**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):

Title: Vietnam National Biogas Programme
Ver.: 8.1
Date: 13/February/2012

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

1. General operating and implementing framework of PoA

The objective of the proposed small-scale CDM Programme of Activities (hereafter referred to as "the PoA") is to reduce GHG emissions from fossil fuels used by installing biogas digesters in households in Vietnam. The PoA will be coordinated and managed by the Ministry of Agriculture and Rural Development (MARD).

The MARD intends to expand the national biogas programme in several phases. The MARD initiated its national biogas programme in 2003 with support from the Government of the Netherlands, which is being implemented with technical support from SNV (Netherlands Development Organization) Viet Nam. The first phase was completed up to January 2006 with a total of 18,000 biogas units installed nationwide. In 2007 Phase II started with the aim to further up scale the programme to the whole of Viet Nam. Anticipated carbon revenues are an integral part of financing concept and the PoA will include all the units installed from 5$^{d}$ July 2007.[1]

2. Policy/measure or stated goal of the PoA

The PoA will contribute to the development of the commercial and structural deployment of domestic biogas in Vietnam in the following way. The PoA will:

- Promote the long-term utilization of biogas systems as a source of renewable energy production in an environmentally compatible and economically viable way. For this purpose the construction and operation of biogas systems will be facilitated.
- Increase the awareness of prospective livestock smallholder households and extension workers on the full extent of the potential costs and benefits of domestic biogas installations
- Strengthen the supporting human capacity regarding all aspects of marketing, construction, after sales service and quality management of domestic biogas installations
- Support the development of a commercially viable, market oriented domestic biogas sector in Vietnam
- Strengthen the institutional infrastructure for coordination and implementation of sustained dissemination of domestic biogas at national, provincial and district level.

Sustainable development covers three aspects of society: i) economic, ii) social and iii) environmental. Biogas units at household level contribute to these three aspects of sustainable development in the following ways:

[1] EB 47$^{th}$ meeting report (para 72): *The Board decides to grant an exemption to paragraph 5(d) of the "Procedures for registration of a programme of activities as a single CDM project activity and issuance of certified emission reduction for a programme of activities" to programmes of activities which have commenced validation prior to 31$^{st}$ December 2009. Therefore such programmes may include CPAs with a starting date between 22$^{nd}$ June 2007 and the commencement of validation of the PoA, if a list of such specific CPAs is provided to validating DOE and UNFCCC secretariat prior to 31$^{st}$ January 2010.*

i) Domestic biogas digesters contribute to economic development because:

- The expenses for domestic energy are significantly reduced.
- The labor required to maintain traditional energy systems (such as firewood collection) can be used in more directly economically productive ways.
- Substitution of petroleum products will reduce the country's foreign exchange demand.
- Application of bio-slurry increases the yield and reduces the need` -and expenses- for synthetic fertilizer.
- A vibrant biogas sector creates significant employment and related economic activities, particularly in rural areas.

ii) Domestic biogas digesters contribute to social development because:

- The reduction in domestic workload, particularly for women and children, increases opportunities for education and other social activities.
- Respiratory illnesses resulting from indoor air pollution and gastro-enteric diseases as a result of poor sanitary conditions reduce significantly.
- In rural areas, biogas digesters often initiate innovation (education, sanitation, agriculture).
- Increase awareness of alternative farming and animal husbandry practices and environmental impacts of behavior.

iii) Domestic biogas digesters contribute to environmental development as follows:

- Substituting conventional fuels and synthetic fertilizer, and changing traditional manure management systems, biogas installations reduce the emission of greenhouse gasses significantly.
- Bio-slurry improves soil texture, thus reducing degradation, and reduces the need for further land encroachment.
- Reduction of firewood use contributes to checking deforestation and reduces forest encroachment.
- Improved manure management practices reduce ground and surface water pollution and odor and improve aesthetics.

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

The PoA is a voluntary action by MARD. Moreover, there are currently no national or regional regulations prescribing the implementation of biogas facilities in small farm holders' households. At present such regulations are not foreseeable.

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

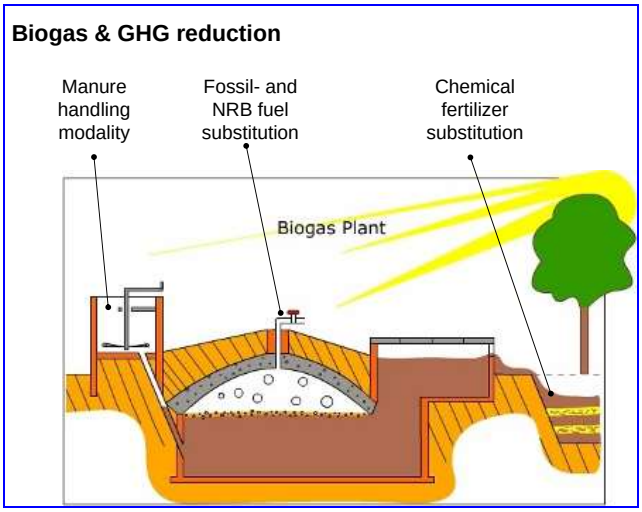
The coordinating/managing entity is Ministry of Agriculture and Rural Development (MARD). The emission reductions take place on the level of the households taking part in the PoA.

| 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 |
|---|---|---|
| Viet Nam(host) | Ministry of Agriculture and Rural Development (MARD) | No |

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

The PoA is supporting the installment of biogas units in households with livestock (cattle, buffalos or pigs). In this way the manure management type is improved leading to less GHG emissions and improved hygienic and environmental living conditions. The installed biogas units are of fixed dome type. The produced biogas is used to replace conventional fuels like coal, LPG and kerosene for cooking. The households who are in possession of only two cows or seven pigs can reach their daily need of energy for cooking from the biogas unit. Apart from biogas, the slurry produced from the digestion process can replace fertilizers.

The installed biogas units contribute to the reduction of GHG in 3 ways: 1) the manure management system which entails less methane emissions is introduced; 2) the produced biogas replaces conventional fossil fuels; and 3) the produced slurry replaces chemical fertilizer. However, due to the lack of data and for the simplification reasons, the emission reductions from reduced consumption of agricultural residues, from manure management and from the fertilizer substitution will not be accounted for under this PoA, which is very conservative.



### A.4.1. Location of the programme of activities:

#### A.4.1.1. Host Party(ies):

Viet Nam

#### A.4.1.2. Physical/ Geographical boundary:

Biogas plants are installed in the backyards of the participating households, the aggregate of these units encompasses the project boundary. As these units can be installed anywhere in Vietnam, the programme, boundary is the geographical boundary of the PoA is Vietnam of all units installed since installed since 05 July 2007.


**Figure 1: Map of Vietnam**

Latitude of Vietnam: 16º00´ North of the Equator
Longitude of Vietnam: 106º00´ East of Greenwich

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

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

The project involves the installation and implementation of model types KT1 and KT2 (model A and B) domestic biogas installationsor a different type of biogas plant provided that these are approved by MARD[2] and are equal to or less than 25$m^3$ of installed capacity.

[2] Provided that the model is approved by MARD and included in the MARD biogas standard.

.Each domestic biogas installation will include a biogas stove for cooking that is available at local markets.

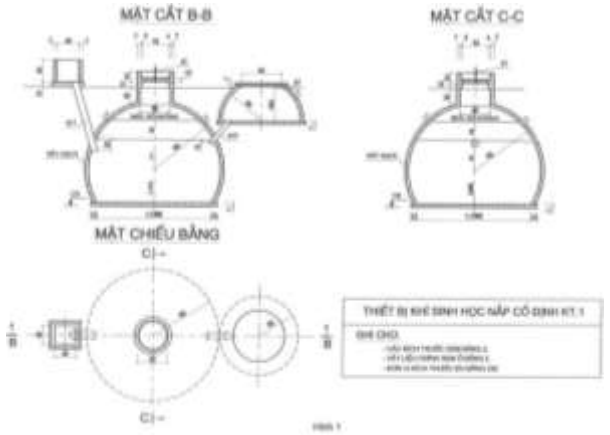
The KT1, KT2 (A and B) and other models of biogas plants have been developed after 1990s in Vietnam. Development is done by the Institute of Energy as well as others based on earlier Chinese and German design. Design, construction and fitting has been standardized in MARD's "standards for small size biogas plants # 10 TCN 497 – 2005 –- Part 6".

The hemi-spherical fixed dome plants are made on-site, entirely out of brick work. The materials required for construction, including bricks, cement, iron bars, fitting materials etc. are all locally manufactured. Basic appliances, which are also widely available, consist of gas pipe, main valves, stoves and gas lamps. Upon the requirement of the households, biogas plants range in digester size from $4m^3$ to 25 $m^3$ with a current average size of $8m^3$ to $10m^3$.

Both designs need a fair amount of construction skills, but have otherwise proven to be robust and virtually maintenance-free. With feeding of on-farm produced manure of pigs, cattle or buffalo to the digester, biogas will be produced to meet the energy demand of the household. The residue of the digestion process can be used as organic fertilizer.

**The KT1 model** is a further development of the model NL.5 of the Institute of Energy and has been accepted widely in the programme. The KT1 digester implemented in this PoA has a maximum volume of 25 $m^3$.

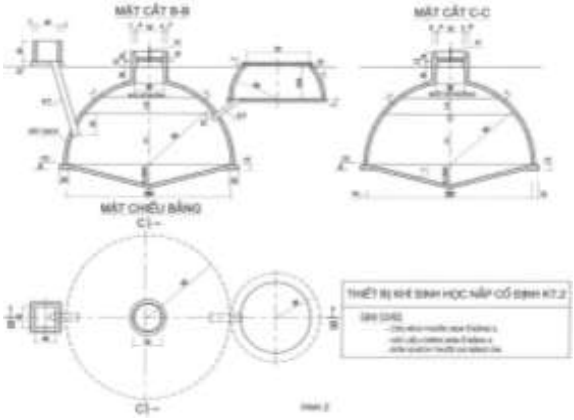
**KT.1 Domestic biogas design**




**The KT2 model** follows the TG-BP design as applied in the Mekong Delta by the Can Tho University. Similar to KT1, the KT2 digester implemented in this PoA has a maximum digester volume of 25 $m^3$. There are two models of KT2 built, KT2A and KT2B. KT2B is a modified version of KT2A, and currently the only model promoted by the programme[3]

[3] Denoted as KT2 model in the database

**KT.2 Domestic biogas design**



Although the KT1 model optimizes material economy best, it needs deeper excavation. For areas with a high water table or rocky ground, the KT2 is then better suited. For both models, design variations allow for the type of manure (pig and cattle/buffalo), the dilution ratios of water and manure (1/1, 2/1 and 3/1) and the specific climatic conditions (the North with a cold winter and the South with a warm winter).Over 100 different design variations have been developed based on climate zone and type of animal.

Key technical parameters of the applied technology will be made available of the technologies applied at CPA level in the CPA-DD.

The project involves energy production from biogas of the Type I.C. "Thermal energy production with or without electricity" (version 18). The project thus falls under sectoral scope 1.

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

The eligibility criteria for a CPA to be included in the PoA are:

1. A new CPA shall have a clearly identified geographical boundary including a time-induced boundary consistent with the geographical boundary of Viet Nam
2. Each biogas unit installed in a CPA shall have an unique identification number
3. A new CPA will install biogas technologies (such as KT1 and KT2 or equivalent) that are recognized in the MARD national biogas standard with a maximum digester volume of 25 $m^3$
4. Each biogas units installed will be inspected on compliance with the national standard before commissioning to the household
5. The starting date of a new CPA is identified as the application date of the first household that has built a biogas plant.
6. A new CPA shall meet the eligibility criteria listed in paragraph 1 to 11 of AMS-I.C version 18 and paragraph 1 to 4 of AMS-I.I version 2.
7. A new CPA shall meet the additionality criteria listed in section A.4.3 of the PoA-DD and the debundling check in A.4.4.1 of the PoA-DD.
8. A new CPA shall affirm that funding from Annex I parties, if any, does not lead to a diversion of Official Development Assistance (ODA) by supplying a non-ODA diversion declaration.
9. A new CPA will only install a biogas unit in household that do not have a biogas plant, have livestock and use partially fossil fuels for cooking

10. A new CPA will execute a monitoring survey according to monitoring methodology and sampling plan as described in section A.4.4.2 of this PoA-DD
11. The biogas units installed under a CPA will be approved and registered under the national biogas programme of MARD.
12. The biogas units under a CPA are to be constructed by the biogas construction teams trained and licensed by MARD.
13. Households that participate in the CPA have transferred their CER rights to the CME in return for after sales services and support.

A new CPA is exempt from conducting an Environmental Impact Analysis and a local stakeholder consultation (LSC) because these activities are executed at PoA level. See section C and D for a description of the EIA and the LSC at PoA level.

Procedure on the CPA eligibility check is described in section A.4.4.1

The maximum number of households within one CPA is calculated in three steps:

STEP 1: Calculation of the specific biogas production ($m^3$/ $m^3$)

*Table 2: Values for estimation of biogas plant capacity*

| Item | Value | Unit |
|---|---|---|
| Average biogas production of a 9.6 $m^3$ biogas plant | 1,32[4] | $m^3$/hh/day |
| Average digester volume[4] | 9.6 | $m^3$ |

The specific biogas production is 1.32/9.6 = 136.8 liter biogas per cubic meter digester volume of the average digester.

STEP 2: Calculation of specific thermal output (kW/ $m^3$)

*Table 3: Values for estimate specific thermal energy capacity*

| Item | Value | Unit | Source |
|---|---|---|---|
| Methane content in biogas | 60 | % | AMS-III.D default value |
| Methane density | 0.67 | kg/ $m^3$ | |
| Methane energy density | 55.65 | MJ/kg | IPCC 2006 volume 4 chapter 10 |
| Biogas stove efficiency | 39[5] | % | |
| Average operating hours of biogas stove | 3.3 | h/hh/day | BUS 2006 |

The specific thermal output is calculated with the following equation.

Specific thermal capacity = Specific biogas production x Methane density x methane content of biogas x Energy density of methane x Biogas stove efficiency / Average operating hours of biogas

[4] Biogas User Survey (BUS) 2006

[5] SNV (2009) Popular Summary of the Test Reports on Biogas Stoves and Lamps prepared by testing institutes in China, India and the Netherlands

stove

| |
|---|
| Specific generation capacity =0.136,8 x 0.67 kg/ $m^3$ x 60% x 55.65 MJ / $m^3$ /3.6 (1MWh/3,600 MJ) x 0.39 / 3.3 = 0.0997 kW/ $m^3$ |

STEP 3: Calculation tot the maximum digester volume in order to remain below the threshold:

The number of households in one CPA in order to stay under the threshold of 45 $MW_{thermal}$ will be:

| |
|---|
| 45,000 kW / 0.0997 kW/ $m^3$ = 451,251.8 $m^3$ |

The cumulative digester volume is simplified to 450,000 $m^3$, which is conservative. For example, if a CPA installs biogas units with an average volume of 15 $m^3$, the maximum bundle size would be 450,000/15 = 30,000 units.

A micro scale CPA, with a threshold of 15$MW_{thermal}$ will consequently have a maximum size of (15/45*450,000) = 150,000 $m^3$ and can if for instance the average biogas unit volume is 15 $m^3$ install only around (150,000/15) 10,000 units

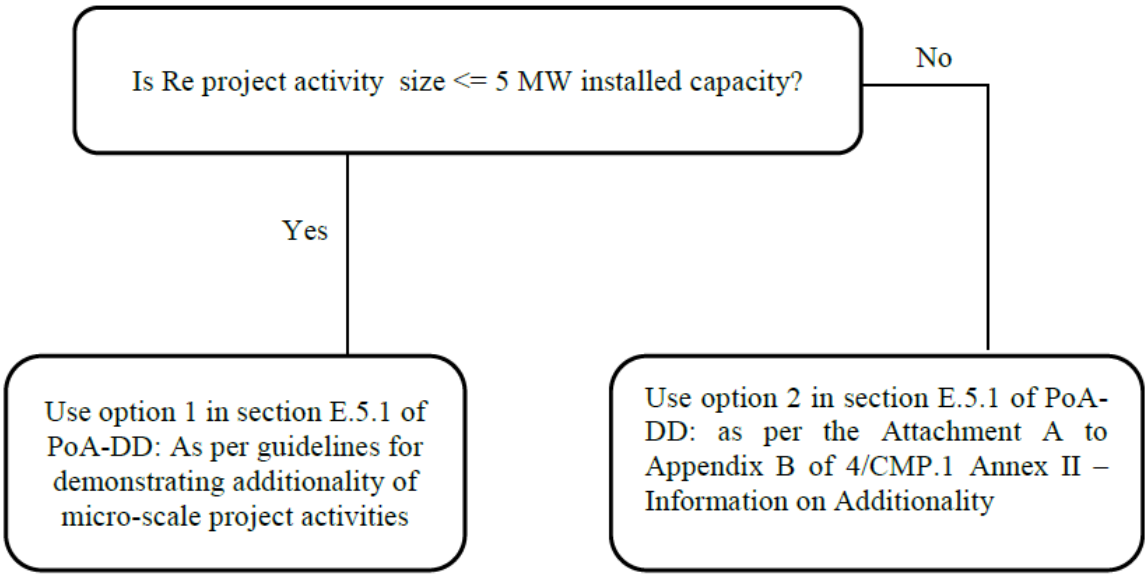
**A.4.3. Description of how the anthropogenic emissions of GHG by sources are reduced by a SSC-CPA below those that would have occurred in the absence of the registered PoA (assessment and demonstration of additionality):**

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

MARD coordinates the identification, facilitation and construction of biogas facilities under the PoA. Consequently the PoA has to be considered as coordinated activity. Moreover, there are currently no national or regional regulations prescribing the implementation of biogas facilities in small farm holders' households. At present such regulations are not foreseeable. Thus it is concluded that the PoA is a voluntary and coordinated action.

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

As per paragraph 73 of the 47th EB meeting report "additionality" is to be demonstrated either at the PoA level or at CPA level". The project participants choose to demonstrate additionality at the CPA level. The decision tree below need to be used for deciding on the option for demonstration of additionality:




I. **Demonstration of additionality for projects having less than 5 MW (or 15 MW thermal) installed capacity**

As per the paragraph 2 of the "Guidelines for demonstrating additionality of Micro-scale project activities" EB 63 (version 3), project activities up to 5 megawatts (or 15 MW thermal) that employ renewable energy as their primary technology are additional if any one of the conditions are satisfied with. The proposed PoA meets condition 2c, which states:

The project activity is designed for distributed energy generation (not connected to a national or regional grid) with both condition (i) and (ii) satisfied

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

Condition I is met, because the largest installed biogas unit has a capacity lower than 1500 kW. The largest installed biogas units has a volume of 25 $m^3$ and at a calculated specific biogas output of 0.0997 kW/ $m^3$ digester volume the thermal capacity of the largest biogas unit is 2.49 kW[6].

Condition II is met because biogas units will only be installed at small farm households as listed in the eligibility criteria (section A.4.2.2).

II. **Demonstration of additionality for projects having more than 15 MW thermal installed capacity**

Further for CPAs in the capacity range of greater than 5 -and up to 15MW (15 – to 45 MW thermal), the project proponent will follow the current SSC guidelines as per the Attachment A to Appendix B of 4/CMP.1 Annex II – Information on Additionality.

[6] See A.4.2.2 for the calculations

According to Attachment A to Appendix B, project participants shall provide an explanation to show that the project activity would not have occurred anyway due to at least one of the following barriers:

a) Investment barrier: a financially more viable alternative to the project activity would have led to higher emissions;

b) Technological barrier: a less technologically advanced alternative to the project activity involves lower risks due to the performance uncertainty or low market share of the new technology adopted for the project activity and so would have led to higher emissions;

c) Barrier due to prevailing practice: prevailing practice or existing regulatory or policy requirements would have led to implementation of a technology with higher emissions;

d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limited information, managerial resources, organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

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

MARD coordinates the identification, facilitation and construction of biogas facilities under the PoA. Consequently the PoA has to be considered as coordinated activity. Moreover, there are currently no national or regional regulations prescribing the implementation of biogas facilities in small farm holders' households. At present such regulations are not foreseeable. Thus it is concluded that the PoA is a voluntary and coordinated action.

***(ii) The PoA is implementing a voluntary coordinated action which would not be implemented in the absence of the PoA.***

Where appropriate the additionality assessment is conducted at two separate levels, i.e. the additionality of the Phase 2 Biogas Programme as a programme, and the additionality of the biogas facilities at household level.

**(a) Investment barriers**

**Investment barrier at the level of the national programme**

*Attracting commercial investments.* The PoA is the national programme to support the dissemination of biogas facilities managed by public entities. It is not designed to attract commercial investment for the generation of revenues.

*Attracting public funding.* The national biogas programme is financed by small farm households contributions and by public funding. To assess the investment barrier of the national biogas programme with regard to public funding, the financing history of the overall programme is briefly outlined.

The national biogas programme started its phase 1 programme (2003-2005) with support from the Government of Netherlands. The phase 1 programme implemented 18,000 biogas facilities in the years 2003 to 2005. With considerable success of the phase 1 programme, the MARD decided to expand the programme.

From 2007, the MARD, with support from the Government of Netherlands, has prepared the phase 2 programme, aiming at the installation of 140,000 biogas facilities in 58 provinces of Vietnam. At the start of the phase 2 programme, the MARD pursued financing options via the Clean Development Mechanism (CDM) in order to alleviate the investment barrier. The carbon revenues were considered as an integral and crucial mean for ensuring the project's financial viability. Without the structuring of carbon revenues, the project cannot reach its goals. The MARD and the Government of the Netherlands confirm that a) the funding without carbon revenues is not sufficient to implement the phase 2 programme, and b) the CDM is considered to be an integral component of the phase 2 programme.

**Investment barrier for biogas facilities at household level**

Households willing to install a biogas plant face an investment barrier due to the high upfront investment of biogas facilities.

***Table 4: Biogas Investment Costs***

| Item | Value | Source |
|---|---|---|
| Average Costs in million VND/ $m^3$ | 0.95 | BUS 2009 |
| Average size of the biogas unit in $m^3$ | 11.81 | Biogas database[7] |
| Total Average Costs in million VND/facility | 11.22 | calculated |
| Average Support Costs in million VND/facility | 1.98 | MARD |
| Total Average Costs (including support) in million VND/facility | 13.20 | Calculated |

The implementation of a biogas facility involves significant investment costs at the time of construction. The average costs of a biogas digester per $m^3$ installed capacity amount to 0.95 million VND. The average size of a biogas facility comprises 11.81 $m^3$. Thus, the total costs of an average facility amount to 11.22 million VND comprising material, labor and biogas appliances (i.e. cooking devices and biogas lamps).

This is complemented by costs arising from support activities. The support comprises

- Workshops where farm holders are informed on the opportunities of biogas facilities,
- Facilitation of the construction of biogas facilities ensuring the application of resilient materials and biogas techniques,
- 12 months guarantee on the biogas facility,
- Training in the sound operation of biogas facilities;

Above services, summarized as support, are crucial to the success of the national biogas programme and inherently connected to the implementation of biogas techniques. The costs of support amount to approx. 20% of a facility's investment cost. The average support costs amount to 1.98 million VND resulting in an average total costs of 13.20 million VND per facility.

This is a significant amount for a small farm holder. The BUS study of 2009 revealed that the average per capita income of the targeted households is 11.9 million VND[8]. Thus biogas investment costs

[7] Average digester size at time of PoA development v1 (based on units installed between 2007 and 2009)

[8] Biogas User Survey (BUS) 2009 page 34

make up more than 100% of the average annual income. This poses a significant barrier to the implementation of biogas facilities.

**(b) Technological barrier**

Biogas digesters were first introduced to Vietnam more than a decade ago. However, to date, the dissemination level remains low. This is due not only to the investment barriers elaborated above, but also due to the suspicion many farmers have towards the biogas digester system. Although the Project's digesters have been proven to work, it has been common in the past for fly-by-night "technology providers" to sell unreliable digesters, at the huge expense of the unsuspecting farmers. The Project thus faces an uphill battle in promoting the biogas technology. In the absence of a proper quality control programme, adequately trained and certified masons, suppliers of biogas plants would compete solely on price. Users cannot determine the quality of biogas units. Thus without the proposed PoA CDM activity, biogas constructors would have an incentive to save on costs and provide poor quality systems.

The MARD national biogas programme provides quality control on all plants constructed under the programme. The carbon revenues will support the quality control and the construction standard. Without the carbon revenues the programme objective of establishing a viable commercial biogas sector would probably fail and the planned target would not be achieved. It is also evident that in the absence of the project activity the households would continue to use conventional fossil fuels and to dispose the manure in the conventional ways. The Project thus faces an uphill battle in promoting the biogas technology.

**(c) Barriers due to prevailing practice**

Current practice in households in Vietnam is to burn fossil fuels and agricultural residue for cooking. The households with higher living standard also cook on electricity; however, these households are neither the target group nor the programme participants. In order to change the prevailing practice it is necessary to implement the programme to coordinate biogas units installation on a wide scale and offer subsidy and support to encourage households to participate.

***Prior consideration of CDM:***

The second phase of the MARD national biogas programme has started since 2007. Already at the time of the programme planning it was clear that the programme goals could only be achieved with carbon financing. This is why MARD developed a PIN for a CDM project and received a Letter of Endorsement from the Vietnamese DNA in 2006. In 2007 it was decided that the programmatic approach is more suitable, but the project documentation was developed only after the simplification of the PoA procedures in 2009. The project documentation was also delayed due to the lack of clarity on methodologies especially for substituting non-renewable agricultural residues.

*Table 5: Timetable of programme activities related to CDM*

| Programme Activity | Year |
|---|---|
| PIN Development and Reception of Letter of Endorsement (LoE) from Vietnam DNA | 2006 |
| PDD Development by Mitsubishi Securities UFJ as bundle CDM project with credit period start date 1-10-2006 | 2006- 2007 |
| Approval on the Biogas Programme phase 2 by MARD with consideration of CDM revenue in financing mechanism[9] | October 12th, 2006 |
| Beginning of the Biogas Programme phase 2 | 2007 |
| Baseline development and GS PDD development by SNV (Felix ter Heegde) (draft PDD developed: Nov 2008, start date crediting period 1-1-2008 | January 2008 |
| Discussions between MARD and Asia Pacific Carbon Fund on selling CERs | February 2008 |
| Approval on the QSEAP-BDP by MARD, with consideration of CDM revenue in financing mechanism | 20 November 2008 |
| PoA methodology development and project documentation by GFA Envest | 24-3-2009 to September 2009 |
| Submission to UNFCCC EB for public comment | December 30th, 2009 |

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

Not applicable since there is no mandatory policy/regulation.

***(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 since there is no mandatory policy/regulation.

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

### A.4.4.1. Operational and management plan:

***A. Definition of roles and responsibilities of personnel involved in the process of inclusion of CPAs, including a review of competencies.***

CPA inclusion will be reviewed by the CME director and will be assisted by the director of the Department of Livestock. Both persons will have followed a CDM course before the review of CPA inclusion.

***B. A record keeping system for each CPA under the PoA***

The operational and management plan is based on and integrated in the project quality control system developed by MARD. Each of the biogas plants constructed under the national biogas programme has to be accepted after the construction by the District Biogas Technician (DBT). All of the households constructing biogas plants are visited and biogas plants are checked for construction standard and proper functioning. The training for DBT includes the acceptance check procedures and filling-out the acceptance form developed by the national biogas

[9] Feasibility Report of the Biogas Programme for Vietnam Livestock Production period 2007-2010, Hanoi, September 2006 (CAR03-a from page 4)

programme. Section E.7.2. elaborates on the quality control systems and record keeping system.

The subsidy is sent to the biogas owner via post only after the biogas unit has been accepted and registered under the national biogas programme with a unique registration number.

A separate database will be organized for each of the CPAs, which will be available up until 2 years after the last crediting period. At the moment of the biogas unit registration, it will be added to the CPA which is under development. When the number of the households in a CPA reaches the size limit, the CPA-DD will be sent to validation and a new CPA database will be formed.

### *C. Procedures for technical review of inclusion of CPAs*

The inclusion of a new CPA will be reviewed by personal at director level in the CME and assisted by MARD director of livestock department, the inclusion procedure will consist of the following steps:

a. Screening of the CPA against the eligibility criteria as put down in the PoA-DD
b. Check with UNFCCC registry to ensure that the CPA is not included in another CDM project
c. Check with the PoA database to ascertain that the CPA biogas units are not included in a another CPA
d. Selecting and contracting a DOE for desk review of the CPA eligibility.

### *D. A system/procedure to avoid double accounting*

Each of the units accepted after commissioning is registered in the MARD database under the unique registration number. The MARD database stores these data for all the units installed. Each CPA under the PoA will have an individual database with the following information, but not limited to:

- Name and ID number of the head of households where biogas units were installed under the CPA;
- Unique plant ID code (PPP/DDD/CCC/xxx); (Province code, District code, Commune code/number).
- Date of commissioning;

All biogas plants registered in one CPA will be uniquely defined and recorded, thus each CPA is uniquely identified. The MARD will ensure that any biogas units in a new CPA have neither already been registered as a CDM project, nor as a CPA of another PoA. by checking the UNFCCC CDM registry.

### *E. Measures for continuous improvement of the PoA management system*

An annual meeting will be organized with all the CPA participants to evaluate the performance of the last year and to develop plans for the next year including measures to improve the performance. Minutes of this meeting will be made available for each verification.

### *F. The SSC-CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.*

Based on Guidance for Determining the occurrence of de-bundling under a Programme of Activities (PoA) the CPA of PoA is exempted from performing de-bundling check in case each of the independent biogas digesters included in the CPA of a POA is no greater than 1% of the small scale thresholds defined by the methodology applied, namely 150 kW electric or 450 kW thermal energy installed. The maximum digester size eligible for the CPA inclusion is 25 $m^3$. The specific thermal output is 0.0997 kW/ $m^3$ (see A4.2.2); therefore, the thermal capacity is for the largest digester 25 x 0.0997 = 2.49 kW, which is much less than 1% of the SSC threshold of 450 kW thermal. Therefore the CPA of this PoA are exempted from performing the de-bundling check i.e. considered as being not de-bundled component of a large scale activity.

***G. The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA;***

The biogas units within each CPA under the PoA are participants of the MARD biogas programme. The MARD is the sole coordinating entity of the PoA and also implementer of all CPAs under the PoA.

**A.4.4.2. Monitoring plan:**

(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.

Not applicable since the coordinating/managing entity opts for a verification method that does not use sampling.

(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;

Ensuring that SSC-CPAs within the proposed PoA do not overlap geographically will prevent double counting of emission reductions. The MARD will verify each CPA individually. A database will be set up by the MARD for each CPA of a PoA. The database for each CPA is based on the standard data monitoring and includes the information on geographic location, name of the owner and the CDM status for each CPA under the PoA to ensure no double counting. The CPA monitoring plan is described hereunder.

**CPA monitoring plan**

The SSC WG declared that household biogas projects may use the monitoring procedures of AMS-I.I (SSC WG 34)[10]. Both the baseline and project emissions shall be determined by estimating the remaining fossil fuel consumption ex-post using survey methods. The emission reductions will then be estimated by subtracting the projects emissions from the baseline emissions.

Fuel consumption data of the baseline and project case will be collected through surveys organized by MARD and consist of the following steps:

[10] http://cdm.unfccc.int/UserManagement/FileStorage/7SWAZIE8F4YDT3BCV96KN2HLUJ5G01

1. The annual fuel consumption of the baseline fossil fuel is determined by applying option B of paragraph 10 of AMS-I.I version 2 according to the sampling requirement of 10A option I. A baseline control group of users not supplied with the project equipment shall be set up for each CPA. Relevant parameters of influence pertaining to the project region shall be defined and the control group shall be set up, taking into account these parameters (e.g. average income level, household occupancy, food or heating habits, climate/temperature zone, availability, price and type of fuel used). Fossil fuel consumption of the control group is monitored throughout the crediting period.
2. Continued use from fossil fuel consumption will be collected via survey in a sample of each CPA according to the option (i) of paragraph 10 (a) as described in paragraph 11 of AMS-I.I version 2
3. Emission reductions will only be applied to systems that are demonstrated to be operational. Based on the share of non-operational and operational units, the performance ratio will be determined. The operation check will be included in the monitoring survey as described in number 2.

Consequently, two surveys are executed for each CPA, the Control Group Survey (CGS) for point 1 above (A) and the Project Performance Survey (PPS) for point 2 and 3 above (B). The sampling plan (sample design, data and implementation) both surveys are described hereunder:

## A. Control Group Survey: Baseline monitoring of the control group

### 1. Sample design

| # | Item | Description |
|---|---|---|
| i | Objectives and Reliability Requirements | The objective is to obtain unbiased and reliable estimates of the baseline parameters described in section E.7.1 and table 1 of AMS-I.I version 2, since they will be used in the calculation of baseline emissions from fossil fuel use. The sampling will be executed according to paragraph 10a of AMS-I.I version 2, and will have a confidence/precision interval of at least 90/10. |
| ii | Target Population | Target population are the households without the project equipment that use fossil fuels for cooking and have the same characteristics as the project participants, taking into account these parameters (e.g. average income level, household occupancy, food or heating habits, climate/temperature zone, availability, price and type of fuel used). As many of these characteristics are not known ex-ante (a national database does not exist with data of each household), the target population size for the calculation of the sample size is simplified to all households with the technical potential for biogas in the CPA project area. The technical potential is identified as households that have daily at least 25 kilogram animal manure at their disposal (at least 2 bovines or 7 pigs). This method will yield a higher target population size and therefore sample size (a larger sample size will increase precision and reliability) |
| iii | Sampling method | Multi Stage sampling. The primary sampling units are the villages in a CPA and the second sampling units are the households, both identified according to the following method:<br>1. A list of all villages included in the CPA is drafted; from that list randomly a number of villages is selected with a confidence/precision interval of at least 90/10.<br>2. Subsequently, from the population of selected villages, a |

| | | |
|---|---|---|
| | | number of households are randomly selected with a confidence/precision interval of at least 90/10.<br>3. In the villages with selected households, the households that match the description of the target population will be identified with help of the village head. |
| iii | Sample size | The minimum sample size will be calculated according to the next equation[11]<br>$$n = \frac{N}{1 + N(e)^2}$$<br>Where:<br><br>n: minimal sample size<br>e: level of precision (10%)<br>N: the CPA population<br><br>The equation assumes a confidence level of 95%[13] which is higher than required for annual sampling (90%), this is conservative.<br><br>For example, if the baseline population from which a sample will be drawn are 100,000 households. The minimum sample size is consequently<br><br>$100{,}000/(1+(100{,}000 * 10\%\text{^}2)) = 100\ households$<br><br>It is good practice to employ oversampling at the design stage, not only to compensate for any attrition, outliers or non-response associated with the sample, but also to prevent a situation at the analysis stage where the required reliability is not achieved and additional sampling efforts would be required. Furthermore, oversampling is necessary to account for households that leave the control group, i.e. households will be removed from the control group at the moment they install a biogas plant (see definition of target population)<br><br>Oversampling with 20% or more will be employed, hence, the minimum sample size for the annual sample will be 100+20%*100 = 120.<br><br>Sampling will be done once for each crediting period, the same group will be used for the whole crediting period. |
| iv | Sampling frame | The sampling frame is a random selection of households that belong to the target population |

## 2. Data

| # | Item | Description |
|---|---|---|
| i | Field measurements | The survey will consist of a household visit with the objective to collect reliable and unbiased baseline fuel data. The baseline data |

[11] http://edis.ifas.ufl.edu/pd006 and Yamane, Taro. 1967. *Statistics, An Introductory Analysis*, 2nd Ed., New York: Harper and Row.

| | | |
|---|---|---|
| | | will be collected using interview methods, the interviewee will be either the head of the household or the wife of the head of household. Ensured is that seasonal pattern of fuel use of the thermal application is captured by collecting data about fuel consumption for each season, as per paragraph 10 A option I of AMS-I.I version 2. The results will be scaled up to the whole year. |
| ii | Quality Assurance/Quality Control | Several mechanisms will be put into place to avoid non-sampling errors (bias) and to obtain reliable date for each parameters:<br>• Good Questionnaire Design<br>The survey questionnaire will be developed and tested under real life conditions (pilot testing: taken to the field and tested with farmers as interviewees). The outcome of that testing will result in an improved questionnaire and will only be used after inspection of the CME.<br>• Data collection preparation<br>Data collection will be commencing only after a work plan is developed. Once this work plan is approved by the CPA implementers data collection can commence.<br>• Fuel data collection<br>Data will be collected for each season as per paragraph 10 A option I of AMS-I.I version 2 to ensure that seasonal pattern of fuel use of the thermal application is captured. Data on annual fuel consumption will be cross-checked with purchase receipts. When fossil fuel receipts are not available, the household will show the fuel consumption in volume for the consumption over the recent period of time; calibrated weighing scale will be used by the surveyor to measure the fuel consumption reliably. The scales will be calibrated as per national standards or manufacturer's requirement; The calibration procedure will be included in the monitoring report after actual monitoring.<br>• Cross checking<br>A random selection of 10% of the surveyed households will be called by telephone by other MARD staff. In case no telephone number is available, the household will be interviewed in person. All data collected during the survey will be cross checked with the respondent during the telephone call or household visit.<br>• Reporting<br>The party involved in data collection shall submit a draft report, which will be inspected by the CME and invited relevant independent experts[12]. In a workshop the results will be discussed between the party, CME and the relevant |

[12] *Relevant experts are professionals working in the field of rural energy, biogas and or agriculture.*

| | | |
|---|---|---|
| | | experts. Based on the outcome of the workshop and comments of the CME and relevant experts, a final report will be written which will be integrated into the monitoring report. The monitoring report is subject to inspection by a contracted DOE.<br>• Data entry and cross checking<br>Data will be entered by trained MARD personal. All data entered will be cross-checked by other MARD staff to ensure that the data is entered in a reliable fashion. |
| iii | Procedures for Administering Data Collection and Minimizing Non-Sampling Errors | The survey team will interview a random selected control household and answers will be recorded in a questionnaire, in case of non-response the surveyor will proceed to the next household in the list of control group households. The surveyor will document the out-of population cases, refusals and other sources of non-response. Also, the surveyor will only interview informed interviewees, i.e. interviewees with knowledge on cooking and the biogas plant.<br><br>The original questionnaire used in monitoring period *y* will be made available for inspection by DOE for the respective verification period *y*. |
| iv | Storage | All survey records and forms will be stored by MARD and available for up to 2 years after the last crediting period |

**3. Implementation**

| # | Item | Description |
|---|---|---|
| i | Implementation | The sampling effort will be executed after the closing of a monitoring period, i.e. if the monitoring period is from year x to year x+1, the monitoring effort will take place after year x+1 but before year x+2 to ensure that monitoring takes place soon after the closing of a monitoring period. Persons involved will have the following qualifications and experience:<br>• Surveyors: Person that has is trained by the survey team leader and has joined the pilot testing of the questionnaire.<br>• Survey team leader: Experience person and has been involved in at least 2 other surveys<br>• Monitoring report author: Experienced person with CDM knowledge<br>• Expert reviewer: Rural agronomist, biogas technician, technical advisors to the project or related<br>• Draft report commenters: CME director, project coordinators of the CPA implementation agencies, technical advisors to the programs. |

**B. Project Performance Survey**

**1. Sampling Design**

| # | Item | Description |
|---|---|---|
| i | Objectives and Reliability Requirements | The objective is to obtain unbiased and reliable estimates of the monitoring parameters described in section E.7.1 and table 1 of AMS-I.I version 2, since they will be used in the calculation of greenhouse gas emission reductions and the annual performance ratio. The sampling will be executed according to the option (i) of paragraph 10 (a) as described in paragraph 11 of AMS-I.I version 2 and will have a confidence/precision interval of at least 90/10. The performance ratio will be executed according to paragraph 17, and will have a confidence/precision interval of at least 90/10 as well. |
| ii | Target Population | The target population are the households that participate in the CPA |
| iii | Sampling method | Simple random sampling |
| iii | Sample size | A unit is a household with a biogas plant. The minimum sample size will be calculated according to the next equation[13]<br>$$n = \frac{N}{1 + N(e)^2}$$<br>Where:<br><br>n: minimal sample size<br>e: level of precision (10%)<br>N: the CPA population<br><br>The equation assumes a confidence level of 95%[13] which is higher than required for annual sampling (90%), this is conservative.<br><br>For example, if a CPA size is 30,000 households. The minimum sample size is consequently<br><br>$30{,}000/(1 + (30{,}000 * 10\%\text{^}2)) = 99\ households$<br><br>It is good practice to employ oversampling at the design stage, not only to compensate for any attrition, outliers or non-response associated with the sample, but also to prevent a situation at the analysis stage where the required reliability is not achieved and additional sampling efforts would be required.<br><br>An oversampling of 20% will be employed, hence, the minimum sample size for the annual sample will be 99+20%*99 = 119 |
| iv | Sampling frame | The sampling frame will be drawn from the CPA database of each CPA; all households in the sampling frame represent the target population. Target population membership is recorded in the CPA database and uniquely identifiable based on the ID code of the biogas plant |

**2. Data**

| # | Item | Description |
|---|---|---|

[13] http://edis.ifas.ufl.edu/pd006 and Yamane, Taro. 1967. *Statistics, An Introductory Analysis*, 2nd Ed., New York: Harper and Row.

| | | |
|---|---|---|
| i | Field measurements | The survey will consist of a household visit with the objective to collect reliable and unbiased data described in section E.7.1. Data will be collected using interview methods, the interviewee will be either the head of the household or the wife of the head of household. The results will be scaled up to the whole year. Ensured is that seasonal pattern of fuel use of the thermal application is captured by collecting data about fuel consumption for each season, as per paragraph 10 A option I of AMS-I.I version 2. The results will be scaled up to the whole year. |
| ii | Quality Assurance/Quality Control | Several mechanisms will be put into place to avoid non-sampling errors (bias) and to obtain reliable date for each parameters:<br>• Good Questionnaire Design<br>The survey questionnaire will be developed by the party that executed the survey and the questionnaire will be tested under real life conditions (pilot testing: taken to the field and tested with farmers). The outcome of that testing will result in an improved questionnaire and will only be used after inspection of the CME.<br>• Data collection preparation<br>Before the party that executes the survey starts with data collection, the party will first develop a work plan in an inception report. Once the work plan is approved the party can commence with data collection.<br>• Fuel data collection<br>Data will be collected for each season as per paragraph 10 A option I of AMS-I.I version 2 to ensure that seasonal pattern of fuel use of the thermal application is captured. Data on annual fuel consumption will be cross-checked with purchase receipts. When fossil fuel receipts are not available, the household will show the fuel consumption in volume for the consumption over the recent period of time; calibrated weighing scale will be used by the surveyor to measure the fuel consumption reliably. The scales will be calibrated as per national standards or manufacturer's requirement; The calibration procedure will be included in the monitoring report after actual monitoring.<br>• Cross checking<br>• A random selection of 10% of the surveyed households will be called by telephone by other MARD staff. In case no telephone number is available, the household will be interviewed in person. All data collected during the survey will be cross checked with the respondent during the telephone call or household visit.<br>• Reporting<br>The party shall submit a draft report, which will be |

| | | |
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| | | inspected by the CME and invited relevant independent experts[14]. In a workshop the results will be discussed between the party, CME and the relevant experts. Based on the outcome of the workshop and comments of the CME and relevant experts, a final report will be written. The final monitoring report is subsequently inspected by a contracted DOE.<br>• Data entry and cross checking<br>Data will be entered by trained MARD personal. All data entered will be cross-checked by other MARD staff to ensure that the data is entered in a reliable fashion. |
| iii | Procedures for Administering Data Collection and Minimizing Non-Sampling Errors | The survey team will interview a random selected control household and answers will be recorded in a questionnaire, in case of non-response the surveyor will proceed to the next household in the list of control group households. The surveyor will document the out-of population cases, refusals and other sources of non-response. Also, the surveyor will only interview informed interviewees, i.e. interviewees with knowledge on cooking and the biogas plant.<br><br>The original questionnaire used in monitoring period *y* will be made available for inspection by DOE for the respective verification period *y*. |
| iv | Storage | All survey records and forms will be stored by MARD and available for up to 2 years after the last crediting period |

## 3. Implementation

| # | Item | Description |
|---|---|---|
| **i** | Implementation | The sampling effort will be executed after the closing of a monitoring period, i.e. if the monitoring period is from year x to year x+1, the monitoring effort will take place after year x+1 but before year x+2 to ensure that monitoring takes place soon after the closing of a monitoring period. Persons involved will have the following qualifications and experience:<br>• Surveyors: Person that has is trained by the survey team leader and has joined the pilot testing of the questionnaire.<br>• Survey team leader: Experience person and has been involved in at least 2 other surveys<br>• Monitoring report author: Experienced person with CDM<br>• Expert reviewer: Rural agronomist, biogas technician, technical advisors to the project or related<br>• Draft report commenters: CME director, project coordinators of the CPA implementation agencies, technical advisors to the programs. |

[14] *Relevant experts are professionals working in the field of rural energy, biogas and or agriculture.*

| | | |
|---|---|---|
| **ii** | Storage | All the survey forms and records will be stored by MARD and available for 2 years after the last crediting period. |

A database will be set-up by the MARD for each CPA under the PoA. The database will include the following information, but not limited to:

- Number of installed biogas units;
- Location of each biogas plant registered under the a CPA;
- Name of the each biogas plant owner;
- Name and ID code of the mason that built the biogas plant
- Date of commissioning for each plant;
- Size and model of each biogas plant;
- Unique biogas plant registration number for each plant;
- The fossil fuel consumption in the baseline case (from control group)
- The fuel consumption in the project (sample from CPA database)
- The annual performance ratio (sample).

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

***Public Funding***. The proposed PoA is likely to receive public funding from the following sources:

- Government of Netherlands.
- Asian Development Bank
- Others (other funding source may be accepted in the future once it is available)

***ODA Diversion.*** Non-ODA diversion letters will be made available for each CPA, if applicable

## SECTION B. Duration of the programme of activities (PoA)

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

The starting date will be the 1st of May 2012 or the date of registration, whichever is later. (The MARD signed the contract with DOE on 30 Dec 2009, and the GSP and validation was then started on 31 Dec 2009.)

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

28 years

## 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 ☐

The environmental analysis is done at the PoA level. The PoA involves the construction of biogas plants in the households. Biogas plants will be registered under the national biogas programme. The construction of biogas plants does not entail significant negative environmental impacts. For this reason, it is reasonable to undertake a single environmental analysis at the level of the PoA rather than individual assessments for each SSC-CPA. A CPA is therefore exempt from conducting a EIA.

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

An environmental analysis is not required by the government's environmental agency for this type of project activity for GHG emissions.

There are no negative impacts resulting from this proposed project activity. The project brings only benefits to the farmers, such as:

- Substituting conventional fuels and synthetic fertilizer, and changing traditional manure management systems, biogas installations reduce the emission of greenhouse gasses significantly.
- Bio-slurry improves soil texture, thus reducing degradation, and reduces the need for further land encroachment.
- Reduction of firewood use contributes to checking deforestation and reduces forest encroachment.
- Reduction in foul odors ensuing from methane emissions to the atmosphere;
- Reduction of fuel costs;
- Reduction of time spent on gathering firewood for fuel;
- Reduction of disease dissemination.

The combination of these factors improves the environmental and health quality of the farmers and their neighbors, resulting in a more sustainable environment.

The project activity is carried out in small and medium animal producing households. The direct environmental impact is considered negligible outside territory of Vietnam. The environmental benefits are limited to the households in the Host Country.

**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),:**

List of documents related to the environmental assessment activities for a project:

1. Vietnamese Environmental Protection Law 2005

2. Decree No. 21/2008/ND-CP dated 28 February 2008 on amending and supplementing a number of articles of the Government's Decree No. 80/2006/ND-CP of 9 August 2006 detailing and guiding the implementation of a number of articles of the Law on Environmental Protection

3. Circular No. 05/2008/TT-BTNMT dated 08 December 2008 on guiding strategic environmental assessment, environmental impact assessment and environmental protection commitment.

Circular No. 05/2008/TT-BTNMT provides the guidance and procedures to prepare environmental assessments, and approval procedures for each category regulated. The Circular also lists activities/projects that must prepare the environmental report and biogas recovery in households is not included in the list. Nonetheless, a livestock farm project which has more than 1.000 heads per year and a poultry farm which has more than 20.000 heads per year are listed in Lines 127 and 128 of the annex of Decree No. 21/2008/ND-CP to require the environmental assessments. The biogas units under this PoA are installed on the households with only a few cattle, buffalo's or swine or other animals.

In conclusion, an environmental assessment for a biogas activity on national and on the household level is not a mandatory.

## 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 ☐

In the local stakeholder workshops that were held at national level no controversial issues and negative impacts of the programme were identified (see hereunder), therefore it is not considered necessary to execute consultation workshops at CPA level.

The local stakeholder comments were collected on the level of 2 workshops organized in different provinces, and a stakeholder workshop in Hanoi where the PoA was presented. Apart from these workshops the biogas programme is a country-wide programme promoted in various media.

The stakeholder ´s consultation has been done in two provinces:
1) 03rd April 2009 Nghe An Province
2) 08th April 2009 Phu Tho Province

The participants on the provincial WS included:
- Representatives from Biogas provincial office;
- Representatives of the district authorities;
- Representatives of mass organizations (Women's Union, Farmers Union, Youth Union);

- Commune extension workers;
- Smallholder farmers with and without biogas plants.
- Representative of the NGO
- Facilitation and observer team

**Summary of participants**

| **Stakeholder meetings** | **Nghe An** | | **Phu Tho** | |
|---|---|---|---|---|
| **Invitees by category** | **Invitees** | **Attendees** | **Invitees** | **Attendees** |
| Representatives of commune authorities, women union, farmer association youth union | 1 | 1 | 3 | 3 |
| GS NGO supporter | 0 | 0 | 1 | 1 |
| Provincial and district biogas technicians | 3 | 3 | 5 | 5 |
| Commune agriculture extensions | 2 | 2 | 1 | 1 |
| Local people impacted by the project | 27 | 27 | 21 | 21 |
| Mason | 2 | 2 | 2 | 2 |
| **Sum** | 35 | 35 | 33 | 33 |
| Facilitators/interpreters | | 4 | | 3 |
| Observers | | 5 | | 3 |
| **Total** | | **44** | | **39** |
| ***Analysis*** | **Nghe An** | | **Phu Tho** | |
| Attendance rate | 100% | | 100% | |
| **Male** | **26** | | **17** | |
| % | 59% | | 44% | |
| **Female** | **18** | | **22** | |
| % | 41% | | 56% | |

Additionally the CDM PoA was presented within a stakeholder WS in Hanoi on the 12th June 2009.

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

The biogas programme is a country-wide programme that is well known and promoted in the media. For the provincial workshops, the provincial biogas office via the provincial office of the Ministry of Agriculture, randomly invited farmers not in a possession of a biogas unit, as well as farmers without the biogas units.

The Group discussion was started by an explanation about the objective of the group work which aimed to seek participants' feedback and opinions about positive and negative impacts of the biogas programme, based on the framework of the sustainable development indicators introduced in the preceding session. Divided into two groups with a mixed representation from participants, each group was supported by 2 moderators and the discussion lasted for an hour. As the majority of the

participants were not familiar with participatory process, the group moderators paid special attentions to ensure views and feedback of female farmers and of quiet participants were included.

The group discussion was quite lively and attracted very active participation by women. The group results were reported back into plenary by a reporter selected by the group.

It was ensured that in both groups participants with biogas experience were present. Discussions in both groups varied in intensity. In general however, both groups shared the same views about many positive impacts of the biogas plants. For that reason, they gave positive scores (+) to almost all indicators. Concerning "Do no harm" indicators, some pointed out the tough working condition under which biogas masons do their work during hot summer days. Two other issues were pointed out in addition to the listed positive impacts:

When discussing about "other pollutants", some participants, who own biogas plants prior to the programme start in the commune in 2006, brought up the issue of surplus of biogas and the bad smell at the time of turning on the biogas stove. Some of them suggested mitigation measures that include for instance, a more frequent checkup of the pipe, reducing daily input volume, installation of gas pressure meter, more frequent uses of gas for cooking, and other facilities like gas light, and electricity generator. The local mason had installed a filter system for his pipe (price 900,000 VND) which effectively filters out the smell.

The lack of access to formal credit for a required up-front investment was noted by some participants. They stated that it is a challenge because the borrowing terms are often short, and the borrowers have to pay high interest rates. They therefore prefer to borrow from friends and relatives and thus expressed their appreciation to be able to benefit from the programme subsidy. At the same time, it was expressed that a faster disbursement of the subsidy would be appreciated.

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

The comments received from the WS in Nghe An Province:

| Stakeholder Comment | Assessment | Response to comment |
|---|---|---|
| **Air quality**:<br>Group 1: some complaint about a bad smell when turning on the gas first time in the morning<br>Group 2: Good, no more eye disease, better smell, | Different opinions were expressed in 2 groups when commenting on the quality of air | Bad smell can be reduced by sealing off the tank, using the gas more often. Using a filter is too expensive for most. |
| **Water quality**<br>*Group 1: Water in streams is obviously cleaner. Less discharge into the water streams.*<br>*Group 2: Surface water is less polluted comparing to before biogas* installation | Both groups have same opinion on this indicator | Clear instructions necessary to avoid feeding too much, and too short retention time. Only if dung is not fully disintegrated a bad smell |

| | | |
|---|---|---|
| | | results. |
| **Soil quality:**<br>- Visible change in color is observed prior (black color) and after having biogas plant (brown);<br>- The soil became softer<br>- Nutrition stays longer in the soil, thus significantly improved, very good for crops | Not only biogas user but also non biogas user know about this benefit by observing the utilization of bio-slurry by neighbors | |
| **Other pollutants**<br>*Group 1:*<br>- No other pollutant, as soon as there is leakage with methane gas in the biogas plant, the household fixes immediately reacts by filling water into the digester neck, turning on biogas cook stove to reduce gas pressure; using gas pressure meter…<br>*Group 2:*<br>- Bad smell when turning on cooking stove<br>- Sometimes surplus of gas creates strong pressure causing the digester cover to rebound. | There are opinions on pollutants but not considered as big problem | Provide proper instruction in operation manual, make pressure meter compulsory<br><br>Regulate stove quality<br><br>Provide safety leaflet to users |
| **Biodiversity**<br>Reduced use of fire woods for domestic energy<br>Improved soil quality contributing to improved plantation productivity (e.g. increased sales of Vietnamese traditional sticky rice leaves) | Not many comments on this indicator | |
| **Quality of employment**<br>- Free women and children from wood/rice straw collection for other social or schooling activities<br>- Higher income for biogas masons in comparison with other types of construction works | Only mason has comment on this indicator | Assessment is more exact by farmers to have a secondary job |
| **Livelihood of the poor**<br>Biogas contributes to reducing workload of family members: men have more time (2 hours) for sport activities, women more time for social and other income generation activities (e.g. embroidery).<br>Group 2: Poor people cannot afford biogas digester or they do not have animals. | Farmers participated in workshops are not poor people | Policy to help poor people access biogas technology via micro credit |
| **Access to affordable and clean energy services:**<br>- The upfront investment is high and poor HH without animal husbandry activities cannot afford<br>- Poor households with few pigs can invest by borrowing money from friends and relatives to invest in biogas plants<br>- Non -smoke and cleaner kitchen more appropriate for modern kitchen appliances | Opinions are controversial | Maintain or increase subsidy level<br>Improve access to micro-finance for biogas |
| **Human and institutional capacity**<br>- Increased knowledge on biogas technology and biogas - related knowledge (global warming, CDM, climate change)<br>- Increased free time from household workload allowing male and female farmers to participate in other community activities or economic activities | Very few comment on this indicator | Training for users is very important |
| **Quantitative employment and income generation**<br>- Women and children have more free time to engage in other income generation activities (embroidery, gardening)<br>- Higher income for biogas masons (compared to other civil | Farmers know about benefits of biogas technology | The programme should update employment |

| | | |
|---|---|---|
| construction jobs);<br>- Current mason teams are potential to become SMEs<br>- Less money spent on conventional domestic energy sources | | and income generation; also provide payback time of an average digester |
| **Balance of payments and investment**<br>Difficult to calculate due to low opportunity costs for agricultural residues used as conventional energy source | Many comments are very general about benefits | |
| **Technology transfer and technological self-reliance**<br>- Simple operation and maintenance after being trained<br>- Easy to train and expand mason teams<br>- Technology transfer is appropriate as construction materials are locally available. | Farmers understand biogas technology very well | Instructions and manual should be developed more attractive and simple |
| **Do-no-Harm Indicators:** | | |
| ***Labor condition*:**<br>Tough working conditions for masons whose work is dependent on weather conditions ( very hot during summer time, rainy season) | People have the same comments on working conditions of mason | Hot working conditions can be mitigated with the use of ventilators, a custom in the south. |
| ***Financing transparency***<br>Clear and simple procedure<br>Nobody asked for any pick back at the post office or elsewhere | Although in the group discussion no problems are indicated, the answer could be different if this issue was discussed in person and not in group/public. | The programme checks proper transfer by random sample telephone interviews |

Summary of comments from the WS in the Phu Tho Province:

| **Stakeholder Comment** | **Assessment** | **Response to comment** |
|---|---|---|
| **Air quality**:<br>Group 1: Air quality improved, better smell, no gas leakage due to well-managed oversupply<br>Group 2: One complaint about air pollution caused by factories nearby that affects the air improved by biogas plant | There are opinions on pollutants but not caused by biogas plants, they come from fertilizer factories and paper mills in the vicinity | |
| **Water quality**<br>*Surface water in locality is obviously cleaner, the color change from black to grey. Less discharge into the water streams, less urine penetrating to underground water* | Both groups have same opinion on this indicator | |
| **Soil quality:**<br>Group 1: Soil quality improved,<br>Some hhs give slurry away, as they have no crops and no market for bio slurry. One complained that bio slurry causes his vegetables to die<br>Group 2: The soil became softer. Nutrition stays longer in the soil, thus significantly improved, very good for vegetables, tea and orchard. | Different opinions were recorded in group 1 | Bio-slurry cannot be used in concentrated ratio, better to dilute it and use as fertilizer directly applied to the |

| | | |
|---|---|---|
| | | soil |
| **Other pollutants**<br>*Group 1:*<br>- No other pollutant, if there is oversupply at night, farmer has to get up and boil water or turn on stove to reduce gas pressure.<br>*Group 2:*<br>*Gas leakage due to the fact that pipes or valves are poor* | | Regularly check and replace the poor quality pipes and valves and check biodigester (mason's responsibility). Share oversupply gas with neighbors. |
| **Biodiversity**<br>Reduced use of fire woods, char coal, farmers don't know where the wood comes from (from natural forest or production forest)<br>Improved soil quality contributing to improved plantation productivity | This indicator is difficult for farmer to assess as they see no direct relationship to biogas. | |
| **Quality of employment**<br>Group 1: Biodigesters free women and children from dirty, hard works such as manure collection, selling or processing. Free time used for other social or schooling activities.<br>Group 2: Higher income for biogas masons in comparison with other types of construction works, less dangerous work since biogas plant place underground. | Assessment is more exact in village which pursue secondary jobs | |
| **Livelihood of the poor**<br>Biogas contributes to reducing workload of family members<br>Poor people cannot afford biogas digester or they do not have animals.<br>One women in group 1 plans to borrow money to finance biogas digester since she has to cover her son's university fee with her saving. | Almost WS participants are not poor farmers | Policy to help poor people access biogas technology via micro credit |
| **Access to affordable and clean energy services:**<br>- The upfront investment is high including paper work to get support by project and subsidy rate is low.<br>- Poor households with few pigs can invest by borrowing money from friends and relatives to invest in biogas plants<br>- In general biogas is clean energy and affordable for local people | Opinions are contrary | Maintain or increase subsidy level<br>Improve access to micro-finance for biogas |
| **Human and institutional capacity**<br>- Increased knowledge on biogas technology and biogas - related knowledge (global warming, CDM, climate change)<br>- Improved gender-balance in locality, more women take part in training, meeting, WS with their own opinions<br>- Increased familiarity with new technology; more time for other family economic activities, | Very few comment on this indicator | Training for users is very important |
| **Quantitative employment and income generation**<br>- Income generation from higher productivity crops<br>- Saving up to 300,000 per month<br>- Higher income for biogas masons (compared to other civil construction jobs);<br>- Current mason teams have potential to become SMEs | Farmers know about benefits of biogas technology | |
| **Balance of payments and investment**<br>Difficult to calculate due to costing use of rice straw and agricultural residues used for conventional energy source | Comments are very general | |

| | | |
|---|---|---|
| **Technology transfer and technological self-reliance**<br>- Simple operation and maintenance after being trained<br>- Easy to train and expand mason teams<br>- Technology transfer is handy as construction materials are locally available. | Farmers understand biogas technology very well | Instructions and manual should be developed more attractive and simple |
| **Do-no-Harm Indicators:** | | |
| ***Labor condition*:**<br>Group 1: Hard working conditions for masons whose work is dependent on weather conditions (very hot during summer time).<br>In rain season, some works are destroyed due to heavy rain and need to be done again<br>Group 2: work safer compared with other construction works | People have the different comments on working conditions of mason | Using ventilations or persuade hh to build biogas digester in cooler season |
| ***Financing transparency***<br>Clear and simple procedure<br>Nobody asked for any kick-back at the post office or elsewhere<br>Complaint about delay in subsidy delivery (about 6 months already) | Although it was so expressed in group discussion, we are not sure if the answer would be different if this issue is discussed in person and not in group/public. | |

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

During the workshops on the provincial level, all the comments were elaborated and answered as seen in the table above.

At the final WS in Hanoi no negative comments were received, thus no further action was deemed necessary.

## 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:

The approved small-scale baseline and monitoring methodology used is AMS-I.C. "Thermal energy production with or without electricity (version 18)".

The SSC WG declared that household biogas projects may use the monitoring procedures of AMS-I.I (SSC WG 34)[15] even when using the methodology AMS-I.C. AMS-I.I version 02 is used to establish both the baseline and the project emissions.

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

Applicability Condition of AMS I C Version 18

| Meth Para | Paragraph | Conclusion on Applicability of the Project |
|---|---|---|
| 1 | This category comprises renewable energy technologies that supply users1 with thermal energy that displaces fossil fuel use. These units include technologies such as solar thermal water heaters and dryers, solar cookers, energy derived from renewable biomass and other technologies that provide thermal energy that displaces fossil fuel. | The proposed project activity displaces fossil fuel by biogas for thermal application. Hence, this condition is applicable and AMS I C is applicable. |
| 2 | Biomass-based cogeneration systems consisting of steam generator(s) and steam turbine(s) are included in this category. For the purpose of this methodology cogeneration shall mean the simultaneous generation of thermal energy and electrical energy in one process. Project activities that produce heat and power in separate element processes (for example, heat from a boiler and electricity from biogas engine) do not fit under the definition of cogeneration project. | The proposed project activity does not involve cogeneration. Hence, this condition is not relevant and AMS I C is applicable. |
| 3 | Emission reductions from a biomass cogeneration system can accrue from one of the following activities:<br>(a) Electricity supply to a grid;<br>(b) Electricity and/or thermal energy (steam or heat) production for on-site consumption or for consumption by other facilities;<br>(c) Combination of (a) and (b). | The proposed project activity does not involve cogeneration. Hence, this condition is not relevant and AMS I C is applicable. |
| 4 | The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal2 (see paragraph 6 for the applicable limits for cogeneration project activities). | Total rated thermal energy generation capacity of the project equipment for each CPA will be less than 45 MW thermal. Hence, AMS |

[15] http://cdm.unfccc.int/UserManagement/FileStorage/7SWAZIE8F4YDT3BCV96KN2HLUJ5G01

| | | |
|---|---|---|
| | | I C is applicable. |
| 5 | For co-fired[3] systems, the total installed thermal energy generation capacity of the project equipment, when using both fossil and renewable fuel shall not exceed 45 MW thermal (see paragraph 6 for the applicable limits for cogeneration project activities). | The proposed project activity does not involve co-firing and hence, this condition is not relevant and AMS I C is applicable. |
| 6. | The following capacity limits apply for biomass cogeneration units:<br>(a) If the project activity includes emission reductions from both the thermal and electrical energy components, the total installed energy generation capacity (thermal and electrical) of the project equipment shall not exceed 45 MW thermal. For the purpose of calculating this capacity limit the conversion factor of 1:3 shall be used for converting electrical energy to thermal energy (i.e. for renewable project activities, the maximal limit of 15 MW(e) is equivalent to 45 MW thermal output of the equipment or the plant);<br>(b) If the emission reductions of the cogeneration project activity are solely on account of thermal energy production (i.e. no emission reductions accrue from electricity component), the total installed thermal energy production capacity of the project equipment of the cogeneration unit shall not exceed 45 MW thermal;<br>(c) If the emission reductions of the cogeneration project activity are solely on account of electrical energy production (i.e. no emission reductions accrue from thermal energy component), the total installed electrical energy generation capacity of the project equipment of the cogeneration unit shall not exceed 15 MW. | The proposed project activity does not involve cogeneration. Hence, this condition is not relevant and AMS I C is applicable. |
| 7 | In case electricity and/or steam/heat produced by the project activity is delivered to another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered into specifying that only the facility generating the energy can claim emission reductions from the energy displaced. | The proposed project activity does not involve use of heat in another facility within the project boundary. Hence, this condition is not relevant and AMS I C is applicable. |
| 8 | Project activities that seek to retrofit or modify an existing facility for renewable energy generation are included in this category. | The proposed project activity involves installation of a new project. Hence this condition is not relevant and AMS I. C is applicable. |
| 9 | The capacity limits specified in the above paragraphs apply to both new facilities and retrofit projects. In the case of project activities that involve the addition of renewable energy units at an existing renewable energy facility, the total capacity of the units added by the project should comply with capacity limits in paragraphs 4 to 6 and should be physically distinct[4] from the existing units. | The proposed project activity involves less than 45 MW thermal capacity. Hence. AMS I C is applicable. |
| 10 | 10. Charcoal based biomass energy generation project | The proposed project |

| | | |
|---|---|---|
| | activities are eligible to apply the methodology only if the charcoal is produced from renewable biomass sources[5] provided:<br>(a) Charcoal is produced in kilns equipped with methane recovery and destruction facility; or<br>(b) If charcoal is produced in kilns not equipped with a methane recovery and destruction facility, methane emissions from the production of charcoal shall be considered. These emissions shall be calculated as per the procedures defined factor values from peer reviewed literature or from a registered CDM project activity can be used, provided that it can be demonstrated that the parameters from these are comparable e.g. source of biomass, characteristics of biomass such as moisture, carbon content, type of kiln, operating conditions such as ambient temperature. | activity is not a charcoal based biomass energy generation project and hence, the condition is not relevant. AMS I C is applicable. |
| 11. | If solid biomass fuel (e.g. briquette) is used, it shall be demonstrated that it has been produced using solely renewable biomass and all project or leakage emissions associated with its production shall be taken into account in emissions reduction calculation. | The proposed project activity does not involve solid biomass fuel. This condition is not relevant and hence AMS I C is applicable. |

In order to apply monitoring plan of AMS I I, it is necessary to check the applicability of AMS I.I. Hence, applicability of AMS I I are attached herewith:

| **Meth Para** | **Paragraph** | **Conclusion on Applicability of the Project** |
|---|---|---|
| 1 | 1. This category comprises activities for generation of renewable thermal energy using renewable biomass or biogas for use in residential, commercial, institutional applications (e.g. for supply to households, small farms or for use in built environment of institutions such as schools). Examples of these technologies that displace or avoid fossil fuel use include but are not limited to biogas cook stoves, biomass briquette cook stoves, small scale baking and drying systems, water heating, or space heating systems. | The proposed project activity involves generation of renewable thermal energy using biogas for residential application. Hence, AMS I I is applicable. |
| 2 | The total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45 MW thermal. | The total installed capacity of each CPA will be less than 45 MW thermal. Hence, AMS I I is applicable. |
| 3 | Each unit (e.g. cook stove, heater) shall have a rated capacity equal to or less than 150 kW thermal. Projects that include units with rated capacity greater than 150 kW thermal may explore AMS I.C "Thermal energy production with or without electricity". | The maximum capacity of the largest units supported by the PoA is 25 $m^3$ x 0.997kW thermal, ~ 25 kW, much less than 150 kW. Hence AMS I I is applicable. |

| | | |
|---|---|---|
| 4 | For the specific case of biomass residues processed as a fuel (e.g. briquettes, wood chips), it shall be demonstrated that:<br>(a) It is produced using solely renewable biomass (more than one type of biomass may be used). Energy use for renewable biomass processing (e.g. shredding and compacting in the case of briquetting) may be considered as equivalent to the upstream emissions associated with the processing of the displaced fossil fuel and hence disregarded;<br>(b) The "General guidance on leakage in biomass project activities" (attachment C to Appendix B of 4/CMP.1 Annex II) shall be followed;<br>(c) The project participant can monitor the mass, moisture content and NCV of the resulting biomass fuel, through sampling that meets the confidence/precision level of 90/10;<br>(d) Where the project participant is not the producer of the renewable fuel, the project participant and the producer are bound by a contract that shall enable the project participant to monitor the source of renewable biomass to account for any emissions associated with biomass production (as per 4 (b) above). Such a contract shall also ensure that there is no double counting of emission reductions. | The proposed project activity does not involve biomass residues as fuel. Hence, this condition is not relevant and hence AMS I I is applicable. |

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

The SSC CPA boundary is the physical, geographical site of the baseline, and project equipment producing the renewable energy, delineates the project boundary within Viet Nam.

| | Source | Gas | Included | Justification/explanation |
|---|---|---|---|---|
| Baseline | Thermal energy – use of coal | $CO_2$ | Yes | Major source of emissions |
| | | $CH_4$ | No | Excluded for simplification |
| | | $N_2O$ | No | Excluded for simplification |
| | Thermal energy – use of liquid fossil fuels (LPG and kerosene) | $CO_2$ | Yes | Major source of emissions |
| | | $CH_4$ | No | Excluded for simplification |
| | | $N_2O$ | No | Excluded for simplification |
| Project activity | Thermal energy – use of coal | $CO_2$ | Yes | Major source of emissions |
| | | $CH_4$ | No | Excluded for simplification |
| | | $N_2O$ | No | Excluded for simplification |
| | Thermal energy – use of liquid fossil fuels (LPG and kerosene) | $CO_2$ | Yes | Major source of emissions |
| | | $CH_4$ | No | Excluded for simplification |
| | | $N_2O$ | No | Excluded for simplification |

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

The baseline scenario is identified in accordance with the instructions provided in the approved small-scale baseline and monitoring methodology, AMS-I.C, "Thermal energy production with or without electricity", Version 18.

In the baseline, the current practice is to use the fossil fuels (namely coal, kerosene and LPG) and agricultural residues for cooking and it would continue in the absence of the project activity. The use of biogas is hampered by the high investment costs, barriers due to the installation, maintenance and after care of the systems.

**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:**

The additionality of each CPA is demonstrated through the eligibility criteria for inclusion of CPAs as explained in the paragraph A.4.2.2. This is taken care of the CPA eligibility criteria in section A.4.2.2

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

As described in section A4.2.2 the additionality of a CPA will be assessed and demonstrated based on the key criteria and data as in the ***option 1*** and ***option 2***.

In case of CPA activities up to 5 megawatts (or 15 MW thermal), the additionality will be demonstrated based on option 1, wherein, one of the conditions (mainly condition (a) in most of the cases) in paragraph 2 of the Guidelines for demonstrating additionality of Micro-scale project activities" EB 61 (version 2) will be satisfied.

For CPA activities in the capacity range of 15 – 45 MW thermal, the additionality will be demonstrated by following the current SSC guidelines as per the Attachment A to Appendix B of 4/CMP.1 Annex II – Information on Additionality.

## 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:

A typical CPA is eligible as small-scale project category AMS-I.C "Thermal energy production with or without electricity" (Version 18).

The SSC WG ruled that household biogas projects may use the monitoring procedures of AMS-I.I (SSC WG 34)[16] even when using the methodology AMS-I.C. The baseline and monitoring methodology of AMS-I.I "biogas/biomass thermal applications for households/small users (Version 2.0)" is applied for a typical SSC-CPA.

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

***Baseline emissions***
The baseline emissions are estimated using AMS-I.I version 2.

The baseline scenario for a CPA is that fossil fuels and agricultural residues are used for cooking in households participating in the biogas programme. The simplified baseline is the fuel consumption of the technologies that would have been used in the absence of the project activity times an emission factor for the fossil fuel displaced

**Step 1**: Identification of the fuel consumption (ex-ante);
**Step 3:** Identification of the Net Calorific Value and the Emission factors for each of the fuels;
**Step 3**: Ex-ante calculation of the baseline emissions per household (plant).

***Step 1:*** The consumption of fossil fuels is calculated as the average value of the control group with similar characteristics as the biogas households: In order to determine the baseline emissions *ex-ante*, the fuel consumption from CPA01 database is used. The ex-post estimate will be obtained from the control group, which will be setup after PoA registration.

*Table 7: Yearly consumption of fossil fuels per household[17]*

| Fossil fuel | Yearly consumption per household (*kg*) |
|---|---|
| Coal | 1238.24 |
| LPG | 20.12 |
| Kerosene | 2.31 |

[16] http://cdm.unfccc.int/UserManagement/FileStorage/7SWAZIE8F4YDT3BCV96KN2HLUJ5G01

[17] Data collected from CPA01 households, the ex-post baseline fuel data will be collected from a control group as described in the monitoring plan

***Step 2*:** Reliable national or local data is not available and hence both the Net Calorific Value (NCV) for each of the fuels, as well as the Emission Factors (EF) is taken from the 2006 IPCC Guidelines. The coal types used in Vietnam are usually coal cake and coal honeycomb, which under the IPCC classification correspond to "other bituminous coal" The NCV and EF of three fossil fuels are presented in Table 8.

*Table 8: Net Calorific Values and Emission Factors of fossil fuels*

| **Fuel type** | **NCV (*MJ/kg*)** | **EF (*t $CO_2$eq./TJ*)** |
|---|---|---|
| Coal | 25.8 | 94.6 |
| LPG | 47.3 | 63.1 |
| Kerosene | 43.8 | 71.9 |

***Step 3**:* The baseline emissions per household per year for a specific CPA are calculated taking account the formula:

$$BE_y = \sum_i FC_{BL,i} * NCV_i * EF_{FF,i}$$

Where:

| | |
|---|---|
| $BE_y$ | Baseline emissions of the control group household during the year *y* ($tCO_2$) |
| *i* | Index for the type of baseline fossil fuel consumed |
| $FC_{BL,j}$ | Annual consumption of baseline fossil fuel *i* (mass or volume unit) |
| $NCV_j$ | Net calorific value of the fossil fuel *i* (GJ/mass or volume unit) |
| $EF_{FF,j}$ | $CO_2$ emission factor of fossil fuel *i* ($tCO_2$/GJ) |

For the ex-ante baseline emissions calculations the CPA01 are applied and it assumed that 100% of the units are in operation.

*Table 9: Ex-ante calculation of baseline emissions per household per year*

| **Fuel type i** | **Yearly consumption per household (*kg*)** | **NCV *(MJ/kg)*** | **EF *(t $CO_2$/TJ)*** | **Baseline emissions *($tCO_2$)*** |
|---|---|---|---|---|
| Coal | 1238.24 | 25.8 | 94.6 | 3.0221 |
| LPG | 20.12 | 47.3 | 63.1 | 0.0601 |
| Kerosene | 2.31 | 43.8 | 71.9 | 0.0073 |
| **Total** | | | | **3.0895** |

Ex-ante estimation of the baseline emissions per household is 3.0895 $tCO_2$ eq. per year.

***Project emissions***

According to AMS-I.I v02, in case the produced biogas does not replace all of the fossil fuels, these emissions have to be accounted for project emissions. The calculation procedure has two steps:

**Step 1:** Identify the amount of fossil fuels consumed in project case;
**Step 2:** Calculate the project emissions per household.

**Step 1**: The consumption of the fossil fuels will be estimated through surveys on a statistically sound for each of the CPAs. The sampling method is described in the monitoring section.

In order to determine the project emissions ex-ante, the fuel consumption in project case from Biogas User Surveys (BUS) conducted in year 2006 are used.

*Table 10: Yearly consumption of fossil fuels per household in project situation* [18]

| Fossil fuel | Yearly consumption per household (*kg*) |
|---|---|
| Coal | 153.2 |
| LPG | 3.4 |
| Kerosene | 0 |

**Step 2:** The project emissions from cooking fuels are calculated taking account the formula:

$$PE_{y,j} = \Sigma_j FP_{i,y,j} * NCV_i * EF_{CO2,i}$$

Where:

$PE_{y,j}$ Project emissions per household in CPA *j* in year *y;*

$FP_{i,,yj}$ Amount of fossil fuel *i* consumed in project case in CPA *j* in year *y*

$NCV_i$ Net Calorific value of the fuel *i*

$EF_{CO2,I}$ Emission factor for the fuel type *i*

For the *ex-ante* project emissions calculations the data from the BUS 2006 survey are applied and it is assumed that 100% of the units are in operation.

*Table 11: Ex-ante calculation of project emissions per household per year*

| Fuel type i | Yearly consumption per household (*kg*) | NCV *(MJ/kg)* | EF *(t $CO_2$/TJ)* | Baseline emissions *($tCO_{2e}$)* |
|---|---|---|---|---|
| Coal | 153.2 | 25.8 | 94.6 | 0.3739 |
| LPG | 3.4 | 47.3 | 63.1 | 0.0101 |
| Kerosene | 0 | 43.8 | 71.9 | 0.0000 |
| **Total** | | | | **0.3841** |

Ex-ante estimation of the project emissions per household is 0.3841 $tCO_2$ eq. per year.

***Leakage emissions***

Methodology AMS-I.C requires leakage calculation in cases: (1) if the energy generating equipment is transferred from another activity; and (2) in case of collecting/processing/transportation of agricultural residues s is outside the project boundary. Since the programme set-up does not include any of the two no leakage emissions are accounted for.

***Emission reductions***

[18] Biogas User Surveys 2006 which include 662 households in 14 provinces.

Emission reductions are calculated as the difference between baseline, obtained from the control group, and project emissions, obtained from the CPA participations times the CPA population and the performance ratio::

$$ER_{y,j} = (BE_{y,j} - PE_{y,j}) * N_{k,j} * n_{k,y,j}$$

Where:

| | | |
|---|---|---|
| $ER_{y,j}$ | = | Emission reductions in CPAj in year y |
| $BE_{y,j,}$ | = | Baseline emissions per control group household in year y belonging to CPAj |
| $PE_{y,j}$ | = | Project emissions in year y in CPAj |
| $N_{k,j}$ | = | Number of biogas units commissioned in CPAj |
| $n_{k,y,j}$ | = | Performance ratio of the biogas units in year y in CPAj |

The ex-ante emission reductions are in year y in CPAj per household:

$$ER_{y,j} = 3.0895 - 0.3841 = 2.7054\ tCO_{2e}\ p.a.$$

And, for example with an CPA size of 30,000 units and a performance ratio of 100%, the ERs are 2.7054*30,000* 100% = 81,162 tCO2e in year y.

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

*(Copy this table for each data and parameter)*

| **Data / Parameter:** | **$NCV_{coal}$** |
|---|---|
| Data unit: | MJ/kg |
| Description: | Net calorific value for fuel type "other bituminous coals" |
| Source of data used: | 2006 IPCC Guidelines |
| Value applied: | 25.8 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | |
| Any comment: | |

| **Data / Parameter:** | **$NCV_{LPG}$** |
|---|---|
| Data unit: | MJ/kg |
| Description: | Net calorific value for LPG |
| Source of data used: | 2006 IPCC Guidelines |
| Value applied: | 47.3 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | |
| Any comment: | |

| Data / Parameter: | $NCV_{kerosene}$ |
|---|---|
| Data unit: | MJ/kg |
| Description: | Net calorific value for kerosene |
| Source of data used: | 2006 IPCC Guidelines |
| Value applied: | 43.8 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | |
| Any comment: | |

| Data / Parameter: | $EF_{coal}$ |
|---|---|
| Data unit: | $tCO_2$ eq./TJ |
| Description: | Emission factor for burning other bituminous coals |
| Source of data used: | 2006 IPCC guidelines |
| Value applied: | 94.6 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | |
| Any comment: | |

| Data / Parameter: | $EF_{LPG}$ |
|---|---|
| Data unit: | t $CO_2$ eq./TJ |
| Description: | Emission factor for burning LPG |
| Source of data used: | 2006 IPCC guidelines |
| Value applied: | 63.1 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | |
| Any comment: | |

| Data / Parameter: | $EF_{kerosene}$ |
|---|---|
| Data unit: | t $CO_2$ eq./TJ |
| Description: | Emission factor for burning kerosene |
| Source of data used: | 2006 IPCC guidelines |
| Value applied: | 71.9 |
| Justification of the choice of data or description of measurement methods and procedures actually applied : | |

| | |
|---|---|
| Any comment: | |

| | |
|---|---|
| **Data / Parameter:** | $N_{k,j}$ |
| Data unit: | - |
| Description: | Number of biogas units k installed in CPA j |
| Source of data to be used: | CPAj database |
| 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: | see E.7.2 |
| QA/QC procedures to be applied: | |
| 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: | |
|---|---|
| *(Copy this table for each data and parameter)* | |
| **Data / Parameter:** | **$FC_{BL,coal,j,y}$** |
| Data unit: | Kg |
| Description: | Consumption of coal per household in year y of the control group belonging to CPA *j* |
| Source of data to be used: | Control group database of CPAj |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 1238.24 *(ex-ante)* |
| Description of measurement methods and procedures to be applied: | The data about the baseline consumption is collected via questionnaires amongst households without the project equipment that use fossil fuels for cooking and have the same characteristics as the project participants, taking into account these parameters (e.g. average income level, household occupancy, food or heating habits, climate/temperature zone, availability, price and type of fuel used). |
| QA/QC procedures to be applied: | |
| Any comment: | |

| **Data / Parameter:** | **$FC_{BL,LPG,j,y}$** |
|---|---|
| Data unit: | Kg |
| Description: | Consumption of LPG per household in year y of the control group belonging to CPA *j* |
| Source of data to be used: | Control group database of CPAj |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 20.12 *(ex-ante)* |
| Description of measurement methods and procedures to be applied: | The data about the baseline consumption is collected via questionnaires amongst households without the project equipment that use fossil fuels for cooking and have the same characteristics as the project participants, taking into account these parameters (e.g. average income level, household occupancy, food or heating habits, climate/temperature zone, availability, price and type of fuel used). |
| QA/QC procedures to be applied: | |
| Any comment: | |

| **Data / Parameter:** | **$FC_{BL,kerosene,j,y}$** |
|---|---|
| Data unit: | kg |

| | |
|---|---|
| Description: | Yearly consumption of kerosene per household of the control group belonging to CPAj |
| Source of data to be used: | Control group database of CPAj |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 2.31 *(ex-ante)* |
| Description of measurement methods and procedures to be applied: | The data about the baseline consumption is collected via questionnaires amongst households without the project equipment that use fossil fuels for cooking and have the same characteristics as the project participants, taking into account these parameters (e.g. average income level, household occupancy, food or heating habits, climate/temperature zone, availability, price and type of fuel used). |
| QA/QC procedures to be applied: | |
| Any comment: | |

| **Data / Parameter:** | **$FC_{coal,j,y}$** |
|---|---|
| Data unit: | Kg |
| Description: | Consumption of coal per household in year *y* in CPA *j* in the project scenario |
| Source of data to be used: | CPAj database |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 153.2 *(ex-ante)* |
| Description of measurement methods and procedures to be applied: | During the project operation the CPAs will be monitored via surveys according to the monitoring plan described in PoA-DD section A.4.4.2 |
| QA/QC procedures to be applied: | |
| Any comment: | |

| **Data / Parameter:** | **$FC_{LPG,j,y}$** |
|---|---|
| Data unit: | Kg |
| Description: | Consumption of LPG per household in a year *y* in CPA *j* in the project scenario |
| Source of data to be used: | CPAj database |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 3.4 *(ex-ante)* |
| Description of measurement methods and procedures to be applied: | During the project operation the CPAs will be monitored via surveys according to the monitoring plan described in PoA-DD section A.4.4.2 |

| | |
|---|---|
| QA/QC procedures to be applied: | |
| Any comment: | |

| **Data / Parameter:** | **$FC_{kerosene,j,y}$** |
|---|---|
| Data unit: | kg |
| Description: | Consumption of kerosene per household in a year *y* in CPA *j* in the project scenario |
| Source of data to be used: | CPAj database |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 0 *(ex-ante)* |
| Description of measurement methods and procedures to be applied: | During the project operation the CPAs will be monitored via surveys according to the monitoring plan described in PoA-DD section A.4.4.2 |
| QA/QC procedures to be applied: | |
| Any comment: | |

| **Data / Parameter:** | **$n_{k,y,j}$** |
|---|---|
| Data unit: | % |
| Description: | Annual performance ratio of installed plants k in year *y* in CPA *j* |
| Source of data to be used: | Calculated |
| Value of data applied for the purpose of calculating expected emission reductions in section B.5 | 100% (ex-ante) |
| Description of measurement methods and procedures to be applied: | The value is calculated = total number of sampled biogas plants operational in year y in CPA *j* / total number of sampled biogas plants installed in CPA *j*; |
| QA/QC procedures to be applied: | |
| Any comment: | |

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

The monitoring plan that shall be applied to each CPA is described in section A.4.4.2

*Table 12: Quality control and recording of QC*

| No | Activity | Actor | Sample | Modality |
|---|---|---|---|---|
| 1 | Plant commissioning and acceptance | District technician | 100% of all plants are checked | Household visits. Plant and household ID. Construction according to standards and training. Proper functioning. |
| 2 | *Quality control of "under construction" plant* | District technician<br><br>Provincial Technician | The district technicians will visit each and every plants being constructed.<br><br>The provincial technicians will visit on average 2% of the "under construction" plants on random sampling basis. | Household visits.<br>Plant and household ID. Construction according to standards and training. Feedback given to the masons to ensure the quality compliance of quality standards. |
| 3 | *Quality control of "construction completed" plant* | Provincial Technician<br><br>MARD Staff | Based on the received testing & acceptance forms, the provincial technician will, at random, visit 5% of the biogas installations.<br><br>MARD Staff will randomly check 1.% of the completed plants. | Household visits. Plant and household ID. Construction according to standards and training. Proper functioning.<br><br>Quality check on the data and information filled in the form by the district technicians. |
| 4 | Provisions of after-sale-services and complaints mechanisms | District technician/ Provincial technician will be involved if a problem cannot be solved | 100% biogas users will receive post-construction training. The household visit will be implemented upon receiving complaints from biogas users. | Household visit.<br>Plant and household ID, functionality. |

Future CPAs might utilize a different system of monitoring elements, the difference will be justified in the CPA-DD to ascertain that proper quality control and assurance has been applied.

***Quality assurance and quality control***

In order to ascertain that the activities are executed with high quality trainings are organized for masons, biogas technicians and each user is trained on the operation and maintenance of their biogas units. Training workshops target 3 groups

(i) Province and district technician,
(ii) Biogas mason

(iii) potential Biogas user (biogas household and none biogas household),

The main purpose is (1) to promote the biogas programme, create awareness of the benefits of biogas and to provide technical supports (2) inform participants about the procedures related to data collection (i.e. for CDM on fuel data collection), subsidy arrangements (3) ensure proper operation and maintenance of the biogas plant by training participants and proper use of the biogas appliances and bio-slurry.

Programme brochure, leaflet (technical, safety), promotional CD, Biogas user handbook, safety leaflet and VCDs will be available and given to participants to ensure the improvement and consolidation of the knowledge obtained from the training trainings.

Target Audience and schedule: Training schedule is based on approved annual plan, normally divided into 'Before-construction' and Post-construction as specified as follows :

- Provincial and district technician training: carried out by biogas component implementing units in provinces/cities, after the decision to approve annual construction quota is issued and before trainings for biogas mason are conducted. BPMU will recommend trainers/ experts and vocational schools that are experienced with biogas technology to biogas component implementing units for their consideration and selection. Trainings will be under supervision of BPMU
- Biogas mason training: Mason training can be conducted at the same time or after training for biogas technicians
- Biogas user training: Trainings are conducted at location or in the relevant district at regular interval and include all households that recently have invested in a biogas plant. This includes the "Before-construction" and "post-construction" training

In addition, refresh training/ exchange workshop are hold to refresh knowledge and to exchange experiences of masons and technicians.

**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)**

12/01/2012

ADB Carbon Market Initiative (CMI) – Technical Support Facility (TSF)
Kenjiro Suzuki: ksuzuki@adb.org (Till May 2010)
Ha Dang Son: son.hadang@gmail.com
Eric Buysman ericishier@gmail.com
Darshak Mehta dmehta.consultant@adb.org

Consultant
Asian Development Bank
6 ADB Ave. Mandaluyong City
1550 Metro Manila, Philippines

## Annex 1

## CONTACT INFORMATION ON COORDINATING/MANAGING ENTITY and PARTICIPANTS IN THE PROGRAMME of ACTIVITIES

| | |
|---|---|
| Organization: | Ministry of Agriculture and Rural Development (MARD) |
| Street/P.O.Box: | 2 Ngoc Ha , Ba Dinh district |
| Building: | N/A |
| City: | Ha Noi |
| State/Region: | N/A |
| Postfix/ZIP: | N/A |
| Country: | Viet Nam |
| Telephone: | N/A |
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| E-Mail: | vuthanhkhcn@yahoo.com |
| URL: | N/A |
| Represented by: | N/A |
| Title: | Deputy Director General |
| Salutation: | Dr. |
| Last Name: | Thanh |
| Middle Name: | N/A |
| First Name: | Dinh Vu |
| Department: | Science, Technology and Environment |
| Mobile: | N/A |
| Direct FAX: | +84 4 44592128 |
| Direct tel: | +84 4 38433637 |
| Personal E-Mail: | N/A |

## Annex 2

## INFORMATION REGARDING PUBLIC FUNDING

For each CPA the nature of public funding will be revealed, and if public funding is involved, a letter of non-ODA diversion will be made available.

## Annex 3

## BASELINE INFORMATION

The figures used for project emissions were taken from the Biogas User Surveys commissioned by BPD in the years 2006. Altogether 662 households were interviewed in 14 provinces (Binh Dinh, Dac Lac, Dong Nai, Hoa Binh, Hai Duong, Ha Noi, Thua Thien – Hue, Nghe An, Tien Giang, Phu Tho, Son La, Ha Tay, Bac Giang, Tra Vinh). The selection of households was random.

## Annex 4

## MONITORING INFORMATION

The CPA monitoring information is found in Section E.7 and A.4.4.2