



**CLEAN DEVELOPMENT MECHANISM
SMALL-SCALE PROGRAMME OF ACTIVITIES DESIGN DOCUMENT FORM
(CDM-SSC-PoA-DD) Version 01**

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NOTE:

- (i) This form is for the submission of a CDM PoA whose CPAs apply a small scale approved methodology.
- (ii) At the time of requesting registration this form must be accompanied by a CDM-SSC-CPA-DD form that has been specified for the proposed PoA, as well as by one completed CDM-SSC-CPA-DD (using a real case).



SECTION A. General description of small-scale programme of activities (PoA)

A.1 Title of the small-scale programme of activities (PoA):

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Programme for Promotion of Access to Domestic Biogas in Rural Bangladesh

Ver.: 2.1

Date: 04/02/2012

A.2. Description of the small-scale programme of activities (PoA):

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0. Background and outline of the PoA

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 literature² 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 CO₂ 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 noted that commercialization of fuelwood is increasing, implying the scarcity in the local environment.

Under these circumstances, the PoA promotes introduction of biogas for rural households coordinated by IDCOL⁴ and implemented by the offices of Grameen Shakti (GS)⁵ and other partner

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 Bangladesh”, 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/>).

organizations.

1. General operating and implementing framework of the PoA

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.

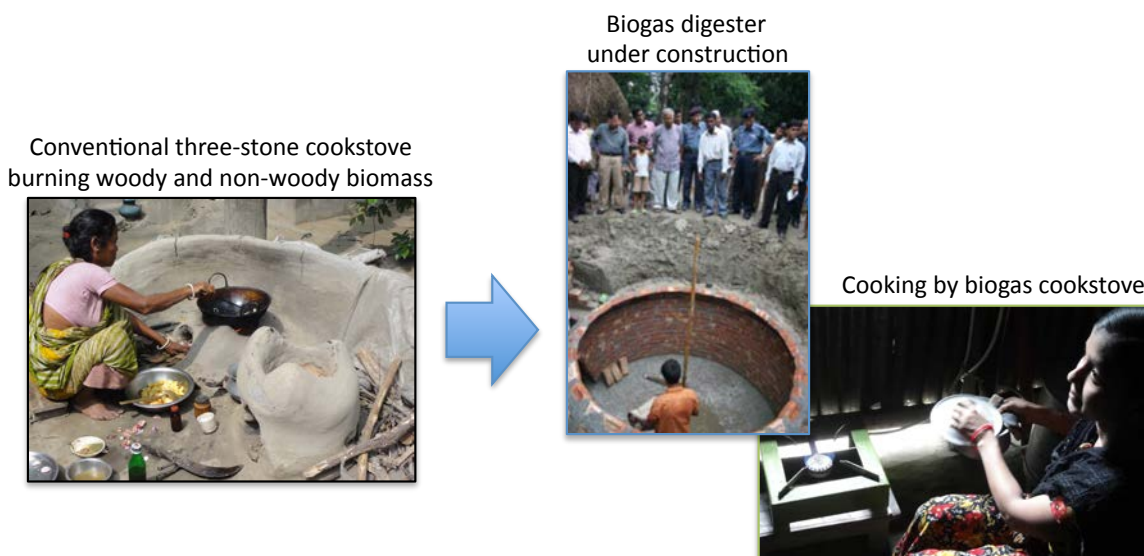


Figure 1: Image of an Element Activity of the PoA

Though there had been a NDBMP that facilitated installation of significant number of biogas digesters in rural area; however, 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.

⁵ <http://www.gshakti.org>.

⁶ National Domestic Biogas and Manure Programme,
<http://www.slidshare.net/faisalbpo/national-domestic-biogas-and-manure-programme-bangladesh>



In order to expand biogas utilization in rural Bangladesh, IDCOL and GS plans 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's own scheme for non-covered digesters by the NDBMP.⁷

The coordinating and/or managing entity (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 CER buyer and the PoA developer.

IDCOL is responsible for coordinating the efforts of the different parties involved in the PoA to promote the biogas business in Bangladesh. There are two types of CPAs under the PoA. One type (GS-type) is managed by GS HQ. Regional and branch offices of the GS are implementing activities of the CPAs. Therefore, GS is a CPA operator for GS-type. It is noted that since CPAs by GS may cover several areas in Bangladesh, GS HQ is managing each CPA directly. Another type (PO-type) is managed by IDCOL. Several other partner organizations (POs) under the NDBMP of IDCOL⁸ may also join as implementers of a part of some CPAs; however, they are not project participants. Therefore, IDCOL is a CPA operator for PO-type as well.

It is noted that each CPA is defined as the period of the installation dates of digesters by type (GS-type and PO-type).

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.

The PoA has also provided related quality control system (for fixed dome biogas digester) with the compliance of quality standards during construction as well as operation/maintenance phases.

There are basically two types of feedstock for fixed-dome type: (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 [m³ daily biogas generation capacity].⁹ The gas generated from the digester with size more than 3.2 m³/day can be used for multiple households where smaller sizes will be used for single household.¹⁰

It is noted that both 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 and IDCOL's subsidy for the digesters with biogas generation capacity no larger than 4.8 m³ per day). CER revenue will be used for the programme (*i.e.*, used for the households). This is completely different from typical CDM projects where project owner invests and obtain the revenue from CERs.

The first CPA is to include biogas digesters installed from the December 13 of 2011 onward

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 an eligible activities under CDM.

⁸ http://www.idcol.org/biogass_installation.php. IDCOL's program includes 6 sizes of biogas plants, namely, 1.2, 1.6, 2.0, 2.4, 3.2 and 4.8 m³ biogas generation capacity per day.

⁹ In Bangladesh, the sizes of biogas digester are classified by gas generation capacity instead of physical volume.

¹⁰ 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.



regardless of geographical location in Bangladesh.¹¹ The slurry/sludge from the biogas digesters may be used as soil conditioner for the field application by substituting synthetic fertilizer.

2. Policy/measure or stated goal of the PoA

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 needing to collect and prepare the biomass for use and also health impacts from indoor air pollution to rural women and children.¹²

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 mostly non-renewable biomass consumed by households; and also improve the environment of target rural area and households using animal manures which causes indoor air pollution as well. 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 clean energy for households through replacing the non-renewable biomass and also it reduces GHG emissions. For other/detailed consideration related to the contribution to sustainable development, please see section C.2.

3. Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity

There is no any mandatory regulation in Bangladesh for biogas introduction, although the National Strategy for Economic Growth, Poverty Reduction and Social Development prepared by the Ministry of Finance and Planning has also put emphasis on “creating a policy environment that is capable of providing right incentives to adopt new technologies”. The NDBMP, supported by Bangladesh Government, is a programme to promote biogas digester introductions by providing incentives and other supports/services. IDCOL is implementing the NDBMP through several partner organizations.

As an implementation entity to lend money/construct biogas digesters, GS engaged in the NDBMP as a partner organization of IDCOL.^{4,6} Since then, GS has voluntarily continued to implement the biogas digester promotion (programme to develop and disseminate domestic biogas plant/digester in rural area with the ultimate goal to establish a sustainable and commercial biogas sector in Bangladesh) in rural Bangladesh by using its micro-credit programme. GS and other implementers have not obliged or mandated to implement such kind of programmes; nevertheless, the proposed

¹¹ 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 1.65 kW_{th} for each burner, the number of biogas cookstove burners under a CPA shall be less than 15MW_{th}/1.65 kW_{th} = 9,096. Eligibility criteria for inclusion of a CPA set the maximum number of the burners as 8,000. The number of digesters is smaller than this number.

¹² 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.*



programme is a voluntary action by GS and others. GS, currently facing financial deficits to continue this biogas programme, is willing to promote the programme as a CPA operator supported by the revenue of CERs and related financial arrangements.

A.3. Coordinating/managing entity and participants of SSC-POA:

Table 1: Project Participants of the PoA

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

(*)In accordance with the CDM modalities and procedures, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.

Infrastructure Development Company Limited (IDCOL) and Grameen Shakti (GS) play the role of the joint focal point for communication with the CDM Executive Board.

A.4. Technical description of the small-scale programme of activities:

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A.4.1. Location of the programme of activities:

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A.4.1.1. Host Party(ies):

>>

Bangladesh

A.4.1.2. Physical/ Geographical boundary:

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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.4.2. Description of a typical small-scale CDM programme activity (CPA):

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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 operate 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 8,000.
- 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 (non-renewable and renewable biomass).
- The households introduced an improved cookstove (ICS) are outside of the scope of the PoA.
- 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, movable cover 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 [m³ 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) typically with the length of 10–100 m.
- The biogas is completely combusted in biogas cookstoves at the households.
- The sludge and slurry soil application guarantees aerobic condition not to result in methane generation.
- Many activities under a CPA are implemented by branch offices of Grameen Shakti under the management system of Grameen Shakti headquarter (GS HQ). Some are by other organizations, which shall meet reporting requirements to GS HQ under the PoA.

A.4.2.1. Technology or measures to be employed by the SSC-CPA:

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

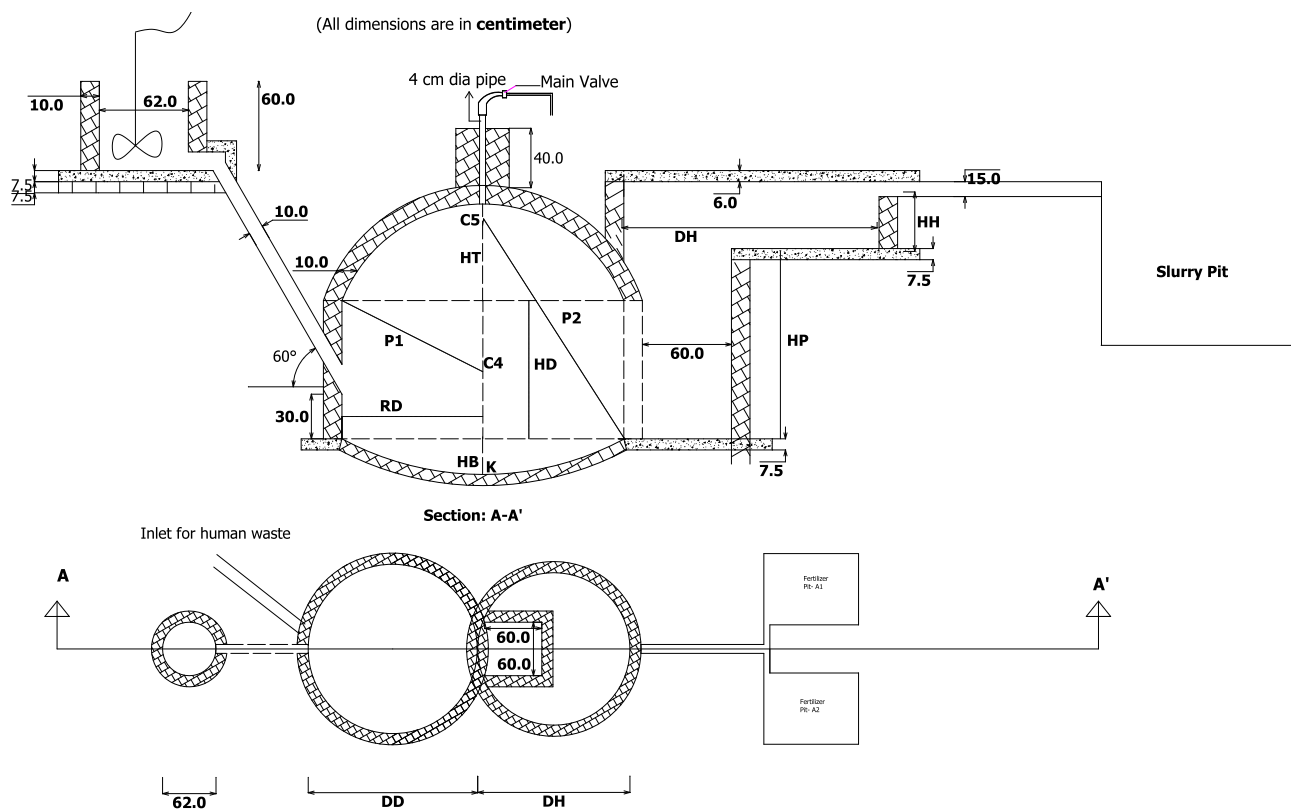
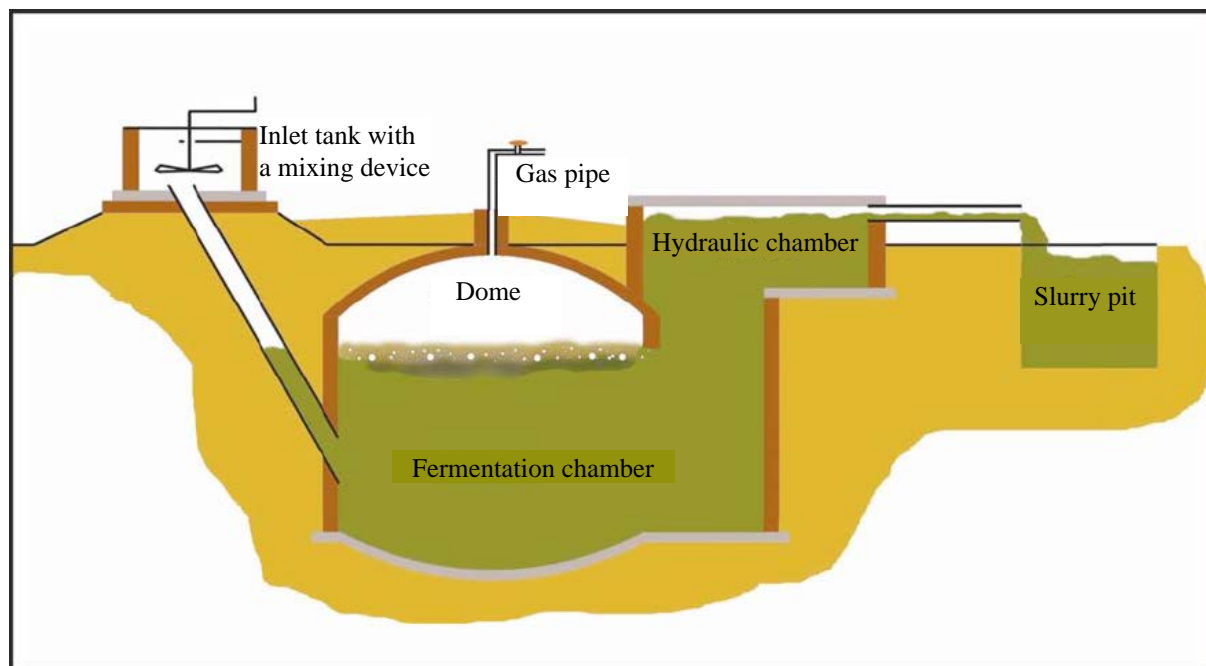


Figure 3: The Structure of a Typical Fixed Dome Type Biogas Digester in Bangladesh

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 pipe 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 angle included between the axis of the inlet pipe and vertical line is 30 degrees.

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, hence called gas storage chamber. 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 the gas 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 appliances including 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 IDCOL's programme) internally. Households will be instructed on proper operation of biogas digester along with installation.

Biogas cookstove is also an important device of the activity and a relatively simple appliance for direct combustion of biogas. The Figure 4 below 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 at Figure 5 below. A biogas cookstove can have single or double burner(s), varying in capacity to consume biogas per hour.

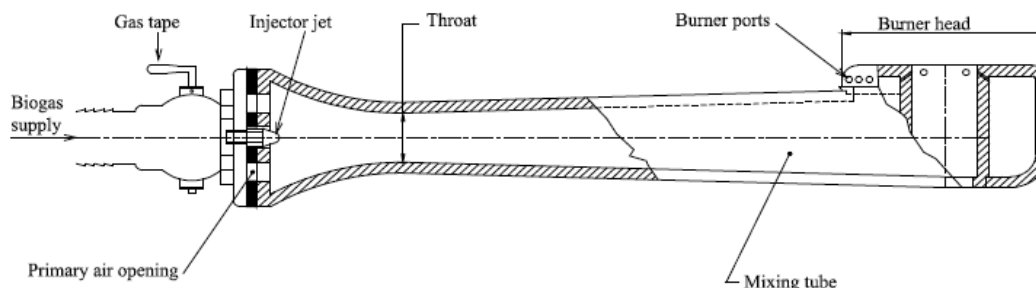


Figure 5: Assembly of Typical Burner for Biogas Cookstove

The biogas flow rate of the biogas cookstove (single burner) is set as $0.3 \text{ m}^3/\text{h}$ as those approved by IDCOL (used by GS activities) for a (common) single burner type. This is equivalent to $1.65 \text{ kW}_{\text{th}}$ assuming that methane content is 60% and 300 K ($= 27 \text{ }^\circ\text{C}$, mean temperature of Dhaka).¹³

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.4.2.2. Eligibility criteria for inclusion of a SSC-CPA in the PoA:

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Any CPA under the PoA shall meet the following five criteria in *italic*. The criteria covers the minimum 12 requirements¹⁴ specified in “Standard for Demonstration of Additionality, Development of Eligibility Criteria and Application of Multiple Methodologies for Programme of Activities” (ver. 01.0).¹⁵

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

- (1) *The CME and GS define the period during which the biogas digester systems covered by the CPA are installed (e.g., 1/4/2012–31/9/2012). The CME (IDCOL) provides a list of all user information with starting date of the service as well as the associated biogas digester and cookstoves for use. Summary list is attached to the CPA-DD and the electronic file is provided also to the DOE with full relevant information.*

DOE is to desk review that the period is consistent with the defined starting date of the CPA as well as to review whether the information is consistent.

¹³ Assumptions for calculation: Methane content: $0.6 \text{ m}^3\text{-CH}_4/\text{m}^3\text{-biogas}$; Biogas flow rate: $0.3 \text{ m}^3\text{-biogas/h}$; Calorific value of methane: 50.4 MJ/kg-CH_4 ; Density of methane: $0.67 \text{ kg-CH}_4/\text{m}^3\text{-CH}_4$ for 20°C (AMS-III.Y); Atmospheric temperature: 27°C (Dhaka; mean).

¹⁴ Requirements ID in (alphabet) are shown the explanation.

¹⁵ <http://cdm.unfccc.int/UserManagement/FileStorage/E6TY7DMI28WGCUV5J0K3LAOHBQ9RFN>.



It is noted that the starting date of CPA can be an earlier date of inclusion if it is after the starting date of the PoA.¹⁶

Location of each household is also shown in the file. DOE is to confirm all of them are in the geographical area of Bangladesh (*i.e.*, geographical area of the CPA).

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

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

CPA-DD with the relevant list of information is submitted for inclusion after installation of all biogas systems in the CPA.

GS HQ or 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.

GS and IDCOL keep 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. GS and IDCOL shall demonstrate that it prepares the management system and has operated it properly to the DOE since the time of first verification.

DOE is to check whether GS and IDCOL prepared the management system and operates it properly with the relevant reporting arrangement to the CME (for GS) and can be verifiable at the time of verification. DOE can desk review of this criterion by checking all relevant information provided by IDCOL. If all of them are met for the first CPA and no changes from that time, this criterion is considered to be met.

It is noted that proper operation of the management system will be checked at the time of verification again in more detail. In case verification identifies some improper functions in the management system, new CPA inclusion cannot be done until the CME or GS will demonstrate to fix all identified issues.

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

- (3) *The CPA is not a part of a registered CDM project or not a CPA under another PoA.*

Regarding inclusion of any CPA to the PoA, IDCOL or GS 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

¹⁶ “Glossary of CDM terms” (ver. 05) (http://cdm.unfccc.int/Reference/Guidclarif/glos_CDM.pdf) specifies that

Starting date of a CDM programme activity (CPA - All types)

The starting date of a CDM programme activity is the earliest date at which either the implementation or construction or real action of a programme activity begins. The starting date of the CPA cannot be prior to the commencement of validation of the programme of activities, *i.e.* the date on which the CDM-POA-DD is first published for global stakeholder consultation.



cooking energy use of targeted households in general.

For this purpose, GS or IDCOL is to prepare the database to exclude the cases where

- (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, by introducing checking system in the database.

It is noted that there is a registered PoA for installation of improved cookstoves (ICS).¹⁷ The CPA does not target the household covered by this PoA. A checking system is introduced whether the household has already installed ICS under registered PoA 4791. If so, the household is not covered under the CPA nor PoA.

In addition, each biogas digester is equipped with some physical label, mark or tag specifying that the digester be installed under the CDM PoA. Its digital photo is taken and collected in a database.

If this procedure is introduced at the time of the first CPA and no changes from that time, this criterion is met.

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.*¹⁸

DOE is to check whether the CME provided all related documents. For proper operation, providing relevant handbook with suitable instruction and establishment of maintenance system are considered to be the evidences. If all of them are provided for the first CPA and no changes from that time, this criterion is met.

It is noted that a monitoring system is introduced to include only properly operating biogas digesters in the calculation of emission reductions.

In addition, the CME may provide its report of the NDBMP which includes the survey and/or analysis of the local stakeholders when new report is released to the DOE.

This criterion covers (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 8,000.*¹⁹

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

¹⁷ PoA 4791: “Improved Cooking Stoves in Bangladesh”. See http://cdm.unfccc.int/ProgrammeOfActivities/poa_db/SE7XIMKF8NYVOTL16BW3U45C9ZDGAP/view.

¹⁸ Infrastructure Development Company Ltd. (IDCOL) Model Biogas Plant Construction Manual, IDCOL/SNV, April 2006.

¹⁹ See footnotes 11 and 13 for calculations.



DOE is to desk review the specification of the system (*esp.*, number of burners of biogas cookstoves) and *ex ante* calculation of GHG emission reductions specified or attached to the CPA-DD.

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

It is noted that the essential elements covering the PoA as a whole—such as the assumption that all of the fuelwood portion of biomass is regarded as non-renewable, compliance with national regulations, and each biogas digester' capacity is below 1% of 45 MW_{th}, *etc.*—are demonstrated at the time of validation in this PoA-DD as well as by supportive reports/documents provided to the DOE. For monitoring, the PoA undertakes entire biogas digester monitoring for the operation status of the digester as the key parameter, not using sampling survey.

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;

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.

As for sampling-related criterion (j), the PoA does not require any sampling per each CPA.

Also as for de-bundling criterion (l), this criterion is met for any CPA as shown in A.4.4.1 (4).

A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a SSC-CPA below those that would have occurred in the absence of the registered PoA (assessment and demonstration of additionality):

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The information presented here shall constitute the demonstration of additionality of the PoA as a whole. Explanation that the following four conditions (i)–(iv) are met is given below:

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

There had been a National Domestic Biogas and Manure Programme (NDBMP) in Bangladesh, which aims to further 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 implementers 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 through getting help from carbon credit, GS, currently facing financial deficits to continue this programme, proposed to implement the PoA voluntarily.

The timetable for the PoA until now is shown below:

February 2010	Initial discussion with GS on the programme implementation with PEAR
September 2010	Tentative discussion with GS on the programme implementation with PEAR
February 2011	Further discussion with GS on the programme implementation with PEAR
April 2011	Signed an MOU by GS and PEAR on the programme implementation
October 2011	Global stakeholder consultation started
December 2011	Validation (global stakeholder consultation) and first CPA will be started
January 2012	Site visit by DOE will be conducted

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

We apply “Guidelines for Demonstrating Additionality of Microscale Project Activities” (version 3) 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 01.0).²⁰

As per the “Guidelines for Demonstrating Additionality of Microscale Project Activities” (paragraph 2, (c)), all CPA are additional, because the capacity of each household biogas cookstove (independent sub-system) is around 1.65 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.

It is noted that since all CPAs are regarded as additional, the aggregated PoA delivers additional emission reductions.²¹ Therefore, without the PoA, the voluntary action of promoting biogas digesters in rural Bangladesh would not occur as the consistent treatment within CDM scheme.

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

Not applicable.

²⁰ See <http://cdm.unfccc.int/UserManagement/FileStorage/E6TY7DMI28WGCUV5J0K3LAOHBQ9RFN>.

²¹ 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 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. It is noted that additionality check of each CPA is included in the eligibility criteria as clarified by the Board as “The Board clarified that a full additionality assessment is not required in the context of component project activities (CPA), rather the confirmation of additionality for CPAs should be conducted by means of the eligibility criteria.” in Annex 26 of the EB 60 Report.



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

Not applicable.

A.4.4. Operational, management and monitoring plan for the programme of activities (PoA):

A.4.4.1. Operational and management plan:

>>

(0) Definition of the roles and terminology:

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

CPAs under the PoA is categorized as following two types:

- GS-type: CPAs implemented by several GS branch offices coordinated by GS HQ.
- PO-type: CPAs implemented by several non-GS organizations coordinated by IDCOL.

CPA operator is an entity which plays the coordinating role of each CPA type. GS is a CPA operator of the PoA for GS-type CPAs. Therefore, GH HQ collects all information of the GS-type CPAs with its management system and reports it to IDCOL. On the other hand, IDCOL is another CPA operator for PO-type CPAs which non-GS organizations introduce biogas digesters.

It is noted that a CPA includes plural implementers (however, GS-type and PO-type are not mixed).

CPA operator is defined as the unique entity responsible for the CPA. *Implementers* of the CPA are branch offices of GS (for GS-type CPAs) or other organizations than GS (for PO-type CPAs) which implement the activities of the CPA under the CPA operator. Implementation includes introduction of biogas digesters, monitoring, *etc.*

Apart from the terminology of CDM, the management role of the GS-type CPAs is to be undertaken by GS HQ, under the supervision of IDCOL, supported by PEAR and that of the PO-type CPAs is to be undertaken by IDCOL. Implementation of the activities is done by GS Unit (Branch) Offices for GS-type CPAs and other organizations for PO-type CPAs (*i.e.*, they are called implementers) in general. The implementers are required to send the necessary information to GS HQ for GS-type CPAs and to IDCOL for PO-type CPAs.

In order to avoid confusion, we do not use the terminology 'CPA implementer'.

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

As specified above, GS HQ is responsible for collection and compilation of all necessary information from implementers—its Unit (Branch) Offices—and reports it to IDCOL (the CME of the PoA) for GS-type CPAs.

For PO-type CPAs, IDCOL is responsible for collection of all necessary information from implementers—non-GS partner organizations (and others if any)—directly and compile them as a CPA operator (as well as its CME role).



There are a variety of non-GS partner organizations.²² Most of them are much smaller than GS with simple structure. We do not specify them each by each in this document.

On the other hand, GS, covering whole Bangladesh, has an organizational structure of 4 tiers:

- Headquarter (HQ)
- Divisional Offices
- Regional Offices
- Unit (Branch) Offices²³

The GS HQ is in charge of managing all implementers of the PoA, collecting necessary data and information from each GS-type CPA for the purpose of monitoring, and also communicating with DOE and the CDM Executive Board as a joint focal point with IDCOL. GS is supported by PEAR for doing so.

It is noted that since each CPA (both GS-type and PO-type) may cover several areas in Bangladesh (*i.e.*, CPA is categorized by the period when the biogas digesters are installed by type), GS HQ is managing each CPA directly for GS-type. Therefore, GS is the CPA operator for GS-type CPAs.

GS's corresponding offices—Divisional, Regional and Unit (Branch) Offices—conduct the tasks of household recruiting, information survey, biogas digesters construction and inspection. GS HQ ensures completion of the tasks through activating offices at the different level.

Unit (Branch) Offices supervised by the GS HQ are responsible for undertaking installation, maintenance, monitoring, recording and reporting. The GS HQ then checks the data, records the data electronically and calculates emission reductions with the monitored data. In case of PO-type CPAs, other organizations than GS—such as partner organizations of IDCOL biogas program—participate in the PoA, they shall play the same role of the GS offices and report the relevant information to IDCOL.

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.

One Unit (Branch) Office has typically 4–7 staff, which includes 1 Unit Manager, 1–2 Sub-Assistant Engineers, 2–3 Field Assistants and 1–2 Technicians.

For installation of biogas digesters, GS 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 GS HQ from the Unit (Branch) Office.

At the Unit (Branch) Office level, the staff 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 customers' houses both to collect the installments and to attend to any servicing requirements. GS has its 5-year warranty of the biogas digester and will keep maintenance as requested by the

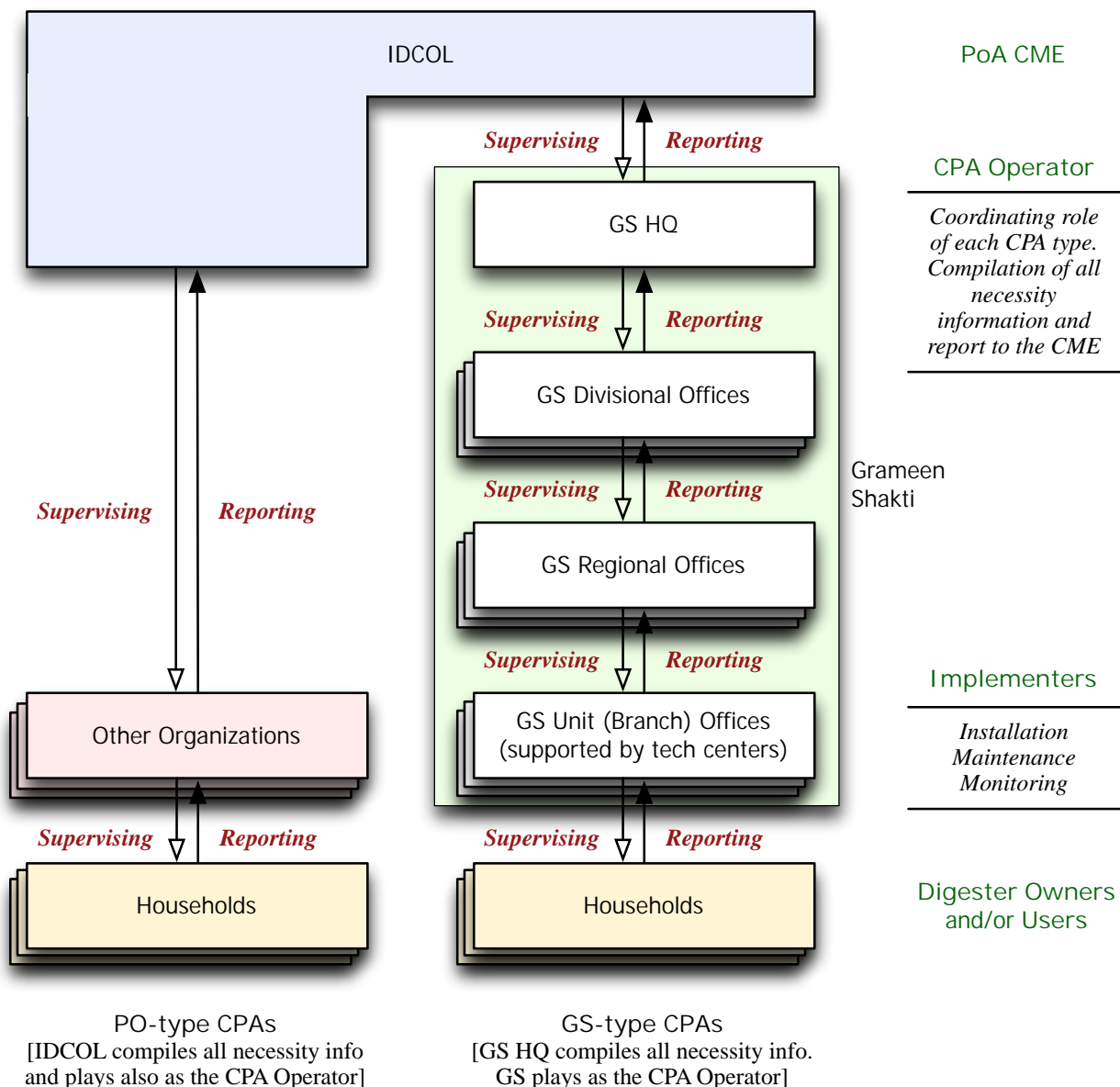
²² See <http://www.idcol.org/contact-LPO,%20CPO,MPO.php>, http://www.idcol.org/biogass_installation.php.

²³ As of January 2012, number of each office are as follows. Divisional offices (14), Regional Offices (158) and Unit (Branch) Offices (1,181). The number of Unit (Branch) Offices are growing every month. In addition, 46 Grameen Technology Centres are established (for SHS to date, but supposed to include biogas in the near future) for capacity development of engineers. Total employees are 11,400 covering whole Bangladesh.



digester owner even after the end of the warranty. It is contracted that as soon as the digester is not operational, the owner shall notify the GS Unit (Branch) Office as soon as possible.

Under the stratified management structure, information detailing the agreements, installations, loan recovery and maintenance and other PoA-specific information is prepared every month by the Unit (Branch) Offices, compiled by Regional Offices and reported back to the GS HQ through Divisional Offices. The database is constructed at the GS HQ and the reports prepared for IDCOL will be the basis for verification.



[Note] Each CPA is defined as the period of the installation dates of digesters by type.
Each CPA may include several implementers. Two types are not mixed.

Figure 6: 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 EB²⁴ 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, objective period for installations, size of each CPA, all necessary information/data of every single household in each CPA including:

For biogas digester:

- Name of GS Branch (Unit) Office or other organization introducing the digester
- ID number of the biogas digester,
- Name of the digester owner, address,
- Which Unit (Branch), Regional and Divisional Offices takes care of the digester,
- ID number of the CPA,
- Biogas generation capacity of the biogas digester,
- Starting date of construction,
- Starting date of operation (this also implies that the inspection was successfully done),
- Status of operation (*incl.* maintenance record),
- Status of compliance with related standards and regulations,
- Status of sludge and slurry treatment,
- User households ID number of the biogas (including owner’s household),
- Digital photo of the label, mark or tag specifying that the digester be installed under the CDM PoA,

and other information not necessary for CDM, such as

- Ordered equipment of the system (spec, price, *etc.*)
- Contract type,
- Payment status
- Feedstock type and approximate number of cattle and/or chickens, and
- Whether power generator is introduced (if yes, whether it is in off-grid area).

For user household:

- ID number of the household,
- Name of targeted household representative, address, associated unit office, regional office, divisional office and other household-related information,

²⁴ These include “Clean Development Mechanism Project Standard”, “Standard for Sampling and Surveys for CDM Project Activities and Programme of Activities” and related measures for operation and management of Clean Development Mechanism Projects in Bangladesh.



- Digester ID from which biogas is delivered,
- Whether the household used ICS,²⁵ and
- Number of biogas cookstove burners.

It is 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 noted that the management system does include other information than the required ones for CDM PoA. IDCOL and other organizations will consider which information/data are to be reported in addition to the ones needed for CDM. In any case, the CPA operator is GS for GS-type CPAs, although other organizations²⁶ many join in this PoA as implementing entities of PO-type CPAs.

For GS-type, the database (especially for CDM) is prepared by GS HQ, *i.e.*, related information, specific to the PoA, shall be submitted to GS HQ periodically. GS HQ verifies the reported data with field check, if necessary. GS has its internal MRV (monitoring, reporting, verification) management scheme for their current business. The PoA’s MRV system is integrated to it.

For PO-type, similar database and management system is prepared by IDCOL based on its on-going management system of NDBMP.

Monitoring is basically entire-household based, except for project non-renewable biomass consumption survey which contributes very limited/minor part in the emission reductions.

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

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

	Player(s)	Processes
Coordination of the PoA	IDCOL	IDCOL, as the CME, supervise GS HQ and will receive the relevant information provided by GS HQ for GS-type CPAs.
Coordination of GS-type and PO-type CPAs	GS HQ (for GS-type) and IDCOL (for PO-type)	GS HQ collects all information needed from its branch offices and compiles them as well as calculates emission reductions (GS-type CPAs). IDCOL collects all information needed from non-GS implementers (PO-type CPAs)
<i>Ex ante</i> and <i>ex post</i> data collection	GS-type: Regional and Unit (Branch) Offices of GS PO-type: Each implementer (typically, partner organization of IDCOL)	Unit (Branch) Offices and non-GS implementers conduct data collection. Recommendation and operation of any CPA is decided by GS HQ which has administration power over Regional and Unit (Branch) Offices

²⁵ In this case, the household is excluded from the calculation of emission reductions.

²⁶ These organizations are typically IDCOL Partner Organizations (POs). POs—including GS—are required to report the digester-wise information to IDCOL under the NDBMP.



		for GS-type CPAs. GS HQ and IDCOL specify the required data/information to be collected before start and during implementation of each CPA.
Data storage and management	<p>GS HQ and IDCOL are responsible for data storage and management in terms of:</p> <ul style="list-style-type: none"> – Develop database format of CPA – Check the reported data from each implementer – Calculate emission reductions based on the data reported by implementers – Implement data management of covered CPAs – Store and maintain records 	<p>All collected data/information by implementers are submitted to GS HQ (for GS-type) or IDCOL (for PO-type).</p> <p>GS HQ and IDCOL are to compile the data in its database.</p> <p>The database is used for technical review by GS HQ and IDCOL for review of inclusion of CPAs including avoidance of double counting.</p> <p>GS HQ and IDCOL also merge CDM-related record and documentation control process to its exiting one.</p>
Communication and reporting	<ul style="list-style-type: none"> – IDCOL – GS HQ – Non-GS implementer – GS Divisional Office – GS Regional Office – GS Unit (Branch) Office – Households 	<p>Communication and reporting are conducted as per the managing and operating system formed based on the GS's MRV system for GS-type.</p> <p>IDCOL, together with GS HQ for GS-type, are responsible for coordinating between project implementers for PO-type and communicating with DOE and CDM EB supported by PEAR.</p> <p>GS HQ reports all relevant information of GS-type to IDCOL, regularly.</p> <p>Implementers (GS Branch Offices and other organizations) report collected information to GS HQ and IDCOL.</p> <p>Households report all related information to Unit (Branch) Office (for GS-type) or non-GS implementers (for PO-type).</p>
CDM training and capacity building	<p>GS HQ, supported by IDCOL, develops and establishes training program for the implementers (GS Branch Offices and other organizations) and households</p>	<p>Implement simple training for staffs and provide guides to households to meet the needs of the monitoring plan. These are recorded by GS HQ and/or by IDCOL.</p>
PDCA cycle	<ul style="list-style-type: none"> – GS HQ and IDCOL 	<p>GS HQ and IDCOL review each type of CPAs and the PoA as a whole annually and assess the performance.</p>



		<p>If necessary, it revises the current programme.</p> <p>The changes of the programme scheme are to be described in the monitoring plan by IDCOL.</p>
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(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), it is checked 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 the CPA proposed. Households covered by any CDM project activity (CPA of a PoA or the PoA or any CDM project activity) should be excluded from a CPA of the PoA. Household information archived under a CPA of the PoA avoids coverage of any household by different CPAs. The information includes whether the households utilizes improved cookstove (ICS) or not.²⁷

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

“Guidelines on Assessment of De-bundling for SSC Project Activities (ver. 03)” specifies that:

If each of the independent subsystems/measures (e.g., biogas digesters, residential solar energy systems, kerosene or incandescent lighting replacements) included in one or more CDM project activities is no greater than 1% of the small scale thresholds defined by the applied methodology and the subsystems/measures are indicated in the PDDs to be each implemented at or in multiple locations (e.g., installed at or in multiple homes) then these CDM project activities are exempted from performing a de-bundling check, i.e., considered as being not a de-bundled component of a large scale activity.

The largest 100 m³/day biogas digester (independent subsystem) under a CPA of the PoA generates around 22 kW_{th} in average. This figure is much less than 1% of the threshold of small scale CDM project (45 MW_{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 GS HQ, IDCOL and PEAR. Moreover, as explained in Table 2 above, under the record keeping system, other implementers are to have a contract to undertake biogas digester penetration activities under the PoA—under supervision by the GS HQ or by IDCOL are well aware of and have agreed to their activity under the PoA.

²⁷ It is noted that the households already installed improved cookstove (ICS) can also introduce biogas digester system if it wants. However, the biogas digester by such household is not counted in (covered by) the PoA.



A.4.4.2. Monitoring plan:

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- (i) *Description of the proposed statistically sound sampling method/procedure to be used by DOEs for verification of the amount of reductions of anthropogenic emissions by sources or removals by sinks of greenhouse gases achieved by CPAs under the PoA.*

The procedures below shall be applied for verification of emission reductions for plural CPAs if every CPA will not be verified each-by-each.²⁸

Suppose N : number of CPAs to be verified
 i : suffix to specify each CPA
 ER^{MR}_i : emission reduction specified in the monitoring report of CPA;
 ER^V_i : verified emission reduction of CPA;
 ER : total emission reductions of all CPAs through the procedures

Step 1: Select all CPAs as a group or 16 CPAs in a random manner as a sample group.

Step 2: Undertake desk review of the monitoring reports of the (sample) group based on the applicable requirements of paragraph 62 of the CDM modalities and procedures.

Step 3: In case the desk review process found some inconsistencies with the monitoring plan or incompleteness of one or more CPAs, the DOE shall ask the project participant to re-check and re-submit monitoring reports of all CPAs. Then, start with Step 1 again.

Step 4: Undertake on-site assessment of one or more CPA in the group. The DOE can choose any CPA in the group, preferably a CPA with unclear descriptions in the monitoring report or large CPA in the group. In case the DOE finds some significant problems, it shall ask the project participant to settle the issues and may ask to re-check and re-submit monitoring reports of all CPAs as needed.

Step 5: If all is settled in Step 4, undertake a numerical evaluation of the data and calculations specified in the monitoring reports of the CPAs in the sample group. Compile the verified results (shaded cells) in a following tabular format:

CPA ID in the sample group	ER^{MR} (after Step 4)	ER^V	Δ $= (ER^{MR} - ER^V) / ER^V$	er $= ER^{MR} / (\text{number of households})$
1				
2				
3				
...				
16				
Average	–	–	Δ^{AV}	er^{AV}

Step 6: For all N CPAs (monitoring reports), assess distribution of the mean value of emission reductions per household. For CPAs with the value above two times the standard deviation (under the 95% confidence interval), assess the monitoring report whether the reason is clearly shown. If not, the DOE shall ask the project participant to describe it in the monitoring report.

²⁸ It is noted that the procedures does NOT describe the verification procedures of each CPA.



Step 7-1: If Δ^{AV} is negative or zero, the procedures recognize that aggregated $\sum_i ER^{MR}_i$ (after Step 4) over N CPAs is verified as ER .

Step 7-2: If Δ^{AV} is positive, verified ER over N CPAs is recognized as $(1 - 1.5 * \Delta^{AV}) * \sum_i ER^{MR}_i$.

Rationale of the above verification procedures:

The procedures aim to provide efficient but reliable verification for many CPAs. The analysis is based on the emission reductions provided in the monitoring report and its verified value. If they are the same or conservative, the results of the monitoring reports are acceptable. If not, statistical adjustment with a conservative factor is applied.

Statistical testing theory shows that the sufficient number of sample group n is

$$n \geq \left(\frac{Z_{\alpha/2}}{d} \right)^2 \sigma^2$$

where α is the significance level, d is the error level, σ is the standard deviation and $Z_{\alpha/2}$ is the value where upper probability is $\alpha/2$ for normal distribution.

Let $\alpha = 5\%$ ($Z_{\alpha/2} = 1.96$) and $d = 5\%$, $\sigma = 0.1$, then the above formula will be $n \geq 15.3$.

As the assessment is for the normalized amount of emission reduction, and the emission reductions for each CPA is simple summation of that of households in the CPA (and double checked for extreme cases in Step 6), it is conservative enough to set the standard deviation as 0.1 for the gap between ER^{MR}/ER^V and 1.

As the distances among the villages are very long and time-consuming for travel, it is unrealistic to visit plural villages. The DOE can choose any CPA based on its expertise.

In case $ER^{MR} > ER^V$, the adjustment factor is applied to reduce the value of emission reductions with the conservative factor 1.5.

- (ii) *In case the coordinating/managing entity opts for a verification method that does not use sampling but verifies each CPA (whether in groups or not, with different or identical verification periods) a transparent system is to be defined and described that ensures that no double accounting occurs and that the status of verification can be determined anytime for each CPA;*

Not applicable.

Project participants do not opt for the sampling of CPAs necessary for verification.

A.4.5. Public funding of the programme of activities (PoA):

>>

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.²⁹ 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.³⁰

IDCOL specifies the carbon financing opportunities by CDM as an attractive and sustainable source of funding. GS, which contributed around 57% (10,637 out of 18,713 biogas plants) of total construction up to May 2011, got approval by IDCOL to undertake CDM activities jointly with IDCOL. It is 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 also noted that any Annex I Party government will not obtain CERs in compensation for the ODA.

²⁹ 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.

³⁰ 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](http://www.idcol.org/Download/20100105%20Implementation%20Plan%202010_12%20NDBMP%20IDCOL1.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. Duration of the programme of activities (PoA)

B.1. Starting date of the programme of activities (PoA):

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The date on which contracts have been signed for equipment or construction/operation services required for the first CPA. This date is expected to be 13/12/2011.

B.2. Length of the programme of activities (PoA):

>>

28 years 0 month



SECTION C. Environmental Analysis

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C.1. Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

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

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

C.2. Documentation on the analysis of the environmental impacts, including transboundary impacts:

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It is 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 below³¹:

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 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.

³¹ Implementation Plan National Domestic Biogas and Manure Programme in Bangladesh, by Infrastructure Development Company Ltd (IDCOL) and Netherlands Development Organization (SNV)



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 below:

Table 3: User’s perception on merits of biogas plant³²

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

³² 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.



Clean kitchen and cooking environment	14	4.00
Safe to use	16	3.98
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

C.3. Please state whether in accordance with the host Party laws/regulations, an environmental impact assessment is required for a typical CPA, included in the programme of activities (PoA):

>>

In “The Environment Conservation Rules of Bangladesh” the industrial units and projects, in consideration of their site and impact on the environment, are classified into the following four categories:

- (a) Green (Environmental Clearance Certificate (ECC) will be issued to all existing industrial units and projects and to all proposed industrial units and projects falling in the Green Category);
- (b) Orange – A (For industrial units and projects falling in this category firstly a Location Clearance Certificate and thereafter an ECC shall be issued)
- (c) Orange – B (For industrial units and projects falling in this category firstly a Location Clearance Certificate and thereafter an ECC shall be issued. Initial Environmental Examination (IEE) is need);
- (d) Red (For industrial units and projects falling in this category firstly a Location Clearance Certificate and thereafter an ECC shall be issued. Environmental Impact Assessment (EIA) is needed).

Biogas digester promotion projects have not been included in the list of either category. To date, the government of Bangladesh has never requested IDCOL, GS or other organization to undertake environmental impact assessments for the microscale biogas digesters.



SECTION D. Stakeholders' comments

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D.1. Please indicate the level at which local stakeholder comments are invited. Justify the choice:

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

Since CPAs under the PoA will be implemented dispersedly in all rural Bangladesh, which is also the geographical boundary for the PoA and the program design, 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 a PoA level. It is undertaken on 03/10/2011 in Mowna, Gazipur.

D.2. Brief description how comments by local stakeholders have been invited and compiled:

As per CDM and Gold standard 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 and from the CME (Grameen Shakti), local NGOs, biogas digester experts, households and poultry farm owners. Invitations and attendance lists are available upon request. As the programme is also applied for gold standard, therefore the local stakeholder consultation was conducted as per requirements of gold standard process. A brief programme introduction was given by the representatives of the CME 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.





D.3. Summary of the comments received:

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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 m³/day. Till now, GS, under IDCOL program, has been offered microcredit facility to the biogas digesters below 4.8 m³ in capacity. Stakeholders also requested clarifications of benefits for them from the programme. All participants showed their positive attitudes to the programme and there were no comments regarding objections to the proposed POA.

D.4. Report on how due account was taken of any 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 E. Application of a baseline and monitoring methodology

E.1. Title and reference of the approved SSC baseline and monitoring methodology applied to a SSC-CPA included in the PoA:

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AMS-I.E. (ver. 04) “Switch from non-renewable biomass for thermal applications by the user”

E.2. Justification of the choice of the methodology and why it is applicable to a SSC-CPA:

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In the proposed CPAs, 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
<ol style="list-style-type: none"> 1. This category comprises activities to displace the use of non-renewable biomass by introducing renewable energy technologies. 2. Project participants are able to show that non-renewable biomass has been used since the 31st of December 1989, using survey methods. 3. The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW_{th}. 	<ol style="list-style-type: none"> 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. 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.³³ 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.

³³ <http://www.countrystudies.us/bangladesh/72.htm>



E.3. Description of the sources and gases included in the SSC-CPA boundary

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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
<i>Baseline</i>	Emissions from non-renewable biomass use	CO ₂	Yes	Major emission source
		CH ₄	No	Not significant. Excluded for simplification
		N ₂ O	No	Not significant. Excluded for simplification
<i>Project Activity</i>	CO ₂ emissions from non-renewable biomass use	CO ₂	Yes	In case household still uses non-renewable woody biomass after use of biogas
		CH ₄	No	Zero emission source
		N ₂ O	No	Zero emission source

E.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

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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.04)

Baseline determination for AMS-I.E.

The baseline scenario for AMS-I.E can be determined as follows.

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)–(g) 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 7 below shows around 99.9% of the cooking (including parboiling) energy comes

from biomass.³

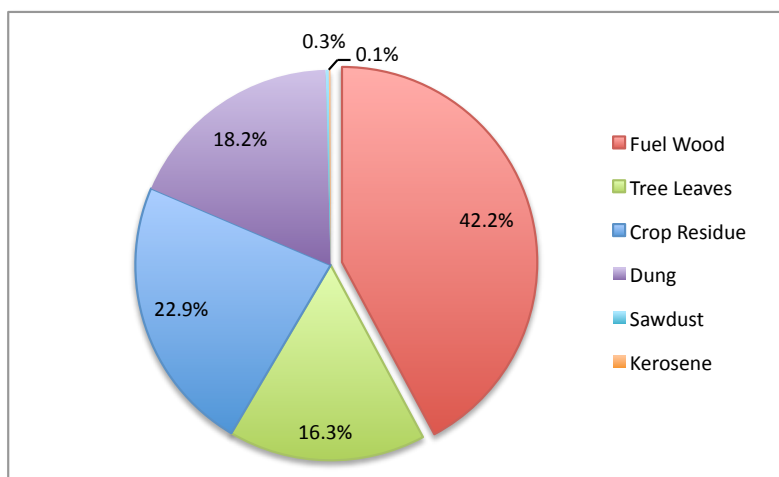


Figure 7: Household energy consumptions for cooking and parboiling in rural Bangladesh³

The survey shows that most households have not used fuel oil or kerosene for cooking, because the fuels are expensive to access and moreover the fuels are not suitable for cooking. 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.³⁴ 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, 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, of which GS has contributed around 57% (10,637 out of 18,713 biogas plants) of total construction up to May 2011. Moreover, 84 million people live in rural area of Bangladesh. Only 0.7% of people have enjoyed the benefits of the biogas so far.³⁵ “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

³⁴ See, e.g., http://www.worldenergyoutlook.org/database_electricity/electricity_access_database.htm.

³⁵ 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.



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.³⁶

E.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the SSC-CPA being included as registered PoA (assessment and demonstration of additionality of SSC-CPA): >>

E.5.1. Assessment and demonstration of additionality for a typical SSC-CPA:

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 03) approved in the 63th meeting of EB.

The Guidelines states:

Paragraph 2 (c). The project activity is designed for distributed energy generation (not connected to a national or regional grid)³⁷ with both conditions (i) and (ii) satisfied;

- (i) *Each of the independent subsystems/measures in the project activity is smaller than or equal to 1500kW electrical installed capacity;*

³⁶ 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 CO₂ 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. 04 specifies the default factor as 81.6 tCO₂/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 CO₂ 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.04)” 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 CO₂ emission factor of the (non-renewable) biomass is around twice of that of LPG (63.0 tCO₂/TJ). Therefore, this treatment is very conservative.

³⁷ This means that projects applying AMS.I-D are not eligible.



- (ii) *End users of the subsystems or measures are households/communities/small and medium enterprises (SMEs).*

The Guidelines also states that:

Paragraph 6. Project activity' in paragraphs 2–4 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 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.

E.5.2. Key criteria and data for assessing additionality of a SSC-CPA:

As mentioned in section E.5.1, the additionality of a CPA under the PoA can be cleared if conditions given in “Guidelines for demonstrating additionality of microscale project activities” are satisfied. Bangladesh is a LDC country. So if a CPA belongs to the microscale project activity category or not becomes the key criterion to judge the additionality of the CPA. Key data or information and criteria in assessing additionality are also provided in Table 7 below:

Table 7: Key Criteria for Assessing Additionality of a CPA

Steps	Key data/information	Key criteria
Step 1. Check thermal capacity of biogas cookstoves under the CPA	Aggregated thermal capacity of all biogas cookstoves under the CPA	Less than 15 MW _{th}

E.6. Estimation of emission reductions of a CPA:

E.6.1. Explanation of methodological choices, provided in the approved baseline and monitoring methodology applied, selected for a typical SSC-CPA:

>>

Selection of options in the AMS-I.E. (ver. 04)

According to the methodology (AMS-I.E., ver. 04), emission reductions ER_y is calculated as:

$$ER_y = B_y \cdot f_{NRB,y} \cdot NCV_{\text{biomass}} \cdot EF_{\text{projected_fossilfuel}} \quad (1)$$

where

B_y : Quantity of woody biomass that is substituted or displaced (ton). 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 (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/ton) is applied.

$EF_{\text{projected_fossilfuel}}$: Emission factor for the substitution of non-renewable woody biomass by similar consumers. Default value of 81.6 tCO₂/TJ is applied per the methodology.

For calculation of B_y , option (a) is applied:

(a) Calculated as the product of the number of appliances multiplied by the estimate of average annual consumption of woody biomass per appliance (tonnes/year); This can be derived from historical data or estimated using survey methods.

It is noted that SSC_538 clarified that

The SSC WG agreed to clarify that the expression “per appliance” does not preclude the survey to be done “per household”. As long as it is known how many appliances there are in the surveyed households, the data per household may be used in the calculation. However, the data per household may need to be corrected if the service provided by the project technology is only part of the service provided by the biomass in the baseline, e.g. a biogas cooking stove is introduced whereas biomass in the baseline has been used for both cooking and room heating.

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

$$f_{\text{NRB},y} = \text{NRB} / (\text{NRB} + \text{DRB}) \quad (2)$$

where

NRB : Share of non-renewable woody biomass used in the absence of the project activity,

DRB : Share of (demonstrably) renewable woody biomass used in the absence of the project activity.

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

(c) As an alternative to subparagraphs (a) and (b), B_y can be multiplied by a net to gross adjustment factor of 0.95 to account for leakages, in which case surveys are not required.

Specific elements for this PoA

Evaluation of B_y

B_y is the aggregated mass of woody biomass *substituted* by the CPA, i.e., aggregated baseline woody biomass consumption (B_y^{BL}) *minus* aggregated project woody biomass consumption (B_y^{PJ}):

$$B_y = (B_y^{\text{BL}} - B_y^{\text{PJ}}) \cdot 0.95 \quad (3)$$

taking account of the leakage factor 0.95 for B_y .

It is *apparent* that summation over appliances (cookstoves) is *identical* to summation over user



households for a CPA.³⁸

Let us consider the baseline woody biomass consumption (B_y^{BL}) first:

$$\begin{aligned} B_y^{BL} &= \sum_{\text{cookstove}} (\text{baseline woody biomass consumption per cookstove})_y \\ &= B_{HH}^{BL} \cdot N_{HH,y}^{OP} \end{aligned} \quad (4)$$

where

- B_{HH}^{BL} : Baseline woody biomass consumption per household in a year [ton]. This parameter is fixed by using a reliable survey report.
- $N_{HH,y}^{OP}$: Number of user households which successfully utilizing the biogas from an operating biogas digester in the CPA in a year y . This parameter is monitored *ex post*. This factor can be a fraction if some digester is out of order for a certain period.

It is noted that if some biogas digesters are out of order or not be used, they are not included in the calculation.

The parameter B_{HH}^{BL} is set as the default as specified by the SSC WG on standardized approaches for facilitating the baseline emission calculations under AMS-I.E,³⁹ the regional default value for Asia (excluding high forest areas and mountainous areas) is applied:

$$B_{HH}^{BL} = 3.29 \text{ [ton of fuelwood consumption per household per year]} \quad (5)$$

It is noted that even if some biogas is used for power generation, this is not counted for emission reductions (by counting diesel power replacement, *etc.*) This treatment is conservative.

For the project woody biomass consumption (B_y^{PJ}), we recognize that most biogas users do not use woody biomass anymore after use of biogas. Therefore, even if it exists, it is a minor portion in the calculation of emission reductions.

GS will undertake a survey for more than 100 current biogas users whether they are still using the woody biomass and if used, how much it is per year.

$$B_y^{PJ} = B_{HH}^{PJ} \cdot N_{HH,y}^{OP} \quad (6)$$

where

- B_{HH}^{PJ} : Project woody biomass consumption per household in a year [ton]. This parameter is monitored by GS by undertaking a sample survey of more than 100 household which has been using biogas already.

It is noted that the Durban CMP Decision FCCC/KP/CMP/2011/L.10 “Materiality standard under the clean development mechanism” specifies the materiality threshold for micro-scale activities as 10% for verification.

It must be noted that we do not include the case where biogas is not used due to some trouble of the

³⁸ This implies that the number of (conventional) cookstoves per household is a *dummy* parameter, *i.e.*, no need in the calculation of emission reductions. However, since it is required by SSC_538, a survey will be conducted for more than 100 households in rural area of Bangladesh.

³⁹ See http://cdm.unfccc.int/Panels/ssc_wg/meetings/033/ssc_033_an08.pdf.



biogas digester, *etc.*, by multiplying the factor $N_{HH,y}^{OP}$.

$N_{HH,y}^{OP}$ is the most important and time-independent parameter. It is an aggregation of each household:

$$N_{HH,y}^{OP} = (1/365) \cdot \sum_i n_i^{OP}_{HH,y} \quad (7)$$

where

- i : Index to denote each household belonging to the CPA
- $n_i^{OP}_{HH,y}$: Number of days during which user household (specified as i) successfully utilizing the biogas from an operating biogas digester in the CPA in a year y . It reflects the starting date of operation and the duration of trouble of the biogas digester in the year.

It is noted that the summation is over the *user households* of biogas and not summation over biogas digesters. Some biogas digester may deliver biogas to several households. On the other hand, judgment of ‘operation’ is related to the status of the associated *biogas digester*, *i.e.*, $n_i^{OP}_{HH,y}$ belonging to the same biogas digester is the same, in principle.

Evaluation of $f_{NRB,y}$

According to a unanimous agreement from a range of experts, there are no examples of sustainably managed forest areas, despite the existence of formally protected areas in Bangladesh.

From 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.⁴⁰ 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, the PoA-DD of the registered PoA 4971: “Improved Cooking Stoves in Bangladesh (footnote 17), shows the value is 1.0 (page 22–23).

Therefore, we can conclude that

$$f_{NRB,y} = 1.0 \quad (8)$$

in Bangladesh.

E.6.2. Equations, including fixed parametric values, to be used for calculation of emission reductions of a SSC-CPA:

>>

On the basis of E.6.1, emission reductions ER_y is given by:

⁴⁰ This fact implies that the calculation of emission reduction is conservative by ignoring the transportation-related baseline emissions.



$$\begin{aligned}
 ER_y &= B_y \cdot f_{NRB,y} \cdot NCV_{\text{biomass}} \cdot EF_{\text{projected_fossilfuel}} \\
 &= 0.95 \cdot N_{HH,y}^{OP} \cdot (3.29 - B_{HH}^{PJ}) \cdot 1.0 \cdot 0.015 \cdot 81.6 \\
 &= 1.163 \cdot N_{HH,y}^{OP} \cdot (3.29 - B_{HH}^{PJ})
 \end{aligned} \tag{9}$$

In case $B_{HH}^{PJ} = 0$, per household emission reductions is calculated as

$$(\text{emission reductions per household}) = 3.83 \text{ [tCO}_2\text{/yr/household]} \tag{10}$$

E.6.3. Data and parameters that are to be reported in CDM-SSC-CPA-DD form:

Data / Parameter:	B_{HH}^{BL}
Data unit:	ton/household/year
Description:	Woody biomass consumption per household per year
Source of data used:	Standardized approaches for facilitating the baseline emission calculations under AMS-I.E
Value applied:	3.29
Justification of the choice of data or description of measurement methods and procedures actually applied:	The default value is set by the SSC WG report: http://cdm.unfccc.int/Panels/ssc_wg/meetings/033/ssc_033_an08.pdf
Any comment:	This value is applied for all CPAs.

Data / Parameter:	f_{NRB}
Data unit:	No dimension
Description:	<i>NRB</i> : Share of non-renewable woody biomass used in the absence of the project activity <i>DRB</i> : Share of (demonstrably) renewable woody biomass used in the absence of the project activity
Source of data used:	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 is the non-renewable woody biomass and DRB is the demonstrable renewable woody biomass.
Value applied:	1.0 (JPMorgan Climate Care report and World Bank “Restoring Balance—Bangladesh’s Rural Energy Realities”)
Justification of the choice of data or	Because Bangladesh is a LDC, available official documents are limited. Therefore, JPMorgan conducted a comprehensive study considering CDM-



description of measurement methods and procedures actually applied:	specific requirements into account. In addition, the World Bank Report (footnote 3) and other materials (see footnote 2) support this result. This is also supported by the registered PoA 4971: “Improved Cooking Stoves in Bangladesh (footnote 11), shows the value is 1.0 (page 22–23).
Any comment:	–

Data / Parameter:	NCV_{biomass}
Data unit:	TJ/ton
Description:	Net calorific value of the woody biomass
Source of data used:	Methodology
Value applied:	0.015
Justification of the choice of data or description of measurement methods and procedures actually applied:	Default value specified in the AMS-I.E. (ver. 04)
Any comment:	–

Data / Parameter:	$EF_{\text{projected_fossilfuel}}$
Data unit:	t CO ₂ /TJ
Description:	Emission factor for substitution of woody biomass
Source of data used:	Methodology
Value applied:	81.6
Justification of the choice of data or description of measurement methods and procedures actually applied:	Default value specified in the AMS-I.E (ver.04)
Any comment:	–

E.7. Application of the monitoring methodology and description of the monitoring plan:

E.7.1. Data and parameters to be monitored by each SSC-CPA:

Data / Parameter:	$N_{\text{HH},y}^{\text{OP}}$
Data unit:	number
Description:	Number of user households which are successfully utilizing the biogas from operating biogas digesters in the CPA in a year <i>y</i> .
Source of data to be used:	This value is specified in the database of the management of the PoA. This parameter is calculated <i>ex post</i> by using the dataset of $n_{i,\text{HH},y}^{\text{OP}}$ below. This value can be a fraction if some digester is out of order for a certain period or a digester starts its operation in the middle of the verification period.



Value of data applied for the purpose of calculating expected emission reductions in section B.5	–
Description of measurement methods and procedures to be applied:	<p>GS constructs a database for the PoA.</p> <p>The database includes the information of the household which introduced a biogas digester and the user households of the biogas digester.</p> <p>This parameter is calculated as an aggregation of each household:</p> $N_{HH,y}^{OP} = (1/365) \cdot \sum_i n_i^{OP}_{HH,y}$ <p>(For notation, see the next monitoring item)</p> <p>It also includes the starting date of operation of the biogas digester as well as the maintenance record of the digester.</p>
QA/QC procedures to be applied:	This parameter is automatically calculated in the database.
Any comment:	It is noted that the summation is over the <i>user household</i> of biogas and not summation over biogas digester. Some biogas digester may deliver biogas to several households. On the other hand, judgment of ‘operation’ is related to the status of the associated <i>biogas digester</i> , i.e., $n_i^{OP}_{HH,y}$ belonging to the same biogas digester is the same.

Data / Parameter:	$n_i^{OP}_{HH,y}$
Data unit:	number of days
Description:	Number of days during which user household (specified as <i>i</i>) is successfully utilizing the biogas from an operating biogas digester in the CPA in a year <i>y</i> .
Source of data to be used:	This parameter is based on the status report by the unit offices of GS or other organizations’ report.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	–
Description of measurement methods and procedures to be applied:	<p>GS unit offices monitor and record each biogas digester’s operation status as well as each household’s use of biogas. This is integrated to its maintenance service. At the unit-office level, the staff will be in close touch with the customers, as they will periodically (once every month, in principle) visit the customers' houses both to collect the installments and to attend to any servicing requirements. After all payment, the unit office staff visits the household at least every year as well as every call for trouble for the operation of the biogas digester.</p>
QA/QC procedures to be applied:	<p>Monitoring, recording and reporting by each unit office is integrated to existing GS management system. Database managed by GS HQ is to collect all the data for calculation of $N_{HH,y}^{OP}$.</p> <p>The biogas digester owner shall communicate with GS unit office if additional user households were included after the installation of the system.</p>
Any comment:	It reflects the starting date of operation and the duration of trouble of the biogas



	digester in the year.
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Data / Parameter:	B_{HH}^{PJ}
Data unit:	ton/household/year
Description:	Project woody biomass consumption per household in a year
Source of data to be used:	This parameter is monitored once by GS by undertaking a sample survey of more than 100 household which has been using biogas already.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	–
Description of measurement methods and procedures to be applied:	Interview by visiting each household with biogas digester.
QA/QC procedures to be applied:	In case some inconsistency is found, the reason shall be clarified. If the reason is not clarified, the data shall not be included.
Any comment:	The woody biomass is the tree cut by the household or the wooden biomass (incl. charcoal) purchased in the market. It does not include the pick-up twigs because they are recognized as renewable.

Data / Parameter:	n_{CCS}
Data unit:	number
Description:	Number of conventional cookstoves per household
Source of data to be used:	This parameter is monitored once by GS by undertaking a sample survey of more than 100 household which is using conventional biomass cookstoves (excluding the household with (a) improved cookstove(s)).
Value of data applied for the purpose of calculating expected emission reductions in section B.5	–
Description of measurement methods and procedures to be applied:	Interview by visiting each household without biogas digester and ICS.
QA/QC procedures to be applied:	In case some inconsistency is found, the reason shall be clarified. If the reason is not clarified, the data shall not be included.
Any comment:	This parameter is a dummy and not used in the calculation of emission reductions.

Data / Parameter:	n_i^{burner}
Data unit:	number
Description:	Number of biogas cookstove burners per each household i
Source of data to be	Order sheet of the biogas digester system



used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	–
Description of measurement methods and procedures to be applied:	Usually, specs and numbers of the biogas cookstoves are shown in the order sheet of the biogas system.
QA/QC procedures to be applied:	Inspected after installation of the biogas digester system. The biogas digester owner shall communicate with GS unit office if additional biogas cookstoves were installed after the installation of the system.
Any comment:	This parameter is used to judge whether the CPA complies with the eligibility criterion (5). The maximum number of the burners per a CPA is 9,096 in order to meet the threshold of Microscale CDM, while the eligibility criterion set the limit as 8,000 (around 88% of the threshold); it has the safety margin.

E.7.2. Description of the monitoring plan for a SSC-CPA:

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1. Monitoring framework

The operation and management structure for monitoring involves both GS HQ and the implementers (GS Branch Offices and other organizations) for GS-type CPAs. For PO-type CPAs, IDCOL and implementing organizations are involved.

For GS-type, GS HQ (supported by PEAR) will act as the overall supervisor of implementers, and undertake data checking reported by each implementer (GS Branch Offices), aggregating the data, conducting necessary calculations of emission reductions.

For PO-type, IDCOL will act as the same role of GS HQ and prepare a monitoring report periodically (typically annually) to the DOE by using the reports by GS and other implementers.

The implementers will undertake the monitoring of the CPA operations including household surveys based on the operation and monitoring manual prepared by GS HQ and IDCOL. Results will be reported to GS HQ (for GS-type) and to IDCOL (PO-type). GS and IDCOL have the responsibility to manage and operate the CPA as the CPA operator of GS-type and PO-type, respectively.

IDCOL will manage whole activities under the PoA as the CME.

Each CPA is basically sequential by type (see Figure 8) and covers whole Bangladesh.

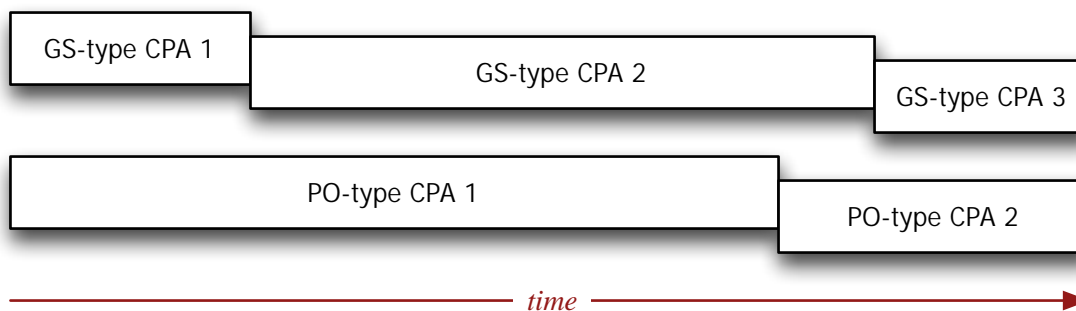


Figure 8: Image of sequential implementation of CPAs by type

2. The role of implementers

The following table shows the role of GS branch (unit) offices and other implementers (for other organizations).

Table 8: Functions of CPA operator (GS and IDCOL) and implementers

	GS HQ and IDCOL (supported by PEAR)	Implementers (GS branch offices and other organizations)
Monitoring management	<ul style="list-style-type: none"> - Develop the operation and monitoring manual for CPAs. - Develop and establish data collection and reporting system for parameters monitored in every CPAs. - Implement and manage monitoring of CPAs. 	<ul style="list-style-type: none"> - Implement and manage monitoring of CPAs.
Data collection	<ul style="list-style-type: none"> - Establish and maintain data collection systems for parameters monitored. - Check data quality and collection procedures of each CPAs regularly. 	<ul style="list-style-type: none"> - Implement data collection. - Check data quality and collection procedures regularly.
Data storage and management	<ul style="list-style-type: none"> - Develop database format of CPA. - Check the reported data from each CPAs. - Calculate emission reductions based on the data reported by the implementers. - Implement data management of CPAs. - Store and maintain records. 	<ul style="list-style-type: none"> - Enter collected data to a computer database. - Implement data management of CPA. - Store and maintain records.
Reporting	<ul style="list-style-type: none"> - Analyze data and compare project performances. - Prepare and forward monthly or 	<ul style="list-style-type: none"> - Report electronic data to the program coordinator. - Households report related information and any malfunctions happened on biogas



	annual reports.	digesters to the implementer (GS branch offices or other organization)
CDM training and capacity building	- Develop and establish training program for GS branch offices, other organizations and households.	- Implement simple training for households, ensuring enabled to meet the needs of the monitoring plan.
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 implementer after that period for recovery. - All of these information are recorded and reported to the GS HQ or IDCOL.

3. Monitored data

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

4. Data collection

Data collection regarding households will mainly be carried out by implementers (GS branch offices and other organizations). The role of GS HQ in data collection is checking the quality of the data collected by implementers.

5. Data management

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

Each implementer (GS branch offices or other organization) shall collect data described in section E.7.1 and archive these electronically using the common template developed by the program coordinator (IDCOL). The electronic files and the hard copy shall be sent to the GS HQ for GS-type and to IDCOL for PO-type.

GS HQ and/or IDCOL will develop an appropriate electronic template for archiving all data of every CPA. After reporting data from each branch office or other implementers, the GS HQ shall check the data for GS-type and IDCOL shall check the data for PO-type. If there are any errors found, they will be checked against original data and carry out interview with farmers if necessary. All the responses to these errors will be documented and compiled.

The GS HQ and IDCOL will calculate emission reductions for each CPA supported by PEAR for GS-type and PO-type, respectively, and store the outputs in hard disks as well as hard copy printouts.

The relevant information for GS-type is reported to IDCOL by GS HQ.



E.8 Date of completion of the application of the baseline study and monitoring methodology and the name of the responsible person(s)/entity(ies)

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11/02/2012

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[Note] PEAR carbon Offset Initiative, Ltd. is a project participant of the PoA.



Annex 1

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Annex 2

INFORMATION 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.⁴¹ 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

⁴¹ 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.



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.⁴²

IDCOL specifies the carbon financing opportunities by CDM as an attractive and sustainable source of funding. GS, which contributed around 57% (10,637 out of 18,713 biogas plants) of total construction up to May 2011, got approval by IDCOL to undertake CDM activities. It is 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 also noted that any Annex I Party government will not obtain CERs in compensation for the ODA.

Annex 3

BASELINE INFORMATION

The baseline study consisted of a literature review, which provided the ex-ante parameter values given in section E.6.3 above.

Annex 4

MONITORING INFORMATION

Please refer to B.6.1.

⁴² 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](http://www.idcol.org/Download/20100105%20Implementation%20Plan%202010_12%20NDBMP%20IDCOL1.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.