution will be reduced due to proper management of wastewater and reduced use of chemical fertilisers and pesticides.

E.3. Environmental impact assessment

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The Government of India does not require any documentation of the environmental impacts of the project activity. The project type/category is not included in the "List of projects or activities requiring prior environmental clearance" included in the Environmental Impact Assessment (EIA)

notification of the Ministry of Environment, Forest and Climate Change (MoEFCC), Government of India, 2018[2].

SECTION F. Local stakeholder consultation

F.1. Level at which local stakeholder consultation is undertaken

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1. Local stakeholder consultation is done at PoA level √
2. Local stakeholder consultation is done at SSC-CPA level √

According to the Gold Standard PoA Rules and Guidance Local Stakeholder Consultation meetings "must happen at both the PoA level and VPA/CPA level ...".Therefore Stakeholder consultations were conducted on PoA - and on CPA level.

The local Stakeholder Consultation shall be conducted on the PoA level and on the CPA level.

- LSC on PoA level has been conducted electronically and physically on 13.9.2011.
- LSC on CPA level has been conducted on 15.9.2011.
- All CPAs implemented in the future will conduct local stake holder meetings at their level.

The event done on September 13th of 2011 was meant to present the PoA, so all discussion and comments were referred to this level. Comments referring each CPA will be collected in local SHC events. The LSC for the first CPA in Gulbarga was already conducted on September 15th of 2011.

F.2. Modalities for local stakeholder consultation

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The LSC on PoA level was consisting of two parts: an electronically and a physical meeting.

Electronically meeting:

The stakeholders for the electronically meeting have been invited by e-mail. Like that it was assured that Stakeholders from all areas of the Republic of India were reached and could provide feedback. 116 people from Local Non-Governmental organisations working in India on topics relevant to the project activity in India have been invited. These are NGOs that are amongst others working on the lines of rural development, environment, renewable energy, sanitation and women issues. Further the DNA and the GS representatives are also relevant stakeholders and were invited to the Consultation. To get the comments from the more experienced organisations in the line of sustainable development issues, the GS supporter NGOs were also the stakeholders for the national level PoA. The invitations for these stakeholders were sent through emails, post and phone calls. 74 relevant international NGOs were invited like that. The different government departments were also invited. The local level Government and non-governmental organisations will be invited to the stakeholder meetings going to be held in their respective area when a CPA is formulated in their area.

Physically meeting:

Additionally to the electronic meeting, SKG Sangha also organised a physical meeting to get direct feedback on the CDM PoA – SKG Sangha Biodigester PoA. This meeting was held on the 13-09-2011 at 3 PM at SKG Sangha office in Kolar. Stakeholders were invited through phone calls and email invitations.

F.3. Summary of comments received

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[2] http://www.indiaenvironmentportal.org.in/files/file/Standardization%20of%20Environment%20Clearance%20conditions.pdf

Electronically meeting:
No feedback was provided from invited organisations electronically. But feedback on PoA design was provided from non-invited Organisations that came to know about the Programme. They expressed to wish that SKG Sangha should take up project activity in their region.

Physical meeting:
Comments were raised regarding benefits of working together with SKG Sangha in the Programme.
People were interested to find out about the financial and organisational gain of participating on the Programme. The women organisations representative was especially impressed with the reduction in environment pollution by replacing the traditional cook stoves. Most of the comments raised were regarding the possibility to take up a Programme Activity in a specific region and the wishes to take up activity by SKG Sangha were expressed. The comments regarding the Sustainable Development Indicators were in accordance with the reflected ones in the PoA Matrix.

In general the PoA activity has been appreciated by all the participants and they wished all success to the Programme. A detailed list of all comments can be found in the Gold Standard LSC Report.

F.4. Consideration of comments received

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All comments were documented, assessed and responded by the CME. There was no comment that brought out completely new issues related to the project activity or demanded for a change of design of Project. An assessment of the comment was written and is available to the public. The wishes that were addressed to take up project activity in a specific region are recorded and will be considered when setting up new CPAs.

SECTION G. Approval and authorization

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The letter of approval has been submitted by the Parties during the first validation of the PoA. The only Project Participant listed and also coordinating/managing entity is SKG Sangha and is authorized by the host Party: India.

PART II. Generic component project activity (CPA)

SECTION H. Description of generic CPA

H.1. Title of generic CPA

>>
SKG Sangha Biodigester PoA Gulbarga Biodigester Project CPAX

H.2. Reference number of generic CPA

>>
Generic CPA 1

H.3. Purpose and general description of generic CPA

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The CPA is to install [insert amount of biogas units] biogas plants one each for rural household [insert region, state] in India. The biogas plant size of either [insert capacity] gas [insert capacity] gas per day depends upon the size of the family and the cattle they own. This CPA is a real case CPA, part of ‘SKG Sangha Biodigester PoA’ for registration of the same. SKG Sangha will implement, maintain and monitor this project.

The proposed project will provide biogas units to households [insert number region, state] in India. The project will reduce the amount of fuel wood and kerosene used for cooking and heating water and will replace inefficient traditional cooking stoves with cleaner biogas stoves. The project will also reduce methane emissions from cattle manure and will contribute strongly to the sustainable development of the rural households involved in the project.

The biogas technology is tried and tested in rural India. [insert PIP name and organisation type] will implement the project.

The project encompasses [insert number of households] households in [insert number of taluks] Taluks in the [insert districts] Districts in [insert state] State.

In each of the [insert number of households] households covered by the proposed project a family size biogas unit will be installed. The biogas unit will be of either [insert capacity] or [insert capacity] capacity depending on the number and type of cattle owned by the household and the number of people in the household. At least [insert number of heads] heads of cattle are required for a household to be eligible for a [insert capacity] biogas unit and at least [insert number of heads] heads of cattle are required for a household to be eligible for a [insert capacity] biogas unit. Overall it is planned to install [insert numbers of units per capacity].

[Insert only in case there or different unit sizes]
The capacity of the unit to be installed in the household will be decided based on the number of members and the number of the cattle they own. If the family is big and they are having less number of cattle then a small size unit will be installed. If the family is small and they own large number of cattle then also a small size unit will be installed. If the family is big and they own more than [insert number of heads] cattle then a large size unit will be installed. This project is meant for creating sustainable energy supply to the households for their energy needs. In some cases where the family is small and having more than [insert number of heads] cattle and have to cook for the labourers a big size unit will be installed. In the baseline survey the wood use meant for the family members only is considered.

The CPA is a small scale project and adheres to AMS.I.E (Type I) and AMS.III.R (Type III) of the CDM SSC Methodologies as mentioned in Sections I.1. and I.6.1. AMS. I.C is optional for the CPA.

The project will result in greenhouse gas (GHG) emission savings in the following ways:

- The biogas will displace GHG emissions from kerosene and fuel wood that are currently used for cooking and water heating. The biogas produced from cattle manure is a renewable source of energy as the CO2 that is absorbed during the growth of the organic matter in the dung equals the CO2 emitted when the biogas is burnt (see the introduction in chapter 10.1, Volume 4 of the Revised IPCC Guidelines 2006). In accordance with approved methodology AMS-I.E, emission reductions are calculated for the non-renewable part of the fuel wood that would be used for cooking and water heating without the proposed project activity.
- The biogas will displace GHG emissions from cattle manure that is currently dumped in the pit near the household. The cattle manure is dumped along with other waste such as straw from the cow shed, some kitchen waste, crop residues and other organic matter and liquids in the pit. This material in the pit is never completely dry and does not get turned therefore animal waste is decaying anaerobically and emitting methane. When cattle manure is fed to the biogas reactor, the emissions from the amount of manure that is added to the bioreactor will be avoided

The project will have multiple sustainable development benefits in addition to the reduction in GHG emissions:

- Efficient cooking stoves fired with biogas will reduce indoor air pollution and respiratory problems currently caused by smoke from inefficient cook stoves burning fuel wood and kerosene;

- Currently the majority of the collected fuel wood used for cooking and heating water represents non-renewable biomass. The installation of a biogas unit will reduce the consumption of fuel wood by participating households and will therefore reduce the pressure on scarce forest resources in the project area;
- Women and children can use time that was otherwise required for collecting fuel wood for education and generating income;
- Biogas provides a more convenient, dependable energy source that is renewable and that reduces cooking time as there is no longer a need to set a fire and get it going;
- Cleaning of the kitchen and pots used for cooking is easier as biogas is a clean burning fuel and does not produce the levels of soot and other particulate matter that is produced by burning fuel wood and kerosene; and
- The slurry produced from the biogas units is a valuable organic fertiliser that can be applied directly to the fields or composted with other organic material to improve crop yields and reduce the use of chemical fertilisers.

[insert PIP name] has developed extensive knowledge about biogas units that are suitable for rural households in India, what functions well and what may induce problems, as well as knowledge about waste management, sludge application, composting and proper use of sludge or compost. [insert PIP name] will conduct a number of meetings with eligible households and provide training to transfer this knowledge.

H.4. Technologies/measures

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Description of biodigester

[Insert description of CPA specific Technology]
Depending on the chosen capacity of biodigester to be installed the number of installed biodigester in each CPA will be limited to the amount that the microscale and small-scale additionality thresholds are still complied with.

[insert CPA specific model] biodigester has been given below:

[insert drawing]

Description of biogas stove:

Biogas stove to be used in the project is having 2 burners. Each burner is having a capacity to burn 450 litres of biogas per hour (Biogas technology by BT Nijaguna). The maximum size of the biogas unit to be installed in the project is having a capacity to generate [insert number of cubic meters] cubic meters of biogas per day. This bigger size unit will be installed for the households having more than [insert number of people] people and having more than [insert kilograms of animal dung] kilograms of animal dung generation per day. Plant size will be decided on the basis of demand for energy. This applies to all the biogas plant sizes. PP will decide the unit size based on the demand of the household to assure the complete burning of generated biogas.
The thermal efficiency of biogas stove is 55% and the lifetime of the biogas plant is more than 20 years.

Description of baseline stoves:
There are two types of cook stoves in use in the households of the project area. One stove is meant for cooking and the other one is meant for water heating. Fire wood is used in the cook stoves and fire wood and/or loose biomass and/or agricultural residues and/or a combination of these three are used in the water heating stoves as fuel. Replacement of these stoves does not involve any transportation or energy as they are made with mud and bricks. The cook stove is a basic model mud stove without a grate and chimney whereas the water heating stove is having a grate and chimney. The life time of these stoves is low as they are basic mud stoves and always under renovation with mud and bricks. The efficiency of these stoves is low and CDM EB provided

default efficiency values for these stoves in SSC methodology AMS I E, Data/parameter table 15, Data unit (i) Default 0.1 or 0.2: Efficiency of pre - project device, which is a three-stone fire using firewood (not charcoal), or a conventional device with no improved combustion air supply or flue gas ventilation, that is without a grate or a chimney; for other types of devices, a default value of 0.2 may be optionally used.

SECTION I. Application of methodologies and standardized baselines

I.1. References to methodologies and standardized baselines

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The following approved small scale baseline and monitoring methodologies will be used in the proposed PoA.

(i) AMS-I.C "Thermal energy for user with or without electricity" ver. 21. https://cdm.unfccc.int/methodologies/DB/VJWCB0FBX89L3K73D4S1QPUP0UBXGC

(ii) AMS-I.E "Switch from non-renewable biomass for thermal applications by the user" ver. 10. https://cdm.unfccc.int/methodologies/DB/XA6RFKB3QM9T8S6ELI0V4P8SY8RR2U

(iii) AMS-III.R "Methane recovery in agricultural activities at the household/small farm level" ver. 3. https://cdm.unfccc.int/methodologies/DB/JQHRMGL23TWZ081T6G7G1RZ63GM1BZ

Methodological tools:

- Assessment of debundling for small-scale project activities ver.4

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-20-v1.pdf/history_view

- Methodological tool calculation of the fraction of non-renewable Biomass ver. 2

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-30-v1.pdf/history_view

- Tool to calculate project or leakage CO2 emissions from fossil fuel combustion ver. 3

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf/history_view

- Methodological tool "Project and leakage emissions from anaerobic digesters" ver. 2

https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-14-v1.pdf/history_view

I.2. Applicability of methodologies and standardized baselines

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(i) AMS-I.C "Thermal energy for user with or without electricity" ver. 21.

Criteria for the applicability of the methodology	Justification why the methodology is suitable for the proposed project activity
1. This methodology comprises renewable energy technologies that supply users i.e. residential, industrial or commercial facilities with thermal energy that displaces fossil fuel use. These units include technologies such as solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass and other technologies that provide thermal energy that displaces fossil fuel.	In the proposed project, this methodology is applied for estimating and monitoring emission reductions from displacing kerosene use (fossil fuel) in household cooking stoves (thermal energy) with the use of biogas generated from cattle dung and organic kitchen waste (renewable sources).
2. Biomass-based cogeneration and	Cogeneration projects are not included in the PoA.

trigeneration systems are included in this category	
3. Emission reductions from a biomass cogeneration or trigeneration system can accrue from one of the following activities: (a) Electricity supply to a grid; (b) Electricity and/or thermal energy production for on-site consumption or for consumption by other facilities; (c) Combination of (a) and (b).	In the proposed project activity the biogas unit will not generate electricity. The biogas stove will burn biogas for cooking purpose. Cogeneration projects are not included in the PoA.
4. Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category.	The proposed project activity will replace inefficient traditional cooking stoves with cleaner biogas stoves. The project will reduce the amount of fuel wood and kerosene used for cooking stoves with cleaner biogas stoves, there are no existing renewable energy facilities.
5. In the case of new facilities (Greenfield projects) and project activities involving capacity additions the relevant requirements related to determination of baseline scenario provided in the "General guidelines for SSC CDM methodologies" for Type-II and Type-III Greenfield/capacity expansion project activities also apply.	New biogas plants will be installed to replace traditional kerosene and wood fuel stoves.
6. For co-fired systems, the total installed thermal energy generation capacity of the project equipment, when using both fossil and renewable fuel, shall not exceed 45 MW thermal	The maximum size biogas plant to be installed in any CPA is having a capacity to generate 6m^3 of biogas per day. The installed electrical capacity of this size of unit is 0.832 kW[3] (see capacity calculation for 6m^3 biogas unit below in the footnote) which corresponds to 2.496 kW thermal. The number of units installed under a CPA will be restricted to keep the CPA under the micro scale limits of less than 5MWe installed capacity. Therefore each CPA will automatically apply also to the SSC limits which are less than or equal to 15MWe and 45MW thermal installed capacity.
7. The following capacity limits apply for biomass cogeneration and trigeneration units: (a) If the emission reductions of the project activity are on account of thermal and electrical energy production, the total installed thermal and electrical energy generation capacity of the project equipment shall not exceed 45 MW thermal. For the purpose of calculating the capacity limit	Cogeneration projects are not included in the PoA.

[3] *Biogas plant with a capacity of 6 cubic meter biogas per day will generate 6 cubic meters of biogas per day. Methane content in the biogas is about 60% and will have the thermal energy capacity of 21.6 MJ per cubic meter (BT Nijaguna book mentioned in the PDD). One megajoule is equivalent of 0.28 Kwh (*http://www.kylesconverter.com/energy,-work,-and-heat/megajoules-to-kilowatt--hours*). 129.6 MJ is equal to 36.288 KWh. As the biogas is generated in a day (24 hours) the installed capacity of a 6 cubic meter unit is equal to 1.512 Kwh. The thermal efficiency of the biogas stove is 55% (BT Nijaguna book) and hence the net installed capacity of the 6 cubic meter gas generation per day unit is equal to 0.832 KWh.*

the conversion factor of 1:3 shall be used for converting electrical energy to thermal energy (i.e. for renewable energy project activities, the installed capacity of 15 MW(e) is equivalent to 45 MW thermal output of the equipment or the plant); (b) If the emission reductions of the project activity are solely on account of thermal energy production (i.e. no emission reductions accrue from the electricity component), the total installed thermal energy production capacity of the project equipment shall not exceed 45 MW thermal; (c) If the emission reductions of the project activity are solely on account of electrical energy production (i.e. no emission reductions accrue from the thermal energy component), the total installed electrical energy generation capacity of the project equipment shall not exceed 15 MW.	
8. The capacity limits specified in paragraphs 7 to 9 above apply to both new facilities and retrofit projects. In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the total capacity of the units added by the project shall comply with capacity limits specified in the paragraphs 7 to 9, and shall be physically distinct2 from the existing units.	The proposed project activity will replace inefficient traditional cooking stoves with cleaner biogas stoves. The project will reduce the amount of fuel wood and kerosene used for cooking stoves with cleaner biogas stoves, there are no existing renewable energy facilities.
9. If solid biomass fuel (e.g. briquette) is used, it shall be demonstrated that it has been produced using solely renewable biomass and all project or leakage emissions associated with its production shall be taken into account in the emissions reduction calculation.	No biomass fuel is used in the project activity. The cow dung which is a renewable source will be used to generate biogas.
10. Where the project participant is not the producer of the processed solid biomass fuel, the project participant and the producer are bound by a contract that shall enable the project participant to monitor the source of the renewable biomass to account for any emissions associated with solid biomass fuel production. Such a contract shall also ensure that there is no double-counting of emission reductions.	No biomass fuel is used in the project activity. The cow dung which is a renewable source will be used to generate biogas.
11. If electricity and/or thermal energy produced by the project activity is delivered to a third party i.e. another	In the proposed project activity the heat produced by the biogas units will not be delivered to another facility. It is used to fulfil cooking and heating needs of

facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into that ensures there is no double-counting of emission reductions.	the household.
12. If the project activity recovers and utilizes biogas for producing electricity and/or thermal energy and applies this methodology on a standalone basis i.e. without using a Type III component of a SSC methodology, any incremental emissions occurring due to the implementation of the project activity (e.g. physical leakage of the anaerobic digester, emissions due to inefficiency of the flaring), shall be taken into account either as project or leakage emissions as per relevant procedures in the tool "Emissions from solid waste disposal sites" and/or "Project emissions from flaring". In the event that the biomass fuel (solid/liquid/gas) is sourced from an existing CDM project, then the emissions associated with the production of the fuel shall be accounted with that project.	The PoA is using AMS III R methodology for calculating emission reductions. AMS III R is a type III SSC methodology.
13. If project equipment contains refrigerants, then the refrigerant used in the project case shall have no ozone depleting potential (ODP).	No refrigerants are contained in project equipment. The proposed project activity install cleaner biogas stoves.
14. Charcoal based biomass energy generation project activities are eligible to apply the methodology only if the charcoal is produced from renewable biomass sources, provided: (a) Charcoal is produced in kilns equipped with methane recovery and destruction facility; or (b) If charcoal is produced in kilns not equipped with a methane recovery and destruction facility, methane emissions from the production of charcoal shall be considered. These emissions shall be calculated as per the procedures defined in the approved methodology "AMS-III.K: Avoidance of methane release from charcoal production by shifting from traditional open-ended methods to mechanized charcoaling process". Alternatively, conservative emission factor values from peer reviewed literature or from a registered CDM project activity can be used, provided that it can be demonstrated that the parameters from these are comparable e.g. source of biomass,	The proposed project activity will replace inefficient traditional cooking stoves with cleaner biogas stoves. The project will reduce the amount of fuel wood and kerosene used for cooking stoves with cleaner biogas stoves, there are not charcoal energy generation.

characteristics of biomass such as moisture, carbon content, type of kiln, operating conditions such as ambient temperature.	
15. In cases where the project activity utilizes biomass, sourced from dedicated plantations, applicability conditions prescribed in the tool "Project emissions from cultivation of biomass" shall apply.	No biomass fuel is used in the project activity. The cow dung which is a renewable source will be used to generate biogas.
15.The spatial extent of the project boundary encompasses: (a) All plants generating electricity and/or thermal energy located at the project site, whether fired with biomass, fossil fuels or a combination of both; (b) All power plants connected physically to the electricity system (grid) that the project plant is connected to; (c) Industrial, commercial or residential facility, or facilities, consuming energy generated by the system and the processes or equipment affected by the project activity; (d) The processing plant of biomass residues, for project activities using solid biomass fuel (e.g. briquette), unless all associated emissions are accounted for as leakage emissions or are part of an independently registered CDM project; (e) The geographic boundaries of the dedicated plantations if the feedstock is biomass produced in dedicated plantations; (f) The transportation itineraries, if the biomass is transported over distances greater than 200 kilometres, unless all associated emissions are accounted for as leakage emissions; (g) The site of the anaerobic digester in the case of project activity that recovers and utilizes biogas for producing electricity and/or thermal energy and applies this methodology on a standalone basis, i.e. without using a Type III component of a SSC methodology.	The project boundary includes the biogas generation unit and the utilization area, i.e. the kitchen of the household.

(ii) AMS-I.E "Switch from non-renewable biomass for thermal applications by the user" ver. 10.

Criteria for the applicability of the methodology	**Justification why the methodology is suitable for the proposed project activity**
1. This methodology comprises of activities to displace the use of non-renewable	The proposed project will introduce small, family-size biogas systems (bioreactors and

biomass by introducing renewable energy technologies. Examples of these technologies include, but are not limited to biogas stoves, bio-ethanol stoves, solar cookers, passive solar homes.	cookers) that supply thermal energy for household cooking needs. The fuel wood used for cooking is considered non-renewable biomass. For households participating in this project, their fuel wood use will be replaced with the use of biogas generated in small biogas reactors (renewable energy derived from cattle dung).
2. Project participants are able to show that non-renewable biomass has been used since 31 December 1989, using survey methods or referring to published literature, official reports or statistics.	The project participant will use survey methods to show that non-renewable biomass has been in use since 31st December, 1989. This applicability condition is therefore met.
3. The methodology is applicable for technologies displacing use of non-renewable biomass by renewable energy.	The proposed project will introduce small, family-size biogas systems (bioreactors and cookers) that supply thermal energy for household cooking needs. The fuel wood used for cooking is considered non-renewable biomass. For households participating in this project, their fuel wood use will be replaced with the use of biogas generated in small biogas reactors (renewable energy derived from cattle dung).
4. Project participants or coordinating and managing entities shall describe in the PDD/PoA-DD how the double counting of emission reductions has been addressed (e.g. between end users, distributors and producers of stoves).	As explained in section B only units which have been named as part of the CPA will be included in the programme. Based on the CPA database it is possible to unambiguously identify the CPAs of the programme. Prior to including a new CPA within the proposed PoA, the CME will check the UNFCCC CDM -and GS project database to verify that the proposed CPA has not been already registered as a CDM/VER project activity or as an CPA/VPA of another PoA/VPoA. Further, all beneficiaries of a CPA will have to sign an agreement with the CME stating all required information about the carbon money and about the rights of carbon savings to be handed over to the CME. Each biodigester included in a CPA under this PoA will have a unique identification number as a reference. To avoid double counting, each biodigester with its reference number will be linked with geographic coordinates marked by GPS for each specific biodigester location.
5. For project activities introducing bio-ethanol cookstoves, project participants or coordinating and managing entities shall demonstrate that the bioethanol cookstoves are designed, constructed and operated to the requirements (e.g. with regard to safety) of a relevant national or local standard or comparable literature. Latest guidelines	The proposed project activity will replace inefficient traditional cooking stoves with cleaner biogas stoves. No bio-ethanol cookstoves are introduced in the project activity.

issued by a relevant national authority or an international organisation may also be used.	
6. The CDM-PDD or CDM-PoA-DD/CPA-DD shall explain the proposed method for distribution of project devices including the method to avoid double counting of emission reductions such as unique identifications of product and end-user locations (e.g. programme logo).	As explained in section B, each biodigester included in a CPA under this PoA will have a unique identification number as a reference. To avoid double counting, each biodigester with its reference number will be linked with geographic coordinates marked by GPS for each specific biodigester location.
7. The CDM-PDD or CDM-PoA-DD/CPA-DD shall also explain how the proposed procedures prevent double counting of emission reductions, for example to avoid that project stove manufacturers, wholesale providers or others also claim credit for emission reductions from the project devices.	As explained in section B, all beneficiaries of a CPA will have to sign an agreement with the CME stating all required information about the carbon money and about the rights of carbon savings to be handed over to the CME.
8. The project boundary is the physical, geographical site of the use of biomass or the renewable energy.	The project boundary includes the biogas generation unit and the utilization area, i.e. the kitchen of the household.
9. It is assumed that in the absence of the project activity, the baseline scenario would be the use of fossil fuels for meeting similar thermal energy needs.	Emission savings for the non-renewable biomass under this methodology will be calculated using the default fossil fuel value provided by the methodology.

(iii) AMS-III.R "Methane recovery in agricultural activities at the household/small farm level" ver. 3.

Criteria for the applicability of the methodology	**Justification why the methodology is suitable for the proposed project activity**
1. This project category comprises recovery and destruction of methane from manure and wastes from agricultural activities that would be decaying anaerobically emitting methane to the atmosphere in the absence of the project activity. Methane emissions are prevented by: (a) Installing methane recovery and combustion system to an existing source of methane emissions, or (b) Changing the management practice of a biogenic waste or raw material in order to achieve the controlled anaerobic digestion equipped with methane recovery and combustion system.	In the proposed project activity, animal manure is currently dumped in pits. Each household has a pit in the ground which is at least 1 m deep, where waste from the cattle shed – cow dung, straw, green fodder and urine – is dumped. Waste from the cattle shed is dumped in the pit along with some crop waste, any food waste, and sometimes toilet waste. The waste is not turned or mixed during the year. Cow urine, wastewater from the kitchen and other liquids are added to keep the mass in the pits wet or liquid. During the rainy season the pits also get filled with rainwater. The animal waste is decaying anaerobically in the pit and emits methane. After introducing a biogas unit, the amount of animal manure fed into biodigesters will not be left to decay anaerobically in the pit. Instead the manure that is fed into the biodigester will break down anaerobically in the biodigester. The biogas that is produced will be held in the biodigester until it is combusted in the biogas burners and used for cooking and heating water. The project scenario conforms to the (b)

	situation described in the methodology.
2. The category is limited to measures at individual households or small farms (e.g. installation of a domestic biogas digester). Methane recovery systems that achieve an annual emission reduction of less than or equal to five tonnes of CO2e per system are included in this category. Systems with annual emission reduction higher than five tonnes of CO2e are eligible under AMS-III.D "Methane recovery in animal manure management systems".	Biogas digesters will be installed in individual households in rural areas. Only methane recovery systems that reduce less than 5 tonnes CO2 per year will be included in the project activity. Therefore, this applicability condition is also met.
3. This project category is only applicable in combination with AMS-I.C "Thermal energy production with or without electricity" and/or AMS-I.I "Biogas/biomass thermal applications for households/small users" and/or AMS-I.E "Switch from non-renewable biomass for thermal applications by the user".	The methodology AMS-I-C/ AMS I E is applied for the use of methane for thermal energy (cooking and heating water).
4. The project activity shall satisfy the following conditions: (a) The sludge must be handled aerobically. In case of soil application of the final sludge the proper conditions and procedures that ensure that there are no methane emissions must be ensured. (b) Measures shall be used (e.g. combusted or burnt in a biogas burner for cooking needs) to ensure that all the methane collected by the recovery system is destroyed.	The sludge from the biodigesters will be used as a fertiliser by spreading thinly and directly on the ground. Training for biogas system users will include training on the proper handling of sludge. The methane that builds up in the biodigester is destroyed on a daily basis by burning it in cookers for meeting household cooking needs and in some cases water heating needs. Regarding the PoA maximum size ($6m^3$ biogas generation per day) unit – it generates 71.28 MJ net energy per day (See Emission reduction excel sheet calculations. The bio-digesters will not create any surplus gas over and above household requirements. This is because the plant size will be decided on the basis of demand for energy. The PP will decide the unit size based on the demand of the household to assure the complete burning of generated biogas. If the household requires more energy than a $6m^3$ biogas gives, then only a 6 m^3 biogas generation/day unit will be installed. This applies to all the biogas plant sizes.
5. Aggregated annual emission reductions of all systems included shall be less than or equal to 60 kt CO2 equivalent.	The Aggregate annual emission reductions of all systems included will be less than the 60,000t CO2e limit that applies to this methodology.
6. The project boundary is the physical, geographical site of the methane recovery and combustion systems.	The project boundary includes the biogas generation unit and the utilization area, i.e. the kitchen of the household.

I.3. Application of multiple methodologies

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The generic CPA applies a combination of multiple methodologies in accordance with the project standard. The following combination is applied: Multiple small-scale methodologies.

The same technologies or measures, in this case biogas digesters in rural households under the same combination of methodologies AMS-I.C ver. 21, AMS-I.E ver. 10 and AMS-III.R ver. 3 are applied consistently in every CPA in the PoA.

According CDM project standard for programmes of activities v02 Appendix 1. Instructions for the consideration of cross effects for the application of multiple methodologies for programmes of activities if multiple methodologies are applied, it need to be demonstrated that the cross effects condition for application of multiple methodologies in the project standard are met.

(a) Type I: No cross effects as there is not an exchange of energy or mass transfer between different measures within a CPA, the three sources of emissions identified in baseline scenario: Thermal energy –use of kerosene, thermal energy –non-renewable biomass share of the fuel wood use and animal waste are primary effect as they do not depend from each other.
(b) Type II: No cross effects as each primary effect rely on different information when estimating GHG emission reductions: Quantity of kerosene used, quantity of biomass substituted and number of cattle.

As the sources of emissions are independent there are determined simultaneously as they are not different measures, one only measure, biogas digesters with different sources of emissions.

In conclusion no cross effects type I and II exists, besides as described in criteria for the applicability of the methodology AMS-III.R (section I.2. below), this project category is only applicable in combination with AMS-I.C and AMS-I.E as set in this PoA.

I.4. Project boundary, sources and greenhouse gases (GHGs)

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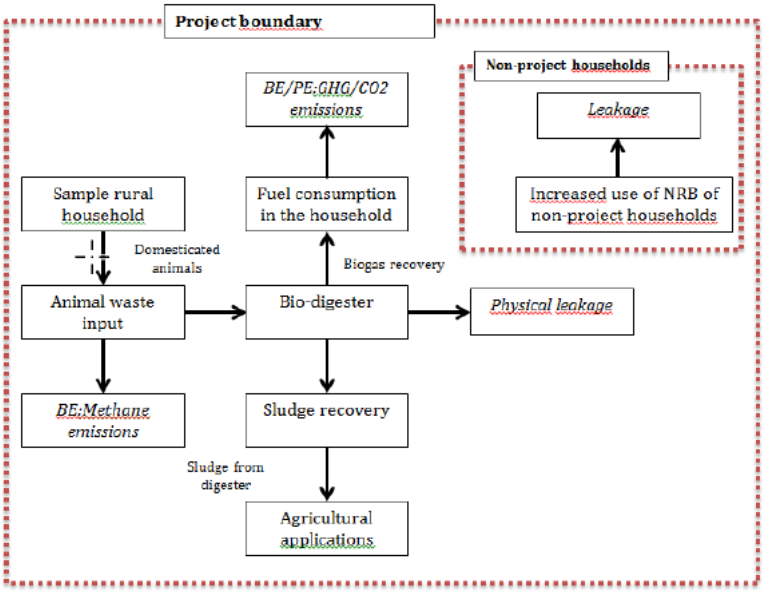
Sources and gases included in the project boundary:



	Source	GHG	Included?	Justification/Explanation
Baseline	Thermal energy need – use of kerosene	CO_2	Yes	Major source of emissions
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
	Thermal energy need – non-renewable biomass share of the fuel wood use	CO_2	Yes	Major source of emissions
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
	Animal waste	CO_2	No	Excluded as emissions from animal waste are CO2- neutral
		CH_4	Yes	Major source of emissions
		N_2O	No	Excluded for simplification
Project activity	Thermal energy need - non-renewable biomass share of the fuel wood use	CO_2	Yes	Major source of emissions
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
	Direct emissions from the biodigester (physical leakage)	CO_2	No	Excluded as emissions from biogas are CO2 neutral
		CH_4	Yes	Major source of emissions
		N_2O	No	Excluded for simplification
	Leakage: Increased use of NRB of non-project households	CO_2	Yes	Major source of emissions
		CH_4	No	Excluded for simplification
		N_2O	No	Excluded for simplification
	Other Leakage	CO_2	No	Any other possible leakage is more than compensated for by unclaimed (a) avoided N2O emissions from cattle manure that goes into the biodigester, (b) avoided CO2 emissions from avoided application of fertiliser due to improved fertiliser from the biogas slurry, and (c) avoided emissions of products of incomplete combustion of fuel wood.
		CH_4	No	
		N_2O	No	

I.5. Establishment and description of baseline scenario

>>

A baseline shall be established on a project-specific basis for each CPA. The baseline scenario will be investigated and identified during the feasibility study in the planning stage or before any project activity decision is confirmed. This will be done at the CPA level. The identified baseline must be in accordance with the procedures provided in the approved small scale baseline and monitoring methodologies as listed below.

The Small-Scale CDM Programme Activity Design Document (CDM-SSC-CPA-DD) will describe in detail the baseline for each CPA after the baseline scenario has been identified.
The baseline parameters will be identified by conducting quantitative and qualitative surveys of a sample of target households in the specific region.

(i) AMS-I.C "Thermal energy production with or without electricity", version 21

In the baseline scenario the households are using some kerosene for cooking and some for starting fire in the traditional wood stoves. This amount of kerosene will be saved by replacing the kerosene use with biogas stove. The biogas stove will fulfil the thermal energy needs of the households.

(ii) AMS-I.E "Switch from non-renewable biomass for thermal applications by the user", version 10

The proposed project will introduce small, family-size biogas systems (bioreactors and cookers) that supply thermal energy for household cooking needs. Only the non-renewable fuel wood used for cooking is considered in the emission savings. For households participating in this project, their fuel wood use will be replaced with the use of biogas generated in small biogas reactors (renewable energy derived from cattle dung).
Supporting indicators for Non-renewable woody biomass as per paragraph 7 of AMS-I.E./ version 04 will be identified on CPA level. The evidence that the trend identified is not occurring due to enforcement of local/national regulations, as required by paragraph 9 of AMS-I.E./version 04 is also CPA specific and will be provided for each CPA separately.

(iii) AMS-III.R "Methane recovery in agricultural activities household/small farm level", version 03

In the proposed project activity, animal manure is currently dumped in pits. Each household has a pit in the ground which is at least 1 m deep, where waste from the cattle shed – cow dung, straw, green fodder and urine – is dumped. Waste from the cattle shed is dumped in the pit along with some crop waste, any food waste, and sometimes toilet waste. The waste is not turned or mixed during the year. Cow urine, wastewater from the kitchen and other liquids are added to keep the mass in the pits wet or liquid. During the rainy season the pits also get filled with rainwater. The pits are cleaned out once a year. The animal waste is decaying anaerobically in the pit and emits methane. After introducing a biogas unit, the amount of animal manure fed into biodigesters will not be left to decay anaerobically in the pit. Instead the manure that is fed into the biodigester will break down anaerobically in the biodigester. The biogas that is produced will be held in the biodigester until it is combusted in the biogas burners and used for cooking and heating water. The project scenario conforms to the (b) situation described in the methodology.

For Renewal of programme of activities period based on Standard CDM project standard for programmes of activities v02.0 para. 287 the coordinating/managing entity shall describe how to demonstrate the validity of the original baseline or how to update it for each of the corresponding CPAs in accordance with the provisions in paragraphs 288−291 below.

288. To demonstrate the validity of the original baseline or its update, the coordinating/managing entity is not required to re-assess the baseline scenario. Instead, the coordinating/managing entity shall assess the modalities to calculate GHG emission reductions or net anthropogenic GHG removals that would have resulted from that scenario.

-> The modalities to calculate GHG emission reductions have been assessed in section I.6.3. according the latest versions of the methodologies and tools applied.

289. The coordinating/managing entity shall assess and incorporate the impact of national and/or sectoral policies and circumstances existing at the time of requesting renewal of the PoA period on the modalities to estimate baseline GHG emissions for the subsequent crediting period of each corresponding CPA, without reassessing the baseline scenario.

-> There current national and/or sectoral policies have not been changed. The government of India is promoting biogas plants with subsidies through the Ministry of New and Renewable Energy[4]. The installation of biogas plants is a thrust programme under 20 point programme of Government of India. Yet, the installation of biogas plants is not mandatory by any law or any programme of the Government in India.

290. The requirements contained in paragraph 289 above are not applicable to a registered CDM PoA applying the valid version of an applicable approved standardized baseline that standardizes baseline scenario in accordance with paragraph 286 above.

[4] https://mnre.gov.in/biogas

-> No applicable as the PoA has not been applied an approved standardized baseline.

291. If data and parameters used for determining the original baseline, that were determined ex ante and not monitored during the PoA period, are no longer valid, the coordinating/managing entity shall update such data and parameters in accordance with the "Methodological tool: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period".

-> The data and parameters determined ex-ante and not monitored during the PoA period (see section I.6.2 below) for determining the original baseline are still valid, as the latest versions methodologies do not change these data and parameters. Therefore no updated based on Methodological tool: Assessment of the validity of the original/current baseline and update of the baseline at the renewal of the crediting period is needed.

I.6. Estimation of emission reductions

I.6.1. Explanation of methodological choices

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Each CPA under this PoA will use one or more of the methodologies mentioned below. The baseline emissions have been calculated based on the equations in baseline and monitoring methodologies for SSC projects mentioned below:

Type I, AMS I C, Version 21 – Thermal energy production with or without electricity.
Type I, AMS I E Version 10 – Switch from non-renewable biomass for thermal applications by the user.
Type III, AMS III R Version 03 – Methane recovery in agricultural activities household/small farm level.

Equations used in calculating emission reductions.

Baseline emissions

(i) Avoided usage of Kerosene for cooking

Annual baseline emissions for 1 operating unit:

$$BE_{kerosene} = FC_{kerosene} * N * \rho_{kerosene} * NCV_{kerosene} * EF_{CO2,\ kerosene} * 10^{-9} \quad (1)$$

$BE_{y,kerosene}$	Baseline emissions from burning of kerosene for household cooking needs (t CO_2e/year)
$FC_{kerosene}$	Annual amount of kerosene used for cooking in an average household (l/year)
N	Number of devices (biodigesters)
$\rho_{kerosene}$	Kerosene density (kg/l)
$NCV_{kerosene}$	Net calorific value of kerosene (TJ/Gg)
$EF_{CO2,\ kerosene}$	Emissions factor of kerosene (kg CO_2/TJ)

ii) Avoided non-renewable biomass

Annual baseline emissions for 1 operating unit:

$$BE_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossil\_fuel} \quad (2)$$

Where:

BE_y	Baseline emission from non-renewable biomass during the year *y* in tCO_2e

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 using survey methods
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)
$EF_{projected\_fossil\ fuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 64.4 tCO2/TJ[5]

(iii) Avoided methane from cattle manure

Annual baseline emissions for 1 operating unit:

$$BE_y = GWP_{CH4} \times D_{CH4} \times UF_b \times \sum_{j,LT} MCF_j \times B_{0,LT} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{Bl,j} \quad (3)$$

Where:

$BE_{y,manure}$	Baseline emissions in year *y* (tCO_2e)
GWP_{CH4}	Global Warming Potential (GWP) of CH_4 (25)
D_{CH4}	CH_4 density (0.00067 t/m^3 at room temperature (20 ºC) and 1 atm pressure)
LT	Index for all types of livestock
j	Index for animal manure management system
MCF_j	Annual methane conversion factor (MCF) for the baseline animal manure management system *j*
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated for animal type *LT* (m^3 CH_4/kg dm)
$N_{LT,y}$	Annual average number of animals of type *LT* in year *y* (numbers)
$VS_{LT,y}$	Volatile solids for livestock *LT* entering the animal manure management system in year *y* (on a dry matter weight basis, kg dm/animal/year)
$MS\%_{Bl,j}$	Fraction of manure handled in baseline animal manure management system *j*
UF_b	Model correction factor to account for model uncertainties (0.94)[6]

(iv) Total baseline emissions for one average operating unit:

$$BE_y = BE_{y,kerosene} + BE_{y,NRB} + BE_{y,manure} \quad (4)$$

[5] Regionwise default values of the fossil fuel emission factor (CO2 and non-CO2 GHG emissions) for South Asia according AMS-I.E version 10.

[6] Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

Project emissions

Annual project emissions for one operating unit: were calculated based on the default value provide in the AMS III R para.7, AMS III D para.21 option (b) and methodological tool "Project and leakage emissions from anaerobic digesters".

$$PE_{CH4,y} = Q_{CH4,y} \times EF_{CH4,default} \times GWP_{CH4} \quad (5)$$

Where:

$PE_{CH4,y}$	=	Project emissions of methane from the anaerobic digester in year *y* ($t CO_2e$)
$Q_{CH4,y}$	=	Quantity of methane produced in the anaerobic digester in year *y* ($t CH_4$)
$EF_{CH4,default}$	=	Default emission factor for the fraction of CH_4 produced that leaks from the anaerobic digester (fraction)
GWP_{CH4}	=	Global warming potential of CH_4 ($t CO_2 / t CH_4$)

$$Q_{CH4,y} = Q_{biogas,y} \times f_{CH4,default} \times \rho_{CH4} \quad (6)$$

Where:

$Q_{CH4,y}$	=	Quantity of methane produced in the digester in year *y* ($t CH_4$)
$Q_{biogas,y}$	=	Amount of biogas collected at the digester outlet in year *y* (Nm^3 biogas)
$f_{CH4,default}$	=	Default value for the fraction of methane in the biogas ($m^3 CH_4 / m^3$ biogas)
ρ_{CH4}	=	Density of methane at normal conditions ($t CH_4 / Nm^3 CH_4$)

Project emissions through fuel wood consumption due to use of traditional stove in case of non-operation of bio-digester will be included in project emissions. Any form of fuel wood consumption due to use of traditional stove will be monitored by yearly surveys and any use found in these surveys will be applied for all the project households. Following equation will be used:

$$PE_{y,NRB} = B_{biomass\ project,y} * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel} \quad (7)$$

Where:

$PE_{y,NRB}$	Project emissions during the year *y* in tCO_2e
$B_{biomass\ project,y}$	Quantity of woody biomass that is used in Project Activity 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 using survey methods

$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)
$EF_{projected\_fossilfuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 64.4 tCO2/TJ[7]

Project emissions through consumption of kerosene due to use of traditional stove in case of nonoperation of bio-digester will be included in project emissions. Any form of kerosene consumption due to use of traditional stove will be monitored by yearly surveys and any use found in these surveys will be applied for all the project households. Following equation will be used:

$$PE_{kerosene} = F_{kerosene,\ project} * N * \rho_{kerosene} * NCV_{kerosene} * EF_{kerosene} * 10^{-9} \quad (8)$$

Leakage

Leakage due to increased use of fuelwood in non-project households will be calculated as follows:

$$LE_y = (B_{biomass,non\text{-}project,y} - Total\ B_{biomass,y,}) * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel} \quad (9)$$

Where:

LE_y	Baseline emission from non-renewable biomass during the year *y* in tCO_2e
$B_{biomass,non\text{-}project,y}$	Quantity of woody biomass that is used during Project Activity in non-project household in tonnes per year
$Total\ B_{biomass\ y,}$	Total quantity of woody biomass that is used in baseline in tonnes per year
$f_{NRB,y}$	Fraction of woody biomass used in the absence of the project activity in year *y* that can be established as non-renewable biomass using survey methods
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (According to AMS.I.E para. 5, IPCC default for wood fuel, 0.015 TJ/tonne)
$EF_{projected\_fossilfuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 64.4 tCO2/TJ[8]

Emission reductions

Emission reductions for one operating unit:

$$BE = BE - PE \quad (10)$$

[7] Regionwise default values of the fossil fuel emission factor (CO2 and non-CO2 GHG emissions) for South Asia according AMS-I.E version 10.

[8] Regionwise default values of the fossil fuel emission factor (CO2 and non-CO2 GHG emissions) for South Asia according AMS-I.E version 10.

I.6.2. Data and parameters fixed ex ante

(Copy this table for each piece of data and parameter.)

Data/Parameter	**$FC_{kerosene}$**
Data unit	L/y (litres per year)
Description	Quantity of kerosene that is substituted or replaced in average household per year
Source of data	Baseline survey
Value(s) applied	xx
Choice of data or Measurement methods and procedures	The value is defined based on a survey of a representative sample of households. The survey is described in Appendix 8
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data/Parameter	**$\rho_{kerosene}$**
Data unit	kg/l (kilograms per litre)
Description	Density of kerosene
Source of data	http://www.simetric.co.uk/si_liquids.htm
Value(s) applied	0.817
Choice of data or Measurement methods and procedures	Local or regional value for kerosene used in the project area is not available, therefore the commonly suggested density is used (e.g. http://www.simetric.co.uk/si_liquids.htm)
Purpose of data	Calculation of baseline emissions
Additional comment	

Data/Parameter	**$NCV_{kerosene}$**
Data unit	TJ/Gg (tera joules per gigagrams)
Description	Net calorific value of kerosene
Source of data	Table 1.2 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 1.
Value(s) applied	43.8
Choice of data or Measurement methods and procedures	Default net calorific value suggested by IPCC
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data/Parameter	**$EF_{CO2,\ kerosene}$**
Data unit	kg CO_2/TJ (kilograms of CO2 per terajoule)
Description	Emissions factor from burning of kerosene in households
Source of data	Table 2.5 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 2, Chapter 2.
Value(s) applied	71,900
Choice of data or Measurement methods and procedures	Default emissions factor for stationary combustion in the residential category suggested by IPCC
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data/Parameter	$B_{biomass}$
Data unit	T (Tonnes)
Description	Quantity of biomass that is substituted or replaced in an average household
Source of data	Baseline survey
Value(s) applied	xx
Choice of data or Measurement methods and procedures	The value is defined based on a survey of a representative sample of households. The survey is described in Appendix 8.
Purpose of data	Calculation of baseline emissions
Additional comment	

Data/Parameter	Total $B_{biomass}$
Data unit	T (Tonnes)
Description	Total quantity of biomass that is used in an average household
Source of data	Baseline survey
Value(s) applied	Xx
Choice of data or Measurement methods and procedures	The value is defined based on a survey of a representative sample of households. The survey is described in Appendix 8.
Purpose of data	Calculation of leakage emissions
Additional comment	

Data/Parameter	$NCV_{biomass}$
Data unit	TJ/ tonne
Description	Net Calorific Value of the non-renewable biomass that is substituted.
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	0.015
Choice of data or Measurement methods and procedures	As national or regional data is unavailable, IPCC guidelines have been used as the source of data.
Purpose of data	Calculation of baseline emissions, project emissions and leakage emissions
Additional comment	

Data/Parameter	$EF_{projected\_fossilfuel}$
Data unit	tCO2/TJ
Description	Emission factor for the substitution of non-renewable woody biomass by similar consumers.
Source of data	AMS I.E.
Value(s) applied	64.4 tCO2/TJ
Choice of data or Measurement methods and procedures	The value is as per guidance of AMS-I.E paragraph 24.
Purpose of data	Calculation of baseline emissions, project emissions and leakage emissions
Additional comment	

Data/Parameter	f_{NRB}
Data unit	Dimensionless
Description	Fraction of biomass used in the absence of project activity that can be established as non-renewable biomass using survey methods
Source of data	NRB assessment according to AMS-I.E
Value(s) applied	xx
Choice of data or Measurement methods and procedures	The fraction of non-renewable biomass will be assessed according to Methodological tool calculation of the fraction of non-renewable Biomass v02. The sources used for the NRB assessment will be literature from reputed institutions, CPA specific baseline survey, general studies and reports, government departmental documents and other reliable sources.
Purpose of data	Calculation of baseline emissions, project emissions and leakage emissions
Additional comment	The value is CPA specific and will be applied for every CPA after NRB assessment has been conducted.

Data/Parameter	GWP_{CH4}
Data unit	t CO_2 / t CH_4 (tonnes of CO_2 per tonne of CH_4)
Description	Global warming potential for methane
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	25
Choice of data or Measurement methods and procedures	Default value suggested by IPCC. Decisions under UNFCCC and the Kyoto Protocol for second commitment period (from 1 January 2013), verified on: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2s2-10-2.html
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data/Parameter	$N_{(LT)}$
Data unit	Dimensionless (number)
Description	Number of heads per cattle species/category in an average household
Source of data	Baseline survey
Value(s) applied	xx for dairy cows, xx for buffalos, xx for other cattle
Choice of data or Measurement methods and procedures	The Number of heads per cattle species/category in an average household is project specific and the data has to be collected in the baseline survey.
Purpose of data	Calculation of baseline emissions
Additional comment	The value is CPA specific and will be applied for every CPA after baseline survey has been conducted.

Data/Parameter	$VS_{(LT)}$
Data unit	kg (kilograms) dry matter / (head * day)
Description	Daily volatile solid excreted for livestock category T
Source of data	Tables 10A-4 to 10A-6 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories (Volume 4, Chapter 10), Biogas Technology by B.T. Nijaguna (see reference 5 in Annex 5), Table 2.12 p29.
Value(s) applied	3.8 for dairy cow, 3.1 for buffalo, 1.4 for other cattle
Choice of data or Measurement methods and procedures	India specific value taken for dairy cows from Biogas Technology by B.T. Nijaguna (see reference 5 in Annex 5). As nationally published values are not available for buffalos and other cattle, IPCC default Indian subcontinent values are used for buffalo and other cattle.

Purpose of data	Calculation of baseline emissions
Additional comment	

Data/Parameter	**$B_{o(LT)}$**
Data unit	m^3 CH_4/kg VS (cubic meters of CH_4 per kilogramme Volatile Solid)
Description	Maximum methane producing capacity for manure produced by livestock category T
Source of data	India specific value taken for dairy cows from Biogas Technology by B.T. Nijaguna (see reference 5 in annex 5). As nationally published values are not available for other cattle, IPCC default values are used for buffalo and other cattle. Tables 10A-4 to 10A-6 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10.
Value(s) applied	0.13 for dairy cattle, 0.1 for buffalo and other cattle
Choice of data or Measurement methods and procedures	India specific value taken for dairy cows from Biogas Technology by B.T. Nijaguna. As nationally published values are not available for buffalo and other cattle, IPCC default values are used for buffalo and other cattle. Tables 10A-4 to 10A-6 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10.
Purpose of data	Calculation of baseline emissions
Additional comment	

Data/Parameter	**MCF_{manure} (MCF_{liquid}, $MCF_{liquid\ with\ crust}$, MCF_{solid})**
Data unit	% (percentage)
Description	Methane correction factor for cattle manure for each manure management system S by climate region k
Source of data	Table 10.17 in 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, Chapter 10.
Value(s) applied	xx for liquid/slurry manure management system (MCF_{liquid}), xx for liquid/slurry manure management system with natural crust cover ($MCF_{liquid\ with\ crust}$), xx for solid storage manure management system (MCF_{solid}) and xx for dry storage manure management system (MCF_{dry})
Choice of data or Measurement methods and procedures	Values corresponding to average annual temperature of xx°C are taken for MCF_{liquid}, $MCF_{liquid\ with\ crust}$, MCF_{solid} and $MCF_{dry.}$ Temperature data will be taken from Indian Meteorological Department, Government of India
Purpose of data	Calculation of baseline emissions
Additional comment	The value is CPA specific and will be applied for every CPA after average temperature for the region has been identified.

Data/Parameter	**$MS\%_{manure}$ (MS_{liquid}, $MS_{liquid\ with\ crust}$, MS_{solid} and MS_{dry})**
Data unit	Dimensionless
Description	Fraction of livestock category T's manure handled using manure management system S in climate region k (fraction of livestock manure handled using liquid/slurry manure management system, fraction of livestock manure handled using liquid/slurry with natural crust cover, fraction of livestock manure handled using solid storage manure management system and , fraction of livestock manure handled using dry storage manure management system)
Source of data	Based on baseline survey
Value(s) applied	xx for liquid/slurry manure management system (MS_{liquid}), xx for liquid/slurry with crust cover manure management system ($MS_{liquid\ with\ crust}$), xx for solid storage manure management system (MS_{solid}) and xx for dry storage manure management system (MS_{dry})

Choice of data or Measurement methods and procedures	In the baseline situation farmers dig out manure pits to store daily manure generated in the animal confinement. Along with the animal dung the fodder waste and agricultural residues socked in urine also ends up in these pits. Depending on the season, the pits have different conditions. The farmers are well aware of the condition of the material in the pit as they are observing it and doing it for several years. In the baseline survey the conditions are discussed with the respondents and the period for each of the 4 conditions is determined. An iron rod is inserted until it reaches the bottom of the pit and the height is measured to know the depth of the pit.
Purpose of data	Calculation of baseline emissions
Additional comment	The value is CPA specific and will be applied for every CPA after baseline survey has been conducted.

I.6.3. Modalities for ex ante calculation of emission reductions

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Emission reductions are calculated as the baseline emissions of the three components – (i) displacement of kerosene, (ii) displacement of non-renewable biomass and (iii) the capture and destruction of methane from animal manure – minus the project emissions and the leakage.

Baseline emissions for the kerosene component are calculated based on the amount of kerosene that will be displaced, its density, net calorific value and the emissions factor for stationary combustion of kerosene in the residential category (according to AMS-I.C "Thermal energy production with or without electricity", version 21).

$$BE_{kerosene} = FC_{kerosene} * N * \rho_{kerosene} * NCV_{kerosene} * EF_{CO2,\ kerosene} * 10^{-9} \quad (1)$$

$BE_{y,kerosene}$	Baseline emissions from burning of kerosene for household cooking needs (t CO_2e/year)
$FC_{kerosene}$	Annual amount of kerosene used for cooking in an average household (l/year)
N	Number of devices (biodigesters)
$\rho_{kerosene}$	Kerosene density (kg/l)
$NCV_{kerosene}$	Net calorific value of kerosene (TJ/Gg)
$EF_{CO2,\ kerosene}$	Emissions factor of kerosene (kg CO_2/TJ)

The fixed parameters are:

Parameter	Value	Unit	Source
$\rho_{kerosene}$	0.817	kg/l	http://www.simetric.co.uk/si_liquids.htm
$NCV_{kerosene}$	43.8	TJ/Gg	IPCC 2006 Default value, T.1.2 Volume
$EF_{CO2,\ kerosene}$	71,900	kg CO2/TJ	IPCC Chapter 1 T.4

Baseline emissions for the non-renewable biomass component are calculated based on the use of the biomass (fuel wood) that is replaced, the fraction of the biomass that is non-renewable biomass, and the emissions factor of kerosene as a projected alternative fuel (according to AMS-I.E "Switch from non-renewable biomass for thermal applications by the user"). The following formula is for one device (biodigester):

$$BE_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossil\_fuel} \quad (2)$$

Where:

BE_y	Baseline emission from non-renewable biomass during the year *y* in tCO_2e
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 using survey methods
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)
$EF_{projected\_fossil\ fuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 64.4 tCO2/TJ[9]

The fixed parameters are:

Parameter	Value	Unit	Source
$NCV_{biomass}$	0.015	TJ/t	AMS.I.E. para 39.
$EF_{projected\_fossil\ fuel}$	64,400	kg CO2/TJ	AMS I.E para 24.

The quantity of the biomass that is replaced is calculated using option (a) Calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of woody biomass per appliance (tonnes/year) using survey methods for estimations in order to provide a more conservative answer.
The baseline is calculated as the product of the number of devices (biodigesters) multiplied by the estimate of average annual consumption of biomass per appliance (i.e. the annual use of fuel wood in an average household) determined based on a survey of a representative sample of households[10].

Baseline emissions for the manure component are calculated based on the amount of manure that would decay anaerobically in the pits. The calculation has been carried out in accordance with AMS-III.R "Methane recovery in agricultural activities at household/small farm level", version3. This methodology does not provide an equation. Instead it states that emission reductions should be calculated using the Tier 2 approach from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories). Emission factors for manure of different cattle categories (dairy cows, buffalo and other cattle) are calculated based on nationally published (where available) and IPCC default values (where nationally published values are not available) for volatile solid excreted by each animal category, maximum methane producing capacity for manure of each animal category, methane correction factors for liquid/slurry, liquid/slurry with natural crust cover, solid storage and dry storage manure management systems in a warm climate with average temperature of xx°C[11] and fractions of total manure handled in these manure management systems.

CH_4 emissions from manure management:

[9] Regionwise default values of the fossil fuel emission factor (CO2 and non-CO2 GHG emissions) for South Asia according AMS-I.E version 10.

[10] Note that the variables N and 10-3 are not included in the originally equation but are needed in order to apply the equation to the 10,000 households that form the project activity and to convert the emission reduction calculations from kg into Tonnes.

[11] The average temperature has been stated as xx°C since the temperature is not a fixed parameter but varies of the climate condition in each CPA. The temperature will be specified in each CPA.

$$CH_{4manure} = \sum_{(T)} (EF_T * N_T) / 10^6 \quad (3)$$

The proposed project will involve N households and will avoid methane emissions which have to be converted into CO2 with the global warming potential for methane:

$$BE_{manure} = \sum_{(T)} (EF_T * N_T) * N * UF_b * GWP_{CH4} / 1000 \quad (4)$$

BE_{manure}	Baseline emissions from methane emissions from anaerobic decay of manure (Gg CH_4/year);
T	Species/category of livestock;
EF_T	Emissions factor for a defined livestock population (category), (kg CH_4 per animal per year)
N_{LT}	Number of head of livestock species/category T in an average household.
N	Number of units
UF_b	Correction factor suggested in the methodology
GWP_{CH4}	Global warming potential of Methane

The fixed parameters are:

Parameter	Value	Unit	Source
UF_b	0.94	factor	AMS.III.D. para. 18
GWP_{CH4}	25	times CO2	IPCC

The proposed project will involve N households and will avoid methane emissions which has to be converted into CO_2e with the Global potential warming for methane:

$$EF_{(T)} = VS_{(LT)} * 365 * B_{o(LT)} * 0.67 \text{ kg/m}^3 * f_{collected} * (MCF_{liquid}/100 * MS\%_{liquid} + * MCF_{liquid\ with\ crust}/100 * MS_{liquid\ with\ crust} + MCF_{solid}/100 * MS\%_{solid} + MCF_{dry}/100 * MS\%_{dry}) \quad (5)$$

$VS_{(LT)}$	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)
$B_{o(LT)}$	Maximum methane producing capacity for manure produced by livestock category (T/ m3 CH4 per kg of VS excreted);
0.67	Conversion factor for converting m^3 CH_4 to kg CH_4;
$f_{collected}$	Animals kept in the shed (% of hours per day)
$MCF_{(S,k)}$	Methane conversion factors for each manure management system S by climate region k (%)
$MS\%_{(T,S,k)}$	Fraction of livestock category T's manure handled using manure management system S in climate region k (dimensionless).

Finally the baseline emissions for one operating unit will be calculated according to the formula given in the methodology (AMS III D as suggested by AMS III R).

Annual baseline emissions for 1 operating unit:

$$BE_y = GWP_{CH4} \times D_{CH4} \times UF_b \times \sum_{j,LT} MCF_j \times B_{0,LT} \times N_{LT,y} \times VS_{LT,y} \times MS\%_{Bl,j} \quad (6)$$

Where:

$BE_{y,manure}$	Baseline emissions in year *y* (tCO_2e)
GWP_{CH4}	Global Warming Potential (GWP) of CH_4 (25)
D_{CH4}	CH_4 density (0.00067 t/m^3 at room temperature (20 ºC) and 1 atm pressure)
LT	Index for all types of livestock
j	Index for animal manure management system
MCF_j	Annual methane conversion factor (MCF) for the baseline animal manure management system *j*
$B_{0,LT}$	Maximum methane producing potential of the volatile solid generated for animal type *LT* (m^3 CH_4/kg dm)
$N_{LT,y}$	Annual average number of animals of type *LT* in year *y* (numbers)
$VS_{LT,y}$	Volatile solids for livestock *LT* entering the animal manure management system in year *y* (on a dry matter weight basis, kg dm/animal/year)
$MS\%_{Bl,j}$	Fraction of manure handled in baseline animal manure management system *j*
UF_b	Model correction factor to account for model uncertainties (0.94)[12]

Total baseline emissions for one average operating unit:

$$\mathbf{BEy = BE_{y,kerosene} + BE_{y,NRB} + BE_{y,manure}} \quad (7)$$

Project emissions

Annual project emissions for one operating unit: were calculated based on the default value provide in the AMS III R para.7, AMS III D para.21option (b) and methodological tool “Project and leakage emissions from anaerobic digesters”.

$$PE_{CH4,y} = Q_{CH4,y} \times EF_{CH4,default} \times GWP_{CH4} \quad (8)$$

Where:

$PE_{CH4,y}$	=	Project emissions of methane from the anaerobic digester in year *y* ($t\ CO_2e$)
$Q_{CH4,y}$	=	Quantity of methane produced in the anaerobic digester in year *y* ($t\ CH_4$)
$EF_{CH4,default}$	=	Default emission factor for the fraction of CH_4 produced that leaks from the anaerobic digester (fraction)
GWP_{CH4}	=	Global warming potential of CH_4 ($t\ CO_2$ / $t\ CH_4$)

[12] Reference: FCCC/SBSTA/2003/10/Add.2, page 25.

$$Q_{CH4,y} = Q_{biogas,y} \times f_{CH4,default} \times \rho_{CH4} \quad (9)$$

Where:

$Q_{CH4,y}$	=	Quantity of methane produced in the digester in year *y* (t CH_4)
$Q_{biogas,y}$	=	Amount of biogas collected at the digester outlet in year *y* (Nm^3 biogas)
$f_{CH4,default}$	=	Default value for the fraction of methane in the biogas (m^3 CH_4 / m^3 biogas)
ρ_{CH4}	=	Density of methane at normal conditions (t CH_4 / Nm^3 CH_4)

Item Description	Unit	Value	Source
Average size of the unit	m^3/day	xx	CPA units
Fraction of methane in the biogas	m^3 CH_4/m^3	0.6	Methodological tool "Project and leakage emissions from anaerobic digesters" (section 6.3).
Density of methane	tCH_4/m^3 CH_4	0.00067	
Default EF fraction CH4 produced that leaks	t CH_4 leaked / t CH_4 produced	0.1	
Global warming potential	CO_2e / t CH_4	25	IPCC
Number of days in year	Days	365	Calendar
Project emissions	**t $CO_{2\,e}$**	**xx**	

Project emissions through fuel wood consumption due to use of traditional stove in case of non-operation of bio-digester will be included in project emissions. Any form of fuel wood consumption due to use of traditional stove will be monitored by yearly surveys and any use found in these surveys will be applied for all the project households. Following equation will be used:

$$PE_{y,NRB} = B_{biomass\ project,y} * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel} \quad (10)$$

Where:

$PE_{y,NRB}$	Project emissions during the year *y* in tCO_2e
$B_{biomass\ project,y}$	Quantity of woody biomass that is used in Project Activity 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 using survey methods
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (IPCC default for wood fuel, 0.015 TJ/tonne)

$EF_{projected\_fossilfuel}$ Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 64.4 tCO2/TJ[13]

The fixed parameters are:

Parameter	Value	Unit	Source
$NCV_{biomass}$	0.015	TJ/t	AMS.I.E. para 39.
$EF_{projected\ fossil\ fuel}$	64,400	kg CO2/TJ	AMS I.E para 24.

Project emissions through consumption of kerosene due to use of traditional stove in case of nonoperation of bio-digester will be included in project emissions. Any form of kerosene consumption due to use of traditional stove will be monitored by yearly surveys and any use found in these surveys will be applied for all the project households. Following equation will be used:

$$PE_{kerosene} = F_{kerosene,\ project} * N * \rho_{kerosene} * NCV_{kerosene} * EF_{kerosene} * 10^{-9} \quad (11)$$

The fixed parameters are:

Parameter	Value	Unit	Source
$\rho_{kerosene}$	0.817	kg/l	http://www.simetric.co.uk/si_liquids.htm
$NCV_{kerosene}$	43.8	TJ/Gg	IPCC 2006 Default value, T.1.2 Volume
$EF_{kerosene}$	71,900	kg CO2/TJ	IPCC Chapter 1 T.4

Leakage

Leakage relating to non-renewable biomass according to AMS I-E (version 10) Paragraph 31 will be assessed from ex-post surveys of users and areas from where biomass is sourced. Following leakage will be considered:

a) Use of non-renewable woody biomass saved under the project activity to justify the baseline of other CDM project activities.
If any CPA is designed in the area where any other CDM or PoA activity is going on the saving of wood of that project will be considered. The saved wood by any other project will be added to the available wood while calculating the NRB.

b) Increase in the use of non-renewable woody biomass outside the project boundary.
Non-project households will be surveyed in the monitoring to know whether their wood usage has been increased compared to the baseline. If at all the survey shows a significant increase of "$B_{biomass\ non\text{-}project}$" in comparison to "Total $B_{biomass,y}$" due to the project activity, than the difference between "Total $B_{biomass,y}$" and "$B_{biomass\ non\text{-}project}$" will be considered for leakage calculation. In case it is shown that the fuelwood consumption of non-project households increased due to non-project related issues, such as i.e. reduction in fuelwood price, leakage will not be considered.

Leakage due to increased use of fuelwood in non-project households will be calculated as follows:

$$LE_y = (B_{biomass,non\text{-}project,y} - Total\ B_{biomass,y,}) * f_{NRB,y} * NCV_{biomass} * EF_{projected\_fossilfuel} \quad (12)$$

[13] Regionwise default values of the fossil fuel emission factor (CO2 and non-CO2 GHG emissions) for South Asia according AMS-I.E version 10.

Where:

LE_y	Baseline emission from non-renewable biomass during the year *y* in tCO_2e
$B_{biomass,non-project,y}$	Quantity of woody biomass that is used during Project Activity in non-project
	household in tonnes per year
Total $B_{biomass\ y,}$	Total quantity of woody biomass that is used in baseline in tonnes per year
$f_{NRB,y}$	Fraction of woody biomass used in the absence of the project activity in year *y* that can be established as non-renewable biomass using survey methods
$NCV_{biomass}$	Net calorific value of the non-renewable woody biomass that is substituted (According to AMS.I.E para. 5, IPCC default for wood fuel, 0.015 TJ/tonne)
$EF_{projected\_fossilfuel}$	Emission factor for the substitution of non-renewable woody biomass by similar consumers. Use a value of 64.4 tCO2/TJ[14]

The fixed parameters are:

Parameter	Value	Unit	Source
$NCV_{biomass}$	0.015	TJ/t	AMS.I.E. para 39.
$EF_{projected\ fossil\ fuel}$	64,400	kg CO2/TJ	AMS I.E para 24.

According to paragraph 83 and 77 of AMS-I.C./version. 21 if the energy generating equipment currently being utilised is transferred from outside the boundary to the project activity, leakage is to be considered.

Leakage relating to use of replaced equipment according to AMS.I.C (version 21) Paragraph 77 does not have to be considered since the traditional cook stove will remain in the house after instalment of bio-digester. Hence there is no transference of baseline equipment from outside the boundary to the project activity. In the few cases where the traditional cook stove is taken out of the kitchen the equipment will not be scrapped in a way that it would make sense to store the equipment since the stoves are mud stoves or three rock stoves.

Any form of fuel wood consumption due to use of traditional stove will be monitored and included in the project emissions as described above.

In the same way there are not CO_2 emissions from collection/processing/transportation of biomass residues to the project site.

Emission reductions

Emission reductions for one operating unit:

$$BE = BE - PE \quad (13)$$

[14] Regionwise default values of the fossil fuel emission factor (CO2 and non-CO2 GHG emissions) for South Asia according AMS-I.E version 10.

Annual emission reductions for the whole project are calculated by multiplying emission reductions for one operating unit by number of biogas units operating in that year. Schedule for construction and operation of biogas units is provided in the table below:

All the CPAs will use SSC methodologies and emission reductions of each CPA will be less than 60,000 tons per year. It is anticipated that there will be about 20 CPAs in the PoA and each CPA will save just under 60,000 tons of emission savings per year.

I.7. Monitoring plan

The CME has opted to implement a verification system for the DOE that will individually verify each CPA (instead of sampling) in order to determine the emission reductions from the CPA. The central database managed by the CME includes data that can be directly attributed to each CPA within the PoA, thereby allowing unambiguous determination of the emission reductions attributable to each CPA:

As per Procedure CDM project cycle procedure for programmes of activities v02.0, each request for issuance shall either

(i) Relate to all CPAs included in the registered PoA; or

(ii) In the case of multiple separate monitoring reports for a monitoring period prepared in accordance with the "CDM project standard for programmes of activities ", relate to all CPAs included in the batch of CPAs that the request covers;

The monitoring survey will be realized with 10% error margin and a 90% confidence interval for the entire POA. For each CPA all parameters included in section E.7.1 will be monitored according to the monitoring plan set as described.

Description of the monitoring plan for a SSC-CPA

The CME has opted to implement a verification system that will individually verify each CPA in order to determine the emission reductions from the CPA. The central database managed by the CME includes data that can be directly attributed to each CPA within the PoA, thereby allowing unambiguous determination of the emission reductions attributable to each CPA.

The Monitoring will consist of quantitative and qualitative surveys. The monitoring report will be completed annually, beginning one year after PoA registration. The monitoring survey investigates changes over time by surveying end users with and without bio-digesters, on an annual basis. It provides critical information on year-to-year trends of biodigester users.

Monitoring of biogas units in operations $N_{operating}$

The operating of all biodigester units will be monitored continuously. Once the unit is installed and checked by the technician, the supervisor marks the start of unit operation. Beneficiaries are instructed to report any faults or problems with a biodigester to the supervisor. Normally any problems with the biogas units will be resolved the same day as the original complaint. The supervisor will record any periods (in days) when the unit was not operating. Households also have a separate pre-paid post form that they can send directly to the PIP head office to inform the PIP of any problems in the event that they experience any problems with their supervisor. The fact that households make an in-kind contribution to the construction of biogas units also makes them more interested in making proper use of these units. Besides recording problems, the supervisor will check all project units in his area at least once per month to record whether they are functioning properly. The records will be made by hand writing, on two copies of a monitoring journal. At the end of each month one copy will be delivered to the Taluk in-charge, and one copy remains with the supervisor.

The Taluk level monitoring team collects monitoring journals from the areas in their Taluk, and compiles monthly Taluk-level reports, which include:

- Number of units that started operations before the monitoring period (i.e. before the beginning of the relevant monitoring month), separately for all sizes;
- Detailed records of units installed during the monitoring month, including the location, the beneficiary, the size of the biodigester, and the date of start of operations;

- Sum of non-operational days of a unit (i.e. if there were 10 units of 2 m3 size that were not operational for 1 day, the record is that a 2 m3 unit was not operational for 10 days).

Sampling Plan

A. Sampling Design:

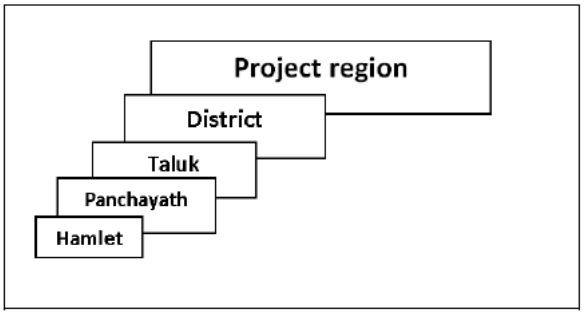
The objective of sampling is to get reliable data with the required confidence. The sampling is designed in such a way that the mean yearly data for all the 10 parameters to be assured with 90/10 confidence/precision.

Target population of the survey are the entire project participating households and for the parameter $B_{biomass,\ non\text{-}project}$, the target population is the non-participating households in the project geographical area. All the participating households are homogeneous and no special features separate them except the number of members in the family and the size of the biogas plant they have.

Sampling method

For each CPA, a clustered sampling approach with a geographic component is applied.

The project region is structured as following:



CPA: Structure of administrative units in project region

The Project region contains several districts. A district contains several Taluks. A Taluk contains several Panchayaths (basic administrative unit) and a Panchayath contains again several Hamlets (Villages). The Hamlet is the smallest defined unit in the hierarchy.

To assure that all the geographical regions are represented in the sample every district will be represented with a cluster in the sample. Therefore the number of district equals the minimum number of clusters to be surveyed.

Definition of Cluster

A cluster corresponds to a Hamlet (village) and all units included in this Hamlet. The clusters will be selected randomly from the existing data base of beneficiaries. All the units in these selected Hamlets will be surveyed. The number of clusters needed will be decided until the number of monitored households has reached the minimum required sample size for each unit size (in case there are more than one unit size installed in the CPA).

Once the clustered villages were surveyed in year one then these villages will be removed from the list for the next year (but only for one year) from the monitoring survey.

Selection of clusters:
Each Hamlet will be a cluster. Hamlets will be selected randomly until the number of total units in the clusters for each unit size reaches the required sample size. In any event every district has to be represented with at least one cluster.

Random selection:
All the Hamlets which are having project units will be under the purview for the survey. In the first randomization process all the Hamlets corresponding to one district will be listed in alphabetical order. Then Excel function will be used to select the villages randomly. All the units in those selected Hamlets will be surveyed.

Sample size As per the sampling methodology outlined in the "Standard Sampling and surveys for CDM project activities and programme of activities" v07 section 4. Sampling requirements, paragraph 10: "Where there is no specific guidance in the applicable methodology, project proponents shall use 90/10 confidence/precision as the criteria for reliability of sampling efforts for small-scale project activities..."

- According to AMS. I.E paragraph 40, "in case of annually inspection 90% confidence interval and a 10% margin of error requirement shall be achieved for the sampled parameters."
- According to AMS.I.C there are no specific guidance for the sampling requirement, therefore refer to "Standard Sampling and surveys for CDM project activities and programme of activities" v07 section 4 and the 90/10 confidence/precision for small-scale project activities.
- According to AMR. III.R. paragraph 10,"The amount of waste or raw materials that would decay anaerobically in the absence of the project activity is determined by survey of a sample group of households/small farms with a 90% confidence interval and 10% margin of error".

Thus the sample size for each of the parameters will be determined on the 90/10 level of precision. In case the CPA includes the installment of more than one biodigester unit size, the required sample size will be calculated specifically for each unit size.

The sample size, number of clusters, Hamlets, to be surveyed will be decided based on the guidelines provided in the Sampling and surveys for CDM project activities and programmes of activities v04.0, paragraphs 32-38- Cluster Sampling example 3. The data of all the biogas units under that particular CPA is recorded at the CME data base on yearly basis. Once the data is recorded sample of clusters to be visited has to be decided on the basis of number of units operating and the variance among the clusters is known. For this purpose, formulae mentioned below, sourced from Guidelines v04.0 will be used to determine the number of clusters 'c' to be surveyed during the year for monitoring surveys.

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

Where,
M = Total number of households –the entire population on project participants (varies according to the CPA)
1.645 = represents the 90% confidence required
0.1 = represents the 10% relative precision

V represents the variance calculated by

$$V = \frac{SD_B{}^2}{\overline{p}^2} = \frac{\text{variance between clusters (villages)}}{\text{average proportion}}$$

Where,
SD = Our expected standard deviation calculated as

$$\mathrm{SD_B}^2 = \frac{1}{n-1}\sum_{i=1}^{n=5}(p_i - \overline{p})^2$$

Where $\overline{p}$ is average proportion of biogas units operating in each village. And p_i is the total usages cross all villages.

The statistics of the mean and SD can be produced using statistical software.

Once the number of clusters 'c' is known all the project participating households in that cluster will be surveyed and data will be collected.

Responses from the households are expected to be 100% as the local supervisor assures them the functionality of biogas plants and continuously visiting the households.

Sampling Frame For all parameters with the exception of $\mathbf{B_{biomass,non\text{-}project}}$ the target population are households participating in the CPA that received a biodigester.

For all parameters with the exception of $\mathbf{B_{biomass,non\text{-}project}}$, the overall sampling frame will be the full list of households receiving bio-digesters in the project and the clusters/hamlets they belong to, and having sufficient levels of literacy to track some of the data that will be required. To ensure that the target population accounts for literacy, information on the literacy of project beneficiaries will be recorded by Project supervisors at the time of installing the bio-digesters and this information will be kept in the central project database that will be managed by the Project in-charge. To enable clustering by geographic area, for each bio-digester installed, the Project in-charge and his team will, record details of the district, taluk and village, hamlet of bio-digester unit installed. As per Sampling and surveys for CDM project activities and programmes of activities v04.0, list of clusters or hamlets will also be maintained.

Parameters to be monitored.	**Sampling Frame**
$N_{operating}$	The full list of households receiving bio-digesters in the project and the clusters/hamlets they belong to.
H_{stove}	
$B_{biomass,project}$	
$FC_{kerosene\ ,project}$	
N_{LT}	
$B_{manure\ generated}$	
$B_{manure,fed}$	
$H_{manure,collected}$	
Application of sludge	

For $\mathbf{B_{biomass,non\text{-}project}}$ the sampling frame are households that are not involved in the project activities but are located in the same villages/hamlet in which the project activities take place.

B. Data to be collected:

Field Measurements of 10 parameters will be made. All the parameters will be monitored continuously and will be recorded in the monitoring journals of the local supervisor. Even though the monitoring surveys were conducted the data variations because of the seasons may be compared with the existing data of the supervisors. If large variations between the data of the supervisor and the yearly monitoring survey data are found in any monitoring year then two monitoring surveys with more than 5 months gap will be conducted in the next monitoring period. The following 10 parameters will be monitored and measured:

$N_{operating}$, Functionality of biogas plants installed under the project

H_{stove} (hours) - Annual hours of operation of an average system (hours of burner functioning)
$B_{biomass,project}$ (Tonnes) – Consumption of fuel wood in households participating in project activity
$B_{biomass,\ non\text{-}project}$ (Tonnes) – Consumption of fuel wood in households not participating in project activity
$FC_{kerosene\ ,project}$ (litres) **–** Average amount of kerosene consumed by household after installation of biogas unit
N_{LT} (dimensionless) – annual average animal population in a household (number of heads of dairy, cow, buffalo and other cattle)
$B_{manure\_generated}$ (Tonnes) **–** Average amount of animal manure generated per household per year at confinement
$B_{manure,fed}$ (Tonnes) – Average amount of animal manure fed into a biogas digester per year
$H_{manure,collected}$ – hours of animal confinement per day
Application of sludge - is included in the sampling plan, it should be noted that this variable does not impact emissions arising from or saved by the project activity. This parameter is monitored for sustainability reasons (as required in AMS.III.R). That is to ensure that project participants derive the most value from being able to use the sludge as a fertilizer.

Information on the variables and data to be collected, the scope and method of the survey and their frequency are provided for each parameter in the following paragraphs:

$N_{operating}$ all the biogas plants installed under the project will be monitored continuously. There is only one variable in this parameter, i.e., functionality of biogas plant. Village level Supervisor will monitor the plants under his/her purview continuously monitors this parameter and it is made mandatory to visit all the plants once in a month and record the data.

H_{stove} (hours) – There are three key variables for this parameter that will determine average annual hours of operation of an average system (hours of burner functioning): cooking start time, cooking end time and whether one or two burners were used The survey will be carried out once a year by village level supervisor. Each supervisor will distribute sheets of paper to project beneficiaries (that are able to write) in their village, on which beneficiaries will make records for every day during one week in the year for the three variables described above.

$B_{biomass,project}$ (Tonnes) – There is one key variable, consumption of fuel wood in households participating in the project activity. The survey will be carried out once a year by supervisors. Each supervisor will meet with project beneficiaries in their area and determine fuel wood usage through discussions with each relevant beneficiary and by weighing wood consumed on the day of the visit. The supervisor will enter findings from their discussions into survey questionnaire sheets which will be completed for each beneficiary.

$B_{biomass,\ non\text{-}project}$ (Tonnes) – There is one key variable, consumption of fuel wood in households not participating in the project activity. Data for this variable will be collected by surveying 100 non-project households that use fuel wood. The survey will be carried out once a year by the Taluk level monitoring team. The team will meet with households and determine fuel wood usage through discussions with each relevant household and by weighing wood consumed on the day of the visit. Team members will enter findings from their discussions into survey questionnaire sheets which will be completed for each household. . In case it will be found that the chosen sample size for the parameter is too small to comply with 90/10 level of precision, it will be enlarged during the monitoring so that the 90/10 level of precision can be assured.

$FC_{kerosene,project}$ (litres) – There is one key variable, consumption of kerosene in households participating in the project activity. The survey will be carried out once a year by supervisors. Each supervisor will meet with project beneficiaries in their area and determine kerosene usage through discussions with each relevant beneficiary and by weighing kerosene consumed on the day of the visit. The supervisor will enter findings from their discussions into survey questionnaire sheets which will be completed for each beneficiary.

N_{LT} (Dimensionless) – There is one key variable, annual average animal population in a household. The survey will be carried out once a year by the Taluk level monitoring team. The team will meet with beneficiaries, count the number of heads of cattle on the day of their visit and will clarify through discussions with each relevant beneficiary whether there were changes in number of heads throughout the year. Team members will enter findings from their discussion into survey questionnaire sheets which will be completed for each beneficiary.

$B_{manure,generated}$ (Tonnes) – There is one key variable, average amount of animal manure generated per unit per year. The survey will be carried out once a year by the Taluk level monitoring team. The team will meet with the beneficiaries, and will determine the amount of manure generated at home/confinement through discussions with each relevant beneficiary and by weighing manure on selected samples on the day of their visit. Team members will enter findings into survey questionnaire sheets which will be completed for each beneficiary.

$H_{manure,collected}$ – There is one variable, average hours of animals kept in shed/confinement. The survey will be carried out once a year by the Taluk level monitoring team. The team will meet with the beneficiaries, and will determine the hours of animals kept in shed/confinement through discussions as the animal confinement time varies during the seasons. Team members will enter findings into survey questionnaire sheets which will be completed for each beneficiary.

$B_{manure,fed}$ (Tonnes) – There is one key variable, average amount of manure fed into a bio-digester per unit per year. The survey will be carried out once a year by the Taluk level monitoring team. The team will meet with the beneficiaries, and will determine the amount of manure fed into the bio-digester through discussions with each relevant household and by weighing manure in sampled households on the day of their visit. Team members will enter findings into survey questionnaire sheets which will be completed for each beneficiary.

Quality assurance/Quality control *selecting the most effective information gathering method*
As described in earlier sections, information will be gathered by the project supervisors and Taluk level monitoring team using a mixture of visual inspections, measurement of parameters during inspections, self-reporting and discussions with project beneficiaries.
In all cases data will be entered into standardized survey forms prepared by the project in-charge and his team to be completed by members of the Taluk level monitoring team/project supervisors or beneficiaries.

The forms will then be transferred, on a monthly basis, upwards through the monitoring team hierarchy (shown in Section C below in the “Monitoring Scheme” figure) until finally data is entered into the database kept by the project in-charge and his team.
Conducting surveys and measurements
Procedures will be put in place to ensure that field data collection is performed properly and that any potential intentional errors or unintentional errors are minimized and documented. These will include:

- Preparation of standard survey forms to be completed by the monitoring team and households (see Appendix 9)
- Training of project monitoring team
- Establishing a clear project monitoring hierarchy, which will enable sample data to be checked at various stages
- Monthly analysis of survey findings by the Project in-charge and his team to identify outliers and possible errors, which will be documented in the database
- Subsequent discussion of possible errors with Taluk level in-charges, who will, in turn, discuss these errors with the individuals responsible for conducting the surveys. On the basis of these discussions, surveys will be carried out again or eliminated from the sample, with the resulting corrective action communicated to the Project Coordinator, who will then log this in the central project database.

Minimizing non-response

Response rates will be maximized by the involvement of project supervisors in sampling. Project supervisors will be individuals selected from the local communities in which the bio-digesters are implemented. As such project supervisors are likely to have good relationships with project beneficiaries that should maximize response rates. Further, project supervisors will be involved in the installation of biogas units and will serve as a point of contact and issue resolution in the case that biogas unit do not work as planned and therefore will be continuously exposed to the households that will be surveyed. In addition, response rates will be maximized by use of a sufficiently large sample that allows room for nonresponse.

Further, the Project in-charge and his team will review response rates on a monthly basis and adjust target sample numbers for subsequent periods, if response rates are lower than anticipated.

Quality assurance

The results from sample findings will be reviewed by the Project in-charge and his team to identify response rates, check that sampling is on track to achieve required sample size and identifies any values that appear to deviate significantly from what was expected. This will enable the Project in-charge to discuss unexpected results with the relevant Taluk level in-charges, Project supervisors or monitoring team members to check whether results can be justified or are the result of errors in data capture/ entry. If results appear to be the result of errors, this will be documented in the database and the household will be re-surveyed or excluded from the sample.

Analysis of data will be done at PoA central data base at the CME office. All the data related to parameters will be analyzed for any variations with the existing data of the previous monitoring surveys.

A 90% confidence level data will be developed and stored in the central CME office to be provided to the verifying DOE personnel. Later the data will be used for annual emission savings calculations.

I.7.1. Data and parameters to be monitored

(Copy this table for each piece of data or parameter.)

Data/Parameter	**$N_{operating}$**
Data unit	Dimensionless
Description	Number of systems (biogas units) operating
Source of data	Yearly survey with clear statistical method for identifying the sample and its size
Value(s) applied	To be determined with respect to each CPA
Measurement methods and procedures	When biogas unit installation stars in an area, a local person (the supervisor) gets trained, to maintain and repair biogas systems, and to monitor and report the operation of systems. All biogas unit beneficiaries in the area are introduced to this person. They report any faults to the supervisor and normally any faults with the biodigesters are resolved by this person on the same day as the complaint is lodged. The supervisor records any periods of non-functioning (in days). In addition, the supervisor visits the beneficiaries at least once per month to check whether biodigesters and burners are functioning properly. All records are made by the supervisor by hand in two paper copies of a monitoring journal. One copy is sent at the end of the month to the area-incharge, and another copy is kept at the area level.
Monitoring frequency	Annually
QA/QC procedures	The level of uncertainty of recording this parameter is low. The methodology requires recording the number of systems operating annually. In this case, the recording will be done monthly, and any periods of nun-functioning will be recorded. Beneficiaries are not likely not to report faults, as any non-functioning means non availability of clean and simple cooking. Normally beneficiaries want to resolve any problems as soon as they appear. Nevertheless, monitoring team from the project level will do random checks to check whether the data recorded by the supervisor is correct.
Purpose of data	Calculation of baseline emissions
Additional comment	

Data/Parameter	**$FC_{kerosene}$**
Data unit	L (Litres)
Description	Amount of kerosene consumed by household after installation of biogas unit
Source of data	Yearly survey
Value(s) applied	To be determined with respect to each CPA
Measurement methods and procedures	The sample surveys will be carried out once per year by the Taluk level monitoring team. The amount will be determined from discussions with the beneficiaries during the visit. The average amount of kerosene still used for cooking will be considered as project emissions.
Monitoring frequency	Annually
QA/QC procedures	Monitoring team from the project level will do random checks to check whether the data recorded by the Taluk level team is reasonable.
Purpose of data	Calculation of baseline emissions and project emissions
Additional comment	

Data/Parameter	**$B_{biomass,\ project}$**
Data unit	T (Tonnes)
Description	Consumption of fuel wood in households participating in the project activities
Source of data	Surveys by SKG Sangha (area in charge)
Value(s) applied	To be determined with respect to each CPA

Measurement methods and procedures	The sample surveys will be carried out once per year by the area in charge and monitoring team. Information will be sought on the quantity of biomass consumed after implementation of the project activity (determined during discussions and by weighing wood consumed on the day of the visit). The difference between the total fuel wood consumption in the baseline (xx t) and the total fuel wood consumption after project implementation (monitored value) will be used for calculating emission reductions from saved biomass, after applying the fraction of non-renewable biomass.
Monitoring frequency	Annually
QA/QC procedures	Monitoring team from the project level will do random checks to check whether the data recorded by the Taluk level team is reasonable and correct.
Purpose of data	Calculation of project emissions
Additional comment	

Data/Parameter	$B_{biomass,non-project}$
Data unit	T (Tonnes)
Description	Total quantity of biomass that is used in an average household not participating in the project activities.
Source of data	Surveys by SKG Sangha (area in charge and monitoring team)
Value(s) applied	To be determined with respect to each CPA
Measurement methods and procedures	Survey of 100 non-project households that use fuel wood. The surveys will be carried out once per year by the Taluk level monitoring team. Information will be sought on the quantity of biomass consumed (from discussions and by weighing wood consumed on the day of the visit). This information will be used to calculate $B_{NRB\_non\_project}$ (consumption of non-renewable biogas by households not participating in the project activities) by applying F_{NRB} of xx% to the monitoring parameter.
Monitoring frequency	Annually
QA/QC procedures	Monitoring team from the project level will do random checks to check whether the data recorded by the Taluk level team is reasonable and correct.
Purpose of data	Calculation of leakage emissions
Additional comment	

Data/Parameter	N_{LT}
Data unit	Dimensionless
Description	Annual average animal population in a household (number of heads of dairy cow, buffalo and other cattle).
Source of data	Yearly survey
Value(s) applied	To be determined with respect to each CPA
Measurement methods and procedures	The sample surveys will be carried out once per year by the Taluk level monitoring team. The team will count the number of heads of cattle and will clarify with the household people during a discussion whether there were any changes in number of heads throughout a year.
Monitoring frequency	Annually
QA/QC procedures	Monitoring team from the project level will do random checks to check whether the data recorded by the Taluk level team is reasonable and correct.
Purpose of data	Calculation of baseline emissions
Additional comment	

Data/Parameter	H_{stove}
Data unit	H (Hours)
Description	Annual hours of operation of an average system (hours of burner functioning)
Source of data	Yearly survey
Value(s) applied	To be determined with respect to each CPA
Measurement methods and procedures	A sample (5%) of beneficiaries of the sample (only those who can write will be selected) will be given a sheet where they will make records for a week writing down each day hours when a burner is functioning. i.e. each day a beneficiary will write down the time of starting cooking and finishing cooking, and note whether one or two burners were used. The supervisor will distribute the sheets and collect the answers.
Monitoring frequency	Annually
QA/QC procedures	This parameter is not used for calculating emission reductions. It is used for checking whether the biodigester produced enough biogas to substitute previous use of non-renewable biomass and kerosene. Nevertheless, during the household visits by the area in charge and project level monitoring team, it will be checked whether recorded hours are reasonable.
Purpose of data	-
Additional comment	

Data/Parameter	$B_{manure,generated}$
Data unit	T (Tonnes)
Description	Average amount of animal manure generated per household per year.
Source of data	Survey of a sample of households by SKG Sangha (Taluk level monitoring team).
Value(s) applied	To be determined with respect to each CPA
Measurement methods and procedures	The sample surveys will be carried out once per year by the Taluk level monitoring team. The amount will be determined by during discussions with the beneficiaries.
Monitoring frequency	Annually
QA/QC procedures	Monitoring team from the project level will do random checks to check whether the data recorded by the Taluk level team is reasonable. Additionally the parameter will be cross-checked with calculated amount of generated manure by multiplying heads of different types of cattle by typical amount of manure generated by these cattle types.
Purpose of data	Calculation of leakage emissions
Additional comment	

Data/Parameter	$B_{manure,fed}$
Data unit	T (Tonnes)
Description	Average amount of animal manure fed into a biogas digester per year.
Source of data	Survey of a sample of households by SKG Sangha (Taluk level monitoring team).
Value(s) applied	To be determined with respect to each CPA
Measurement methods and procedures	Survey of a representative sample (at least 5%) of beneficiaries. The surveys will be carried out once per year by the Taluk level monitoring team. The amount will be determined from discussions with the beneficiaries and by weighing manure fed into the biodigester at the day of the visit.
Monitoring frequency	Annually

QA/QC procedures	Monitoring team from the project level will do random checks to check whether the data recorded by the Taluk level team is reasonable.
Purpose of data	Calculation of leakage emissions
Additional comment	

Data/Parameter	$H_{manure,collected}$
Data unit	Hours/day
Description	Average hours of animals kept in shed/confinement
Source of data	Yearly survey
Value(s) applied	To be determined with respect to each CPA
Measurement methods and procedures	The sample surveys will be carried out once per year by the Taluk level monitoring team. The hours will be determined by during discussions with the beneficiaries.
Monitoring frequency	Annually
QA/QC procedures	Monitoring team from the project level will do random checks to check whether the data recorded by the Taluk level team is reasonable. Additionally the parameter will be cross-checked with calculated amount of generated manure by multiplying heads of different types of cattle by typical amount of manure generated by these cattle types.
Purpose of data	Calculation of baseline emissions
Additional comment	

Data/Parameter	**Application of sludge**
Data unit	n/a (qualitative information)
Description	Proper application of the sludge from the biogas unit.
Source of data	Survey of a sample of households by SKG Sangha (Taluk level monitoring team).
Value(s) applied	To be determined with respect to each CPA
Measurement methods and procedures	The surveys will be carried out once per year by the Taluk level monitoring team. Application of the sludge will be determined from discussions with the beneficiaries on where, how and when the sludge is used.
Monitoring frequency	Annually
QA/QC procedures	Monitoring team from the project level will do random checks to check whether the information recorded by the Taluk level team is reasonable.
Purpose of data	-
Additional comment	CPA Implementer will conduct a number of meetings with eligible households and provide training to transfer this knowledge. The project biogas units will have wide and very low depth collection pits to gather the spent slurry. The accumulated slurry will be used either for vermicompost production or for direct application in agricultural soils as manure or both. Beneficiaries will be trained in the correct application.

I.7.2. Sampling plan

>>

The CME shall define CPAs for which issuance of credits is requested so that not all CPAs at a given time shall go for request of issuance of credits.

- For **1-10 CPAs** for which issuance of credits is requested, at the minimum 50% of the clusters of 1 CPA selected randomly, will be verified
- For **11-20 CPAs** for which issuance of credits is requested, at the minimum 50% of the clusters of 2 CPAs selected randomly, will be verified
- For every batch of up to 10 CPAs for which issuance of credits is requested, at the minimum 50% of the clusters of 1 CPA selected randomly, will be verified.

The following sampling procedure shall be applied for each CPA-group corresponding to each version of PoA that will exist at any particular time.

While all the digesters in each CPA shall be regularly monitored, the CER calculations shall be performed on the basis of the project sample group (PSG). For this purpose, a sample of biogas digesters installed would be monitored to record the values of the monitored parameters such as operating status, operational hours, etc.

The sampling methodology outlined in the Guideline Sampling and surveys for CDM project activities and programmes of activities v04.0 section 5.4 shall be followed by using cluster sampling with a geographic component.
First, the CPA will be divided in geographical areas. Each of the geographical area has to be represented with at least one cluster in the sample.
Second, the geographical areas are to be divided into sub-groups (clusters) that are randomly selected for data collection. The data are then collected from all the units existent in the sample cluster. The monitored digesters would constitute the PSG for the particular CPA. The formula for determining the size of the sample group is given below.

Step 1: Collect data for all digesters sold in a particular CPA.

Step 2: Determine the minimum sample size n using the equation given below

$$n = (Z\alpha/2 * \sigma/E)^2$$

Where:

n = the sample size
Zα/2= 1.96 for a confidence interval of 95%
σ = the standard deviation
E = the maximum error of estimate – in this case 10% of the average value of the specific parameter

The survey must be realized with 10% error margin and a 95% confidence interval. This confidence interval corresponds to the specification provided in “Standard Sampling and surveys for CDM project activities and programme of activities” v07 section 4 paragraph 10.

Step 3: The survey on the biogas digester users must be conducted by doing site visits and conducting personal interviews based on the standard questionnaire.

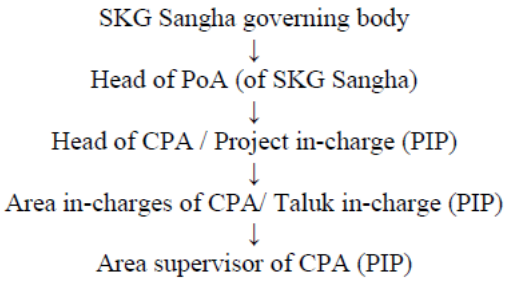
Step 4: The results of the survey will be extrapolated for the entire CPA.

I.7.3. Other elements of monitoring plan

>>

Implementation plan

The responsibilities of coordinating and conducting the sample activities are given below PoA Monitoring Scheme:



Level	
Head of CME:	• Is the overall in-charge for the PoA. Takes decisions about inclusion of new CPAs. Manages the central database about instalment of biodigesters.
	• Communicates with the DOE
	• Communicates the lists of beneficiaries to the CPA heads meant for yearly monitoring surveys.
	• Randomly visits and checks the accuracy of the data provided by the CPA Heads.
	The central database holds the following information:
	-Households location, beneficiary name, unit size, number of people in the HH, animal population, biodigester identification number, GPS Data, date of installation of the plant and the end of operations in case the unit broke down, number of non-operational days, project serial number, corresponding taluk incharge and corresponding supervisor, monthly monitoring visits and repairs carried out on any aspect of the biogas plant.
	- Sample database for CPAs,
	- Data about number of operating units of biodigester during each monitoring period
	-The data will be collected by the supervisor and entered into electronic form by the taluk in-charge. Project in-charge will check the data and forward it to Head of CPA who will import data in central database. Central database is basis for:
	- Archiving and analysis of monitoring Data
	- Calculation of emission reductions
	- Preparation of monitoring report
Head of CPA/Project in-charge:	• Is the responsible person for that particular CPA. Plans, installs, procures material, maintains, and monitors the entire CPA activity.
	• Enters all data to central database and sends monthly reports to the CME,
	• Participates in yearly validations, provides any clarifications and information needed by the verifier.
	• Checks and forwards the monitoring list form the CME to area in-charges.
	• Randomly visits and rechecks the monitoring survey data.
Area in-charge/Taluk in	• Receives monthly reports from the area supervisors and sends a consolidated report (in electronic form) to the CPA head.
	• Takes necessary steps to resolve the problems in the biodigester within 48 hours.
	• Organize yearly monitoring surveys with the help of area supervisors and the CPA head.
Area Supervisor	In each area there will be one or more area supervisors depending upon the concentration of the project units.
	• Is the key grass root level person of the CPA. He motivates the beneficiaries and arranges the material for the construction of the project unit in association with the beneficiary and the area in-charge.

	• Supervises the unit installation, guides the beneficiary in operation, maintenance of the unit.
	• Regularly visits the units in his purview and records the data of the units.
	• Helps the area in-charge in training the beneficiaries and helps in regular monitoring surveys.
	• Reports monthly to the area in-charge on the monitoring of the units and reports the non-functioning of any unit immediately after receiving such complaint from the beneficiary. Coordinates the repair or rectification of the problem of the unit.
	• Maintains record of all the units (Paper copies) in his area. The hard copies will have all the basic information required for the central database

The head of the CME has very good experience in CDM projects and also implemented many number of projects in many nations and also have qualified staff to conduct the management of PoA in all respects.

The head of the CPA will be trained if at all the person requires any capacities to manage the CPA by the CPA. Accordingly the Taluk level personnel and area supervisors are also trained by the experienced staff of the CME on monitoring aspects of the projects.

SECTION J. Crediting period type and duration

>>
Type of crediting period: Renewable or Fixed crediting period.
Length of crediting period: 7 years or 10 years.

SECTION K. Eligibility criteria for inclusion of CPAs

>>
To include a CPA into PoA the following criteria should be fulfilled by the CPA as per EB 70 Annex 05.

No.	Eligibility criterion - Category	Eligibility criterion - Required condition	Supporting evidence for inclusion
1	Geographical boundary	The geographical boundary of the CPA is within the geographical boundary of the PoA, the Republic of India	Central Database
2	Avoid double counting	The CPA has not yet been included in another PoA or has not yet been registered as a single CDM project activity	Declaration from CPA Implementer
3	Avoid double counting	The CPA is uniquely identified and defined by way of unique identification number attached to each biodigester unit and the location of each biodigester unit is recorded in the central database.	Central Database
4	Specifications of technology	The CPA involves the installation of biodigesters, with a size in the range of 2-15 m3 with a capacity of up to 6m3 gas per day, at household level in rural areas.	Central Database
5	Baseline scenario	In the case households use traditional cook stoves, the fire wood used is from a non-renewable source and/ or the animal waste management system is based on anaerobic fermentation.	Declaration from CPA Implementer

6	Inclusion	The start of the CPA occurs after the start date of the validation of the PoA. The start date will be defined as the date on which the CPA is included in the PoA, whichever comes earlier.	Central Database
7	Methodology	The CPA adheres to AMS.I.E (Type I) and AMS.III.R (Type III) of the CDM SSC Methodologies as mentioned in Sections I.1. and I.6.1. AMS. I.C is optional for the CPA. The CPA adheres to the applicability criteria as per section I.2. of PoA-DD. This is line with Standard CDM project standard for programmes of activities v02.0 section 7.12.4.2 Application of multiple small-scale methodologies. Section I.1. and I.6.1.of the PoA: The following approved small scale baseline and monitoring methodologies will be used in the proposed PoA. (i) AMS-I.C “Thermal energy for user with or without electricity” ver. 21. (ii) AMS-I.E “Switch from non-renewable biomass for thermal applications by the user” ver. 10. (iii) AMS-III.R “Methane recovery in agricultural activities at the household/small farm level” ver. 3.	CPA-DD

8	Additionality[15]	The CPA meets all criteria, based on the "Guidelines on the demonstration of additionality of small-scale project activities" Annex 27 EB 68 pertaining to the demonstration of auto additionality. According to para 2 "Documentation of barriers, as per paragraph 1 above, is not required for the positive list of technologies and project activity types that are defined as automatically additional for project sizes up to and including the small-scale CDM thresholds (e.g. installed capacity up to 15 MW). The positive list comprises of:" sub Para (c) says "Project activities solely composed of isolated units where the users of the technology/measure are households or communities or Small and Medium Enterprises (SMEs) and where the size1 of each unit is no larger than 5% of the small-scale CDM thresholds; The PoA is meant for installing isolated biogas plants where the users are the individual households. Further the foot note 1 elaborated the capacity as "That is the size of each unit under 750 kW installed capacity or under 3000 MWh of energy savings per year or 3000 tonnes of emission reductions per year. EB 68 further elaborated in its Annex 26 Para 2 says "Project activities up to five megawatts that employ renewable energy technology are additional if any one of the conditions below is satisfied: Sub Para (c) says "The project activity is designed for distributed energy generation (not connected to a national or regional grid) with both conditions (i) and (ii) satisfied; (i) Each of the independent subsystems/measures in the project activity is smaller than or equal to 1500kW electrical installed capacity; (ii) End users of the subsystems or measures are households/communities/small and medium enterprises (SMEs). PoA is planned to install the biogas plants of 1 to 6 cubic meter biogas generation per day capacity with the digester volumes of 2-15 cubic meters. The maximum unit is having 6 cubic meter biogas generation per day capacity. Each CPA will demonstrate that: 1. Each unit is no larger than the 5% of the small scale CDM thresholds. 2. Each of the independent subsystem in the project activity is smaller than or equal to 1500 kW electrical installed capacity 3. End user of the subsystem, biogas plant is a household	

[15] This eligibility criteria has not been updated. According Project Standard CDM project standard for programmes of activities v02.0 para 285 "For renewal of the PoA period of a registered CDM PoA, the coordinating/managing entity is not required to reassess the additionality of the PoA nor update the section of the PoA-DD relating to additionality".

9	LSC	The CPA has carried out a local stakeholder consultation	LSC Report
10	ODA	The CPA has not received funding from Annex I parties that results in a diversion of official development assistance.	Declaration from CPA Implementer
11	Debundling check	The CPA is not a debundled component of a large-scale project activity in accordance with the approved version of the Methodological tool "Assessment of debundling for small-scale project activities v04".	
12	Methodologies	The CPA complies with the sampling plan as set out in Section I.7 of the PoA-DD.	Sampling Plan CPA-DD
13	Carbon credit ownership	All households within the CPA transfer their right of CER ownership to the CME, SKG Sangha.	Beneficiary agreement
14	Additionality	The CPA is a voluntary action and not required by law.	Declaration from CPA Implementer
15	Inclusion	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.	Declaration from CPA Implementer
16	Target group	All beneficiaries are rural households without grid connection.	Central Database

Appendix 1. Contact information of coordinating/managing entity and project participants

Coordinating/managing entity and/or project participants	☐ Coordinating/managing entity ☐ Project participant
Organization name	SKG Sangha
Country	India
Address	2nd Main Road, Gandhi Nagar
Telephone	+91 9243436266, +91 81522 25370
Fax	+91 8152224146
E-mail	skgsangha@gmail.com
Website	www.skgsangha.org
Contact person	Vidya Sagar Devabhaktuni

Appendix 2. Affirmation regarding public funding

No public funding is involved in the PoA.
The participating households will make a small in kind contribution of materials and labour but otherwise no other funding or assistance will be available to implement the project. The project will be funded solely from the sale of the offsets created from the project's GHG emission reductions. Some of the CPAs may approach the Government of India for incentives/assistance provided through Ministry of new and Renewable Energy as an additional investment for that CPA.

Appendix 3. Applicability of methodologies and standardized baselines

No further information.

Appendix 4. Further background information on ex ante calculation of emission reductions

No further information

Appendix 5. Further background information on monitoring plan

No further information

Appendix 6. Summary report of comments received from local stakeholders

Electronically meeting:
No feedback was provided from invited organisations electronically. But feedback on PoA design was provided from non invited Organisations that came to know about the Programme. They expressed to wish that SKG Sangha should take up project activity in their region.

Physical meeting:
Comments were raised regarding benefits of working together with SKG Sangha in the Programme.
People were interested to find out about the financial and organisational gain of participating on the Programme. The women organisations representative was especially impressed with the reduction in environment pollution by replacing the traditional cook stoves. Most of the comments raised were regarding the possibility to take up a Programme Activity in a specific region and the wishes to take up activity by SKG Sangha were expressed. The comments regarding the Sustainable Development Indicators were in accordance with the reflected ones in the PoA Matrix.

In general the PoA activity has been appreciated by all the participants and they wished all success to the Programme. A detailed list of all comments can be found in the Gold Standard LSC Report.

Appendix 7. Summary of post-registration changes

No information about post-registration changes.

Appendix 8. Survey Template – Baseline Information

A. Baseline survey sheet:

Household Energy & Manure Management Survey	
Village: Taluk:	Date: Survey Number in Village:

1. General Data

Name:	
Number of people in household:	
Income:	.....Rs ☐ per day ☐ per week ☐ per month ☐ per year

2. Fuel Consumption

Kerosene			
Used for	**Amount (litres)**		**Price per litre (Rs)**
Cooking:		☐ per day ☐ per week ☐ per month ☐ per year	Subsidised:
Lighting Fire:		☐ per day ☐ per week ☐ per month ☐ per year	
Lighting:		☐ per day ☐ per week ☐ per month ☐ per year	In the market:
Other:		☐ per day ☐ per week ☐ per month ☐ per year	
Amount subsidised by government:		☐ per day ☐ per week ☐ per month ☐ per year	

Firewood			
Use and Source		**Amount (kg)**	
Used for cooking			☐ per day ☐ per week ☐ per month ☐ per year
Used for other purposes			☐ per day ☐ per week ☐ per month ☐ per year
Purchased			☐ per day ☐ per week ☐ per month ☐ per year
Collected from forests			☐ per day ☐ per week ☐ per month ☐ per year
Collected from private land			☐ per day ☐ per week ☐ per month ☐ per year
Other source (specify).....			☐ per day ☐ per week ☐ per month ☐ per year
Purchased wood:	Price:		..... Rs / kg, or ..... Rs/tonne
	Price trend in recent years:		☐ increasing ☐ stable ☐ decreasing ☐ don't know
Collected Wood:	Time spent collecting (hours):		☐ per day ☐ per week ☐ per month
	Trend in time taken to collect wood in recent years:		☐ increasing ☐ stable ☐ decreasing ☐ don't know
	Distance to collection area:		

	Distance trend in past years:	□ increasing □ stable □ decreasing □ don't know	
	Type of firewood collected (if possible, provide approximate share)	Chopped trees:	□
		Chopped branches:	□
		Dead wood on ground:	□
		Other:	□

Other biomass					
Type (specify)	**Amount (kg)**				
		□ per day	□ per week	□ per month	□ per year
		□ per day	□ per week	□ per month	□ per year

3. Manure management

Livestock numbers:	Dairy cows: ……	Buffalos: …..	Other cattle: ……	
Where do you normally keep the animals?	□ In a shed	….. □ hours per day ….. □ share (%)	□ In the fields	….. □ hours per day ….. □ share (%)
Where is the manure from the shed put?	□ In a pit □ On the fields □ Other …….			
What happens to the manure from the animals when they are in the fields?	□ Collected and put in pit □ Left in the fields □ Other……			
Total amount of manure produced by animals (approximately, if known):	□ kg □ tonnes □ baskets		□ per day □ per week □ per month □ per year	
Total amount of manure collected from shed and put in pit:	□ kg □ tonnes □ baskets		□ per day □ per week □ per month □ per year	
Total amount of manure collected from fields and put in pit:	□ kg □ tonnes □ baskets		□ per day □ per week □ per month □ per year	

If some dung goes into a compost pit	
(i) What is the depth of the pit (in metres)?	……. m
(ii) Apart from dung, what else is added to the pit?	□ Crop waste □ Food waste □ Toilet waste □ Other
(iii) What share of the pit is made up of this other waste?	Approximately ……. % of the total material in the pit

(iii) For how many months of the year is the material in the pit most like the following state?	☐ An uncovered slurry ☐ A covered slurry or slurry with crust ☐ Solid material but wet ☐ Solid material and dry	..... months ..... months ..... months ..... months
(v) How long does it take the pit to fill up?	..... months	
(vi) What happens to manure and other pit waste once the pit is full?	☐ Manure and other waste is piled on top of the existing pit ☐ A new pit is dug and manure and waste is put in there ☐ Other	
(vii) Does the material in the pit get mixed or turned?	☐ yes ☐ no (if yes please indicate how often)	
(viii) How often does the pit get emptied?	☐ once per year (indicate month(s) when pit emptied.....) ☐ more than once per year (indicate how often .....)	

4. Interest in biogas

Are you interested in getting a biogas unit?	
If yes, why?	☐ money savings ☐ time savings ☐ cleaner ☐ less smoke ☐ more convenient to cook ☐ other
If no, why?	

Appendix 9. Survey Template – Monitoring Information

A. Monitoring survey sheet (Project Households):

Monitoring Survey				
Village:	Taluk:	District:	Date:	Project ID:

1. General Data

Name:		
Number of people in household:	Elders:	Children below 12 years:

2. Fuel Consumption

Kerosene			
Used for	**Amount (litres)**		Other purpose
Cooking:		□ per month	
Lighting Fire:		□ per month	

Firewood					
Use and Source	**Amount (kg)**				
Used for cooking		□ per day	□ per week	□ per month	□ per year
Used for other purposes		□ per day	□ per week	□ per month	□ per year

3. Manure management

Livestock numbers:	Dairy cows: ……	Buffalos: …..	Other cattle: ……
Where do you normally keep the animals?	□ In a shed	….. □ hours per day ….. □ share (%)	□ In the fields	….. □ hours per day ….. □ share (%)
Where is the manure from the shed put?	□ In a pit □ On the fields □ Other			
What happens to the manure from the animals when they are in the fields?	□ Collected and put in pit □ Left in the fields □ Other.....			
Total amount of manure produced by animals (approximately, if known):	□ kg □ baskets		□ per day	
Total amount of manure collected from shed and put in pit:	□ kg □ baskets		□ per day	

Total amount of manure collected from fields and put in pit:	□ kg □ baskets	□ per day
Hours of biogas stove usage:		If 2 burner are used for 1 hour, then write as 2 hours

B. Monitoring survey sheet (Non Project Households):

Monitoring Survey				
Village:	Taluk:	District:	Date:	Survey serial number:

1. General Data

Name:		
Number of people in household:	Elders:	Children below 12 years:

2. Fuel Consumption

Firewood		
Use and purpose	**Amount (kg)**	
Used for cooking		□ per day
Used for other purposes		□ per day

Appendix 10. CPA Eligibility Form

SKG Sangha Biodigester Programme - CPA PIP Eligibility Form

This form is used to show the eligibility to implement the activity that involves the Implementation of bio-digesters to low-income households and institutions within the geographical boundary of India of the following PIP in the following CPA in the framework of the PoA "SKG Sangha bio-digester Programme in India' and has to be filled out by the managing entity 'SKG Sangha' together with the Project Implementing Party (PIP). All points under step 1 to 4 have to be answered with yes to make the PIPs activity eligible. Step 5 is optional.

Name of CPA: _____

Name of PIP: _____

1. General Framework and Technology
The CPA is developed under the general framework described in section A.4.2 of the PoA-DD.

Technology of biodigester must then follow these guidelines:
1.1 The capacity of the biodigesters must be between $2m^3$ and $15m^3$ of biogas per day.
1.2 Favour local materials for the construction
Sustainable development assessment
1.3 PIP's activity corresponds to Sustainable development assessment validated through corresponding stakeholder consultation.

2. Additionality
Must assess clearly its additionality with the complete list of criteria provided in section E.5.2.of the PoA-DD. If any of the following steps needs more clarification it will be analysed in more detail inside the CPA-DD.

A CPA is considered additional if the project activity is

I. Project Activity employs renewable energy technology and shall not exceed 5 Megawatt
II. Emissions reductions achieved through methane avoidance (Type III) are below 20 ktCO2e per year
III. Each of the independent subsystems/measures in the project activity achieves an estimated annual emission reduction equal to or less than 600 tCO2e per year
IV. The project activity is an off grid activity supplying energy to households/communities

.

3. Sustainability and no harm assessment
No Harm Assessment:
3.1 The PIP has signed the "Do Not Harm Declaration"
Official Development Assistance:
3.2 The PIP has signed the "Official Development Assistance Declaration"

4. Miscellaneous
The project activity:
4.1 is a voluntary action decided and implemented by the project participants;
4.2 Is coordinated by SKG Sangha in India.

4.3 Is not registered as an individual voluntary project activity nor is part of another registered PoA and is not a de-bundled component of a larger project and has not been already presented in any CPA of this PoA.
4.4 The PIP shall implement a monitoring as stated in the PoA-DD that is following the step-wise approach of applied methodology to calculate emission reductions.

5. Similarities to a previous registered PIPs activity

5.1 Whenever there is a similarity between the activity of this PIP and a previous activity of any CPA registered under the PoA 'SKG Sangha Biodigester Programme', please clarify which one:

CPA:_____

PIP:_____

Observations:_____
_____
_____

CME: SKG Sangha: Date, Name

_____

Project Implementing Party: Date, Organization, Name

_____

Appendix 11. Model End User Agreement between the CME and the beneficiaries regarding the ownership of

Model End User Agreement for providing Biodigester under SKG Sangha Biodigester Programme (PoA)

Name of CPA:.....

Name of PIP:.....

The agreement is entered on this ..... day of ..... (Month) ..... (Year) at ..... (Village) between xxxx[insert name of PIP] (PIP under of the PoA), xxxx [address], xxxx [City], xxxx [State] (hereinafter called the PIP) and Name: ..... W/o or D/o: ..... (hereinafter called the beneficiary) address .... agreed on the following conditions:

1. The rural India is suffering from many problems like indoor air pollution, usage of chemical fertilizers, pesticides, lack of health facilities, poor sanitation, lack of educational facilities etc.
2. In these conditions the Indian NGO SKG Sangha situatded in 2rd Main Road, Gandhi Nagar, Kolar, Karnataka State has made an attempt to find sources to address some of the problems faced by rural families. It has developed a programme of Activity under the CDM to provide a biodigester unit. This provides the rural women with clean fuel, biogas for cooking and water heating needs, very rich compost for their farm lands that gives the woman money savings and social equality. At the same time this unit processes rural waste and helps the environment by conserving water, replacing chemical fertilizers with biogas spent slurry, avoiding indoor air pollution and green house gases.
3. The beneficiary has to contribute a portion of the building material like sand, gravel etc., dig the pit and contribute in physical labour required for building the unit.
4. ..... [insert name of PIP] builds the unit; train the beneficiary, monitor and maintain the units.
5. myclimate is funding this project through carbon funds. Acting as the funder, myclimate owns all carbon credits produced out of the project.
6. The beneficiary acknowledges that all carbon credits (Certified Emission Reductions) produced by the project will automatically be the exclusive ownership of myclimate.
7. The unit is to be owned by the women of the house, run by her and the income if any shall go to her.
8. The beneficiary is under obligation to send her children to school in case she has any school going aged children.
9. Xxx [insert name of PIP] will give preference to the existing beneficiaries in all its future projects.
10. The beneficiary shall maintain and run the system properly and regularly.

Authorized Signatory
[PIP]

Signature and name of the beneficiary

- - - - -

Document information

Version	*Date*	*Description*
09.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for programmes of activities" (CDM-EB93-A07-STAN); • Make editorial improvements.
08.1	28 June 2017	Revision to: • Remove a duplicated instruction; • Make editorial improvement.
08.0	7 June 2017	Revision to: • Improve consistency with the "CDM project standard for programmes of activities" and with the PDD and CPA-DD forms; • Make editorial improvement.
07.0	25 May 2017	Revision to: • Ensure consistency with the "CDM project standard for programmes of activities" (CDM-EB93-A07-STAN) (version 01.0); • Incorporate the "Programme design document form for small-scale CDM programmes of activities" (CDM-SSC-PoA-DD-FORM); • Make editorial improvement.
06.0	15 April 2016	Revision to ensure consistency with the "Standard: Applicability of sectoral scopes" (CDM-EB88-A04-STAN) (version 01.0).
05.0	9 March 2015	Revision to: • Include provisions related to choice of start date of PoA; • Include provisions related to delayed submission of a monitoring plan; • Provisions related to local stakeholder consultation; • Add exception for generic CPA where technology is under positive lists; • Make editorial improvement.
04.1	5 August 2014	Editorial revision to correct the document information table.
04.0	25 June 2014	Revision to: • Include the Attachment: Instructions for filling out the project design document form for CDM programme of activities (these instructions supersede the Guideline: Completing the programme design document form for CDM programme of activities (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for the application of the methodology (ies) to the PoA in B.4 and Appendix 1; • Add general instructions on post-registration changes in paragraphs 2 and 3 of general instructions and Appendix 6; • Change the reference number from F-CDM-PoA-DD to CDM-PoA-DD-FORM; • Make editorial improvement.

Version	*Date*	*Description*
03.0	3 December 2012	EB 70 Revision to reflect changes to the *Guideline: Completing the programme design document form for CDM programmes of activities* (EB 70, Annex 6).
02.0	13 March 2012	EB 66 Revision required to ensure consistency with the "Guidelines for completing the programme design document form for CDM programmes of activities" (EB 66, annex 12).
01.0	27 July 2007	EB 33, Annex 41 Initial publication.

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