> **CLEAN DEVELOPMENT MECHANISM**
> **SMALL-SCALE PROGRAM ACTIVITY DESIGN DOCUMENT FORM (CDM-SSC-CPA-DD)**
> **Version 01**

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NOTE:

(i)   This form is for submission of CPAs that apply a small-scale approved methodology using the provision of the proposed small scale CDM PoA.

(ii)   The coordinating/managing entity shall prepare a CDM Small Scale Programme Activity Design Document (CDM-SSC-CPA-DD)[1,2] that is specified to the proposed PoA by using the provisions stated in the SSC PoA DD. At the time of requesting registration the SSC PoA DD must be accompanied by a CDM-SSC CPA-DD form that has been specified for the proposed SSC PoA, as well as by one completed CDM-SSC CPA-DD (using a real case). After the first CPA, every CPA that is added over time to the SSC PoA must submit a completed CDM-SSC CPA-DD.

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[1]   The latest version of the template form CDM-CPA-DD is available on the UNFCCC CDM web site in the reference/document section.

[2]   At the time of requesting validation/registration, the coordinating managing entity is required to submit a completed CDM-POA-DD, the PoA specific CDM-CPA-DD, as well as one of such CDM-CPA-DD completed (using a real case).

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

SECTION A.   General description of small scale CDM programme activity (CPA)

A.1.   Title of the small-scale CPA:

Emission Free Community Composting Programmatic CDM in Tagbilaran City, Bohol, Philippines
Version 1
1 March 2008

A.2.   Description of the small-scale CPA:

Type of the CPA:
This CPA falls under Type 3, as defined in the proposed CDM Small-Scale Programmatic Activity
Design Document (CDM-SC-PoA-DD).

Description of the CPA:
This CPA aims to avoid the production of methane from organic waste materials that are currently being
left to decay anaerobically in a solid waste disposal sites in Tagbilaran City.

Tagbilaran City is the capital of Bohol Province with a total population of approximately 77,700 (year
2000 actual) and a total land area of about 3,270 hectares. It is estimated that 12,876 households live in
Tagbilaran, generating 62tons/day of organic waste. The City is divided into 15 Barangays, or the
smallest local government unit. Table 1 is a list of the 15 Baranguays in Tagbilaran City[3].

Table 1. Barangays in Tagbliaran City

Barangay	Area (ha)
URBAN	
Poblacion I	25.9
Poblacion II	70.2
Poblacion III	70.7
Cogon	204.4
RURAL	
Bool	348.8
Booy	146.4
Cabawan	267.3
Dampas	443.7
Dao	390.9
Manga	117.3
Mansasa	82.9
San Isidro	429.4
Taloto	244.5
Tiptip	282.1
Ubujan	145.6
TOTAL	3,270.1

Source: Office of the City Planning and Development Coordinator, *Socio-Economic Profile: City of Tagbilaran*, 2002

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[3] City Government of Tagbilaran. Official Website < http://www.tagbilaran.gov.ph/cityprofile.php >

Household waste is the dominant organic waste material generated in Tabilaran City. At present, the organic waste material, along with other waste, are disposed in landfill site in Tagbilaran City. Due to the lack of a methane recovery facility, methane is generated through an anaerobic decomposition process and emitted into the atmosphere.

This CPA will prevent methane emission by implementing a composting facility that treats waste materials through an aerobic process and properly applying the produced compost into fields. The CPA does not recover or combust methane, and does not undertake controlled combustion of the waste. Annual emissions of methane from each CPA are expected to be 13,899t CO_2 equivalent annually (totally 97,290t CO_2 equivalent within the first crediting period).

Purpose of the CPA:
The purpose of the Project is to achieve "co-benefits," where both the global environmental aim to reduce greenhouse gas emissions and the local social and economic needs for proper waste treatment are met. Promoting the implementation of composting through this CPA contributes to the sustainable development of Tagbilaran City by bringing about the following economic, environmental and social benefits:

a) Economic Benefits
  ・ Investments from Japan to the local economy
  ・ Creation of job opportunities (approximately 30 new jobs are created in waste sorting, at composting facilities; etc) and potential stabilization of the volatile unemployment rate
  ・ Capacity building of workers to develop viable skills (i.e. composting techniques and machinery operation) and provide information regarding health and safety measures
  ・ Promotion of recycles and reuse of recyclables

b) Environmental Benefits
  ・ Reduction of greenhouse gas emissions
  ・ Improvement of sanitary conditions by presenting an alternative to dumping waste near households
  ・ Improvement of soil quality due to the utilization of organic fertilizer and the reduction of chemical fertilizers
  ・ Increase of waste collection that is mainly disposed improperly

c) Social Benefits
  ・ Transfer of know-how on waste management and environmental technologies from Japan
  ・ Provision of alternative livelihoods to those currently working under hazardous conditions such as waste pickers[4] who make their livings by collecting and selling recyclable elements from dumping sites

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A.3.   Entity/individual responsible for the small-scale CPA:

The implementer of the CPA is Tagbilaran City.

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[4] It is estimated that there are more than 200 waste pickers in Bohol Province based on investigation done by Bohol Provincial Government

The City Government of Tagbilaran is responsible for the collection[5] and transportation of the waste, s well s the operation and management of the composting facility.

A.4.	Technical description of the small-scale CPA:

A.4.1. Identification of the small-scale CPA:

A.4.1.1.	Host Party:

Republic of the Philippines

A.4.1.2.	Geographic reference or other means of identification allowing the unique identification of the small-scale CPA (maximum one page):

The project site (composting facility) for Tagbilaran City is located near the existing waste treatment facility situated on reclaimed land in Dampas. Latitude of the project site is N 9'38, and longitude is E 123'51.

Waste will be collected from the entire Tagbilaran City as shown in the following map[6].

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[5] Some household and market wastes are self-hauled into composting sites from within and outside of Tagbilaran City.

[6] Some household and market wastes are self-hauled into composting sites from within and outside of Tagbilaran City.

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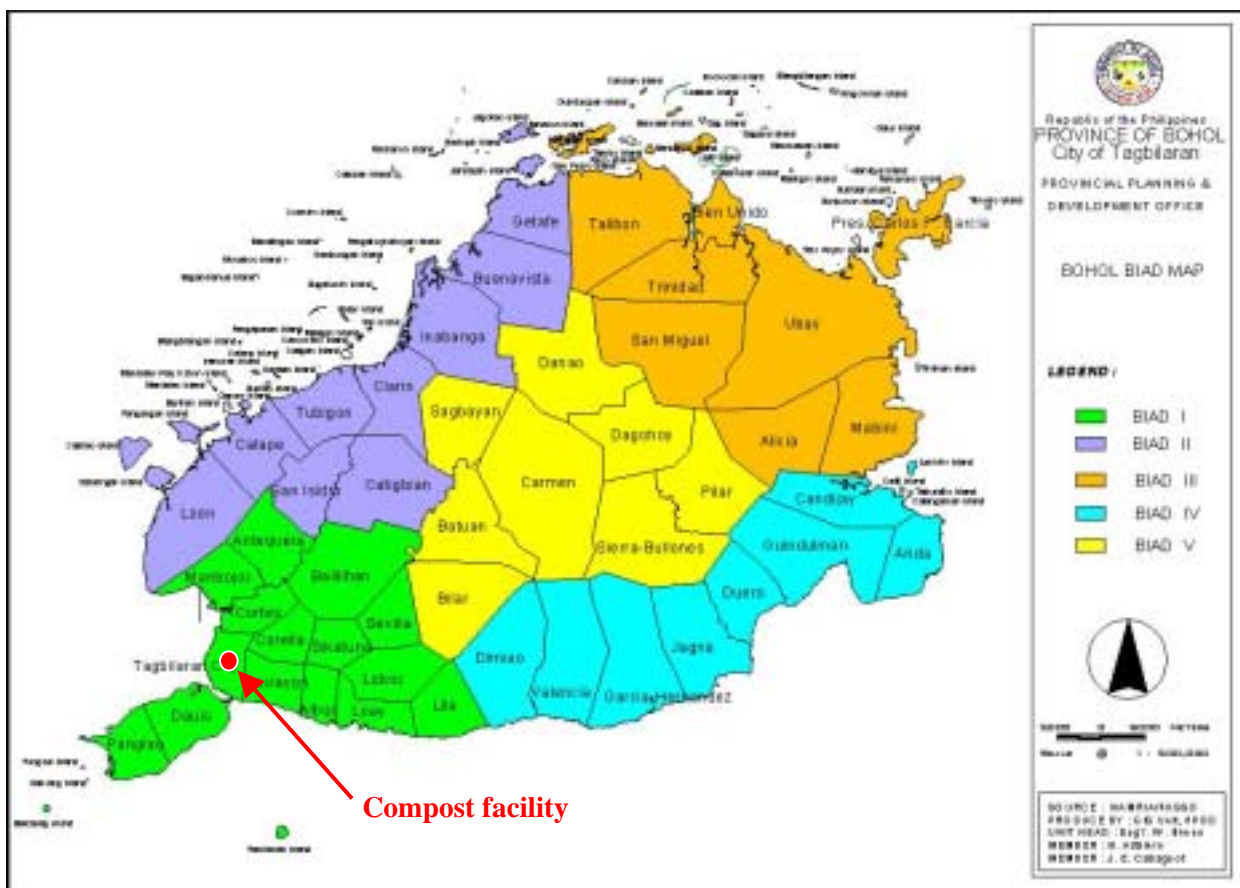
Figure 1. Location Map of the Project Site and Waste Collection Coverage

A.4.2.   Duration of the <u>small-scale CPA</u>:

A.4.2.1. <u>Starting date of the small-scale CPA</u>:

This starting date of this CPA is 1st of January 2009, which is the same date as the proposed PoA.

A.4.2.2. Expected <u>operational lifetime of the small-scale CPA:</u>

20years

A.4.3.   Choice of the crediting period and related information:

<u>Renewable crediting period</u>

A.4.3.1. Starting date of the <u>crediting period</u>:

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The starting date of the crediting period is the registration date.

A.4.3.2. Length of the crediting period, first crediting period if the choice is renewable CP:

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7 years

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

Table2. Estimated amount of emission reductions

Years	Estimation of annual emission reductions (tCO$_2$e)
2009	3,844
2010	7,214
2011	10,071
2012	12,551
2013	14,754
2014	16,749
2015	18,631
Total emission reductions (tCO$_2$e)	83,813
Total number of crediting years	7
Annual average over the crediting period of estimated reductions (tCO$_2$e)	11,973

A.4.5. Public funding of the CPA:

Public funding from each related municipality is involved in this CPA. However, this CPA does not include any diversion of ODA funds.

A.4.6. Information to confirm that the proposed small-scale CPA is not a de-bundled component

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As highlighted in Appendix C of the Simplified Modalities and Procedures for Small-Scale CDM project activities, a proposed small-scale project activity shall be deemed to be a debundled component of a large project activity if there is a registered small-scale CDM or an application to register another small-scale CDM with the following characteristics:

- With the same project participants;
- In the same project category and technology/measure;
- Registered within the previous 2 years; and
- Whose project boundary is within 1 km of the project boundary of the proposed small-scale activity at the closest point.

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The project participant of the CPA is Tagbilaran City. This CPA is the first and only CPA that Tagbilaran City is part of. Therefore, it can be inferred that the CPA does not have the same project participants with any other CPAs (first criteria), thus verifying that the CPA is not a debundled component of another CPA.

A.4.7. Confirmation that small-scale CPA is neither registered as an individual CDM project activity or is part of another Registered PoA:

Bohol Provincial Government, who is the managing entity of the PoA in which this CPA is under, will periodically obtain and update information regarding CDM project activities and PoAs related to composting. Prior to the implementation of the CPA, Bohol Provincial Government will verify that the small-scale CPA is neither registered as an individual CDM project activity or is part of another Registered PoA by cross-checking the geographic location of the CPA with existing CDM project activities.

SECTION B. Eligibility of small-scale CPA and Estimation of emissions reductions

B.1. Title and reference of the Registered PoA to which small-scale CPA is added:

Emission Free Community Composting Programmatic CDM in Bohol, the Philippines

B.2. Justification of the why the small-scale CPA is eligible to be included in the Registered PoA :

This CPA is eligible to be included in the registered PoA since it satisfies the criteria defined in A.4.2.2. in CDM-SC-PoA-DD of the registered PoA as described below.

- A composting project to newly construct, or expand current, composting facility in order to treat organic waste materials that are otherwise treated through anaerobic fermentation in land fills
→Applicable (The activity of this CPA is described in A.2)

- Located within Bohol Province
→ Applicable (The location of this CPA is described in A.4.1.2.)

- Achieves emission reductions of less than or equal to 60 kilotons CO_2 e/year per CPA
→Applicable (Emission reduction achieved by this CPA is less than 60 kilotons CO_2 equivalent per year as shown in Table 2 in A.4.4.)

- Implements at least one of the technology options introduced in A.4.2.1
→ Applicable. MBT will be applied for the CPA.

- Monitors and collects appropriate data on the parameters listed in A.4.4.2
→ Applicable. Monitoring items in A.4.4.2. will be applied.

B.3. Assessment and demonstration of additionality of the small-scale CPA , as per eligibility criteria listed in the Registered PoA:

In the absence of the CPA, organic waste materials are most likely to be disposed in a legally allowable solid waste disposal site in Tagbilaran City, resulting in the production and release of methane into the atmosphere, as is the current situation. The CPA will reduce greenhouse gas emissions by avoiding the production of methane at dumpsites by composting the organic matter through an aerobic process instead of an anaerobic process.

According to the CDM-SC-PoA-DD of the registered PoA, the CPA would not have occurred due to the following investment barrier, technology barrier and barrier due to prevailing practice.

a)   Investment barrier: profits from sales of the compost are below the operation cost of the CPA

b)   Investment barrier: Income from sales of the compost can not sufficiently cover the cost of the CPA

Development of a large scale composting facility in the City of Tagbilaran have investment barriers due to low market value of the compost produced through the CPA.

Tagbilaran City generates a large amount of market wastes daily. Since sorting of waste at sources are generally more difficult to implement in urban areas than in rural regions, this CPA will collect and transport organic wastes without sorting at sources (as mixed wastes). Instead, the waste will be sorted upon arrival at the composting facility. Residual waste (materials that cannot be composted or recycled) generated at the composting facility will be disposed at landfills.

Due to the sorting of organic waste after the collection of mixed waste, it is not possible to completely remove all impurities disturbing the production of compost such as plastic films. Therefore, the final compost cannot have enough high quality to be sold as fertilizers. It can only be sold as soil conditioners with much lower price or only provided for free of charge to the nearby farmers.

However, compost production from the solid waste can contribute to reduction of waste disposal at landfills, that currently costs about US$ 5 per ton of waste disposed. In this regard, compost production from waste indirectly provide benefit to Tagbilaran City in terms of saving the cost of waste disposal. Assuming that this cost saving is a benefit obtained from the project activity, financial viability of the project is evaluated as shown in the table below.

Table 3. Financial viability without CER sales (IRR 7years)

	Initial Inv.	Income		Expense	Balance	BBF
		CER sales	Saved disposal cost	O/M		
2008	950,000				- 950,000	
2009		0	92,040	50,000	42,040	- 907,960
2010		0	92,040	50,000	42,040	- 865,920
2011		0	92,040	50,000	42,040	- 823,880
2012		0	92,040	50,000	42,040	- 781,840
2013		0	92,040	50,000	42,040	- 739,800
2014		0	92,040	50,000	42,040	- 697,760
2015		0	92,040	50,000	42,040	- 697,760

Table 4. Financial viability with CER sales (IRR 7years)

	Initial Inv.	Income		Expediture	Balance	BBF
		CER sales	Saved disposal cost	O/M		
2008	950,000				- 950,000	
2009		52,467	92,040	50,000	94,507	- 855,493
2010		98,473	92,040	50,000	140,513	- 714,980
2011		137,464	92,040	50,000	179,504	- 535,476
2012		171,323	92,040	50,000	213,363	- 322,113
2013		201,387	92,040	50,000	243,427	- 78,686
2014		228,626	92,040	50,000	270,666	191,980
2015		254,309	92,040	50,000	296,349	217,664

IRR: 9.7%

Table3 and Table 4 above show the results of financial analysis for CPA without CER sales and with CER sales. The initial cost for the CPA is USD950,000 while the annual operation and maintenance cost of the composting facility is USD50,000. Without CER sales, the CPA is not financially viable because the investment cost cannot be recovered within the project period. On the other hand, Table 4 clearly indicates that the project will only become financially viable as the public project with the internal rate of return of 9.7% if the CER produced by the project can be sold at the rate of more than US$14 per ton of CO2 reduced. These results clearly show the existence of investment barrier of the project.

c) Technology barrier: a large-scale composting project that is operated by a group of LGUs or an entire city with a total solid waste generation of more than 50 tons/day (Type 3 CPA)

There is a need to bring in new technologies for this CPA. Although there has been an example of a middle-scale composting project in Manila with a partial mechanized process, due to the high O/M costs, it is currently not in operation. The MBT system for large-scale projects proposed in the PoA for implementation is not only a new technology to be introduced into the Philippines, but also has a high potential of generating income through CER sales, which will make the CPA economically viable.

d) Barrier due to prevailing practice: low adoption rate of composting facilities and most organic waste materials are being treated at dump sites

In Bohol Province, waste are still treated mainly through open dumping, and currently there are only seven[7] composting facilities, most of which are small-scale facilities focused on the treatment of market waste. The lack of economic incentives due to the low market value of the compost can be identified as one of the major obstacles inhibiting the further establishment of composting projects.

In 2001, the Philippines Government issued RA9003 requiring all final disposal sites to be converted into sanitary landfills in five years (by 2006), and mandating LGUs to reduce their waste and divert at least 25% of all solid waste from waste disposal facilities through re-use, recycling and composting activities,

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[7] One of the seven facilities is not in operation.

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as well as other resource recovery activities. However, due to lack of funds, only 3.7%[8] of municipalities in the Philippines have installed Material Recovery Facilities (MRF) for waste recycling.   Composting is one of the major activities at MRF, however, there are few MRFs, which produce significant amount of compost. Therefore, it is clear that composting activities are not yet a common practice throughout the country.

B.4.   Description of the sources and gases included in the <u>project boundary</u> and proof that the <u>small-scale CPA</u> is located within the geographical boundary of the registered PoA.

The project boundary for the CPA is illustrated in the following figure. The boundary includes the disposal site, composting facility site and application site located within Tagbilaran City.
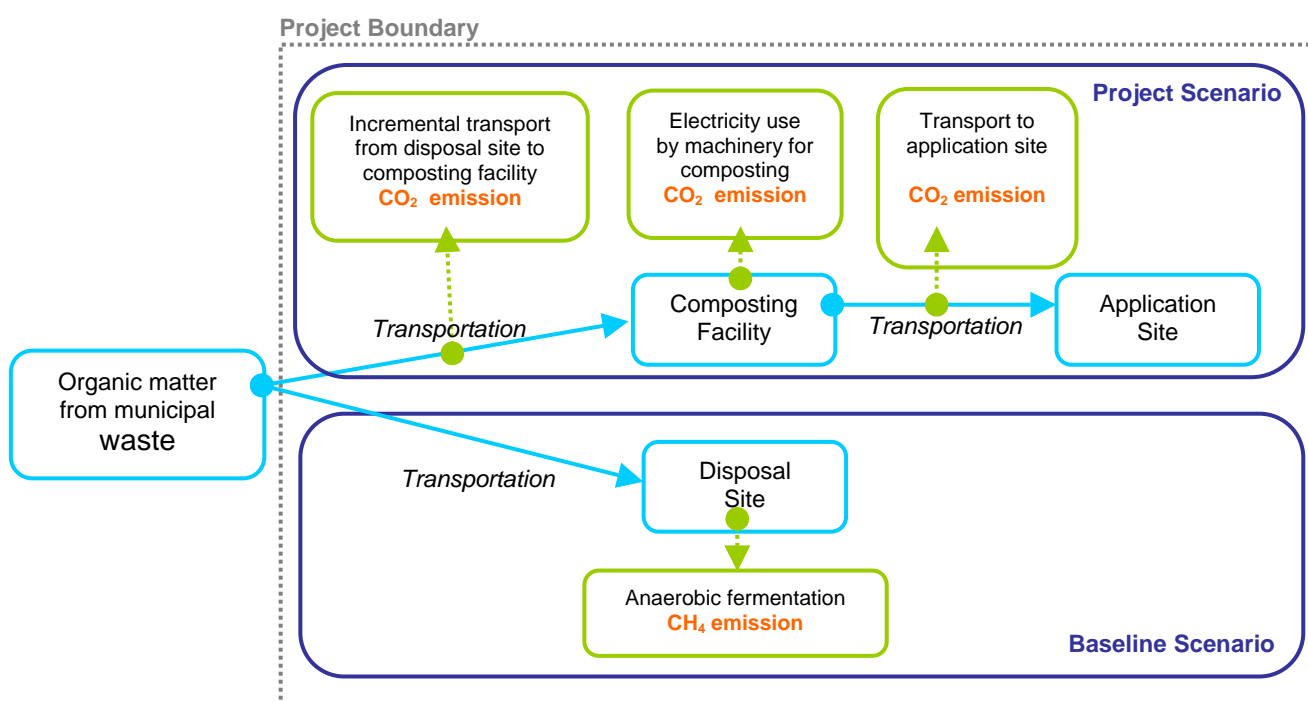
Figure 2. Layout of CPA Boundary

B.5.   Emission reductions:

B.5.1.   Data and parameters that are available at validation:

The detail information on the data and parameters not requiring monitoring are described as follows. For data and parameters used for ex-ante calculation but need to be monitored after project implementation are shown in Annex 3.

Data / Parameter:	ϕ

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[8] Information provided by the National Solid Waste Management Commission. In September 2006, 1,550 of the 41,943 Barangays in the country are covered by Material Recovery Facilities (MRFs).

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Data unit:	-
Description:	Model correction factor to account for model uncertainties
Source of data used:	"Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site (Version 2)"
Value applied:	0.9
Justification of the choice of data or description of measurement methods and procedures actually applied:	IPCC default values recommended in "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site (Version 2)"
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:	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:	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:	Use 0.1 for managed solid waste disposal sites that are covered with oxidizing material such as soil or compost. Use 0 for other types of solid waste disposal sites.
Justification of the choice of data or description of measurement methods and procedures actually applied:	IPCC default values recommended in "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site (Version 2)"
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:	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.
Any comment:	

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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:	IPCC default value since no local values are available
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:	IPCC 2006 Guidelines for National Greenhouse Gas Inventories (adapted from Volume 5, Tables 2.4 and 2.5)
Value applied:	Wood and wood products: 43 Pulp, paper and cardboard: 40 Food and food waste: 15 Garden and park waste: 20 Glass, plastic, metal and inert waste: 0
Justification of the choice of data or description of measurement methods and procedures actually applied:	IPCC default values for wet base waste since no local values are available
Any comment:	

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:	Pulp, paper, cardboard :0.07 Wood and wood products:0.035 Other (non-food) putrescible garden and park waste: 0.17 Food, food waste, sewage sludge, beverages and tobacco: 0.4
Justification of the	IPCC default values for wet tropical climate since no local data was available.

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[9] Global Historical Climatology Network (GHCN), selected data on WorldClimate.com
<http://www.worldclimate.com/cgi-bin/data.pl?ref=N09E123+2100+98644W>

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choice of data or description of measurement methods and procedures actually applied:	Mean annual precipitation in Bohol Province is 1,290mm[9] (>1000 mm) and the mean annual temperature is 29 centigrade[10] (>20 centigrade).
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:	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. 0.8 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 meters.
Justification of the choice of data or description of measurement methods and procedures actually applied:	The default values are given by "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site (Version 2)." Bohol Provincial Government conducted field visits to landfill sites of each municipality in November 2007.
Any comment:	

Data / Parameter:	$MD_{y,reg}$
Data unit:	-
Description:	Methane that would be destroyed or removed in the year "y" for safety or comply with regulation.
Source of data used:	
Value applied:	0
Justification of the choice of data or description of measurement methods and procedures actually applied:	No national/local regulations exist which enforce recovery or removal of landfill gas.

[10] Provincial Government of Bohol. Official Website: <http://www.bohol.gov.ph/profile.html>

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Any comment:	

Data / Parameter:	W_x
Data unit:	tons/year
Description:	Total amount of organic waste prevented from disposal in year x (tons)
Source of data used:	Measurements undertaken by the composting plant operator of each CPA
Value applied:	To be measured by each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied:	The value will be obtained by the figures of the related municipalities of each CPA: population, estimated population increase, organic content of the waste, and garbage collection ratio (See equation (4) in section E.6.2.).
Any comment:	

Data / Parameter:	$CT_{y,comp}$ and C_{ty}
Data unit:	m^3/truck
Description:	Truck capacity for hauling raw and finished compost
Source of data used:	Trucks currently used for collection in municipality
Value applied:	To be measured by each CPA
Justification of the choice of data or description of measurement methods and procedures actually applied:	Average truck capacity to be used
Any comment:	

Data / Parameter:	DAF_w
Data unit:	km/truck
Description:	Average incremental distance for raw waste collection
Source of data used:	Incremental collection distance between dumpsite and composting facility
Value applied:	To be measured by each CPA operating agency
Justification of the choice of data or description of measurement methods and procedures actually applied:	
Any comment:	

Data / Parameter:	DAF_{comp}
Data unit:	km/truck
Description:	Average distance for compost transportation
Source of data used:	Based on typical transportation distance in municipalities
Value applied:	To be measured by each CPA operating agency

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Justification of the choice of data or description of measurement methods and procedures actually applied:	Most probably the actual end users of the compost will not be known ex ante, therefore an average value will be estimated depending on the local conditions of each CPA.
Any comment:	

Data / Parameter:	EF_{CO_2}
Data unit:	$kgCO_2/km$
Description:	CO_2 emission factor from fuel use due to transportation
Source of data used:	Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, Volume 3, Table 1-28, p.1.71 and Table 1-31, p. 1.74.
Value applied:	Light duty gasoline trucks: 0.579 Light duty diesel trucks: 0.331
Justification of the choice of data or description of measurement methods and procedures actually applied:	The figure will be determined depending on the trucks to be used at each CPA.
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:	A value of 21 is to be applied for the first commitment period of the Kyoto Protocol
Any comment:	After first commitment period of the Kyoto Protocol, the figure should be reviewed under decisions under UNFCCC.

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:	
Value applied:	0
Justification of the choice of data or	This project does not involve methane recovery.

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description of measurement methods and procedures actually applied:	
Any comment:	

Data / Parameter:	**Fuel**
Data unit:	tons/year
Description:	Annual fuel consumption for onsite power generation
Source of data used:	Based on the electricity requirement of the composting facility
Value applied:	
Justification of the choice of data or description of measurement methods and procedures actually applied :	The figure will be determined depending on the equipment used for composting facility.
Any comment:	

Data / Parameter:	**NCV$_{fuel}$**
Data unit:	TJ/kt
Description:	NET Calorific value of the fuel of the fuel used
Source of data used:	IPCC default value
Value applied:	Gas/Diesel Oil: 43.0
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data will be obtained by "the 2006 IPCC Guidelines for National Greenhouse Gas Inventories"
Any comment:	

Data / Parameter:	**EF$_{CO2\_fuel}$**
Data unit:	tCO$_2$/TJ
Description:	CO$_2$ Emission factor of the fuel used
Source of data used:	IPCC default value
Value applied:	Gas/Diesel Oil: 74.1
Justification of the choice of data or description of measurement methods and procedures actually applied :	The data will be obtained by "the 2006 IPCC Guidelines for National Greenhouse Gas Inventories"
Any comment:	

B.5.2.   Ex-ante calculation of emission reductions:

>>
(i)   Baseline Emissions
Baseline emissions were calculated by equation (1).

$$BE_y = BE_{CH4,SWDS,y} - MD_{reg,y} \times GWP\_CH_4 + MEP_{y,ww} \times GWP\_CH_4 \quad …(1)$$

This template shall not be altered. It shall be completed without modifying/adding headings or logo, format or font.

Where:

Parameter	Description	Figure	Unit	Data Source
BE_y	Baseline emissions in year "y"	Calculated by equation (1)	tCO_2e	-
$BE_{CH4,SWDS,y}$	Methane emissions avoided during year "y" from preventing waste disposal at the solid waste disposal site during the period from the start of the project activity to the end of the year "y"	Calculated by equation (2)	tCO_2e	-
$MD_{reg,y}$	Amount of methane that would have to be captured and combusted in the year "y" to comply with the prevailing regulations	0	-	No regulations both in Bohol Province and the Philippines requiring methane capture and/or combustion
$MEP_{y,ww}$	Methane emission potential in the year "y" of the wastewater. The value of this term is zero if co-composting of wastewater is not included in the project activity	0	-	The project activity does not include co-composting
CH_4_GWP	Global Warming Potential (GWP) of methane, valid for the relevant commitment period	21	tCO_2e/tCH_4	Decisions under UNFCCC and the Kyoto Protocol

Parameters required for the calculation of equation (1) are determined as follows:

■ $BE_{CH4,SWDS,y}$: Methane emissions avoided during the year y from preventing waste disposal at the solid waste disposal site during the period from the start of the project activity to the end of the year y (t CO_2e)

Methane emissions from disposal site without the CPA project activity is determined utilizing the following equation provided in the "Tool to determine methane emissions avoided from dumping waste at a solid waste disposal site," which has been revised at Executive Board (EB) 35.

$$BE_{CH4,SWDS,y} = \varphi \cdot (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot \frac{16}{12} \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=l}^{y} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-k_j \cdot (y-x)} \cdot (1-e^{-k_j})$$
…(2)

Where:

Parameter	Description	Figure	Unit	Data Source
ϕ	Model correction factor to account for model uncertainties	0.9	-	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
OX	Oxidation factor (reflecting the amount of methane from SWDS that is oxidised in the soil or other material	Refer to Annex 3	-	IPCC 2006 Guidelines for National Greenhouse Gas Inventories

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	covering the waste)			
F	Fraction of methane in the SWDS gas (volume fraction)	0.5	-	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
DOC_f	Fraction of degradable organic carbon (DOC) that can decompose	0.5	-	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
MCF	Methane correction factor	Refer to Annex 3	-	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
DOC_j	Fraction of degradable organic carbon (by weight) in the waste type j	Wood and wood products: 43 Pulp , paper and cardboard: 40 Food and food waste: 15 Garden and park waste: 20 Glass, plastic, metal and inert waste: 0	-	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
k_j	Decay rate for the waste type j	Pulp, paper, cardboard: 0.07 wood and wood products: 0.035 Other (non-food) putrescible garden and park waste: 0.17 Food, food waste, sewage sludge, beverages and tobacco: 0.4	-	IPCC 2006 Guidelines for National Greenhouse Gas Inventories
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 more detail information on the each parameter is described in B.5.1.

For the extension of the crediting period, the most updated "IPCC Guidelines for National Greenhouse Gas Inventories" will be referred for figures regarding OX, F, DOC_f, MCF, DOC_j, k_j, GWP.

■ $W_{j,x}$:Amount of organic waste type j prevented from disposal in the SWDS in the year x

Where different waste types j are prevented from disposal, determine the amount of different waste types ($W_{j,x}$) through sampling and calculate the mean from the samples, as follows:

$$W_{j,x} = W_x \times \sum_{n=1} \frac{P_{n,j,x}}{Z} \qquad \text{...(3)}$$

Where:

Parameter	Description	Figure	Unit	Data Source
$W_{j,x}$	Amount of organic waste type j prevented from disposal in the SWDS in the year x	Refer to Annex 3	tons	Calculated by the statistical data of Bohol Provincial Government
W_x	Total amount of organic waste prevented from disposal in year x	Refer to Annex 3	tons	Calculated by the statistical data of Bohol Provincial Government

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$P_{n,j,x}$	Weight fraction of the waste type j in the sample n collected during the year x	Wood and wood products: 8.1% Pulp, paper and cardboard: 20.3% Food and food waste: 16.6% Garden and park waste: 1.7% Glass, plastic, metal and inert waste: 52.2%	-	Data provided by Tagbilaran city
Z	Number of samples collected during the year x	1	-	-

■ W_x : Total amount of organic waste prevented from disposal in year x

As indicated in equation (4) below, the generation volume of organic wastes (W_x) was calculated by multiplying the Bohol's average per capita waste generation volume (0.45kg/person/day) by the total population in Bohol.

$$W_x = POP_x \times WC_x \times CR_x \qquad \ldots(4)$$

Where:

Parameter	Description	Figure	Unit	Data Source
POP_x	Population of the related municipalities in year x	Refer to Annex 3	tons	The statistical data of Bohol Provincial Government
WC_x	Per capita garbage production in year x	0.45	kg/person/day	Mean value of Bohol Province by the statistical data of Bohol Provincial Government
CR_x	Percent of garbage collected in year x	Refer to Annex 3	-	Data obtained from the related municipality

However, for municipalities with self-produced waste management assessments available, waste generation volumes were calculated utilizing figures from the local assessments

(ii) Project Emissions

Emissions from the CPA are the sum of the emissions from incremental transportation and electricity or diesel consumption due to CPA, as described in the following equation.

$$PE_y = PE_{y,transp} + PE_{y,power} \qquad \ldots(5)$$

Where:

Parameter	Description	Figure	Unit	Data Source
PE_y	Project activity emissions in the year "y"	Calculated by equation (5)	t CO_2/y	-
$PE_{y,transp}$	Emissions from incremental transportation in the year "y"	Calculated by equation (6)	t CO_2/y	-
$PE_{y,power}$	Emissions from electricity or diesel consumption in the year "y"	Calculated by the monitored data	t CO_2/y	-

Parameters utilized to calculate equation (5) are determined as follows:

■ $PE_{y,transp}$: Emissions from incremental transportation in the year "y"

$$PE_{y,transp} = (Q_y/CT_y) \times DAF_w \times EF_{CO2} + (Q_{y,comp}/CT_{y,comp}) \times DAF_{comp} \times EF_{CO2} \quad \ldots (6)$$

Where:

Parameter	Description	Figure	Unit	Data Source
Q_y	Quantity of waste composted in the year "y"	Refer to Annex 3	tons	The statistical data of Bohol Provincial Government
CT_y	Average truck capacity for waste transportation		tons/truck	
DAF_w	Average incremental distance for solid waste and/or wastewater transportation		km/truck	
EF_{CO2}	CO_2 emission factor from fuel use due to transportation	Light duty gasoline trucks: 0.579 Light duty diesel trucks: 0.331	kg CO_2/km	IPCC default values
$Q_{y,comp}$	Quantity of final compost product produced in the year "y"	Refer to Annex 3	tons	-
$CT_{y,comp}$	Average truck capacity for final compost product transportation		tons/truck	
DAF_{comp}	Average distance for final compost product transportation		km/truck	

■ $PE_{y,power}$:Emissions from power usage in the year "y"

$PE_{y,power}$ will be calculated by power consumption by the composting facilities in kWh/year and the electricity emission factor. Electricity emission factor will be used for the Luzon-Visayas grid since Bohol Province is located within the Luzon-Visayas grid.

Power used in the composting facilities will be generated by diesel generator sets. $PE_{y,power}$ will be calculated by fuel consumption by the composting facilities

$$PE_{y,power} = Fuel \times NCV_{fuel} \times EF_{CO2\_fuel} \quad \ldots (7)$$

Where:

Parameter	Description	Figure	Unit	Data Source
Fuel	Annual fuel consumption	53	tons/year	Based on equipment to be installed
NCV_{fuel}	net calorific value of diesel oil	43.0	TJ/kt	IPCC default values
EF_{CO2_fuel}	CO_2 emission factor diesel oil	74.1	$tCO2_e$/TJ	IPCC default values

(iii)   Leakage Emissions
Emissions from leakage are calculated when composting facilities are transferred from other activities or existing composting facilities are transferred into other activities. Leakage emission is 0 since this CPA does not transferred any facilities from other activities.

(iv)   Emissions Reduction of Greenhouse Gas
GHG emissions reduction is calculated as indicated in equation (8).

$$ER_y \quad = \quad (BE_y \quad - \quad (PE_y \quad + \quad Leakage_y) \qquad \ldots \ (8)$$

B.5.3.   Summary of the ex-ante estimation of emission reductions:

Table 3. Summary of ex-ante estimation of emission reduction

Year	Estimation of project activity emissions (tCO$_2$ e)	Estimation of baseline emissions (tCO$_2$ e)	Estimation of leakage (tCO$_2$ e)	Estimation of overall emission reductions (tCO$_2$ e)
2009	249	4,093	0	3,844
2010	252	7,466	0	7,214
2011	254	10,325	0	10,071
2012	257	12,808	0	12,551
2013	259	15,013	0	14,754
2014	262	17,011	0	16,749
2015	265	18,896	0	18,631
Total (tCO$_2$e))	1,799	85,612	0	83,813

B.6.   Application of the monitoring methodology and description of the monitoring plan:

B.6.1.   Description of the monitoring plan:

(i)   Monitoring and reporting framework
Monitoring and reporting framework is shown in the Figure 3 below. The operation and management of composting facilities are carried out by Tagbilaran City (the compost facility operator). Based on monitoring manual that is provided by the Government of Bohol, Tagbilaran City will monitor the the average load of trucks for transportation of the waste and the operation of the facility and will report to Bohol Provincial Government, who will then undertake data checking, calculation of emission reduction, site visits and provision of advice to the municipalities. Bohol Provincial Government will also be responsible for communication with Designated Operational Entity (DOE) for verification procedures. Items monitored by Tagbilaran City and Bohol Provincial Government are included in the figure below.

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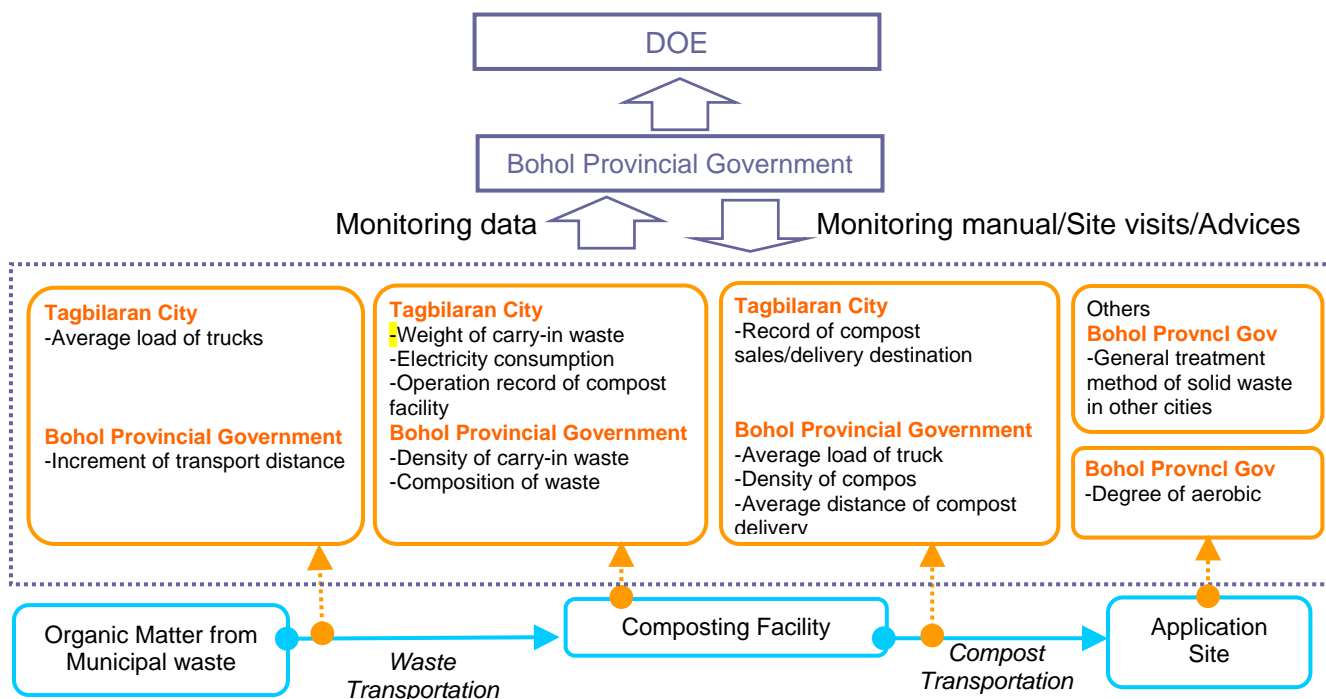
Figure 3. Monitoring plan for this CPA

(ii) Monitoring method
The detail information of the monitoring items and their monitoring method are described below.

Data / Parameter:	W_x
Data unit:	tons/year
Description:	Total amount of organic waste prevented from disposal in year x (tons)
Source of data to be used:	Measurements undertaken by the composting plant operator of each CPA
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:	[Type 1] For small-scale project (Type1), measurement will be taken by the compost facility operator. The weight will be estimated by the volume and the density of the waste. For Type 1 CPA, measurement by number of bags (boxes) used for transporting organic waste can be used. In this case, the mean weight of a bag (box) filled with organic waste shall be measured and used. [Type2, 3] All the collected organic wastes will be weighed by each composting facility operator using scales on site before the material is transferred to composting process. [Type1~3]

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	Measurements will be conducted daily and the data is recorded and compiled in either digital or analogue format. The data will be sent regularly (at least annually) to Bohol Provincial Government for checking and computation.
QA/QC procedures to be applied:	Potential error is low. Commercially available scales will be used for measurement. Procedures will include regular calibration of scales since error could increase if scales are not calibrated.
Any comment:	

Data / Parameter:	$Q_{y,comp}$
Data unit:	tons/year
Description:	Quantity of compost produced in the year
Source of data to be used:	Measurements undertaken by the composting plant operator of each CPA
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:	All the collected organic wastes will be weighed by each composting facility operator using scales on site before the material is transferred to composting process. For Type 1 CPA, measurement by number of bags (boxes) for organic waste transportation can be used. In this case, the mean weight of a bag (box) filled with organic wastes shall be measured and used as measurement unit. Measurements will be conducted daily the composting facility operator of each CPA and the data is recorded and compiled in either digital or analogue format by them. The data will be sent regularly (at least annually) to Bohol Provincial Government for checking and computation.
QA/QC procedures to be applied:	Potential error is low. Commercially available scales will be used and regular calibration of scales will be done in order to avoid error increase.
Any comment:	

Data / Parameter:	$P_{n,j,x}$
Data unit:	-
Description:	Weight fraction of the waste type j in the sample n collected during year x
Source of data to be used:	Sampling by the municipal engineer in each municipality
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:	Bohol Provincial Government using proper equipment for weight fraction measurement will conduct sample measurement quarterly. Waste types include: (i) Pulp, paper, cardboard (other than sludge), textiles (ii) Wood, wood products and straw; (iii) Other (non-food) organic putrescible garden and park waste and (iv) Food, food waste, sewage sludge, beverages and tobacco in accordance with the waste types in IPCC 2006 Guidelines for

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	National Greenhouse Gas Inventories (adapted from Volume 5, Table 3.3)
QA/QC procedures to be applied:	Potential error is low. Each municipality will take sufficient samples to ensure a maximum uncertainty of 20% at a 95% confidence level. Regular calibration will be conducted and technical engineers will ensure proper procedures of sampling.
Any comment:	

Data / Parameter:	CT_y
Data unit:	tons/truck
Description:	Average truck capacity for waste transport
Source of data to be used:	Based on the size of trucks to be used for waste transport
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:	Bohol Provincial Government will record the capacity of truck to be used for waste transport annually.
QA/QC procedures to be applied:	Potential error is low. The capacity data will be obtained by the record provided by the manufacturer.
Any comment:	

Data / Parameter:	$PE_{y,power}$
Data unit:	t CO_2e/year
Description:	Based on record of power and/or fuel consumption for composting facility operation
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:	Power consumption will be monitored by electricity meter in kWh on a monthly basis and fuel consumption will be recorded by fuel purchase bill compiled by composting facility operator of each CPA. Bohol Provincial Government will gather data annually.
QA/QC procedures to be applied:	Potential error is low. Accuracy of commercially available analog meters to be used is high (error <5%) provided periodic maintenance is undertaken. Technical engineers will conduct regular calibration.
Any comment:	

Data / Parameter:	DAF_w
Data unit:	km/truck

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Description:	Average incremental distance for solid waste transportation.
Source of data to be used:	Based on the distance of waste transportation by comparing the current waste transportation of related municipalities and the waste transportation plan developed for each CPA.
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:	Incremental distance will be monitored using odometer by Bohol Provincial Government based on the current waste transportation distance and the waste transportation plan developed for each CPA.
QA/QC procedures to be applied:	Potential error is low.
Any comment:	

Data / Parameter:	DAF_{comp}
Data unit:	km
Description:	Distance for destination of compost materials to be transferred
Source of data to be used:	Based on the mean distance from the composting facility to destination of the compost materials and the frequency of transport
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:	Distance will be estimated using rout map from the composting facility to destinations of the compost material. The composting facility operator of each CPA will record the destination and the frequency. Bohol Provincial Government will gather the data annually.
QA/QC procedures to be applied:	Potential error is low.
Any comment:	

Data / Parameter:	$CT_{y,comp}$
Data unit:	tons/truck
Description:	Average truck capacity for waste transport
Source of data to be used:	Based on the size of trucks to be used for compost material transport
Value of data applied for the purpose of calculating expected emission reductions in section B.5	
Description of measurement methods	Composting facility operator will monitor and record the capacity of the truck to be used for compost transport. Bohol Provincial Government will gather the

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and procedures to be applied:	data annually.
QA/QC procedures to be applied:	Potential error is low. The capacity data will be obtained by the record provided by the manufacturer.
Any comment:	

Data / Parameter:	Aerobic degree of composting procedures
Data unit:	-
Description:	Based on the aerobic degree of the waste during composing process.
Source of data to be used:	Analysed data of the samples taken at composting facilities
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:	Samples of the waste under composting will be taken four times a year by Bohol Provincial Government to measure the aerobic degree of the composting process. The sample taking and the analyzing method will be based on the proper procedures under provision of technical engineers.
QA/QC procedures to be applied:	Potential error is low since the analysis will be conducted in a proper laboratory of the third party.
Any comment:	

Data / Parameter:	Soil application method to ensure aerobic condition of the compost.
Data unit:	-
Description:	Aerobic condition of the compost soil application
Source of data to be used:	Based on the soil application condition of the compost after distribution to the end users
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:	The soil application method of each destination will be briefly recorded when if is distributed/sold to the end user by composting facility operator of each CPA. Bohol Provincial Government will gather the data annually and the spot check to take samples to analyse aerobic degree of the compost will be conducted quarterly by Bohol Provincial Government.
QA/QC procedures to be applied:	Potential error will be low since the analysis will be conducted in a proper laboratory of the third party.
Any comment:	

Data / Parameter:	Presence of a methane recovery facility at disposal site used by municipality
Data unit:	-
Description:	Demonstration that the amount of waste composted in the project activity facilities would have been disposed in a solid waste disposal site without

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	methane recovery
Source of data to be used:	Site visits to disposal sites by Bohol Provincial Government
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:	Observation of the presence or absence of a gas collection and use facility.
QA/QC procedures to be applied:	Potential error is not expected.
Any comment:	

C.1.   Please indicate the level at which environmental analysis as per requirements of the CDM modalities and procedures is undertaken. Justify the choice of level at which the environmental analysis is undertaken:

☐   Please tick if this information is provided at the PoA level. In this case sections C.2. and C.3. need not be completed in this form.

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

Environmental management plan (EMP) for this CPA will be submitted to National Environmental Agency (DENR)

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

The capacity of the composting facility to be installed in the CPA is more than 15 MT/day, however, the location of the facility is not in ECA (environmental critical area). Therefore, according to Philippines Department Administrative Order (DAO) 2003-30, this CPA is not required to submit Initial Environmental Examination (IEE) report which is equivalent to environmental impact assessment.

SECTION D.   Stakeholders' comments
>>

D.1.   Please indicate the level at which local stakeholder comments are invited. Justify the choice:

☒   Please tick if this information is provided at the PoA level. In this case sections D.2. to D.4. need not be completed in this form.

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As indicated in the proposed PoA, a public consultation was held at the PoA level where representatives from the National Environmental Agency (DENR), Bohol Provincial Government, municipalities, research institutions, universities and environmental NGOs were invited and given the opportunity to discuss and provide comments to the PoA.

In addition to the public consultation at the PoA level, CPAs will invite and compile comments from local citizens by hosting a public consultation at the CPA level.

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

Local citizens will be invited to participate in a public consultation where they will receive information on the objectives, process, implications and benefits for sustainable development of the CPA. Representatives from the local office of the National Environmental Agency (DENR), Bohol Provincial Government and Tagbilaran City Government may also be present at the consultation. Comments from local citizens will be invited and compiled during this time.

D.3.   Summary of the comments received:

Comments from local citizens will be collected and summarized here.

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

The report on how the comments are received will be described here.

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Annex 1

CONTACT INFORMATION ON ENTITY/INDIVIDUAL RESPONSIBLE FOR THE SMALL-SCALE CPA

Organization:	City Planning & Development Coordinator, City of Tagbilaran
Street/P.O.Box:	
Building:	
City:	
State/Region:	Tagbilaran City
Postfix/ZIP:	
Country:	Philippines
Telephone:	(038) 411-2264 / (038) 501-7560
FAX:	(038) 235-5060
E-Mail:	
URL:	http://www.tagbilaran.gov.ph
Represented by:	Mr. Eduardo C. Macalandag, MSc.
Title:	
Salutation:	Mr.
Last Name:	Macalandag
Middle Name:	C.
First Name:	Eduardo
Department:	
Mobile:	091 8979 2755
Direct FAX:	Refer to above FAX number
Direct tel:	Refer to above Telephone number
Personal E-Mail:	emacalandag@yahoo.com

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No public funding is involved in this PoA and related CPAs.

Annex 3

BASELINE INFORMATION

Table 5 Parameters Used to Determine OX and MCF

	Type of landfill managed by municipality	Depth of landfill	Level of water table	OX	MCF
Tagbilaran City	Opendump	> 5m	low	0	0.8

Source: Information provided by municipality and site observation

Table 6 Population Estimates in the First Crediting Period

	2009	2010	2011	2012	2013	2014	2015
Tagbilaran City	101,724	104,360	106,963	109,455	111,915	114,351	117,384

Source: Based on census 2000 of the Provincial of Bohol and the population increase data obtained by each municipality

Table7. Estimated Waste Collection Ratio in the First Crediting Period [%]

	2009	2010	2011	2012	2013	2014	2015
Tagbilaran City	8%	8%	8%	8%	8%	8%	8%

Source: For Albuquerque, Corella, Cortes, Dauis, Maribojoc, Panglao, and Tagbilaran City: Data from Solid Waste Management Assessment created by each municipalities, for other municipalities: Data obtained by each municipality

Table 8. Estimated Organic Waste Generation in the First Crediting Period [tons/day]

	2009	2010	2011	2012	2013	2014	2015
Tagbilaran City	61.9	63.9	66.0	68.0	70.0	71.9	73.9

Source: Data obtained by each municipality

Table 9. Total Amount of Organic Waste Type *j* Prevented from Disposal ($W_{j,x}$) by the CPA [tons/day]

	wood	pulp	food	textiles	garden	others	total
2008	11.7	234.1	368.8	2.7	194.7	0.0	812.0
2009	23.4	459.8	627.7	5.3	365.2	0.0	1,481.3
2010	35.0	677.6	813.0	7.8	515.2	0.0	2,048.6
2011	46.6	888.0	948.6	10.2	647.8	0.0	2,541.2
2012	58.2	1,091.4	1,051.0	12.6	765.7	0.0	2,978.8
2013	69.7	1,288.3	1,131.1	14.8	871.2	0.0	3,375.1
2014	81.3	1,481.9	1,200.5	17.1	968.5	0.0	3,749.3
Total	325.8	6,121.1	6,140.7	70.5	4,328.3	0.0	16,986.4

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Table 10. Compost Production [tons/day]

	2009	2010	2011	2012	2013	2014	2015
Tagbilaran City	25.6	26.4	27.2	28.0	28.8	29.6	30.7

Remarks: Estimated compost yield from the organic waste is assumed as 0.4.

Table 11. Other Information Related to Baseline Scenario

	New facility or expansion of existing one	Landfill Gas Collection
Tagbilaran City	New	No

Annex 4

MONITORING INFORMATION

Refer to Section B.6.1 for the Monitoring Information.

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