

**SMALL-SCALE CDM PROGRAMME ACTIVITY DESIGN DOCUMENT FORM  
(CDM-SSC-CPA-DD) - Version 01**



**NAME /TITLE OF THE PoA:** Biogas Utility Programme for Households  
by Grameen Shakti in Municipalities of Bangladesh



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**CLEAN DEVELOPMENT MECHANISM  
SMALL-SCALE PROGRAM ACTIVITY DESIGN DOCUMENT FORM (CDM-SSC-CPA-DD)  
Version 01**

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**NOTE:**

- (i) This form is for submission of CPAs that apply a small scale approved methodology using the provision of the proposed small scale CDM PoA.
- (ii) The coordinating/managing entity shall prepare a CDM Small Scale Programme Activity Design Document (CDM-SSC-CPA-DD)<sup>1,2</sup> that is specified to the proposed PoA by using the provisions stated in the SSC PoA DD. At the time of requesting registration the SSC PoA DD must be accompanied by a CDM-SSC CPA-DD form that has been specified for the proposed SSC PoA, as well as by one completed CDM-SSC CPA-DD (using a real case). After the first CPA, every CPA that is added over time to the SSC PoA must submit a completed CDM-SSC CPA-DD.

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<sup>1</sup> The latest version of the template form CDM-CPA-DD is available on the UNFCCC CDM web site in the reference/document section.

<sup>2</sup> At the time of requesting validation/registration, the coordinating managing entity is required to submit a completed CDM-POA-DD, the PoA specific CDM-CPA-DD, as well as one of such CDM-CPA-DD completed (using a real case).

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**SECTION A. General description of small scale CDM programme activity (CPA)**

**A.1. Title of the small-scale CPA:**

>>

Biogas Utility Programme to Households by Grameen Shakti in Faridpur of Bangladesh- CPA-[Far]-[01]

26/01/2011

Version: 1.1 [On-site Validation 以前のバージョン]

**A.2. Description of the small-scale CPA:**

>>

Grameen Shakti (GS), a non-governmental organization under the Grameen 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 with a social objective for disseminating biogas technology and solar home systems to millions of rural villagers.

In order to expand biogas utilization in Bangladesh, GS plans to implement Programme of Activities (PoA) which promotes plant type commercial biogas digesters in local cities of Bangladesh to supply biogas for thermal usage of targeted households. The PoA will install numerous medium or large size biogas digesters (fixed dome type or soft bag type) which consume municipal organic wastes that are otherwise disposed to landfills, emitting methane into the atmosphere. It is noted that this series of activities (programme) is the *first-of-its-kind* in Bangladesh.

This CPA is to be implemented in the Faridpur municipality and install commercial biogas digesters with total biogas (methane content is around 60%) production capacity of 500 m<sup>3</sup>/day initially. The Faridpur municipal government will be responsible for collecting, classifying and transporting the wastes to the sites of biogas digesters under the contract with GS. And the sludge from the biogas digesters will be dried before used for field application as soil conditioner.

The CPA contributes to the sustainable development of Bangladesh in various aspects.

In general, it contributes to affordable energy gas utility service for the households in municipal areas who cannot access the natural gas distribution network. The biogas is a self-sufficient, renewable energy source which contributes to the energy security of Bangladesh as well.

The system also provides a good quality, organic fertilizer.

In social and environmental aspects, the programme mitigates the impacts of biomass reliance including 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.

For details, please see section A.2 and C.2 of the PoA-DD.

This CPA under the PoA consists of:

- 1) Installations of two biogas digesters initially and related equipments, which consume municipal organic wastes as feedstock.

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- 2) The CPA targets Faridpur, where natural gas distribution network coverage for households do not exist.
- 3) The biogas digester system is composed of pre-treatment chambers, anaerobic digesters, gas storage tanks and other relevant equipments such as desulphurization and dehumidification devices.
- 4) The system composed of two digesters whose biogas generation capacity is 250 m<sup>3</sup>/day each initially.
- 5) The generated biogas is supplied to households through distribution pipelines as thermal energy mainly for cooking.
- 6) The fuels currently used in households for cooking are non-renewable biomass and a small portion of renewable biomass and a little portion of LPG.
- 7) The biogas is completely combusted in biogas stoves at the households.
- 8) GHG emission reductions can be attained through reducing non-renewable biomass (and along with a small portion of fossil fuels) combustions and avoiding CH<sub>4</sub> emissions from municipal solid waste disposal sites.
- 9) The sludge and slurry soil application guarantees aerobic condition to not result in methane emissions.

**A.3. Entity/individual responsible for the small-scale CPA:**

*>> Here the information on the entity/individual responsible of the CPA shall be included, hence forth referred to as CPA implementer(s). CPA implementers can be project participants of the PoA, under which the CPA is submitted, provided their name is included in the registered PoA.*

The following two entities are the project participants, among which Grameen Shakti plays as the Coordinating/Managing Entity of the PoA and responsible for this CPA as well.

Table 1: Participants of the PoA

<b>Name of Party involved ((host) indicates a host Party)</b>	<b>Private and/or public entity(ies) project participants (as applicable)</b>	<b>Party involved wishes to be considered as project participant (Yes/No)</b>
Bangladesh (host)	Grameen Shakti (coordinating/managing entity)	No
Japan	PEAR Carbon Offset Initiative, Ltd.	No

Information of the participants is listed in Annex 1.

For this specific CPA, the following branch office of GS is playing as the operator/implementer:

Operator of the CPA: Grameen Shakti, Faridpur branch office  
 Contact information: Abdullah-al-Mamun (Division Manager)  
 Grameen Shakti  
 Allardan Bhaban, Goal Chamat, Faridpur, Bangladesh  
 Cell: 880-1730050800

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Email: gshaktifaridpur@yahoo.com

**A.4. Technical description of the small-scale CPA:**

**A.4.1. Identification of the small-scale CPA:**

>>

**A.4.1.1. Host Party:**

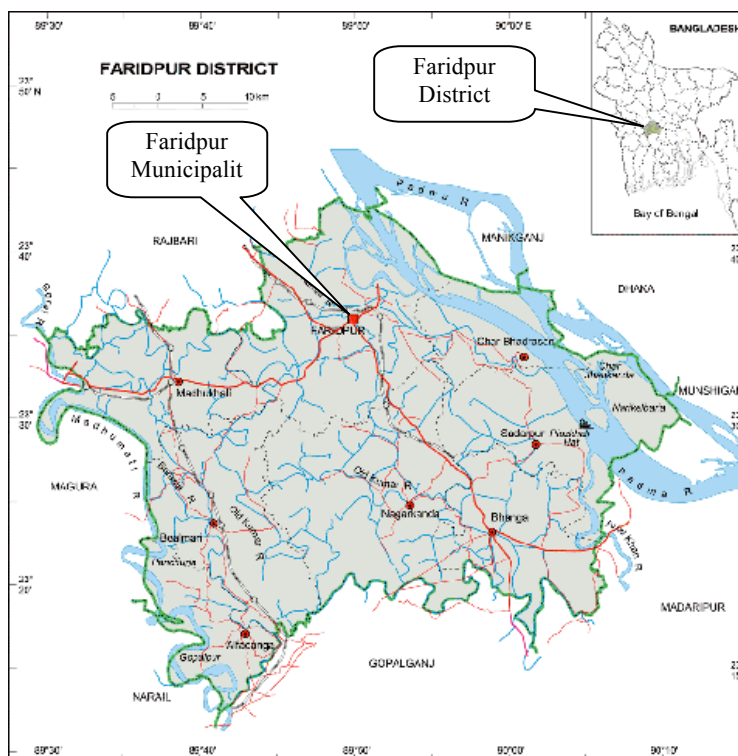
>>

Bangladesh

**A.4.1.2. Geographic reference or other means of identification allowing the unique identification of the small-scale CPA (maximum one page):**

>>Geographic reference or other means of identification<sup>3</sup>, Name/contact details of the entity/individual responsible for the CPA, e.g. in case of stationary CPA geographic reference, in case of mobile CPAs means such as registration number, GPS devices.

The CPA covers “municipal area of Faridpur” alongside N803. The geographical coordinates are 23°36' 36" N – 89° 51' 00" E with around 10 km<sup>2</sup>. The figure below shows the location of Faridpur (district and municipality) in Bangladesh. Supplied area of biogas in the municipality has not yet determined.



<sup>3</sup> E.g. in case of stationary CPA geographic reference, in case of mobile CPAs means such as registration number, GPS devices.

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Figure 1: Geographical Location of the CPA

**A.4.2. Duration of the small-scale CPA:**

**A.4.2.1. Starting date of the small-scale CPA:**

>>

The expected date on which contracts have been signed for equipment or construction/operation services required for the CPA: 01/07/2011.

**A.4.2.2. Expected operational lifetime of the small-scale CPA:**

>>

25 years

**A.4.3. Choice of the crediting period and related information:**

**Fixed Crediting period**

**A.4.3.1. Starting date of the crediting period:**

>>

The date of request for registration or the date of registration of PoA or the starting date of operation of the CPA, expected to be 01/01/2012.

**A.4.3.2. Length of the crediting period, first crediting period if the choice is renewable CP:**

>>

*NOTE: Please note that the duration of crediting period of any CPA shall be limited to the end date of the PoA regardless of when the CPA was added.*

Fixed crediting period (10 years, 0 month) is selected for the CPA.

**A.4.4. Estimated amount of emission reductions over the chosen crediting period:**

>>

Emission reductions of the CPA are estimated as follows.

Table 2: Estimated Emission Reduction

Year	Annual estimation of emission reductions (tonnes of CO <sub>2</sub> e)
2012	2,108
2013	2,382
2014	2,566
2015	2,689

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2016	2,772
2017	2,827
2018	2,865
2019	2,889
2020	2,906
2021	2,917
<b>Total</b>	<b>26,921</b>
<b>Total number of crediting years</b>	<b>10</b>
<b>Annual average over the crediting period</b>	<b>2,692</b>

[Note] The “Year” specifies one year from the starting date of operation of the CPA.  
(If calendar year is chosen, adjustment is needed)

**A.4.5. Public funding of the CPA:**

>>

There is no public fund applied to the CPA.

**A.4.6. Information to confirm that the proposed small-scale CPA is not a de-bundled component**

>>

1. For the purposes of registration of a Programme of Activities (PoA)<sup>4</sup> a proposed small-scale CPA of a PoA shall be deemed to be a de-bundled component of a large scale activity if there is already an activity<sup>5</sup>, which:

- (a) Has the same activity implementer as the proposed small scale CPA or has a coordinating or managing entity, which also manages a large scale PoA of the same sectoral scope, and;
- (b) The boundary is within 1 km of the boundary of the proposed small-scale CPA, at the closest point.

According to the “Guidelines on Assessment of De-bundling for SSC Project Activities (ver. 03)”,<sup>6</sup> it is specified 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*

<sup>4</sup> Only those POAs need to be considered in determining de-bundling that are: (i) in the same geographical area; and (ii) use the same methodology; as the POA to which proposed CPA is being added

<sup>5</sup> Which may be a (i) registered small-scale CPA of a PoA, (ii) an application to register another small-scale CPA of a PoA or (iii) another registered CDM project activity

<sup>6</sup> [http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC\\_guid17.pdf](http://cdm.unfccc.int/Reference/Guidclarif/ssc/methSSC_guid17.pdf).

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*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.*

Since one biogas digester of the CPA is designed to produce biogas of 250 m<sup>3</sup> for per day, the output of the subsystem in the CPA (biogas digester) will be 70 kW. As the threshold of small scale is 45 MW<sub>thermal</sub>, then its 1% will be 450 kW and bigger than the output of biogas digesters in the CPA. Therefore, the CPA of the PoA is exempt from performing the de-bundling check.

- If a proposed small-scale CPA of a PoA is deemed to be a debundled component in accordance with paragraph 2 above, but the total size of such a CPA combined with a registered small-scale CPA of a PoA or a registered CDM project activity does not exceed the limits for small-scale CDM and small-scale A/R project activities as set out in Annex II of the decision 4/CMP.1 and 5/CMP.1 respectively, the CPA of a PoA can qualify to use simplified modalities and procedures for small-scale CDM and small-scale A/R CDM project activities.*

Not applicable

**A.4.7. Confirmation that small-scale CPA is neither registered as an individual CDM project activity or is part of another Registered PoA:**

>>

As specified in the eligibility criteria, 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, another registered CDM project activity or another CDM PoA. It is checked whether CDM activities are implemented targeting the same households covered by the CPA.

It is noted that this criterion is stronger than the avoidance of double counting of CPA itself.

**SECTION B. Eligibility of small-scale CPA and Estimation of emissions reductions**

**B.1. Title and reference of the Registered PoA to which small-scale CPA is added:**

>>

Title:

Biogas Utility Programme for Households by Grameen Shakti in Municipalities of Bangladesh

Reference ID: Not yet determined

**B.2. Justification of the why the small-scale CPA is eligible to be included in the Registered PoA :**

>>

The CPA under the PoA shall meet the following criteria as specified in the PoA-DD:

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- 1) The CPA includes installation/construction of plant type biogas digesters, pre-treatment chambers, gas storage tanks, biogas distribution lines and their related equipments in municipalities of Bangladesh.

OK. All of these equipments are needed for biogas utility business by this CPA.

- 2) Generated biogas is supplied to households to replace biomass (mainly non-renewable biomass) and fossil fuel used at households.

OK. This is the business practice of the CPA. A survey study was undertaken for the fuel consumption mix of the household.

- 3) Installations/operations of biogas digester shall be complied with related national and sectorial standards and regulations.

OK. Compliance with all related regulations is confirmed before operation of the CPA. Please see C.3 of the PoA-DD for environmental regulation consideration. Grameen Shakti is implementing the CPA with the consultation of the municipal government.

- 4) A CPA is not a part of a registered CDM project or not a CPA under another PoA.

OK. There are no CDM-related activities covering the thermal energy use of households in Faridpur.

- 5) Each sub-system (one biogas digester) of the CPA has biogas generation capacity of no more than 450 kW<sub>th</sub> (around 1,600 m<sup>3</sup>/day), which is less than 1% of the SSC threshold, with the aggregated capacity is less than 15 MW<sub>th</sub>, and annual aggregated emission reduction from all systems is estimated to be less than 60 kt CO<sub>2</sub>e *ex ante*.

OK. The capacity of the subsystem (one biogas digester) is 250 m<sup>3</sup>/day each and 500 m<sup>3</sup>/day in total which are much less than the thresholds. The expected annual reduction by whole system is around 3 ktCO<sub>2</sub>e/yr which is also much less than the specified threshold.

- 6) Feeding material for biogas digesters are municipal organic wastes that are otherwise disposed to landfills, emitting methane into the atmosphere. The municipality has no composting or any other city-wide alternative system for waste management.

OK. Municipal waste is collected and used for feedstock of the CPA. Faridpur municipality does not have an alternative waste management system than the disposal to landfill site.

- 7) CPA will be implemented in a municipality where city-wide natural gas distribution network for household is not present.

OK. There is no natural gas distribution system for households in Faridpur municipality.

- 8) For additionality demonstration, “Guidelines for demonstrating additionality of renewable energy projects =< 5 MW and energy efficiency projects with energy savings <= 20 GWh per year (version 01)” is applied.

OK. As shown in criterion 5), the CPA satisfies with the condition of the Guidelines.





**B.3. Assessment and demonstration of additionality of the small-scale CPA, as per eligibility criteria listed in the Registered PoA:**

>>

The activities under the PoA—commercial biogas supply system targeting municipal households by using municipal waste as feedstock—are the first-of-its-kind activity in Bangladesh. No other similar activities are found. Therefore, prevailing practice barrier does not allow this activity to be implemented as an activity without CDM.

Moreover, as specified in E.5.1., additionality is demonstrated by using “Guidelines for demonstrating additionality of renewable energy projects  $\leq 5$  MW and energy efficiency projects with energy savings  $\leq 20$  GWh per year (version 01)” as each CPA satisfies all conditions mentioned in the Guidelines:

The Guidelines states:

*Paragraph 2. Project activities up to 5 megawatts that employ renewable energy as their primary technology<sup>7</sup> are additional if any one of the below conditions are satisfied:*

- (a) *The geographic location of the project activity is in LDCs/SIDs or in a special underdeveloped zone of the host country identified by the Government before 28 May 2010;*

As shown in eligibility criterion 5), the CPA under the PoA is designed to produce biogas in not more than 15 MW<sub>th</sub> (around 54,000 m<sup>3</sup> per day).

Bangladesh is a LDC (less developing country) where each CPA satisfies the condition stipulated in the “Guidelines for demonstrating additionality of renewable energy projects  $\leq 5$  MW and energy efficiency projects with energy savings  $\leq 20$  GWh per”.

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

**B.4. Description of the sources and gases included in the project boundary and proof that the small-scale CPA is located within the geographical boundary of the registered PoA.**

>>

The project boundary of the CPA is as follows:

- The physical site of the biogas digesters,
- The physical sites in Faridpur, where the solid waste (including animal manure, where applicable) would have been disposed and the methane emission occurs in absence of the proposed project activity, and
- The geographical area of Faridpur municipality, where biogas digesters and targeted households located and other related project activities have occurred.

After the final decision of the location of the site and distribution network, the geographical boundary is set to cover all of them. Therefore, by definition, the CPA is within the boundary.

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<sup>7</sup> All technologies/measures included in approved Type I Small Scale CDM methodologies are eligible to be considered.

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Table 3: Emission Sources Included in or Excluded from the Project Boundary

	Source	Gas	Included?	Justification / Explanation
Baseline emissions	Emissions from fossil fuels consumptions, typically non-renewable biomasses.	CO <sub>2</sub>	Yes	Major emission source
		CH <sub>4</sub>	No	Not significant. Excluded for simplification and conservativeness
		N <sub>2</sub> O	No	Not significant. Excluded for simplification and conservativeness
	Emissions from landfills	CO <sub>2</sub>	No	Not significant. Excluded for simplification and conservativeness
		CH <sub>4</sub>	Yes	Major emission source
		N <sub>2</sub> O	No	Not significant. Excluded for simplification and conservativeness
Project emissions	Emissions from fossil fuels consumptions, typically non-renewable biomasses.	CO <sub>2</sub>	Yes	Major emission source
		CH <sub>4</sub>	No	Not significant. Excluded for simplification
		N <sub>2</sub> O	No	Not significant. Excluded for simplification
	Emissions from physical leakages from the BMDs	CO <sub>2</sub>	No	Not significant. Excluded for simplification
		CH <sub>4</sub>	Yes	Major emission source
		N <sub>2</sub> O	No	Not significant. Excluded for simplification
	CO <sub>2</sub> emissions due to incremental transportation distances;	CO <sub>2</sub>	Yes	Major emission source
		CH <sub>4</sub>	No	Not significant. Excluded for simplification
		N <sub>2</sub> O	No	Not significant. Excluded for simplification
	CO <sub>2</sub> emissions from electricity and/or fossil fuel consumption by the project activity facilities;	CO <sub>2</sub>	Yes	Major emission source
		CH <sub>4</sub>	No	Not significant. Excluded for simplification
		N <sub>2</sub> O	No	Not significant. Excluded for simplification
	The methane emissions from the disposal/storage/treatment of these residual waste;	CO <sub>2</sub>	No	Not significant. Excluded for simplification
		CH <sub>4</sub>	Yes	Major emission source
		N <sub>2</sub> O	No	Not significant. Excluded for simplification

**B.5. Emission reductions:**

**B.5.1. Data and parameters that are available at validation:**

>>

<b>Data / Parameter:</b>	$NCV_{biomass}$
<b>Data unit:</b>	TJ/ton
<b>Description:</b>	Net Calorific Value of the non-renewable woody biomass
<b>Source of data used:</b>	IPCC
<b>Value applied:</b>	0.015
<b>Justification of the choice of data or description of measurement methods and procedures actually applied :</b>	Default value from 2006 IPCC Guidelines for National Greenhouse Gas Inventories Chapter 1, Table 1.2 This value does not appear explicitly in the final form of emission reductions.

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Any comment:	–
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<b>Data / Parameter:</b>	$EF_{projected\ fossilfuel}$
Data unit:	tonne CO <sub>2</sub> e/TJ
Description:	Emission Factor for substitution of non-renewable woody biomass
Source of data used:	IPCC
Value applied:	63.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value for LPG from 2006 IPCC Guidelines for National Greenhouse Gas Inventories Chapter 1, Table 1.2 is applied.
Any comment:	–

<b>Data / Parameter:</b>	$\eta_{old}$
Data unit:	TJ
Description:	Efficiency of the system being replaced
Source of data used:	AMS-I.E. and “A Technical Manual of Improved Cooking Stoves”
Value applied:	0.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	Please see E.6.1.
Any comment:	–

<b>Data / Parameter:</b>	$\phi$
Data unit:	No dimension
Description:	Model correction factor to account for model uncertainties
Source of data used:	Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	Oonk et al. (1994) have validated several landfill gas models based on 17 realized landfill gas projects. The mean relative error of multi-phase models was assessed to be 18%. Given the uncertainties associated with the model and in order to estimate emission reductions in a conservative manner, a discount of 10% is applied to the model results.
Any comment:	–

<b>Data / Parameter:</b>	$OX$
Data unit:	No dimension
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)

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Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	Described in each CPA-DD; for the first CPA under the PoA, the value is 0.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	Use 0.1 for managed solid waste disposal sites that are covered with oxidizing material such as soil or compost. Use 0 for other types of solid waste disposal sites. Determined before implementation of the CPA.
Any comment:	–

<b>Data / Parameter:</b>	$F$
Data unit:	No dimension
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. A default value of 0.5 is recommended by IPCC.
Any comment:	–

<b>Data / Parameter:</b>	$DOC_f$
Data unit:	No dimension
Description:	Fraction of Degradable Organic Carbon (DOC) that can decompose
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	–
Any comment:	–

<b>Data / Parameter:</b>	$MCF$
Data unit:	No dimension
Description:	Methane Correction Factor
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	Described in each CPA-DD; for the first CPA under the PoA, the value is 0.4
Justification of the choice of data or description of measurement methods and procedures actually applied :	Use the following values for MCF: <ul style="list-style-type: none"> <li>• 1.0, for anaerobic managed solid waste disposal sites. These must have controlled placement of waste (i.e., waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following: (i) cover material; (ii)</li> </ul>

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applied :	<p>mechanical compacting; or (iii) leveling of the waste;</p> <ul style="list-style-type: none"> <li>• 0.5, for semi-aerobic managed solid waste disposal sites. These must have controlled placement of waste and will include all of the following structures for introducing air to waste layer: (i) permeable cover material; (ii) leachate drainage system; (iii) regulating pondage; and (iv) gas ventilation system;</li> <li>• 0.8, for unmanaged solid waste disposal sites – deep and/or with high water table. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 meters and/or high water table at near ground level. Latter situation corresponds to filling inland water, such as pond, river or wetland, by waste;</li> <li>• 0.4, for unmanaged-shallow solid waste disposal sites. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 metres</li> </ul>
Any comment:	<p>The Methane Correction Factor (MCF) accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS.</p> <p>This value is determined before implementation of the CPA.</p>

<b>Data / Parameter:</b>	<i>DOC<sub>j</sub></i>																					
Data unit:	%																					
Description:	Fraction of Degradable Organic Carbon (by weight) in the waste type <i>j</i>																					
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)																					
Value applied:	Described in each CPA-DD; for the first CPA under the PoA, the value is 15																					
Justification of the choice of data or description of measurement methods and procedures actually applied :	<p>Apply the following values for the different waste types <i>j</i>:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Waste type <i>j</i></th> <th style="text-align: center;">DOC<sub>j</sub> (% wet waste)</th> <th style="text-align: center;">DOC<sub>j</sub> (% dry waste)</th> </tr> </thead> <tbody> <tr> <td>Wood and wood products</td> <td style="text-align: center;">43</td> <td style="text-align: center;">50</td> </tr> <tr> <td>Pulp, paper and cardboard (other than sludge)</td> <td style="text-align: center;">40</td> <td style="text-align: center;">44</td> </tr> <tr> <td>Food, food waste, beverages and tobacco (other than sludge)</td> <td style="text-align: center;">15</td> <td style="text-align: center;">38</td> </tr> <tr> <td>Textiles</td> <td style="text-align: center;">24</td> <td style="text-align: center;">30</td> </tr> <tr> <td>Garden, yard and park waste</td> <td style="text-align: center;">20</td> <td style="text-align: center;">49</td> </tr> <tr> <td>Glass, plastic, metal, other inert waste</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> </tr> </tbody> </table> <p>If a waste type, prevented from disposal by the proposed CPA, cannot clearly be attributed to one of the waste types in the table above, project participants should choose among the waste types that have similar characteristics as that waste type where the values of <i>DOC<sub>j</sub></i> and <i>k<sub>j</sub></i> result in a conservative estimate (lowest emissions), or request a revision of / deviation from this methodology. In the case of Empty Fruit Bunches (EFB), as their characteristics are similar to garden waste, the parameter value correspondent of garden shall be used. In</p>	Waste type <i>j</i>	DOC <sub>j</sub> (% wet waste)	DOC <sub>j</sub> (% dry waste)	Wood and wood products	43	50	Pulp, paper and cardboard (other than sludge)	40	44	Food, food waste, beverages and tobacco (other than sludge)	15	38	Textiles	24	30	Garden, yard and park waste	20	49	Glass, plastic, metal, other inert waste	0	0
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	the case of industrial sludge, a value of 9% (% wet sludge) shall be used assuming an organic dry matter content of 35 percent <sup>8</sup>
Any comment:	This value is determined before implementation of the CPA.

<b>Data / Parameter:</b>	$k_j$																												
Data unit:	No dimension																												
Description:	Decay rate for the waste type $j$																												
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)																												
Value applied:	Described in each CPA-DD; for the first CPA under the PoA, the value is 0.035																												
Justification of the choice of data or description of measurement methods and procedures actually applied :	<p>Apply the following default values for the different waste types <math>j</math>:</p> <table border="1"> <thead> <tr> <th rowspan="2">Waste type <math>j</math></th> <th colspan="2">Boreal and Temperate (MAT ≤ 20°C)</th> <th colspan="2">Tropical (MAT &gt; 20°C)</th> </tr> <tr> <th>Dry (MAP/PET &lt; 1)</th> <th>Wet (MAP/PET &gt; 1)</th> <th>Dry (MAP &lt; 1000mm)</th> <th>Wet (MAP &gt; 1000mm)</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Slowly degrading Pulp, paper, cardboard (other than sludge), textiles</td> <td>0.04</td> <td>0.06</td> <td>0.045</td> <td>0.07</td> </tr> <tr> <td>0.02</td> <td>0.03</td> <td>0.025</td> <td>0.035</td> </tr> <tr> <td>Moderately degrading Other (non-food) organic putrescible garden and park waste</td> <td>0.05</td> <td>0.10</td> <td>0.065</td> <td>0.17</td> </tr> <tr> <td>Rapidly degrading Food, food waste, sewage sludge, beverages and tobacco</td> <td>0.06</td> <td>0.185</td> <td>0.085</td> <td>0.40</td> </tr> </tbody> </table> <p>NB: MAT – Mean Annual Temperature, MAP – Mean Annual Precipitation, PET-- Potential Evapotranspiration. MAP/PET is the ratio between the Mean annual Precipitation and the Potential Evapotranspiration.</p> <p>If a waste type, prevented from disposal by the proposed CDM project activity, can not clearly be attributed to one of the waste types in the table above, project participants should choose among the waste types that have similar characteristics that waste type where the values of <math>DOC_j</math> and <math>k_j</math> result</p>	Waste type $j$	Boreal and Temperate (MAT ≤ 20°C)		Tropical (MAT > 20°C)		Dry (MAP/PET < 1)	Wet (MAP/PET > 1)	Dry (MAP < 1000mm)	Wet (MAP > 1000mm)	Slowly degrading Pulp, paper, cardboard (other than sludge), textiles	0.04	0.06	0.045	0.07	0.02	0.03	0.025	0.035	Moderately degrading Other (non-food) organic putrescible garden and park waste	0.05	0.10	0.065	0.17	Rapidly degrading Food, food waste, sewage sludge, beverages and tobacco	0.06	0.185	0.085	0.40
Waste type $j$	Boreal and Temperate (MAT ≤ 20°C)		Tropical (MAT > 20°C)																										
	Dry (MAP/PET < 1)	Wet (MAP/PET > 1)	Dry (MAP < 1000mm)	Wet (MAP > 1000mm)																									
Slowly degrading Pulp, paper, cardboard (other than sludge), textiles	0.04	0.06	0.045	0.07																									
	0.02	0.03	0.025	0.035																									
Moderately degrading Other (non-food) organic putrescible garden and park waste	0.05	0.10	0.065	0.17																									
Rapidly degrading Food, food waste, sewage sludge, beverages and tobacco	0.06	0.185	0.085	0.40																									

<sup>8</sup> This value must be adjusted for other percentages of organic dry matter content as follows:

$$DOC (\% \text{ wet sludge}) = 9 * (\% \text{ organic dry matter content}/35).$$

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	in a conservative estimate (lowest emissions), or request a revision of / deviation from this methodology. In the case of Empty Fruit Bunches (EFB), as their characteristics are similar to garden waste, the parameter values correspondent of garden waste shall be used. In case of sludge from pulp and paper industry, a conservative value of 0.03 shall be used for all precipitation and temperature combinations
Any comment:	Document in the CDM-PDD the climatic conditions at the SWDS site (temperature, precipitation and, where applicable, evapotranspiration). Use long-term averages based on statistical data, where available and provide reference. This value is determined before implementation of the CPA.

<b>Data / Parameter:</b>	$GWP_{CH_4}$
Data unit:	
Description:	Global Warming Potential of methane
Source of data used:	IPCC 2 <sup>nd</sup> Assessment Report, WG-I Report.
Value applied:	21 (for –2012)
Justification of the choice of data or description of measurement methods and procedures actually applied :	–
Any comment:	–

<b>Data / Parameter:</b>	$EF_{CO_2\ transport}$
Data unit:	kg CO <sub>2</sub> /km
Description:	CO <sub>2</sub> Emission Factor from Fuel use due to transportation
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	Described in each CPA-DD.
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default values or local values may be used.
Any comment:	–

<b>Data / Parameter:</b>	$EF_{grid}$
Data unit:	ton CO <sub>2</sub> e/MWh
Description:	Grid Emission Factor for Bangladesh
Source of data used:	Calculated by project participants
Value applied:	0.584
Justification of the choice of data or description of	Please see CPA-DD for the first CPA.

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measurement methods and procedures actually applied :	
Any comment:	–

<b>Data / Parameter:</b>	$f_{NRB}$
Data unit:	%
Description:	Fraction of woody biomass used in the absence of the project activity that can be established as non renewable biomass
Source of data used:	Survey
Value applied:	Calculated as the average value of fuel wood portion among whole biomass used by households by using the fact that all fuel wood is non-renewable in Bangladesh. 77% for the first CPA in Faridpur.
Justification of the choice of data or description of measurement methods and procedures actually applied :	The sample survey of fuel consumption in households in the municipal area where the CPA covers. Sample number is set around 100.
Any comment:	–

**B.5.2. Ex-ante calculation of emission reductions:**

>>

For this *ex ante* estimation, it is assumed that the two digesters start their operations simultaneously from the beginning of 2012.

**(1) AMS-I.E**

**(a) Emission Reductions by fuel switching ( $ER_{FS,y}$ )**

As specified in E.6.2 of the PoA-DD,

$$ER_{FS,y} = HG_{p,y} * f_{NRB} * EF_{projected\_fossilfuel} / \eta_{old}$$

$$= 630 * HG_{p,y} * f_{NRB} \text{ (t CO}_2\text{)}$$

Where:

$HG_{p,y}$ : Quantity of thermal energy generated by the biogas digester by the CPA in year  $y$  (TJ/year)

$f_{NRB}$ : Fraction of woody biomass used in the absence of the CPA that can be established as non renewable biomass using survey methods. This is measured once by sampling for





the municipality of each CPA once before implementing the CPA. 77% is applied for Faridpur.

Assuming that  $HG_{p,y} = 3.66$  (TJ/yr)<sup>9</sup>, we obtain

$$ER_{FS,y} = 1,775 \text{ (tCO}_2\text{/yr)}$$

## (2) AMS-III.AO

### (a) Baseline Emission of methane from land-filling ( $BE_{LF,y} = BE_{CH_4,SWDS,y}$ )

As specified in E.6.2 of the PoA-DD,

$$BE_{CH_4,SWDS,y} = 0.3 \cdot GWP_{CH_4} \cdot (1 - OX) \cdot MCF \cdot \sum_{x=1}^y \sum_j W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot (1 - e^{-k_j})$$

with the notations specified in the PoA-DD.

Assuming that  $OX = 0.1$ ,  $MCF = 0.4$ ,  $W = 3,650$ ,  $DOC = 0.15$ ,  $k = 0.4$ , we obtain

$$BE_{CH_4,SWDS} = 409 \text{ (t CO}_2\text{e/yr)}$$

for the first year of operation.

### (b) Project Emission

$$PE_y = \left\{ \begin{array}{l} PE_{transp,y} + PE_{power,y} + PE_{res\ waste,y} \\ + PE_{phys\ leakage,y} + PE_{flaring,y} \end{array} \right\}$$

Assuming that the transportation, energy consumption at site, waste water, and flaring parts are negligible, the physical leakage must be counted.

$$\begin{aligned} PE_y &= PE_{phys\ leakage,y} \\ &= 1.04 * HG_{p,y} * GWP_{CH_4} \\ &= 76 \text{ (t CO}_2\text{e/yr)} \end{aligned}$$

### (c) Leakage

Since the project does not use equipments transferred from other activities, the leakage = 0.

---

<sup>9</sup> The assumptions are: biogas generation rate 500 m<sup>3</sup>/day, 365 days/year operation, average temperature 24°C, pressure 1 atm, 60% methane content in the biogas. Methane's low calorific value is 50.4 MJ/kg.

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**(3) Overall Emission Reduction**

$$\begin{aligned}
 ER_y &= BE_y - PE_y - \text{Leakage} \\
 &= 1,775 + 409 - 76 \\
 &= 2,108 \text{ (ton CO}_2 \text{ e/year)}
 \end{aligned}$$

for the first year.

**B.5.3. Summary of the ex-ante estimation of emission reductions:**

Table 4: Summary of Estimated Emission Reduction

Year	Estimation of project activity emissions (tonnes of CO <sub>2</sub> e)	Estimation of baseline emissions (tonnes of CO <sub>2</sub> e)	Estimation of leakage (tonnes of CO <sub>2</sub> e)	Estimation of overall emission reductions (tonnes of CO <sub>2</sub> e)
2012	76	2,184	0	2,108
2013	76	2,459	0	2,382
2014	76	2,643	0	2,566
2015	76	2,766	0	2,689
2016	76	2,849	0	2,772
2017	76	2,904	0	2,827
2018	76	2,941	0	2,865
2019	76	2,966	0	2,889
2020	76	2,983	0	2,906
2021	76	2,994	0	2,917
<b>Total</b> (tonnes of CO <sub>2</sub> e)	762	27,690	0	26,921

[Note] The “Year” specifies one year from the starting date of the CPA operations.  
(If calendar year is chosen, adjustment is needed)

**B.6. Application of the monitoring methodology and description of the monitoring plan:**

**B.6.1. Description of the monitoring plan:**

>>

**1. Monitoring framework**

The operation and management structure for monitoring involves both the role of the program coordinator and the CPA operators.

The program coordinator (supported by PEAR) will act as the overall supervisor of the PoA, and undertake data checking reported by the CPA operator (Faridpur branch office of Grameen Shakti),

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aggregating the data, conducting necessary calculations of emission reductions and preparing a monitoring report periodically (typically annually) to the DOE.

The CPA operators will, based on the operation and monitoring manual prepared by the program coordinator, undertake the monitoring of CPA operations including household survey and report to the program coordinator. The CPA operators have responsibility to manage and operate the CPA.

**2. The role of the CPA implementers**

The following table shows the role of CPA operators:

Table 5: Functions of CPA Operators

	The program coordinator (supported by PEAR)	The CPA operators
Monitoring management	<ul style="list-style-type: none"> <li>- Develop the operation and monitoring manual for CPAs.</li> <li>- Develop and establish data collection and reporting system for parameters monitored in every CPAs.</li> <li>- Implement and manage monitoring of CPAs.</li> </ul>	<ul style="list-style-type: none"> <li>- Implement and manage monitoring of CPAs.</li> </ul>
Data collection	<ul style="list-style-type: none"> <li>- Establish and maintain data collection systems for parameters monitored.</li> <li>- Check data quality and collection procedures of each CPAs regularly.</li> </ul>	<ul style="list-style-type: none"> <li>- Implement data collection including the entire household survey before the CPA starts and sample household survey after the CPA starts.</li> <li>- Check data quality and collection procedures regularly.</li> </ul>
Data storage and management	<ul style="list-style-type: none"> <li>- Develop database format of CPA.</li> <li>- Check the reported data from each CPAs.</li> <li>- Calculate emission reductions based on the data reported by the CPA implementers.</li> <li>- Implement data management of PoA.</li> <li>- Store and maintain records.</li> </ul>	<ul style="list-style-type: none"> <li>- Enter collected data to a computer.</li> <li>- Implement data management of CPA.</li> <li>- Store and maintain records.</li> </ul>
Reporting	<ul style="list-style-type: none"> <li>- Analyze data and compare project performances.</li> <li>- Prepare and forward monthly or annual reports.</li> </ul>	<ul style="list-style-type: none"> <li>- Report electronic data to the program coordinator.</li> </ul>
CDM training and capacity building	<ul style="list-style-type: none"> <li>- Develop and establish training program for the CPA implementers and households.</li> </ul>	<ul style="list-style-type: none"> <li>- Implement simple training for households, ensuring enabled to meet the needs of the monitoring plan.</li> </ul>

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Quality assurance and verification	<ul style="list-style-type: none"><li>- Establish and maintain quality assurance system with a view to ensuring transparency and allowing for verification.</li><li>- Prepare for, facilitate and co-ordinate verification process.</li></ul>	<ul style="list-style-type: none"><li>- Undertake regular maintenance of biogas digesters.</li><li>- On-site verifications of household questionnaire survey.</li></ul>
------------------------------------	---	---

### 3. Monitored data

The data which should be monitored are described in section E.7.1.

### 4. Data collection

Baseline emissions are calculated based on the *ex ante* survey; on the other hand project emissions and leakages are calculated based on the *ex post* survey and monitoring. Therefore, all the necessary monitoring data are to be used for project emissions and leakage calculations.

Data collection regarding households will mainly be undertaken by CPA operators. The role of program coordinator in data collection is checking the quality of the data collected by CPA operators.

Each CPA operator shall undertake an annual questionnaire or interview survey to collect data, including fuel consumptions in the baseline and the project.

#### Sample household survey

The sample household survey is conducting a questionnaire or interview survey by sampling the number of households included in a CPA. The major data in the survey includes fuel consumptions, amount of organic waste, household income, and related information of each household including name of representative and address. The sampling method is described in Annex 5.

### 5. Data management

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

Each CPA implementer shall collect data described in section E.7.1 and archive these electronically using the common template developed by the program coordinator. Data will be archived as soon as the entire/sample household survey is finished. The electronic files will be stored in hard disks as well as a hard copy printout. The electronic files and the hard copy shall be sent to the program coordinator.

The program coordinator (Grameen Shakti) will develop an appropriate electronic template for archiving all data of every CPA. After reporting data from each CPA, the program coordinator shall verify and certify the data. 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 programme coordinator will calculate emission reductions for each CPA and store the outputs in hard disks as well as hard copy printouts.

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

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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:**

Please tick the box if this information is provided at the PoA level. In this case, sections C.2. and C.3. need not be completed in this form.

Environmental analysis will be undertaken at a CPA level.

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

>>

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

Based on the findings of the survey by SNV/IDCOL, the assumed benefits from biogas are briefly discussed below<sup>10</sup>:

**Gender benefits:**

Biogas provides a direct benefit, especially for 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 an 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 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. In addition, construction of biogas plants results in better living condition due to appropriately treated solid wastes avoiding bad smells in and around the community near to landfills.

It reduces considerable amount of green house gases from two perspectives: the carbon released from burning of biomass is minimized; and the saved forest can act as 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 is one of the major risk 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.

<sup>10</sup> Implementation Plan National Domestic Biogas and Manure Programme in Bangladesh.

By Infrastructure Development Company Ltd (IDCOL) and Netherlands Development Organization (SNV)

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During the construction, some solid wastes such as stone debris, will be generated. This can be eliminated as soon as the construction is completed.

During the operation of the biogas digester and related equipments, we see almost no impacts on the environment (i.e. no air, water, or noise pollution). Desulphurisation and other safety-related equipments will be operated as specified in the operation manuals.

For collected waste other than the feedstock of the biogas digester, Grameen Shakti will collaborate with the local government for environmentally safe treatment.

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

>>

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

- (a) Green (Environmental Clearance Certificate 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 Environmental Clearance Certificate shall be issued)
- (c) Orange – B (Initial Environmental Examination (IEE) is need);
- (d) Red (Environmental Impact Assessment (EIA) is needed).

Biogas digester promotion projects were not in the list of either category that IEE or EIA will be done at a CPA level if required from municipal governments based on any local regulations. Grameen Shakti will responsible for conducting IEE or EIA to get Environmental Clearance Certificate for CPAs.

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**SECTION D. Stakeholders' comments**

>>

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

Please tick the box if this information is provided at the PoA level. In this case sections D.2. to D.4. need not be completed in this form.

Local stakeholder consultation is done at SSC-CPA level.

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

>>

To get public opinion towards the proposed project, the project owner distributed questionnaires soliciting public input. The investigation lasted for one month.

Dr. Rabbani of Grameen Shakti completed the survey of stakeholders (Faridpur city dwellers and GO/NGO officials) on 13/01/2011. All 70 stakeholders (dwellers= 30 male+20 female and GO/NGO officials=20) were each supplied with one questionnaire. The completed questionnaires have been preserved at the Grameen Shakti Office. The findings of the survey work are summarized as shown in D.3.

70 questionnaires were distributed and all of the distributed questionnaires had been returned with 100% response rate.

The questions in the questionnaires included:

- What impacts do you think the project activity will have on the local environment?
- What impacts do you think the project activity will have on employment and social welfare in the local area?
- Are there any negative impacts on your livelihood during the construction of the project?
- What would be the overall positive effects of the construction and operation of the project?
- What would be the overall negative effects of the construction and operation of the project?
- What is your attitude towards the construction of the project?
- Do you support the project? Please address if you have any questions or comments about the project.

**D.3. Summary of the comments received:**

>>

The consultation results of experts and local residents and government officials are summarized as follows.

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Table 6: Summary of Opinions of 20 Experts on Large Biogas Plant Construction in Faridpur

Questions	Answers				
	Positive impacts or Yes	Negative impacts or No	No impacts	Don't know	No comments
What impacts do you think the project activity will have on the local environment	Improve living conditions of householders nearby landfill, reduce fuel cost, maintained family health (20 person)	Nil	Nil	Nil	Nil
What impacts do you think the project activity will have on employment and social welfare in the local area	Have an employment opportunity, positive impact on social welfare (20 person)	Nil	Nil	Nil	Nil
Are there any negative impacts on your livelihood during the construction of the project? (Please address in the column of negative impacts if there are)	Nil	20 person	Nil	Nil	Nil
What would be the overall positive effects of the construction and operation of the project? (Please address in the column of positive impacts, if applicable)	Creation of new jobs, Friendly environment, wastes would converted into wealth, organic fertilizer produced, reduce afforestation (20 person)	Nil	Nil	Nil	Nil
What would be the overall negative effects of the construction and operation of the project? (Please address in the column of negative impacts, if applicable)	Nil	Bad odor could spread, local labour might be affected by different diseases (02 person)	Nil	Nil	18 person
What is your attitude towards the construction of the project?	Excellent 20 person				



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Table 7: Summary of Opinions of 50 Households (30 male and 20 female)  
on Large Biogas Plant Construction in Faridpur

Questions	Answers				
	Positive impacts or Yes	Negative impacts or No	No impacts	Don't know	No comments
What impacts do you think the project activity will have on the local environment	28 male + 19 female	Nil	Nil	02 male + 01 female	Nil
What impacts do you think the project activity will have on employment and social welfare in the local area	21 male + 10 female	Nil male + 03 female	03 male + 04 female	Nil male + 01 female	06 male + 02 female
Are there any negative impacts on your livelihood during the construction of the project? (Please address in the column of negative impacts if there are)	Nil	11 male + Nil female	18 male + 20 female	01 male + Nil female	Nil
What would be the overall positive effects of the construction and operation of the project? (Please address in the column of positive impacts, if applicable)	30 male + 20 female	Nil	Nil	Nil	Nil
What would be the overall negative effects of the construction and operation of the project? (Please address in the column of negative impacts, if applicable)	Nil	Nil	26 male + 20 female	02 male + Nil female	02 male + Nil female
What is your attitude towards the construction of the project?	Excellent 30 male +20 female				
Do you support the project? Please address if you have any questions or comments about the project	Yes (30 male +20 female) 1. Source segregation of organic and inorganic wastes would be done at household level. 2. Wastes would be carried by van. 3. Awareness raising programme would be continued. 4. Wastes should be put into digester with machine. 5. Predigestion is necessary.				
Date of completion	13.01.2011				

**D.4. Report on how due account was taken of any comments received:**

>>

The residents/households, local government officials, experts and delegates of NGO are all very supportive of the proposed project. No negative comments have been received on the project.

Regarding the questions, clarifications were given to eliminate the uncertainties held by households.

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There were some questions from the stakeholders about the availability of gases connection or supply to each of them. Some raised question about bad odor near the plant. Otherwise, everybody is interested to have such project in Faridpur city. It will open new window for supply of biogas to the city dwellers for cooking purpose.

Comments raised will be taken into account along with implementation of the project.

The environmental impact was fully considered, and proper action will be taken to minimize the negative impact to the local environment through the environmental impact assessment.

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**Annex 1**

**CONTACT INFORMATION ON ENTITY/INDIVIDUAL RESPONSIBLE FOR THE SMALL-SCALE CPA**

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Salutation:	Mr.
Last Name:	Kamal
Middle Name:	...
First Name:	Abser
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Personal E-Mail:	<a href="mailto:g_shakti@grameen.com">g_shakti@grameen.com</a>

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Represented by:	Naoki Matsuo
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Middle Name:	
First Name:	Naoki

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**Annex 2**

**INFORMATION REGARDING PUBLIC FUNDING**

There is no public fund applied for the CPA.

**Annex 3**

**BASELINE INFORMATION**

Baseline emissions are calculated *ex ante* based on sample survey to households included in a CPA and adjusted after monitoring. The following data need to be collected for each household.

- Fuel consumptions including biomass (non-renewable and renewable) and other fossil fuels.
- Amount and type of organic wastes disposed.

The results:

	Fuelwood	Other biomass	Kerosene	LPG
Weight(kg)/Month	133.4	39.6	0.5	5.3

**Annex 4**

**MONITORING INFORMATION**

Please refer to B.6.1.



**Annex 5**

**Determination of the sample of household survey**

Sample households of baseline and project household surveys are determined by the following method.

1. Calculate the sample size

The sample size  $n$  can be calculated by the following formulae for simple random sampling if the population size is known.<sup>11</sup> According to the EB decision (EB 22 report, Annex 2; EB 50 report, Annex 30) and in order to fit the Gold Standard requirement,<sup>12</sup> 90% confidence level with error margin of  $\pm 10\%$  (90/10 confidence/precision) is applied to the PoA.

Sample statistic	Population size	Sample size
Mean (1)	Known	$n = \{ z^2 * \sigma^2 * [ N / (N - 1) ] \} / \{ ME^2 + [ z^2 * \sigma^2 / (N - 1) ] \}$
Proportion (2)	Known	$n = [ ( z^2 * p * q ) + ME^2 ] / [ ME^2 + z^2 * p * q / N ]$

The sample size can either be calculated based on the variance through preliminary survey/analysis (for “Mean” (1)) or based on the default value of population portion (for “Proportion (2)”).

Example: In the case that the CPA includes 10,000 households, the sample size is 68.2 by using the formula for proportion sample statistics (2). (Even if  $N$  is set as infinity,  $n < 69$  for 90/10)

Where:

- $n$  : Sample size
- $N$  : The number of households included in a CPA
- $ME$  : Margin of error =  $\pm 10\%$
- $p$  : Population proportion (= 0.5 for a conservative estimation)
- $q$  :  $1-p$
- $z$  : Standard score (= 1.645 for confidence level = 90%)

This approach works when the sample size is relatively large (greater than or equal to 30). For proportions, the sample size requirements vary, based on the value of the proportion. Set  $p$  equal to 0.5, if the right value is unknown. This will produce a conservative sample size estimate; that is, the sample size will produce at least the precision called for and may produce better precision.

2. Choose sample households

The number of sample households determined should be chosen randomly among target households of a CPA.

<sup>11</sup> <http://stattrek.com/Lesson6/SampleSize.aspx>

<sup>12</sup>

[http://www.cdmgoldstandard.org/fileadmin/editors/files/6\\_GS\\_technical\\_docs/manuals\\_and\\_methodologies/GS\\_Methodology\\_Biodigester.pdf](http://www.cdmgoldstandard.org/fileadmin/editors/files/6_GS_technical_docs/manuals_and_methodologies/GS_Methodology_Biodigester.pdf)