PROGRAMME DESIGN DOCUMENT FORM FOR SMALL-SCALE CDM PROGRAMMES OF ACTIVITIES (F-CDM-SSC-PoA-DD) Version 02.0

PROGRAMME OF ACTIVITIES DESIGN DOCUMENT (PoA-DD)

PART I. Programme of activities (PoA)

SECTION A. General description of PoA

A.1. Title of the PoA

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Programme for Promotion of Access to Domestic Biogas in Rural Bangladesh

Ver.: 5.0

Date: 15/01/2014

A.2. Purpose and general description of the PoA

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The natural gas supply network in Bangladesh covers only 4% of the population.[1] Households in rural areas continue to use mainly biomass for cooking. This practice forces the people (especially housewives) to spend money for purchasing fuelwood and/or to require substantial time to collect biomass as well as for cooking. Indoor air pollution is also a big problem for health of household members, especially women and children.

Therefore, several new practices started for better use of thermal energy in rural area. One is to introduce improved cookstove (ICS) technology, which reduces the amount of fuel biomass to around a half from conventional traditional three-stone type practice without chimney. The other and better (but much more expensive) solution is to utilize biogas by installing a micro-scale domestic digester.

Many literature[2] shows that the forest is seriously decreasing in Bangladesh with the rate far exceeding that of replanting, due to pressures from timber extraction, collection of fuelwood for domestic and industrial use, *etc*. Therefore, the fuelwood saved by ICS and biogas digester is recognized as a non-renewable biomass in Bangladesh, *i.e*, ICS and biogas utilization contributes to reduce CO_2 emissions.

For general consumption pattern of thermal energy in household, biomass is used almost exclusively for cooking purpose. Among the biomass, fuelwood constitutes around 42% of total biomass cooking energy in average.[3] It is to be noted that commercialization of fuelwood is increasing, implying the scarcity in the local environment.

Under these circumstances, the PoA voluntarily promotes introduction of biogas digesters for rural households coordinated by IDCOL[4] and implemented by the offices of Grameen Shakti (GS)[5] and other partner organizations.

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[1] "Assessment of Existing Improved Cook Stove in Bangladesh", MA Quaiyum Sarkar *et al*, Environment, BRAC Research Report 2006.

[2] For example, "Non-Renewable Biomass (NRB) Assessment Report—A Component of The Bangladesh Stoves Baseline Study 2008–9", ClimateCare, 009;
"Environmental Literacy and NGOs: Experience from the Microcredit Based Social Forestry Program of Proshika in Banglades", J.A. Chowdhury, SANDEE Working Paper No 50-10. August 2010.

[3] "Restoring Balance—Bangladesh's Rural Energy Realities", M. Asaduzzaman, *et al.*, World Bank Working Paper No. 181, 2010. http://www.scribd.com/doc/29647179/Restoring-Balance-Bangladesh-s-Rural-Energy-Realities

[4] Infrastructure Development Company Limited was established on 14 May 1997 by the Government of Bangladesh as a non-bank financial institution (http://www.idcol.org/).

[5] http://www.gshakti.org.

IDCOL—a non-bank financial corporation—has been the implementing agency of the National Domestic Biogas and Manure Program (NDBMP)[6] from 2006 to develop and disseminate domestic biogas in rural areas with the ultimate goal to establish a sustainable and commercial biogas sector in Bangladesh. IDCOL's mission is to promote economic development in Bangladesh by encouraging private sector investment in energy and infrastructure projects. Since its inception, IDCOL is playing a major role in bridging the financing gap for developing medium and large-scale infrastructure and renewable energy projects in Bangladesh. IDCOL is implementing the NDBMP with support from Government of Bangladesh, SNV Netherlands and KfW as a programme of renewable energies.

Grameen Shakti, a non-governmental and non-profit organization under the Grameen Family Group of Bangladesh, is one of the largest and fastest growing rural based renewable energy entities in the world. GS has developed one of the most successful market based programs (micro-credit programme) with a social objective for disseminating improved cookstoves (ICSs) and solar home systems (SHSs) to many rural villagers (SHS promotion is under the IDCOL's programme as in the case of biogas digester). Biogas model is trying to follow these successes.

Though there had been a NDBMP that facilitated installation of significant number of biogas digesters in rural area, there is still a huge potential number of rural households need biogas digester installation. As only 4% of the population is covered by the natural gas supply network in Bangladesh,[1] the most of the rural households still use biomass (woody and non-woody biomass) as the fuel for cooking.

In order to expand biogas utilization in rural Bangladesh, IDCOL voluntarily plays a role as a Coordinating and/or Managing Entity (CME) to implement the biogas promotion programme as a Programme of Activities (PoA) that generates additional carbon benefit to enable more rural households to install biogas digester under the micro-credit scheme by utilizing the IDCOL's financing scheme of NDBMP or by GS and other organizations' own scheme for non-covered digesters by the NDBMP.[7]

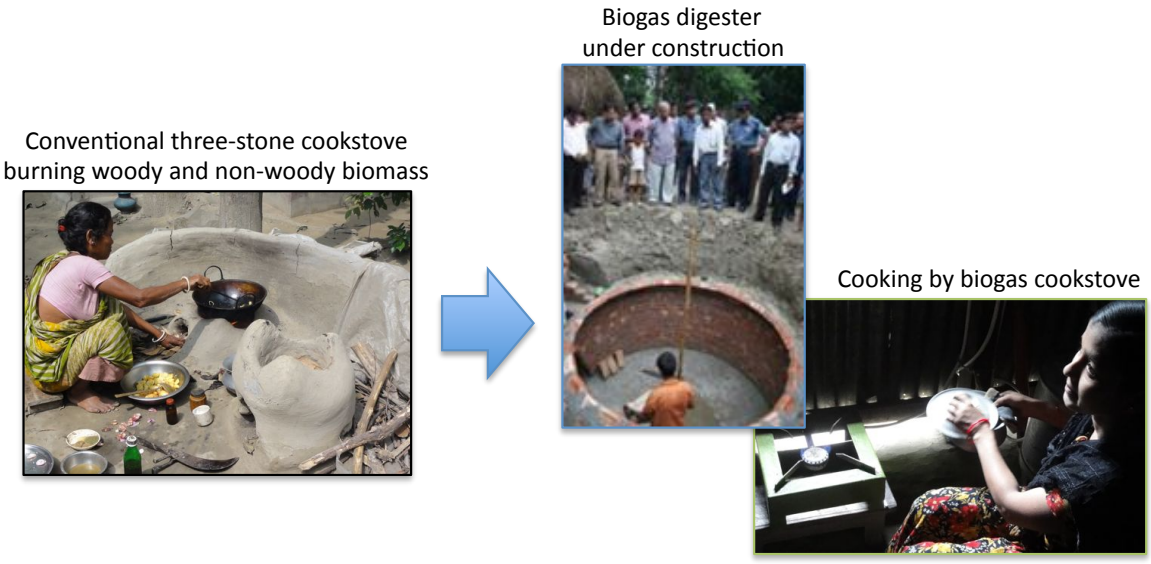

Figure 1: Image of an Element Activity of the PoA

[6] National Domestic Biogas and Manure Programme, http://www.idcol.org/biogass_installation.php. NDBMP includes 6 sizes of biogas plants, namely, 1.2, 1.6, 2.0, 2.4, 3.2 and 4.8 m^3 biogas generation capacity per day. http://www.slideshare.net/faisalbpo/national-domestic-biogas-and-manure-programme-bangladesh

[7] It is noted that GS voluntarily implement the activities with the use of IDCOL's financing scheme. CDM does not allow the policy such as subsidy scheme itself as the project activity, but allows the real actions by using the scheme as eligible activities under CDM.

IDCOL is responsible for coordinating the efforts of the different parties involved in the PoA to promote the biogas business in Bangladesh. The PoA includes biogas digesters covered by NDBMP (up to 4.8 m^3/day capacity) and also those not covered by NDBMP (up to 100 m^3/day capacity).

It is to be noted that each CPA is defined as the period of the installation dates (= start dates of completion of construction) of digesters.

The inclusions of new CPAs to the PoA will be requested by the CME (IDCOL) to a Designated Operational Entity (DOE) during the lifetime of the PoA.

There are basically two types of feedstock for biogas digesters: (a) cattle dung, and (b) poultry droppings. The sizes of the digester are 1.2, 1.6, 2.0, 2.4, 3.2, 4.8, 6.0, 9.0, 12.0, 15.0, *etc*. with the unit of [m^3 daily biogas generation capacity].[8] The gas generated from the digester with size more than 3.2 m^3/day can be used for multiple households where smaller sizes will be used for single household.[9]

It is to be noted that neither IDCOL nor GS does invest in the biogas digesters. Each household invests (in many cases by utilizing the NDBMP's micro-financing scheme and subsidy for the digesters with biogas generation capacity no larger than 4.8 m^3 per day). CER revenue will be used for the programme (*i.e.*, used for the households).

The first CPA is to include biogas digesters installed from the December 13 of 2011 to January 31 of 2012 regardless of geographical location in Bangladesh.[10] The slurry/sludge from the biogas digesters may be used as soil conditioner for the field application by substituting synthetic fertilizer.

The PoA contributes to the sustainable development of Bangladesh as explained below:

Most of the population in rural areas in Bangladesh still heavily rely on fuelwood, dung, and crop residues for their cooking needs. The impacts of biomass reliance include deforestation, drudgery from the need to collect and prepare the biomass for use and also health impacts from indoor air pollution to rural women and children.[11]

In order to prevent further environmental deterioration, it is required to promote non-conventional energy technologies in this country. Biogas generated from animal manure and/or other organic wastes is undoubtedly one of the most appropriate sources of energy. Therefore, the goal of the PoA is to accelerate dissemination of biogas application in rural Bangladesh using micro-credit scheme (to reduce the burden for initial investment) with the additional carbon credit-related revenue through the programme

The PoA will contribute to reduce deforestation, as the biogas generated will be used to replace non-renewable biomass consumed by households. It also set the trajectory of no carbon development pathway by utilizing indigenous renewable energy source in rural Bangladesh.

As a result, the PoA will provide sustainable and self-reliant clean energy for households through replacing the non-renewable biomass and also it reduces GHG emissions.

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[8] In Bangladesh, the sizes of biogas digester are classified by gas generation capacity instead of physical volume.

[9] The PoA includes an innovative rural development model called "micro-utility" which enables the larger biogas digester owner to undertake a gas utility business to supply biogas to his neighbors by tube. This model enables the poorest farmers incapable to invest in biogas digester to enjoy the benefits of biogas with around 1/2 cost for purchasing fuelwood.

[10] The number of biogas digesters belonging to a CPA is decided through counting up the number of biogas cookstove burners to the number that cannot exceed the threshold of microscale CDM projects (15 MW_{th}). Since a biogas cookstove under the program have capacity of 1.79–2.09 kW_{th} for each burner, the number of biogas cookstove burners under a CPA shall be less than $15MW_{th}/2.09\ kW_{th}$ = 7,177. Eligibility criteria for inclusion of a CPA set the maximum number of the burners as 7,100. The number of digesters is smaller than this number.

[11] Domestic Health Hazard and Indoor Air-Pollution: An Approach to Find Alternative Energy Source for Rural Bangladesh to Minimize the Threat, S. M. Reazul Ahsam, *et al*.

A.3. CMEs and participants of PoA

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The CME) of the PoA is IDCOL. Grameen Shakti (GS), which is an operator of the CPAs, is another project participant in Bangladesh. PEAR Carbon Offset Initiative, Ltd. (PEAR)—a Japanese social venture with expertizes in CDM—is the project participant, CER buyer and the PoA developer.

A.4. Party(ies)

Table 1: Parties

Name of Party involved (host) indicates a host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Bangladesh (host)	**Infrastructure Development Company Limited** (IDCOL) (Coordinating/Managing Entity and CPA implementer) **Grameen Shakti** (GS) (A CPA operator / project participant)	No
Japan	**PEAR Carbon Offset Initiative, Ltd.** (PEAR) (A project participant)	No

A.5. Physical/ Geographical boundary of the PoA

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The PoA covers whole Bangladesh which sits in between 24° 00' North latitude and 90° 00' East longitude (see Figure 2).

Figure 2: Boundary of the PoA
(whole Bangladesh)

A.6. Technologies/measures

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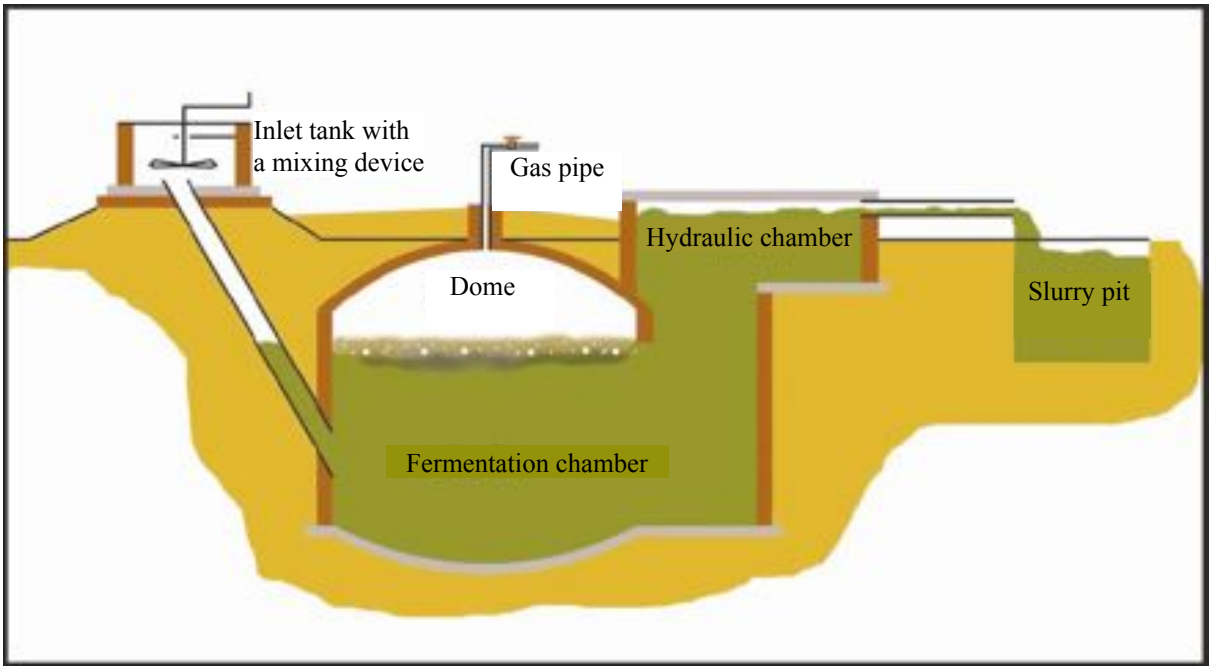
A typical biogas digester system consists of function parts including inlet tank, gas pipe, hydraulic chamber, dome and fermentation chamber. The structure of conventional fixed dome type biogas digester applied in the PoA is shown in Figure 3 followed by explanations:



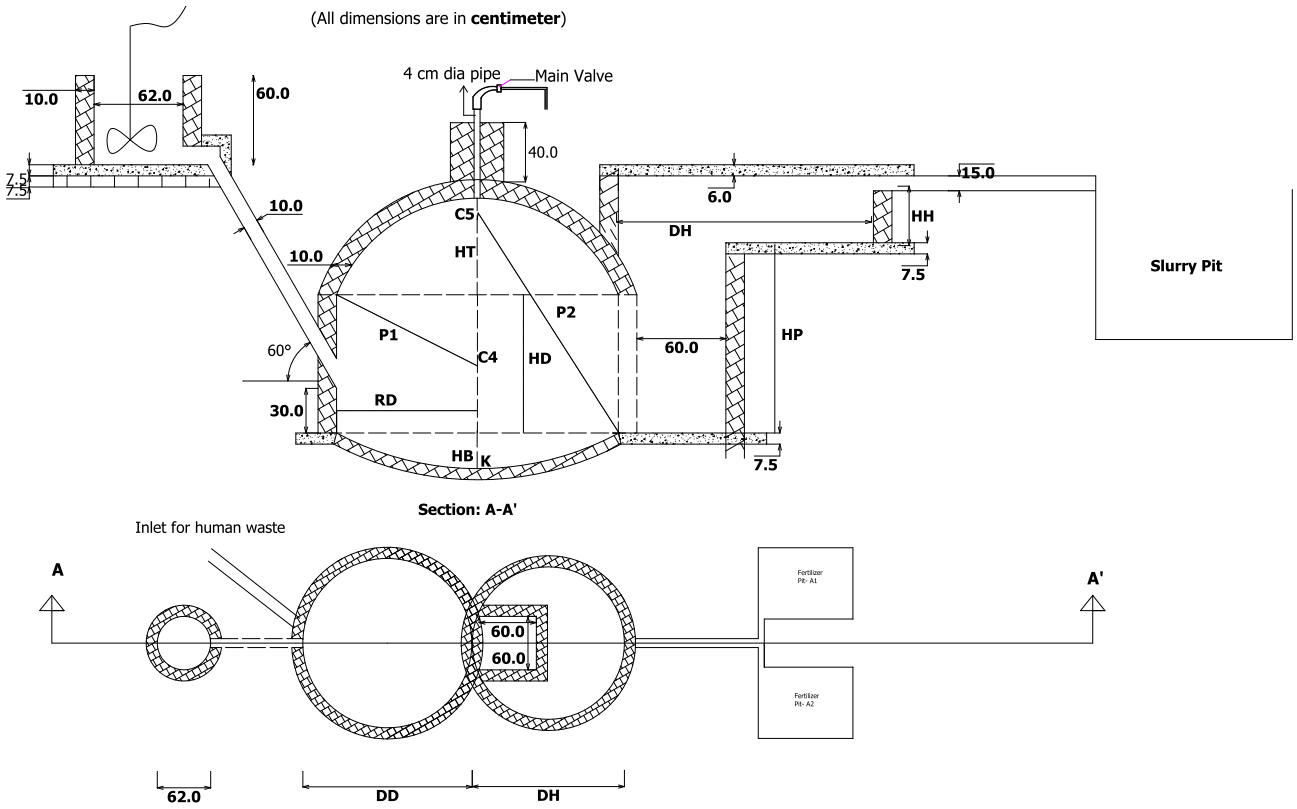


Figure 3: The Structure of a Typical Fixed Dome Type Biogas Digester in Bangladesh

The domestic biogas digester will be installed below or near to the livestock pen so that wastes from the pen are fed into the digester *via* the inlet tank and undergoes anaerobic digestion in the fermentation chamber, that is a complex biochemical reaction occur under the catalysis of micro organism in the absence of air. As a result of that anaerobic digestion, the biogas—mainly methane (around 60%) and carbon dioxide (around 40%)—is produced from the organic wastes.

For fixed dome type (others are functionally same), the inlet is a circular tank with a mixing device, which is connected with the inlet pipe through which the digester ordinarily acquires excrements and urine. And inlet pipes lower end is inserted in the middle of the wall of the fermentation chamber.

The fermentation chamber is used for the storage of the fermented slurry and the gas produced. And also, the whole fermentation process goes on in this chamber. The upper part of the fermentation chamber is a dome mainly used for the storage of generated biogas. In order to protect the center pipe from the dome, a brick turret is provided.

The hydraulic chamber mainly acts as hydraulic pressure besides serving as slurry discharge and seal for preventing outgassing. The generated biogas will occupy a definite space in the digester and a part of fermented liquid will be pressed into the hydraulic chamber so as to make the liquid surface inside the hydraulic chamber rising gradually. This is the action of gas pressing on the water. As the generated biogas is consumed, the space that the biogas occupied will diminish continuously, and the liquid inside the hydraulic chamber will gradually be pressed back into the fermentation chamber. This is the action of water pressing on gas.

The center tube from the dome is connected with a gas delivery tube(s) so as to convey the gas generated in the digester out.

The generated biogas in digester is then delivered to biogas cookstoves at the household for thermal energy use through the biogas conveyance system that consists of a gas tube, valves and water traps that remove the water from the pipes. The gas pipeline connects the gas tube and the biogas cookstoves. In some cases—micro-utility model, the biogas is delivered to other households by tube.

Slurry pits are also provided to ensure proper storing of digested slurry.

The performance of the system is assured by related IDCOL standards. Compliance with the standards is inspected during and after construction (for the activities under NDBMP) internally. Households will be instructed on proper operation of biogas digester along with installation with a manual for operation.

Biogas cookstove is also an important device of the activity and a relatively simple appliance for direct combustion of biogas. Figure 4 shows the type of biogas cookstoves used in Bangladesh.

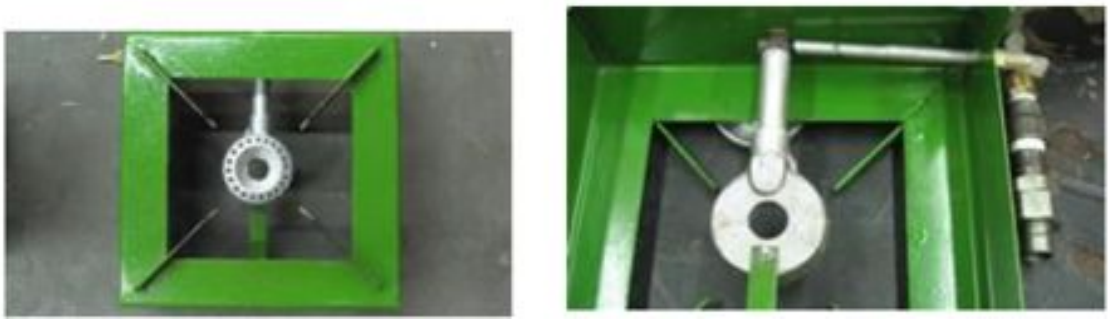


Figure 4: Typical Biogas Cookstove Applied in Bangladesh

A typical biogas cookstove consists of gas supply tube, gas tap/valve, gas injector jet, primary air opening(s) or regulator, throat, gas mixing tube/manifold, burner head, burner ports (orifices), pot supports and body frame. Assembly of a typical biogas burner is shown in Figure 5.

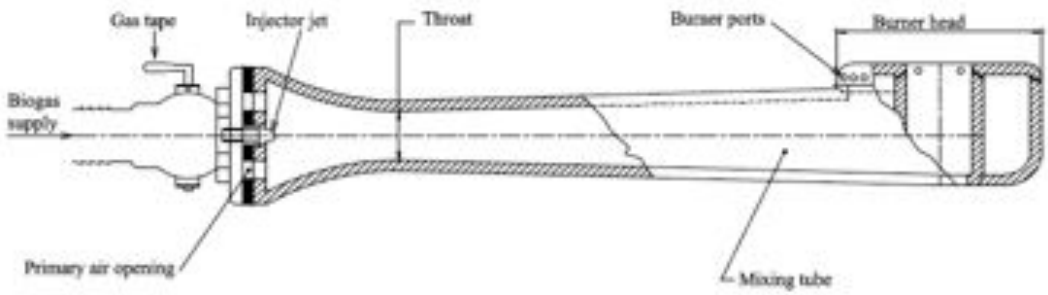


Figure 5: Assembly of Typical Burner for Biogas Cookstove

The biogas flow rate of the biogas cookstove is set as 0.3–0.35 m^3/h as those approved by IDCOL for a (common) single burner type. This is equivalent to 1.79–2.09 $kW_{th}$by applying default net calorific value of biogas (0.0215GJ/m^3) provided in AMS-I.I. (Version 04.0).[12]

All technologies utilized in the project activity are technologies in Bangladesh and there will be no need for international technology transfer involved in this project.

A.7. Public funding of PoA

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Since a part of the PoA (currently, biogas digesters up to 4.8 m^3/day) is undertaken as the IDCOL program (NDBMP), public funding is used mainly for the source of micro-financing (loan) which provides flexibility for the households for initial investment.[13] It is expected that around 80% of the households requires the loan. Designing the loan scheme is dependent on each partner organization (such as GS) of the IDCOL.

The current subsidy covers about 25% of the total investment requirements by households (biogas digester owners). The subsidy rate will be 9,000 Taka per plant (per household). Currently, the total subsidy amount required for the programme period is Euro 2.5 million of which KfW will provide 85% while the rest 15% will be contributed from the Government of Bangladesh. The total budget required to implement the NDBMP over 3 years (2010–12) will be Euro 10.76 million.[14]

IDCOL specifies the carbon financing opportunities by CDM as an attractive and sustainable source of funding. It is to be noted that the PoA may cover larger biogas digesters (> 4.8 m^3/day) not yet covered by IDCOL's program.

It is also to be noted that any Annex I Party government will not obtain CERs in compensation for the ODA.

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[12] Calculation: Biogas flow rate: 0.3 m^3-biogas/h; Net Calorific value of biogas: 0.0215GJ/m^3, then 0.3m^3/h*0.0215GJ/m^3*1,000*0.278kW/MJ/h = 1.79kWth and 0.35m^3/h*0.0215GJ/m^3*1,000*0.278kW/MJ/h = 2.09kWth

[13] It is noted that neither IDCOL nor GS do not invest in the biogas digesters. Each household invests (in many cases by utilizing the micro-financing scheme operated by GS). CER revenue will be used for the programme (*i.e.*, used for the households). This is completely different from typical CDM project where project owner invests and obtain the revenue from CERs.

[14] National Domestic Biogas and Manure Programme Implementation Plan 2010–12, IDCOL, Dec. 2009. http://www.idcol.org/Download/20100105 Implementation Plan 2010_12 NDBMP IDCOL1.pdf. It says (p.20):

Out of the total amount required for implementing the programme, Government of Netherlands/DGIS/ABP provides Euro 1.35 million for programme operation cost whereas Government of Bangladesh is expected to contribute about Euro 0.37 million on part of subsidy at the rate of 15 percent of subsidy amount while KfW fund of about Euro 2.1 million will be utilized for covering the subsidy for the period of 2010-–2012. In addition KfW will also provide Euro 3.1 million for refinancing.

SECTION B. Demonstration of additionality and development of eligibility criteria
B.1. Demonstration of additionality for PoA
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The information presented here shall constitute the demonstration of additionality of the PoA as a whole.

There had been a National Domestic Biogas and Manure Programme (NDBMP) in Bangladesh, which aims to develop and disseminate domestic biogas plants in rural areas with the ultimate goal to establish a sustainable and commercial biogas sector in Bangladesh. Infrastructure Development Company, Ltd. (IDCOL), a government-owned company, had implemented the programme with the involvement of several capable partners including GS.

GS and other CPA operators participating the programme have engaged in domestic biogas digesters dissemination in rural area voluntarily by their micro-crediting schemes.

In order to accelerate the dissemination of the biogas digesters, getting help from carbon credit is essential, because some of the partner organizations like GS are currently facing financial deficits to continue this programme. This is one of the reasons why biogas digesters programme have not been so successful like similar programme of SHS by IDCOL or ICS by GS.

We apply "Guideline for Demonstrating Additionality of Microscale Project Activities" (Version 5.0) for demonstrating this, as shown in the "Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities" (version 03.0).[15]

If a CPA that employs renewable energy under the PoA is up to 5 MW_e, then the CPA is demonstrated to be additional by following the Guidelines specified in "Guidelines for demonstrating additionality of microscale project activities" (version 05).

The Guidelines states:

> *Paragraph 8 (c). The project activity is designed for distributed energy generation (not connected to a national or regional grid)[16] with both conditions (i) and (ii) satisfied;*
>
> *(i) Each of the independent subsystems/measures in the project activity is smaller than or equal to 1500 kW electrical installed capacity;*
>
> *(ii) End users of the subsystems or measures are households/communities/small and medium enterprises (SMEs).*

The Guidelines also states that:

> *Paragraph 12. Project activity' in paragraphs 8–10 means a small scale or large scale CDM project activity or a project activity under a programme of activities (CPA of a PoA).*

Because the capacity of each household biogas cookstove (independent sub-system) is around 1.65–1.93 kW_{th} (for single burner), *i.e.*, much less than the threshold 1,500 kW_e (4,500 kW_{th}) and all end users of the sub-systems are households that each CPA satisfies the condition stipulated in the "Guidelines for demonstrating additionality of microscale project activities".

Therefore, according to the Guidelines mentioned above, any CPA under the PoA is additional.

It is to be noted that since all CPAs are regarded as additional, the aggregated PoA delivers additional emission reductions.[17] Therefore, without the PoA, the voluntary action of promoting biogas digesters in rural Bangladesh would not occur.

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[15] See http://cdm.unfccc.int/filestorage/e/x/t/extfile-20130729142721867-meth_stan04.pdf/meth_stan04.pdf?t=VFF8bXhqOGpifDDfuWXfjsLslMg8fg8OZN7B.

[16] This means that projects applying AMS.I-D are not eligible.

[17] The additionality related to the criteria outlined in Attachment A to Appendix B of the simplified modalities and procedures for small-scale CDM project activities and the Guidelines for Demonstrating Additionality of Microscale Project Activities are for the additionality of the CPA. Because the additionality is the concept to

B.2. Eligibility criteria for inclusion of a CPA in the PoA
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Definition of "start date of CPA" and "start date of operation":

- *Date of installation*: Defined as the "completion date of construction" of the digester. Each CPA is defined as the period of "date of installation" of the covered digesters. Therefore, the "start date of CPA" is the date of installation of the first digester covered by the CPA (see footnote 15 and A.4.4.1).

- *Start date of operation*: Defined as "30-days after the date of installation" of the digester. This is the start date to calculate emission reductions by the digester in a conservative manner (*i.e.*, usually, biogas can be generated fully within two weeks after installation).

Any CPA under the PoA shall meet the following five eligibility criteria in *italic*. The criteria covers the 12 requirements[18] specified in Para 16 of "Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities" (Version 03.0).[19]

The means of checking by the DOE at the time of inclusion are also explained in roman letters:

(1) The CME (IDCOL) defines the expected period during which the biogas digester systems covered by the CPA are installed (e.g., 1/4/2012–31/9/2012). If the covered digesters have been already installed, the CME provides a provisional list of all user information with the date of installation and the start date of operation as well as the associated biogas digester and cookstoves for use, and the summary list is attached to the CPA-DD and the electronic file is provided also to the DOE with full relevant information as a provisional data. If the digesters have not yet installed fully, the expected calculation table is shown in the main text of the CPA-DD.

DOE is to desk review whether the period is consistent with the defined start date of the CPA.

It is to be noted that the start date of CPA cannot be earlier than the date of inclusion.[20] Therefore, in most cases, CPA-DD will be prepared not based on actual list of households but an installation expectation. In this case, the list will be checked at the time of verification precisely.

If the provisional list is provided (template is attached to the generic CPA-DD), the location of each household is also shown in the file. DOE is to confirm whether all of them are in the geographical area of Bangladesh (*i.e.*, geographical area of the PoA).

This criterion covers (a) and (d) of the requirements specified in the Standard.

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deliver emission reductions, if all CPA delivers additional emission reductions, then the PoA—as an aggregation of the activities of all CPAs—delivers additional emission reductions, by definition.

[18] Requirements ID in (alphabet) are shown the explanation.

[19] http://cdm.unfccc.int/filestorage/e/x/t/extfile-20130729142721867-meth_stan04.pdf/meth_stan04.pdf?t=VFF8bXhqOGpifDDfuWXfjsLslMg8fg8OZN7B2.

[20] "Clean Development Machanism Project Standard" (ver. 05.0) specifies that

162. The coordinating/managing entity shall confirm that the start date of any proposed CPA is on or after the start date of the PoA

(2) Any CPA includes installation/construction of biogas digester systems, biogas delivery lines and biogas cookstoves at rural households or small and medium farms in Bangladesh. IDCOL shall maintain records and documentation control processes for each CPA as a part of its management system.

IDCOL will inspect installation of biogas digesters and watch their operation regularly. Inspection procedures have been introduced in NDBMP by IDCOL for proper installation of the system. Each partner organization already has the maintenance system/service for proper operation of the biogas digesters as the eligibility requirements by IDCOL to be a partner organization.

IDCOL keeps information of digesters in a CPA such as locations, ID numbers, names of user households including that of the digester owner and number of biogas cookstove burners and starting date of operation. IDCOL shall demonstrate that it prepares the management system and has operated it properly to the DOE.

This criterion covers (c), (e) and (i) of the requirements specified in the Standard.

(3) Any CPA under the PoA shall not be a part of a registered CDM project or not a CPA under another PoA.

Regarding inclusion of any CPA to the PoA, IDCOL identifies if there is any registered CDM project activity or CPA of a registered PoA that targeting the same households in Bangladesh.

DOE is to check whether the information of all current registered CDM project activities and CPAs under PoAs in Bangladesh provided by the CME cover the cooking energy use of targeted households in general.

For this purpose, IDCOL is to prepare the database in order to meet this criterion for the cases mentioned below:

(a) User households of the CPA are not covered by other existing CPAs of this PoA, by checking that the period to define the CPA is different from others. Basically this is true, but if some overlap is set for the period, the households in the overlapping period is checked to avoid double-counting; and

(b) User households of the CPA used ICS before use of biogas will not result in double counting of emission reductions, by introducing checking system in the database.

It is to be noted that there is a registered PoA for installation of improved cookstoves (ICS).[21] The CPA may include the household covered by this PoA but includes a procedural arrangement to avoid double counting, *i.e.*, a checking system is introduced whether the household has already installed ICS (under registered PoA 4791 as well as by non-CDM programmes or independently). If so, emission reductions for the households are calculated in a conservative manner.

This criterion covers (b) of the requirements specified in the Standard.

(4) Installations/operations of biogas digesters shall be in compliance with related national and sectorial standards and regulations, if any.[22]

DOE is to check whether the CME provided all related documents. For installation,

[21] PoA 4791: "Improved Cooking Stoves in Bangladesh". See http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/SE7XIMKF8NYVOTL16BW3U45C9ZDGAP/view.

[22] Infrastructure Development Company Ltd. (IDCOL) Model Biogas Plant Construction Manual, IDCOL/SNV, April 2006.

NDBMP-covered activities shall utilize equipment approved by the IDCOL's technical committee (*e.g.*, recently, the committee approved fiberglass type digester). For proper operation, relevant handbook with suitable instruction and establishment of maintenance system are considered. For digesters not covered by NDBMP, there are no standards so far. Therefore, the each CPA operator applies its own rules similar to those above.

It is to be noted that a monitoring system—*incl*. annual survey—is introduced to include only properly operating biogas digesters in the calculation of emission reductions. The latest survey report will be provided to the DOE.

This criterion covers (c) and (g) of the requirements specified in the Standard.

(5) The aggregated capacity of biogas cookstoves under a CPA is less than 15 MW_{th}, i.e., the aggregated number of burners of cookstoves is less than 7,100.[23]

Bearing the threshold in mind, IDCOL construct the database of digester systems (including cookstoves and related equipment) for each CPA and provide all specific information of biogas digester system to DOE.

If all of the covered digesters have been already installed, the DOE is to desk review the number of burners of biogas cookstoves and *ex ante* calculation of GHG emission reductions specified or attached to the CPA-DD by using the provisional list. If the data of the number of burners is missing, a conservative default value[24] is applied. If all of the digesters have not yet installed, the expected calculation table shown in the main text of the CPA-DD will be checked.

This criterion covers (e), (f) and (k) of the requirements specified in the Standard.

It is also noted that that the eligibility criterion (h) specified in the Standard:

(h) Conditions to provide an affirmation that funding from Annex I Parties, if any, does not result in a diversion of official development assistance;

This requirement cannot be judged by the DOE nor by the CDM EB because this judgment is out of scope for these bodies as shown in the Marrakech Accords "Modalities and procedures for a clean development mechanism, as defined in Article 12 of the Kyoto Protocol". This CMP Decision does not specify any entity to judge this condition. It means that only the host country DNA can judge it in the approval process of the project activity or programme of activities. Therefore, after obtaining the approval letter by Bangladesh DNA, this condition will be no more needed to be checked. It is to be noted that Annex I Party involved in the proposed PoA (Japan) and donor countries for NDBMP (Germany and Netherland) are completely different and CER will not be transferred in compensation for ODA.

As for sampling-related criterion (j), the PoA designs the sampling in accordance with "Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities" (Version 04.0) and "Guidelines for sampling and surveys for CDM project activities and programme of activities" (Version 03.0). Please see Appendix 5 for details.

Also as for de-bundling criterion (l), this criterion is met for any CPA since it is exempted from performing a de-bundling check as shown in (4) of Section C.

[23] See footnotes 10 and 12 for calculations.

[24] The default value is set as 2 burners per household conservatively. This can be justified by the fact that the available data for CPA 1 (640 households, 779 burners) shows the average number of cookstove burners per household is 1.2.

B.3. Application of methodologies

>>

AMS-I.E. (ver. 05) "Switch from non-renewable biomass for thermal applications by the user" is applied. Sampling plan applied to CPAs in the PoA, which is based on "Standard for sampling and surveys for CDM project activities and programme of activities" (Version 04.1), is provided in Appendix 5.

SECTION C. Management system

>>

(0) Definition of the roles and terminology:

IDCOL is the CME of the PoA responsible for all requirements set forth for the CME.

Each CPA is defined as its "period of the date of installation of the digesters (= completion date of biogas digester construction)" rather than some geographical boundary. Each CPA may cover the most parts of Bangladesh.

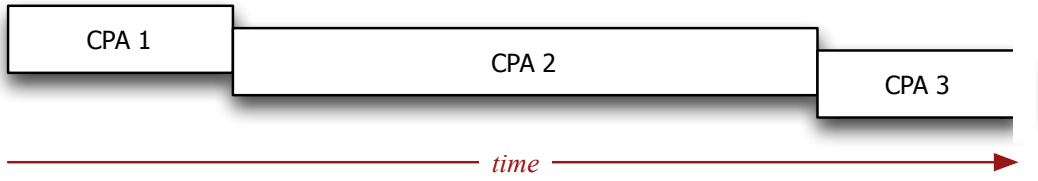

Figure 6: Image of the definition of CPAs concerning the period of the installation date of biogas digesters

It is to be noted that a CPA includes plural CPA operators, most of them are partner organizations of NDBMP like GS.

(1) Generic description of the operation and management system:

IDCOL is responsible for collection of all necessary information from CPA operators directly and compile them as the CME. IDCOL—the director who leads NDBMP—is also responsible for definition and inclusion of each CPA supported by PEAR.

There are a variety of partner organizations.[25] Most of them are much smaller than GS with simple structure. We do not specify them each by each in this document.

The CDM PoA includes both NDBMP (IDCOL's program) covered and non-covered digesters. For NDBMP covered digesters, IDCOL has already established its management system. This is extended to include the requirements by CDM. For NDBMP non-covered digesters, a similar management system will be applied by IDCOL.

It is to be noted that the most of digesters not covered by NDBMP (> 4.8 m^3/day) deliver biogas not only to the digester owner but also to its neighbour households.

Households/farms who voluntarily participate in a CPA have responsibility to provide necessary information for management of the PoA. They also promise to use biogas for the purpose of cooking.

For installation of biogas digesters, the CPA operators will sign an agreement (using a specific format) with the user giving all the relevant information, including system capacity, price, mode of payment, location/address of customer, maintenance, *etc*. Information of the agreements will be collected and compiled every month by the CPA operator.

The local staff of the CPA operators will be in close touch with the customers, as they will periodically (once every month, during loan payment period which is typically 2 years) visit the

[25] See http://www.idcol.org/contact-LPO,%20CPO,MPO.php, http://www.idcol.org/biogass_installation.php.

customers' houses both not only to collect the instalments but also to satisfy any servicing requirements. For example, GS has its 5-year warranty of the biogas digester and will keep maintenance as requested by the digester owner even after the end of the warranty. It is mandated that as soon as the digester is not operational, the owner shall notify the CPA operator as soon as possible.

Under the (stratified) management structure shown in Figure 7, information detailing the agreements, installations, loan recovery and maintenance and other PoA-specific information is prepared every month by each CPA operator. The related database is constructed by the CPA operator consistent with the formats prepared by IDCOL.

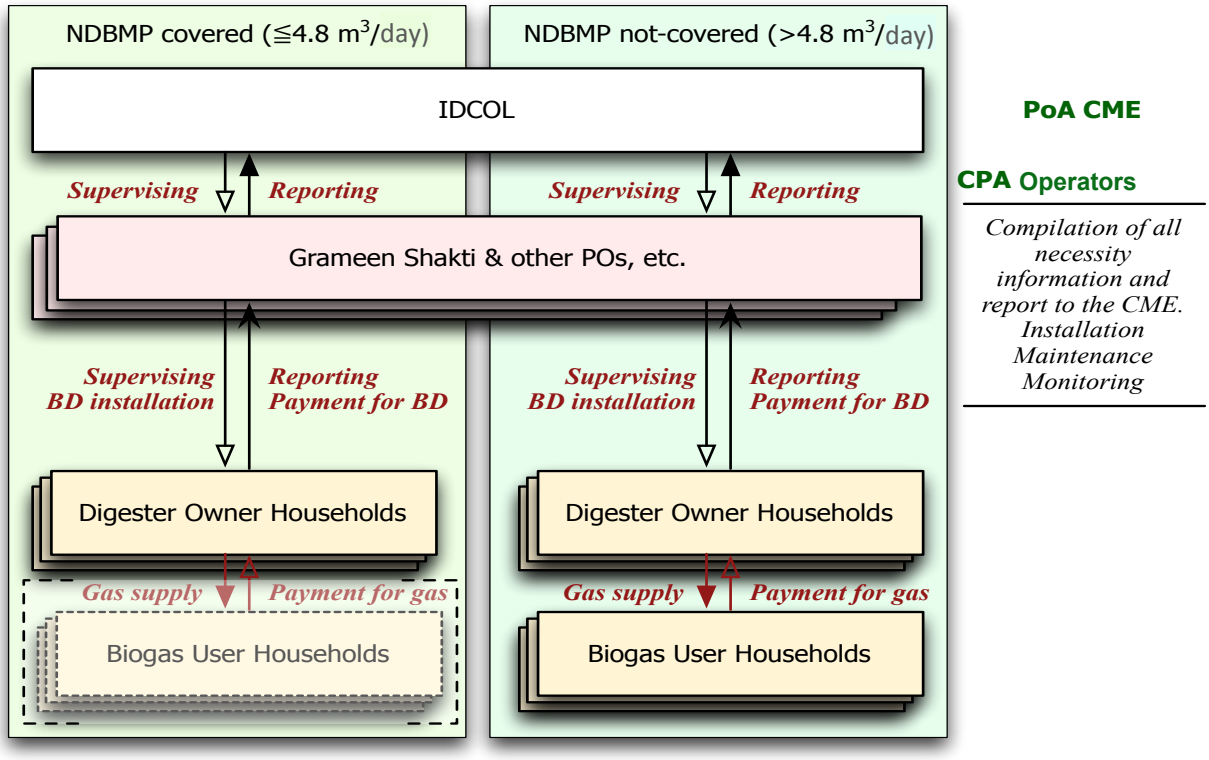

Figure 7: Managing and Reporting Structure of the PoA

(2) A record keeping system for each CPA under the PoA:

A well-designed record keeping system in full compliance with all relevant standards of the CDM EB[26] and the Bangladesh DNA will be operated for a timely completion of all activities in line with the project schedule and in accordance with the project objectives. The record keeping system consists of the method of data collection, the duty and roles of each player and the database including but not limited to schedule and ID number for each CPA, period for installations, size of each CPA, all necessary information/data of every single household in each CPA including:

For biogas digester:

- Name of CPA operator installing the digester
- ID number of the biogas digester,
- Name of the digester owner and address,
- ID number of the CPA,

[26] These include "Clean Development Mechanism Project Standard", "Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities", etc.

- Biogas generation capacity of the biogas digester,
- Installation date defined as the completion date of the biogas digester construction,
- Start date of operation, defined as the 30 days after the completion date of the biogas digester construction (for conservativeness),
- Status of operation (*incl*. maintenance record),
- Status of sludge and slurry treatment, and
- User households ID number of the biogas (including owner's household),

For user household:

- ID number of the household,
- Name of targeted household representative, address and other household-related information,
- Digester ID from which biogas is delivered,
- Whether the household used ICS,[27] and
- Number of biogas cookstove burners.

It is to be noted that household ID and biogas digester ID shall be separately treated. One digester may deliver biogas to plural households (including owner's household) based on micro-utility model.

It is also to be noted that the management system does include other information[28] than the required one for CDM PoA. IDCOL will consider which information/data are to be reported.

[27] In this case, the emission reductions associated with ICS use is subtracted from the calculation of emission reductions in a conservative manner (see E.6.).

[28] The following reports can be obtained from the NDBMP software maintained by IDCOL currently:

- Quality Standard List
- Employee Information
- Materials specification
- Approved Manufacturing Partner Organization
- Training List
- PO-wise Mason list
- Pre construction approval list
- Approval status
- Plant proposal report
- Plant-wise QC result
- QC average
- Disbursement Request list
- Disbursement Report
- PO information list
- Plant discrepancy report (list of ineligible plants for disbursement)
- Plant Completion Report
- Branch Code
- Completion Statistics
- QC number-wise report
- Plants inspection report
- List of disbursed plants

In case some data are missing, conservative estimation will be applied for the calculation of emission reductions.

Related responsibilities and tasks of participants under the record keeping system are described in Table 2.

It is to be noted that the process of definition and inclusion of each CPA is to be undertaken by the NDBMP manager of IDCOL, who leads the NDBMP, supported by PEAR using the information of above-mentioned management system.

Table 2: Responsibilities and tasks of players involved in the PoA

	Player(s)	Processes
Coordination of the PoA	IDCOL	IDCOL, as the CME, supervise CPA operators and will receive the relevant information by the CPA operators. IDCOL is also responsible for defining each CPA (*esp*., its covered period) and its inclusion supported by PEAR.
Ex ante and *ex post* data collection	Each CPA operator	CPA operators conduct data collection. IDCOL specifies the required data/information to be collected before start and/or during implementation of each CPA.
Data storage and management	IDCOL is responsible for data storage and management in terms of: – Develop database format of CPA – Check the reported data from each CPA operator – Calculate emission reductions based on the data reported by CPA operators – Implement data management of covered CPAs – Store and maintain records	All collected data/information by CPA operators are submitted to IDCOL. IDCOL compiles the data in its database. The database is used by IDCOL for review of inclusion of CPAs including avoidance of double counting. IDCOL also merge CDM-related record and documentation control process to its exiting one.
Communication and reporting	– IDCOL – CPA operators	Communication and reporting are conducted as per the managing and

- Plant completed report
- Feeding percentage
- Bio-slurry pit status
- Average cattle/poultry
- List of the worst plants
- User training status
- Mason with QC default
- Supervisors/technician information
- Maintenance report of plants by IDCOL
- Claim reports of maintenance by PO

	– Households / small farms	operating system formed based on the IDCOL's MRV system. IDCOL is responsible for coordinating between CPA operators and communicating with DOE and CDM EB supported by PEAR. CPA operators report collected information to IDCOL. Households report all related information to the CPA operators.
CDM training and capacity building	IDCOL develops and establishes training program for the CPA operators and households / small farms	Implement seminars for CPA operators and provide guides to households to meet the needs of the monitoring plan. These are integrated to existing training system under NDBMP.
PDCA cycle	– IDCOL	IDCOL review each type of CPAs and the PoA as a whole annually and assess the performance as its integrated part of the Annual Biogas Users Survey. If necessary, it revises the current programme. The changes of the programme scheme are to be described by IDCOL.

(3) A system/procedure to avoid double accounting *e.g.*, to avoid the case of including a new CPA that has been already registered either as a CDM project activity or as a CPA of another PoA:

As specified in the eligibility criterion (3), IDCOL technically reviews at the time of CPA inclusion that any biogas digester system under the CPA does not belong to another CPA under this PoA or another registered CDM project activity or another CDM PoA.

It is also checked whether there is any other CDM activity (targeting household-level cooking energy) that targeted the same households covered by a CPA included in the PoA. A CPA in the PoA may include the household covered by the existing CDM PoA 4791 for ICS but includes a procedural arrangement to avoid double counting, *i.e.*, a checking whether the household has already installed ICS (under registered PoA 4791 as well as by non-CDM programmes or independently). If so, the emission reductions for such households are calculated in a conservative manner.

(4) The SSC-CPA included in the PoA is not a de-bundled component of another CPA or CDM project activity:

Para 10 of "Guidelines on Assessment of De-bundling for SSC Project Activities (Version 03.0)" specifies that:

> *If each of the independent subsystems/measures (e.g., biogas digester, solar home system) included in the CPA of a PoA is no larger than 1% of the small-scale thresholds defined by the methodology applied,9 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 largest 100 m^3/day biogas digester (independent subsystem) under a CPA of the PoA generates around 25 kW_{th}[29] in average. This figure is much less than 1% of the threshold of small scale CDM project (450 kW_{th}). Therefore, any CPA of the PoA is exempt from performing a de-bundling check.

(5) The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA:

Any CPA under the PoA is recommended and planned by IDCOL and PEAR. Moreover, as explained in Table 2 above, under the record keeping system, the CPA operators are to have a contract to undertake biogas digester penetration activities under the PoA—under supervision by IDCOL—are well aware of and have agreed to their activity under the PoA.

SECTION D. Duration of PoA

D.1. Start date of PoA

>>

The start date of the PoA is the date of the publication of the PoA-DD for global stakeholder consultation. This date is 13/12/2011.

D.2. Length of the PoA

>>

28 years and 0 month

SECTION E. Environmental impacts

E.1. Level at which environmental analysis is undertaken

>>

Biogas digester promotion projects are seen to have few negative impacts on environment. Especially domestic biogas digester promotion projects are implemented at household level and their impact on environment is identical in most extension regardless of location; therefore, environmental analysis was undertaken at the PoA level.

E.2. Analysis of the environmental impacts

>>

It is to be noted that no environmental impact assessment is required by the Government for the activities implemented under the PoA. In reality, we see few negative impacts.

For benefits, biogas is a reliable, affordable, easy and a very useful source of household energy; hence, it is also a stable source of energy. In addition, biogas has several benefits. These benefits are the main motivating factors for households to use biogas.

Based on the findings of the survey by IDCOL/SNV, the assumed benefits from biogas are briefly discussed below[30]:

Gender benefits:

Biogas provides a direct benefit, especially to rural women, as a result of the reduction of the workload when shifting from cooking on conventional biomass to biogas.

Biogas is quicker and easier for cooking than biomass. Moreover, biogas is smokeless and does not require constant attention while cooking; therefore, women can do other activities simultaneously.

On average, biogas enables to save approximately 1 hour and 5 minutes per day per family due to the

[29] kW=J/(1000*s). Then, 100 m^3/day*0.0215 GJ/m^3= 2.15 GJ/day = 2,150,000,000 J/(1000*86400) =24.88 kW_{th}.

[30] Implementation Plan National Domestic Biogas and Manure Programme in Bangladesh, by Infrastructure Development Company Ltd (IDCOL) and Netherlands Development Organization (SNV).

reduction of time used for collecting biomass, cooking and cleaning of utensils; this saved time can be used for childcare, income generating activities, education, recreation and other social works.

Environmental benefits:

From an individual perspective, the use of biogas significantly improves the indoor air quality by the avoidance of black carbon. In addition, construction of biogas plants results in better living condition due to appropriately treated solid wastes and avoiding bad smells in and around the community near landfills.

It reduces a considerable amount of greenhouse gases from two perspectives: the carbon released from burning of biomass is minimized; and the saved forest can act as a sink-basin to absorb carbon dioxide.

Health benefits:

A major problem for rural people especially for the housewives is indoor air pollution due to exposures to smoke inside the kitchen while cooking with biomass.

Poor indoor air quality (especially black carbon) is one of the major risks factors for acute respiratory infections especially with housewives and children. Biogas reduces the smoke exposures and significantly improves the air condition inside the kitchen which will ultimately improve the health conditions by reducing the incidences of eye infection, respiratory diseases, coughing, dizziness and headache.

IDCOL expected that better sanitation (toilets) is for around 20% of the total households, while reduction of indoor air pollution is for all households.

For the user's perception on merits, see the survey results shown in Table 3:

Table 3: User's perception on merits of biogas plant[31]

Benefits	Rank	Mean
Easy and comfortable cooking	1	19.66
Environment friendly/Protection of forest	2	17.46
Saves time and workload	3	17.30
Nutrient rich fertilizer	4	12.14
Economically beneficial	5	11.78
Health benefits	6	8.58
Fuel saving	7	8.46
Comfort in cleaning cooking vessels	8	8.34
Utilizes waste materials	9	8.02
Readily available cooking fuel	10	7.24
Eliminates the problem due to wet-firewood during rainy season	11	5.26
Encourages livestock development	12	4.72
Easy to handle/operate	13	4.14
Enhances prestige in society	14	4.00
Clean kitchen and cooking environment	14	4.00
Safe to use	16	3.98

[31] Final Report on Technical Study of Biogas Plants Installed in Bangladesh, Report submitted to IDCOL/SNV, P.C. Ghimire, Dec. 2005. (http://www.idcol.org/Download/Final_Survey_Report_Bangladesh.pdf) Survey was conducted as follows (Sect. 4.5.2):

Users were asked to mention three main merits and demerits of biogas plants based upon their experience with the technology. Weights were then allocated according to the number of responses. The highest was given 20 points while subsequent answers were allocated 19,18,17... points each.

Helps to enhance quality of rural life	16	3.98
No need of storage place for firewood	16	3.98
Reduces foul odor from poultry farm	19	3.80

SECTION F. Local stakeholder comments

F.1. Solicitation of comments from local stakeholders

>>

Since CPAs under the PoA will be implemented dispersedly in all rural Bangladesh, which is the geographical boundary for the PoA, distribution and implementation aspects including the CDM issues are essentially uniform across the country with no CPA specific characteristics, hence it is appropriate to conduct a stakeholder consultation at the PoA level.

As per CDM requirement and procedure, the local stakeholder consultation meeting was held on 3 October 2011, at the Conference room of Proshiku Training Center in Mowna, Gazipur, Bangladesh. Stakeholders were invited by invitation letters, e-mails and posters. Participants included representatives from both Project Participants, local NGOs, biogas digester experts, households and poultry farm owners. As the PoA was initially aimed at applying for the Gold Standard certification, the local stakeholder consultation was conducted with reference to the requirements of the Gold Standard. A brief programme introduction was given by the representatives of the project participants followed by giving clarifications to questions and comments. The floor was then open for the stakeholders for their sustainable development assessment on the programme and then for evaluation the consultation process.

Figure 8: Local stakeholders' meeting

F.2. Summary of comments received

>>

Total 39 participants attended the local stakeholders consultation process and during the open/discussion session the most of the potential poultry farm owners unfolded their interests to have access to microcredit facility for installation of biogas digesters with the size (capacity) of above 4.8 m^3/day. Till now, GS, under IDCOL program, has been offered microcredit facility to the biogas digesters below 4.8 m^3 in capacity. Stakeholders also requested clarifications of benefits for them from the programme. All participants showed their positive attitudes to the PoA and there were no comments regarding objections to the proposed PoA.

F.3. Report on consideration of comments received

>>

Comments of stakeholders and due accounts of the comments received are given in the table below. All comments are clarified to the local stakeholders.

Table 4. Assessment of Comments

Stakeholders' comments	Was comment taken into account (Yes/ No)?	Explanation (Why? How?)
Is there possibility to provide subsidies for the biogas digesters bigger than 4.8 m^3 in capacity?	Clarification	Under the current IDCOL program there has been no subsidy for the biogas digesters bigger than 4.8 m^3 in size; we would like to propose expansion of subsidies for bigger size biogas digesters to IDCOL. Moreover, the PoA will encourage installation of bigger digesters through the micro utility scheme.
What are the benefits from the program?	Clarification	For households, additional carbon benefit will ease their loan burden. For poultry farmers, the additional carbon benefit will also is used to ease their risks in some extent. Furthermore, some portion of the carbon benefits could be used for sustainable maintenance and management of biogas digesters that will also minimize technical risks on the lifetime of biogas digester operation.
How to deal with the sludge and slurry?	Clarification	The sludge and slurry can be used as organic fertilizer/soil conditioner to one's own field or can be sold to others if one has no own field. Regarding organic fertilizer sales, Grameen Shakti who has a license for selling organic fertilizer, will provide support to biogas digester owners in the terms of information and other issues.

SECTION G. Approval and authorization

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The approval letters from both Bangladesh and Japanese Governments have been gained.

PART II. Generic component project activity (CPA)

SECTION A. General description of a generic CPA

A.1. Purpose and general description of generic CPAs

>>

The purpose of any CPA under the PoA entitled "Programme for Promotion of Access to Domestic Biogas in Rural Bangladesh" is to introduce micro-type biogas digesters and supply biogas for households in rural Bangladesh

A typical CPA under the PoA is characterized as follows:

- A CPA consists of activities to install biogas digester systems for a certain period of time and operates the systems throughout the crediting period in many rural places in Bangladesh. The aggregated heat capacity of biogas cookstoves under a CPA shall not exceed 15 MW_{th} (*i.e.*, below the threshold of micro-scale project category), namely, the number of burners of biogas cookstoves is no more than 7,100.
- A CPA is defined as installation of biogas digester systems for a given period of time, not defining any specific area(s) in Bangladesh.
- A CPA targets rural (mainly farmer) households in villages and small towns.
- The fuels used in households for cooking before use of biogas are conventional biomass.
- Micro-type biogas digesters (fixed dome, fiberglass digesters, *etc.*) and related equipment for rural households are installed. The digesters consume organic waste (typically, cow dung or poultry litter) as a principal feedstock to produce biogas.
- A typical biogas digester system is composed of major parts: inlet, inlet pipe, fermentation chamber, hydraulic chamber, dome and gas tube and other relevant equipment (Figure 3 for conventional fixed dome type). Each design typically has different capacities. These sizes will be 1.2, 1.6, 2.0, 2.4, 3.2, 4.8, 6.0, 9.0, 12.0, ... until 100 with the unit of [m^3 daily biogas generation as its production capacity].
- In some cases, a digester may deliver biogas to its neighbour households for cooking through distribution pipelines (tubes).
- The biogas is combusted in biogas cookstoves at the households.
- The sludge and slurry soil application guarantees aerobic condition not to result in methane generation.
- Most of the activities under a CPA are implemented by branch offices of partner organizations of IDCOL.

SECTION B. Application of a baseline and monitoring methodology

B.1. Reference of the approved baseline and monitoring methodology(ies) selected

>>

AMS-I.E. (ver. 05) "Switch from non-renewable biomass for thermal applications by the user"

B.2. Application of methodology(ies)

>>

In CPAs under the PoA, GHG emission reduction is gained mainly through replacing non-renewable biomass with renewable biogas. Therefore, the methodology of AMS-I.E will be applied for CPAs under the PoA.

Justification of applicability of the methodology is given in the table below.

Table 5: Justification of applicability of the methodology

Applicable conditions	Justifications
AMS-I.E.	Typical CPA
1. This category comprises activities to displace the use of non-renewable biomass by introducing renewable energy technologies.	1. The CPA is to employ domestic biogas digesters to produce biogas and provide to households for thermal use through replacing non-renewable biomasses with renewable biogas.

2. Project participants are able to show that non-renewable biomass has been used since the 31st of December 1989, using survey methods.	2. Since the 1980s, Bangladesh has been facing steady population growth, placing pressure on the forest resources. A study conducted in Bangladesh between 1986 and 1998 published by the Federal Research Division of the Library of Congress, found that deforestation conditions, and thus the use of non-renewable biomass, existed in the 1980s.[32]
3. The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW_{th}.	3. This is a designing point of each CPA. This condition will be confirmed by the DOE based on an eligibility criterion (5) of the CPA.

B.3. Sources and GHGs

>>

The boundary of a CPA is the geographical areas where the domestic biogas digester systems are installed and targeted households are located. The GHGs and sources being considered within the boundary are concluded in the table below.

Table 6: Emission sources included in or excluded from the project boundary

Source		Gas	Included?	Justification / Explanation
Baseline	Combustion of non-renewable biomass	CO_2	Yes	Major emission source
		CH_4	No	Not significant. Excluded for simplification
		N_2O	No	Not significant. Excluded for simplification
Project Activity	Combustion of biogas	CO_2	No	Excluded as per methodology
		CH_4	No	Excluded as per methodology
		N_2O	No	Excluded as per methodology

The elements included and energy flows in the project boundary is shown in the figure below.

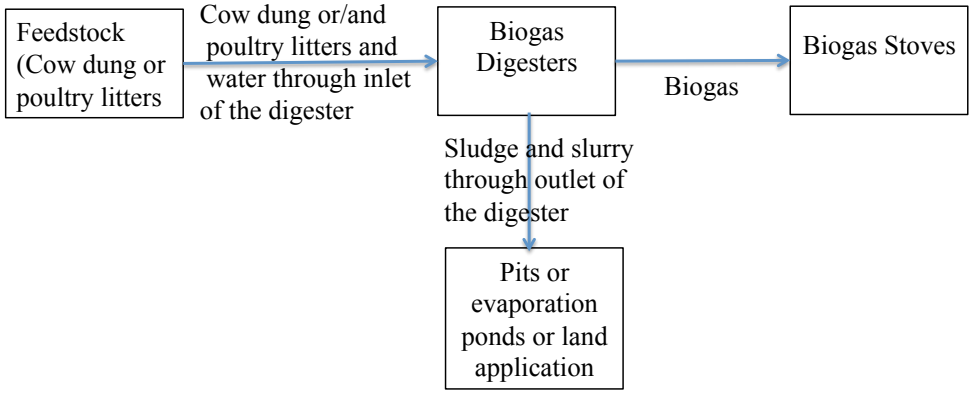

Figure 9: Biogas Digester System Boundary

[32] http://www.countrystudies.us/bangladesh/72.htm

Sampling plan applied to CPAs in the PoA, which is based on "Standard for sampling and surveys for CDM project activities and programme of activities" (Version 04.1), is provided in Appendix 5.

B.4. Description of baseline scenario

>>

The methodology utilizes the following baseline scenario for calculation of emission reductions:

– 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 (Paragraph 4 of AMS- I.E, ver.05)

Baseline scenario of the PoA

All possible options (for thermal energy demand mainly for cooking) comply with all applicable and enforced legislation, technically feasible and accessible for households as the main energy source include:

(a) Continuation of current practice (use of fuel wood as the main fuel);

(b) Fossil fuels currently not used mainly (LPG, coal, fuel oil, kerosene, *etc*.);

(c) Grid electricity;

(d) Renewable biomass (tree leaves, crop residue, dung, sawdust) use;

(e) Use of renewable energy from biogas digester.

(f) Use of other renewable energies.

Options (b)–(f) implies *fuel switch* from the current practice. Based on many literatures, *e.g.*, reports shown in the footnotes 1, 2 and 3, households in rural Bangladesh currently use mainly biomass (non-renewable and renewable), because these fuels are the only accessible fuels in the region. Figure 10 shows around 99.9% of the cooking (including parboiling) energy comes from biomass.[3]

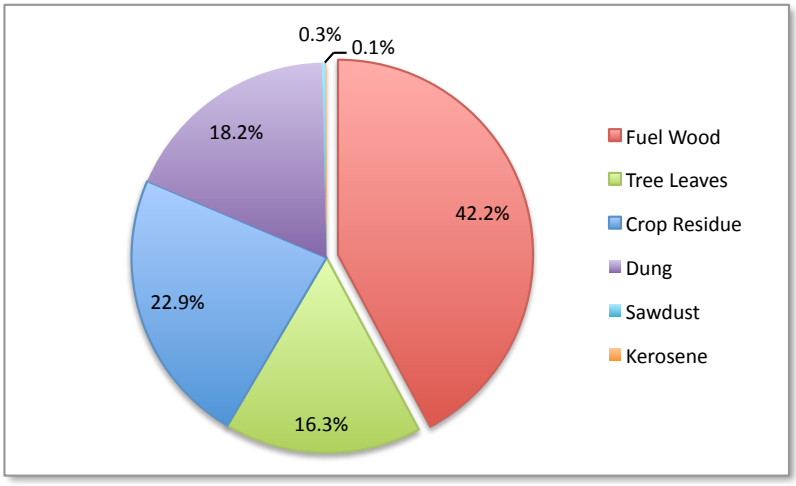

Figure 10: Household energy consumptions for cooking and parboiling in rural Bangladesh[3]

The survey shows that most households have not used fuel oil or kerosene for cooking, because fossil fuels are expensive to access. Therefore, in option (b) switching to coal, fuel oil or kerosene cannot be an applicable scenario as a baseline.

Electricity has not been used for cooking at households in rural Bangladesh due to the costs of electronic cooking appliances and the use of electricity itself. It is also noted that only 30% of rural households can access to grid electricity.[33] Therefore, option (c) cannot be a credible scenario for a baseline.

Renewable biomass, which is outside of the fuel market, is used as supplemental fuel. However,

[33] See, *e.g.*, http://www.worldenergyoutlook.org/database_electricity/electricity_access_database.htm.

switching from fuel wood to other biomass is difficult because of the lack of supply (with high burden for collection) and difficult accessibility. Therefore, option (d) also cannot be a baseline scenario.

It is difficult for households to install biogas digesters by themselves outside of the IDCOL program. According to NDBMP Implementation Plan 2010–12, over 80 percent population of Bangladesh resides in rural areas. Only 0.7% of people have enjoyed the benefits of the biogas so far.[34] "Guidelines for objective demonstration and assessment of barriers" (ver. 01) specifies that the barrier can be demonstrated by showing the penetration rate of the technology in similar circumstances (Guidance 3). Therefore, option (e) cannot be a baseline scenario.

Because of the high cost to install solar energy or wind energy, and also unsuitable for cooking purposes, it is difficult for rural households to switch to them. Therefore, option (f) cannot be a baseline scenario.

Therefore, continuation of current practice seems to be the most plausible scenario for baseline.[35]

B.5. Demonstration of eligibility for a generic CPA

>>

Conformity of eligibility of a CPA is shown as below.

(1) The CME (IDCOL) defines the expected period during which the biogas digester systems covered by a CPA are installed (e.g., 1/4/2012–31/9/2012). If the covered digesters have been already installed, a CPA should provide a list of all user information with the date of

[34] It is uncertain how many households have introduced biogas digesters in Bangladesh. Considering GS's accumulated installation number to date as 20,000 as well as pre-NDBMP number (around 25,000 as shown in Annex 6 of "Implementation Plan—National Domestic Biogas and Manure Programme in Bangladesh", 2006 http://www.idcol.org/newse/download/Final%20%20NDBMP%20implementation%20Plan_25%20May,2006_.pdf), there may be less than 70,000 digesters. Assuming that there are around 10 million households, the biogas digester has penetrated 0.7% of households nowadays. It is noted that "Guidelines for objective demonstration and assessment of barriers" shows the application of the Guidance 3 by using an example of 10%. Therefore, 0.7% is strong enough to demonstrate the existence of the prohibitive barriers.

[35] The most plausible baseline fuel is continuation of current practice, *i.e.*, non-renewable biomass (fuel wood). Therefore, *theoretically* it is correct to use the CO_2 emission factor of the non-renewable biomass in the calculation of emission reductions. However, the methodology does not allow to use such emission factor but requests to use that of (most plausible) fossil fuel by *assuming* that the use of such fossil fuel is the baseline scenario (para. 4 of the methodology). AMS-I.E ver. 05 specifies the default factor as 81.6 tCO_2/TJ.

Historical background of this un-theoretical treatment is the requirement by the Marrakech Accords (Modalities and Procedures for CDM; Decision 17/CP.7): "(CMP) decides: (a) That the eligibility of land use, land-use change and forestry project activities under the clean development mechanism is limited to afforestation and reforestation" (para. 7). Switching from non-renewable biomass to renewable energy is to reduce CO_2 but it may be recognized also as a "land use, land-use change and forestry"-type project activity.

After two years' negotiations, CMP 3 decides that "24. (CMP) *Requests* the Executive Board to approve, at its first meeting in 2008, the simplified methodologies for "Switch from non-renewable biomass for thermal application by the user" and "Energy efficiency measures in thermal applications of non-renewable biomass", as recommended by the Executive Board, for use for clean development mechanism project activities, as contained in annexes 3 and 4 to document FCCC/KP/CMP/2007/3 (Part II), incorporating the necessary changes to ensure that the application of these methodologies introduces new or improves existing end-user technologies and that, in the case of the methodology "Energy efficiency measures in thermal applications of non-renewable biomass", the baseline energy efficiency is measured or is based on referenced literature values" (Decision 2/CMP.3).

Therefore, a *skewed* treatment is incorporated in the methodology such as "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 (Paragraph 4 of AMS- I.E, ver.05)" even if the real baseline scenario is continuation of use of non-renewable biomass. The "CDM methodology booklet" prepared by the CDM Secretariat also shows that the real baseline is continuation of non-renewable biomass use.

It is noted that the CO_2 emission factor of the (non-renewable) biomass is around twice of that of LPG (63.0 tCO_2/TJ). Therefore, this treatment is very conservative.

installation and the start date of operation as well as the location, size and type of biogas digester and cookstoves for use, and the summary list is attached to the CPA-DD and the electronic file is provided also to the DOE with full relevant information as a provisional data. If the digesters have not yet installed fully, the expected calculation table is shown in the main text of a CPA-DD.

Installation date and other of related information of biogas digester systems under each CPA should be documented in the database of the PoA, the CME will provide all related information such as the start date of digesters, size, type, owner and users of the biogas digester systems to DOE.

(2) *Any CPA includes installation/construction of biogas digester systems, biogas delivery lines and biogas cookstoves at rural households or small and medium farms in Bangladesh. IDCOL shall maintain records and documentation control processes for each CPA as a part of its management system.*

IDCOL will inspect installation and operation of biogas digesters under a CPA.

IDCOL confirms and keeps information of digesters in a CPA such as locations, ID numbers, names of user households including that of the digester owner and number of biogas cookstove burners and start date of operation.

(3) *Any CPA under the PoA shall not be a part of a registered CDM project or not a CPA under another PoA.*

IDCOL identifies if there is any registered CDM project activity or CPA of a registered PoA that targeting the same households in Bangladesh.

There is a registered PoA for installation of improved cookstoves (ICS).[36] Any CPA under the PoA may include the household covered by this PoA and should avoid double counting through a checking system that confirm whether the household has already installed ICS (under registered PoA 4791 as well as by non-CDM programmes or independently). If so, emission reductions for the households are calculated in a conservative manner.

(4) *Installations/operations of biogas digesters shall be in compliance with related national and sectorial standards and regulations, if any.*

Any CPA under the PoA shall utilize equipment approved by the IDCOL's technical committee. It is to be noted that a monitoring system—*incl*. annual survey—is introduced to include only properly operating biogas digesters in the calculation of emission reductions.

(5) *The aggregated capacity of biogas cookstoves under a CPA is less than 15 MW_{th}, i.e., the aggregated number of burners of cookstoves is less than 7,100.*

The CME develops a database of digester systems for each CPA and provides all specific information of biogas digester system to DOE.

Based on the database, the CME will confirm the number of biogas stoves under each CPA not exceeded 7,100 and provide a list of biogas digesters to the DOE for check.

B.6. Estimation of emission reductions of a generic CPA

B.6.1. Explanation of methodological choices

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According to Para 5 and Para 18 (c) of the methodology (AMS-I.E., ver. 05), emission reductions ER_y is calculated as:

[36] PoA 4791: "Improved Cooking Stoves in Bangladesh". See http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/SE7XIMKF8NYVOTL16BW3U45C9ZDGAP/view.

$$ER_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossilfuel} - LE_y \quad (1)$$

Where

B_y : Quantity of woody biomass that is substituted or displaced (tonnes). See the calculation method below.

$f_{NRB,y}$: Fraction of woody biomass used in the absence of the project activity that can be established as non-renewable biomass using survey methods or government data or approved default country specific fraction of non-renewable woody biomass values available on the CDM website (no dimension). Fixed (time-independent) parameter. See the definition below.

$NCV_{biomass}$: Net calorific value of the non-renewable woody biomass that is substituted. IPCC default factor for wood fuel (0.015 TJ/tonne) is applied.

$EF_{projected\_fossilfuel}$: Emission factor for the substitution of non-renewable woody biomass by similar consumers. Default value of 81.6 tCO_2/TJ is applied per the methodology.

LE_y : Leakages in a years y (tCO_2e/year).

B_y, is calculated from the thermal energy generated in the project activity as per (b) of para 6 of the methodology.

$$B_y = HG_{P,y}/(NCV_{biomass} \times \eta_{old,i}) \quad (2)$$
$$= R_{O,y} \times \sum_i^N (D_{i,y} \times R \times V_i \times NCV_{biogas} \times \eta_{biogas,i}/1{,}000)/(NCV_{biomass} \times \eta_{old,i})$$

Where

$HG_{P,y}$: Quantity of thermal energy generated by the new renewable energy technology in the project in year y (TJ)

$\eta_{old,i}$: 1. Efficiency of a biomass stove being replaced by digester system *i*. measured using representative sampling methods or based on referenced literature values (fraction), use weighted average values if more than one type of system is being replaced;
2. A default value of 0.10 may be optionally used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney; for other types of systems a default value of 0.2 may be optionally used.

NCV_{biogas} : Net calorific value of the biogas (GJ/m^3) A default value of 0.0215 GJ/m^3 is applied based on AMS-I.I.

$\eta_{biogas,i}$: Efficiency of a biogas stove in a biogas digester system *i*

R : Biogas production rate of a biogas digester system. A default value of 0.13 $m^3.m^{-3}$/day is applied.

V_i	:	Installed capacity of each biogas system (m^3)
$D_{i,y}$	:	Number of days from the start date of operation of each biogas digester in a year y (the start date of biogas digesters is different).
N	:	Number of biogas digesters in a CPA
$R_{O,y}$	:	Ratio of biogas digesters in normal operation in year y

For $f_{NRB,y}$, it is defined as

$$f_{NRB,y} = NRB/(NRB + DRB) \quad (3)$$

where

NRB	:	Quantity of non-renewable woody biomass used in the absence of the project activity,
DRB	:	Quantity of (demonstrably) renewable woody biomass used in the absence of the project activity.

Evaluation of $f_{NRB,y}$

According to a study commissioned by JPMorgan Climate Care conducted in Bangladesh on non-renewable biomass (footnote 2), interviews with wood sellers indicated how collection distances have been increasing radically, with many trucks nowadays travelling more than 100 km with wood fuel cargo.[37] The study also found that wood fuel prices have been rising sharply in recent years, and that the mixing in of secondary fuels (dung, leaves, and crop residue) is partly a result of difficulties in procuring wood. With the strong evidence that land across the country is deforesting rapidly and the absence of any evidence for renewable resources sustainably managed, all woody biomass or fuelwood used in households can be seen as non-renewable biomass (NRB).

In addition, we see that woody biomass is traded in the market. This implies that even if some woody biomass is from sustainably managed forest, the consumption of such renewable biomass drives avoidance of other person's use of renewable biomass, in theory.[38]

In addition, the PoA-DD of the registered PoA 4791: "Improved Cooking Stoves in Bangladesh (footnote 17), shows the value is 1.0 (page 22–23).

Therefore, we can conclude that

$$f_{NRB,y} = 1.0 \quad (4)$$

in Bangladesh.

Evaluation of leakage

For leakage, we choose option (c) in Para 18 specified in the methodology:

(c) As an alternative to subparagraphs (a) and (b), B_y can be multiplied by a net to gross

[37] This fact implies that the calculation of emission reduction is conservative by ignoring the transportation-related baseline emissions.

[38] This is backed by the fact that the woody biomass is traded in market and the renewable biomass *supply* into the market is limited (and not influenced by the project activity).

adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

$$LE_y = B_y \times (1 - Af) \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossilfuel} \quad (5)$$

Where

LE_y : Leakages in a year (tCO_2e/year)

Af : Adjustment factor for leakages (0.95).

B.6.2. Data and parameters that are to be reported ex-ante

Data / Parameter	f_{NRB}
Unit	No dimension
Description	Fraction of non-renewable woody biomass used among whole woody biomass in the absence of the project activity, defined as $f_{NRB} = \frac{NRB}{NRB + DRB}$ Where *NRB*: Amount of non-renewable woody biomass used in the absence of the project activity *DRB*: Amount of (demonstrably) renewable woody biomass used in the absence of the project activity
Source of data	JPMorgan Climate Care report and World Bank "Restoring Balance—Bangladesh's Rural Energy Realities"
Value(s) applied	1.0
Choice of data or Measurement methods and procedures	JPMorgan conducted a comprehensive study considering CDM-specific requirements into account (footnote 2). In addition, the World Bank Report (footnote 3) supports this result. This is also supported by the registered PoA 4971: "Improved Cooking Stoves in Bangladesh, shows the value is 1.0.
Purpose of data	For calculation of emission reductions and leakage
Additional comment	–

Data / Parameter	$NCV_{biomass}$
Unit	TJ/tonne
Description	Net calorific value of the woody biomass
Source of data	AMS-I.E. (ver. 05)
Value(s) applied	0.015
Choice of data or Measurement methods and procedures	Default value specified in the AMS-I.E. (ver. 05)
Purpose of data	For calculation of emission reductions and leakage
Additional comment	–

Data / Parameter	NCV_{biogas}
Unit	GJ/m^3
Description	Net calorific value of the biogas
Source of data	AMS-I.I. (ver. 04)
Value(s) applied	0.0215
Choice of data or Measurement methods and procedures	Default value specified in the AMS-I.I. (ver. 04)
Purpose of data	For calculation of emission reductions and leakage
Additional comment	–

Data / Parameter	$EF_{projected\_fossilfuel}$
Unit	t CO_2/TJ
Description	Emission factor for substitution of woody biomass
Source of data	AMS-I.E (ver. 05)
Value(s) applied	81.6
Choice of data or Measurement methods and procedures	Default value specified in the AMS-I.E (ver. 05)
Purpose of data	For calculation of emission reductions and leakage
Additional comment	–

Data / Parameter	$\eta_{biogas,i}$
Unit	%
Description	Efficiency of a biogas stove in a biogas digester system *i*
Source of data	Laboratory test
Value(s) applied	52.1
Choice of data or Measurement methods and procedures	SNV (Netherlands Development Organization) Study[39] Lowest value of the stove of Bangladesh for conservativeness
Purpose of data	For calculation of emission reductions and leakage
Additional comment	Since biogas is qualitatively stable and clean fuel, the efficiency of biogas cookstove does not vary much by location and time. Therefore, a conservative fixed value is applied for η_{biogas}. This approach is consistent with the registered PoA 8239 "African Clean Energy Switch – Biogas (ACES-Biogas)", which also determines efficiency of biogas cookstove *ex-ante* based on the manufacture's specifications or water boiling test.

Data / Parameter	$\eta_{old,i}$
Unit	%
Description	Efficiency of a biomass stove being replaced by biogas digester system *i.*
Source of data	AMS-I.E (ver. 05)
Value(s) applied	10 or 20
Choice of data or Measurement methods and procedures	Default value specified in the AMS-I.E (ver. 05). A default value of 0.10 (10%) for three stone fire, or a conventional systems with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney; for other types of systems (including improved cooking stoves) a default value of 0.2 (20%).
Purpose of data	For calculation of emission reductions and leakage
Additional comment	–

[39] Popular Summary of the Test Reports on Biogas Stoves and Lamps prepared by testing institutes in China, India and the Netherlands.
http://www.snvworld.org/sites/www.snvworld.org/files/publications/biogas_stoves_and_lamps_test_report_2009.pdf

Data / Parameter	R
Unit	$Nm^3.m^{-3}$/day
Description	Biogas production of rate of a biogas digester system
Source of data	AMS-I.E (ver. 05)
Value(s) applied	0.13
Choice of data or Measurement methods and procedures	Default value specified in the AMS-I.E (ver. 05). Volume of biogas generated in normal conditions of temperature and pressure per unit useful volume of the digester per day for regions/countries where annual average ambient temperature is higher than 20°C.
Purpose of data	For calculation of emission reductions and leakage
Additional comment	–

Data / Parameter	Af
Unit	%
Description	Adjustment factor for leakages
Source of data	AMS-I.E (ver. 05)
Value(s) applied	95
Choice of data or Measurement methods and procedures	Default value specified in the AMS-I.E (ver. 05). B_y is multiplied by the factor 0.95 to account for leakages, in which case surveys are not required
Purpose of data	For calculation of leakage
Additional comment	–

B.6.3. Ex-ante calculations of emission reductions

>>

As per the formulae given in this PoA-DD Part II Section B 6.1, the ex-ante calculations of the emission reductions are explained as below.

$$ER_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossilfuel} - LE_y \quad (1)$$

Where

B_y : Quantity of woody biomass that is substituted or displaced (tonnes).

$f_{NRB,y}$: Fraction of woody biomass used in the absence of the project activity that can be established as non-renewable biomass using survey methods or government data or approved default country specific fraction of non-renewable woody biomass values available on the CDM website.

$NCV_{biomass}$: Net calorific value of the non-renewable woody biomass that is

substituted (0.015 TJ/tonne).

$EF_{projected\_fossilfuel}$: Emission factor for the substitution of non-renewable woody biomass by similar consumers (81.6 tCO_2/TJ).

LE_y : Leakages in a years y (tCO_2e/year).

$$ER_y = B_y \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossilfuel} - LE_y$$

$$= B_y \times 1 \times 0.015 \times 81.6 - LE_y = \text{xxx ton } CO_2\text{/year}$$

$$B_y = HG_{P,y}/(NCV_{biomass} \times \eta_{old,i}) \quad (2)$$

$$= R_{O,y} \times \sum_i^N (D_{i,y} \times R \times V_i \times NCV_{biogas}/1{,}000 \times \eta_{biogas,i})/(NCV_{biomass} \times \eta_{old,i})$$

Where

$HG_{P,y}$: Quantity of thermal energy generated by the new renewable energy technology in the project in year y (TJ).

$\eta_{old,i}$: Efficiency of a biomass stove being replaced by digester system *i*. A default value of 0.10 is used if the replaced system is a three stone fire, or a conventional system with no improved combustion air supply or flue gas ventilation system, i.e. without a grate or a chimney; for other types of systems such as improved cooking stoves a default value of 0.2 is used.

NCV_{biogas} : Net calorific value of the biogas (0.0215 GJ/m^3)

$\eta_{biogas,i}$: Efficiency of a biogas stove in a biogas digester system *i*

R : Biogas production of rate of a biogas digester system. A default value of 0.13 $m^3.m^{-3}$/day is applied.

V_i : Installed capacity of each biogas system (m^3)[40].

$D_{i,y}$: Number of days from the starting date of operation of each biogas digester in year y (the start date of biogas digesters is different).

N : Number of biogas digesters in a CPA (number).

$R_{O,y}$: Ratio of biogas digesters in normal operation in year y

For *ex-ante* emission reduction calculation, it is assumed that all biogas digesters operated normally $R_{O,y}=0.7$ and $D_{i,y}=365$.

Then,

[40] The sizes of the digester are 1.2, 1.6, 2.0, 2.4, 3.2, 4.8, 6.0, 9.0, 12.0, 15.0, *etc*. with the unit of [m^3 daily biogas generation capacity]. The physical capacity of biogas digesters up to 15 m^3/day is determined as per Grameen Shakti Biogas Technical Guide. For others, digesters specific information is provided by CPA operators.

$$B_y = R_{O,y} \times \sum_{i}^{N} (D_{i,y} \times R \times V_i \times NCV_{biogas} / 1{,}000 \times \eta_{biogas,i}) / (NCV_{biomass} \times \eta_{old,i})$$
$$= 0.7 \times \sum_{i}^{N} (365 \times 0.13 \times V_i \times 0.0215 / 1{,}000 \times 0.521) / (0.015 \times 0.1 \; or \; 0.2)$$
= xxx tonnes/year

For Bangladesh

$$f_{NRB,y} = 1.0 \quad (4)$$

For leakage,

$$LE_y = B_y \times (1 - Af) \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossilfuel} \quad (5)$$

Where

LEy	:	Leakages in year y (tCO_2e/year)
Af	:	Adjustment factor for leakages (0.95).

$$LE_y = B_y \times (1 - Af) \times f_{NRB,y} \times NCV_{biomass} \times EF_{projected\_fossilfuel}$$
$= B_y \times$ (1 - 0.95) × 1× 0.015 × 81.6 = xxx tCO_2e/year

B.7. Application of the monitoring methodology and description of the monitoring plan
B.7.1. Data and parameters to be monitored by each generic CPA

Data / Parameter	*N*
Unit	Number
Description	Number of biogas digesters covered by a CPA
Source of data	The CME
Value(s) applied	Dependent on each CPA
Measurement methods and procedures	The management system is used to manage all biogas digesters with a number of attributions.
Monitoring frequency	Once after installation of all digesters completed and operation started. The recorded value is updated through the management system and used the following years.
QA/QC procedures	QA/QC procedures of NDBMP are applied.
Purpose of data	For calculation of emission reductions and leakage
Additional comments	This parameter is also used as a key parameter to calculate sample size for monitoring of $R_{O,y}$.

Data / Parameter	V_i
Unit	m^3
Description	Installed capacity of biogas digester *i*
Source of data	The CME
Value(s) applied	Depend on each CPA
Measurement methods and procedures	The management system is used to manage all biogas digesters with a number of attributions.
Monitoring frequency	Once after installation of all digesters completed and operation started. The recorded value is used the following years
QA/QC procedures	QA/QC procedures of NDBMP are applied.
Purpose of data	For calculation of emission reductions and leakage
Additional comments	–

Data / Parameter	$R_{O,y}$
Unit	%
Description	Ratio of biogas systems in normal operation in year y
Source of data	This parameter is based on the status reports and sample survey by the CME
Value(s) applied	Dependent on each CPA
Measurement methods and procedures	The parameter is obtained through a sample survey integrated with IDCOL's Annual Biogas Users Survey[41]. The number of sample user households should keep (90/10) confidence/precision level for the sampling method.
Monitoring frequency	Annually
QA/QC procedures	The interviewer is to check the obtained information from various aspects. If some inconsistencies are found in the interview, the interviewer is trying to clarify such inconsistencies. If the interviewer concluded that the obtained data is not reliable, the household should be outside of the sample group.
Purpose of data	For calculation of emission reductions and leakage
Additional comments	See Appenedix 5 for the sampling method.

[41] Annual Biogas Users Survey 2010:
http://www.snvworld.org/sites/www.snvworld.org/files/publications/biogas_user_survey_2010_bangladesh_2011.pdf
Annual Biogas Users Survey 2009:
http://www.snvworld.org/sites/www.snvworld.org/files/publications/biogas_user_survey_in_2009_bangladesh_2010.pdf

Data / Parameter	$D_{i,y}$
Unit	days
Description	Number of operation days of digester *i* since start in year y.
Source of data	The CME
Value(s) applied	Dependent on each CPA
Measurement methods and procedures	CPA operators shall prepare a database of the installation of biogas digesters as well as the user households. The database includes the start date of operation defined as 30 days after the completion date of the biogas digester construction. From this date, the number of claimed days is calculated as the remaining number of days during the monitoring period for each user household.
Monitoring frequency	Once after installation of all digesters completed and operation started for the first year. 365 is used the following years
QA/QC procedures	QA/QC procedures of NDBMP are applied.
Purpose of data	For calculation of emission reductions and leakage
Additional comments	-

B.7.2. Description of the monitoring plan for a generic CPA

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1. Monitoring framework

IDCOL will manage whole activities under the PoA as the CME and CPA implementer. The monitoring system is integrated part of the management system as shown in Section C.

The operation and management structure for monitoring is based on IDCOL's existing monitoring system with involvement of CPA operators (partner organizations). IDCOL will act as the overall supervisor and prepare a monitoring report periodically (typically annually) to the DOE by using the reports by GS and other CPA operators.

The CPA operators will undertake the monitoring (especially preparing the monthly and annual status report) based on the operation and monitoring manual prepared by IDCOL. Results will be reported to IDCOL. IDCOL have the responsibility to manage and operate all of the CPA.

Each CPA is basically sequential for the period of its dates of installation (completion date of construction) of digesters (see Figure 6) and covers whole Bangladesh.

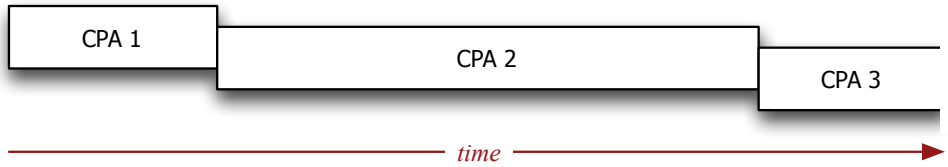

Figure 6 (revisited): Image of the definition of CPAs concerning the period of the date of installation of biogas digesters

2. The role of CME/CPA implementer and CPA operators

The following table shows the roles of the CME/CPA implementer (IDCOL) and CPA operators (GS and other organizations) for monitoring.

Table 7: Functions of IDCOL (CME/CPA implementer) and CPA operators

	IDCOL (supported by PEAR)	CPA operators (GS and other organizations)
Monitoring management	- Develop the operation and monitoring manual for activities. - Develop and establish data collection and reporting system for parameters monitored in every CPAs. - Implement and manage monitoring of CPAs.	- Implement and manage monitoring of activities (information related to installation of biogas digesters and biogas use, undertaking maintenance services, *etc*.). - This can be supported by monthly collection of installments.
Data collection	- Establish and maintain data collection systems for parameters monitored. - Check data quality and collection procedures regularly. - Undertake Annual Biogas Users Survey to grasp the status of the program which includes monitoring related to CDM ($R_{o,y}$).	- Implement data collection; especially the number of biogas digesters (N), installed capacity of biogas digesters (V_i) and the time of biogas digester installation and operation start ($D_{i,y}$). - Check internal data collection procedures regularly.
Data storage and management	- Develop database format of CPA. - Check the reported data from each CPAs. - Calculate emission reductions based on the data reported by the CPA operators. - Implement data management of CPAs. - Store and maintain records.	- Enter collected data to a computer database. - Implement data management of the activities. - Store and maintain records.
Reporting	- Analyze data and compare project performances. - Prepare monthly or annual reports.	- Report electronic data to IDCOL. - Households report related information and any malfunctions happened on biogas digesters to the CPA operator.
CDM training and capacity building	- Develop and establish training program for CPA operators and prepare a manual for households.	- Implement simple training for households for operation of the digester and biogas use.
Quality assurance and verification	- Establish and maintain quality assurance system with a view to ensuring transparency and allowing for verification. - Prepare for, facilitate and co-ordinate verification process.	- Undertake regular check of biogas digester for 2 years (monthly for households utilizing micro-finance), including assurance for 5 years maintenance as well as to make contract to inform malfunction to the CPA operator after that period for recovery. - All of these information are recorded and reported to IDCOL.

3. Monitored data

The data to be monitored are described in section B.7.1.

4. Data collection

Data collection regarding households will mainly be carried out by CPA operators. The role of IDCOL in data collection is checking the quality of the data collected by CPA operators.

Sampling to determine parameter $R_{O,y}$ is implemented by IDCOL at first hand. The sampling plan applied to CPAs under the PoA is explained in Appendix 5 in detail.

5. Data management

Data management is the most important step in the monitoring process to ensure transparent and credible emission reduction calculations.

Each CPA operator (GS or other organization) shall collect data described in section B.7.1 and archive these electronically using the common template developed by IDCOL. The electronic files and the hard copy shall be sent to IDCOL.

IDCOL will develop an appropriate electronic template for archiving all data of every activity. After reporting data from CPA operators, IDCOL shall check the data. If there are any errors found, they will be checked against original data and carry out interview with farmers if necessary.

IDCOL will calculate emission reductions for each CPA supported by PEAR, and store the outputs in hard disks as well as hard copy printouts.

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Appendix 1: Contact information on entity/individual responsible for the PoA

Coordinating and Managing Entity and Joint Focal Point

Organization	Infrastructure Development Company Limited
Street/P.O. Box	8 Panthapath, Kawran Bazar
Building	UTC Building, 16th Floor,
City	Dhaka
State/Region	Dhaka
Postcode	1215
Country	Bangladesh
Telephone	9102171-8
Fax	+880-2-8116663
E-mail	contact@idcol.org
Website	http://www.idcol.org/
Contact person	Mahmood Malik
Title	Executive Director and CEO
Salutation	Mr.
Last name	Malik
Middle name	
First name	Mahmood
Department	
Mobile	
Direct fax	+880-2-8116663
Direct tel.	
Personal e-mail	mmalik@idcol.org

Project Participant and Joint Focal Point

Organization	Grameen Shakti
Street/P.O. Box	Mirpur-2
Building	Grameen Bank Bhaban (19th Floor)
City	Dhaka
State/Region	Dhaka
Postcode	1216
Country	Bangladesh
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Appendix 2: Affirmation regarding public funding

Since a part of the PoA (currently, biogas digesters up to 4.8 m3/day) is undertaken as the IDCOL program (NDBMP), public funding is used mainly for the source of micro-financing (loan) which provides flexibility for the households for initial investment.[42] It is expected that around 80% of the households requires the loan. Designing the loan scheme is dependent on each partner organization (such as GS) of the IDCOL. The current subsidy covers about 25% of the total investment requirements by households (biogas digester owners). The subsidy rate will be 9,000 Taka per plant (per household). Currently, the total subsidy amount required for the programme period is Euro 2.5 million of which KfW will provide 85% while the rest 15% will be contributed from the Government of Bangladesh. The total budget required to implement the NDBMP over 3 years (2010–12) will be Euro 10.76 million.[43]

IDCOL specifies the carbon financing opportunities by CDM as an attractive and sustainable source of funding. GS, which contributed around 57% (12,795 out of 22,549 biogas plants) of total construction up to April 2012, got approval by IDCOL to undertake CDM activities. It is to be noted that the PoA may cover activities of other partner organizations of IDCOL and also it covers larger biogas digesters (> 4.8 m3/day) not yet covered by IDCOL's program. It is to be also noted that any Annex I Party government will not obtain CERs in compensation for the ODA.

[42] It is noted that IDCOL nor GS do not invest in the biogas digesters. Each household invests (in many cases by utilizing the micro-financing scheme operated by GS). CER revenue will be used for the programme (*i.e.*, used for the households). This is completely different from typical CDM project where project owner invests and obtain the revenue from CERs.

[43] National Domestic Biogas and Manure Programme Implementation Plan 2010–12, IDCOL, Dec. 2009. http://www.idcol.org/Download/20100105 Implementation Plan 2010_12 NDBMP IDCOL1.pdf. It says (p.20):

Out of the total amount required for implementing the programme, Government of Netherlands/DGIS/ABP provides Euro 1.35 million for programme operation cost whereas Government of Bangladesh is expected to contribute about Euro 0.37 million on part of subsidy at the rate of 15 percent of subsidy amount while KfW fund of about Euro 2.1 million will be utilized for covering the subsidy for the period of 2010-–2012. In addition KfW will also provide Euro 3.1 million for refinancing.

Appendix 3: Application of methodology (ies)

Please refer to section B.2 of part II of the PoA-DD

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

Please refer to section B.6.1 and B.6.2 of the Part II of the PoA-DD

Appendix 5: Further background information on the monitoring plan

Sampling Plan

(a) Sampling Design

(i) Objectives and Reliability Requirements

To check a representative sample of appliances, at least once every two years (biennial) to ensure that biogas system are still operating or are replaced by an equivalent in service appliance ($R_{O,y}$; Ratio of biogas systems in normal operation in year y).
The survey is undertaken once a year as an integrated (and extended from current annual survey) element of the IDCOL's Annual Biogas Users Survey, and with 90/10 confidence/precision as per AMS-I.E. Version 05.
The latest results are used for the calculation of emission reductions.

(ii) Target Population

The target population is all biogas digester systems installed by a CPA under this PoA by the end of year. The data is determined by the CME's management system (computer database system) that is used to storage and manage all biogas digesters data with a number of attributions.

(iii) Sampling Method

The sampling applies a simple random sampling approach. The biogas systems will be sampled using simple random sampling with the aid of a computerized randomizer.
The database of biogas systems and user information for each CPA is established under the CME's management system.

(iv) Sample Size

As shown in the following theoretical calculations, minimum sampling size is calculated based on the equation given below[44].

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

n	:	Samples
N	:	Total number of biogas digesters installed by a CPA
p	:	Expected proportion of biogas systems in normal operation in year y
1.64	:	Represents the 90% confidence required
0.1	:	Represents the 10% relative precision

The minimum sample sizes for the different scenarios required meeting the confidence and precision requirements are calculated in a sample size calculation spreadsheet. The following table shows sample sizes for different population scenarios in a condition of 70%[45] of biogas digester systems are operated well.

[44] Page 16 "Guidelines for sampling and surveys for CDM project activities and programme of activities" Version 03.0 EB75Annex 8

[45] Based on the past Annual Biogas Users Survey.

Table 8: Sample size calculation

Population	Calculated Samples	Adjusted sample size according to response rate of 80%
600	98	123
1,500	108	135
3,000	112	140
5,000	114	143
6,000	114	143
7,100	115	144

(v) Sampling frame

The sampling list is the all biogas digester systems (including digester user households and owner households) covered by a CPA of the PoA until the designing date of the Annual Biogas Users Survey in the year. The associated file is kept in the management system. The sample digester systems are selected by computer randomly.

(b) Data

(i) Field Measurement

The parameters to be monitored are:

- Ratio of biogas digester systems operated normally in a year *y* ($R_{O,y}$)

The frequency is once a year.

The method is conducting detailed interview with the biogas digester owners and checking actual condition of digester systems at households (together with subjects specified in the Annual Biogas Users Survey.

(ii) QA/QC

The interviewer is to check the obtained information from various aspects. If some inconsistencies are found in the interview, the interviewer is trying to clarify such inconsistencies. If the interviewer concluded that the obtained data is not reliable, the household should be outside of the sample group.

As per AMS-I.E. (Version 05), in cases where survey results indicate that 90/10 precision is not achieved, the lower bound of a 90% confidence interval of the parameter value may be chosen as an alternative to repeating the survey efforts to achieve the 90/10 precision.

(iii) Analysis

The obtained results will be checked against the historical trend. If some specific aspects are found, some analysis would be undertaken and the results will be explained in the monitoring report. Experts' opinion may also be included.

Using the result, IDCOL will determine the parameter and describe them in the monitoring report.

(c) Implementation

(i) Implementation Plan

IDCOL will choose a consultant firm with the expertise every year and ask it with the requirements shown above for CDM and other routine elements to be surveyed. Typically, the survey would be undertaken in April to June.

The results will be compiled as the Annual Biogas Users Survey Report.

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History of the document

Version	Date	Nature of revision(s)
02.0	EB 66 13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the programme design document form for small-scale CDM programmes of activities" (EB 66, Annex 13).
01	EB33, Annex43 27 July 2007	Initial adoption.
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