CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 03 - in effect as of: 28 July 2006

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

>>

Anaerobic digestion of municipal solid waste with biogas collection and electricity generation in Can Tho, Vietnam

A.2. Description of the project activity:

>>

The project comprises the construction of a waste treatment plant at Tan Long Landfill Site. It involves anaerobic digestion and biogas power generation.

The landfill was established in 2005 by the local governments of Can Tho city and Hau Giang province. Waste is collected from households, business and service organizations, markets and street in Can Tho city and Hau Giang province, then it is transported and disposed in the landfill. Gas extraction equipment is not installed at the landfill and landfill gas (LFG) is emitted into the atmosphere.

In the project activity, organic waste is sorted out from the collected waste and is treated by anaerobic digestion. The project will process 50 tonnes of organic waste per day to generate biogas. The generated biogas is collected and used to generate electricity. Part of the electricity is used for the project operation and the rest will be supplied to the national grid.

The project promotes mitigation of greenhouse gas emissions through;

(i) avoiding methane emissions from organic waste that would be disposed in a landfill without capturing LFG.

(ii) partially substituting grid electricity generated from at least one fossil fuel or non-renewable biomass fired generating unit with renewable electricity, which GHG emissions from biomass energy consumption are defined as “Carbon neutral” under IPCC guidelines.

The project will contribute to sustainable development of Vietnam in several ways;

- **Technology transfer**: The technology applied to the project, anaerobic digestion of municipal solid waste on a commercial scale, is new to Vietnam. The project will include the training of local employees.
- **Waste management**: The strategic orientation for sustainable development in Vietnam (Vietnam Agenda 21) was issued together with Decision No 153/2004/QD-TTg dated August 17, 2004 by the Prime Minister in order to sustainably develop the country on the basis of close, reasonable and harmonious coordination of economic and social development and environmental protection. The agenda gives some priority areas for sustainable development, and solid waste and toxic waste management is mentioned as one of priority areas in natural resources utilization, environmental protection and pollution control. It says “In industrial and urban areas, the collection and treatment of domestic and industrial solid waste and toxic waste is an urgent issue.” And also says “There should be encouragement for joint stock, private companies, and cooperatives to participate more actively in collection and treatment of solid waste.” The project will introduce a new waste treatment option and will contribute to the improvement of waste management in Vietnam.

- **Pollution mitigation**: Municipal solid waste is currently disposed in the landfill without any measures for odor control. The project can reduce the amount of waste disposed in the landfill and it helps to reduce LFG odor.
- **Renewable energy**: Vietnam gives priority to the development of new and renewable energy, aimed at increasing to about 2%, 3%, and 6-7% of total commercial primary energy by 2010, 2020 and 2050 respectively. Currently, the use of renewable energy in Vietnam is still small and the project will contribute to the target by utilizing biogas.
- **Job creation**: At the waste separation process of the project, materials unsuitable for anaerobic digestion are to be removed manually. The project will hire some scavengers for the work. Besides, it is expected that the project will create new jobs in construction, operation and maintenance.

A.3. Project participants:

>>

Table 1: Project participants

Name of Party involved	Private and/or public entity(ies) project participants	Kindly indicate if the Party involved wishes to be considered as project participant
Vietnam (host)	Urban Public Works Company (UPWC) of Can Tho city	No
Japan	Taisei Corporation Sojitz Corporation	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

>>

A.4.1.1. Host Party(ies):

>>

Socialist Republic of Vietnam

A.4.1.2. Region/State/Province etc.:

>>

Hau Giang province

A.4.1.3. City/Town/Community etc:

>>

Tan Long Commune, Tan Hiep Town

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

>>

The project will be implemented at Tan Long Landfill Site. The landfill is physically located in Hau Giang province although it is administratively located in Can Tho city. The landfill is approximately 28km south west of Can Tho city, which is the hub of Mekong River Delta.

Tan Long Landfill Site started its operation in November 2005 and a 20-year lifetime is expected. The landfill is 20ha and approximately 11ha is available for the project activity.

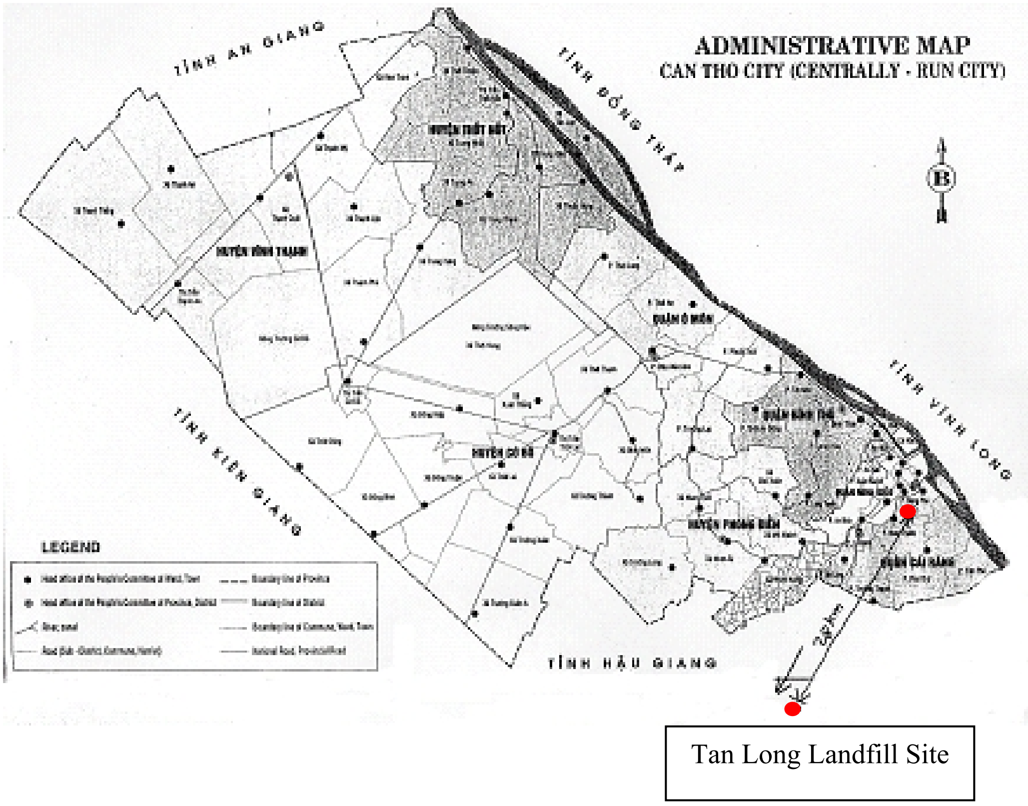

Figure 1: Location of the project site

A.4.2. Category(ies) of project activity:

\>>

The project activity is referred to as the following categories;

Sectoral Scope 1: Energy industries (renewable - / non-renewable sources)

Sectoral Scope 13: Waste handling and disposal

A.4.3. Technology to be employed by the project activity:

\>>

Technology Outline

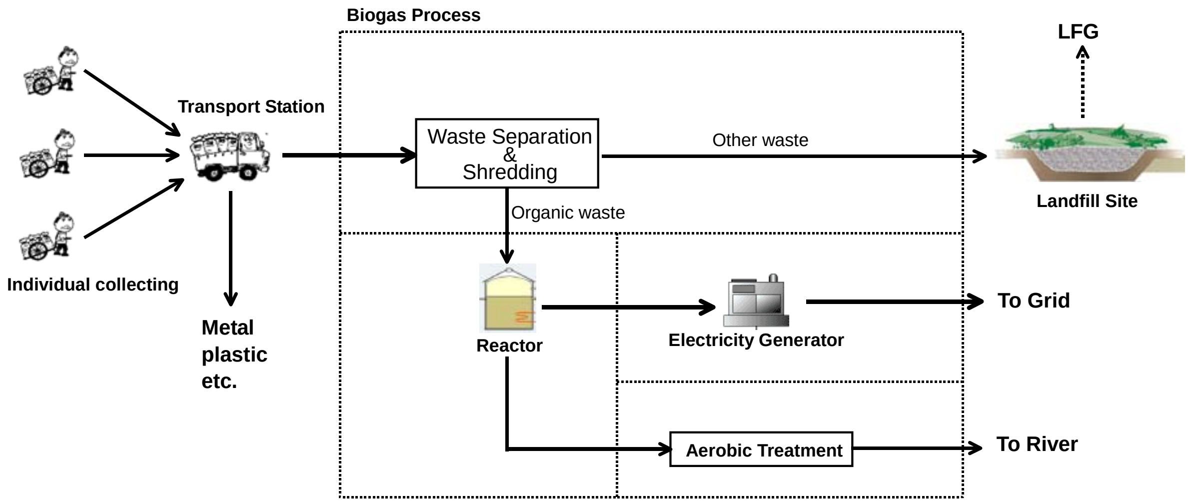

Figure 2: Project flow diagram

The key technology employed in the proposed project is utilizing biogas to be produced from the organic wastes separated from the collected municipal wastes by way of anaerobic fermentation process. The process comprises several processes such as pre-treatment, anaerobic digestion, biogas use and digested liquor treatment as specifically described below;

1. Pre-treatment Process
   Separating municipal solid wastes delivered to the treatment work site, then shredding them to promote faster fermentation.

2. Anaerobic Digestion Process
   Keeping anaerobic fermentation environment stable for constant production of biogas.

3. Biogas Utilization Process
   Storing recovered biogas to convert it efficiently to electric energy; the biogas, when stored too much over storage capacity, will be burnt each time to prevent any leakage in the air.

4. Digested Liquor Treatment Process
   Treating the digested effluent coming out mixed with the undigested residue the way it can meet the mandated environmental regulations.

Technology Description

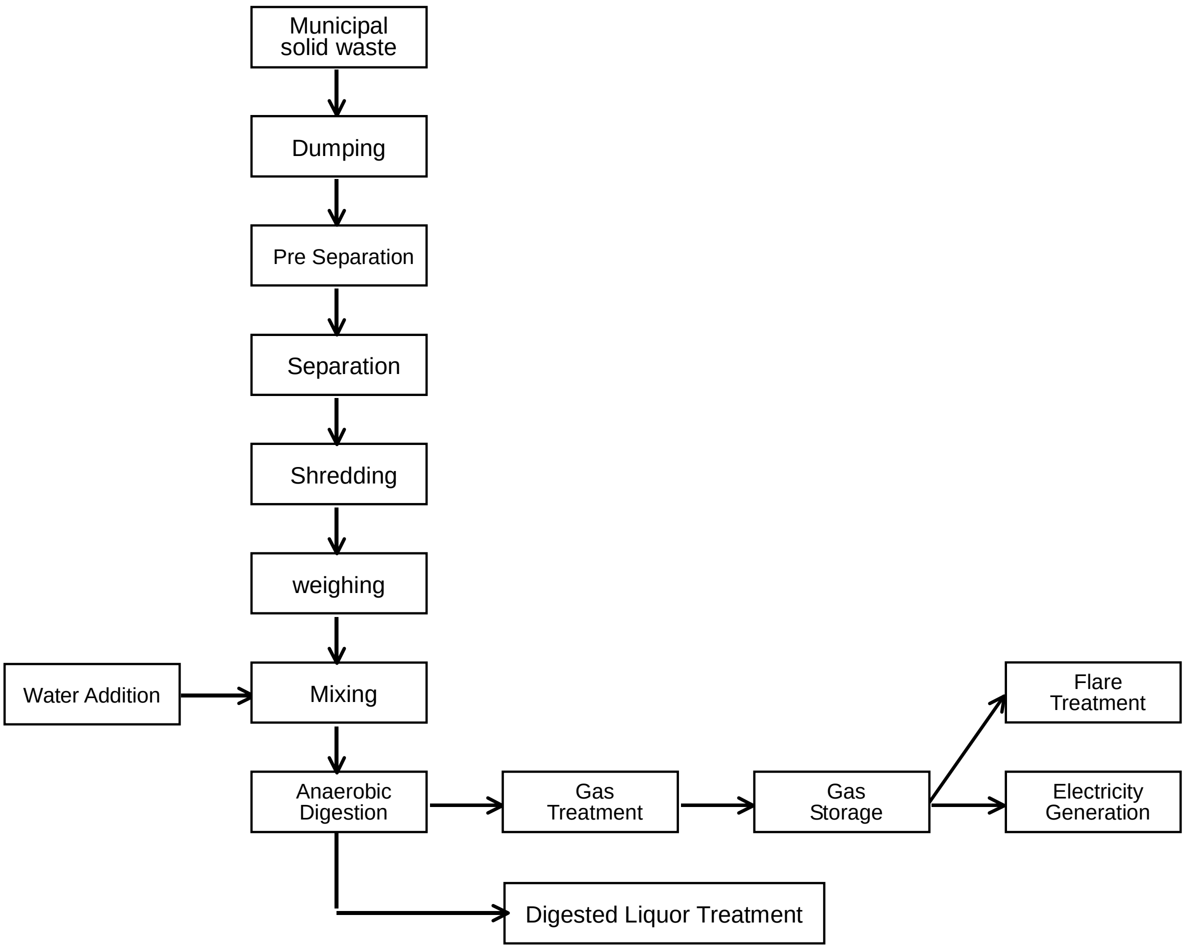

Figure 3: Process flow diagram

1. Waste Dumping
   is the work zone in which the wastes delivered each day by garbage pickup trucks between 17:00 p.m. and 04:00 a.m. next morning. The work space required is as wide as enough to accept the volume of wastes for 2 days.

2. Pre- Waste Separation
   is the process where scavengers can pick up valuable pieces (e.g. Vinyl bags) out of the dumped wastes even when the proposed project is implemented; the separation work place will be kept open from 05:00 a.m. to 18:00 p.m. every day.

3. Waste Separation
   is selecting solid wastes, after separated by scavengers, carried on to the conveyer belt on which employee staff can pick out the objects unsuitable for fermentation (or inorganic wastes).

4. Shredding & Mixing
   The selected organic wastes will be shredded into the approximate size 15 – 25mm in diameter, so that degrading speed can be shortened for better biogas production than otherwise done as much as approx. 15%. The shredded organic wastes then will be transported to the Mixing Tank, and be diluted by raw water with the dry organic contents ratio of 67kg/m^3; the water-diluted organic wastes will be kept stirred for full one day in the Mixing Tank before carried into the following Anaerobic Digester (Tank).

5. Anaerobic Digestion
   The type of anaerobic digester to be employed is vertically-structured fermentation tank for general mixing; the method of stirring in the tank is done by water with retention time as long as for 30 days. The fermentation temperature is approx. 35°C, requiring no temperature control tanks to stable external temperature around 30°C. There will be no mal-effect for fermentation even when outside temperature comes down in night time, because the tank capacity is large enough to make temperature control unnecessary. The anaerobic digester is designed to keep anaerobic atmosphere constantly stable by stopping the air coming in from the outside, which also enables well to prevent leakage of the biogas from the tank into the air.

6. Gas Treatment
   The recovered biogas will be 90% moisture rate with temperature approx. 40°C, containing methane, CO_2, H_2S and suspended granular solid; so that they should go through air-water separation process as well as desulphurization accordingly. H_2S gas is so corrosive against steel materials as to necessitate employing stainless steel required in the process, including digester tank and desulphurization tower.

7. Gas Storage
   Since Biogas must be stored according to the required operation mandates of the generator, the model of the storage tank should be a simple wet- type structure.

8. Electricity Generation
   In the proposed project Chinese-made generator(s) will be employed because it has a good track record in China, enabling to ease maintenance works in the project in Vietnam.

9. Flare Treatment
   When a trouble takes place to the generator for any reason, the biogas will be burnt to prevent from leaking in the air.

10. Digested Liquor Treatment
   The anaerobic-digested liquid effluent or liquor goes though the solid-liquid separator for removing undigested residue; the solid residue will be returned back to the treatment process, while the final effluent will be discharged in the river after aerobic treatment done.

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

>>
Table 2 shows the estimated amount of emission reductions over the crediting period.

Table 2: Estimated amount of emissions reduction

Year	Annual estimation of emission

	reductions in tonnes of CO_2e
1	3,017
2	5,651
3	7,697
4	9,305
5	10,583
6	11,608
7	12,437
8	13,112
9	13,667
10	14,123
Total estimated reductions (tonnes of CO_2e)	101,200
Total number of crediting years	10 years
Annual average of estimated reductions over the crediting period (tonnes of CO_2e)	10,120

A.4.5. Public funding of the project activity:

>>

No public funding is used in the project activity.

SECTION B. Application of a baseline and monitoring methodology

B.1. Title and reference of the approved baseline and monitoring methodology applied to the project activity:

>>
The approved methodology AM0025 "Avoided emissions from organic waste through alternative waste treatment processes" (version 10) is applied to the project.

B.2 Justification of the choice of the methodology and why it is applicable to the project activity:

>>
AM0025 is applicable under the following conditions;

- The project activity involves one or a combination of the following waste treatment options for the fresh waste that in a given year would have otherwise been disposed of in a landfill:
  a) a composting process in aerobic conditions;
  b) gasification to produce syngas and its use;
  c) anaerobic digestion with biogas collection and flaring and/or its use;
  d) mechanical/thermal treatment process to produce refuse-derived fuel (RDF)/stabilized biomass (SB) and its use. The thermal treatment process (dehydration) occurs under controlled conditions (up to 300 degrees Celsius). In case of thermal treatment process, the process shall generate a stabilized biomass that would be used as fuel or raw material in other industrial process. The physical and chemical properties of the produced RDF/SB shall be homogenous and constant over time;
  e) incineration of fresh waste for energy generation, electricity and/or heat. The thermal energy generated is either consumed on-site and/or exported to a nearby facility. Electricity generated is either consumed on-site, exported to the grid or exported to a nearby facility. The incinerator is rotating fluidized bed or hearth or grate type.

The proposed project activity is to digest organic waste anaerobically and generate electricity using biogas. Therefore the project meets the option (c) above.

The project also meets all the related criteria given in the methodology.

- In case of anaerobic digestion, the residual waste from these processes is delivered to a landfill.

- The proportions and characteristics of different types of organic waste processed in the project activity can be determined, in order to apply a multiphase landfill gas generation model to estimate the quantity of landfill gas that would have been generated in the absence of the project activity.

- The project activity includes electricity generation from the biogas generated from the anaerobic digester. The electricity is exported to the grid and used internally at the project site.

- Waste handling in the baseline scenario shows a continuation of current practice of disposing the waste in a landfill despite environmental regulation that mandates the treatment of the waste, if any, using any of the project activity treatment options mentioned above.

- The compliance rate of the environmental regulations during (part of) the crediting period is below 50%; if monitored compliance with the MSW rules exceeds 50%, the project activity shall receive no further credit, since the assumption that the policy is not enforced is no longer tenable.

- The project activity does not involve thermal treatment process of neither industrial nor hospital waste.

AM0025 also states:
"This methodology is not applicable to project activities that involve capture and flaring of methane from existing waste in the landfill. This should be treated as a separate project activity due to the difference in waste characteristics of existing and fresh waste, which may have an implication on the baseline scenario determination."

This project does not involve capture and flaring of methane from existing waste in the landfill.

B.3. Description of the sources and gases included in the project boundary

>>
AM0025 defines that the spatial extent of the project boundary is the site of the project activity where the waste is treated. This includes the facilities for processing the waste, on-site electricity generation and/or consumption, onsite fuel use, thermal energy generation, waste water treatment plant and the landfill site. The project boundary does not include facilities for waste collection, sorting and transport to the project site. In the case of the project, thermal energy generation is not included in the project activity and flaring equipment is installed for emergencies at the project site, which shall be included within the project boundary.

Since the project provides electricity to a national grid, the spatial extent of the project boundary will also include those plants connected to the energy system to which the plant is connected.

The project boundary is shown in Figure 4.

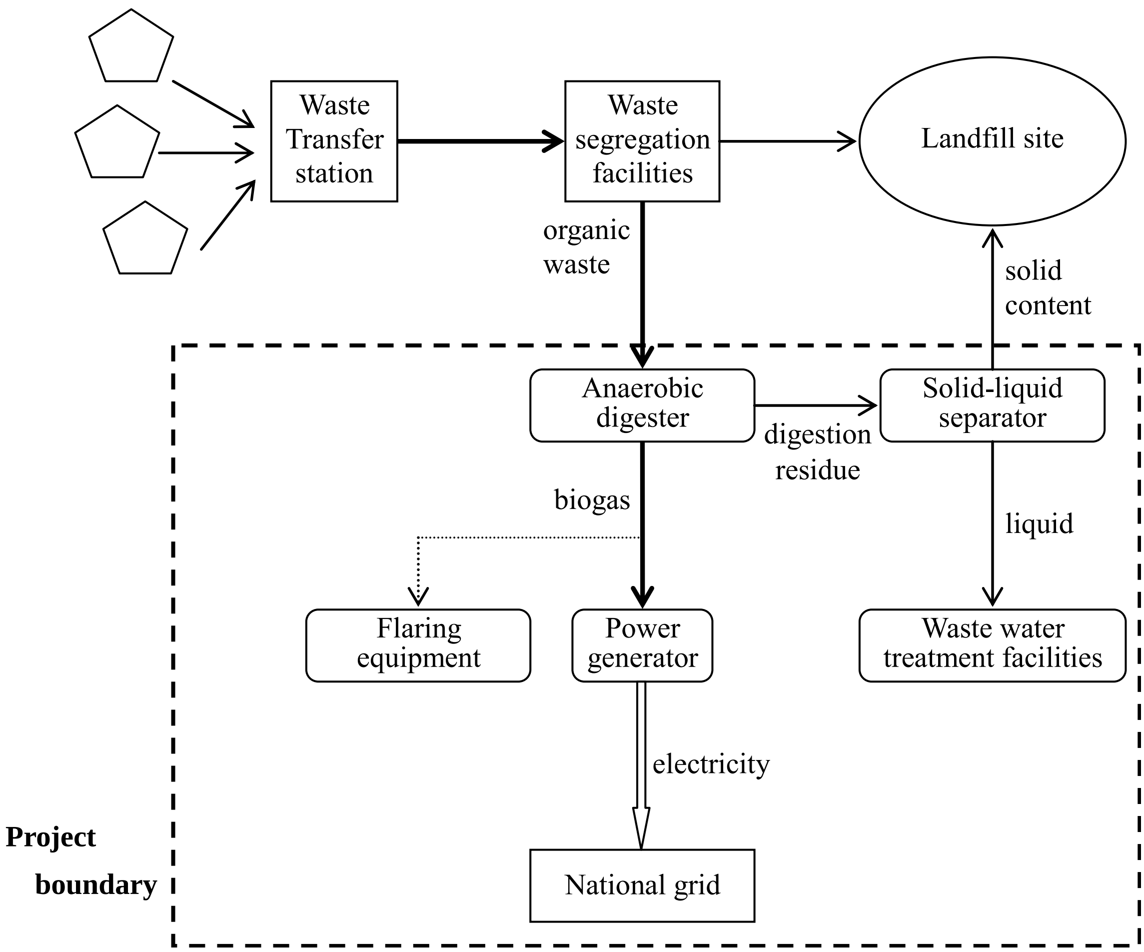

Figure 4: Project boundary

The greenhouse gases and emission sources included in or excluded from the project boundary are listed in Table 3.

Table 3: Emission sources included in or excluded from the project boundary

	Source	**Gas**		**Justification / Explanation**
Baseline	Emissions from decomposition of waste at the landfill site	CH_4	Included	The major source of emissions in the baseline
		N_2O	Excluded	N_2O emissions are small compared to CH_4 emissions from landfills. Exclusion of this gas is conservative.
		CO_2	Excluded	CO_2 emissions from the decomposition of organic waste are not accounted.
	Emissions from electricity consumption	CO_2	Included	Electricity from the grid is consumed in the baseline scenario.
		CH_4	Excluded	Excluded for simplification. This is conservative.
		N_2O	Excluded	Excluded for simplification. This is conservative.
	Emissions from thermal	CO_2	Excluded	No thermal energy generation is included in the project activity

		CH_4	Excluded	No thermal energy generation is included in the project activity
		N_2O	Excluded	No thermal energy generation is included in the project activity
Project Activity	On-site fossil fuel consumption due to the project activity other than for electricity generation	CO_2	Excluded	No additional on-site fossil fuel is consumed due to the project activity.
		CH_4	Excluded	No additional on-site fossil fuel is consumed due to the project activity.
		N_2O	Excluded	No additional on-site fossil fuel is consumed due to the project activity.
	Emissions from onsite electricity use	CO_2	Excluded	CO_2 emissions from the electricity generated from collected biogas are not accounted.
		CH_4	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.
	Direct emissions from the waste treatment processes	N_2O	Included	The final stack emissions of N_2O from electricity generation process are to be accounted.
		CO_2	Excluded	Excluded for simplification. This emission source is assumed to be very small.
		CH_4	Included	The physical leakage of CH_4 from the anaerobic digester is a potential source of project emissions. The final stack emissions of CH_4 from electricity generation process are also to be accounted.
	Emissions from waste water treatment	CO_2	Excluded	CO_2 emissions from the decomposition of organic waste are not accounted.
		CH_4	Excluded	The wastewater treatment should not result in CH_4 emissions since the wastewater is treated using aerobic treatment process
		N_2O	Excluded	Excluded for simplification. This emission source is assumed to be very small.

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

>>

Step 1 of the "Tool for the demonstration and assessment of additionality" (version 4) is used to identify all realistic and credible baseline alternatives.

The following alternatives for the disposal/treatment of the fresh waste in the absence of the project activity are analyzed.

M1. The project activity (anaerobic digestion and electricity generation) not implemented as a CDM project;

M2. Disposal of the waste at a landfill where landfill gas captured is flared;
M3. Disposal of the waste on a landfill without the capture of landfill gas.

Since the project provides electricity to a grid, alternatives for power generation in the absence of the project activity should also be separately determined. The following alternatives are analyzed for power generation.

P1. Power generated from by-product of one of the options of waste treatment as listed in M1 above, not undertaken as a CDM project activity.
P2. Existing or Construction of a new on-site or off-site fossil fuel fired cogeneration plant.
P3. Existing or Construction of a new on-site or off-site renewable based cogeneration plant.
P4. Existing or Construction of a new on-site or off-site fossil fuel fired captive power plant.
P5. Existing or Construction of a new on-site or off-site renewable based captive power plant.
P6. Existing and/or new grid-connected power plants.

"Tool for demonstration and assessment of additionality" (version 4) shall be used to assess which of these alternatives should be excluded from further consideration, then the most credible and plausible alternative shall be identified as the baseline scenario for the project activity.

<u>Baseline for waste treatment</u>
The project could expect only tipping fee revenue from Can Tho People's Committee and revenue from selling electricity where it is operated as a private business. Preference policy for renewable energy has not been fully developed in Vietnam and there is no governmental subsidy for the purchase of electricity generated from renewable energy. Therefore, the purchase price by the national power company is approximately 4 cents/kWh and it is not high enough to increase the project economics. Besides, it is difficult to attract investment in a project without good revenue while Can Tho People's Committee does not plan to increase tipping fee. In view of such a situation, an alternative scenario M1 cannot be considered as the most credible and plausible one.

The Ministry of Science, Technology and Environment and the Ministry of Construction issued a joint circular on January 18, 2001, guiding the regulations on environmental protection for the selection of location for, the construction and operation of, solid waste burial sites. The circular states "To ensure safety and environmental hygiene, all solid waste burial sites must have the waste gas-gathering and-treating system. Depending on the volume of generated gas, the gas may be used for welfare purpose or destroyed by method of burning, without letting the gas leak into the surrounding environment." However, this circular has not been fully recognized in the country and therefore a few solid waste burial sites with any waste gas-gathering and-treating system are seen only in Ho Chi Minh City in 2008, 7 years after the issuance of the circular. Noncompliance with the circular is common practice and it is unlikely that an alternative scenario M2 is considered as the baseline scenario.

M3 is the continuation of a current activity and it is identified as the baseline scenario for waste treatment.

<u>Baseline for electricity generation</u>
As mentioned above, preference policy for renewable energy has not been fully developed in Vietnam and the purchase price by the national power company is not high enough to increase the project economics. It is unlikely to operate the biogas power generation project not undertaken as a CDM project activity and P1 cannot be considered as the most credible and plausible one.

The waste treatment plant will be built on Tan Long Landfill Site currently in operation. The landfill site does not have any cogeneration facilities or captive power generation facilities and gird electricity is currently used for the operation of the landfill site. There is no restriction on using grid electricity and there is need to installs new power generation facilities in the baseline scenario. Therefore, P6 is considered as the most credible and plausible one.

Table 4 shows combinations of baseline options and scenarios applicable to AM0025.

Table 4: Combinations of baseline options and scenarios

Scenario	Baseline		Description of situation
	waste	electricity	
1	M2/M3	P4 or P6	The disposal of the waste in a landfill site without capturing landfill gas or the disposal of the waste in a landfill site where the landfill gas is partly captured and subsequently being flared. The electricity is obtained from an existing/new fossil based captive power plant or from the grid and heat from an existing/new fossil fuel based boiler.
2	M2/M3	P2	The disposal of the waste in a landfill site without capturing landfill gas or the disposal of the waste in a landfill site where the landfill gas is partly captured and subsequently being flared. The electricity and/or heat are generated by an existing/new fossil fuel based cogeneration plant.

It is demonstrated that the baseline option for waste treatment is M3 and the baseline option for power generation is P6, therefore the baseline scenario is applicable to the methodology. The baseline scenario for the project activity is described as “the disposal of the waste in a landfill site without capturing landfill gas and the electricity obtained from the grid”.

B.5. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity (assessment and demonstration of additionality):

>>

As per AM0025, the additionality of the project activity shall be demonstrated and assessed using the “Tool for the demonstration and assessment of additionality” (version 4).

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step 1a. Define alternatives to the project activity:

The following alternatives to the project activity are identified.

Alternative 1: The proposed project activity undertaken without being registered as a CDM project activity

Alternative 2: The disposal of the waste in a landfill site where the landfill gas is captured and subsequently being used or flared.

Alternative 3: The disposal of the waste in a landfill site without capturing landfill gas (The continuation of the current situation)

Sub-step 1b. Enforcement of applicable laws and regulations:

As mentioned above, "Guiding the regulations on environmental protection for the selection of location for, the construction and operation of, solid waste burial sites" states that all solid waste burial sites must have the waste gas-gathering and-treating system. However, this circular has not been fully recognized in the country and noncompliance with the circular is common practice. Therefore Alternative 3 does not necessarily comply with applicable legislation and regulations.

There are no legal and regulatory requirements which prevent the implementation of neither Alternative 1 nor Alternative 2 in Vietnam.

It is identified that all the alternative scenarios to the project activity are in compliance with mandatory legislation and regulations.

Step 3. Barrier analysis
Sub-step 3a. Identify barriers that would prevent the implementation of type of the proposed project activity:

The following barrier is identified for the project activity.

Technological barrier
According to Institute of Energy, which is an energy research and planning institute established according to the Decision by the Ministry of Energy (now it is Ministry of Industry), only one biogas power generation facility on a commercial scale is in operation in Vietnam. However the facility does not use anaerobic digestion technology but it captures landfill gas from municipal solid waste dumped at a landfill. Energy utilization of biogas generated from animal manure is also seen in Vietnam, however it is mostly used for cooking in homes and such biogas equipments are small.

The technology applied to the project activity, which is anaerobic digestion of municipal solid waste on a commercial scale, is not available in Vietnam and therefore a technological barrier is identified for the project activity.

Sub-step 3b. Show that the identified barriers would not prevent the implementation of at least one of the alternatives (except the proposed project activity):

The proposed project activity cannot be implemented without the technology explained above and the implementation of Alternative 1, the project activity undertaken without being registered as a CDM project activity, will be prevented by the identified barrier. However the identified barrier would not prevent the implementation of Alternative 2 and Alternative 3.

Step 4. Common practice analysis
Sub-step 4a. Analyze other activities similar to the proposed project activity:
Sub-step 4b. Discuss any similar options that are occurring:

As stated in Sub-step 3a, anaerobic digestion technology of municipal solid waste on a commercial scale is not available in Vietnam and any other activities similar to the proposed project activity are not considered.

Since Sub-steps 4a and 4b are satisfied, it is demonstrated that the proposed project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

>>
The emission reductions of the project activity are calculated pursuant to AM0025.

Project emissions

To calculate the project emissions of the project in year y, project participants shall use the following equation:

$$PE_y = PE_{elec,y} + PE_{fuel,on-site,y} + PE_{a,y} + PE_{w,y} \quad (1)$$

Where:

PE_y	is the project emissions during the year y (tCO_2e)
$PE_{elec,y}$	is the emissions from electricity consumption on-site due to the project activity in year y (tCO_2e)
$PE_{fuel, on-site,y}$	is the emissions due to fuel on-site consumption in year y (tCO_2e)
$PE_{a,y}$	is the emissions from the anaerobic digestion process in year y (tCO2e)
$PE_{w,y}$	is the emissions from waste water treatment in year y (tCO_2e)

The project plant has flaring equipment for emergency use in case biogas power generators do not work properly. In the current project plan, it is not expected that flaring occurs. If flaring occurs, methane emissions should be calculated using the "Tool to determine project emissions from flaring gases containing methane".

Emissions from electricity consumption on-site ($PE_{elec,y}$)

The project activity uses electricity generated from biogas by the project. In that case, the emissions from electricity consumption on-site due to the project activity ($PE_{elec,y}$) are assumed to be zero because biogas is considered to be "carbon neutral".

However, there is a possibility that the project activity uses any electricity other than captive electricity. If grid electricity or fossil fuel based electricity is used, the emissions from electricity consumption on-site shall be estimated from the following equation:

$$PE_{elec,y} = EG_{PJ,FF,y} * CEF_{elec} \quad (2)$$

Where:

$EG_{PJ,FF,y}$	is the amount of electricity generated in an on-site fossil fuel fired power plant or consumed from the grid as a result of the project activity, measured using an electricity

	meter (MWh)
CEF_{elec}	is the carbon emissions factor for electricity generation in the project activity (tCO_2/MWh)

Emissions from fuel consumption ($PE_{fuel,\ on\text{-}site,y}$)

In the current project plan, the project activity uses only electricity and it does not require any fuel. Therefore, the emissions due to on-site fuel consumption ($PE_{fuel,\ on\text{-}site,y}$) are assumed to be zero.

However, project participants should monitor whether any fuel is used on-site. If any fossil fuel is used, the emissions from o fuel consumption shall be estimated from the following equation:

$$PE_{fuel,on-site,y} = F_{cons,y} * NCV_{fuel} * EF_{fuel} \quad (3)$$

Where:

$F_{cons,y}$	is the fuel consumption on site in year y (l or kg)
NCV_{fuel}	is the net caloric value of the fuel (MJ/l or MJ/kg)
EF_{fuel}	is the CO_2 emissions factor of the fuel (tCO_2/MJ)

Emissions from anaerobic digestion ($PE_{a,y}$)

The emissions from the anaerobic digestion process in year y shall be estimated from the following equation:

$$PE_{a,y} = PE_{a,l,y} + PE_{a,s,y} \quad (4)$$

Where:

$PE_{a,l,y}$	is the CH_4 leakage emissions from the anaerobic digesters in year y (tCO_2e)
$PE_{a,s,y}$	is the total emissions of N_2O and CH_4 from stacks of the anaerobic digestion process in year y (tCO_2e)

CH_4 emissions from leakage ($PE_{a,l,y}$)

A potential source of project emissions is the physical leakage of CH_4 from the anaerobic digester. Three options are provided for quantifying these emissions, in the following preferential order:
Option 1: Monitoring the actual quantity of the gas leakage;
Option 2: Applying an appropriate IPCC physical leakage default factor, justifying the selection:
Option 3: Applying a physical leakage factor of zero where advanced technology used by the project activity prevents any physical leakage. In such cases, the project proponent must provide the DOE with the details of the technology to prove that the zero leakage factor is justified.

For the proposed activity, Option 2 is applied and CH_4 leakage emissions shall be estimated from the following equation:

$$PE_{a,l,y} = P_l * M_{a,y} \quad (5)$$

Where:

P_l	is the physical leakage factor from a digester (fraction)

$M_{a,y}$	is the total quantity of methane produced by the digester in year y (tCO_2e)

Emissions from anaerobic digestion stacks ($PE_{a,s,y}$)

$$PE_{a,s,y} = SG_{a,y} * MC_{N2O,a,y} * GWP_{N2O} + SG_{a,y} * MC_{CH4,a,y} * GWP_{CH4} \quad (6)$$

Where:

$SG_{a,y}$	is the total volume of stack gas from the anaerobic digestion in year y (m^3/yr)
$MC_{N2O,a,y}$	is the monitored content of nitrous oxide in the stack gas from anaerobic digestion in year y (tN_2O/m^3)
GWP_{N2O}	is the Global Warming Potential of nitrous oxide (tCO_2e /tN_2O)
$MC_{CH4,a,y}$	is the monitored content of methane in the stack gas from anaerobic digestion in year y (tCH_4/m^3)
GWP_{CH4}	is the Global Warming Potential of methane (tCO_2e /tCH_4)

Emissions from waste water treatment ($PE_{w,y}$)

AM0025 defines that methane emissions shall be estimated if the project activity includes waste water release. It also says that if the wastewater is treated using aerobic treatment process, the CH_4 emissions from waste water treatment are assumed to be zero. In the proposed project activity, the wastewater is treated using aerobic treatment process and there is no necessity to estimate the emissions from waste water treatment ($PE_{w,y}$).

In case wastewater is treated anaerobically or released untreated, CH_4 emissions are estimated as follows:

$$PE_{CH4,w,y} = Q_{COD,y} * P_{COD,y} * B_0 * MCF_p \quad (7)$$

Where:

$PE_{CH4,w,y}$	Methane emissions from the waste water treatment in year y (tCH_4/y)
$Q_{COD,y}$	Amount of wastewaster treated anaerobically or released untreated from the project activity in year y (m^3/yr), which shall be measured monthly and aggregately annually.
$P_{COD,y}$	Chemical Oxygen Demand (COD) of wastewaster (tCOD/ m^3), which will be measured monthly and averaged annually.
B_0	Maximum methane producing capacity (t CH_4/t COD)
MCF_p	Methane conversion factor (fraction), preferably local specific value should be used. In absence of local values, MCF_p default values can be obtained from table 6.3, chapter 6, volume 4 from IPCC 2006 guidelines.

Then,

$$PE_{w,y} = PE_{CH4,x,y} * GWP_{CH4} \quad (8)$$

Where:

GWP_{CH4}	is the Global Warming Potential of methane (tCO_2e /tCH_4)

<u>Baseline emissions</u>

To calculate the baseline emissions project participants shall use the following equation:

$$BE_y = (MB_y - MD_{reg,y}) + BE_{EN,y} \quad (9)$$

Where:

BE_y	is the baseline emissions in year y (tCO_2e)
MB_y	is the methane produced in the landfill in the absence of the project activity in year y (t_4CO_2e)
$MD_{reg,y}$	is methane that would be destroyed in the absence of the project activity in year y (t_4CO_2e)
$BE_{EN,y}$	is the baseline emissions from generation of energy displaced by the project activity in year y (tCO_2e)

As demonstrated in B4, the baseline scenario for the project activity for waste treatment is described as "the disposal of the waste in a landfill site without capturing landfill gas". Therefore, methane that would be destroyed in the absence of the project activity ($MD_{reg,y}$), are to be zero.

Methane generation from the landfill in the absence of the project activity (MB_y)

The amount of methane that is generated each year (MB_y) is calculated as per the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site" (hereafter referred to as methane tool).

$$MB_y = BE_{CH4,SWDS,y} \quad (10)$$

Where:

$BE_{CH4,SWDS,y}$	is the methane generation from the landfill in the absence of the project activity at year y

The following equation is provided in the methane tool.

$$BE_{CH4,SWDS,y} = \varphi * (1\text{-}f) * GWP_{CH4} * (1 - OX) * \frac{16}{12} * F * DOC_f * MCF * \sum_{x=1}^{y} \sum_{j} W_{j,x} * DOC_j * e^{-k_j*(y-x)} * (1 - e^{-kj}) \quad (11)$$

Where:

$BE_{CH4,SWDS,y}$	Methane emissions avoided during the year y from preventing waste disposal at the solid waste disposal site (SWDS) during the period from the start of the project activity to the end of the year y (tCO_2e)
ϕ	Model correction factor to account for model uncertainties (0.9)
f	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
GWP_{CH4}	Global Warming Potential (GWP) of methane, valid for the relevant commitment period
OX	Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste)
F	Fraction of methane in the SWDS gas (volume fraction) (0.5)
DOC_f	Fraction of degradable organic carbon (DOC) that can decompose
MCF	Methane correction factor
$W_{j,x}$	Amount of organic waste type *j* prevented from disposal in the SWDS in the year *x* (tonnes)
DOC_j	Fraction of degradable organic carbon (by weight) in the waste type *j*
k_j	Decay rate for the waste type *j*

j	Waste type category (index)
x	Year during the crediting period: x runs from the first year of the first crediting period (x = 1) to the year y for which avoided emissions are calculated (x = y)
y	Year for which methane emissions are calculated

The methane tool indicates to determine the amount of different waste types ($W_{j,x}$) through sampling and calculate the mean from the samples, as follows;

$$W_{j,x} = W_x * \frac{\sum_{n-1}^{z} p_{n,j,x}}{Z} \quad (12)$$

Where:

$W_{j,x}$	Amount of organic waste type *j* prevented from disposal in the SWDS in the year *x* (tonnes)
W_x	Total amount of organic waste prevented from disposal in year *x* (tonnes)
$p_{n,j,x}$	Weight fraction of the waste type *j* in the sample *n* collected during the year *x*
z	Number of samples collected during the year *x*

Baseline emissions from generation of energy displaced by the project activity ($BE_{EN,y}$)

Baseline emissions from generation of energy displaced by the project activity shall be estimated from the following equation:

$$BE_{EN,y} = BE_{elec,y} + BE_{thermal,y} \quad (13)$$

Where:

$BE_{elec,y}$	is the baseline emissions from electricity generated utilizing the biogas in the project activity and exported to the grid (tCO_2e)
$BE_{thermal,y}$	is the baseline emissions from thermal energy produced utilizing the biogas in the project activity displacing thermal energy from onsite/offsite fossil fuel fueled boiler (tCO_2e)

The proposed project activity does not involve any thermal energy production and the baseline emissions from generation of thermal energy displaced by the project activity ($BE_{thermal,y}$) are not to be considered.

Baseline emissions from electricity ($BE_{elec,y}$)

$$BE_{elec,y} = EG_{d,y} * CEF_d \quad (14)$$

Where:

$EG_{d,y}$	is the amount of electricity generated utilizing the biogas in the project activity and exported to the grid during the year *y* (MWh)
CEF_d	is the carbon emissions factor for the displaced electricity source in the project scenario (tCO_2/MWh)

CEF_d is calculated according to the "Tool to calculate the emission factor for an electricity system" since the generated electricity from the biogas displaces electricity that would have been generated by other power plants in the grid in the baseline.

Leakage

To calculate the leakage emissions, project participants shall use the following equation:

$$L_y = L_{t,y} + L_{r,y} \quad (15)$$

Where:

$L_{t,y}$	is the leakage emissions from increased transport in year y (tCO_2e)
$L_{r,y}$	is the leakage emissions from the residual waste from the anaerobic digester in case it is disposed of in landfills in year y (tCO_2e)

Emissions from increased transport ($L_{t,y}$)

This would occur when the waste is transported from waste collecting points, in the collection area, to the treatment facility, instead of to existing landfills. The treatment facility of the project will be built at Tan Long Landfill Site, which is the existing landfill. Therefore, the leakage emissions from increased transport ($L_{t,y}$) can be neglected. In case transport of waste is increased, $L_{t,y}$ shall be calculated as follows;

$$L_{t,y} = \sum_{i}^{n} NO_{vehicles,i,y} * DT_{i,y} * VF_{cons,i} * NCV_{fuel} * D_{fuel} * EF_{fuel} \quad (16)$$

Where:

$NO_{vehicles,i,y}$	is the number of vehicles for transport with similar loading capacity
$DT_{i,y}$	is the average additional distance travelled by vehicle type i compared to baseline in year y (km)
$VF_{cons,i}$	is the vehicle fuel consumption in litres per kilometre for vehicle type i (l/km)
NCV_{fuel}	is the Calorific value of the fuel (MJ/Kg or other unit)
D_{fuel}	is the fuel density (kg/l), if necessary
EF_{fuel}	is the Emission factor of the fuel (tCO_2/MJ)

Emissions from the residual waste from the anaerobic digester in case it is disposed of in landfills ($L_{r,y}$)

Emissions from the residual waste include N_2O emissions and CH_4 emissions in case the residual waste is aerobically treated through composting. Emissions shall be estimated as follows:

$$L_{r,y} = L_{N2O,y} + L_{CH4,y} \quad (17)$$

Where:

$L_{N2O,y}$	is the N_2O emissions from the residual waste in year y (tCO_2e)
$L_{CH4,y}$	is the CH_4 emissions from the residual waste in year y (tCO_2e)

N_2O emissions

N_2O emissions shall be estimated using Equation 5 of AM0025 replacing $M_{compost,y}$ by the sum of the weights of different waste types ($A_{ci,x}$), as follows;

$$L_{N2O,y} = A_{ci,x} * EF_{c,N2O} * GWP_{N2O} \quad (18)$$

Where:

$A_{ci,x}$	is the sum of the weights of each of the waste types i in year x (tonne)
$EF_{c,N2O}$	is the emission factor for N_2O emissions from the composting process (tN_2O/t compost)
GWP_{N2O}	is the Global Warming Potential of nitrous oxide, (tCO_2/tN_2O)

CH_4 emissions

CH_4 emissions shall be estimated using the methane tool. The value of variable $W_{j,x}$ is $A_{ci,x}$. The result should be multiplied by S_{LE} factor.

$$L_{CH4,y} = \varphi * (1\text{-}f) * GWP_{CH4} * (1 - OX) * \frac{16}{12} * F * DOC_f * MCF * \sum_{x=1}^{y} \sum_{j} A_{ci,x} * DOC_j * e^{-k_j*(y-x)} * (1 - e^{-kj}) * S_{LE} \quad (19)$$

S_{LE} is estimated as follows:

$$S_{LE} = S_{OD,LE} / S_{LE,total} \quad (20)$$

Where:

$S_{OD,LE}$	is the number of samples per year with an oxygen deficiency (i.e. oxygen content below 10%)
$S_{LE,total}$	is the total number of samples taken per year, where Stotal should be chosen in a manner that ensures the estimation of Sa with 20% uncertainty at a 95% confidence level.
$A_{ci,x}$	is the sum of the weights of each of the waste types i in year x (tonne)

Emission reductions

To calculate the emission reductions the project participant shall apply the following equation:

$$ER_y = BE_y - PE_y - L_y \quad (21)$$

Where:

ER_y	is the emissions reductions in year y (t CO_2e)
BE_y	is the emissions in the baseline scenario in year y (t CO_2e)
PE_y	is the emissions in the project scenario in year y (t CO_2e)
L_y	is the leakage in year y (t CO_2e)

B.6.2. Data and parameters that are available at validation:

(Copy this table for each data and parameter)

Data / Parameter:	**P_l**
Data unit:	fraction
Description:	Leakage of methane emissions from anaerobic digester
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	15%

Justification of the choice of data or description of measurement methods and procedures actually applied :	Applying an appropriate IPCC physical leakage default is one of three options provided in AM0025.
Any comment:	

Data / Parameter:	**GWP_{CH4}**
Data unit:	tCO_2e / tCH_4
Description:	Global Warming Potential (GWP) of methane, valid for the relevant commitment period
Source of data used:	Decisions under UNFCCC and the Kyoto Protocol
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	**GWP_{N2O}**
Data unit:	tCO_2e / tN_2O
Description:	Global Warming Potential (GWP) of N_2O, valid for the relevant commitment period
Source of data used:	Decisions under UNFCCC and the Kyoto Protocol
Value applied:	310
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

Data / Parameter:	**B_0**
Data unit:	tCH_4/t COD
Description:	Maximum methane producing capacity
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.265 tCH_4/tCOD
Justification of the choice of data or description of measurement methods and procedures actually applied :	

Any comment:	

Data / Parameter:	MCF_p
Data unit:	%
Description:	Methane conversion factor (fraction)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Table 6.3, chapter 6, volume 4)
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	As stated in AM0025, the wastewater is treated using aerobic treatment process and the CH_4 emissions from waste water treatment are assumed to be zero.
Any comment:	When wastewater is treated anaerobically or released untreated, project participants shall chose the most appropriate MCF_p default values from IPCC 2006 guidelines.

Data / Parameter:	ϕ
Data unit:	-
Description:	Model correction factor to account for model uncertainties
Source of data used:	Methane tool
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the methane tool.
Any comment:	Oonk et el. (1994) have validated several landfill gas models based on 17 realized landfill gas projects. The mean relative error of multi-phase models was assessed to be 18%. Given the uncertainties associated with the model and in order to estimate emission reductions in a conservative manner, a discount of 10% is applied to the model results.

Data / Parameter:	**f**
Data unit:	-
Description:	Fraction of methane captured at the SWDS and flared, combusted or used in another manner
Source of data used:	AM0025
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per AM0025.

Any comment:	

Data / Parameter:	**OX**
Data unit:	-
Description:	Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste)
Source of data used:	Conduct a site visit at the solid waste disposal site in order to assess the type of cover of the solid waste disposal site. Use the IPCC 2006 Guidelines for National Greenhouse Gas Inventories for the choice of the value to be applied.
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied :	Project participants conducted a site visit at the solid waste disposal site and it was found that the site was not a managed solid waste disposal site that is covered with oxidizing material such as soil or compost.
Any comment:	

Data / Parameter:	**F**
Data unit:	-
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the methane tool.
Any comment:	This factor reflects the fact that some degradable organic carbon does not degrade, or degrades very slowly, under anaerobic conditions in the SWDS. A default value of 0.5 is recommended by IPCC.

Data / Parameter:	**DOC_f**
Data unit:	-
Description:	Fraction of degradable organic carbon (DOC) that can decompose
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the methane tool.
Any comment:	

Data / Parameter:	**MCF**

Data unit:	-
Description:	Methane correction factor
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
Value applied:	0.8
Justification of the choice of data or description of measurement methods and procedures actually applied :	AM0025 suggests to use the following values for MCF: • 1.0 for anaerobic managed solid waste disposal sites. These must have controlled placement of waste (i.e., waste directed to specific deposition areas, a degree of control of scavenging and a degree of control of fires) and will include at least one of the following: (i) cover material; (ii) mechanical compacting; or (iii) leveling of the waste. • 0.5 for semi-aerobic managed solid waste disposal sites. These must have controlled placement of waste and will include all of the following structures for introducing air to waste layer: (i) permeable cover material; (ii) leachate drainage system; (iii) regulating pondage; and (iv) gas ventilation system. • 0.8 for unmanaged solid waste disposal sites – deep and/or with high water table. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of greater than or equal to 5 meters and/or high water table at near ground level. Latter situation corresponds to filling inland water, such as pond, river or wetland, by waste. • 0.4 for unmanaged-shallow solid waste disposal sites. This comprises all SWDS not meeting the criteria of managed SWDS and which have depths of less than 5 metres. Project participants conducted a site visit at the solid waste disposal site and it was found that the site had depths of greater than 5 meters but it did not meet the criteria of managed SWDS.
Any comment:	The methane correction factor (MCF) accounts for the fact that unmanaged SWDS produce less methane from a given amount of waste than managed SWDS, because a larger fraction of waste decomposes aerobically in the top layers of unmanaged SWDS.

Data / Parameter:	**DOC_j**
Data unit:	-
Description:	Fraction of degradable organic carbon (by weight) in the waste type *j*
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)
Value applied:	Apply the following values for the different waste types *j*:

waste types *j*	DOC_j (% wet waste)	DOC_j (% dry waste)
Wood and wood products	43	50
Pulp, paper and cardboard (other than sludge)	40	44
Food, food waste, beverages and tobacco	15	38

	(other than sludge) | | Textiles | 24 | 30 Garden, yard and park waste | 20 | 49 Glass, plastic, metal, other inert waste | 0 | 0 If a waste type, prevented from disposal by the proposed CDM project activity, can not clearly be attributed to one of the waste types in the table above, project participants should choose among the waste types that have similar characteristics that waste type where the values of DOC_j and k_j result in a conservative estimate (lowest emissions), or request a revision of / deviation from this methodology. For example, in the case of empty fruit bunches (EFB), as their characteristics are similar to wood in terms of cellulose, hemi-cellulose, and lignin content, the parameters correspondent of wood should be used.
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	As per the methane tool.

Data / Parameter:	**k_j**
Data unit:	-
Description:	Decay rate for the waste type *j*
Source of data used:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)
Value applied:	Apply the following default values for the different waste types *j* Waste types *j* | | Slowly degrading | Pulp, paper, cardboard (other than sludge), textiles | 0.07 Slowly degrading | Wood, wood products and straw | 0.035 Moderately degrading | Other (non-food) organic putrescible garden and park waste | 0.17 Rapidly degrading | Food, food waste, sewage sludge, beverages and tobacco | 0.40 If a waste type, prevented from disposal by the proposed CDM project activity, can not clearly be attributed to one of the waste types in the table above, project participants should choose among the waste types that have similar characteristics that waste type where the values of DOCj and kj result in a conservative estimate (lowest emissions), or request a revision of / deviation from this methodology. For example, in the case of empty fruit bunches (EFB), as their characteristics are similar to wood in terms of cellulose, hemi-cellulose, and lignin content, the parameters correspondent of wood should be used.
Justification of the	The mean temperature of Ca Mau province in 2006 is 27.6°C and the annual

choice of data or description of measurement methods and procedures actually applied :	precipitation of Ca Mau province in 2006 is 2,387mm. Since the mean annual temperature is higher than 20°C and the mean annual precipitation is greater than 1,000mm, default values under "Tropical - Wet" will be applied to the project activity.
Any comment:	The temperature and precipitation data is adapted from *Statistical Yearbook of Vietnam 2006*.

Data / Parameter:	**CEF_d**
Data unit:	tCO_2/MWh
Description:	Emission factor of displaced electricity by the project activity
Source of data used:	Tran Minh Tuyen and Axel Michaelowa. "CDM Baseline Construction for Vietnam National Electricity Grid." *HWWA Discussion Paper*
Value applied:	705 g CO_2/kWh
Justification of the choice of data or description of measurement methods and procedures actually applied :	The baseline emissions factor is calculated as ½ OM + ½ BM and it is following "Tool to calculate the emission factor for an electricity system"
Any comment:	

Data / Parameter:	**$EF_{c,N2O}$**
Data unit:	tN_2O/tonnes of compost
Description:	Emission factor for N_2O emissions from the composting process
Source of data used:	Schenk et al, 1997
Value applied:	0.043kg-N_2O/t-compost
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per AM0025.
Any comment:	The value is provided to calculate the N_2O emissions from composting. But this is also applicable to estimate the emissions from the residual waste from the anaerobic digester as per AM0025.

B.6.3 Ex-ante calculation of emission reductions:

>>

Project emissions

Emissions from electricity consumption on-site ($PE_{elec,y}$)

The project activity uses electricity generated from biogas by the project. In that case, the emissions from electricity consumption on-site due to the project activity ($PE_{elec,y}$) are assumed to be zero because biogas is considered to be "carbon neutral".

Emissions from fuel consumption ($PE_{fuel, on-site,y}$)
In the current project plan, the project activity uses only electricity and it does not require any fuel. Therefore, the emissions due to on-site fuel consumption ($PE_{fuel, on-site,y}$) are assumed to be zero.

Emissions from anaerobic digestion ($PE_{a,y}$)

CH_4 emissions from leakage ($PE_{a,l,y}$)
CH_4 emissions from leakage from the anaerobic digesters are calculated using Equation 5. The values used for calculation and the calculation result are shown in Table 5

Table 5: Calculation data of $PE_{a,l,y}$

Parameter	Value	Remarks
P_l	15%	A default value specified by IPCC 2006 Guidelines for National Greenhouse Gas Inventories
$M_{a,y}$	14,633tCO_2e/yr	Estimation by experts
$PE_{a,l,y}$	2,195tCO_2/yr	Calculated using Equation 5

Emissions from anaerobic digestion stacks ($PE_{a,s,y}$)
Biogas generated from the anaerobic process is delivered to power generators and used for electricity generation. N_2O and CH_4 emitted from stacks are expected to be minor and they are assumed to be zero for ex-ante calculation. However, they should be monitored regardless.

Emissions from waste water treatment ($PE_{w,y}$)
In the proposed project activity, wastewater is treated using aerobic treatment process, the CH_4 emissions from waste water treatment are assumed to be zero.

Total project emissions (PE_y)
Estimated amount of the project emissions over the crediting period is shown in Table6.

Table 6: Total project emissions

Year	$PE_{elec,y}$ (tCO_2e)	$PE_{fuel, on-site,y}$ (tCO_2e)	$PE_{a,y}$		$PE_{w,y}$ (tCO_2e)	**PE_y (tCO_2e)**
			$PE_{a,l,y}$ (tCO_2e)	$PE_{a,s,y}$ (tCO_2e)		
1	0	0	2,195	0	0	2,195
2	0	0	2,195	0	0	2,195
3	0	0	2,195	0	0	2,195
4	0	0	2,195	0	0	2,195
5	0	0	2,195	0	0	2,195
6	0	0	2,195	0	0	2,195
7	0	0	2,195	0	0	2,195
8	0	0	2,195	0	0	2,195
9	0	0	2,195	0	0	2,195
10	0	0	2,195	0	0	2,195
Total for the crediting	**0**	**0**	**21,950**	**0**	**0**	**21,950**

period						

Baseline emissions

Methane generation from the landfill in the absence of the project activity (MB_y)

Methane emissions avoided from preventing waste disposal are calculated using Equation 11. The values used for calculation are shown in Table 7

Table 7: Parameters for Equation 11

<table>
<tr><th>Parameter</th><th colspan="3">Value</th><th>Remarks</th></tr>
<tr><td>ϕ</td><td colspan="3">0.9</td><td>A default value</td></tr>
<tr><td>f</td><td colspan="3">0</td><td>As per AM0025</td></tr>
<tr><td>GWP_{CH4}</td><td colspan="3">21</td><td>Decisions under UNFCCC and the Kyoto Protocol</td></tr>
<tr><td>OX</td><td colspan="3">0</td><td>The solid waste disposal site is not covered with oxidizing material such as soil or compost.</td></tr>
<tr><td>F</td><td colspan="3">0.5</td><td>A default value specified by IPCC 2006 Guidelines for National Greenhouse Gas Inventories</td></tr>
<tr><td>DOC_f</td><td colspan="3">0.5</td><td>A default value specified by IPCC 2006 Guidelines for National Greenhouse Gas Inventories</td></tr>
<tr><td>MCF</td><td colspan="3">0.8</td><td>A value adapted from IPCC2006Guidelines for National Greenhouse Gas Inventories.
The solid waste disposal site has depths of greater than 5 meters but it does not meet the criteria of managed SWDS</td></tr>
<tr><td rowspan="3">$W_{j,x}$</td><td>Waste type</td><td>%</td><td>Amount of waste (ton/y)</td><td rowspan="3">The project plant will receive only organic wastes through the waste separation process. The expected input of the waste is 50 tonnes per day. It may include kitchen waste and garden waste in the proportion of one to two.</td></tr>
<tr><td>Garden, yard and park waste</td><td>66.7</td><td>12,167</td></tr>
<tr><td>Food, food waste, beverage and tobacco</td><td>33.3</td><td>6,083</td></tr>
<tr><td rowspan="3">DOC_j</td><td>Waste type</td><td colspan="2">DOC_j （Wet%）</td><td rowspan="3">Values adapted from Vol.5, Table 2.4 and 2.5 in IPCC2006 Guidelines for National Greenhouse Gas Inventories</td></tr>
<tr><td>Garden, yard and park waste</td><td colspan="2">20</td></tr>
<tr><td>Food, food waste, beverage and tobacco</td><td colspan="2">15</td></tr>
</table>

k_j	Waste types	k_j	Values adapted from Vol.5, Table 3.3 in IPCC2006 Guidelines for National Greenhouse Gas Inventories. The mean annual temperature of the area is higher than 20°C and the mean annual precipitation is greater than 1,000mm.
	Non-food organic putrescible, garden and park waste	0.17	
	Food, food waste, beverage and tobacco	0.40	

When the above parameters are applied, Equation 11 is condensed as follows;

$$BE_{CH4,SWDS,y} = 5.04\sum_{x=1}^{y}\sum_{j=1}^{2} W_{j,x} * DOC_j * e\left(-k_j\left(y-x\right)\right) * \left(1-e\left(-k_j\right)\right) \qquad (11')$$

For ex-ante calculation, it is assumed that the proportions and characteristics of different types of organic waste processed in the project activity remain unchanged during the crediting period. Under that assumption, the variable *x* does not affect $W_{j,x}$ and it can be replaced by W_j. Table 8 shows parameters used for Equation 11'.

Table 8: Parameters for Equation 11'

j	W_j	DOC_j	k_j
1	12,173	0.2	0.17
2	6,077	0.15	0.40

The calculation result of $BE_{CH4,SWDS,y}$ (y = 1 to 10) and the amount of organic waste processed are shown in Table 9.

Table 9: Amount of organic waste processed and methane emissions avoided

Year	Amount of organic waste processed (tonnes)	Methane generation in the absence of the project activity ($BE_{CH4,SWDS,y}$) (tCO_2e)
1	18,250	3,432
2	18,250	6,066
3	18,250	8,112
4	18,250	9,720
5	18,250	10,998
6	18,250	12,023
7	18,250	12,852
8	18,250	13,527
9	18,250	14,082
10	18,250	14,538
Total for the crediting period	**182,500**	**105,350**

Baseline emissions from electricity ($BE_{elec,y}$)

Baseline emissions from electricity generation displaced by the project activity are calculated using Equation 14. The values used for calculation and the calculation result are shown in Table 10.

Table 10: Calculation data of $BE_{elec,y}$

Parameter	Value	Remarks
$EG_{d,y}$	2,595,150 kWh/yr	Estimation by experts
CEF_d	705 g CO_2/kWh	Tran Minh Tuyen and Axel Michaelowa. "CDM Baseline Construction for Vietnam National Electricity Grid." *HWWA Discussion Paper*
$BE_{elec,y}$	1,829 tCO_2/yr	Calculated using Equation 14

Total baseline emissions (BE_y)

Estimated amount of the baseline emissions over the crediting period is shown in Table 11.

Table 11: Total baseline emissions

Year	MB_y (tCO_2e)	$BE_{elec,y}$ (tCO_2e)	**BE_y (tCO_2e)**
1	3,432	1,829	**5,261**
2	6,066	1,829	**7,895**
3	8,112	1,829	**9,941**
4	9,720	1,829	**11,549**
5	10,998	1,829	**12,827**
6	12,023	1,829	**13,852**
7	12,852	1,829	**14,681**
8	13,527	1,829	**15,356**
9	14,082	1,829	**15,911**
10	14,538	1,829	**16,367**
Total for the crediting period	**105,350**	**18,290**	**123,640**

<u>**Leakage**</u>

Emissions from increased transport ($L_{t,y}$)

The treatment facility of the project will be built at Tan Long Landfill Site, which is the existing landfill. Therefore, the leakage emissions from increased transport ($L_{t,y}$) can be neglected.

Emissions from the residual waste from the anaerobic digester in case it is disposed of in landfills ($L_{r,y}$)

N_2O emissions

N_2O emissions from the residual waste are calculated using Equation 18. The values used for calculation and the calculation result are shown in Table 12.

Table 12: Calculation data of $L_{N2O,y}$

Parameter	Value	Remarks
$A_{ci,x}$	3,650 tonnes/yr	Estimation by experts
$EF_{c,N2O}$	0.043 kg N_2O /t compost	A default value provided by Schenk et al, 1997
GWP_{N2O}	310	Decisions under UNFCCC and the Kyoto Protocol
$L_{N2O,y}$	49t CO_2/yr	Calculated using Equation 18

CH_4 emissions
The composition of the residual waste from the anaerobic digester is unspecified and $L_{CH4,y}$ cannot be estimated ex-ante.

Total leakage emissions (L_y)
Estimated amount of the leakage over the crediting period is shown in Table 13.

Table 13: Total leakage emissions

Year	$L_{t,y}$ (tCO_2e)	$L_{r,y}$		**L_y (tCO_2e)**
		$L_{N2O,y}$ (tCO_2e)	$L_{CH4,y}$ (tCO_2e)	
1	0	49	0	**49**
2	0	49	0	**49**
3	0	49	0	**49**
4	0	49	0	**49**
5	0	49	0	**49**
6	0	49	0	**49**
7	0	49	0	**49**
8	0	49	0	**49**
9	0	49	0	**49**
10	0	49	0	**49**
Total for the crediting period	**0**	**490**	**0**	**490**

B.6.4 Summary of the ex-ante estimation of emission reductions:
>>
Table 14 shows the ex-ante estimation of emission reduction for the crediting period.

Table 14: Total estimated emission reductions

Year	BE_y (tCO_2e)	PE_y (tCO_2e)	L_y (tCO_2e)	**ER_y (tCO_2e)**
1	5,261	2,195	49	**3,017**
2	7,895	2,195	49	**5,651**
3	9,941	2,195	49	**7,697**
4	11,549	2,195	49	**9,305**

5	12,827	2,195	49	**10,583**
6	13,852	2,195	49	**11,608**
7	14,681	2,195	49	**12,437**
8	15,356	2,195	49	**13,112**
9	15,911	2,195	49	**13,667**
10	16,367	2,195	49	**14,123**
Total for the crediting period	123,640	21,950	490	**101,200**

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

B.7.1 Data and parameters monitored:

(Copy this table for each data and parameter)

Data / Parameter:	**$EG_{PJ,FF,y}$**
Data unit:	MWh
Description:	Amount of electricity generated in an on-site fossil fuel fired power plant or consumed from the grid as a result of the project activity
Source of data to be used:	Electricity meter
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:	Electricity meter will be subject to regular (in accordance with stipulation of the meter supplier) maintenance and testing to ensure accuracy. The readings will be double checked by the electricity distribution company.
Any comment:	To be monitored continuously

Data / Parameter:	**CEF_{elec}**
Data unit:	tCO_2/MWh
Description:	Emissions factor for electricity generation in the project activity
Source of data to be used:	Official utility documents
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of	Calculated according to the “Tool to calculate the emission factor for an

measurement methods and procedures to be applied:	electricity system", or as diesel default factor according to AMS I.D, Table I.D.1, if the conditions of the table are fulfilled or according to data from captive power plant, if any.
QA/QC procedures to be applied:	Calculated as per appropriate methodology at start of crediting period.
Any comment:	To be monitored annually

Data / Parameter:	$\mathbf{F_{cons,y}}$
Data unit:	mass or volume units of fuel
Description:	Fuel consumption on-site during year 'y' of the crediting period.
Source of data to be used:	Purchase invoices and/or metering.
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:	The amount of fuel will be derived from the paid fuel invoices (administrative obligation).
Any comment:	To be monitored annually

Data / Parameter:	$\mathbf{NCV_{fuel}}$
Data unit:	MJ/mass or volume units of fuel
Description:	Net caloric value of fuel
Source of data to be used:	The source of data should be the following, in order of preference: project specific data, country specific data or IPCC default values. As per guidance from the Board, IPCC default values should be used only when country or project specific data are not available or difficult to obtain.
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:	To be monitored annually

Data / Parameter:	$\mathbf{EF_{fuel}}$
Data unit:	tCO_2/MJ

Description:	Emissions factor of the fuel
Source of data to be used:	The source of data should be the following, in order of preference: project specific data, country specific data or IPCC default values. As per guidance from the Board, IPCC default values should be used only when country or project specific data are not available or difficult to obtain.
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:	To be monitored annually

Data / Parameter:	$\mathbf{M_{a,y}}$
Data unit:	tCO_2/year
Description:	Total methane produced from anaerobic digester
Source of data to be used:	Project participant
Value of data applied for the purpose of calculating expected emission reductions in section B.5	14,633tCO_2e/yr
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	Data can be checked from usage records.
Any comment:	This quantity is necessary to calculate the leakage of methane from the digester which has a default leakage of 15%. To be monitored continuously.

Data / Parameter:	$\mathbf{SG_{a,y}}$
Data unit:	m^3/yr
Description:	Stack gas volume flow rate.
Source of data to be used:	Project participant
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:	Maintenance and calibration of equipment will be carried out according to internationally recognised procedures. Where laboratory work is outsourced, one which follows rigorous standards shall be selected.
Any comment:	The stack gas flow rate is either directly measured or calculated from other variables where direct monitoring is not feasible. Where there are multiple stacks of the same type, it is sufficient to monitor one stack of each type. The stack gas volume flow rate may be estimated by summing the inlet biogas and air flow rates and adjusting for stack temperature. Air inlet flow rate should be estimated by direct measurement using a flow meter. Monitoring frequency is continuous or periodic (at least quarterly)

Data / Parameter:	**$MC_{N2O,a,y}$**
Data unit:	tN_2O/m^3
Description:	Concentration of N_2O in stack gas.
Source of data to be used:	Project Participants
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:	Maintenance and calibration of equipment will be carried out according to internationally recognised procedures. Where laboratory work is outsourced, one which follows rigorous standards shall be selected.
Any comment:	Monitoring frequency is at least quarterly but more frequent sampling is encouraged.

Data / Parameter:	**$MC_{CH4,a,y}$**
Data unit:	tCH_4/m^3
Description:	Concentration of CH_4 in stack gas.
Source of data to be used:	Project Participants
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:	Maintenance and calibration of equipment will be carried out according to internationally recognised procedures. Where laboratory work is outsourced, one which follows rigorous standards shall be selected.
Any comment:	Monitoring frequency is at least quarterly more frequent sampling is encouraged.

Data / Parameter:	$\mathbf{Q_{COD,y}}$
Data unit:	m^3/yr
Description:	Amount of wastewaster treated anaerobically or released untreated from the project activity in year y
Source of data to be used:	Measured value by flow meter
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:	The monitoring instruments will be subject to regular maintenance and testing to ensure accuracy.
Any comment:	To be monitored monthly, aggregated annually. If the wastewater is treated aerobically, emissions are assumed to be zero, and hence this parameter does not need to be monitored.

Data / Parameter:	$\mathbf{P_{COD,y}}$
Data unit:	tCOD/ m^3
Description:	Chemical Oxygen Demand (COD) of wastewaster
Source of data to be used:	Measured value by purity meter
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:	The monitoring instruments will be subject to regular maintenance and testing to ensure accuracy.
Any comment:	To be monitored monthly, aggregated annually. If the wastewater is treated aerobically, emissions are assumed to be zero, and hence this parameter does not

	need to be monitored.

Data / Parameter:	**$FV_{RG,h}$**
Data unit:	m^3/h
Description:	Volumetric flow rate of the residual gas in dry basis at normal conditions in hour *h*
Source of data to be used:	Measurements by project participants using a flow meter
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:	Flow meters are to be periodically calibrated according to the manufacturer’s recommendation.
Any comment:	Monitoring frequency is continuously. Values to be averaged hourly or at a shorter time interval

Data / Parameter:	**$fv_{CH4,RG,h}$**
Data unit:	-
Description:	Volumetric fraction of methane in the residual gas in the hour *h*
Source of data to be used:	Measurements by project participants using a continuous gas analyser
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:	Analysers must be periodically calibrated according to the manufacturer’s recommendation. A zero check and a typical value check should be performed by comparison with a standard certified gas.
Any comment:	Participants may consider the remaining part as N_2. Monitoring frequency is continuously. Values to be averaged hourly or at a shorter time interval

Data / Parameter:	**MB_y**
Data unit:	tCO_2
Description:	Methane produced in the landfill in the absence of the project activity in year y.
Source of data to be	Calculated as per the “Tool to determine methane emissions avoided from

used:	dumping waste at a solid waste disposal site”.
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:	As per the “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site”.
Any comment:	To be monitored as per the “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site”.

Data / Parameter:	$\mathbf{W_x}$
Data unit:	tonnes
Description:	Total amount of organic waste prevented from disposal in year *x*
Source of data to be used:	Measurements by project participants
Value of data applied for the purpose of calculating expected emission reductions in section B.5	18250 tonnes (50 ton/day)
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	To be monitored continuously, aggregated at least annually.

Data / Parameter:	$\mathbf{p_{n,j,x}}$
Data unit:	-
Description:	Weight fraction of the waste type *j* in the sample *n* collected during the year *x*
Source of data to be used:	Sample measurements by project participants.
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:	Sample the waste prevented from disposal, using the waste categories *j*, as provided in the table for DOC_j and k_j, and weigh each waste fraction.

QA/QC procedures to be applied:	
Any comment:	The size and frequency of sampling should be statistically significant with a maximum uncertainty range of 20% at a 95% confidence level. As a minimum, sampling should be undertaken four times per year. This parameter only needs to be monitored if the waste prevented from disposal includes several waste categories *j*, as categorized in the tables for DOC_j and k_j.

Data / Parameter:	**z**
Data unit:	-
Description:	Number of samples collected during the year *x*
Source of data to be used:	Project participants
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:	To be monitored continuously, aggregated annually. This parameter only needs to be monitored if the waste prevented from disposal includes several waste categories *j*, as categorized in the tables for DOC_j and k_j.

Data / Parameter:	$\mathbf{EG_{d,y}}$
Data unit:	MWh
Description:	Amount of electricity generated utilizing the biogas in the project activity displacing electricity in the baseline during the year *y*.
Source of data to be used:	Electricity meter
Value of data applied for the purpose of calculating expected emission reductions in section B.5	2,595,150 kWh
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	
Any comment:	Monitoring frequency is continuously

Data / Parameter:	**CEF_d**
Data unit:	tCO_2/MWh
Description:	Emission factor of displaced electricity by the project activity.
Source of data to be used:	as per the “Tool to calculate the emission factor for an electricity system”
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:	Monitoring frequency is annually

Data / Parameter:	**$NO_{vehicles,i,y}$**
Data unit:	Number
Description:	Vehicles per carrying capacity per year
Source of data to be used:	Counting
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:	Counter should accumulate the number of trucks per carrying capacity
QA/QC procedures to be applied:	Number of vehicles must match with total amount of sold compost. Procedures will be checked regularly by DOE.
Any comment:	Monitoring frequency is annually

Data / Parameter:	**$DT_{i,y}$**
Data unit:	km
Description:	Average additional distance travelled by vehicle type i compared to baseline in year *y*
Source of data to be used:	Expert estimate
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:	Assumption to be approved by DOE.
Any comment:	Monitoring frequency is annually

Data / Parameter:	**VF_{cons}**
Data unit:	l/km
Description:	Vehicle fuel consumption in litres per kilometre for vehicle type *i*
Source of data to be used:	Fuel consumption record
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:	Monitoring frequency is annually

Data / Parameter:	**D_{fuel}**
Data unit:	kg/l
Description:	Density of fuel
Source of data to be used:	The source of data should be the following, in order of preference: project specific data, country specific data or IPCC default values. As per guidance from the Board, IPCC default values should be used only when country or project specific data are not available or difficult to obtain.
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:	To be monitored annually or ex-ante Not necessary if NCV_{fuel} is demonstrated on a per liter basis

Data / Parameter:	$\mathbf{A_{ci,x}}$
Data unit:	tonnes/yr
Description:	Amount of residual waste type 'ci' from anaerobic digestion.
Source of data to be used:	Project participants.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	3,650 tonnes
Description of measurement methods and procedures to be applied:	Weighbridge
QA/QC procedures to be applied:	Weighbridge will be subject to periodic calibration (in accordance with stipulation of the weighbridge supplier).
Any comment:	Monitoring frequency is annually

Data / Parameter:	$\mathbf{S_{LE}}$
Data unit:	%
Description:	Share of samples anaerobic
Source of data to be used:	
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	See $S_{LE,total}$
QA/QC procedures to be applied:	O_2-measurement-instrument will be subject to periodic calibration (in accordance with stipulation of instrument-supplier). Measurement itself to be done by using a standardised mobile gas detection instrument. A statistically significant sampling procedure will be set up that consists of multiple measurements throughout the different stages of the composting process according to a predetermined pattern (depths and scatter) on a daily basis.
Any comment:	Monitoring frequency is weekly. Used to determine percentage of compost material that behaves anaerobically.

Data / Parameter:	$\mathbf{S_{OD,LE}}$
Data unit:	Number
Description:	Number of samples with oxygen deficiency
Source of data to be used:	Oxygen measurement device

Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods and procedures to be applied:	See $S_{LE,total}$
QA/QC procedures to be applied:	O_2-measurement-instrument will be subject to periodic calibration (in accordance with stipulation of instrument-supplier). Measurement itself to be done by using a standardised mobile gas detection instrument. A statistically significant sampling procedure will be set up that consists of multiple measurements throughout the different stages of the composting process according to a predetermined pattern (depths and scatter) on a daily basis.
Any comment:	Monitoring frequency is weekly Samples with oxygen content <10%. Weekly measurements throughout the year but accumulated once per year only.

Data / Parameter:	**$S_{LE,total}$**
Data unit:	Number
Description:	Number of samples
Source of data to be used:	Oxygen measurement device
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:	statistically significant
QA/QC procedures to be applied:	O_2-measurement-instrument will be subject to periodic calibration (in accordance with stipulation of instrument-supplier). Measurement itself to be done by using a standardised mobile gas detection instrument. A statistically significant sampling procedure will be set up that consists of multiple measurements throughout the different stages of the composting process according to a predetermined pattern (depths and scatter) on a daily basis.
Any comment:	Monitoring frequency is weekly. Total number of samples taken per year, where $S_{LE,total}$ should be chosen in a manner that ensures estimation of S_{LE} with 20% uncertainty at 95% confidence level.

B.7.2 Description of the monitoring plan:

>>

A special purpose company (SPC) will be established for the project activity with the investment of project participants of Annex I Party. The SPC will commission the operation and maintenance of the waste treatment plant to Urban Public Works Company (UPWC), which is the project participant of the Host Country. UPWC is in charge of monitoring as well.

The required data is collected by operators and reported to a project manager in charge of monitoring. The manager computerizes the data and stores it to present to a DOE.

B.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: 31/01/2008

Name of the responsible entity: Sojitz Research Institute, Ltd.
Address: 14-27, Akasaka 2-chome, Minato-ku, Tokyo 107-0052, Japan
Tel: +81-3-5520-2197
Fax: +81-3-5520-4954
E-mail: nishinomiya.akiko@sea.sojitz.com

SECTION C. Duration of the project activity / crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

>>
01/01/2010

C.1.2. Expected operational lifetime of the project activity:

>>
At least for more than 10 years

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

>>
N.A.

C.2.1.2. Length of the first crediting period:

>>
N.A.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

>>
01/01/2010

C.2.2.2. Length:

>>
10 years

SECTION D. Environmental impacts

>>

D.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

>>
The following environmental impacts are expected from the proposed project activity;

- impact on air quality,
- impact on water quality,
- impact of noise,
- impact of vibration.

According to Circular No.10/2006/TT-BTNMT, dated December 12, 2006 guiding the development of CDM projects under KP (Kyoto Protocol) issued by the Ministry of Natural Resources and Environment (MONRE), PDD must be submitted to MONRE together with Environment Impact Report or Certification form of Environment Protection Commitment.

Guidelines of Environment Impact Assessment (EIA) and Environment Protection Commitment (EPC) in Vietnam are explained in Decree 80/ND-CP, dated August 09, 2006 regarding detailed stipulation and guidance on applying the Law of Environmental Protection and the proposed project activity requires EIA, instead of EPC. Therefore, more detailed information of environmental impact of the project activity will be identified in EIA.

D.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

>>
The project activity will be designed in consideration of environmental impact and mitigation measures will be proposed in EIA when the project activity does not meet any relevant environmental standards in Vietnam.

SECTION E. Stakeholders' comments

>

E.1. Brief description how comments by local stakeholders have been invited and compiled:

>>

Comments were received through the meetings with stakeholders. The following stakeholders were identified for the project activity;

- Can Tho People's Committee (PC)
- DNA of Vietnam - International Cooperation Department of MONRE
- Vietnam Environmental Protection Agency (VEPA)
- Institute of Energy
- Scavengers (waste pickers) working at Tan Long Landfill Site

Also, public consultations will be conducted for preparing an EIA report and further comments from local people are expected.

E.2. Summary of the comments received:

>>

Can Tho People's Committee

- Can Tho People's Committee welcomes the project.
- Can Tho People's Committee expects that the project is implemented as a CDM project because of additional revenue from CER.
- It seems a good project since the project process the waste with lower tipping fee from the People's Committee.

DNA

- The project meets National criteria for CDM projects in Vietnam and it can contribute to sustainable development.
- To get approval for CDM project by host country, cooperation with partners in Vietnam is very important.

VEPA

- VEPA will support the project because it is a solid waste management project.
- Landfilling is the most popular method for municipal solid waste disposal in Vietnam, and composting and LFG collection/utilization can be seen as well. However, any project like the proposed anaerobic digestion project is not found in Vietnam. The reason may be lack of money and technology.
- The project activity must meet the relevant emission standards.

Institute of Energy

- Waste management in large cities is a big problem and biogas utilization is important.
- By 2050, the total installed capacity of biogas power generation facilities will be 100-180 MW, which is only 1-2 % of the total generation capacity.
- Institute of Energy has biogas technology and they will support the power generation of the project activity.

Scavengers

- Many scavengers said that they want to get a steady job if available.

E.3. Report on how due account was taken of any comments received:

>>

No negative comments have been received and it is not required to modify the proposed project.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Urban Public Works Company
Street/P.O.Box:	
Building:	
City:	
State/Region:	TP Can Tho
Postfix/ZIP:	
Country:	Socialist Republic of Viet Nam
Telephone:	
FAX:	
E-Mail:	
URL:	
Represented by:	
Title:	
Salutation:	
Last Name:	
Middle Name:	
First Name:	
Department:	
Mobile:	
Direct FAX:	
Direct tel:	
Personal E-Mail:	

Organization:	Taisei Corporation
Street/P.O.Box:	1-25-1 Nishi Shinjuku
Building:	
City:	Shinkuku-ku
State/Region:	Tokyo
Postfix/ZIP:	163-0606
Country:	Japan
Telephone:	+81-3-3348-1111
FAX:	+81-3-3344-9476
E-Mail:	
URL:	http://www.taisei.co.jp/english/index.html
Represented by:	
Title:	General Manager
Salutation:	Mr.
Last Name:	Nishimura
Middle Name:	
First Name:	Masakazu
Department:	Ecology Division
Mobile:	
Direct FAX:	+81-3-3344-9476
Direct tel:	+81-3-5381-5191
Personal E-Mail:	masakazu.nishimura@sakura.taisei.co.jp

Organization:	Sojitz Corporation
Street/P.O.Box:	1-20, Akasaka 6-chome
Building:	
City:	Minato-ku
State/Region:	Tokyo
Postfix/ZIP:	107-8655
Country:	Japan
Telephone:	+81-3-5520-5000
FAX:	+81-3-5520-2390
E-Mail:	
URL:	http://www.sojitz.com/en/index.html
Represented by:	
Title:	General Manager
Salutation:	Mr.
Last Name:	Suzuki
Middle Name:	
First Name:	Hidehiro
Department:	Plant Project Department
Mobile:	
Direct FAX:	+81-3-5520-2905
Direct tel:	+81-3-5520-7615
Personal E-Mail:	suzuki.hidehiro@sojitz.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is used in the project activity.

Annex 3

BASELINE INFORMATION

Please refer to Section B.

Annex 4

MONITORING INFORMATION

Please refer to Section D.

- - - - -