2007 Commissioned by the Ministry of the Environment

2007 CDM/JI Project Study

Feasibility Study on Emission Free Community Composting Programmatic CDM in Bohol, Philippines

Summary Report

March 2008

EX Corporation

1. Objective of the Study

This study aims to investigate the feasibility of an emissions reduction program of greenhouse gases that meets the needs of developing countries under the new programmatic Clean Development Mechanism (CDM) approach.

2. Project Overview

(1) Project Background and Objectives

The Ecological Solid Waste Management Act (RA9003), issued by the Philippine Government,, requires all final disposal sites to be converted into sanitary landfills by 2006, and mandates 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, as well as other resource recovery activities. Despite such national efforts to promote sorting of waste and the reduction of waste materials through composting, very little progress has been made at the municipality levels to implement composting projects, mainly due to the lack of funds.

Bohol Province is an island province in the Philippines located in the Central Visayas region. It is the tenth largest island in the country with a population of approximately 1.14 million, and the provincial capital is located at Tagbilaran City[1]. Bohol Province has been one of the forerunners in the Philippines and Southeast Asia in regards to their environmental efforts, and it was the first local government in Southeast Asia to establish an Environmental Management System (EMS) as well as receive ISO 14001 accreditation. As part of their strong commitment to the environment, Bohol Province has adopted RA9003 and is promoting the construction of composting facilities to improve the sanitary condition of existing landfills. However, due to financial barriers, very little progress is made, and only few community level composting programs have been initiated.

Therefore, the Emission Free Community Composting Programmatic CDM in Bohol, Philippines (hereafter, the "Project") may support and further promote such efforts made by the Province of Bohol by providing financial and technical assistance through a composting CDM project. The Certified Emission Reduction (CER) generated through the programmatic CDM has the potential of making the composting projects financially viable. In addition, technology transfer will occur through the implementation of appropriate composting technologies.

The increase of composing facility as a result of to this effort will bring about "co-benefits," not only at the local level by solving regional waste management issues, but also at the global level by reducing greenhouse gas emissions by preventing the emission of methane generated from conventional waste treatment process. Furthermore, the successful implementation of this project has a potential of being applied to other developing nations facing similar economic, social and environmental issues.

(2) Project Overview

This study investigates the feasibility of implementing a composting programmatic CDM through the participation of the 48 municipalities, or local government unit (LGU), of the Bohol Province and examines the greenhouse gas emission reduction potentials from composting.

The study divides Bohol Province into five clusters in order to analyze composting technologies that are most suitable for each composting project, taking into consideration the unique regional characteristics. The Project will make available three technology options, in order that each composting project may choose a composting technology that best suits their composting scale and needs. Futuristically, the Project intends to establish a "Compost Fund,", where financial assistance can be

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

provided to waste management efforts that support the further development of CDM projects.

(3) PoA and CPA

This Project is a programmatic CDM project that consists of Program of Activity (PoA) and CDM Project Activities (CPAs). Figure 1 describes the general layout of the PoA and CPA.

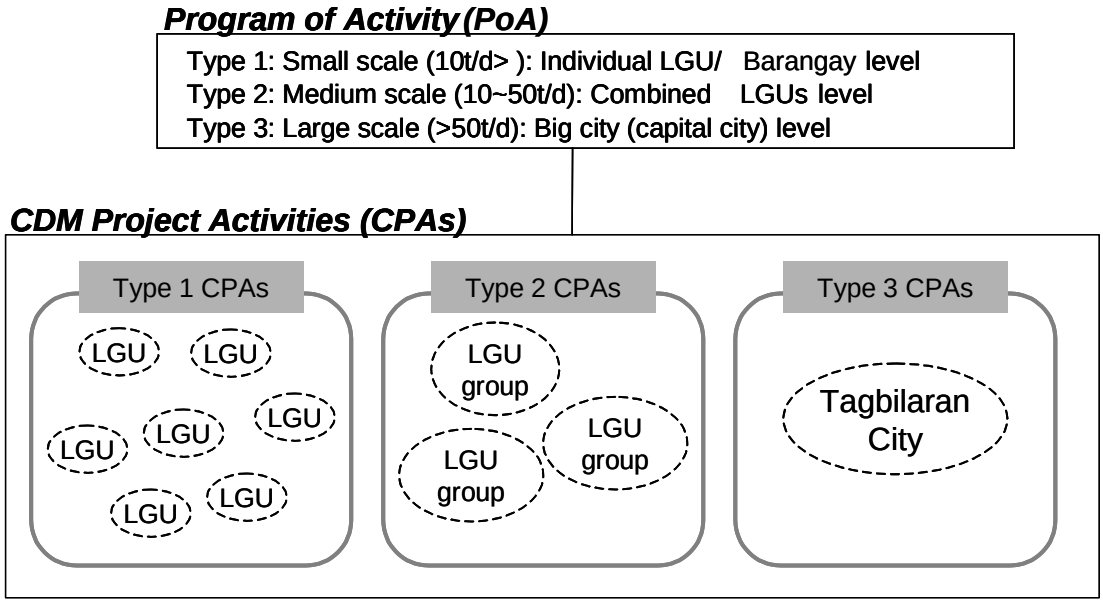

Figure 1. PoA and CPA Layout

As illustrated in Figure 1, each project activity will be divided into Type 1～3 depending on their regional characteristics and biodegradable waste quantity. In general, most municipalities are expected to implement the Project with other municipalities at middle or large-scale, because it would require less effort from individual municipalities in terms of the management of the CDM project, such as monitoring, etc. However, for some municipalities, due to high transportation costs and/or geographic conditions (i.e. municipalities that are isolated islands), implementation of the project individually may be preferred.

Although composting activities at the household level would bring about significant improvement to the current waste treatment conditions in Bohol Province, this Project will not include household composting as part of the PoA due to the difficulty of monitoring[2].

(4) Implementation Framework

Figure 2 illustrates the implementation framework of the proposed Project. The project participants and their main responsibilities are provided below.

■ Kajima Corporation
- ➢ Provide financial contribution to the Compost Fund
- ➢ Receive CER proportionate to their contribution

■ EX Corporation
- ➢ Provide assistance and advice to the Project's managing entity

[2] SSC AMS-III.F, requires the monitoring of the composting waste materials and the produced compost

- Distribute project manuals to municipalities, etc.

■ Bohol Provincial Planning and Development Office (PPDO)
- Managing entity of the PoA
- Communicate with DOE
- Manage Compost Fund
- Manage and assist CPAs
- Negotiate Emission Reduction Purchase Agreement (ERPA)

■ Compost Fund
- Fund to implement programmatic CDM
- Run by PPDO (managing entity of the PoA)
- Distribute funds to CPAs and for Fund operation based on management methods decided by stakeholders
- Third party audit will be conducted for transparent operation

■ Municipalities
- Bear partial cost of composting project
- Implement composting project
- Monitor CDM parameters

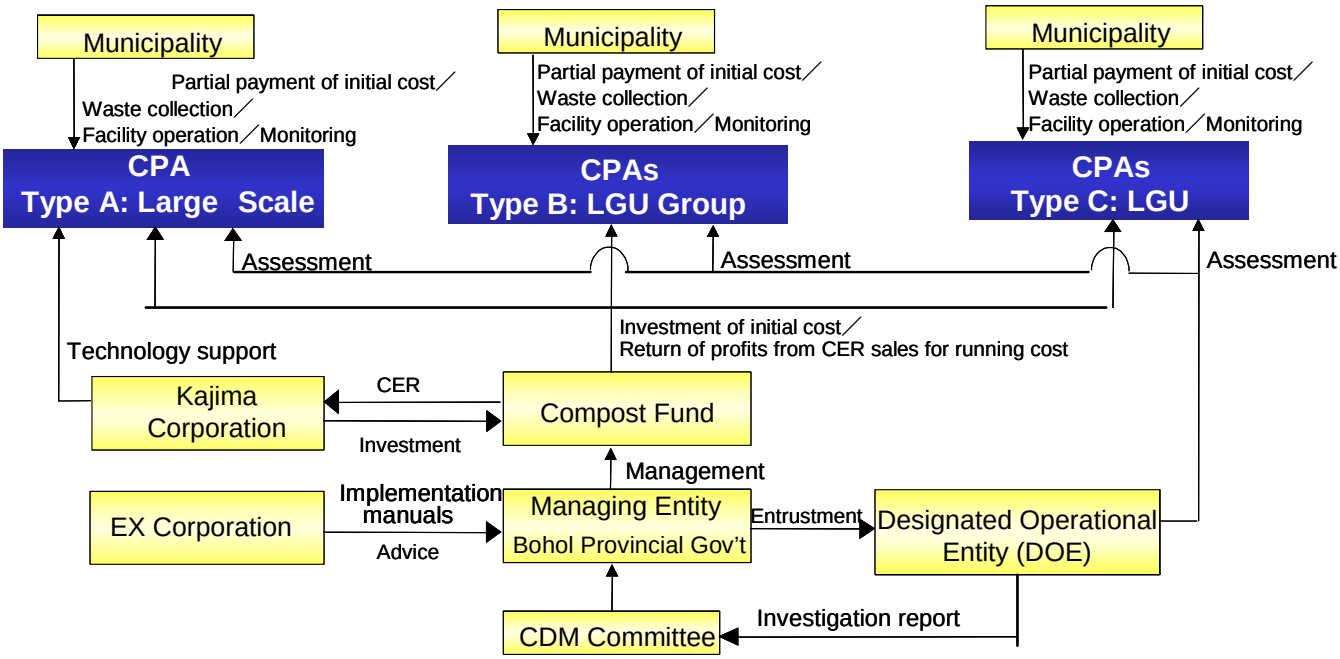

Figure 2. Implementation Framework

(5) Overview of Technologies

Composting is one of the most common waste management methods where the organic content of waste is fermented, decomposed and stabilized through an aerobic process usually by bacteria. Composting has various benefits such as reducing the waste volume through decomposition of organic matter and water

evaporation, as well as producing useful fertilizer and soil amendment through appropriate composting process. The following figure describes the general processes involved in composting

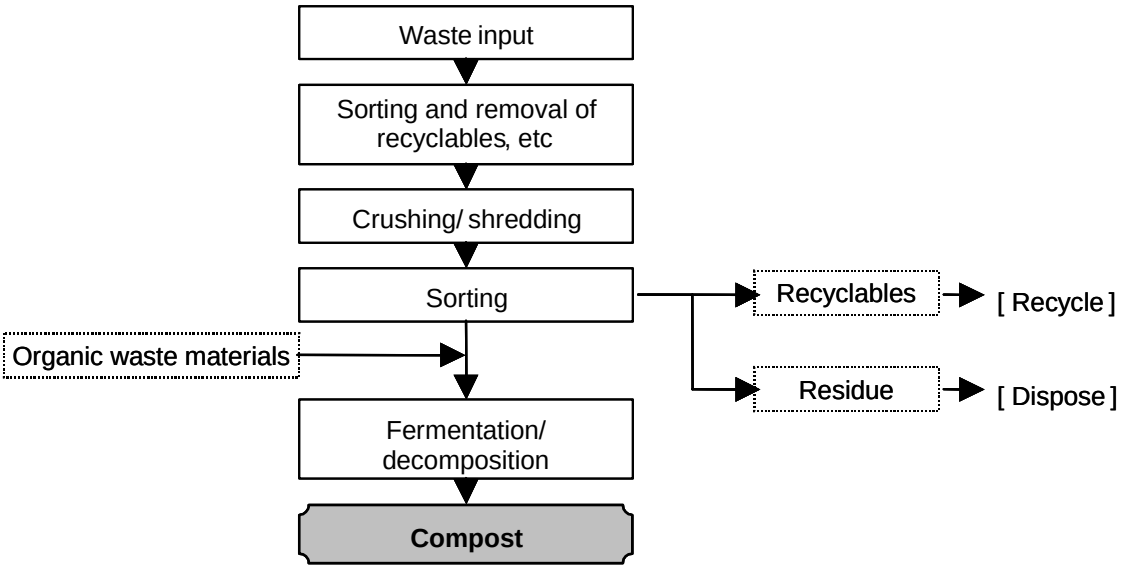

Figure 3. Waste Composting Process (Mixed Waste)

(6) Project Boundary

PoA Boundary

The PoA boundary is set within Bohol Province. PoA boundaries should be set to include the largest possible area. Considering the fact that the Project is undertaken through the efforts of Bohol Province, and that managing composting projects outside the Provincial boundary would be difficult, the project boundary of this PoA is set at Bohol Province.

CPA Boundary

According to SSC AMS-III.F, CPA boundary y will be defined as follows.

- Landfills owned by municipalities– site of solid waste disposal and methane generation without the implementation of the PoA
- Composting facility
- Compost application site
- Solid waste, effluent (in case of mixing compost with effluent) and compost transportation route

(7) Project Implementation Period and Crediting Period

Project Implementation Period

Maximum implementation period of the PoA is 28 years. Implementation period of CPAs may vary depending on the speed and extent of the dissemination of the Project, however, it is estimated to be within the Project period.

Crediting Period

Maximum crediting period of the PoA is 28 years. For CPAs, crediting period will be set at seven years that can be renewed up to twice (maximum 21 years).

(8) Project Schedule

Bohol Provincial Government and municipalities in Bohol are very supportive of this Project, and their enthusiasm towards composting CDM is very high. Therefore, letters of intention (LOIs) from municipality leaders will be gathered shortly after the conclusion of this study. If/when sufficient numbers of LOIs are received, efforts to implement this Project will be resumed, and the Project will sign memorandums of understanding (MOUs) with participating municipalities for PoA registration. In addition, the Project will initiate the validation process as well as apply for letters of approval from the governments of Japan and the Philippines. In regards to the Compost Fund, methods to distribute funds, decision-making process regarding Fund operation and auditing process will be decided in 2008. Composting facilities are aimed to be established, starting in 2009. After 2009, construction and operation of composting facilities are planned to continue.

		2008																2009	
		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec		Jan		Feb	
		15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30	15	30
1	**Consensus Building for PoA**																								
	Development of MOU for PoA							o																	
	Establishment of MOU									o															
2	**Development of CPA Project**																								
	Collection of letters of intent			o				o																	
	Individual consultations							o		o				o				o				o			
	Development of individual CPA MOU													o											
	Establishment of individual MOU													o											
	Collection of stakeholder comments (local citizens)													o											
	Drafting of CPA-DD																								
3	**UNFCCC Project Registration**																								
	Validation - PDD desk review - Field survey - Validation report																	o							
	Application for national approval																	o							
	Approval from Japanese Government																	o							
	Environmental Impact Assessment at target site									o				o											
	Application to UNFCCC																								
	- Collection of public comments																								
	- Registration application																								
	- Registration																								
4	**Establishment of the Compost Fund**																								
	Development of terms and conditions									o															
	Hiring of staff									o				o				o				o			
	Development of CDM implementation manual									o				o				o				o			

Figure 4. Project Registration Schedule

	2007	2008	2009	2010	2011	2012	2013	'''
	GEC F/S	Japan, Philippine National Approval						
UNFCCC Project Registration	PDD Production	Validation/Registration						
Establishment of EFCA		Development of Terms, etc	Establishment					
First Phase Project Implementation			Construction/installatio	Compost production/utilization				
Second Phase Project Implementation				Construction/installatio	Compost production/utilization			
Third Phase Project Implementation					Construction/installatio	Compost		

Figure 5. Project Implementation Schedule

3. Baseline Scenario

(1) Establishment of the Baseline Scenario

Results from the survey[3] taken through the feasibility study indicated that in Bohol Province, 17 municipalities treat their waste in open landfills and 16 in managed treatment sites[4]. No municipalities who participated in the survey had sanitary landfills (Figure 6). Furthermore, the waste collection rate in Bohol Province is relatively low at 55% of the total population living within the waste collection area in Bohol. In areas where waste is not collected, municipalities claim that waste are being composted in individual households at their backyards. However, the study frequently witnessed waste compiled in mountains during site visits, where methane is likely to be generated through the decomposition process.

There are only seven small-scale composting facilities operating within the province (Figure 7). One of the major reasons of the low adoption rate is the high implementation cost and the low profit generated from compost sales. It is economically difficult to producing high quality compost that have a high market value under present conditions.

For this reason, the baseline scenario of this Project is the scenario where waste is treated in landfills where methane is generated through anaerobic fermentation.

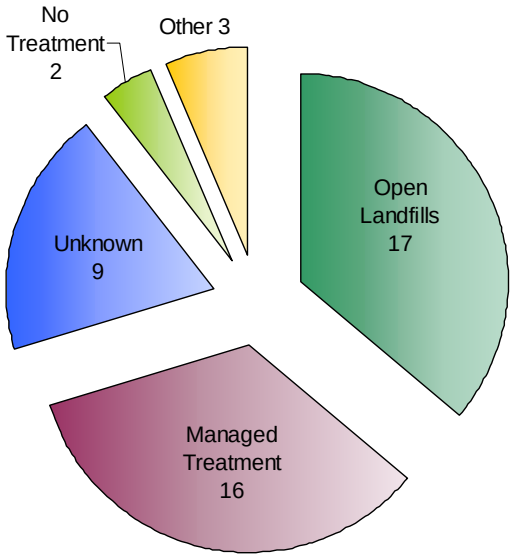

Figure 6. Waste treatment Methods by Municipalities

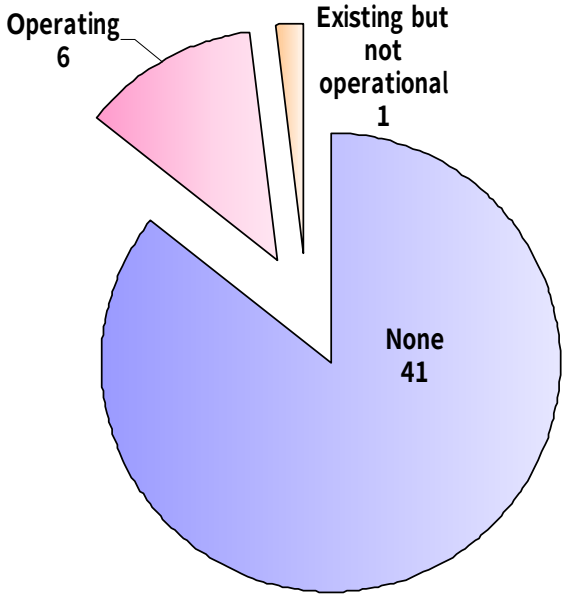

Figure 7. Composting Faclities in Municipalities

(2) Potential of Technology Dissemination in the Philippines

With the establishment of RA9003, the Government of Philippines has been promoting composting, along with re-use and recycling, for the reduction waste. Since very little progress has been made for the promotion of these efforts, there is a very high dissemination potential of the technologies involved in this Project.

(3) Methodology

Methodologies applicable for this Project are, AM0025, "Avoided emissions from organic waste composting at landfill sites," and SSC AMS-III.F. "Avoidance of methane production from biomass decay through composting, (Version 5)." For the purpose of simplifying the monitoring and other processes,

[3] The survey had a 83% response rate
[4] Sites with periodic soil application for coverage

methodologies of SSC AMS-III.F. will be applied in this Project.

(4) Evidence of Additionality

Determination of additionality will be established in line with Attachment A of Appendix B of the "Simplified Modalities and Procedures for Small-Scale CDM project activities." The project participants will provide an explanation to show that the project activity would not have occurred without the PoA, due to at least one of the following barriers: investment barrier, technology barrier, barrier due to prevailing practice and other barriers. For CPAs implemented under this PoA, investment barrier, due to the low potential of income generation from compost sales, and barrier due to prevailing practice, where currently only seven small-scale composting facilities exist and 99% of waste are treated at landfills, will be applicable to all CPAs.

4. Calculation of Emission Reductions of Greenhouse Gas

(1) Calculation of Emission Reductions

The baseline scenario of this PoA and the emission volume from this Project are calculated as follows. The emission reduction is the difference between the baseline emission and the Project emission.

Baseline Emission = Methane generated at landfill sites − Methane broken down in baseline scenario × Global Warming Potential of methane

Project Emission = Emission from incremental transportation + Emission from electricity or diesel consumption

Emission Reductions = Baseline Emission − Project Emission

(2) Basic Data Necessary for Baseline Emission Projection

The following basic data is necessary for the calculation of baseline emission.

■ Waste Generation Volume

Basic data required to calculate emission reductions of greenhouse gas was obtained from an independent survey conducted during the feasibility study and waste management reports of individual municipalities. For municipalities without these reports, generation volume of organic waste was calculated by multiplying Bohol's average per capita waste generation volume (0.45kg/person/day) by the total population in Bohol.

■ Composition of Generated Waste

Since fermentation methods vary depending on waste composition, waste composition data is necessary for the calculation of projected methane emission. In this Project, waste composition data of Tagbilaran City, the capital of Bohol Province, was used, due to the relatively high reliability of their data[5]. In Tagbilaran City, industrial waste comprises a large portion of their total waste. However, in most municipalities, more than 90% of waste consists of household waste. Therefore, composition data of Tagbilaran City's entire waste was used for Tagbilaran City, while Tagbilaran City's household waste composition data was applied to other municipalities.

[5] Data for Tagbilaran City was obtained utilizing methods applicable to other municipalities.

Table 1. Composition of Generated Waste in Tagbilaran City

Waste Composition	Proportion (% of total general waste)	Proportion (% of total household waste)
Wood	2%	5%
Pulp	22%	12%
Food	19%	10%
Fiber	0%	1%
Leaves and branches	16%	31%
Inorgaic matter	41%	42%
Proportion of organic matter (compostable)	59%	58%
Total	100%	100%

(3) Projections of Greenhouse Gas Emission Reductions

■ Greenhouse Gas Emission Reductions by Clusters

Greenhouse gas emission reductions by clusters are indicated in Figure 8 below. The figure indicates that BIAD[6] 1, where the Tagbilaran City is part of, has a significantly higher emission reductions projection compared to the generally low emission reduction projections of other clusters.

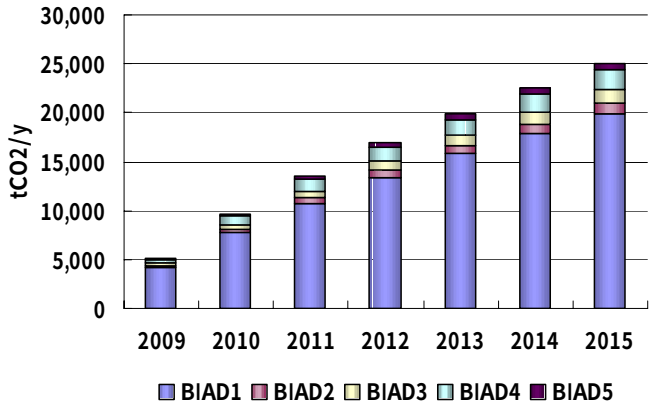

Figure 8: Greenhouse Gas Emission Reductions by BIAD

■ Greenhouse Gas Emission Reductions by Type

The study's findings show that the Project will have the following greenhouse gas emission reductions by project type (scale).

Table 2. Projections of Greenhouse Gas Emissions Reduction by Project Type

Case	Waste Volume (tons/day)	Project Type	First Year Emissions (tCO_2/year)	Total Emission during First Commitment Period (tCO_2)	Total Emission during Crediting Period (tCO_2)
Case 1	1	Type 1	17	138	337
Case 2	10	Type 2	171	1,379	3,367
Case 3	50	Type 2	855	6,894	16,837
Case 4	100	Type 3	3,466	30,376	72,735

[6] Bohol Integrated Area Development

5. Project Impacts

(1) Environmental Impact Assessment

In the Philippines, requirements for an environmental analysis, or the Environmental Impact Statement (EIS), are stated within the Department Administrative Order (DAO) 2003-30. DAO 2003-30 states that, "organic fertilizer (composting) facilities with an annual production capacity exceeding 15 MT/day (or 5,475 MT annual capacity)" and "located in environmentally critical areas (ECA)" are required to complete and submit an Initial Environmental Examination (IEE) report. All other composting facilities are required to complete and submit an environmental managements plan (EMP).

(2) Project Impacts and Benefits

The following impacts and benefits are expected from the implementation of this PoA.

■ Environmental Impacts and Benefits
- Reduction of greenhouse gas emissions (longer operating life of final disposal site)
- Reduction of methane and odor generation

■ Social Impacts and Benefits
- Creation of employment (improvement of livelihoods and social status of those who are making a living by collecting and selling recyclable waste elements)
- Change of mindsets and awareness raising on waste treatment issues

■ Economic Impacts and Benefits
- Reduction of the "social costs of waste management" through the reduction of waste volume
- Higher agricultural production and lower production cost from the improvement of soil quality through compost application

■ Cultural Impacts and Benefits

Due to cultural and religious beliefs, there is a potential that some citizens in Bohol may be opposed to the utilization compost produced from organic waste materials for agricultural production. However, no other negative cultural impacts from the implementation of this Project are identified.

6. Stakeholder Comments

Public consultation was held from the 20th through the 21st of February 2008 for the purpose of gathering comments from stakeholders. A total of 150 participants from 44 municipalities, NGOs and research institutions attended the consultation. Many participants expressed high interest and enthusiasm towards the project, and no negative opinions were expressed during or after the consultation.

7. Project Viability

CER sales are estimated to be the only source of actual income generated from the composting Project. However, the cost saved from the reduction of waste volume to be disposed in landfills may also be accounted as part of the Project benefit. Therefore, the viability of this Project was calculated considering both benefits for Type 1 through Type 3.

Results of the cost-benefit analysis of the Project indicated that sufficient profits for a viable public project could be expected during the 2009-2012 period. However, if only the CER sales were

included in the analysis, results showed that there is a high potential that the costs of the Project would not be collected during 2009-2012, even for middle and large-scale projects.

8. Next Steps for Project Implementation

(1) Development of CPA Project Plan

Development of concrete implementation plans for CPAs is crucial. If municipalities choose to operate composting facilities independently, discussions will be held with individual municipalities. If municipalities choose to implement the Project in collaboration with other municipalities, or if municipalities would like to participate in composting projects where they transport their organic waste to composting facilities operated by other municipalities, discussions with the participation of all stakeholders, as well as individual consultations with each municipalities will be held to reach to an agreement in terms of waste acceptance fees, the distribution of initial costs, etc.

(2) Improvement of Waste Collection Rate

At present, waste collection rate in Bohol Province is low. The success of the compost CDM project highly depends on the amount of organic waste that can be collected for composting. Therefore, discussions between municipalities must take place to find ways to increase their budget allocation to improve waste collection efforts. In addition, considerations to implement low-cost waste collection alternatives such as the use of bicycle trailers in Barangays will be necessary.

(3) Operation of the Compost Fund

For the establishment of the Compost Fund that will manage the budget of the CDM project, the following actions are necessary.

- Decide and develop a method to collect operation cost from each CPAs (e.g. payment of a proportion of income generated from CER sales for fund operation)
- Hire Compost Fund staff for general management and operation of the Fund
- Decide and develop the terms and condition of the Compost Fund
- Select an auditing organization (in order to monitor that the fund management operation is carried oute in a just and transparent manner)