



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):

>>

Yunnan Eco-Farming Biogas Project

Version: Version 1.01

Date: 25/12/2009

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

>> *The following information shall be included here:*

1. *General operating and implementing framework of PoA*
2. *Policy/measure or stated goal of the PoA*
3. *Confirmation that the proposed PoA is a voluntary action by the coordinating/managing entity.*

1. General operating and implementing framework of PoA

The proposed PoA plans to install household-biogas digesters with utilizing the pig manure as raw materials for the low-income farmers living below the UN specified poverty line in Yunnan Province, China. The pig manure shall be fermented in the biogas digester instead of being stored in an anaerobic condition in a deep pit. The methane which is supposed to be emitted to the atmosphere in the absence of the proposed PoA shall be recovered and combusted for cooking, heating and other purposes. As a result, the fossil fuel (coal, LPG etc.) currently used to meet the household's daily energy needs shall be replaced by the recovered methane gas.

According to the plan, about 100,000 sets of the biomass digesters are to be installed annually consisting of 10 to 30 of CPAs with 2,000 to 10,000 households in each CPA on the municipal level of County or City throughout the Province. The estimated annual reductions of GHG emission are about 150,000 to 400,000 tonnes of CO₂e in total by implementing all CPAs under the proposed PoA.

The general operating and implementing framework of the proposed PoA is as follows:

PoA Coordinating or Managing Entity (CME): CME of the proposed PoA is Yunnan Sun Valley Energy Conservation Industry Development Co., Ltd (hereafter referred as SVEC). SVEC, a leading private company providing in various energy saving services in cooperation with the local authorities on industrial and agricultural energy management, as the PoA coordinator, will organize and supervise the whole PoA and is also responsible for the management of each CPA's application, data monitor, calculation of GHG emission reduction, and it will also take charge of necessary communication with the UNFCCC and DOE.

Implementer of CPAs under the proposed PoA (Implementer): The Rural Energy and Environmental Office (hereafter referred as REEO) within the jurisdiction of Agricultural Bureau of the municipal government in the targeted County or City of the Province is to be the implementer of the CPAs under the proposed PoA. REEO, as a CPA implementer will be responsible for monitoring the necessary data to calculate the amount of GHG emission reduction and submit to CME.

The crediting period of the PoA is 28 years and that of each CPA is fixed 10 years.

2. Policy/measure or stated goal of the PoA



In the recent years, China, the second energy consuming country in the world is under a process of rapid economic growth accompanying with the remarkable increase of the energy consumption. In particular, the consumption of coal, one of the most popular fossil fuels is markedly increasing every year. The amount of the coal consumption for daily use in Yunnan Province is 3.16 million tons, 2.58 million tons of which is used by rural areas, making up 82% of the total. This ratio exceeds about 15% more than the average level over the entire county¹.

There are two reasons for the high consumption of coal. One is that the rural populations in Yunnan province are mostly in the mountain area and thus there are few town energy infrastructures such as gas pipeline and grid-connected electrical power, etc. The other one is that the farmers are very easy to access to the coal due to the abundant mining resources in the region.

In the other hand, in rural areas the manure from people and animals is stored in deep pit and left to decay anaerobic ally and produced methane is emitted to the atmosphere without treatment. This results not only in the pollution of the atmosphere but also the intensive global warming effect. Meanwhile, the useable energy resource of the methane gas is wasted without any collecting and recovering.

The targets of the proposed PoA are to realize the significant reduction of the coal consumption and notable improvement of the household's living, health and environmental conditions through the installation of the biogas digesters in the rural area. ,

In conclusion, the proposed PoA will contribute to the sustainable development of China in the following points:

- a) To contribute to the energy saving plan and renew energy plan of the 11th 5-year plan of central Chinese government.
 - b) To contribute to the “West Development strategy”.
 - c) To reduce GHG and pollutants by collecting methane and reducing the fossil fuel consumption.
 - d) To improve the life and health conditions of the farmers.
 - e) To lighten financial burden of the farmers by reducing the coal consumption.
 - f) To expand the business market of energy saving technology in China, especially in the under-developed Yunnan Province.
3. Confirmation that the proposed PoA is a voluntary action by the CME.
The proposed PoA is a voluntary action by CME to comply with the targets mentioned above and this is not a legally enforced action.
The revenues from each CPA in terms of CER shall be preferentially distributed to those farmers included in the CPAs under the proposed PoA, after covering the basic costs for management and coordination of CME and the costs for data-collection and monitoring of CPA's implementer as well.

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

>> *The following information shall be included here:*

1. *Coordinating or managing entity of the PoA as the entity which communicates with the Board*
2. *Project participants being registered in relation to the PoA. Project participants may or may not be involved in one of the CPAs related to the PoA.*

¹ China Energy Statistical Yearbook 2008



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1. Coordinating or managing entity of the PoA as the entity, which communicates, with the Board

CME of the proposed PoA is SVEC and which takes charge of necessary communication with the Board and DOE.

2. Project participants being registered in relation to the PoA. Project participants may or may not be involved in one of the CPAs related to the PoA.

Project participants of the PoA are SVEC and Tepia Corporation Japan Co., Ltd. as shown below.

Name of Party involved (*) (host) indicates a host Party)	Private and/or public entity(ies) project participants (*) (as applicable)	Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No)
People’s Republic of China (host)	Yunnan Sun Valley Energy Conservation Industry Development Co., Ltd, Coordinating or Managing Entity	No
Japan	Tepia Corporation Japan Co., Ltd., CER Buyer	No

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

A.4.1. Location of the programme of activities:

A.4.1.1. Host Party(ies):

>>

People’s Republic of China

A.4.1.2. Physical/ Geographical boundary:

>> *Definition of the boundary for the PoA in terms of a geographical area (e.g., municipality, region within a country, country or several countries) within which all small-scale CDM programme activities (SSC-CPAs) included in the PoA will be implemented, taking into consideration the requirement that all applicable national and/or sectoral policies and regulations of each host country within that chosen boundary;*

The physical boundary of the PoA covers all over Yunnan Province. The households to be included in the CPAs under the proposed PoA are those who are living in the rural area of the Province and whose annual income is lower than the average level of the Province.



Figure 1 Boundary of the proposed PoA

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:

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The biogas digesters can collect the methane which is supposed to be exhausted to the atmosphere in the absence of the proposed PoA., and will recover the methane into thermal energy to replace the coal currently used to meet the household’s daily energy needs.

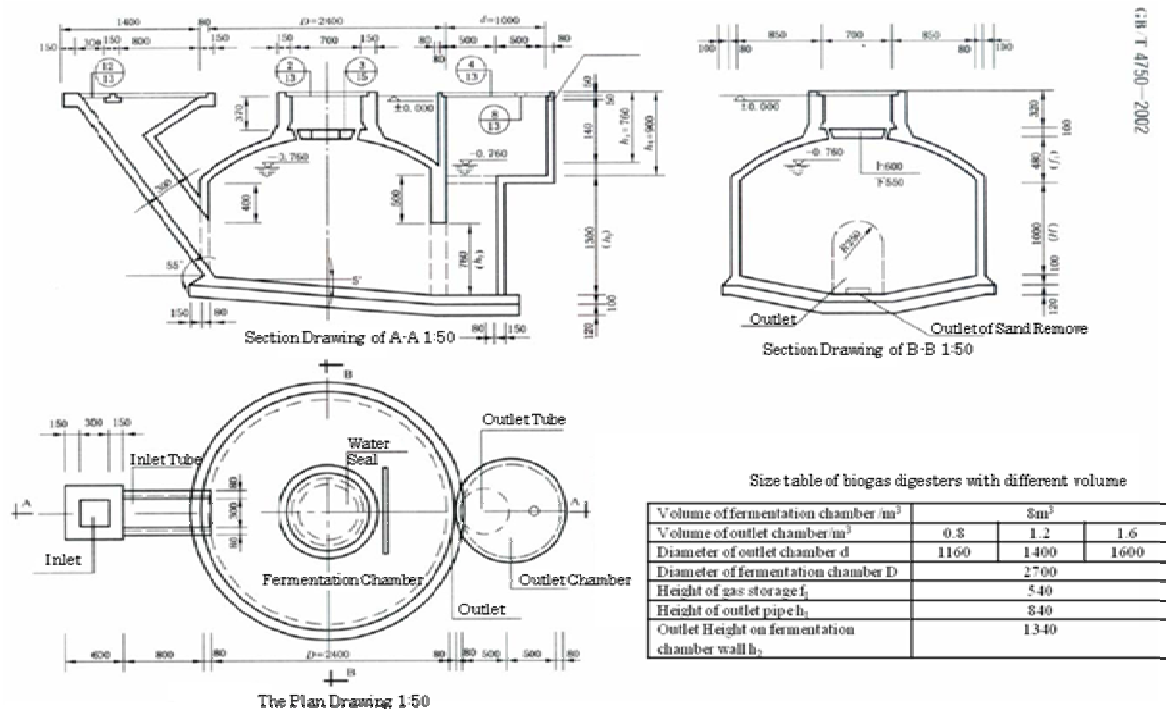
Each CPA activity will comprise of three steps as follows:

Step 1 : Installation biogas digesters

The each CPA activity shall also support renovation of a toilet, pig house and kitchen besides the newly installed biogas digesters(so called “Three in one”). The design of the whole system will be based on the technical standards “The collection of standard design drawings for household anaerobic digesters” (GB/T 4750-2002)² and “Technology criterion on rural biogas digester and three renovations” (NY/T 1639-2008)³ established by the China government. The sample design and image are displayed in Figure 2 and Figure 3 but minor modifications are allowed. The design and construction of the “Three in one” is certified by a technician accredited by the Ministry of Agriculture.

² “The collection of standard design drawings for household anaerobic digesters”, Ministry of Agriculture of the People’s Republic of China, 2002

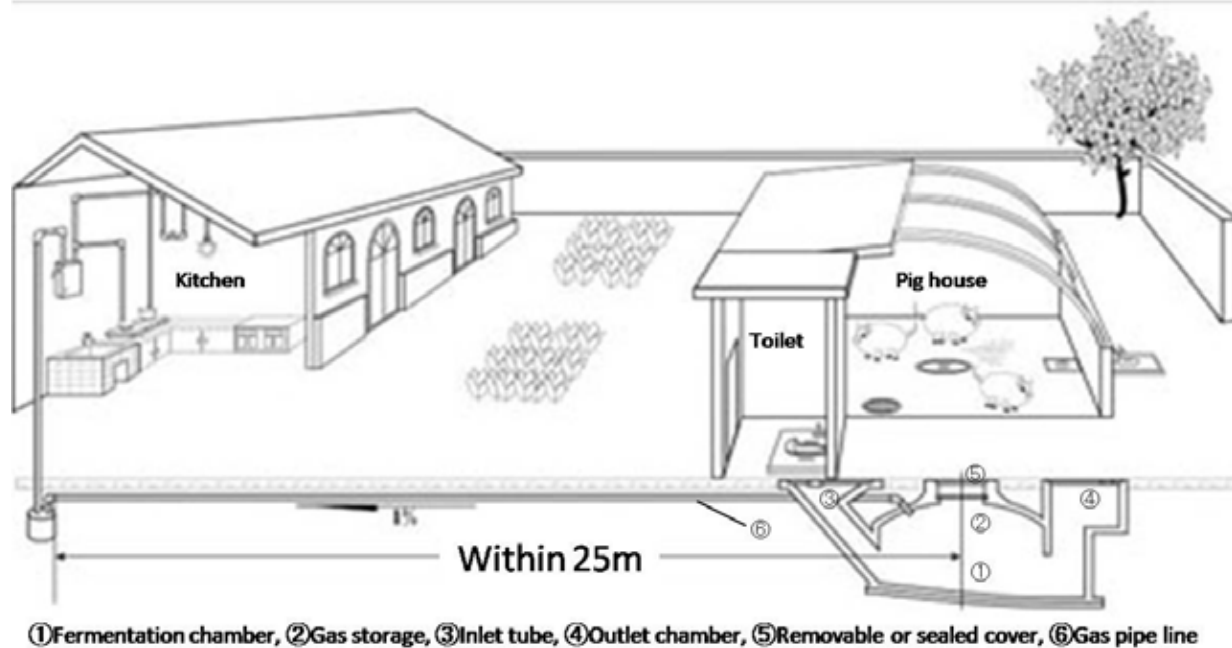
³ “Technology criterion on rural biogas digester and three renovations”, Ministry of Agriculture of the People’s Republic of China, 2008



Source: Ministry of Agriculture

Figure 2 Technical Design of Biogas Digesters

Renovation of pig pen size must be over 12m³ and the toilet size must be over 1.2 m³. The biogas digester size must be 8 m³, which is composed of six parts: Fermentation chamber, gas storage, inlet tube, outlet chamber, removable or sealed cover, and a gas pipe line. The biogas digester will install below the pig pen and the toilet for heat preservation (see in Figure 3). To facilitate the supply of excreta, the inlet of biogas digester will be directly connected to the pig pen and toilet, so that the dung and human excreta can directly drain to the biogas digester.



① Fermentation chamber, ② Gas storage, ③ Inlet tube, ④ Outlet chamber, ⑤ Removable or sealed cover, ⑥ Gas pipe line
Source: Ministry of Agriculture

Figure 3 Schematic of “Three in One” combination of Household Biogas Digesters

Step 2 : Biogas of fermentation

The minimum raw material for the fermentation of the biogas can be guaranteed if the farmers under the CPA breed at least 3 pigs per household. The farmers pour the excreta into the biogas digesters with water, the collected sludge will be the raw materials for fermenting the biogas.

The utilizing method of the biogas digesters and daily maintenance can be described as follows:

- For example, pour 1.8m³ pigs' excreta, 1m³ liquid for fermentation and 4m³ water into the biogas digesters which volume is 8m³ at the beginning, the ratio of the raw materials is about 85%.
- The inlet and outlet of the biogas digesters must be covered to prevent humans or animals from slipping into it.
- The pressure gauge should be always observed, a regular value is about 8,000pa. Gas will be used if it is more than 8,000pa. If the pressure is under 8,000pa, it should be checked whether there is a leakage on the pipe or not.
- Human and animals' excreta is supposed to be poured into the biogas digesters every day, it will become the raw materials of the fermentation about 35-45kg every day. To be careful that before the excreta is poured into the biogas digesters, the existing raw materials will be put out from the biogas digesters and it will be used as fertilizers in the field.
- The method of mixing the raw materials is putting some buckets of it out from the outlet and pour them into the inlet. To be careful that mixing the raw materials should be done once a day in the high temperature season and 3 or 5 times in the low temperature season.

Step 3 : Use the biogas

The fermented biogas will be routed to biogas stove and biogas rice cooker by gas pipe line. A pressure indication device is installed to ensure proper control of gas flow at the flare, and a sulphide capture device is also installed to clean the gas before burning. The biogas will be used as thermal energy to replace coal currently used to meet the households' daily energy needs for cooking. The



guidance on biogas installation and biogas use method is certified by a technician accredited by China government. And Yunnan Province government will distribute “Users’ Manual” to the farmers.

To sum up, “Three in one” is a high level technology of this project, in addition it has been long time to put it into development, research and experiment in China. Furthermore, China government strongly supports this technology to spread it to all parts of the country. In the case of that happens any problem or trouble to the biogas digesters, service station of REEO will provide after-services to the farmers.

All technologies utilized in the project activity are domestic technologies and there will be no international technology transfer involved in all the CPAs under this PoA.

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

>> *Here only a description of criteria for enrolling the CPA shall be described, the criteria for demonstrating additionality of CPA shall be described in section E.5*

The criteria for enrolling the CPA under the proposed PoA are as follows:

- The CPA is implemented in Yunnan Province, China.
- The CME of the proposed PoA is SVEC and the each REEO, the implementer of the CPA has an exclusive agreement with SVEC on PoA development.
- The CPA will install a new biogas digester for each household.
- All the farmers included in the CPAs must meet the key criteria for demonstrating additionality of CPA as indicated in E.5 of this PoA-DD.
- The farmers enrolled in CPA must breed at least 4 pigs.
- The design of the biogas digesters is to be based on the technical standards established by Chinese government.
- The CPA should apply the same technology as well as the baseline and monitoring methodology, AMS I.C. and AMS III.R as all the other CPAs in the PoA do. Versions of the baseline and monitoring methodology may be changed according to most recent guidance provided by the CDM Executive Board.

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):

>> *The following shall be demonstrated here:*

- (i) *The proposed PoA is a voluntary coordinated action;*
 - (ii) *If the PoA is implementing a voluntary coordinated action, it would not be implemented in the absence of the PoA;*
 - (iii) *If the PoA is implementing a mandatory policy/regulation, this would/is not enforced;*
 - (iv) *If mandatory a policy/regulation is enforced, the PoA will lead to a greater level of enforcement of the existing mandatory policy/regulation.*
- (i) The proposed PoA is a voluntary coordinated action;
The proposed PoA is a voluntary coordinated action by CME to comply with the targets as described in A.2. and this is not enforced or mandated by laws or national regulations.



The revenues from each CPA in terms of CER shall be preferentially distributed to those farmers included in the CPAs under the proposed PoA, after covering the basic management and coordination costs of CME, the data-collection and monitoring costs of CPA's implementer as well.

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

The household-based biogas digester is to be installed for the household's self-use without producing any commodity that can be put on market to sell and get revenues. Therefore, the most of farmers is well aware that the installation of biogas digester is a kind of "non-productive" investment. i.e. it is economically unattractive for farmers to accept the digester.

Furthermore, each biomass digester costs about RMB8,000 to 10,000 varying by regions in the province. Although there is a subsidy of RMB 1,650 granted by Chinese government for covering a part of the initial installation costs and a local public/private Funds' loan with a low interest rate ranging from 2.5% to 2.7% is readily available for farmers living in the rural area of the Province, the low-income households below the poverty line still face unavoidable financial hurdles to make any initial investment.

In one word, any CPA would not be implemented in the absence of the PoA.

Detailed barrier and financial analysis shall be done in E.5 of this PoA-DD and B.3. of each CPA-DD.

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

Not applicable.

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

Not applicable.

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

A.4.4.1. Operational and management plan:

>> *Description of the operational and management arrangements established by the coordinating/managing entity for the implementation of the PoA, including:*

- (i) *A record keeping system for each CPA under the PoA.*
 - (ii) *A system/procedure to avoid double accounting e.g. to avoid the case of including a new CPA that has been already registered either as a CDM project activity or as a CPA of another PoA,*
 - (iii) *The SSC-CPA included in the PoA is not a de-bundled component of another CDM programme activity (CPA) or CDM project activity.*
 - (iv) *The provisions to ensure that those operating the CPA are aware of and have agreed that their activity is being subscribed to the PoA;*
- (i) A record keeping system for each CPA under the PoA.

Each CPA will build a record keeping system in the proposed PoA. The service station and village office managed by REEO, the implementer of the CPA will keep data and report record to town



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office. The original and electronical data will be kept respectively during the lifetime of CPAs plus three year in each town office, which is also managed by REEO. and then reported to REEO and SVEC respectively. SVEC will use special record keeping system for data keeping and management.

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

To avoid double accounting of the households and the CPAs to be included respectively in CPAs and PoA, REEO and SVEC the CPA implementers and CME shall check the followings respectively:

- (a) REEO: Check the serial-No carved on the biogas digester that whether the household has been enrolled in other CPAs or not;
- (b) SVEC: Check the China DNA and UNFCCC website that whether the CPA has been already registered either as a CDM project activity or as a CPA of another PoA or not.

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

To avoid the CPA is a debundled component of another bundled SSC CDM project or PoA, via asking SVEC, the EMC of the proposed PoA to check China DNA and checking UNFCCC website.

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

To implement the project as a CPA of the PoA, SVEC will conclude a contract with each REEO, the CPA implementer. Therefore, each CPA implementer can be aware of and agree that their activity is being subscribed to the PoA.

A.4.4.2. Monitoring plan:

>> *The following information shall be provided here:*

- (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 GHG achieved by CPAs under the PoA.*
- (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;*

- (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 GHG achieved by CPAs under the PoA.

In the proposed PoA , the monitoring of all CPAs will be implemented by means of questionnaire survey which is to be verified by DOE. DOE shall check NOT all but some of CPAs for verification of the amount of reductions of anthropogenic emissions by sources with 95% reliability sampling method. The number of CPAs to be verified by DOE shall be decided through formula as below.

$$n = N + \left\{ (\varepsilon + \mu(\alpha))^2 \times [(N - 1) + \rho(1 - \rho)] + 1 \right\}$$



Where:

- n Numbers of CPAs to be verified by DOE;
- $\mu(\alpha)$ Value of standard normal distribution when reliability 95%, taking 1.96;
- N Total numbers of CPAs in the proposed PoA;
- Precision, taking 5%;
- Population rate, taking 0.5.

The monitoring plan for Each CPA is as below :

1. Monitoring summary

REEO, the CPA implementer will operate and manage the CPA and measure necessary data for the monitoring of the CPA and report to CME of the PoA periodically based on the operation and monitoring manual prepared by PoA. The questionnaire survey method shall be carried out and the results of questionnaire survey of each CPA shall be monitored. Monitoring data includes the amounts of the running biogas digesters and breeding pigs, etc. The total numbers of the households to be make the sampling of questionnaire surveys for each CPA shall be decide through the equation as below.

$$n = N + \left\{ (\epsilon + \mu(\alpha))^2 \times [(N - 1) + \rho(1 - \rho)] + 1 \right\}$$

Where:

- n Numbers of households to make questionnaire surveys with sampling method;
- $\mu(\alpha)$ Value of standard normal distribution when reliability 95%, taking 1.96;
- N Total numbers of households in the CPA to be monitored;
- Precision taking 5%;
- Population rate, taking 0.5.

2. Monitoring system

Refer in section E.7.2.

3. The role of the of PoA and CPA implementers

The following table shows the role of PoA and CPA implementers.

	CPA implementers (REEO of each county or City)	CME (SVEC)
Operation and management of monitoring	Operate and manage monitoring of CPAs	Operation and management of the PoA and supervision of each CPA. Develop the operation and monitoring manual for CPAs.
Data collection and reporting	1. Each city agriculture bureau's service station will monitor the amount and operate time of the biogas digesters. Each service station must keep data and report record to each town office. 2. Each village office will monitor swine population and the	Check and instruct.



	coal consumption of households after the installation of the biogas digesters. Each village office must keep data and report record to each town office.	
Data keep and management	<p>1. Data will be archived originally and electronically during project plus 3 years in each town office, and then report record to each city agriculture bureau.</p> <p>2. Data will be archived originally and electronically during project plus 3 years in each city agriculture bureau, and then report record to PoA.</p>	<p>1. PoA will keep and manage the whole data.</p> <p>2. The whole data will be archived originally and electronically during project plus 3 years.</p>
Quality assurance	Undertake regular maintenance of the monitoring systems.	Request regular maintenance of the monitoring systems to each CPA implementer.

4. Monitoring data
Refer in section E.7.1.

5. Check of double accounting occurs
Refer in section E.7.2.

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

Not applicable.

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

No public fund from Annex I Party is involved in PoA.

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

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

>>
01/01/2010

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

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

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Therefore it is not necessary to implement environmental impact assessment.

Manure which will be utilized by the biogas digesters was stored in deep pit before it would overflow in rainy days. So it is expected that drain quality will be improved and stench will be prevented through the PoA. In addition, emission reduction of the coal consumption is expected, and the emission of exhaust gas like SO₂ and CO is expected to be reduced. Therefore, the installation of biogas digesters is favourable for improvement of the environment.

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

>>

In accordance with the relevant Chinese law and regulations, there is no environmental impact assessment requirement to the biogas digester systems of each CPA in the proposed PoA.

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

Note: If local stakeholder comments are invited at the PoA level, include information on how comments by local stakeholders were invited, a summary of the comments received and how due account was taken of any comments received, as applicable.

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

>>

Not applicable.

D.3. Summary of the comments received:

>>

Not applicable.

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

>>

Not applicable.



SECTION E. Application of a baseline and monitoring methodology

This section shall demonstrate the application of the baseline and monitoring methodology to a typical SSC-CPA. The information defines the PoA specific elements that shall be included in preparing the PoA specific form used to define and include a SSC-CPA in this PoA (PoA specific CDM-SSC-CPA-DD).

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

>>

NOTE: The approved SSC baseline and monitoring methodology should be approved for use in a PoA by the Board.

The following approved SSC baseline and monitoring methodology is applied to a SSC-CPA in the PoA:

- (1) Approved methodology, Version 15 of AMS I.C titled “Thermal energy production with or without electricity”
- (2) Approved methodology, Version 01 of AMS III.R titled “Methane recovery in agricultural activities at household/small farm level” was applied.

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

>>

NOTE: In the case of CPAs which individually do not exceed the SSC threshold, SSC methodologies may be used once they have first been reviewed and, as needed, revised to account for leakage in the context of a SSC-CPA.

Category I.C - Version15. Thermal energy production with or without electricity is defined as follows:

This category comprises renewable energy technologies that supply users 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 total installed/rated thermal energy generation capacity of the project equipment is equal to or less than 45MW thermal.

Each CPA activity will change the existing manure management system at the household level from deep pits to household biogas digesters. The biogas digesters provide biogas for cooking and other heating needs for households, replacing coal. Each project household has around 4 pigs.

The thermal energy production capacity for the bundled project would be about 1MW which is less than 45MW. Therefore, Each CPA qualifies under categories I.C, “Thermal energy for the user with or without electricity”.

Category III.R. (Version 1) Methane recovery in agricultural activities at household/small farm level is defined as follows:

1. This project category comprises recovery and destruction of methane from manure and wastes from agricultural activities that would be decaying aerobically emitting methane to the atmosphere in the absence of the project activity. Methane emissions are prevented by:

- a) Installing methane recovery and combustion system to an existing source of methane emissions, or



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- b) Changing the management practice of a bioorganic waste or raw material in order to achieve the controlled anaerobic digestion equipped with methane recovery and combustion system.
- 2. The category is limited to measures at individual households or small farms (e.g. installation of a domestic biogas digester). Methane recovery systems that achieve an annual emission reduction of less than or equal to 5 tonnes of CO₂e per system are included in this category.
- 3. This project category is only applicable in combination with AMS I.C.
- 4. The project activity shall satisfy the following conditions:
 - a) The sludge must be handled aerobically. In case of soil application of the final sludge, the proper conditions and procedures that there are no methane emissions must be ensured.
 - b) Measures shall be used (e.g. combusted or burnt in a biogas burner for cooking needs) to ensure that all the methane collected by the recovery system is destroyed.
- 5. Aggregated annual emission reductions of all systems included shall be less than or equal to 60 kt CO₂ equivalent.

Each CPA is to change swine manure management from deep pit storage to an aerobically digest in biogas digesters, recover methane produced by the biogas digester and use biogas for cooking and heating water for individual households. An annual emission reduction by each household biogas digester is less than 5 tones of CO₂e per biogas digester. Aggregated annual emission reduction of all systems included will be less than or equal to 60 kt CO₂ equivalent. The biogas residue will be used as high quality fertilizer for vegetable and crops under aerobic condition. Therefore, Each CPA qualifies under categories III.R, “Methane recovery in agricultural activities at household/small farm level”

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

Each CPA will adopt the biogas digesters to treat pig manure an aerobically, in order to replace the slurry that would have been stored in a deep pit. The biogas will be recovered and used for cooking and heating water for household members to replace coal. Only CO₂ emission from the coal burning is included in calculating the project GHG emission reduction.
In the table below, all sources of the baseline and the project activity are listed.

Table 1 Emission sources included or excluded from the project boundary

	Sources	Gas	Included?	Explanations
Baseline	Emissions from manure	CH ₄	YES	Major emission source
		N ₂ O	NO	Not significant. Excluded for simplification and conservativeness
		CO ₂	NO	Not significant. Excluded for simplification and conservativeness
	Emissions from burning of coal	CO ₂	YES	Major emission source
		N ₂ O	NO	Not significant. Excluded for simplification and conservativeness
		CH ₄	NO	Not significant. Excluded for simplification and conservativeness
	Emissions from burning of biomass (firewood and crop straw)	CO ₂	NO	Not significant. Excluded for simplification and conservativeness
		N ₂ O	NO	Not significant. Excluded for simplification and conservativeness
		CH ₄	NO	Not significant. Excluded for simplification and conservativeness
Project Activity	Emissions from biogas	CH ₄	YES	Major emission source
		N ₂ O	NO	Not significant. Excluded for simplification



	digester	CO2	NO	Not significant. Excluded for simplification
	Emissions from burning of coal	CO2	NO	Not significant. Excluded for simplification
		N2O	NO	Not significant. Excluded for simplification
		CH4	NO	Not significant. Excluded for simplification
	Emissions from burning of biomass (firewood and crop straw)	CO2	NO	Not significant. Excluded for simplification
		N2O	NO	Not significant. Excluded for simplification
CH4		NO	Not significant. Excluded for simplification	

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

According to AMS I.C. (version 15), for biogas digesters with biogas recovered and gas burners that displace traditional stove using fossil fuels, the simplified baseline is the fossil fuel consumption, in the absence of the project activity. Baseline emission (BEy) is the fossil fuel consumption that would have been used in the absence of the project activity times an emission coefficient for replaced fossil fuel

According to AMS III.R. (version 1), the baseline scenario is the situation where, in the absence of the project activity, swine manure is left to decay an aerobically within the project boundary and methane is emitted to the atmosphere. Baseline emissions (BEy) are calculated ex ante using the amount of swine manure that would decay an aerobically in the absence of the project activity, with the most recent IPCC tier 2 approach (please refer to the chapter “Emissions from Livestock and Manure Management” under the volume “Agriculture, Forestry and other Land use” of the 2006 IPCC Guidelines for National Greenhouse Gas Inventories). Because there are no country/regional-specific values, IPCC default values will be applied in this project.

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:

>> *Here the PPs shall demonstrate, using the procedure provided in the baseline and monitoring methodology applied, additionality of a typical CPA.*

According to the simplified modalities and procedures for small-scale CDM project activities, Project participants shall provide an explanation to show that the CDM project activity would not have occurred anyway due to at least one of the following barriers:

- (a) Investment barriers: a financially more viable alternative to the project activity would have led to higher emissions;
- (b) Technology barriers: a less technologically advanced alternative to the project activity involves lower risk 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) Barriers due to prevailing practice: prevailing practice or policy requirements would have led to implementation of a technology with high emissions;
- (d) Other barriers: without the project activity, for another specific reason identified by the project participant, such as institutional barriers or limit information, managerial resources,



organizational capacity, financial resources, or capacity to absorb new technologies, emissions would have been higher.

Several barriers are mentioned herewith even though only one of barriers is necessary to demonstrate the additionality according to the guideline of small-scale CDM project.

1. Investment Barrier

According to the official report issued by Yunnan Municipal Bureau of Statistics on February 6, 2009⁴, the average annual income of per farmer of Yunnan Province of China in 2008 is RMB3,102.6 and the average expenditure for essential living necessities including the expenditure for food, clothes, residence and medical expenses is RMB2,455 counting about 79.1% of all the annual income. That is, only RMB647.7, counting about 20.9% are left for the expenditure of other purposes.(Table B.3.)

Table 2 Yunnan farmers' balance sheets in 2008

Annual Income/ expenditure		Amount (RMB)		Percentage
Annual Income		Per farmer	Per household*	100%
		3,102.6	12,412	
Expenditures for essential living necessities				
(1)	1)Food	1,483.2		47.8%
	2)Clothes	119.6		3.9%
	3)Residence	626.1		20.2%
	4)Medical expenses	44.0		1.4%
	5)Education	182.0		5.9%
	Total		2,455	9,820
Expenditures for other purposes				
(2)	1)Traffic and communication	248.3		8.0%
	2)Family equipment	119.0		3.8%
	3)Others	168.6		5.4%
	4)Balance	111.8		3.6%
	Total		647.7	2,591

Source: China State Statistical Bureau, 2008

*Note: The annual income of household is calculated as a standard core family consisting of four(4) persons.

⁴http://wsws.xxgk.yn.gov.cn/canton_model21/newsview.aspx?id=729470

http://www.stats.gov.cn/tjfx/dfxx/t20090203_402535567.htm



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In addition, the poverty line set by United Nations Statistics Division based on the results of the 2005 *International Comparison Program* (ICP)⁵ is US\$1.25 a day per person, which is equal to US\$456.25 (about RMB3,116 as an annual income, using an exchange of US\$1=RMB6.829). This indicates that the most of farmers under the average annual income in the Province is living below the UN specified poverty.

In the other hand, according to the technical documents of the biogas digester design, the average initial investment costs, including the installation, operation and maintenance cost for each household is estimated to be about RMB 8,000 to 10,000 varying by regions in the province. This makes the low-income households still facing unavoidable financial hurdles to make any initial investment even if there is a subsidy of RMB1,650, about 16.5% to 20.1% of the total initial investment granted by Chinese government and a local public/private Funds' loan with a low interest rate ranging from 2.5% to 2.7% is readily available for farmers living in the rural area of the Province.

In fact, the local Funds strictly restrict amount of the loan to the farmers, especially to those needy households due to the frequent failure of the farmers' repayment on time. Usually, 50 % is set as the maximum on the farmers' self-bearing initial investment ranging from RMB6,350 to 8,350 for each household after deducting the government subsidy. This upper limit made the low-income households hardly bear the remained share of the initial investment and thus the installation never be implemented in the absence of the PoA.

In the other hand, the household-based biogas digester is to be installed for the household's self-use without producing any commodity that can be put on market to sell and get revenues. Therefore, the most of farmers is well aware that the installation of biogas digester is a kind of "non-productive" investment; i.e. it is economically unattractive for farmers to accept the digester.

By implementing the CPA under the PoA, however, there will be revenue from each CPA in terms of CERs and this will make the installation of biogas digester attractive economically. The local Funds shall remove the restriction of the loan condition and it will become feasible.

On CPA level, the demonstration of additionality and the selection of the households to be included in the CPA shall be done simultaneously; That is, only the households who have additionality are selected to include in the CPA by means of a financial analysis method. The procedures are as follows:

Step 1: Perform a financial analysis

(a) Calculate IRR (Internal Rate of Return) of the biogas digester installation project with considering the cash-in from the saving of fossil fuels, like coal, LPG etc.

(b) Confirm that the IRR < BM (benchmark) if the CER revenue is not considered and thus the project is economically unfeasible;

(c) Meanwhile, confirm the IRR > BM (benchmark) if the CER revenue is considered and thus the project is economically getting feasible.

5

<http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/0,,contentMDK:21881954~pagePK:34370~piPK:34424~theSitePK:4607,00.html>



The main parameters for performing a financial analysis are shown on the table below.

Table 3 Main parameters for financial analysis

Items	Unit	Value	Source
Installed capacity of digester	m ³	8	
Total initial investment	RMB	8,000-10,000	
Governmental subsidy	RMB	1,650	
Household's contribute money	RMB	6,350-8,350	The Minimum
Loan to cover the investment	RMB	3,175-4,175	The Maximum
Interest rate	%	2.7	
O&M	RMB/yr	160	
Quantity of coal saved	tonne/yr	0.85	
Unit price of coal	RMB /tonne	800	
Lifetime of the biomass digester project	years	15	
CERs price (assumed)	€/tCO ₂	9	Assumed
Exchange rate	(RMB/€)	10	
Credit period	years	10	

Step 2: Select target households

The target household has to meet the following condition:

- (a) The household is the low-income one with an annual income lower than the UN specified poverty line;
- (b) The household has applied for the installation of biogas digester and been approved to be available for a subsidy granted by Chinese government.
- (c) The household has applied for a local Fund's loan and been approved to be available for the loan with a low interest rate.
- (c) decide the target household using the self-bearing percentage of individual household payment, R calculated in accordance with the equation as below:

$$R = (I - S - L) / W_s \times 100\%$$

Where:

- R* percentage of individual household payment;
- I* Initial investment of individual household for the installation of biogas digester;
- S* Chinese government Subsidy;
- L* Loan;
- W_s* Annual income of household;

If R = 100%, then the household is the target one with an additionality; otherwise not.

2. Technical Barrier

The farmers in the project areas are lack of education, so whether the biogas digesters can function and maintain properly is a problem. The most problem is the farmers haven't known the time of pouring pig manure as fermentation raw materials, and neither have they known the quantity and density of the raw materials.



To solve the problem, guidance and support from the expert, who has the qualification from the Ministry of Agriculture, is required. Farmer training will be carried out concerning the time of pouring pig manure, the quantity and density, and methods of operating biogas digester properly. Each town will set up service station, in which experts with the qualification are deployed.

However, in reality the income of migrant workers is relatively large, so the situation of experts outflow with the qualification is serious. In addition, due to the spread of the biogas digesters, more experts are required. It is necessary to set a training course for educating experts by cooperating with local government. According to the first half rural areas energy report of Yunnan province in 2009, there is a lack of about 3,000 experts at present. If the CER is obtained from the project, the experts working conditions and the outflow of experts will be expected to be improved.

3. Barrier from Prevailing Practice

The urbanization construction of rural areas in Yunnan province is later than the other provinces. One reason is there are 26 races in Yunnan province, each of which has its life style and custom. The other reason is the rural areas in Yunnan province are mostly in the mountains, so it is difficult for infrastructure construction of town gas and water service.

According to the traditional way, in China rural areas farmers store manure from animals and persons in deep pit. When the pits almost overflows they carry manure to the fields by buckets and use it as fertilizer. For daily use the farmers use energy they can get in easy way. In the past they got energy by deforestation, due to the protection of forest by China government, felling was prevented. Furthermore, the farmers are afraid of landslide, so along with the increase of income the coal consumption has increased nowadays. According to China energy statistic yearbook, the amount of the coal consumption for daily use in Yunnan province (in which there are lots of poor areas) is 3.16 million tons, 2.58 million tons of which is used by rural areas, making up 82% of the total. This ratio exceeds 15% more than a China average level.⁶ There are two reasons of the high consumption of coal. One reason is the rural areas in Yunnan province are mostly in the mountains so that town gas and electricity is almost not. The other reason is Yunnan is the place of origin coal, so it is easy for the farmers to get coal. It is believed that coal is the most energy for the farmers' daily use.

In conclusion, the CER revenue for the activity is indispensable to achieve this project and thus is additional.

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

>> Here the PPs shall provide the key criteria for assessing additionality of a CPA when proposed to be included in the registered PoA. The criteria shall be based on additionality assessment undertaken in E.5.1 above. The project participants shall justify the choice of criteria based on analysis in above section.

It shall be demonstrated how these criteria would be applied to assess the additionality of a typical CPA at the time of inclusion.

NOTE: Information provided here shall be incorporated into the PoA specific CDM-SSC-CPA-DD that shall be included in documentation submitted by project participants at registration of PoA.

The key criteria and data for assessing the additionality of the CPAs in the proposed PoA are as follows. The additionality of CPAs shall be recognized if they meet the specifications in the table.

⁶ China Energy Statistical Yearbook 2008



Table 4 The key criteria and data for assessing the additionality

key criteria		Data	Remarks
Project <i>IRR</i>		4%	benchmark decided based on the interest rate of loan
Annual income of household, <i>I</i>		US\$456.25= RMB12,463	UN specified poverty line per household
Chinese government subsidy, <i>S</i>	=	RMB1,650	in Yunnan Province
ratio of loan, <i>L/(I-S)</i>		50%	set by local funds as the maximum
Ratio of individual payment, <i>R</i>		100%	

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 a small-scale project category AMS I.C. (Version 15) “Thermal energy production with or without electricity” and AMS III.R. (Version 1) “Methane recovery in agricultural activities at household/small farm level”. The baseline and monitoring methodology of AMS I.C. (Version 15) and AMS III.R. (Version 1) are applied for a typical SSC-CPA. Versions of the baseline and monitoring methodology may change according to the most recent guidance provided by the CDM Executive Board.

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

>>

1. Baseline emission

(1) CH₄ emission from manure management

Four steps have been applied to determine CH₄ emissions from manure management:

- Step 1: Identification of baseline emission sources;
- Step 2: Identification of emission factor for methane emission from manure management;
- Step 3: Survey of swine population;
- Step 4: Calculation of baseline CH₄ emission from manure management for each household.

Step 1: Identification of baseline emission sources

Baseline emission sources for manure management have been identified previously in Table 1.

Step 2: Identification of emission factor for methane emission from manure management

Swine manure is stored in deep pits around 6 months before land application. Annual average temperature ranges 14 °C in the Xuanwei. According to IPCC Tier 2 approach, formula (1) is applied to calculate methane emission factor for deep pit manure management system. Default IPCC values for Bo and Vs will be applied because no national specific values.

$$EF_{CH_4} = (Vs \times 365) \times (Bo \times 0.67 \text{kg/m}^3 \times MCF \times MS) \quad (1)$$

Where,

EF_{CH_4} Annual CH₄ emission factor for swine in Xuanwei, kgCH₄/swine/year



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VS	Daily volatile solid excreted for swine, kg dry matter swine/day, as per 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, and Chapter 10
Bo	Maximum methane producing capacity for manure produced by swine, m ³ CH ₄ kg of VS excreted, as per 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, and Chapter 10
0.67	Conversion factor of m ³ CH ₄ to kilograms CH ₄ , kg/m ³
MCF	Methane conversion factor for deep pit manure management system upon the climate of Yunnan Province, %, from IPCC 2006 Guidelines Table 10A-7, chapter 10, volume
MS	Fraction of swine manure handled using manure management system. In this project, 100 percent of manure is stored in deep pit.

Step 3: Survey of swine population

In order to obtain information on the swine population raised by households, an extensive household survey for 70 households within and without biogas digester was conducted. Table 3 presents the swine population of the households.

The swine population of the households (head/household)

Swine population Average	Swine population within biogas digesters household	Swine population without biogas digesters household
to be decided on CPA level through questionnaire method	to be decided on CPA level through questionnaire method	to be decided on CPA level through questionnaire method

Step 4 : Calculation of baseline CH₄ emission from manure management for each household

Baseline CH₄ emission can be calculated based on equation (2):

$$BE_{CH_4, household} = GWP_{CH_4} \times \frac{1}{1000} \times SP \times EF_{CH_4} \quad (2)$$

Where,

$BE_{CH_4, household}$ Baseline CH₄ emission from deep pit manure management system for the biogas digester, tCO₂e/year

GWP_{CH_4} Global Warming Potential (GWP) of CH₄.

SP Average swine population for household

EF_{CH_4} CH₄ emission factor for deep pit swine manure management, kg CH₄/swine/year

(2) Baseline CO₂ emission from the coal consumption

Four steps will be applied to determine CO₂ emission in baseline:

- Step 1: Identification of baseline emission sources;
- Step 2: Identification of emission factors;
- Step 3: Survey and calculation of the coal consumption before biogas digester construction;
- Step 4: Calculation of baseline CO₂ emission from the coal consumption.

Step 1: Identification of baseline emission sources

Baseline CO₂ emission sources have been identified as listed in Table 1.

Step 2: Identification of emission factor of the coal combustion



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According to the IPCC 2006 Guidelines, Volume 2, Chapter 2, Table 2.5, the CO₂ emission factor per unit of energy of the fuel that would have been used in the baseline plant, 94.6 tCO₂ / TJ, default value for coking and other bituminous coal.

Step 3: Survey and calculation of the coal consumption before biogas digester construction

Since the methane leakage from biogas digesters is estimated to be 10%, the amount of methane generated by each biogas digester using only swine manure can be estimated to be, on equation (3):

$$MG_y = (VS \times 365) \times B_o \times D_{CH_4} \times SP \times (1 - LF_{AD}) \quad (3)$$

Where,

MG _y	Methane generated by one biogas digester from swine manure only, kgCH ₄
VS	Daily volatile solid excreted for swine, kg dry matter swine/day, as per 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, and Chapter 10
B _o	Maximum methane producing capacity for manure produced by swine, m ³ CH ₄ kg of VS excreted, as per 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, and Chapter 10
LF _{AD}	Methane leakages from anaerobic the biogas digesters; a default value of 0.10 can be taken according to table 10A-8 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, and Chapter 10.
D _{CH₄}	Conversion factor of m ³ CH ₄ to kilogram CH ₄ (as per 2006 IPCC guidelines, see Volume 4, Chapter 10, Page 10.42).
SP	Average swine population for household

The net quantity of heat supplied by the project corresponds to the methane from the biogas digester, taking into account the efficiency of the gas stove on equation (4):

$$EG_y = MG_y \times Q_{CH_4} \times \eta_{gas} \div 1000000 \quad (4)$$

Where,

EG _y	The net quantity of heat supplied by the project activity during the year y in TJ
MG _y	Methane generated by one biogas digester from swine manure only, kgCH ₄
Q _{CH₄}	Lower heating value of methane, 50MJ/kg
η _{gas}	The efficiency of the gas stove, 55%

Step 4 : Calculation of baseline CO₂ emission from the coal consumption

According to the methodology AMS-I.C. (v.15), the simplified baseline is the fuel consumption of the fossil fuel technology that would have been used in the absence of the project activity times the CO₂ emission factor for the fossil fuel displaced on equation (5):

$$BE_{CO_2, household} = EG_y \times EF_{coal} \div \eta_{coal} \quad (5)$$

Where,



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$BE_{CO_2, household}$	Baseline CO ₂ emission from the coal combustion for household before the installation of the biogas digester, tCO ₂ e/year for each household
EG_y	The net quantity of heat supplied by the project activity during the year y in TJ
EF_{coal}	The CO ₂ emission factor per unit of energy of the fuel that would have been used in the baseline plant, 94.6 tCO ₂ / TJ, IPCC 2006 Guidelines, Volume 2, Chapter 2, Table 2.5, default value for coking and other bituminous coal.
η_{coal}	The efficiency of the plant using fossil fuel that would have been used in the absence of the project activity, 20%.

(3) Total baseline GHG emission calculation per household GHG emission for each household under the baseline scenario can be calculated based on equation (6)

$$BE_{y, household} = BE_{CH_4, household} + BE_{CO_2, household} \quad (6)$$

Where,

$BE_{y, household}$ Baseline GHG emission for household before the installation of the biogas digester, tCO₂e/year for each household

(4) Total baseline GHG emission of CPA

Total baseline GHG emission of CPA can be calculated based on equation (7)

$$BE_y = (BE_{CH_4, household} + BE_{CO_2, household}) \times BDN \quad (7)$$

Where,

BE_y Total baseline GHG emission of CPA, tCO₂e/year

BDN Biogas digester numbers in CPA

2. Project Emission

Project emissions consist of CO₂ emissions from the coal combustion and CH₄ emissions from biogas digester.

(1) CH₄ emission from biogas digester

The CH₄ emission from biogas digester is calculated using equation (8):

$$PE_{CH_4, household} = LF_{AD} [GWP_{CH_4} \times D_{CH_4} \times B_o \times VS_{m,y}] \div 1000 \quad (8)$$

Where:

$PE_{CH_4, household}$ Project emissions from physical leakages in the each biogas digesters in year y, (t CO₂e).

LF_{AD} Methane leakages from anaerobic the biogas digesters; a default value of 0.10 can be taken according to table 10A-8 of 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, and Chapter 10.

GWP_{CH_4} Global Warming Potential of CH₄.

D_{CH_4} Conversion factor of m³ CH₄ to kilogram CH₄ (as per 2006 IPCC guidelines, see Volume 4, Chapter 10, Page 10.42).

B_o Maximum methane producing potential of the manure type treated in the biogas digesters as per 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, and Chapter 10 (m³ CH₄ per kg of dm by animal type)



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VS Annual amount of volatile solids treated in the biogas digesters on dry matter weight basis as per 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 4, and Chapter 10 (kg of dm per year)

(2) Project CO₂ emission from the coal combustion

Based on the methodology AMS-I.C. only the amount of coal replaced by the renewable energy is considered, which is not part of the baseline. Because the biogas is 100 % renewable, the project emission from the coal consumption is zero.

(3) Project GHG emission calculation for each household

GHG emission for each household under the project activity can be calculated based on equation (9)

$$PE_{y,household} = PE_{CH_4,household} + PE_{CO_2,household} \quad (9)$$

Where,

PE_{y,household} Annual project GHG emission of the household after the installation of the biogas digester, tCO₂e/year for each household

PE_{CH₄,household} Project emissions from physical leakages in the each biogas digesters in year y, (t CO₂e).

PE_{CO₂,household} 0

(4) Total project GHG emission of CPA

Total project GHG emission of CPA can be calculated based on equation (10)

$$PE_y = (PE_{CH_4,household} + PE_{CO_2,household}) \times BDN \quad (10)$$

Where,

PE_y Total project GHG emission of CPA, tCO₂e/year

BDN Biogas digester numbers in CPA

3. Leakage

For methodology AMS I.C (Version 15) titled “Thermal energy production with or without electricity” if the energy generating equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered. For methodology AMS III.R (version 1) titled “Methane recovery in agricultural activities at household/small farm level”, if the energy methane recover and combustion equipment is transferred from another activity or if the existing equipment is transferred to another activity, leakage is to be considered for ^{CPA}, it is not the case.

Therefore, leakage will not be considered.

4. Calculation of total CPA GHG emission reductions can be use equation (11)

$$ER_y = BE_y - PE_y - LE_y \quad (11)$$

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)

Parameter:	MS percent
Data unit:	Fraction
Description:	Fraction of manure handled in system j in the baseline



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Source of data used:	Project proponents
Value applied:	100 percent
Justification of the choice of data or description of measurement methods and procedures actually applied :	Manure produced by pig was applied to deep pit
Any comment:	

Data / Parameter:	LF _{AD}
Data unit:	%
Description:	Methane leakage from anaerobic the biogas digester
Source of data used:	2006 IPCC Guidelines
Value applied:	10%
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	VS
Data unit:	kg dry matter/animal/day
Description:	Volatile solid excretion
Source of data used:	2006 IPCC Guidelines
Value applied:	0.3 kg dry matter/animal/day
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	Bo
Data unit:	m ³ CH ₄ /kg-dm VS
Description:	Maximum methane production
Source of data used:	IPCC 2006 Guidelines
Value applied:	0.29
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	MCF
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Data unit:	Fraction
Description:	Methane conversion factor
Source of data used:	IPCC 2006 Guidelines
Value applied:	25% for Xuanwei
Justification of the choice of data or description of measurement methods and procedures actually applied :	Decided according to annual average temperature of Xuanwei (2003-2008)
Any comment:	

Data / Parameter:	GWP_{CH_4}
Data unit:	tCO ₂ e/tCH ₄
Description:	Global warming potential for CH ₄
Source of data used:	IPCC 2006 Guidelines
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	D_{CH_4}
Data unit:	kg/m ³
Description:	Conversion factor of 1 m ³ CH ₄ to kilograms CH ₄
Source of data used:	2006 IPCC Guidelines
Value applied:	0.67
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 /TJ
Description:	CO ₂ emission factor per unit of energy of the fuel
Source of data used:	2006 IPCC Guidelines
Value applied:	94.6 tCO ₂ /TJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	The data corresponds the emission factor for raw coal 25.8 tC/TJ



	(25.8 × 44 ÷ 12=94.6 tCO ₂ /TJ) provided by National Development and Reform Committee (NDRC: www.ccchina.gov.cn)
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Data / Parameter:	η_{coal}
Data unit:	%
Description:	Efficiency of the plant using coal
Source of data used:	
Value applied:	20%
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	η_{gas}
Data unit:	%
Description:	Efficiency of the gas stove
Source of data used:	National Standards of China
Value applied:	50%
Justification of the choice of data or description of measurement methods and procedures actually applied :	According to the minimum requirements of National Standards of China
Any comment:	

Data / Parameter:	NCV
Data unit:	kJ/kg
Description:	Default net calorific values of cooking coal
Source of data used:	Published data by China NDRC (www.ccchina.gov.cn)
Value applied:	20908
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	EF _{coal}
Data unit:	tC/TJ
Description:	Carbon emission factor per unit of energy of coal that would have been used in the baseline in (tC/ TJ)
Source of data used:	Published data by China NDRC (www.ccchina.gov.cn)
Value applied:	25.8
Justification of the	



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choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	Fraction oxidized
Data unit:	
Description:	Fraction oxidized
Source of data used:	Published data by China NDRC (www.ccchina.gov.cn)
Value applied:	1.00
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	H
Data unit:	Hour
Description:	annual operational hours of biogas digesters
Source of data to be used:	Baseline survey
Value of data	8640
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	To cross-check the operation hour with the biogas volumes.
Any comment:	Data will be archived electronically during project plus 3 years

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

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

Data / Parameter:	BDN
Data unit:	Number
Description:	Total number of household biogas digester users included in the biogas digesters project activity.
Source of data to be used:	Project proponents
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of	Monitoring data



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measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	Verify the household number of biogas digesters according to the sales record of biogas stove.
Any comment:	Data will be archived electronically during project plus 3 years

Data / Parameter:	PGcoal
Data unit:	Kg/household/year
Description:	Annual average the coal consumption for household after installation of biogas digesters
Source of data to be used:	Sample survey
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:	Monitoring data
QA/QC procedures to be applied:	
Any comment:	

Data / Parameter:	H
Data unit:	Hour
Description:	Annual operational hours of biogas digesters
Source of data to be used:	Project proponents
Value of data applied for the purpose of calculating expected emission reductions in section B.5	8640
Description of measurement methods and procedures to be applied:	Monitoring data
QA/QC procedures to be applied:	To cross-check the operation hour with the biogas volumes.
Any comment:	Data will be archived electronically during project plus 3 years

Data / Parameter:	T
Data unit:	
Description:	Annual Average ambient temperature at county weather station nearby project site
Source of data to be used:	Each city weather station



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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:	Purchase from County meteorology stations. Archive electronically during project plus 5 years.
QA/QC procedures to be applied:	
Any comment:	Used to select the annual MCF from IPCC 2006 Guidelines

Data / Parameter:	SP
Data unit:	Number
Description:	Swine population in individual household in project case
Source of data to be used:	Project proponents
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:	Monitoring data
QA/QC procedures to be applied:	
Any comment:	Archive electronically during project plus 3 years

Data / Parameter:	The amount of manure VS generated by pigs in individual household
Data unit:	Kg dry matter/day
Description:	Volatile solid contained in the manure generated by pigs in individual household in project case
Source of data to be used:	Project proponents
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Product of pig number in Table 3 and IPCC default VS values of 0.3 kg dry matter/animal/day
Description of measurement methods and procedures to be applied:	The amount of pig manure VS generated in individual household will be calculated as product of swine population (SP) in individual household in project case and IPCC default VS values
QA/QC procedures to be applied:	
Any comment:	Archive electronically during project plus 3 years



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Data / Parameter:	Sludge
Data unit:	
Description:	Destination of biogas sludge application
Source of data to be used:	Household
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:	
QA/QC procedures to be applied:	
Any comment:	Data will be archived electronically during project plus 3 years

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

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In the PoA, monitoring will be done for each CPA. The monitoring plan is provided as follows.

1. Monitoring summary

In the proposed PoA , the monitoring of all CPAs will be implemented by means of questionnaire survey which is to be verified by DOE. DOE shall check NOT all but a part of CPAs for verification of the amount of reductions of anthropogenic emissions by sources with 95% reliability. The number of CPAs to be checked by DOE shall be decided through formula as below.

$$n = N + \left\{ (\varepsilon + \mu(\alpha))^2 \times [(N - 1) + \rho(1 - \rho)] + 1 \right\}$$

Where:

- n Numbers of households to make questionnaire surveys with random sampling method;
- $\mu(\alpha)$ Value of standard normal distribution when reliability 95%, taking 1.96;
- N Total numbers of households in the CPA to be monitored;
- Precision taking 5%;
- Population rate, taking 0.5.

2. Monitoring system

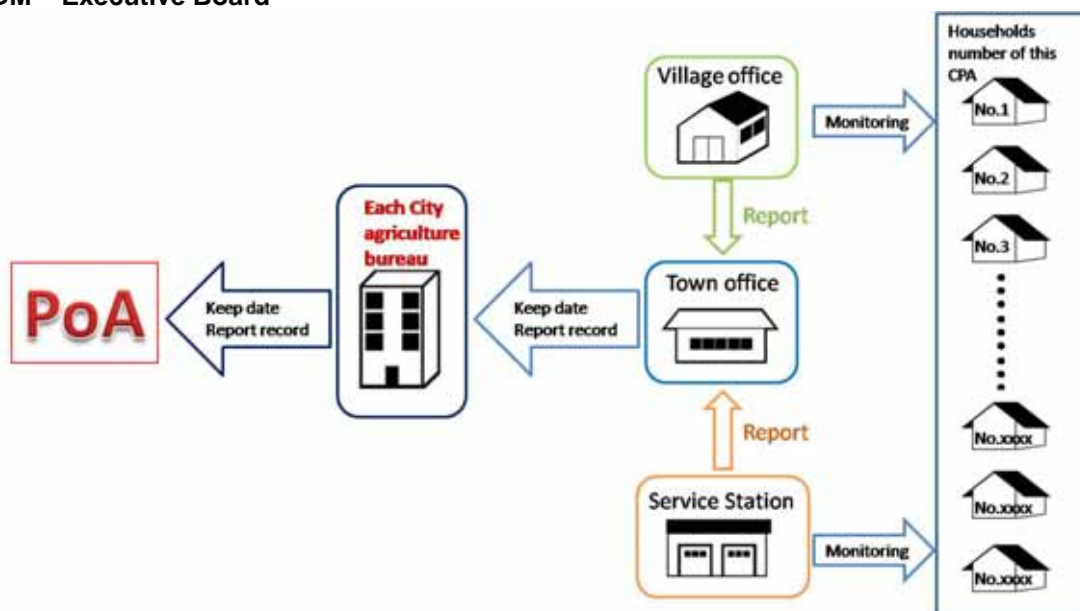


Figure 4 Monitoring system of Each SSC-CPA

3. The role of the CPA implementers

	REEO (CPA implementers)
Operation and management of monitoring	Operate and manage monitoring of CPAs
Data collection and reporting	1. Each city agriculture bureau's service station will monitor the amount and operate time of the biogas digesters. Each service station must keep data and report record to each town office. 2. Each village office will monitor swine population and the coal consumption of households after the installation of the biogas digesters. Each village office must keep data and report record to each town office.
Data keep and management	1. Data will be archived originally and electronically during project plus 3 years in each town office, and then report record to each city agriculture bureau. 2. Data will be archived originally and electronically during project plus 3 years in each city agriculture bureau, and then report record to PoA.
Quality assurance	Undertake regular maintenance of the monitoring systems

4. Avoid double accounting

CPAs will make mark as Figure 5 for each biogas digesters with serial number to avoid double accounting of the biogas digesters



Figure 5 Mark of the biogas digesters

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

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Date of completion: 26/2/2009, Name of the responsible person(s)/entity

Name	Company	Department
Tomohiko IKE	E & E Solutions Inc.	Environment Division, GHG and Energy Solution Group
Keiji NIJIMA	E & E Solutions Inc.	Environment Division, GHG and Energy Solution Group



Annex 1

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

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Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public fund from Annex I Party is involved in PoA.

Annex 3

BASELINE INFORMATION

Refer to this PoA-PDD main text.

Annex 4

MONITORING INFORMATION

Refer to this PoA-PDD main text.