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:

Title of the project activity: Organic Waste Composting Project in Ipoh City, Malaysia
Version number: 1
Date: 31/3/2010

A.2. Description of the project activity:

The Landfill is located in the northeast of Ipoh City, Perak State, Malaysia. It has a total area of 40 ha.

The objective of the project is to establish a waste treatment facility with a mechanical segregation process and compositing plant for organic wastes on the site of the existing landfill of Ipoh City, Perak State, Malaysia. The project activities involves the sorting and recovering of the recyclable, reusable and recoverable resources from mixed municipal waste generated in Ipoh City, and aerobic treatment of the organic waste utilizing composting technology.

In Ipoh City, about 600 tons of municipal solid waste (hereinafter, MSW) are generated daily, and most of them are disposed of in the landfill site wherein landfill gasses are not extracted. Through the above-mentioned project activities, this project will realize the reduction of the amount of landfilled wastes, consequently the reduction of the greenhouse gas (GHG) emission. The proposed waste treatment facility will have a daily input capacity of 600 tons of MSW disposed at the landfill. Considering the product quality, the compost produced through the project activities will not be sold to the end-user, but will be transported to the landfill site to be utilized as cover soil.
Based on the calculations, the project will realize 328,302 tons CO_2 equivalents over the 7 years period from 2013 to 2019.

The project is being developed by LEE TUCK CONSTRUCTION SDN.BHD. (hereinafter, LT), a company in charge of collection of MSW and management of the landfill from Ipoh City. The implementation of the project including operation of the waste treatment facility will be carried out by the Special Purpose Company (hereinafter, SPC), which will be formed jointly by the LT and Midac Co., LTD.
Besides climate change mitigation, the project will contribute to the sustainable development of Malaysia in the following aspects:

Environmental well-being

- The project will promote sanitization of landfill site.
- The project will reduce current environmental and health impacts deriving from landfill sites in the region of the Project site as the result of reducing the load of MSW, particularly the contained organics disposed of at landfill sites

Economic and social well-being

- The project will extend operational lifetime of the landfill site.
- The project will improve local economy by providing job opportunity to local people for the operation of the facility.

- The project will contribute to the development of the sustainable society in Ipoh City which is in line with the national policy of Malaysia.

A.3. 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)
Malaysia (host)	LEE TUCK CONSTRUCTION SDN.BHD. (LT)	No
	Special Purpose Company (SPC) formed by LT and Midac CO., LTD	Yes
Japan	Midac CO., LTD	No

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

>>

A.4.1.1. Host Party(ies):

Malaysia

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

Perak State

A.4.1.3. City/Town/Community etc.:

Ipoh City

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

The treatment facitlity for MSW will be constructed at the part of the landfillsite located in Kampung Lim Tang in Ipoh City. Ipoh city is the capital of Perak State, in the northern part of West Malaysia. Ipoh City is located about 200 km to the north of Kuala Lumpur.

Figure 1: Map of Malaysia and Ipoh City

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

The project falls under the Sectoral Scope 13: “Waste handling and disposal”.

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

The principal technology to be applied in this project activity is mechanical segregation and hand-sorting of MSW and composting of organic wastes, followed by a stabilization process.
The process starts with the separation of MSW into recyclable materials, organic waste, and other waste, by using trommel (mechanical segregation) and belt conveyer (hand-sorting). Organic waste in this project includes organic matters such as food waste, wood, and papers which cannot be recycled. Once separated, the organic fraction enters in the bio-treatment areas, and the biological degradation process starts. During the process, organic waste is decomposed aerobically under controlled temperature, humidity, and air concentration, consequently its volume becomes small. After being stabilized with adequate humidity, it is transported to the landfill site, and disposed of, or utilized as cover soil.

A schematic diagram of the process is shown in Figure 2.

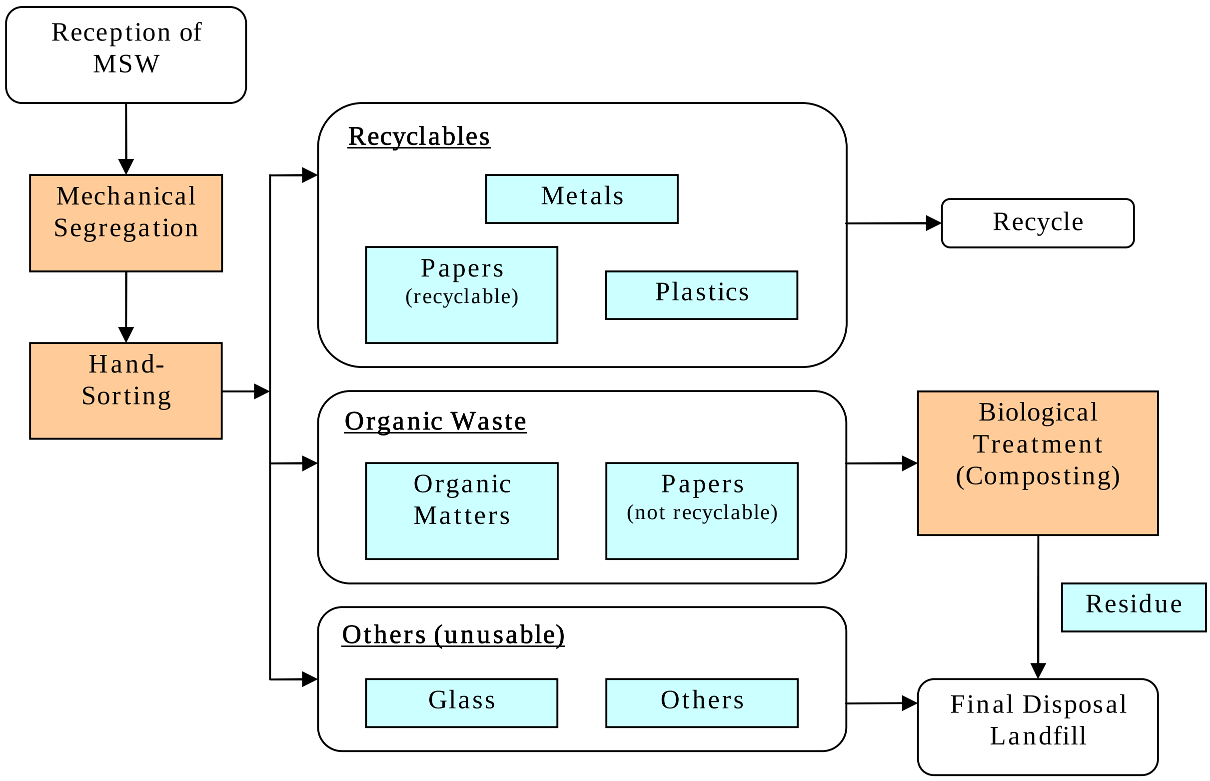

Figure 2: Schematic Diagram for the Treatment Process

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

Table 1: Estimation of emission reduction

Year	Annual estimation of emission reductions in tons of CO2e
2013	14,437
2014	26,091
2015	34,947
2016	41,841
2017	47,344
2018	51,844
2019	55,609
Total estimated reductions (tons of CO2e)	272,112
Total number of years in first crediting period	7
Annual average estimated reductions, first crediting period (tons of CO2e)	38,873

A.4.5. Public funding of the project activity:

This project will not receive any national or international funding for the development of the proposed project.

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:

AM0025 Version 11 ”Avoided emissions from organic waste through alternative waste treatment process”

“Tool to calculate the emission factor for an electricity system” Version 2
“Tool to determine methane emissions avoided from disposal of waste at a solid waste disposal site - Version 4
“Tool for the demonstration and assessment of additionality” Version 5.2

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

As stated in the methodology, the methodology is applicable to scenarios which involve one or a combination of the following waste treatment options.

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 be or hearth or grate type.

The proposed project activity corresponds to a) a composting process in aerobic conditions. In addition, the proposed project satisfies the following requirements as described in the methodology.

Requirement	Project Condition
In case of composting, the produced compost is either used as soil conditioner or disposed of in landfills	The proposed project aims to dispose all of the compost produced in the 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 proportions and characteristics of different types of organic waste processed in the project activity can be determined.
Waste handling in the baseline scenario shows a continuation of current practice of disposing waste in landfill despite environmental regulation that mandates the treatment of waste, if any, using any of the project activity mentioned above.	The baseline scenario shows that the current practice of disposing waste in landfill without any treatment will be continued.
The compliance rate of the environmental regulation 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.	There are no regulations that mandate the intermediate treatment of waste before landfill in Malaysia. Therefore, the compliance rate does not need to be taken into account.
The project activity does not involve thermal treatment process of neither industrial or hospital waste.	The proposed project activity handles household waste and wastes from offices and markets. Therefore, neither industrial nor hospital waste is treated in the project activity.
This methodology is not applicable 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.	The proposed project does not involve landfill gas capture or flaring.

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

The project boundary is the site of the project activity where the waste is segregated and composted as shown in the figure below. This includes the facilities for sorting, aerobic conversion and composting. The project boundary does not include facilities for waste collection, prior sorting (before reaching project site) nor transport to the project site.

The project activity avoids methane emissions by diverting organic waste to a MBT facility instead of dumping the waste at a landfill, where methane emissions are generated due to anaerobic processes. Since the composting process is basically aerobic, no methane is generated. The GHG involved in the baseline and project emissions are CO_2, CH_4 and N_2O as shown in Table below.

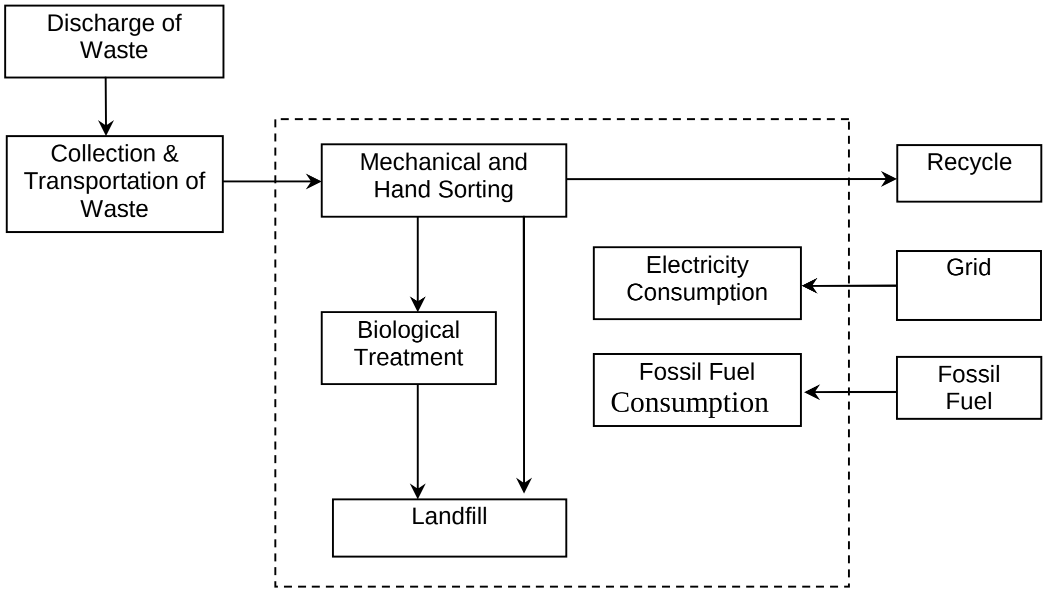

Figure 3: Project Boundary

The gases and sources relevant to the Project are listed below based on the AM0025 methodology.

Table 2: The Greenhouse Gases included in or excluded from the Project Boundary

	Source	Gas	Included?	Justification / Explanation
Baseline	Emissions from decomposition of waste at the landfill site	CH_4	Yes	The major source of emissions in the baseline from the landfill.
		N_2O	No	N_2O emissions are small compared to CH_4 emissions from landfills. This is conservative.
		CO_2	No	Not accounted for.
	Emissions from electricity consumption	CO_2	No	There is no electricity consumption at the project site in the absence of the project activity.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.
	Emissions from thermal energy generation	CO_2	No	There is no thermal energy generation at the project site in the absence of the project activity.
		CH_4	No	Excluded for simplification. This is conservative.
		N_2O	No	Excluded for simplification. This is conservative.

	Source	Gas	Included?	Justification / Explanation
Project Activity	On-site fossil fuel consumption due to the project activity other than for electricity generation	CO_2	Yes	May be an important emission source.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Emissions from on-site electricity use	CO_2	Yes	Operation of the mechanical segregation system and the anaerobic digester, and use of the office.
		CH_4	No	Excluded for simplification. This emission source is assumed to be very small.
		N_2O	No	Excluded for simplification. This emission source is assumed to be very small.
	Direct emissions from the waste treatment processes	N_2O	Yes	May be an important emission source for composting activities.
		CH_4	Yes	The composting process may not be complete and result in anaerobic decay.
		CO_2	No	CO2 emissions from the decomposition of organic waste are not accounted.

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

AM0025 version 11 requires a procedure of 4 steps for the selection of the most plausible baseline scenario:

Step 1. Identification of alternative scenarios

Sub-step 1a: Define alternatives to the project activity:
All realistic and credible alternatives to the project activity that can be (part of) the baseline scenario are defined as follows.
M1. The project activity is not implemented as a CDM project;
M2. Disposal of waste at a landfill where landfill gas is captured and flared;
M3. Disposal of waste at a landfill without the capture of landfill gas.

Sub-step 1b: Consistency with mandatory laws and regulations:
All alternatives are in compliance with the mandatory laws and regulations that are set by the Government of Malaysia.

Step 2: Identify the fuel for the baseline choice of energy source taking into account the national and/or sectoral policies as applicable.
Since there is no power generation or heat utilization in the project activity, thus baseline does not involve fuel for energy.

Step 3. Investment analysis

The alternative M1 is unrealistic and should be eliminated as possible baseline. Although composting of the organic component of MSW is a well known technology, its implementation has been limited in Malaysia due to lack of budget and technical capability. In addition, as the compost products produced through the proposed project will not be sold but be used as soil cover at the landfill site, Project will not be able to obtain additional income from compost sales. Furthermore, the necessary expenses (incl. investment and operational & maintenance costs) to develop and implement the proposed project would be additional MSW management cost for the project owner. It faces the risk of the investment and high operational & maintenance costs. Therefore, M1 cannot be financially attractive without CDM revenue, and thus can be eliminated from consideration as baseline scenario.

In scenario M2, since there are no mandatory laws or regulations that specify that the gases from the landfill must be captured and flared, there will be no public funding, money grants, or any sort of incentive for the installation of gas collection and flaring equipments. There is no income other than the CDM related income. Therefore, it can be clearly stated that scenario M2 is economically unattractive, and shall also be excluded from further consideration.

The above identified barriers do not affect M3 (continuation of the current situation). It faces no financial barriers and it is economically feasible one for the project proponent. Through the assessment above, it is determined that the most plausible baseline scenario is M3 which is the disposal of waste at a landfill without the capture of landfill gas.

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):

In Malaysia, though recycling of waste and upgrading of unsanitary landfills are recommended, it is difficult to start such projects in terms of financial situation. At the landfill in Ipoh City, the common practice for disposal is just open dumping.

Then, the project participants plan to establish a waste treatment facility with mechanical segregation process and composting plant for organic wastes, in order to promote recycling and environmental improvement, with being registered as CDM project activity.

The latest version of the “Tool for the demonstration and assessment of additionality”, version 05.2 is used to demonstrate the additionality of the program.

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

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

From above analysis in B.4 Step1, the alternatives to the Project have been identified as follows.
M1. The project activity not implemented as a CDM project;
M2. Disposal of waste at a landfill where landfill gas is captured and flared;
M3. Disposal of waste at a landfill without the capture of landfill gas.

Sub-step 1b: Consistency with mandatory laws and regulations:

As stated in the previous section for assessment of the baseline scenario, all alternatives are in compliance with the mandatory laws and regulations that are set by the government of Malaysia.
Based on the legal framework and common practice study in the B4, there is no any law or regulation mandates the treatment option of waste, further more, the landfill gas recovery and utilization is not common practice in Malaysia, so the alternative M2 can be eliminated. M1 and M3 go into step 2.

Step 2. Investment Analysis
The purpose of this step is to determine whether the proposed Project activity is financially less attractive than other alternatives without revenues from the sale of CERs. The investment analysis was implemented in the following steps:

Sub-step 2a. Determine appropriate analysis method:
The proposed project activity generates financial benefits other than the CDM related income from the sale of recyclable material. The financial attractiveness of the proposed project activity will be determined by using Option Ⅲ, the benchmark analysis.

Sub-step 2b. – OptionⅢ. Apply benchmark analysis:
The economic attractiveness of the proposed project activity (scenario M1) and baseline scenario (M3) will be examined by using the benchmark analysis method. The financial indicator is the project IRR and the benchmark is the coupon rate issued by the government of Malaysia which is 5.094 %. (Issued November, 2009)

Sub-step 2c. Calculation and comparison of financial indicators:
The IRR is calculated according to the following basic conditions.

Item	Description
Project Period	7 years
Waste Amount	No change during the project (600t/d)
Amount of Loans	None
Inflation Rate	1.12% (as of 2009)
Corporate Tax	25%
Depreciation Period	5 years

Expense	
Initial Investment	7,667,000 RM
O&M Cost	1,900,000 RM/year
Expense Total (7 years)	20,967,000 RM
Income	
CER Sales	33 RM/tCO2
Recyclables Sales	2,879,000 RM/year
Income Total (7 years)	29,221,000 RM

Project IRR	
With CER	8.0 %
Without CER	-13.2 %

As shown in the table above, the project IRR is negative without CER. With the additional revenue from sale of carbon credits from CDM, the IRR increases to acceptable rates. This clearly indicates that an investment barrier exists in the projects implementation and the project is unattractive without CER revenue.

Sub-step 2d. Sensitivity analysis:
The purpose of sensitivity analysis is to examine whether the conclusion regarding the financial viability of the proposed project is sound and tenable with those reasonable variations in the critical assumptions. The critical assumptions include:

Expense : Range from –5% to –15% compared to the original condition
Income : Range from +5% to +15% compared to the original condition
(Income only includes the revenues from recyclables sales)

These parameters were selected as being the most likely to fluctuate over time due to external factors. The results of the sensitivity analysis are as given below:

		Expense		
		-15%	-10%	-5%
Income	+5%	-0.4%	-3.8%	-7.0%
	+10%	2.3%	-1.0%	-4.2%
	+15%	4.9%	1.6%	-1.6%

As is evident in the table, even with the decreased expense and increased income, the IRR of the project is negative or lower than the benchmark rates.

Thus, the sensitivity analysis reveals that even with significant changes in various parameters, the project IRR does not cross benchmark rate. Therefore, the project is additional and is not a business as usual scenario. The project can become financially attractive only with the CDM benefit.

Step 3. Barrier analysis

According to the "Tool for the demonstration and assessment of additionality", the project developer could choose between Step 2 and Step3. As Step 2 shows already that there is a high financial barrier Step3 will not be described any further.

Step 4. Common practice analysis

Sub-step 4a. Analyze other activities similar to the proposed activity:
Although the government of Malaysia encourages the composting of food wastes as part of their environmental measures, composting in Malaysia has not yet been developed into full-scale business. Only few pilot-scale composting activities are implemented by educational institutes in collaboration with

NGOs. In addition, compost market in Malaysia has not been fully developed yet, the composts produced through those activities are just used for tree-planting activity, and no revenue is generated from composting.

Therefore, composting activities similar to the proposed project in terms of scale, investment environment and technology have not been implemented in the Host country, except for those being developed under CDM.

Sub-step 4b.Discuss any similar options that are occurring:
As stated in sub-step 4a, there are no similar options commonly occurring in the Host country. The common practice in Malaysia is disposal of waste without any treatment or processing, and implementation of a composting project is difficult without additional incomes and investment.

In conclusion, the proposed project activity is economically unattractive, and it will not be implemented without the incentive provided by the CDM. Therefore, the proposed project activity is additional.

B.6. Emission reductions:

B.6.1. Explanation of methodological choices:

Project Emissions

Project emissions are calculated using equation (1) provided in the methodology. $PE_{a,y}$, $PE_{g,y}$, $PE_{r,y}$, $PE_{i,y}$, $PE_{w,y}$, are excluded from the calculation since the proposed project activity involves only composting.

$$PE_y = PE_{elec,y} + PE_{fuel,on-site,y} + PE_{c,y} \qquad (1)$$

Where:

PE_y	is the project emissions during the year *y* (tCO_2e/yr)
$PE_{elec,y}$	is the emissions from electricity consumption due to the project activity during the year *y* (tCO_2e/yr)
$PE_{fuel,on-site,y}$	is the emissions due to fuel consumption on-site in year *y* (tCO_2e/yr)
$PE_{c,y}$	is the emissions during the composting process in year *y* (tCO_2e/yr)

Emissions from electricity use ($PE_{elec,y}$)

The proposed project activity involves consumption of electricity. The emissions from electricity consumption are calculated using equation (2).

$$PE_{elec,y} = EG_{PJ,EF,y} \times CEF_{elec} \qquad (2)$$

Where:

$PE_{elec,y}$	is the emissions from electricity consumption due to the project activity during the year *y* (tCO_2e/yr)

$EG_{PJ,EF,y}$	is the amount of electricity generated in an on-site fossil fuel fired power plant or consumed from the grid in the project activity, measured using an electricity meter (MWh/yr)
CEF_{elec}	CO_2 emission factor for electricity generation in the project activity (tCO_2e/MWh)

Since electricity will be purchased from the grid, CEF_{elec} will be calculated according to the "Tool to calculate the emission factor for an electricity system".

Emissions from fuel use on-site ($PE_{fuel,on-site,y}$)

The proposed project activity involves on-site fossil fuel consumption. The emissions from fossil fuel consumption on-site are calculated using equation (3).

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

Where:

$PE_{fuel,on-site,y}$	is the CO_2 emissions due to on-site fuel combustion in year y (tCO_2e/yr)
$F_{cons,y}$	is the fuel consumption on site in year y (l)
NCV_{fuel}	is the net calorific value of the fuel (MJ/l)
EF_{fuel}	is the CO_2 emission factor of the fuel (tCO_2e/MJ)

Emissions from Composting ($PE_{c,y}$)

Project emissions from composting are calculated using equation (4).

$$PE_{c,y} = PE_{c,N2O,y} + PE_{c,CH4,y} \qquad (4)$$

Where:

$PE_{c,y}$	is the emissions during the composting process in year y (tCO_2e/yr)
$PE_{c,N2O,y}$	is the N_2O emissions during the composting process in year y (tCO_2e/yr)
$PE_{c,CH4,y}$	is the emissions during the composting process due to methane production through anaerobic conditions in year y (tCO_2e/yr)

N_2O emissions

The N_2O emissions during the composting process are calculated using equation (5).

$$PE_{c,N2O,y} = M_{compost,y} \times EF_{c,N2O} \times GWP_{N2O} \qquad (5)$$

Where:

$PE_{c,N2O,y}$	is the N_2O emissions during the composting process in year y (tCO_2e/yr)
$M_{compost,y}$	is the total quantity of compost produced in year y (tonnes/yr)
$EF_{c,N2O}$	is the emission factor for N_2O from the composting process (tN_2O/t compost)
GWP_{N2O}	is the Global Warming Potential of nitrous oxide (tCO_2e/tN_2O)

CH_4 emissions

The CH_4 emissions during the composting process are calculated using equation (6).

$$PE_{c,CH4,y} = M_{compost,y} \times GWP_{CH4} \times S_{a,y} \qquad (6)$$

Where:

$PE_{c,CH4,y}$	is the project methane emissions due to anaerobic conditions in the composting process in year *y* (tCO_2e/yr)
$M_{compost,y}$	is the total quantity of compost produced in year *y* (tonnes/yr)
GWP_{CH4}	is the Global Warming Potential of methane, (tCO_2e/tCH_4)
$S_{a,y}$	is the share of the waste that degrades under anaerobic conditions in the composting plant during year *y* (%)

$S_{a,y}$ is calculated using equation (7)

$$S_{a,y} = S_{OD,y} / S_{total,y} \qquad (7)$$

Where:

$S_{a,y}$	is the share of the waste that degrades under anaerobic conditions in the composting plant during year *y* (%)
$S_{OD,y}$	is the number of samples per year with an oxygen deficiency (i.e. oxygen content below 10%)
$S_{total,y}$	is the total number of samples taken per year, where $S_{total,y}$ should be chosen in a manner that ensures the estimation of $S_{a,y}$ with 20% uncertainty at a 95% confidence level.

<u>Baseline Emissions</u>

Baseline emissions are calculated using equation (17) provided in the methodology.

$$BE_y = MB_y - MD_{reg,y} + BE_{EN,y} \qquad (8)$$

Where:

BE_y	is the baseline emissions in year *y* (tCO_2e/yr)
$MB_{reg,y}$	is the methane produced in the landfill in the absence of the project activity in year *y* (tCO_2e/yr)
$MD_{reg,y}$	is the methane that would be destroyed in the absence of the project activity in year *y* (tCO_2e/yr)
$BE_{EN,y}$	Baseline emissions from generation of energy displaced by the project activity in year *y* (tCO_2/yr)

Adjustment Factor (AF)

Since regulatory or contractual requirements do not specify $MD_{reg,y}$ in the proposed project activity, Adjustment Factor (AF) will be used to determine the methane that would be destroyed in the absence of the project activity.

$$MD_{reg,y} = MB_y \times AF \quad (9)$$

Where:

AF	is Adjustment Factor for MB_y (%)

Rate of Compliance

There are no laws or regulations that mandate the use of the treatment process of the proposed project activity in Malaysia. Therefore, method for adjusting the baseline emissions by rate of compliance does not apply.

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", considering the following equation:

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

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

Where:

MB_y	is $BE_{CH4,SWDS,y}$ (tCO_2e/yr)
$BE_{CH4,SWDS,y}$	is the 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/yr)
φ	is the model correction factor to account for model uncertainties (0.9)
f	is the fraction of methane captured at the SWDS and flared, combusted or used in another manner
GWP_{CH4}	is the Global Warming Potential (GWP) of methane, valid for the relevant commitment period
OX	is the oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste)
F	is the fraction of methane in the SWDS gas (volume fraction) (0.5)
DOC_f	is the fraction of degradable organic carbon (DOC) that can decompose
MCF	is the methane correction factor
$W_{j,x}$	is the amount of organic waste type *j* prevented from disposal in the SWDS in the year *x* (tonnes)

DOC_j	is the fraction of degradable organic carbon (by weight) in the waste type *j*
k_j	is the decay rate for the waste type *j*
j	is the waste type category (index)
x	is the year during the crediting period: *x* runs from the first year of the first crediting period (*x*=1) to year *y* for which avoided emissions are calculated (*x*=*y*)
y	is the year for which methane emissions are calculated

$$W_{j,x} = W_x \times \frac{\sum_{n=1}^{z} P_{n,j,x}}{z} \qquad (12)$$

Where:

$W_{j,x}$	is the amount of organic waste type *j* prevented from disposal in the SWDS in the year *x* (tonnes)
W_x	is the total amount of organic waste prevented from disposal in year *x* (tonnes)
$P_{n,j,x}$	is the weight fraction of the waste type *j* in the sample *n* collected during the year *x*
z	is the number of samples collected during the year *x*

Baseline emissions from generation of electricity displaced by the project activity

This section is not applicable since the proposed project activity does not involve any electricity generation.

Baseline emissions from electricity and heat cogeneration that is displaced by the project activity

This section is not applicable since the proposed project activity does not involve cogeneration by electricity or heat.

<u>Leakage</u>

The leakage emissions of the proposed project activity are estimated using the following equation:

$$L_y = L_{t,y} + L_{r,y} + L_{s,y} \qquad (13)$$

Where:

L_y	is the leakage emissions during the year *y* (tCO_2e/yr)
$L_{t,y}$	is the leakage emissions from increased transport in year *y* (tCO_2e/yr)
$L_{r,y}$	is the leakage emissions from the residual waste from the anaerobic digester, the gasifier, the processing/combustion of RDF/stabilized biomass, or compost in case it is disposed of in landfills in year *y* (tCO_2/yr)
$L_{s,y}$	is the leakage emissions from end use of stabilized biomass in year *y* (tCO_2e/yr)

There is no increase of transportation related to the proposed project activity or use of stabilized biomass, and the project does not involve the use of stabilized biomass, so there are no leakage emissions associated with this. Therefore, the only leakage emission from the proposed project activity is the leakage emission from compost which will be disposed of in the landfill.

Emissions from compost ($L_{s,y}$)
In the proposed project activity, all the compost produced will be disposed of in the landfill site. Therefore, CH4 emissions from the compost are estimated through equation (11) using estimated weights of each waste type.

<u>Emission Reduction</u>

The emission reductions are calculated by applying the following equation.

$$ER_y = BE_y - PE_y - L_y \qquad (14)$$

Where:

ER_y	is the emissions reductions in year *y* (tCO_2e/yr)
BE_y	is the emissions in the baseline scenario in year *y* (tCO_2e/yr)
PE_y	is the emissions in the project scenario in year *y* (tCO_2e/yr)
L_y	is the leakage in year *y* (tCO_2e/yr)

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

(Copy this table for each data and parameter)

Data / Parameter:	***CEF_{elec}***
Data unit:	tCO_2e/MWh
Description:	The emission factor for electricity generation corresponding to electricity used in the project activity.
Source of data used:	
Value applied:	0.684
Justification of the choice of data or description of measurement methods and procedures actually applied :	Calculated value given in a paper “Study on Grid Connected Electricity Baselines in Malaysia” issued by Pusat Tenaga Malaysia. The methodology used in the paper is based on the ACM0002 “Consolidated Baseline Methodology for Grid-ConnectedElectricity”.
Any comment:	

Data / Parameter:	***NCV_{fuel}***
Data unit:	MJ/l
Description:	Net calorific value of fuel
Source of data used:	IPCC
Value applied:	36.3

Justification of the choice of data or description of measurement methods and procedures actually applied :	Adjusted by multiplying 0.844 kg/l (density of diesel) to the NCV value in TJ/Gg (43.0 TJ/Gg) provided for Gas/Diesel in the IPCC guideline.
Any comment:	

Data / Parameter:	EF_{fuel}
Data unit:	tCO_2e/MJ
Description:	Emission factor for the fuel
Source of data used:	IPCC
Value applied:	0.000074
Justification of the choice of data or description of measurement methods and procedures actually applied :	Diesel is a standard fuel, for which IPCC is a reliable data source.
Any comment:	

Data / Parameter:	$EF_{C,N2O}$
Data unit:	tN_2O/t compost
Description:	Emission factor for N_2O from the composting process
Source of data used:	AM0025
Value applied:	0.000043
Justification of the choice of data or description of measurement methods and procedures actually applied :	Default value given in the approved methodology AM0025, based on Schenk et al., 1997
Any comment:	

Data / Parameter:	GWP_{N2O}
Data unit:	-
Description:	Global Warming Potential of nitrous oxide
Source of data used:	Kyoto Protocol
Value applied:	310
Justification of the choice of data or description of measurement methods and procedures actually applied :	Valid for the First Commitment Period
Any comment:	

Data / Parameter:	GWP_{CH4}
Data unit:	-
Description:	Global Warming Potential of methane
Source of data used:	Kyoto Protocol
Value applied:	21
Justification of the choice of data or description of measurement methods and procedures actually applied :	Valid for the First Commitment Period
Any comment:	

Data / Parameter:	φ
Data unit:	-
Description:	Model correction factor to account for model uncertainties of the “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site”
Source of data used:	“Tool to determine the methane emissions avoided from dumping waste at a solid waste disposal site”
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied :	
Any comment:	

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 :	Already accounted for as AF (Adjustment Factor)
Any comment:	

Data / Parameter:	OX
Data unit:	-
Description:	Oxidation Factor (reflecting the amount of methane from SWDS that is oxidized in the soil or other material covering the waste)

Source of data used:	Assessed according to site visit and the "Tool to determine the methane emissions avoided from dumping waste at a solid waste disposal site"
Value applied:	0.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	The site for the proposed project activity is a managed solid waste disposal site that is covered with soil.
Any comment:	

Data / Parameter:	***F***
Data unit:	-
Description:	Fraction of methane in the SWDS gas (volume fraction)
Source of data used:	"Tool to determine the methane emissions avoided from dumping waste at a solid waste disposal site"
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	A default value recommended by the IPCC.
Any comment:	

Data / Parameter:	DOC_f
Data unit:	-
Description:	Fraction of degradable organic carbon (DOC) that can decompose
Source of data used:	"Tool to determine the methane emissions avoided from dumping waste at a solid waste disposal site"
Value applied:	0.5
Justification of the choice of data or description of measurement methods and procedures actually applied :	A default value recommended by the IPCC.
Any comment:	

Data / Parameter:	***MCF***
Data unit:	-
Description:	Methane correction factor
Source of data used:	"Tool to determine the methane emissions avoided from dumping waste at a solid waste disposal site"
Value applied:	1.0

Justification of the choice of data or description of measurement methods and procedures actually applied :	Value applied for anaerobic managed solid waste disposal sites – It has controlled placement of waste. Waste directed to specific deposition area and will include : (i) cover material and, (ii) mechanical compacting
Any comment:	

Data / Parameter:	***DOC$_j$***
Data unit:	-
Description:	Fraction of degradable organic carbon (by weight) in the waste type *j*
Source of data used:	"Tool to determine the methane emissions avoided from dumping waste at a solid waste disposal site"
Value applied:	Following values are applied for each waste type *j* according to the values provided in the "Tool to determine the methane emissions avoided from dumping waste at a solid waste disposal site".
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the "Tool to determine the methane emissions avoided from dumping waste at a solid waste disposal site".
Any comment:	

Waste Type *j*	*DOC$_j$* (% wet waste)	*DOC$_j$* (% dry waste)
Food	15	38
Garden	20	49
Wood and Straw	43	50
Paper	40	44
Textiles	24	30
Disposable nappies	24	30

Data / Parameter:	***k$_j$***
Data unit:	-
Description:	Decay rate for the waste type j
Source of data used:	"Tool to determine the methane emissions avoided from dumping waste at a solid waste disposal site"

Value applied:	Following values are applied for each waste type *j* according to the values provided in the "Tool to determine the methane emissions avoided from dumping waste at a solid waste disposal site". The conditions for the project site is tropical (MAT>20℃) and wet (MAP>1000mm), and the decomposition of waste is very fast (Rapidly degrading).
Justification of the choice of data or description of measurement methods and procedures actually applied :	As per the "Tool to determine the methane emissions avoided from dumping waste at a solid waste disposal site".
Any comment:	

Waste Type *j*	Tropical (MAT>20℃) Wet (MAP>1000mm)
Food	0.4
Garden	0.17
Wood and Straw	0.035
Paper	0.07
Textiles	0.07
Disposable nappies	0.17

B.6.3. Ex-ante calculation of emission reductions:

Project Emissions

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

Where:

PE_y is the project emissions during the year *y* (tCO_2e/yr)

$PE_{elec,y}$ is the emissions from electricity consumption due to the project activity during the year *y* (tCO_2e/yr)

$PE_{fuel,on-site,y}$ is the emissions on-site due to fuel consumption on-site in year *y* (tCO_2e/yr)

$PE_{c,y}$ is the emissions during the composting process in year *y* (tCO_2e/yr)

PE_y	$PE_{elec,y}$	$PE_{fuel,on-site,y}$	$PE_{c,y}$
tCO_2e/yr	tCO_2e/yr	tCO_2e/yr	tCO_2e/yr
1,250	445	146	660

Emissions from electricity use ($PE_{elec,y}$)

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

Where:

$PE_{elec,y}$ is the emissions from electricity consumption due to the project activity during the year y (tCO_2e/yr)

$EG_{PJ,EF,y}$ is the amount of electricity generated in an on-site fossil fuel fired power plant or consumed from the grid in the project activity, measured using an electricity meter (MWh)

CEF_{elec} CO_2 emission factor for electricity generation in the project activity (tCO_2e/MWh)

$PE_{elec,y}$	$EG_{PJ,EF,y}$	CEF_{elec}
tCO_2e/yr	MWh	tCO_2e/MWh
445	650	0.684

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

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

Where:

$PE_{fuel,on\text{-}site,y}$ is the CO_2 emissions due to on-site fuel combustion in year y (tCO_2/yr)

$F_{cons,y}$ is the fuel consumption on site in year y (t)

NCV_{fuel} is the net calorific value of the fuel (MJ/t)

EF_{fuel} is the CO_2 emission factor of the fuel (tCO_2/MJ)

$PE_{fuel,on\text{-}site,y}$	$F_{cons,y}$	NCV_{fuel}	EF_{fuel}
tCO_2e/yr	t	MJ/t	tCO_2e/MJ
146	45.36	43,330	0.000074

Emissions from Composting ($PE_{c,y}$)

$$PE_{c,y} = PE_{c,N2O,y} + PE_{c,CH4,y} \quad (4)$$

Where:

$PE_{c,y}$ is the emissions during the composting process in year y (tCO_2e/yr)

$PE_{c,N2O,y}$ is the N_2O emissions during the composting process in year y (tCO_2e/yr)

$PE_{c,CH4,y}$ is the emissions during the composting process due to methane production through anaerobic conditions in year y (tCO_2e/yr)

$PE_{c,y}$	$PE_{c,N2O,y}$	$PE_{c,CH4,y}$
tCO_2e/yr	tCO_2e/yr	tCO_2e/yr
660	660	0

N_2O emissions

$$PE_{c,N2O,y} = M_{compost,y} \times EF_{c,N2O} \times GWP_{N2O} \quad (5)$$

Where:

$PE_{c,N2O,y}$	is the N_2O emissions during the composting process in year *y* (tCO_2e/yr)
$M_{compost,y}$	is the total quantity of compost produced in year y (tonnes/yr)
$EF_{c,N2O}$	is the emission factor for N_2O from the composting process (tN_2O/t compost)
GWP_{N2O}	is the Global Warming Potential of nitrous oxide, (tCO_2/tN_2O)

$PE_{c,N2O,y}$	$M_{compost,y}$	$EF_{c,N2O}$	GWP_{N2O}
tCO_2e/yr	tonnes/yr	tN_2O/t compost	tCO_2e/tN_2O
660	49,453	0.000043	310

CH_4 emissions

$$PE_{c,CH4,y} = M_{compost,y} \times GWP_{N2O} \times S_{a,y} \quad (6)$$

Where:

$PE_{c,CH4,y}$	is the project methane emissions due to anaerobic conditions in the composting process in year *y* (tCO_2e/yr)
$M_{compost,y}$	is the total quantity of compost produced in year y (tonnes/yr)
GWP_{CH4}	is the Global Warming Potential of methane, (tCO_2e/tCH_4)
$S_{a,y}$	is the share of the waste that degrades under anaerobic conditions in the composting plant during year *y* (%)

$PE_{c,CH4,y}$	$M_{compost,y}$	GWP_{CH4}	$S_{a,y}$
tCO_2e/yr	tonnes/yr	tCO_2/tCH_4	%
0	49,453	21	0

$$S_{a,y} = S_{OD,y} / S_{total,y} \quad (7)$$

Where:

$S_{a,y}$	is the share of the waste that degrades under anaerobic conditions in the composting plant during year *y* (%)
$S_{OD,y}$	is the number of samples per year with an oxygen deficiency (i.e. oxygen content below 10%)
$S_{total,y}$	is the total number of samples taken per year, where $S_{total,y}$ should be chosen in a manner that ensures the estimation of $S_{a,y}$ with 20% uncertainty at a 95% confidence level.

$S_{a,y}$	$S_{OD,y}$	$S_{total,y}$
%	-	-
0	0	5,000

Baseline Emissions

$$BE_y = MB_y - MD_{reg,y} + BE_{EN,y} \quad (8)$$

Where:

BE_y is the baseline emissions in year *y* (tCO_2e/yr)

$MB_{reg,y}$ is the methane produced in the landfill in the absence of the project activity in year *y* (tCO_2e/yr)

$MD_{reg,y}$ is the methane that would be destroyed in the absence of the project activity in year *y* (tCO_2e/yr)

$BE_{EN,y}$ Baseline emissions from generation of energy displaced by the project activity in year *y* (tCO_2e/yr)

Year *y*	BE_y	MB_y	$MD_{reg,y}$	$BE_{EN,y}$
	tCO_2e/yr	tCO_2e/yr	tCO_2e/yr	tCO_2e/yr
2013	26,144	26,144	0	0
2014	45,568	45,568		
2015	60,327	60,327		
2016	71,818	71,818		
2017	80,988	80,988		
2018	88,489	88,489		
2019	94,765	94,765		

Adjustment Factor (AF)

$$MD_{reg,y} = MB_y \times AF \quad (9)$$

Where:

AF is the Adjustment Factor for MB_y (%)

$MD_{reg,y}$	MB_y	*AF*
tCO_2e/yr	tCO_2e/yr	%
0	See table above	0

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

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

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

Where:

MB_y is $BE_{CH4,SWDS,y}$ (tCO_2e/yr)

$BE_{CH4,SWDS,y}$	is the 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/yr)
φ	is the model correction factor to account for model uncertainties (0.9)
f	is the fraction of methane captured at the SWDS and flared, combusted or used in another manner
GWP_{CH4}	is the Global Warming Potential (GWP) of methane, valid for the relevant commitment period
OX	is the oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material covering the waste)
F	is the fraction of methane in the SWDS gas (volume fraction) (0.5)
DOC_f	is the fraction of degradable organic carbon (DOC) that can decompose
MCF	is the methane correction factor
$W_{j,x}$	is the amount of organic waste type j prevented from disposal in the SWDS in the year x (tonnes)
DOC_j	is the fraction of degradable organic carbon (by weight) in the waste type j
k_j	is the decay rate for the waste type j
j	is the waste type category (index)
x	is the year during the crediting period: x runs from the first year of the first crediting period (x=1) to year y for which avoided emissions are calculated (x=y)
y	is the year for which methane emissions are calculated

$$W_{j,x} = W_x \times \frac{\sum_{n=1}^{z} P_{n,j,x}}{z} \tag{12}$$

Where:

$W_{j,x}$	is the amount of organic waste type j prevented from disposal in the SWDS in the year x (tonnes)
W_x	is the total amount of organic waste prevented from disposal in year x (tonnes)
$P_{n,j,x}$	is the weight fraction of the waste type j in the sample n collected during the year x
z	is the number of samples collected during the year x

Year y	MB_y	$BE_{CH4,SWDS,y}$
	tCO_2e/yr	tCO_2e/yr
2013	26,144	26,144
2014	45,568	45,568
2015	60,327	60,327
2016	71,818	71,818
2017	80,988	80,988
2018	88,489	88,489
2019	94,765	94,765

φ	f	GWP_{CH4}	OX	F	DOC_f	MCF
-	-	-	-	-	-	-
0.9	0	21	0.1	0.5	0.5	1.0

Waste type j	$W_{j,x}$	DOC_j	k_j
	tons/yr	%	1/yr
Food	64,641	0.15	0.4
Garden	14,790	0.20	0.17
Paper	25,881	0.43	0.035
Wood and Straw	10,941	0.40	0.07
Textile	5,553	0.24	0.07

Year	W_x
	tons/yr
2013	121,806
2014	121,806
2015	121,806
2016	121,806
2017	121,806
2018	121,806
2019	121,806

Waste Type	$P_{n,j,x}$
	%
Food	36
Garden	8
Paper	14
Wood and Straw	6
Textile	3
Plastics, other inert	32

The waste composition considered for the calculations is a result of investigation made in 2009 by Midac CO., LTD. The references are attached under the “Waste composition analysis” section in Annex 3.

Baseline emissions from generation of electricity displaced by the project activity
This section is not applicable since the proposed project activity does not involve any electricity generation.

Baseline emissions from electricity and heat cogeneration that is displaced by the project activity
This section is not applicable since the proposed project activity does not involve electricity or heat cogeneration.

<u>Leakage</u>

$$L_y = L_{t,y} + L_{r,y} + L_{s,y} \quad (13)$$

Where:

L_y is the leakage emissions during the year *y* (tCO_2e/yr)
$L_{t,y}$ is the leakage emissions from increased transport in year *y* (tCO_2e/yr)
$L_{r,y}$ is the leakage emissions from the residual waste from the anaerobic digester, the gasifier, the processing/combustion of RDF/stabilized biomass, or compost in case it is disposed of in landfills in year *y* (tCO_2e/yr)
$L_{s,y}$ is the leakage emissions from end use of compost in year *y* (tCO_2e/yr)

All the compost produced in the proposed project activity will be disposed of in the landfill site. Therefore, the amount of compost products is estimated as the Table below.
To be conservative, it is assumed that the compost waste consists of the original input waste to composting (only pulp, food waste, because other types have been taken out by sorting) as follows:

Year	$M_{compost,y}$
	tons/yr
2013	49,453
2014	49,453
2015	49,453
2016	49,453
2017	49,453
2018	49,453
2019	49,453

Waste Type	$W_{ci,x}$	$P_{n,j,x}$
	tons/yr	%
Food	25,856	52
Garden	5,916	12
Paper	4,377	21
Wood and Straw	10,352	9
Textile	2,221	5
Plastics, other inert	731	1
Total	49,453	100

The references are attached under the "Calculating waste composition of compost" section in Annex 3.

The calculation results are as in following table:

Year *y*	L_y	$L_{t,y}$	$L_{r,y}$	$L_{s,y}$
	tCO_2e/yr	tCO_2e/yr	tCO_2e/yr	tCO_2e/yr
2013	10,457	0	10,457	0
2014	18,227	0	18,227	0
2015	24,131	0	24,131	0
2016	28,727	0	28,727	0
2017	32,395	0	32,395	0
2018	35,395	0	35,395	0
2019	37,906	0	37,906	0

Emission Reduction

$$ER_y = BE_y - PE_y - L_y \quad (14)$$

Where:

ER_y is the emissions reductions in year *y* (tCO_2e/yr)
BE_y is the emissions in the baseline scenario in year *y* (tCO_2e/yr)
PE_y is the emissions in the project scenario in year *y* (tCO_2e/yr)
L_y is the leakage in year *y* (tCO_2e/yr)

B.6.4 Summary of the ex-ante estimation of emission reductions:

The ex-ante emission reductions throughout the crediting period are estimated as below:

Year *y*	ER_y	BE_y	PE_y	L_y
	tCO_2e/yr	tCO_2e/yr	tCO_2e/yr	tCO_2e/yr
2013	14,437	26,144	1,250	10,457
2014	26,091	45,568	1,250	18,227
2015	34,947	60,327	1,250	24,131
2016	41,841	71,818	1,250	28,727
2017	47,344	80,988	1,250	32,395
2018	51,844	88,489	1,250	35,395
2019	55,609	94,765	1,250	37,906

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:	$EG_{PJ,EF,y}$
Data unit:	MWh/year
Description:	The amount of electricity consumed from the grid in the project activity.
Source of data to be used:	Measurements at the composting facility and metering data from the electric company.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	650 MWh /year
Description of measurement methods and procedures to be applied:	Electricity consumption will be measure by an electric meter of the composting facility.
QA/QC procedures to be applied:	The electric meter will be checked periodically to test the accuracy of its measurement. The data will be double checked with the electric company.
Any comment:	

Data / Parameter:	$F_{cons,y}$
Data unit:	tons/year
Description:	The diesel fuel consumption for equipment used in the composting process
Source of data to be used:	Fuel purchase invoice and/or metering
Value of data applied for the purpose of calculating expected emission reductions in section B.5	45.36 tons

Description of measurement methods and procedures to be applied:	Original invoices for fuel purchases would be kept by paper as well as electronic data by SPC.
QA/QC procedures to be applied:	Consistency between the original invoice and the accumulated electronic data will be checked periodically.
Any comment:	

Data / Parameter:	$M_{compost,y}$
Data unit:	tonnes / yr
Description:	Quantity of compost produced.
Source of data to be used:	Record of compost facility
Value of data applied for the purpose of calculating expected emission reductions in section B.5	see table below
Description of measurement methods and procedures to be applied:	Measured by truck scale. Data will be stored by paper as well as electronic data.
QA/QC procedures to be applied:	Periodical calibration of the truck scale.
Any comment:	

Year	$M_{compost,y}$ tonnes/yr
2013	49,453
2014	49,453
2015	49,453
2016	49,453
2017	49,453
2018	49,453
2019	49,453

Data / Parameter:	$S_{OD,y}$
Data unit:	Dimensionless
Description:	The number of samples taken per year with an oxygen deficiency (i.e. oxygen content below 10%)
Source of data to be used:	On-site measurement
Value of data applied for the purpose of calculating expected emission reductions in section B.5	0 (For ex-ante estimation, it is assumed that no samples will have oxygen deficiency in the composting process.)

Description of measurement methods and procedures to be applied:	Oxygen concentration will be measured using a portable oxygen analyzer.
QA/QC procedures to be applied:	Calibration of oxygen analyzer will be done periodically.
Any comment:	

Data / Parameter:	$S_{total,y}$
Data unit:	Dimensionless
Description:	The total number of samples taken per year.
Source of data to be used:	On-site measurement
Value of data applied for the purpose of calculating expected emission reductions in section B.5	5,000 (number of samples taken will be decided after commencement of the project taking into account the result of the first measurement)
Description of measurement methods and procedures to be applied:	
QA/QC procedures to be applied:	Frequency of measurement and the number of samples taken will be decided so as to comply with the statistical requirements.
Any comment:	

Data / Parameter:	W_x
Data unit:	Tonnes/year
Description:	Total amount of organic waste prevented from disposal during the year *x*
Source of data to be used:	On-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	(see table below)
Description of measurement methods and procedures to be applied:	The amount of organic waste prevented from disposal is the amount of organic waste processed at the composting facility. This amount will be measured at the truck scale which will be located at the entrance of the facility.

Year	W_x tons/yr
2013	121,806
2014	121,806
2015	121,806
2016	121,806
2017	121,806
2018	121,806
2019	121,806

QA/QC procedures to be applied:	Periodical calibration of the truck scale.
Any comment:	

Data / Parameter:	$\boldsymbol{P_{n,j,x}}$
Data unit:	% by weight of waste
Description:	Weight fraction of the waste type *j* in the sample *n* collected during the year *x*
Source of data to be used:	Sample on-site measurements
Value of data applied for the purpose of calculating expected emission reductions in section B.5	see table below
Description of measurement methods and procedures to be applied:	Sampling of waste will be conducted at least four times a year. Volume of waste to be sampled, and the frequency of sampling will be adjusted in the project activity to meet the statistical requirements.
QA/QC procedures to be applied:	
Any comment:	

Waste Type	$P_{n,j,x}$
	%
Food	36
Garden	8
Paper	14
Wood and Straw	6
Textile	3
Plastics, other inert	32

Data / Parameter:	***z***
Data unit:	Dimensionless
Description:	Number of samples taken per year, for determination of waste composition, $\boldsymbol{P_{n,j,x}}$
Source of data to be used:	On-site measurement
Value of data applied for the purpose of calculating expected emission reductions in section B.5	N/A
Description of measurement methods and procedures to be applied:	Number of samples taken for analysis will be recorded on paper and electronic format.
QA/QC procedures to be applied:	
Any comment:	

B.7.2. Description of the monitoring plan:

All data will be converted and stored by electronic format and cross checked with the original data. The data and calculation result will be managed by the Special Purpose Company (SPC) that will be established for project implementation. The various data and calculation results will be verified by a DOE yearly for the issuance of CER's.

	Items	Responsible Organization	Description
1	Monitoring Planning	SPC	Training will be done for the O/M team for the good understanding of the monitoring plan and the actual monitoring methods.
2	Monitoring	SPC or outsourced	All data will be stored by paper and electronic files.
3	Monitoring of Regulation	SPC or outsourced	Periodical reports will be made
4	Calibration of Monitoring Equipments	Authorized entity	Calibration record will be kept by the SPC

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):

Nobuyoshi Furukori
Midac Co.Ltd.
Tokyo Office
MitsuiBuilding215-B,8 Higashita-machi, Kawasaki-ku
Kawasaki-City
Kanagawa
Japan
Telephone: +81-44-210-1631
E-mail: n.furukori@midac.jp

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:

The project is expected to start from January 2012 (1/1/2012).

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

22 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:

1/1/2013

C.2.1.2. Length of the first crediting period:

7 years.

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

Not applicable.

C.2.2.2. Length:

Not applicable.

SECTION D. Environmental impacts

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

The project might have some environmental impacts such as air pollution, noise and vibration, etc. which may occur along with construction and operation of the facility. However, the project's overall impact on environment will be small, and be reduced to minimum by implementation of project.

Negative impacts that may occur on environment during construction and operation include as follows;

<Construction>
- Air pollution, through the use of fossil fuel on vehicles required for transportation of construction materials, and machinery required for construction.
- Generation of noise and vibration to some extent, due to material transportation, installation of the facilities, etc.

• Generation of the waste due to the construction work

<Operation>
• Generation of noise and vibration due to the facility operation
• Generation of odd smells, due to the storage and treatment of organic wastes.

These negative impacts shall be reduced by taking the appropriate mitigation measures. In addition, all the potential negative impacts were taken into account in the environmental management plan which was developed in accordance with the Environmental Impact Assessment System defined by the Law on Environmental Protection.

Positive environmental impacts of the project activity are as follows;

• Significant decrease in methane generation due to organic waste degradation in the landfill, which contributes to the GHG emissions reduction
• Decrease in leachate generation and its contaminant load in the landfill.
• Extension of the landfill life time due to smaller amount of disposed waste
• Improvement of landfill's stability
• Mitigation of fire / explosions risk in the landfill caused by methane gas emissions from disposed organic wastes
• Recovery of recycling materials and saving of new raw materials

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:

There are no significant negative environmental impacts resulting from the project activity.

SECTION E. Stakeholders' comments

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

This project is to establish the waste treatment facilities within on the area of the existing landfill site. Thus, the local stakeholders in the project area include;

1. Ministry of Natural Resources and Environment (NRE) – NRE is the DNA in Malaysia.
2. Perak State Government – The project site is located in Perak State.
3. Ipoh City Council– The project site is located in Ipoh City, Perak State.
4. LEE TUCK CONSTRUCTION SDN.BHD. (LT) – LT is the local counterpart company in Malaysia in this project and in charge of collection of MSW and management of the existing landfill.
5. Neighborhood inhabitants – There are no immediate inhabitants, but there are some living comparatively close.

The project participants have heard comments from NRE, Perak State, Ipoh City, LT, and Neighborhood inhabitants. At that time, the general plans on project activities including applied methodologies, project scale, implementation structures, schedule, etc. were also explained.

E.2. Summary of the comments received:

Since this project will contribute to improving the waste management in Ipoh City, as well as reducing the GHG emission through the organic waste composting, all the stakeholders welcomed the project activities and expressed their support for the implementation of project in Ipoh City.

Major comments from stakeholders are as follows;

1. Ministry of Natural Resources and Environment (NRE) – There are some CDM projects in Malaysia, but not so much in the "Waste handling and disposal" category. The most popular category is concerning "Biomass". As they positively accept technical support through CDM project in Malaysia, it would be fine to get technical support also in this project.
2. Perak State – The presentation about CDM project (for Ipoh City) was taken place in Ipoh City office on August, 2009. The officer expects that this project will be carried on in close cooperation with Ipoh City.
3. Ipoh City – The presentation about CDM project (for Ipoh City) was taken place in Ipoh City office on August, 2009. The mayor showed a favorable understanding of this project, on the other hand, he suggested there is a rival on this matter.
4. LT – LT wants the technical support for waste management as well as this project.
5. Neighborhood inhabitants – At the moment, they don't have big problems except odor one. After explained the outline of this project, many inhabitants want to positively go ahead with it because it will make the environment better.

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

At present, the project has not received any claims from local stakeholders to obstruct its implementation.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	LEE TUCK CONSTRUCTION SDN.BHD.
Street/P.O.Box:	129-B, JALAN KAMPAR
Building:	
City:	30250 IPOH
State/Region:	PERAK
Postcode/ZIP:	
Country:	MALAYSIA
Telephone:	+605-2547129
FAX:	+605-2417334
E-Mail:	
URL:	
Represented by:	LEE TUCK
Title:	
Salutation:	Mr.
Last name:	TUCK
Middle name:	
First name:	LEE
Department:	
Mobile:	
Direct FAX:	+805-2417334
Direct tel:	+805-2547129
Personal e-mail:	

Organization:	Midac CO., LTD
Street/P.O.Box:	2163 Aritamaminami-cho, higashi-ku
Building:	
City:	Hamamatsu
State/Region:	Shizuoka Prefecture
Postcode/ZIP:	431-3122
Country:	Japan
Telephone:	+81-53-471-9361
FAX:	+81-53-471-9373
E-Mail:	
URL:	http://www.midac.co.jp/
Represented by:	Masahiro Doi
Title:	
Salutation:	Mr.
Last name:	Doi
Middle name:	
First name:	Masahiro
Department:	

Mobile:	
Direct FAX:	+81-53-471-9373
Direct tel:	+81-53-471-9361
Personal e-mail:	

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No applicable. The project will be privately funded and will not involve any public funding or Official Development Assistance (ODA).

Annex 3

BASELINE INFORMATION

Waste composition analysis

Waste composition is decided based on the following analysis investigation.

Table 3: Basic condition on the analysis

Date	23/11/2009 ~ 27/11/2009
Place	Existing landfill in Ipoh City
Objective	1. Understanding the waste composition installed to the landfill 2. Understanding the recyclables
Volume of waste	600 tons/day of waste is installed to the landfill.
Origin of waste	The waste is originated from Household, Shop, and Market, the ratio of each item is 70%, 25%, and 5%.

Based on the hearing test about recyclables and the waste type category provided by “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site”, waste classification items are showed as follows:

Table 4: Waste classification items

・Food (including Beverage and Tobacco)		・Garden
・Paper	・Carton box	・Wood and Straw
・Textile	・Disposal nappies	・Rigid plastic
・Plastic container (transparent)		・Plastic container (white)
・Plastic bag (film-like)	・Other plastic	・Steel
・Aluminum	・Glass	・Others

This is the result about recyclables by hearing test (items and selling price) and segregation analysis (recycle rate).

Table 5: Recyclable items, Selling price, and Estimated Recycle rate

Item	Selling Price [RM/ton]	Recycle rate
Paper	200	0 %
Carton box	250	0 %
Rigid plastic	600	60 %
Plastic container (transparent)	600	60 %
Plastic container (white)	600	60 %
Plastic bag (film-like)	250	0 %
Steel	400	80 %
Aluminum	2,800	80 %

This is the result of waste composition analysis.

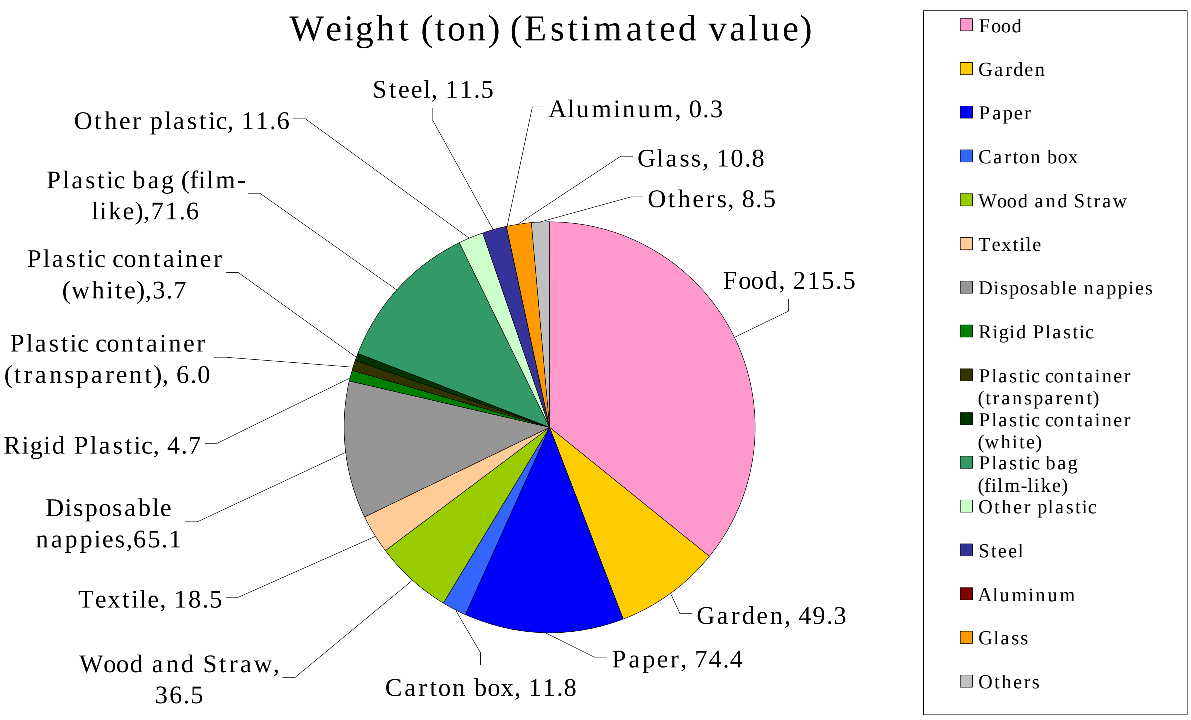

Figure 4: Result of waste composition analysis

Table 6: Result of waste composition analysis

Items	Food	Garden	Paper	Carton box	Wood and Straw	
Weight (ton) (Estimated value)	215.5	49.3	74.4	11.8	36.5	
Ratio (%)	35.9%	8.2%	12.4%	2.0%	6.1%	
Items	Textile	Disposable nappies	Rigid Plastic	Plastic container (transparent)	Plastic container (white)	Plastic bag (film-like)
Weight (ton) (Estimated value)	18.5	65.1	4.7	6.0	3.7	71.6
Ratio (%)	3.1%	10.9%	0.8%	1.0%	0.6%	11.9%
Items	Other plastic	Steel	Aluminum	Glass	Others	Total
Weight (ton) (Estimated value)	11.6	11.5	0.3	10.8	8.5	600.0
Ratio (%)	1.9%	1.9%	0.1%	1.8%	1.4%	100.0%

Classifying these items into the waste type category of “Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site”.

Table 7: Waste composition for calculation

Waste type *j*	**Waste composition**		$W_{j,x}$
	tons/day	%	tons/yr
Food	251.5	36%	91,798
Garden	49.3	8%	17,995
Wood and Straw	36.5	6%	13,323

Paper	86.3	14%	31,500
Textile	18.5	3%	6,753
Others	194.0	32%	70,810

Calculating waste composition of compost

With mechanical and hand sorting, the input for composting is estimated as below.

Table 8: Waste composition before composting

Waste type	**Waste composition before composting**	
	tons/day	%
Food	251.5	52%
Garden	49.3	12%
Wood and Straw	36.5	9%
Paper	86.3	22%
Textile	18.5	4%
Others	2.4	1%

According to the result of composting analysis, this is the output of composting.

Table 9: Waste composition after composting

Waste type *i*	**Waste composition after composting**		$A_{ci,x}$
	tons/day	%	tons/yr
Food	86.2	51%	25,856
Garden	19.7	12%	5,916
Wood and Straw	14.6	9%	4,377
Paper	37.2	22%	10,352
Textile	7.4	4%	2,221
Others	2.4	2%	731

Annex 4

MONITORING INFORMATION

- - - - -