FY2010 CDM/JI Feasibility Study
Summary Report

Title of feasibility Study: Vietnam Municipal Solid Waste Composting Programme

1. Study implementing structure

Main Implementing Entity: Ichikawa Kankyo Engineering Co., LTD.(IKE)

FS Partners:

＜Host country＞Hanoi Urban Environment Company (URENCO):
Waste composition analysis, questionnaire survey on waste treatment technology trends, obtaining information related to waste management, study advisor

＜Domestic＞JACO-CDM (DOE): Pre-validation of PoA-DD, CPA-DD

Japan Organics Recycling Association (JORA): Composting facility planning, compost technology advisor

Japan Environmental Consultant (CUES): Field survey coordination, obtaining general and business information in Vietnam

2. Project overview

(1) Project outline

This project is programmatic CDM to support the Vietnamese Government's policy to extend the life of landfill sites while meeting increasing needs for organic fertilizer through the individual CDM project described below.

This PoA is conducted in accordance with the Vietnamese Government's policy to extend landfill life. In Vietnam, MSW is collected and treated by the cleaning sector of a waste management company directly managed by the local government or run as a public company. The association of these waste management companies (Vietnam Urban Environment and Industrial Zone Association, hereafter VUREIA) is supposed to become the CME of this project. Although VUREIA's goal is to spread correct waste management over Vietnam, CER management and monitoring under CER transaction plans has not been assigned as their responsibility. Therefore CER management and monitoring are voluntary activities for VUREIA.

In this project, separating and treating organic waste mixed in MSW under aerobic conditions without dumping it in the landfill site will reduce methane gas emissions from the landfill site. In the baseline scenario, mixed wastes are directly dumped in the landfill site and covered by the soil. Oxygen will not be supplied sufficiently and the landfill site will be anaerobic. Organic waste will decompose into CH4, resulting in a 21 times greater greenhouse effect than CO2. The project is the construction and operation of a composting facility that will decompose organic waste under aerobic conditions and emit CO2, which has a greenhouse effect much lower than CH4.

The first CPA is to construct a composting facility next to the landfill site owned and operated by Hung Yen city, Hung Yen province. MSW are collected by a public company and mixed waste will be brought to the facility. The amount of waste brought to the facility is estimated at 50 tons per day. In the facility, organic waste including kitchen and garden waste, paper and cloth will be separated mainly by hand and processed to compost. Compost will be sold to farmers around the city, used in the green spaces in the city, and enrich the earth for suburban tea plantations. Waste plastics that can not be composted will be washed briefly and sold to recyclers. IKE is considering investing in and operating this project and is assuming the project will start in the latter half of 2013.

(2) Adopted methodology

AMS-Ⅲ.F

3. Survey contents

(1) Survey subjects

① Obtaining information and evaluating project feasibility, sustainability, and profitability
   1) Studying technologies: technology enabling stable composting and producing fuel from compost residue
   2) Calculating project profitability: compost production and making fuel from compost residue
   3) Studying the funding plan
   4) Designing the project scheme (CPA level)

② Feasibility study of the Programmatic CDM. (Designing project scheme)
   Developing procedure for realization of the project by making VUREIA, CME candidate, understand the contents of CME work, by presenting arrangement of manpower and

schedule for action plan to VUREIA, by considering whole project operation scheme including cost sharing for CME operation, and by obtaining advice from MOC and MONRE.

③ Activities for making PDD, obtaining and organizing information

The results of the survey conducted last year will be confirmed and utilizing residue as fuel will be studied.

1) Survey on the baseline scenario
2) Survey on monitoring methodology and plan
3) Survey on project period and period for obtaining credit
4) Survey on calculating the greenhouse gas emissions quantity
5) Survey on environment impact
6) Survey on other indirect impact
7) Survey on stakeholder feedback
8) Making PDD
9) Conduct pre-validation

④ Evaluating co-benefit

⑤ Reporting and presenting the research results through a co-benefit seminar

(2) Survey contents

1) Preliminary research

① Study of the composting technology

- Based on the results of feasibility studies conducted last year in Hai Doung province, focusing on low initial cost and complete operation management, the preliminary research on the facility and machinery was conducted with JORA assistance.
- Basic survey on agricultural machinery including the maintenance system

② Obtaining basic information

- Data for the baseline scenario (amount of rainfall, temperature, waste analysis in Vietnam)
- Basic data on the Vietnamese economy and agriculture

③ Making PDD

- Based on the hypothesis individual PDDs were conducted on PoA and CPA.
- List items for detailed research

④ Considering the CDM business model

Make a draft of a report on the implementation structure and organizing the

elements necessary to implement the project.

2) First field survey

① Coordinating the research system

・ Confirm and sign the contract, schedule coordination with subcontractor.

② Making the agreement and coordinating with counterpart

Meeting with the counterpart was held

- to confirm the CME role
- to confirm the programmatic CDM contents
- to present the draft of the project implementation structure
- to present the facility concept
- to share and discuss funding plans and project feasibility

Meeting with committee from Hung Yen province and city

- to share the survey content
- to discuss the schedule
- to request assistance with the survey

Meeting with the Hung Yen Administrative Co.(HYAC), which is managing MSW now, is held

- to confirm responsibility sharing
- to coordinate the survey schedule
- to request to obtain information

Visiting the CPA construction site

③ Reporting for JICA Vietnam about the project

④ Coordination for the co-benefit seminar: adjusting schedule and other details

3) Second field survey

① Site visit to Tien Gian province (a candidate for the CPA site)

② Confirming data and information obtained and implementing additional surveying

・ Compost facilities: Visited three compost facilities in Hanoi suburbs and obtained useful information for calculating the initial running costs: facility and machinery specifications, site area, building specifications, MSW characteristics and the compost condition.

・ Construction machinery distributors and truck dealers: Visited three distributors of the heavy machinery sold to compost facilities. Researched truck market prices.

・ Construction company: Visited Kajima Overseas Asia in HCMC and Hanoi

and obtained information on special regulations for construction and construction methods in Vietnam.

③ Implementing and monitoring MSW composition analysis

④ Interviewing potential users of compost and fuel made from residue: Hanoi University of Agriculture. Farmers in Hung Yen city, plastic buyers

4) Third field survey

① Implementing and monitoring the second MSW composition analysis

② Confirming data and information obtained and implementing additional surveying: confirming information obtained by URENCO (data on waste volume, evidence of waste composition analysis)

③ Interviewing potential users of fuel made from residue: brick company, laundry, boiler manufacturer, paper company

④ Coordinating the co-benefit seminar (VUREIA, Hanoi University of Agriculture)

5) Fourth field survey

① Holding the co-benefit seminar

② Site visit to Hung Yen: Visiting HYAC for interviewing their master plan and plan for expansion of landfill site. Visiting landfill site and regulating pond next to the site.

③ Confirming data and information obtained and implementing additional surveying

6) Co-benefit seminar

Co benefit seminar was held on 21st January 2011 mainly for local authority, URENCO or company like URENCO who can be candidate of the CPA site, to provide information for implementing CDM project and utilizing the residue from waste separation. Some comment about expectation of implementing this project in Vietnam and act ivies of IKE in Vietnam was provided by the attendee.

4. Survey results for implementing the CDM project

(1) Setting the baseline scenario and project boundaries:

① Setting baseline scenario and project boundaries, and adopting methodology

- CPA based on composting PoA will be conducted in Vietnam.
- The first CPA site meets the conditions above.
- The baseline scenario is that a landfill site will be used because there is no obligation to adapt intermediate treatment facilities such as composting facilities, which results in methane gas being emitted into the atmosphere.

Because CPA activities of the composting PoA would meet the conditions of AMS-Ⅲ.F, which are "Avoiding methane emissions through composting (Version 09)," one of the approved methodologies, the methodology is applicable.

a. Due to the project, decay is prevented through aerobic treatment by composting and proper soil application of the compost. The project does not recover or combust methane and does not undertake controlled waste combustion. The project activity does not recover biogas in the process of water treatment either.
b. The annual GHG emissions reduction will be the equivalent of 60 kt.
c. MSW or agricultural waste including livestock manure will be utilized by the project.

② Baseline emissions

The calculation formula of the baseline emissions is as follows:

$BE_y = BE_{CH4,SWDS,y} + BE_{ww,y} + BE_{CH4,manure,y} - MD_{y,reg} * GWP_{CH4}$

Where:

$BE_{CH4,SWDS,y}$	= yearly methane generation potential of solid waste
$BE_{ww, y}$	= (in the case of projects co-composting waste water) Baseline scenario of AMS-Ⅲ.D
$BE_{CH4,manure,y}$	= Baseline scenario of AMS-Ⅲ.D when utilizing livestock manure
$MD_{y,reg}$	= amount of methane that would have to be captured and combusted in the year "y" to comply with the prevailing regulations.
GWP_{CH4}	= GQP for CH_4

Because this project will not use manure or mix waste with water for compost and there is no regulation on capturing methane gas, the formula will be as follows:

$BE_y = BE_{CH4,SWDS,y} * GWP_{CH4}$

$BE_{CH4,SWDS,y} =$

$$\psi \cdot (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot 16/12 \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-kj \cdot (y-x)} \cdot (1-e^{-kj})$$

Table 1: CO2 emission in base line scenario

Year	Base line emissions (tCO2e/year)
2013	2,830
2014	5,094
2015	6,925
2016	8,420
2017	9,650
2018	10,671
2019	11,522
First 7 crediting years	55,112

(2) Project Emissions

① Project emissions consist of the following:

a. CO2 emissions due to incremental distances
b. CO2 emissions due to fossil fuel based energy and grid electricity consumption used by the project
c. Methane emission from the composting process
d. Methane emission from waste water treatment
e. Storing compost product under anaerobic conditions or methane emission when compost is brought to the landfill site.

The calculation formula of the project emissions is as follows:

$$PE_y = PE_{y,transp} + PE_{y,power} + PE_{y,comp} + PE_{y,runoff} + PE_{y,reswaste}$$

a. CO2 emissions due to incremental distances

$PE_{y,transp}$ = $(Q_y/CT_y) * DAF_w * EF_{CO2} + (Q_{y,treatment}/CT_{y,treatment}) * DAF_{treatment} * EF_{CO2}$

Q_y = quantity of organic waste, livestock manure, and co-composted waste water in the year "y"

CT_y = average truck capacity for waste transportation

DAF_w = average incremental distance for solid waste, livestock manure, and/or waste water transportation

EF_{CO2} = CO2 emission factor from fuel use for transportation

$Q_{y,treatment}$ = quantity of final compost product produced in the year "y"
$CT_{y,treatment}$ = average truck capacity for final compost product transportation
$DAF_{treatment}$ = average distance for final compost product transportation

b. CO2 emissions due to project using fossil fuel based energy and grid electricity consumption

$PE_{y,\ power} = PE_{electricity,y} + PE_{fuel,onsite,y}$

$PE_{electricity,y}$ = $MWh_{e,y} * EF_{CO2,grid,y}$
$MWh_{e,y}$ = quantity of grid electricity consumption in the year "y"
$EF_{CO2,grid,y}$ = CO2 emission factor of grid electricity
$PE_{fuel,onsite,y}$ = $F_{cons,y} * EF_{fuel}$
$F_{cons,y}$ = quantity of fuel consumption in the project
EF_{fuel} = CO2 emission factor from fuel use

c. Methane emission from composting process

$PE_{y,comp} = Q_y * EF_{composting} * GWP_{CH4}$

Q_y = quantity of organic waste and livestock manure and/or wastewater co-composted in the year "y"
$EF_{composting}$ = CO2 emission factor from composting from organic waste and livestock manure
GWP_{CH4} = GHG factor of methane gas

d. Methane emission from waste water treatment

$PE_{y,runoff} = Q_{y,ww,runoff} * COD_{y,ww,runoff} * B_{o,ww} * MCF_{ww,treatment} * UF_b * GWP_{CH4}$

$Q_{y,ww,runoff}$ = quantity of runoff water in the year "y"
$COD_{y,ww,runoff}$ = COD of runoff water from the composting facility in the year "y"
$B_{o,ww}$ = Methane producing capacity for the wastewater
$MCF_{ww,treatment}$ = methane correction factor for the wastewater treatment system
UF_b = model correction factor to grasp model contingency
GWP_{CH4} = GHG factor of methane gas

e. Storing compost product under anaerobic conditions or methane emission when the

compost is brought to the landfill site.

$$\psi \cdot (1-f) \cdot GWP_{CH4} \cdot (1-OX) \cdot 16/12 \cdot F \cdot DOC_f \cdot MCF \cdot \sum_{x=1} \sum_{j} W_{j,x} \cdot DOC_j \cdot e^{-kj \cdot (y-x)} \cdot (1-e^{-ki})$$

② Project emissions

The project results in emissions of 2,370 tons in 7 years, 339 tons per year.

Year	PE y, transp	PE y, power	PE y, comp	PE y, runoff	PE y, rewaste	Total
2013	55	229	0	54	0	339
2014	55	229	0	54	0	339
2015	55	229	0	54	0	339
2016	55	229	0	54	0	339
2017	55	229	0	54	0	339
2018	55	229	0	54	0	339
2019	55	229	0	54	0	339

③ Leakage

AMS-Ⅲ.F. states: "If the composting technology is equipment transferred from another project or if the existing equipment is transferred to another project, leakage effects are to be considered." Because the condition does not apply to this project, leakage would not to be considered.

(3) Monitoring Plan

① Adopted monitoring methodology

All the CPA will be monitored in this project. Because each CPA will adopt the approved methodology "Avoidance of methane emission through composting (Version 09)," the methodology monitoring plan will be adopted. And "Tool to determine methane emissions avoided from disposal of waste at solid waste disposal site Version 05 (EB55)" will be referred to.

② Monitoring items and frequency

Please see attached. In AMS Ⅲ.F., the amount of electricity used for the project is needed to calculate project emissions; fuel consumption, compost production volume and amount of samples which lack oxygen in the process of the composting will be measured directly.

③　Monitoring system

The basic monitoring system is shown in the table below. All the data will be computerized into electronic data and stored. The DOE will verify the original data, results and calculation method for emissions reduction. The DOE will issue the validation report and submit it to the CDM committee for CER issue.

Items	Person/organization in charge	Remarks
Organization of monitoring plan	VUREIA & IKE	Making manual and training staff
Implementation of monitoring (including monitoring the quantity of fuel and grid electricity consumption, compost production, and O2 and CH4 density from the project)	VUREIA & CPA project	All the data are computerized and stored. However some data are stored in paper form.
Monitoring requirements in the regulation related to waste management	VUREIA	The person in charge will report on related regulations.
Calibration of measurement equipments (Truck sale, power meter, O2 density meter, CH4 and COD analyzer)	Organization in charge of calibration	Calibration will issue calibration certification; compost producer will store the certification.

(4) Greenhouse gas reduction amount

GHG reduction amount during the project period is calculated as follows. GHG gas reduction will be 52,739 tons in 7 years and 7,534 tons per year on average.

Year	Estimation of project activity emissions (tonnes of CO_2 e)	Estimation of baseline emissions (tonnes of CO_2 e)	Estimation of leakage (tonnes of CO_2 e)	Estimation of overall emission reductions (tonnes of CO_2 e)
1	339	2,830	0	2,491
2	339	5,094	0	4,756
3	339	6,925	0	6,587
4	339	8,420	0	8,081

5	339	9,650	0	9,312
6	339	10,671	0	10,332
7	339	11,522	0	11,183
Total	2,373	55,112	0	52,739

(5) Project period- Credit period

The PoA period is assumed as 28 years; the project in Hung Yen city will start operation in 2013. The main facilities are heavy equipment and the estimated life expectancy of the facilities is 15 years because the operating hours per day are not that long and the equipment will be inspected regularly. For the time being, the guidelines on demonstrating and assessing the prior considerations for the CDM have not been submitted yet. IKE is coordinating this.

Considering economic growth in Vietnam, it is assumed that simple composting facilities would be used for 20 years; the economic level is sufficient to operate simple composting facilities comparable to those adopted in this project. The period for obtaining credit for the CPA would be once every 7 years after the 14th year of operation, and the CPA would be set at 7 years after the 15th year of operation. The starting date of the credit obtaining period of each CPA would be the date of the end of construction or test operations.

(6) Environmental and other indirect impact:

Each CIA needs to be conducted EIA under Vietnamese law. In the Hung Yen project, EIA has not been conducted yet for the first CPA candidate, although it was conducted for the existing landfill site. In Vietnam, project implementation needs to follow the five steps of 1) company establishment, 2) obtaining a business license, 3) concluding a land lease contract, 4) EIA and 5) implementing investment. Therefore, EIA is assumed to be conducted in the latter half of 2011 at the earliest.

Although the odor from the fermentation process of the composting plant could have environmental impact at the site where the landfill site already is, proper management can solve this problem. It is planned to consult with an EIA consultant in the country and the related department of Hung Yen city.

(7) Feedback from stakeholders:

The following feedback is from the Ministry of Construction and Hung Yen province at the PoA and CPA level in the first field survey. Further feedback will be obtained during the 4th field survey through the seminar or visiting directly.

Chart 5: Feedback from stakeholders (PoA level)

Stakeholders	Collection method	Feedback	Situation
Ministry of Construction, Vietnam (as a MSW governing agency)	Direct interview	Preferable that proper waste management and extension of landfill site will be conducted through this project	No major problems

Chart 6: Feedback from stakeholders (CPA level)

Stakeholders	Collect method	Feedback	Situation
Hung Yen city provincial committee (as both local government and citizen representatives)	Direct interview	Preferable that proper waste management and extension of landfill site be conducted through this project	No major problems

(8) Project implementation scheme

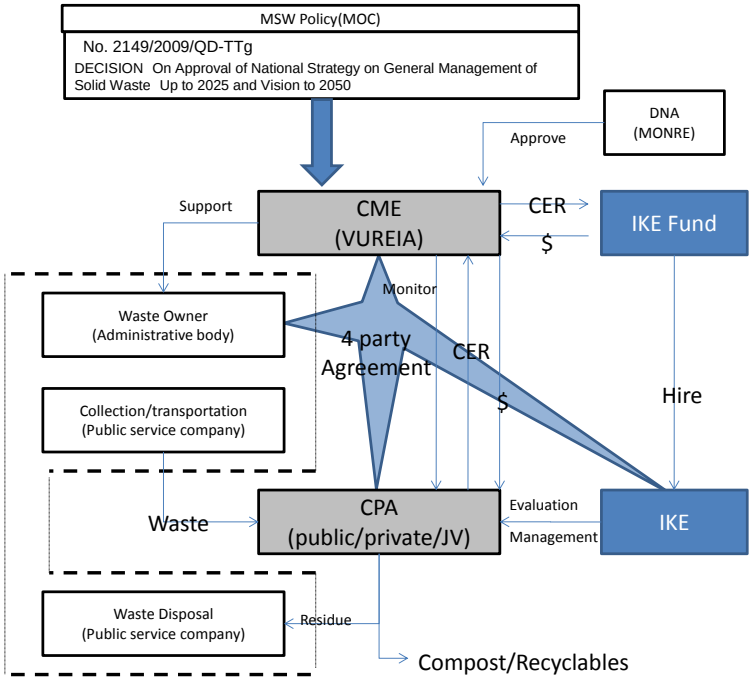

Figure1: PoA implementation structure

There are no capital ties between the CME and CPA owner. The IKE fund buying the CER expects to acquire CER steadily by supporting the CPA to manage the project properly. The CME needs support for funding the project, in the CDM procedure, and for technological guidance for monitoring, especially during the first stage. The CPA implementing entity needs support, especially for operation management, to acquire CER income by steadily composting. Because each separate people's committee has responsibility for specific aspects of MSW management, they expect a system that can confirm the certainty of the project tasks. Therefore, to share the profit between the CME, People's committees, CPA implementing entity, and IKE as the agent of the IKE fund will require agreeing to the above preconditions.

At first CPA IKE would be the CPA owner, and the preconditions would be in common between all CPA. Thus, the scheme is applied to this project. (The actual CPA would be managed by the SPC that IKE owns, and the scheme that IKE would support management would work.)

(9) Financial Plan

Table: Financial plan

		FY 2011		FY 2012		Total
Necessary Investment		619,445	7,924,240	6,428,446	6,366,007	21,338,138
	Land Acquisition	0				
	Civil/Building	0	3,150,063	2,362,547	2,362,547	7,875,157
	Machine/Equipment		3,506,648	2,629,986	2,629,986	8,766,620
	Cost for investment preparation	282,677	0		0	282,677
	Investment implementation cost		930,761	930,761		1,861,523
	Cost after investiment		0		170,214	170,214
	Contingence	336,768	336,768	505,152	505,152	1,863,841
	Operation cash (for one year)	0	0		698,108	698,108
	Interest rate(VN-EPF)	0	0			
	Interest during construction	0	0			
Finance		2,133,814	12,802,883	4,267,628	2,133,814	21,338,139
	Capital	2,133,814	12,802,883	4,267,628	2,133,814	21,338,139
Income and expenditure		1,514,369	4,878,643	-2,160,818	-4,232,193	1
Accumulative I&E		1,514,369	6,393,012	4,232,194	1	

● Capital structure		21,338,139
	IKE Group 100%	21,338,139
	0%	0

● JBIC Loan				
	Payment	10 years	Grance period	0
	Interest	1.40%	Upfront	0

● Japanese bank loan				
	Payament	7 years	Grance period	0
	Interest	3.00%	Upfront	0

The first CPA is planned to be invested in by IKE's own find. The following CPA would be invested in by other companies, private funds such as IKE or funds that IKE is planning to establish, or public funds by public companies and People's committee. The fund IKE is planning to establish would buy all CER.

(10) Economical analysis

It was estimated that the project could not be run without CER when it is compared with the long-term banking rate of Vietnam Bank, 9%.

	Construction period		Operation period						
	−2	−1	1	2	3	4	5	6	7
● Profit and Loss									
Revenue	0.0	0.0	32.6	27.1	27.1	27.1	27.1	27.1	27.1
Cost	0.0	0.8	13.3	13.3	13.3	13.3	13.3	13.3	13.3
Sales Profit	0.0	−0.8	19.3	13.8	13.8	13.8	13.8	13.8	13.8
Interest pay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Depreciatio	0.0	0.0	7.8	7.8	7.8	7.8	7.8	7.8	7.8
Profit befor	0.0	−0.8	11.5	6.0	6.0	6.0	6.0	6.0	6.0
Business ta	0.0	0.0	0.0	0.0	0.0	0.6	0.6	0.6	0.6
Profit after	0.0	0.8	11.5	6.0	6.0	5.4	5.4	5.4	5.4
● Cash flow statement									
inflow	62.5	26.8	32.6	27.1	27.1	27.1	27.1	27.1	27.1
Outflow	34.2	52.0	13.3	13.3	13.3	13.3	13.9	13.9	13.9
Cash flow	28.4	−25.2	19.3	13.8	13.8	13.8	13.2	13.2	13.2
Accumulati	28.4	3.2	22.5	36.3	50.1	63.8	77.0	90.2	103.4
●IRR simulation (without CER)									
FCF	−34.2	−52.0	19.3	13.8	13.8	13.8	13.2	13.2	13.2
Accumulati	−34.2	−86.1	−66.8	−53.1	−39.3	−25.5	−12.3	0.9	14.0
IRROI	#NUM!	#NUM!	#NUM!	−0.4	−22.90%	−11.66%	−4.59%	0.28%	3.74%
●IRR Simulation (with CER)									
FCF	−34.2	−52.0	21.2	17.4	18.8	19.9	20.2	21.0	21.6
Accumulati	−34.2	−86.1	−65.0	−47.6	−28.8	−8.9	11.3	32.3	53.9
IRROI	#NUM!	#NUM!	#NUM!	−35%	−15.62%	−3.69%	3.72%	8.70%	12.12%

(11) Demonstration of additionality

Based on Methodological Tool: "Tool for the demonstration and assessment of additionality (Version5.2)" the additionality of this project was demonstrated.

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

Step 1a: Define alternatives to the project activity:

(Case 1) Composting (without being registered as a CDM project)

(Case 2) Landfill to a sanitary landfill site. Recovery and flaring of methane gas from landfill

(Case 3) Methane fermentation

(Case 4) Landfill to a sanitary landfill site (the status quo)

(Case 5) Incineration

(Case 6) RDF

Cases 3 and 5 require comparably advanced technology, and investment and operation cost would be high, rendering the feasibility of the cases low. Thus, these cases will not be evaluated further.

Case 6 was considered with the composting project by APT-Seraphin, the counter part of our feasibility study in 2009. The investment and running costs were high, but not as high as cases 3 and 5. Also, because caloric value of the RPF and other conditions would not satisfy the users, the feasibility of the case would be low. Thus the case will not be evaluated further.

Case 2 will not be evaluated further because methane gas recovery from landfill is not required by Vietnamese law, creating little incentive to invest.

Therefore, the following 2 cases would be the alternative scenarios:
(Case 1) Composting (without being registered as a CDM project)
(Case 4) Landfill to the sanitary landfill site (the status quo)

Step 1b: Consistency with necessary regulations
The only regulations are the guidelines to reduce the waste volume for prolonging the life of landfill sites in Vietnam.

② Step2: Investment analysis

Step 2a Specifications of proper analysis methodology
Composting from MSW is not widespread in Vietnam, but there are potential needs for the organic fertilizer. Thus, the expansion of the compost market is expected. The alternative scenario was evaluated by the investment comparison analysis.

Step 2b Investment comparison analysis
IRR was used as a barometer for comparing alternative scenarios. It was pre-conditioned as follows for equal analysis:

- 2 years of construction and 7 years of operation
- Same amount of treatment fee for both cases would be supplied by local government
- A new facility that can accept 50 tons per year for 15 years would be constructed in both cases.

Economic analysis shows that the direct landfill status quo is the most economical alternative: business as usual. Without CER, the IRR of the project would be below 9%, which is beneath the benchmark of basic interest of the Vietnamese central bank, 9%.

Table 9: Investment comparative analysis

	Options considered		
	Continuation of current practice	Composting without CDM	Composting with CDM
Quantity of MSW	50 tons per day (18,250 tons per year)		
Investment amount	10,360,238,000VND	21,338,000,000VND	
Operating costs per year (7years average)	908,192,000VND	3,347,242,000VND	3,957,543,000VND
Income per year	3,650,000,000VND	6,763,450,000VND	
CER Income per year (7 years average)	0VND	0 VND	2,034,338,000VND
Accumulated Free Cash Flow	9,053,018,000VND	3,507,130,000VND	13,475,338,000VND
IRR	17.18%	3.73%	12.12%

Sensitivity analysis

Sensitivity analysis for case 1 by considering the increase and decrease of income shows that IRR of any case would not be over 9%.

Table 10: Sensitivity analysis

Sensitivity analysis (capital cost)		
Description of scenarios	IRR	Values
Base case	3.73%	21,338,000,000VND
Decrease by 5%	5.31%	20,271,232,000 VND
Decrease by 10%	7.01%	19,204,325,000 VND
Sensitivity analysis (Total income)		
Description of scenarios	IRR	-

Base case	3.73%	6,763,450,000VND
Increase by 5%	5.93%	7,101,623,000 VND
Increase by 10%	8.03%	7,439,795,000 VND

③　Step 3: Barrier analysis

Step 3a: technical barrier

This project introduces composting produce from MSW to Vietnam. Because these kinds of facilities are not widespread in Vietnam, there would be technical risk for composting operation management. They could use the composting technology on their own, but it would be difficult to use a system suitable for Vietnam and train operation managers without sufficient experience. They would have to go through trial and error until obtaining sufficient experience. Also, because this requires funding, establishing a support scheme with CDM would help spread the technology quickly, reducing landfill and GHG.

Step 3b: Show the identified barriers would not prevent implementing at least one of the alternatives.

What needs to be evaluated is direct dumping for the landfill status quo. Direct dumping for the landfill have been adopted by many local authorities as a general method to manage waste, and have been implemented at a certain level. Thus, this can be implemented technically and economically in the situation as it is now. This case will not be a barrier for implementing case 4: Landfill to the sanitary landfill site (the status quo).

④　Step 4: Common practice analysis

In order to complement the results of Step 3, analyze the extent to which the proposed project type has already been diffused in the relevant sector and region.

Step 4: Analyze other activities similar to the proposed project.

There are 9 composting facilities in operation in Vietnam that are mentioned in the survey results of Hanoi URENCO; 6 of these have received equipment and funding from ODA. As there are 87 official landfills, landfill is the general practice.

As discussed above, a project similar to this project is not likely to be implemented, and being registered as a CDM Project is necessary to implement this project. Therefore, this proposed project activity is additional.

(12) Feasibility of the project

Cost for obtaining CER unit shall be high comparing to CDM project which has priority in obtaining CER itself. IKE is aiming to use CER as sub-income for us to develop business in developing countries such as Vietnam, which the society and the government could not pay enough cost for better waste management. This FS showed us that CDM will be supportive to our business strategy.

5. Pre-validation

The pre-validation, limited to desk review of the PDD, was entrusted to JACO CDM and reported to IKE on 21st February, 2011. No major issue was reported. What was pointed that need to be clarified would be clarified before Validation.

6. Study results on Co-benefit aspects

This project contributes to increasing landfill site life. The amount of landfill could be reduced to 17.3 % in weight (15,092.75t/year)The project also expects to decrease the organic in leachate water from the landfill site.

7. Study results concerning the contribution to sustainable development in Vietnam

The PoA can provide an opportunity for investment towards waste management projects development in small-midium size local authorities. As a result, the better waste management and recycling activities in these area will be provided.