Executive Summary

Chapter 1 Overview of Malaysia and the Background of the Project

Malaysia is one of the countries whose social and economic conditions are most stable in Asia. Since the country is also politically stable, many Japanese companies, centering on electronics and machinery, have invested to Malaysia. In addition, the "Look East" policy by the Malaysian government has boosted bilateral relations in areas of personnel exchange and economic cooperation.

Malaysia has also been working on the utilization of CDM scheme as a measure against global warming. The country seems the best choice among Asian countries for Japan to implement a CDM project because of its well-organized social structure and governmental management system.

Chapter 2 Overview of the Project

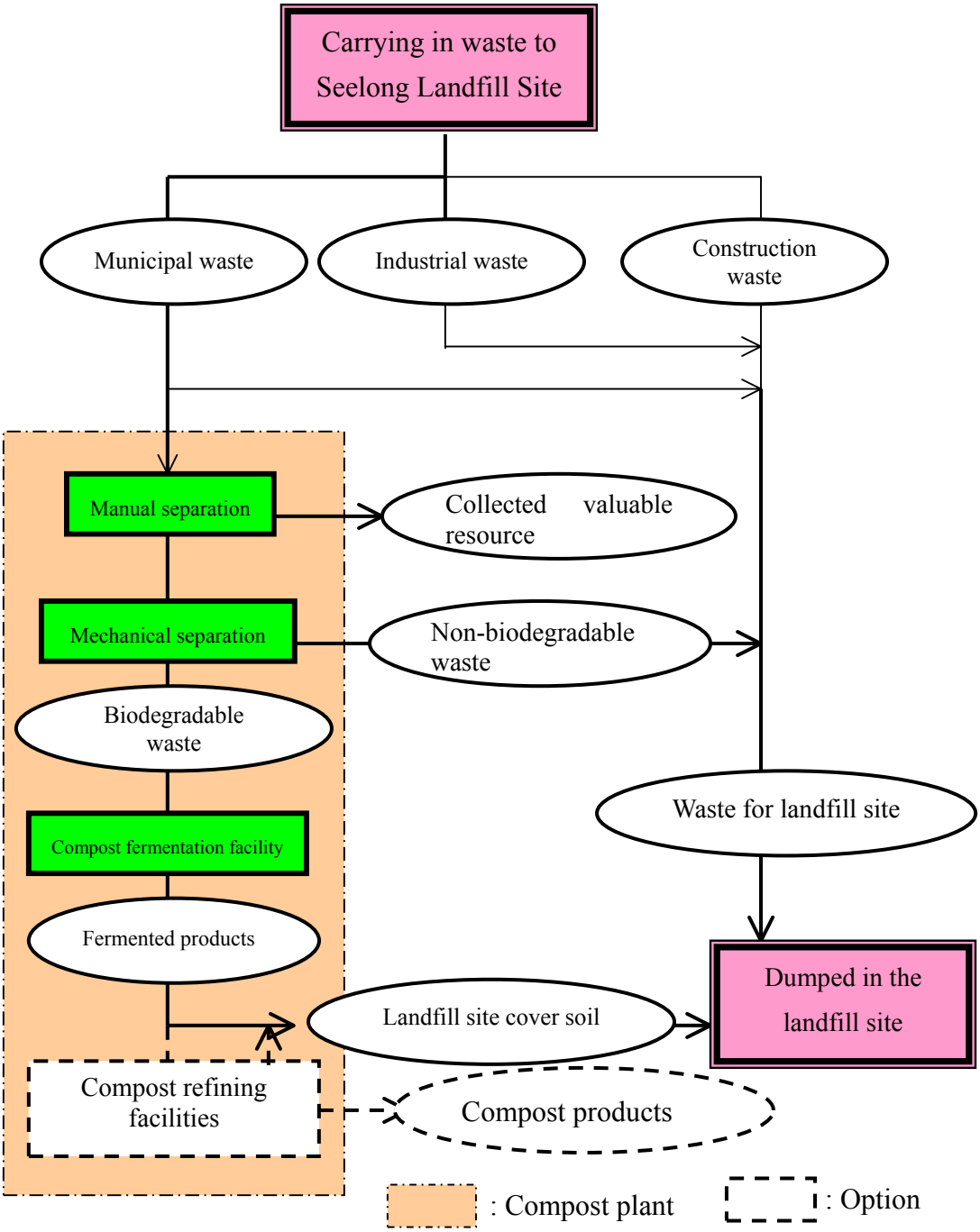
This project aims to build and operate an aerobic fermentation facility that treats 300 tons of biodegradable waste per day. The biodegradable waste, which is currently transported to a landfill site, will be collected from solid waste being generated in Johor. The aerobic fermentation facility can reduce emissions of methane gas that is otherwise emitted from the existing landfill site. This project can be regarded as a first step of a long-term total waste treatment program that covers recycling of compost and construction of recycling and incineration facilities. The project is expected to be a model for waste treatment policy in Malaysia.

Table 1 Concept of the Project

Stage		Objectives	Remarks
First step	This project (Aerobic fermentation of biodegradable waste and use of cover soil)	- Reduce in emission of methane gas - Intermediate treatment of waste - Reduction in load of leachate - Effective utilization of the landfill site	
Second step	Recycling of composts	- Effective utilization of the landfill site - Development of the recycling - Reduce in use of chemical fertilizers	- Separated collection of waste in cooperation with people is very important. - Government support for compost use may be also helpful.
Third step	Introduction of incineration facilities Introduction of recycling facilities	- Effective landfill site utilization - Reduce in methane gas emissions - Waste to Energy utilization	- High waste calories are important for efficient incineration. - Government needs to bear cost for material recycling.

This plant is designed assuming that the plant will be built next to the current landfill site. An overview of the plant is depicted in the following figure of the compost plant and the associated treatment flow.

Figure 1 Compost Plant and Treatment Flow



In addition, this plant is estimated to spend the following construction and maintenance costs, and utility volumes.

Table 2 Plant Construction Costs

Item	k RM	M Yen
Receiving facilities	310	9
Pre-treatment facilities	7,345	213
Fermentation facilities	7,517	218
Deodorizing facilities	3,310	96
Other miscellaneous facilities	310	9
Electrical instrumentation	6,862	199
CIF	2,414	70
Design cost, etc.	4,586	133
Spare items	345	10
Construction cost	17,172	498
Heavy equipment	1,552	45
Total	51,724	1,500

Table 3 Annual Maintenance Cost

Item	k RM	M Yen
Maintenance cost	776	22.5

Table 4 Utility Volumes for the Plant

Item	Unit
Electricity (plant operation day)	6,890 kWh/d
Electricity (no plant operation day)	2,530 kWh/d
Industrial water (for washing, supplementing, etc.)	22 t/d
City water (for employees)	6 t/d
Fuel (light oil for vehicles)	510 l/d
Lubrication oil (for vehicles)	9 l/d
Lubrication oil (for machines)	4 l/d

Chapter 3 Overview of the Base Line

The base line is based on the emission volume by the method whose technology is attractive in terms of economy, considering the obstacles against the investment. Financial and technological barriers against this project include the following:

Financial barriers

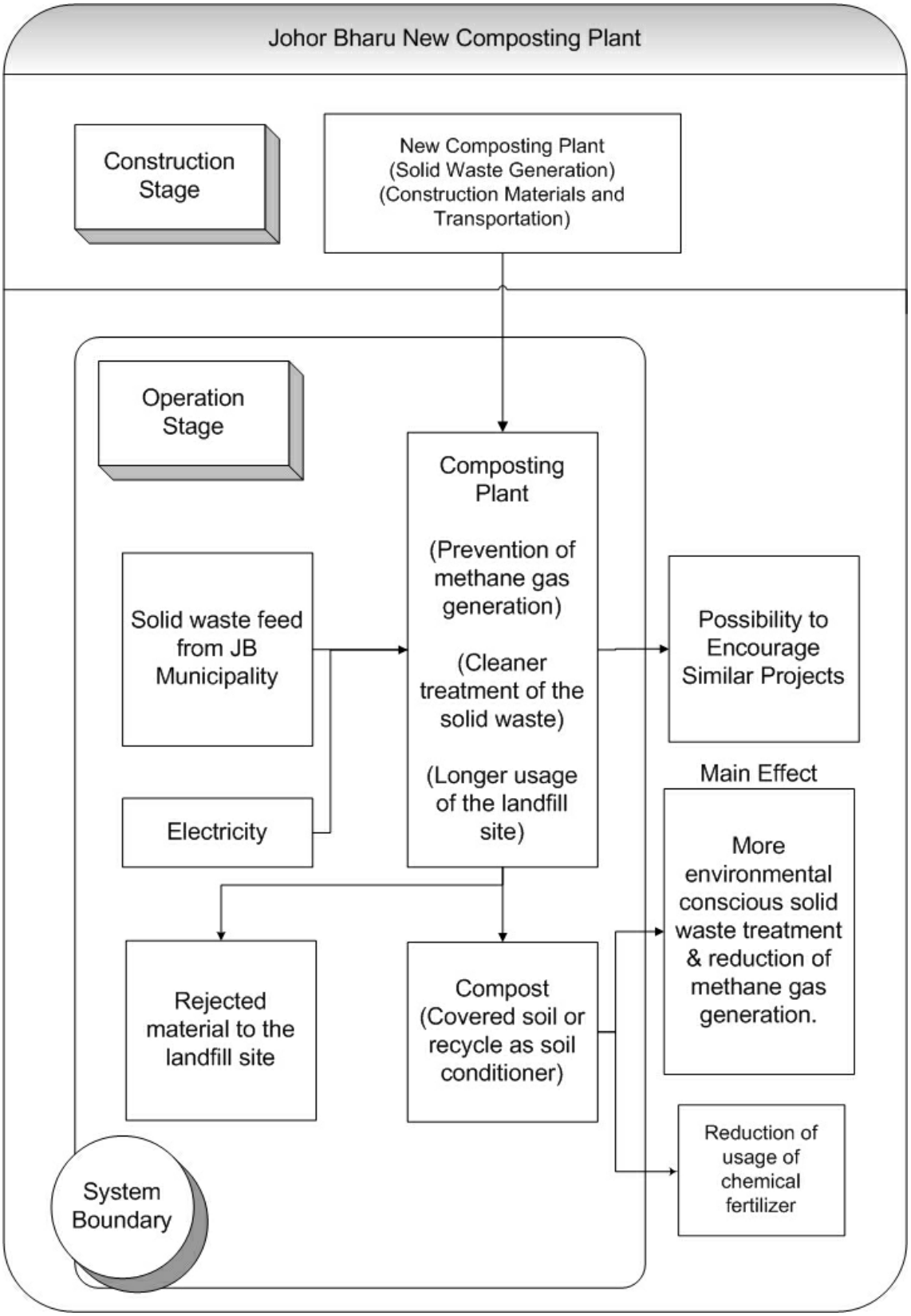
- This project aims to implement the appropriate treatment of waste and to reduce emission gases that result in global warming. The project itself does not yield cash flow. Therefore, additional investments in this project by the local government concerned will mean additional payments of tax, which requires political consideration and consent by local residents.
- There is no policy or financial support from central or local government for attracting investors (including overseas investors) who will implement this project.
- This plan provides no advantages (returns) in implementing the project in terms of financing.
- There are no economical advantages to introduce other treatment systems to be implemented (such as incineration, collection of methane gas, power generation with waste incineration).

Technological barriers

- The technology to be applied to this project is not at all popular in Malaysia in terms of scale and technology.

The figure on the following page shows the boundary of the project.

Figure 2 Overview of the Project Boundary



We assume that no additional investments in the construction of waste treatment facilities in the area are expected. Accordingly, the base line is based on the emission volume of methane gas, which is otherwise emitted from biodegradable waste dumped in the existing landfill site.

The following IPCC formula is used to calculate the generation of methane gas as the base line volume:

$$CH4Generation(Gg/yr) = (MSW_T \times MSW_F \times MCF \times DOC \times DOC_F \times F \times 16 \div 12 - R) \times (1 - OX)$$

Biodegradable waste, which is excluded from aerobic fermentation treatment in the separating machine in the plant, is directly dumped in the landfill site. Since this waste will generate methane gas, the expected methane gas volume from this source must be subtracted. Likewise, electricity used for the plant must be subtracted.
Accordingly, the amount of net GHG reduction will be calculated to be 104,810t annually.

Chapter 4 Monitoring Plan

The IPCC Default Method is applied to the calculation of a GHG generation volume, which is the base line. The following block diagram depicts monitoring points in the plant to calculate the GHG generation volume.

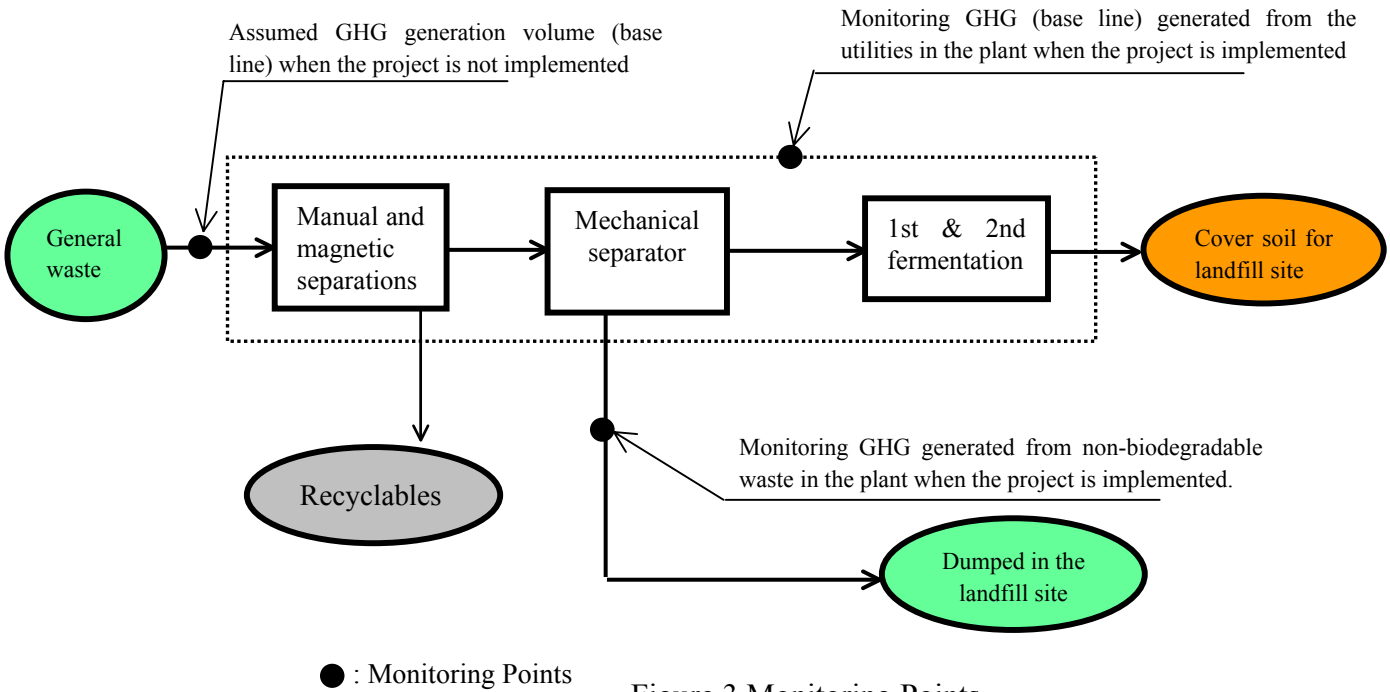


Figure 3 Monitoring Points

The following data are to be collected in monitoring.

Table 5 Data Collected in Monitoring

ID No.	Data type	Data variable	Unit	Monitoring frequency
1-1	Waste volume received	Waste humidity weight	t/d	Daily
1-2	Composition of waste received	(paper, cloth)、(gardening waste), (cotton and the like), humidity weight ratio (of food)	%	Monthly
1-3	Emission volume of non-biodegradable waste	Humidity weight of waste	t/d	Daily
1-4	Composition of non-biodegradable waste	(paper, cloth), (gardening waste), (cotton and the like), humidity weight ratio (of food)	%	Monthly
1-5	Power consumption		kWh	Daily
1-6	Power emission co-efficient	GHG generation volume per electricity generated	kg-CO2e/kWh	Yearly

Chapter 5 Environmental Impact Assessment (EIA)

We reviewed the EIA method and associated procedure in Malaysia. This construction and operation project needs to pay attention to the environmental impact, especially to the emission of bad odors. However, since anticipated impacts seem minor for local people and the environment, the project will be able to clear the regulated values.

Chapter 6 Project Implementation System and Funding Plan

To implement a CDM project, we have prepared the following two types of implementation systems and plans.

Figure 4. Project Implementation System Proposal 1 (Case 1)

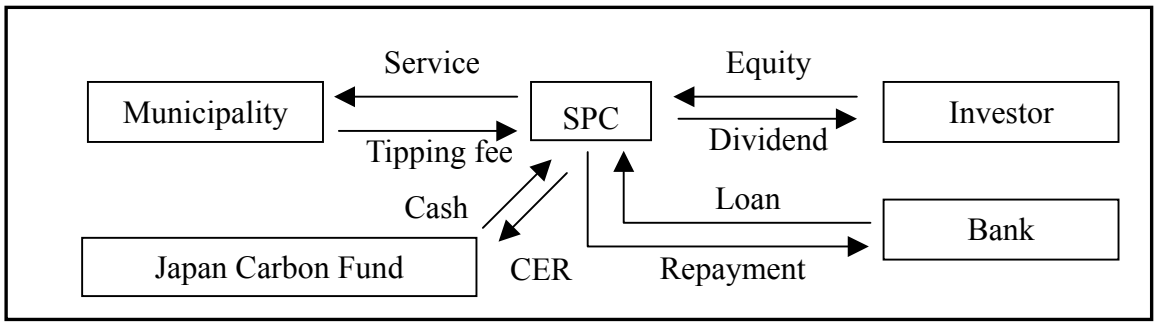
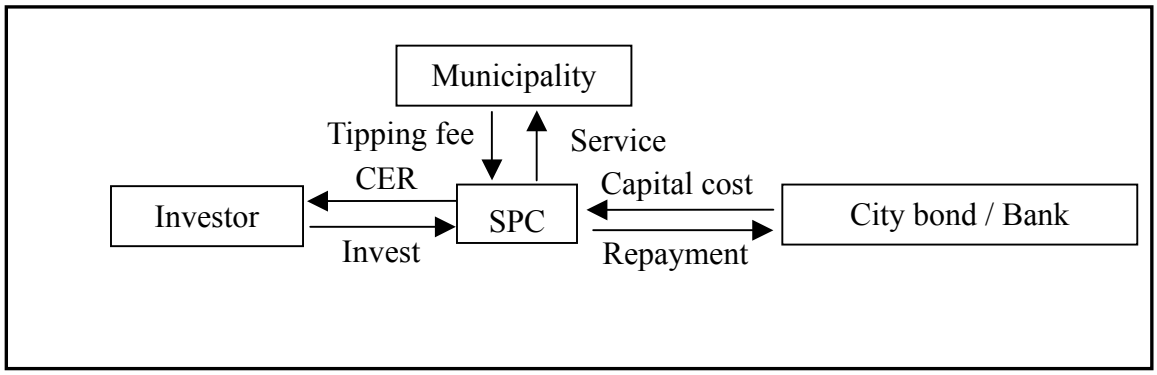


Figure 5 Project Implementation System Proposal 2 (Case 2)



Case-1 is based on the existing formation while Case-2 is based on CER returns that are distributed to investors as dividends. In other words, Case-1 focuses on the economies of the project rather than CER dividends for investors whereas Case-2 focuses on CER dividends to be distributed to investors. Case-2 is advantageous for the local government because it doesn't need to pay dividends to investors although no income from CER credits is returned.

Means of fundraising include possible financing by the Japan Bank for International Cooperation, or Japan Carbon Fund to be set up, or investment by Japanese corporations.

Chapter 7 Project Analysis

We discussed revenues from this project (Case-1), which is calculated based on the given conditions as follows:

Project period: 21 years
Equity ratio: 35%

Dividend ratio: 70% of net profit when reserves exceed 90% of the capital
Handling of CER: Disposal to the fund (Yearly cash-in)
Annual acquisition of CER volume: 102,696
（CER after 2% of the acquired CER, calculated in Chapter 3, is donated to CDM EB）
Fund: JBIC investment finance (Repayment period: 10 years, Grace Period: 3 years)
Interest rate: 2%.
Waste treatment cost: RM 45/t（payment to the project implementation company from JB government. No change from the current conditions.）
Inflation: Not considered for revenues and costs
Interest rate during construction: Not considered to avoid complicated calculations
Foreign exchange rate: $US1= RM3.8=¥110

For revenue indexes, we used IRR（ROI）that stands for the project profitability, IRR（ROE） that stands for the investor profitability, and Loan Life DSCR that stands for the project soundness and bank index. The conditions used to calculate these indexes are as follows:

In-flow to calculate IRR（ROI）: Profit After Tax + Depreciation + Interest - (Tax Shield)
In-flow to calculate IRR(ROE): Net cash flow + Dividend(-short term loan)
Loan Life DSCR: (EBIT (for term of long-term borrowing) + Depreciation)÷Sum of long-term borrowing

Revenues from this project based on the above formulas are as follows:

Table 6 Summary of Credit Sales Prices and Revenues from the Project

Credit price USD/CO2e-t	IRR (ROI) %	LLDSCR	IRR (ROE) %
0	-0.9	0.66	--
3	2.1	1.01	2.4
5	3.8	1.25	5.6
8	6.2	1.59	10.3
10	7.7	1.83	13.6
15	11.1	2.41	22.0

A waste treatment project usually is of the nature of a high-level public interest, and therefore it is difficult to collect the waste treatment costs in proportion to the scale of individual projects, so that there is little possibility to gain financial IRR. However, the present project shows a very good profitability among the solid waste plant projects, since it is a rare one that can create CER income at very high efficiency.

Table 7 Profitability of the Project on CDM Aspect

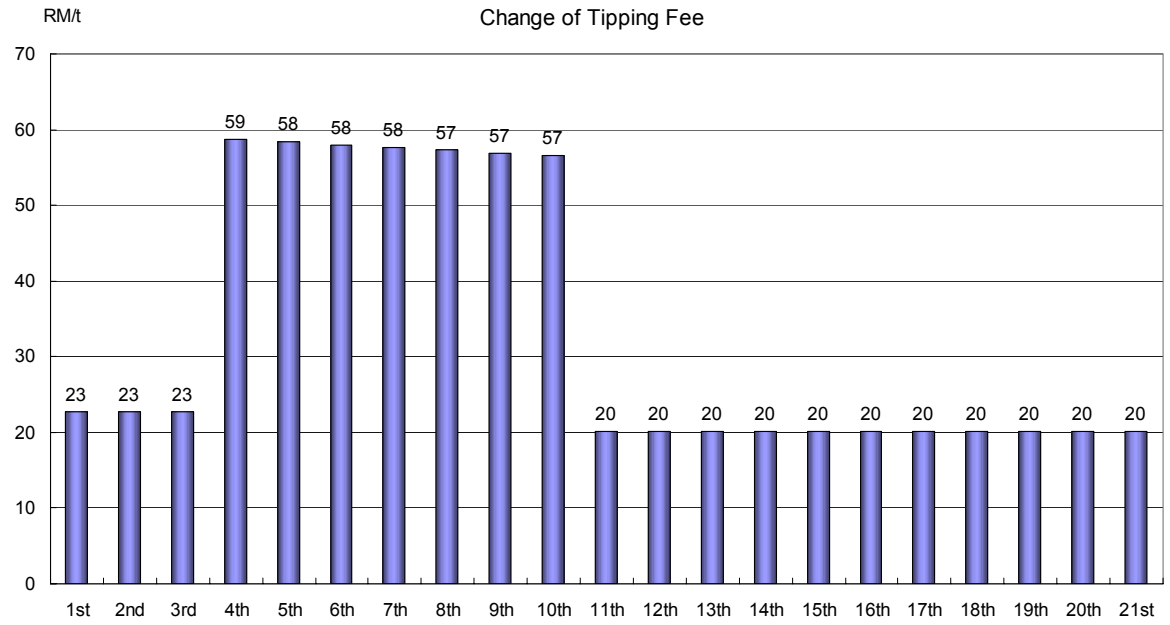
Acquired Credit (21 years)	2,156,910CER
Initial Investment Cost per Acquired Credit (7 years)	RM72/CER
Initial Investment Cost per Acquired Credit (10 years)	RM50/CER
Initial Investment Cost per Acquired Credit (21 years)	RM24/CER
GHG reduction per ton of waste treated	1.14CER/t
Additional Income per ton of waste (USD5/CER)	RM22

According to this case study, the project company can generate 1.14 of Certified Emission Reduction (CER) as it treats one ton of waste. That is to say, if the price of CER would be USD5 or USD10, additional RM22 or RM44, respectively can be obtained for treating solid waste as a kind of subsidy. It is also possible to nearly double the additional income, by increasing the portion of biodegradable waste,

Likewise, we also examined revenues for Case-2 under the same conditions mentioned above.

In this case, dividends are calculated as CER, thus, the waste treatment unit cost that the JB government will pay can be lowered. (The average waste treatment unit cost for the project period stands at RM33/t, which is lower than the direct dumping of waste in the landfill site.)

Figure 6 Changes in Waste Treatment Cost (Case-2)



Chapter 8 Conclusions and Recommendations

This project is suitable for the CDM project. It also proposes a solution for waste treatment in modern cities.

When this project is implemented, Johor and surrounding areas will lay the foundation for waste treatment and take the step toward introducing a recycling facility and an incinerator. Furthermore, since methane gas will be substantially reduced which will otherwise be emitted from the landfill site, the landfill site will have more options for new secondary applications. This will contribute to improving the environment and contributing to sustainable development in these areas.

This project offers good opportunities for both Malaysia and Japan. Japan will be able to obtain some credit needed to attain the goals of the Kyoto Protocol, whereas Malaysia will be able to access Japanese technology and receive a waste treatment system when this project is implemented. This opportunity is instrumental for Malaysia because the country is eager to promote CDM projects.

The Malaysian side will need to work on obtaining consensus among the ministries and agencies concerned. The Johor government will need to take steps so that the local people can participate in the waste treatment programs formulated by the administration.

Meanwhile, the Japanese side will need to formulate a mechanism to settle the purchase prices of the credit and a mechanism, which encourages private companies to invest in the project. These measures will play an important role in implementing the CDM project.