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

CONTENTS

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

B. Duration of the small-scale programme of activities

C. Environmental Analysis

D. Stakeholder comments

E. Application of a baseline and monitoring methodology to a typical small-scale CDM Programme Activity (SSC-CPA)

Annexes

Annex 1: Contact information on Coordinating/managing entity and participants of SSC-PoA

Annex 2: Information regarding public funding

Annex 3: Baseline information

Annex 4: Monitoring plan

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):

Biogas support programme of activity in Nepal(draft)

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

The Biogas Support Program (BSP) in Nepal is established in July 1992 with funding from Directorate General for International Cooperation of the Netherlands (DGIS). The BSP aims to install 200 thousands biogas plants in households until 2009 December as alternative energy.

The proposed PoA would be implementing under the BSP. The purpose of the PoA is also to install the biogas plant at household in order to reduce the GHG by reducing the consumption of the firewood which is identified as non-renewable biomass, and by avoiding the methane emission from open-dumped livestock dung. The BSP is the voluntary activity based on Nepal government, so the people, private sectors and municipalities are not imposed of any obligations. So, the proposed PoA under the BSP is the voluntary action.

The PoA boundary covers the whole Nepal(however some part of the remote hill area might be excluded). CPA boundary which shall include the cooking place as fuel combustion place and the site where livestock dung is dumped before the installation of the biogas plant is defined in each household. Although the Coordinating or Managing entity of PoA manages all CPA which manages about 100 biogas plant in their boundary, Each CPA site is dotted in each region of Nepal. So, PoA communicates and sends/receives the monitoring data to CPA with telecommunication network like tele-center in the duration of the PoA.

The amount of GHG reduction per one biogas plant is estimated at about 3.1t-CO_2/year. If 10 CPA which is expected to hold 100 households, that is, 100 bigasplant can be registered under the PoA, the amount of GHG reduction is estimated approximately 3,100t-CO_2/year.

And we expect that the installation of the biogas plant also contributes to sustainability in Nepal in the followings;

Environmental impact

- The amount of collected firewood decreases by the proposed project, which is consequently expected to lead to avoid deforestation. And the appropriate treatment of livestock dung leads to appropriate treatment of waste materials. And ground water contamination caused by Nitrate Nitrogen and Nitrite Nitrogen produced by open dumping is also expected to be mitigated.

Economical impact

- In BSP, the registered biogas companies are eligible to install biogas plants. So far, some 72 companies have been registered, which helps to expand the employment opportunity.

- Generally, farmers use chemical fertilizer, however, it is controlled by installation of biogas plant. This is because the slurry discharged from the plant is used as agricultural fertilizer to save the cost of fertilizer and increase the yield of crops.

Social impact

- It is reported that the hours spent in collecting firewood is saved by the installation of biogas plant, and the saved hour is 93 minutes per a day average. 228 to 89 minutes in Terai area, 187 to 90 minutes in Hill area, and the installation of biogas plant leas to save considerable amount of hours.

- Women are released from the hard work (collection of firewood) by the installation of biogas plant. And 93 minutes of hours can be saved as average daily. It has also promoted social advancement by women.

- There are a lot of households which use firewood as cooking fuel in Nepal. Kitchen is filled with smoke by combustion of firewood, and therefore, there are a lot of women who claim of bad health condition. However, cases of eye ache, head ache and sore throat as well as diseases of lung have bee reported to decrease after the installation of biogas plant.

The year of 2009 is considered as CDM registration and the start of the project is assumed in 2010.

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

Coordinating or Managing entity

As for the assignment of coordinating managing entity, Alternative Energy Promotion Center (AEPC) and Biogas Sector Partnership-Nepal (BSP-N) are nominated at present.

Project Participants

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)
Government of Nepal	Anaikot Village Development Community (V.D.C.)	No
Government of Japan	NTT GP (Private sector) NTT-WEST (Private sector)	No
(*)In accordance with the CDM modalities and procedure, at the time of making the CDM-PDD public at the stage of validation, a Party involved may or may not have provided its approval. At the time of requesting registration, the approval by the Party(ies) involved is required.		

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

>>

A.4.1. Location of the programme of activities:

>>

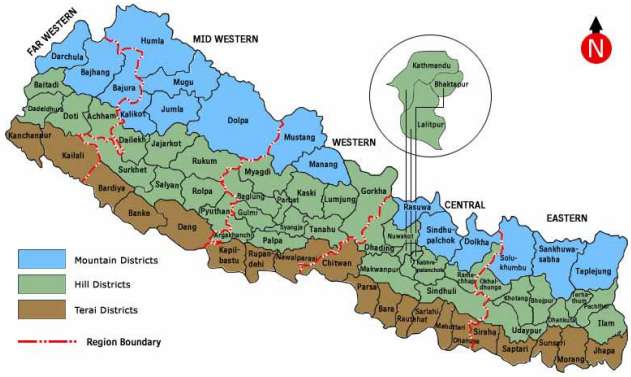
A.4.1.1. Host Party(ies):

>>

Federal Democratic Republic of Nepal

A.4.1.2. Physical/ Geographical boundary:

The geographical boundary of the PoA is whole of Federal Democratic Republic of Nepal, but the regions where average temperature in a year is less than 5 ℃ are excluded from the boundary because the appropriate performance of biogas plant are not expected.



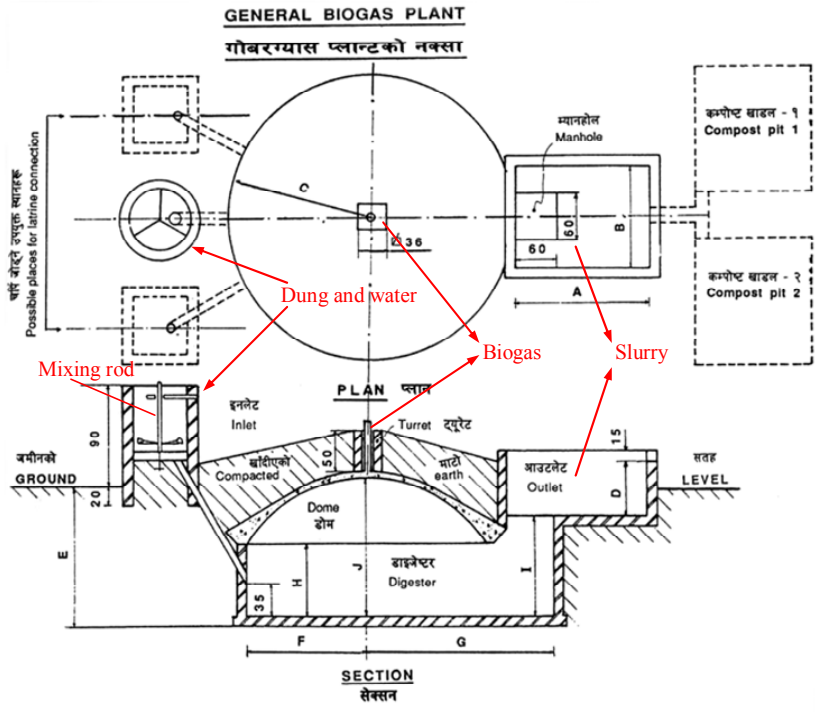
Meanwhile, a CPA comprise of households in a V.D.C. In each household, the biogas plant, cooking place and the site where livestock dung is dumped before the installation of the biogas plant is included in CPA boundary.

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:

Outline of the biogas plant

The biogas plant would be used under the proposed PoA is called GGC-2047 as below.



The length described in above figure is the below table.

Different Parts of the Digester	The size of digesters (unit :cm)			
	$4m^3$	$6m^3$	$8m^3$	$10m^3$
A	140	150	170	180
B	120	120	130	125
C	135	151	170	183
D	50	60	65	68
E	154	155	172	168
F	102	122	135	154
G	185	208	221	240
H	86	92	105	94
I	112	116	127	124
J	151	160	175	171

The operating procedure is simple as the following;

1. Livestock dung and water are fed into inlet section by same weight.
2. They are stirred using the mixing rod equipped with inlet and sent into the dome.
3. The livestock dung fed into the dome with water are fermented to generate the biogas.
4. The biogas emits through the turret to kitchen and used as cooking fuel.
5. The slurry is discharged from the outlet and used as dung.

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

The eligibility criteria for inclusion is as the followings.

- The annual average temperature is higher than 5 ℃ in biogas plant installation site in Nepal.
- The household uses the firewood as cooking fuel.
- The household feed the livestock like cattle, cow, buffalo, etc. and manages its population.
- The amount of annual GHG reduction in an additional CPA is less than 60kt-CO_2

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;

The BSP is the voluntary activity based on Nepal government, so the people, private sectors and municipalities are not imposed of any obligations. So, the proposed PoA under the BSP is the voluntary action.

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

According to the Attachment B of General guidance to small scale methodology, one additionality among several barriers shall be proved. So, additionality is proved about investment barriers at PoA level as in the followings.

Operation of BSP has been funded by the Netherlands and Germany. The table below describes the funding for BSP and its use. Operating capital is made up of fund by the government of the Netherlands, Germany and Nepal, CER revenue, and registration fee of biogas companies. 77% of the whole capital at the fourth phase is used as subsidies for installation of biogas plant, and the rest is for operating fee of BSP.

Investment on BSP	M€	Purpose of use
SNV/DGIS (the Netherlands)	0.95	Subsidy for biogas plant
	2.78	Operation cost of BSP
KfW (Germany)	7.09	Subsidy for biogas plant
The government of Nepal	2.82	Subsidy for biogas plant
CER	0.22	Operation cost of BSP
Biogas companies registration fee and others	0.25	Operation cost of BSP
Sub total	10.86	Subsidy for biogas plant (77%)
	3.25	Operation cost of BSP (23%)
Ground total (=Cost on implementing BSP)	14.11	(100%)

The amount of funding at the fourth phase is reduced from that of the third phase, and therefore the balance is needed to be compensated by CER revenue. In the absence of CER revenue, BSP in Nepal would not be implemented due to the shortage of capital. So, the investment additionality at PoA level is proved.

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;

The owner who would participate in BSP agreed the activity and is registered to the BSP Database after the construction of their biogas plant through the biogas company. In BSP Database, information about household, biogas plant type, constructed date and etc. is recorded with serial number of the owner. And the Database is managed directly by Coordinating/Managing entity of the proposed PoA. So, Coordinating/Managing entity could distinguish the biogas plant with others by owner's serial number. Therefore, the double accounting and de-bundled would be prevented from.

A.4.4.2. Monitoring plan:

The role of the PoA in monitoring is 1) initial training, 2) making manual, 3) Calculation of the amount of GHG emission reduction, 4) Communication, and 5) Preparing for Verification.
1) Initial training for the CPA

Instructors from PoA are dispatched to each CPA sites at the start of CPA, and training described as the followings is conducted for project participants.

- All menber
  - ・General description of PoA (aim, goal, schedule, framework and etc.)
  - ・The aim of CPA and schedule
  - ・Framework for implementation of CPA
  - ・Environment education (impact to deforestation, land slide and climate change by non-renewable biomass, ground water pollution caused by open dumped livestock dung, and others)
- Household
  - ・Monitoring procedure at household level, data recording as well as storage, and reaction in times of emergency (biogas plant, troubles on cooking stove and others)
- CPA manager
  - ・Monitoring procedure at CPA level, quality control on monitoring data, calibration of monitoring devices and reaction in times of emergency (reaction to troubles of monitoring devices)
- PC operator
  - ・PC operation, recording method of monitoring data, and reaction in times of emergency (troubles of PC and others)
- Monitoring staff
  - ・Monitoring procedure by monitoring staff, data recording, collection of repayment for microfinance, and communication method between household and CPA.

2) Making the training manuals for CPA

PoA makes the monitoring training manuals for CPA participants (about the monitoring procedures, operation of the computer, effect of biogas plant, etc.) and distributes to the CPA office.

3) Communication between PoA and CPA

Communication network (internet and telephone) is mainly used for communication between PoA and CPA.

4) Calculation of the amount of GHG emission reduction

In order to calculate the amount of GHG emission reduction, PoA receives monitoring data from CPA monthly and accumulates the received data by CPAs and makes monitoring report.

5) Preparing for Verification

Verification is conducted at PoA level with DOE. PoA prepares monitoring report with monitoring data as per evidence for Verification. The household are verified with 5% sampling by DOE.

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

BSP is supported by funding from DGIS(the Netherlands), KfW(Germany) and AEPC(HMG/Nepal). However, the sponsors committed that these funding is not any divergence of their respective ODAs.

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

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

July 1st, 2010

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

28years

SECTION C. Environmental Analysis

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:

In Nepal, the deforestation is significant issue because of causing the land-slide. Saving the non-renewable biomass which many households use as per cooking fuel, by installing biogas plant could mitigates the deforestation on forest nearby their community and consequently mitigates the land slide.

Many households in Terai area use well water for drinking and feed a few cattle as per livestock. The livestock dung dumped nearby the well would cause the ground water pollution which increase Nitrate Nitrogen and Nitrite Nitrogen content. In the installation of the biogas plant, livestock is fed into the plant to vanish the dumped ground nearby the well. Consequently, the Nitrate Nitrogen and Nitrite Nitrogen content in the well water would decrease.

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),:

Although the environmental impact assessment act has been enacted in Nepal, the Act doesn't oblige biogas project to conduct EIA. However, Coordinating or Managing entity would implement voluntary impact assessment including environment, social, economical and etc. from the project.

SECTION D. Stakeholders' comments

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:

By stakeholders hearing, comments on PoA have been collected after explanation of the biogas plant project and CDM.

D.3. Summary of the comments received:

Output of the stakeholders hearing is summarized by stakeholder as the followings.

- DNA Secretariat greatly approve of using tele-center function as per communication tool in the project and requests that sustainable operation plan under PoA with tele-center should be considered.
- Biogas companies approve of the project implementation.
- Association of Biogas Companies approve of the project implementation. They proposed that their branch offices could be taken in to account for framework of monitoring in cooperation with tele-center.
- Microfinance organization would be interested in the biogas plant loan. However, complete repayment rate from biogas plant household achieve approximately 90%. They would have to be careful of the mortgage like land when they loan to household for biogas plant.
- Households are interested in the project and think that they could complete to repay the micro finance loan which practically must be completed in few years, if subsidy for installation of biogas plant would be approximately 50%.
- V.D.C. office secretary at the proposed CPA sites approve of the project implementation and is interested in taking charge of managing CPA. However, there are a few staffs in office and who can operate computer.
- School principal at the proposed CPA sites is possible to provide place for tele-center and cooperates with other project participants in the CPA.

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

The collected comments have been reflected to PoA-DD and CPA-DD.

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:

Baseline and monitoring methodologies is applied to the SSC-CPA included in this PoA are below.

- AMS-Ⅰ.E (ver. 01): Switch from Non-Renewable Biomass for Thermal Applications by the User,
- AMS-Ⅲ.D(ver. 14) : Methane recovery in livestock dung management systems

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

As the result of consideration on applicability of AMS-I.E. and AMS-III.D., they are applicable to the SSC-CPA. Details are described as the followings.

AMS-I.E. Switch from Non-renewable Biomass for Thermal Applications

Technology / Measure conditions	Propriety
This category comprises small thermal appliances that displace the use of non-renewable biomass by introducing new renewable energy end-user technologies. Examples of these end user technologies include biogas stoves and solar cookers.	Applicable, because biogas stove is used.
If any similar registered small-scale CDM project activities exist in the same region as the proposed project activity then it must be ensured that the proposed project activity is not saving the non-renewable biomass accounted for by the other registered project activities.	Applicable to the non-renewable biomass which is not applied as per the baseline in the two already registered CDM projects.
Project participants are able to show that non-renewable biomass has been used since 31 December 1989, using survey methods.	Applicable

AMS-III.D. Methane recovery in animal dung management systems

Technology / Measure conditions	Propriety
This methodology covers project activities involving the replacement or modification of existing anaerobic dung management systems in livestock farms to achieve methane recovery and destruction by flaring/combustion or gainful use of the recovered methane. This methodology is only applicable under the following conditions: ・The livestock population in the farm is managed under confined conditions; ・Dung or the streams obtained after treatment are not discharged into natural water resources (e.g. river or estuaries) ・The annual average temperature of baseline site where anaerobic dung treatment facility is located is higher than 5°C ・In the baseline scenario the retention time of dung waste in the anaerobic treatment system is greater than 1 month, and in case of anaerobic lagoons in the baseline, their depths are at least 1 m; ・No methane recovery and destruction by flaring, combustion or gainful use takes place in the baseline scenario.	・The head number of live stock which households have is monitored in the project. ・The slurry obtained from biogas plant is expected to be used as fertilizer. ・The geographical boundary in the project is in the whole of Nepal, however, some mountainous regions with annual average temperature is below 5°C are excluded. ・ Although it is confirmed that open dumped period of livestock dung is longer than 1 month, it is monitored during the project period. ・Methane is not combusted because it is released from the open dumping sites in the baseline.
The project activity shall satisfy the following conditions: ・The final sludge must be handled aerobically. ・In case of soil application of the final sludge the proper conditions and procedures (not resulting in methane emissions) must be ensured. ・Technical measures shall be used (including a flare for exigencies) to ensure that all biogas produced by the digester is used or flared.	・Slurry is treated aerobically. ・Project participants are instructed to treat slurry appropriately. ・No methane leakage from biogas plant.
The recovered methane from the above measures may also be utilised for the following applications instead of flaring or combustion: (a) Thermal or electrical energy generation directly; or (b) Thermal or electrical energy generation after bottling of upgraded biogas; or (c) Thermal or electrical energy generation after upgrading and distribution: (d) Upgrading and injection of biogas into a natural gas distribution grid with no significant transmission constraints; or (e) Upgrading and transportation of biogas via a dedicated piped network to a group of end users.	・The project is applicable to thermal energy use(a).
If the recovered methane is used for project activities covered under paragraph 4 (a), that component of the project activity shall use a corresponding category under type I.	・AMS-I.E. is applied to the project.
Emission reductions under this category are estimated *ex ante* (ERex-ante)(the balance of the amount of emission reduction in the baseline and project) shall be lower than 60kt-CO_2 /year	・Annual emission reduction of AMS-III.D. is 310t-CO_2 per 1CPA, which is applicable.

In addition, the amount of emission reduction would be about 310 t-CO_2 if CPA would hold 100 household, so the proposed CPA meets small scale CDM project.

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

As the result of consideration on AMS-I.E. and AMS-III.D., The emission source/activity in both methodologies is described as the followings.

Scenario	Methodology	Emission source / activity	GHG	Included?	Reasons
Baseline emission	AMS-I.E.	Combustion of non-renewable biomass	CO_2	Yes	Major emission source
			CH_4	No	Emission factor of CH_4 is sufficiently smaller than that of CO_2
			N_2O	No	Emission factor of N_2O is sufficiently smaller than that of CO_2
	AMS-III.D.	Open dumped of livestock dung	CH_4	Yes	Major emission source
Project emission	AMS-III.D.	Leakage of CH_4 from biogas plant	CH_4	Yes	Not a major emission source, but calculation is considered
		Combustion of biogas	CO_2	No	Carbon neutral
			CH_4	Yes	Not a major emission source, but calculated
			N_2O	Yes	Not a major emission source, but calculated
		Power and thermal energy source for plant	CO_2	No	Not used as power and thermal energy
Leakage	AMS-I.E.	Leakage in production of renewable biomass	CO_2	No	Not included in applying conditions
		Potential source of leakage	CO_2	No	Not calculated, but ex-post survey is conducted
		Leakage on transfer	CO_2	No	Calculated only when transferred

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

Baseline scenario analysis and identification is conducted as below.

AMS-I.E. Switch from Non-renewable Biomass for Thermal Applications

Now many household often use the firewood for cooking fuel, possible scenario including Business as Usual (BaU) is as below in the absence of the PoA

- BaU scenario
- Replacement with LPG
- Replacement with electricity

The replacement with LPG scenario would not be implemented because of expensiveness of purchase of LPG except for high income household. The replacement with electricity would not be implemented because of the absence of IH cooking technology in rural area of Nepal. So, BaU scenario is identified as baseline scenario.

AMS-III.D. Methane recovery in animal dung management systems

Most household dump the livestock dung, possible scenario including Business as Usual (BaU) is as below in the absence of the PoA

- BaU scenario
- Composting of the dung

By hearing survey, livestock dung is used for manure, wall material, fuel for cooking. Most the livestock dung is dumped nearby household and is anaerobically treated in our watching the site. So, It is difficult to set the composting scenario as baseline scenario. So, BaU scenario is identified as baseline scenario.

The baseline scenario of AMS-IE and AMS- III D is identified as BaU. And therefore, it is described as the table and figure below.

Baseline Scenario

Methodologies	Baseline Scenario
AMS-I.E.	Kitchen at households where firewood as non-renewable biomass is combusted, and its combusting activities.
AMS-III.D.	Biogas plant installed at households, kitchen where methane gas is combusted and its combusting activities.
Total baseline scenario	Within the households and areas including biogas plant and kitchen, where the above mentioned activities are implemented.

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:

According to the Attachment B of General guidance to small scale methodology, one additionality of several barriers shall be proved. And investment, technology and other barriers at CPA level are described as the following sections.

In case of installing biogas plant at household, subsidies for construction cost are provided by BSP, Operation of BSP is available only after CER revenue. In the case that household install of biogas plant without CDM, they are forced to install the plants by their own capital or microfinance loan equivalent to the total amount or the part of construction cost. In that case, the project would not be obviously implemented, according to the trial calculation below.

The result of hearing survey which has been conducted to financial organizations and biogas companies on microfinance is described as the table below.

General description of microfinance

Categories	Contents (only valid within the hearing survey, and not applicable to all case)
Microfinance organization	180 organizations such as banks and Agricultural Cooperatives in Nepal
Term of repayment	Generally, no longer than 5 years
Interest rate on repayment	Generally, more than 10%
Mortgage	A guarantor, recommendation by biogas companies, land and others
Others	The above contents are on micro financial system exclusively for installation of biogas plants. There is other micro financial system.

Financial organizations include banks, Agricultural Cooperatives and others. As shown above, financing conditions are that term of repayment is generally no longer than 5 years, and interest rate on repayment

is generally more than 10% and so on. Considering that construction, the cost of biogas plant at household is financed by microfinance organization, trial calculation is as the table below.

General description of loan on microfinance

Conditions	Contents
Initial cost	60 thousand yen /plant
Annual income	225 thousand yen
Total amount of capital	60 thousand yen
Total amount of capital to average salary	26.7%
Term of repayment	Three years
Interest rate on repayment	15%

Repayment schedule is as the following table.

Repayment schedule

Repayment schedule	1st	2nd	3rd
Repayment amount of capital	20	20	20
Interest on repayment	9	6	3
Total repayment amount	29	26	23
Total amount of debt to annual income	12.9%	11.6%	10.2%

Unit:Thousand yen

According to the table above, debt to income rate is 10.2% to 12.9%, and mortgage such as land and others are required for loan. However, households could not be financed because they have less mortgage. For a lot of households, the scenario of installation of biogas plant would not be implemented. And therefore, investment additionality is also proved at CPA level.

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

As shown in section E.5.1, the barrier is debt to annual income when the household would install the biogas plant. Therefore, it would be eligible that the key criteria would be the annual income of the owner of biogas plant. The construction cost of biogas plant is different by size and area, so the income criteria is set in 12 case (=3 area × 4 size) as the following. The household whose income is less than annual income described in this table have an additionality to participate the project.

Income criteria (yellow part)

			Terai				Hill				Remote Hill			
			4m³	6m³	8m³	10m³	4m³	6m³	8m³	10m³	4m³	6m³	8m³	10m³
(1) annual income		JPY	332,761	398,191	461,840	509,428	368,842	429,164	505,342	555,397	410,735	489,354	573,856	636,697
(2) biogas plant		JPY	35,044	41,541	47,939	53,179	38,310	45,262	52,720	58,494	42,987	50,941	59,469	66,162
(3) period		year	3	3	3	3	3	3	3	3	3	3	3	3
(4) the principal	=(2)/(3)													
(4-1) 1st		JPY	11,681	13,847	15,980	17,726	12,770	15,087	17,573	19,498	14,329	16,980	19,823	22,054
(4-2) 2nd		JPY	11,681	13,847	15,980	17,726	12,770	15,087	17,573	19,498	14,329	16,980	19,823	22,054
(4-3) 3rd		JPY	11,681	13,847	15,980	17,726	12,770	15,087	17,573	19,498	14,329	16,980	19,823	22,054
(5) interest rate		-	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
(6) interest														
(6-1) 1st	=(2)*(5)	JPY	5,257	6,231	7,191	7,977	5,746	6,789	7,908	8,774	6,448	7,641	8,920	9,924
(6-2) 2nd	=((2)-(4-1))*(5)	JPY	3,504	4,154	4,794	5,318	3,831	4,526	5,272	5,849	4,299	5,094	5,947	6,616
(6-3) 3rd	=((2)-(4-1)-(4-2))*(5)	JPY	1,752	2,077	2,397	2,659	1,915	2,263	2,636	2,925	2,149	2,547	2,973	3,308
(7) repeyment	=(4)+(6)													
(7-1) 1st		JPY	16,938	20,078	23,171	25,703	18,516	21,877	25,481	28,272	20,777	24,621	28,743	31,978
(7-2) 2nd		JPY	15,186	18,001	20,774	23,044	16,601	19,614	22,845	25,348	18,628	22,074	25,770	28,670
(7-3) 3rd		JPY	13,433	15,924	18,377	20,385	14,685	17,350	20,209	22,423	16,478	19,527	22,796	25,362
(8) ratio debt to annual income	=(7)/(1)													
(8-1) 1st		-	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
(8-2) 2nd		-	5%	5%	4%	5%	5%	5%	5%	5%	5%	5%	4%	5%
(8-3) 3rd		-	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
(9) Maxmun	=max[(8-1), (8-2), (8-3)]		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%

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:

AMS-Ⅰ.E and AMS –Ⅲ.D is applied to the proposed project in the proposed project.

In the AMS-Ⅰ.E, B_y is calculated from *HG*, *NCV* and η. Other calculation is conducted among the methodology with default value, literature value, monitoring data.

In the AMS-Ⅲ.D, *VS* is calculated from $VS_{default}$. Other calculation is conducted among the methodology with default value, monitoring data.

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

Baseline emission

The amount of baseline emission by combustion of non-renewable biomass is calculated, according to AMS-I.E.

$$BE_y = \frac{HG_{p,y}}{\eta_{old}} \cdot f_{NRB,y} \cdot EF_{projected\_fossilfuel} \quad (A)$$

Where,

BE_y	:	Emission reductions during the year in t-CO_2
$HG_{p,y}$	:	Quantity of thermal energy generated by the new renewable energy technology in the project in year y (TJ)
η_{old}	:	Efficiency of the system being replaced, measured using representative sampling methods or based on referenced literature values
$f_{NRB,y}$	:	Fraction of biomass used in the absence f the project activity in year y that can be established as non renewable biomass using survey mtethods.
$EF_{projected\_fossil\,fuel}$	:	Emission factor for the projected fossil fuel combustion in the baseline. The fossil fuel likely to be used by similar consumers is taken.

The amount of baseline emission by the open dumped livestock dung is calculated according to AMS-III.D.

$$BE_y = GWP_{CH_4} \cdot D_{CH_4} \cdot UF_b \cdot \sum_{j,LT} MCF_j \cdot B_{0,LT} \cdot N_{LT,y} \cdot VS_{LT,y} \cdot MS\%_{Bl,j} \quad (B)$$

Where,

GWP_{CH4}	:	Global Warming Potential (GWP) of CH4 (21)
D_{CH4}	:	CH4 density (0.00067 t/m3 at room temperature (20 ºC) and 1 atm pressure).
LT	:	Index for all types of livestock
j	:	Index for animal waste management system
MCF_j	:	Annual methane conversion factor (MCF) for the baseline animal waste management system "j"
$B_{O,LT}$	:	Maximum methane producing potential of the volatile solid generated for animal type "LT" (m3 CH4/kg dm)
$N_{L,Ty}$	:	Annual average number of animals of type "LT" in year "y"

(numbers)

$VS_{L,Ty}$: Volatile solids for livestock "LT" entering the animal manure management system in year "y" (on a dry matter weight basis, kg dm/animal/year)

$MS\%_{Bl,j}$: Fraction of manure handled in baseline animal manure management system "j"

UF_b : Model correction factor to account for model uncertainties (0.94)

Project emission

The emission in Methane recovery in animal manure management systems is calculated according to AMS-III.D.

$$PE_y = PF_{PL,y} + PE_{flare,y} \quad (C)$$

Where,

PE_y : Project emissions in year "y" (tCO2e)

$PE_{PL,y}$: Emissions due to physical leakage of biogas in year "y" (tCO2e)

$PE_{flare,y}$: Emission from flaring or combustion of the biogas stream in the year "y" (tCO2e)

Leakage

In AMS-I.E. and AMS-III.D, leakage is not calculated. However, ex-post survey is implemented for potential leakage of non-renewable biomass in AMS-I.E.

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

Data / Parameter:	$HG_{p,y}$
Data unit:	TJ
Description:	The amount of thermal energy which has been generated by renewable energy in the year y
Source of data used:	Estimated value from the amount of consumed firewood
Value applied:	0.0048
Justification of the choice of data or description of measurement methods and procedures actually applied :	The quantity of consumed firewood is given in the Biogas User Survey in 2006/07 by BSP-Nepal. This survey is conducted carefully, so the value is reliable.
Any comment:	-

Data / Parameter:	η_{old}
Data unit:	-
Description:	Efficiency of the replaced thermal devices (cooking stoves).
Source of data used:	Reference literature value
Value applied:	0.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	The value is referred to the Eritrea Improved stove project
Any comment:	—

Data / Parameter:	$f_{NRB,y}$
Data unit:	-
Description:	Non-renewable biomass of the biomass which is consumed in the absence of the project in the year y
Source of data used:	Assessment from the survey result on the forests
Value applied:	1
Justification of the choice of data or description of measurement methods and procedures actually applied :	If the amount of saving the non-renewable biomass by installation of the biogas plant would be less than the amount of non-renewable biomass in Nepal, the factor $f_{NRB,y}$ equal 1. This is because the total amount of consumed firewood is more than renewable biomass in Nepal, that is, the deforestation in progress.
Any comment:	—

Data / Parameter:	$EF_{projected\ fossilfuel}$
Data unit:	tCO_2/TJ
Description:	Emission factor of fossil fuel which is considered to have been consumed in the baseline
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories Vol.2
Value applied:	63.1t-CO_2/TJ
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	GWP_{CH4}
Data unit:	-
Description:	Global Warming Potential
Source of data used:	Kyoto Protocol/1995 IPCC GWP values
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	D_{CH4}
Data unit:	t/m^3
Description:	Methane concentration
Source of data used:	-
Value applied:	0.00067(at room temperature(20℃) and 1atm pressure)
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	UF_b
Data unit:	-
Description:	Model correction factor
Source of data used:	AMS-Ⅲ.D.
Value applied:	0.94
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	MCF_j
Data unit:	-
Description:	Methane conversion factor in the baseline of livestock dung management procedure j
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories Vol.4 Chapter 10 Annex 10A.2
Value applied:	Other cattle (Table10A-5) : 0.0015 Buffalo (Table10A-6) : 0.0015 Breeding swine (Table10A-8) :0.0015 Goats (Table10A-9) :0.0015
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	$B_{0,LT}$
Data unit:	$m^3CH_4/kg\text{-}dm$
Description:	Maximum methane producing potential from volatile solid which is discharged from livestock LT
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories Vol.4 Chapter 10 Annex 10A.2
Value applied:	Other cattle (Table10A-5) : 0.1 Buffalo (Table10A-6) : 0.1 Breeding swine (Table10A-8) :0.29 Goats (Table10A-9) :0.13
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	$N_{LT,y}$
Data unit:	-
Description:	Annual average head number of livestock LT in the year y
Source of data used:	Monitoring data
Value applied:	Other cattle : 4.2 Buffalo : 2 Breeding swine :1 Goats :3.4
Justification of the choice of data or description of measurement methods and procedures actually applied :	This value is average of the monitoring data confirmed by hearing and watching survey in proposed CPA site.
Any comment:	-

Data / Parameter:	$VS_{LT,y}$
Data unit:	Kg-dm/animal/year
Description:	The amount of volatile solid by livestock LT which is to be fed into livestock dung management system in the year y
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories Vol.4 Chapter 10 Annex 10A.2
Value applied:	Other cattle (Table10A-5) : 3.9×365=1,424 Buffalo (Table10A-6) : 2.3×365=840 Breeding swine (Table10A-8) :0.3×365=110 Goats (Table10A-9) :0.35×365=128
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

Data / Parameter:	$MS\%_{Bl,y}$
Data unit:	-
Description:	Fraction of manure handled in baseline animal manure management system "*j*"
Source of data used:	2006 IPCC Guidelines for National Greenhouse Gas Inventories Vol.4 Chapter 10 Annex 10A.2
Value applied:	Other cattle (Table10A-5) : 3.9×365=1,424 Buffalo (Table10A-6) : 2.3×365=840 Breeding swine (Table10A-8) :0.3×365=110 Goats (Table10A-9) :0.35×365=128
Justification of the choice of data or description of measurement methods and procedures actually applied :	-
Any comment:	-

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

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

Data / Parameter:	N_{hh}
Data unit:	-
Description:	The number of household where biogas plant and thermal application are appropriately operated
Source of data to be used:	Monitoring data
Value of data applied for the purpose of calculating expected emission reductions in section E.6	1,000 =10(CPA)×100 (household / CPA)
Description of measurement methods and procedures to be applied:	Confirmation by hearing and visual inspection
QA/QC procedures to be applied:	Quality of haring data can be assured through training program for staffs who confirm by hearing and visual inspection
Any comment:	—

Data / Parameter:	$N_{LT,y}$
Data unit:	-
Description:	Average head number of livestock *LT* in the year *y*
Source of data to be used:	Monitoring data
Value of data applied for the purpose of calculating expected emission reductions in section E.6	Other cattle : 4.2 Buffalo : 2 Breeding swine :1 Goats :3.4
Description of measurement methods and procedures to be applied:	Confirmation by hearing and visual inspection
QA/QC procedures to be applied:	Quality of haring data can be assured through training program for staffs who confirm by hearing and visual inspection
Any comment:	-

Data / Parameter:	$BG_{burnt,y}$
Data unit:	m^3/year
Description:	The amount of used biogas
Source of data to be used:	Monitoring data
Value of data applied for the purpose of calculating expected emission reductions in section E.6	-
Description of measurement methods and procedures to be applied:	The measured value of gas flow meter is read and recorded
QA/QC procedures to be applied:	The accuracy guarantee period of gas meter flow is 10 years. Calibration is not required during the period.
Any comment:	-

Data / Parameter:	$w_{CH4,y}$
Data unit:	%-mass
Description:	Methane gas ratio of biogas
Source of data to be used:	Monitoring data
Value of data applied for the purpose of calculating expected emission reductions in section E.6	0.6(Refer to the literature value)
Description of measurement methods and procedures to be applied:	This quantity is measured by methane gas analyzer
QA/QC procedures to be applied:	By periodical calibration
Any comment:	The central value of the following table shall be introduced temporary.

Data / Parameter:	*FE*
Data unit:	%
Description:	Flaring efficiency
Source of data to be used:	The literature value
Value of data applied for the purpose of calculating expected emission reductions in section E.6	0.99
Description of measurement methods and procedures to be applied:	Monitoring staff would confirm whether the application properly flare by visual inspection, whether the whole of the flare hole in cooking stove flare or not.
QA/QC procedures to be applied:	-
Any comment:	-

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

Monitoring procedure in the project is as following.

Managing entity of CPA is established at each site, where a PC operator, a monitoring manager and 10 monitoring staffs are stationed. The entity dispatches them to each household monthly. A staff takes care of 10 households, and conduct monitoring.

Monitoring staffs are trained in advance on the method of measuring gas meter, recording and using monitoring devices. They take care of Methane gas analyzing periodically. In addition, they measure the amount of biogas by the gas meter which are installed at household, and also conduct hearing survey on the monitoring quantity.

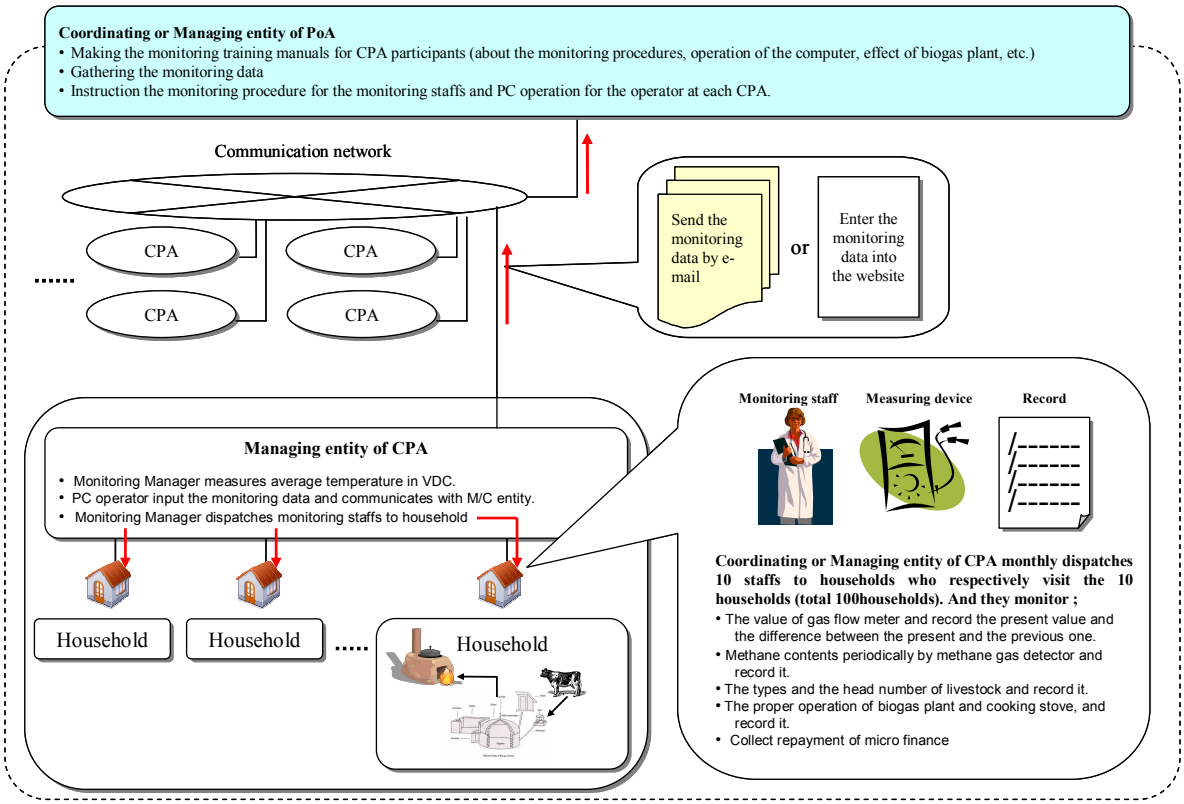
Besides monitoring, the staffs conduct the following works.

- Collection of repayment for microfinance (repayment to micro finance organization)
- Checking the conditions of biogas plant (outputs of biogas, the amount of water to be fed into biogas plant) (inform to biogas companies or Association of Biogas Companies, if any)
- Collection of comments from households (inform to Coordinating or Managing entity through Managing entity of CPA)

Data recording staff at Management entity of CPA sends monitoring data monthly to Coordinating or Managing entity through communication tool after hearing data and record of gas meter value are checked.

Coordinating or Managing entity drafts monitoring report after they accumulate the received data.

Monitoring Flow



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)

>>

Date of completion: 13/02/2009

Climate Change Project, NTT GP-ECO communication, Inc.
2-14-1 Shakujiimachi, Nerima-ku, Tokyo 177-0041, Japan
Tel: +81-3-5910-7908, Fax: +3-5910-7880

Annex 1

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

Participant

Organization:	NTT GP-ECO communication, Inc.
Street/P.O.Box:	2-14-1 Shakujiimachi, Nerima-ku
Building:	-
City:	Tokyo
State/Region:	
Postfix/ZIP:	177-0041
Country:	Japan
Telephone:	+3-5910-7900
FAX:	+3-5910-7880
E-Mail:	
URL:	http://www.ntt-gp.com
Represented by:	
Title:	Senior consultant
Salutation:	Mr.
Last Name:	NIIDA
Middle Name:	
First Name:	Kei
Department:	Climate Change Project
Mobile:	
Direct FAX:	
Direct tel:	+3-5910-7908
Personal E-Mail:	niida@ntt-gp.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

Annex 3

BASELINE INFORMATION

Annex 4

MONITORING INFORMATION

- - - - -