"Feasibility Survey and Pilot Project for Disseminating SME's Technologies to Developing Countries" under the Governmental Commission on the Projects for ODA Overseas Economic Cooperation in FY2012

Summary Report

Republic of Indonesia

Pilot Project on Intermediate Waste Treatment / Recycling in Surabaya, Indonesia

April, 2013

Nishihara Corporation

NTT DATA Institute of Management Consulting, Inc.

This report is a summary of a feasibility survey and pilot project disseminating SME's technologies to developing countries conducted by the contractor, under the Governmental Commission on the Project for ODA Overseas Economic Cooperation, commissioned by the Ministry of Foreign Affairs of Japan in Fiscal Year 2012. It does not necessarily represent the official views of the Ministry of Foreign Affairs of Japan.

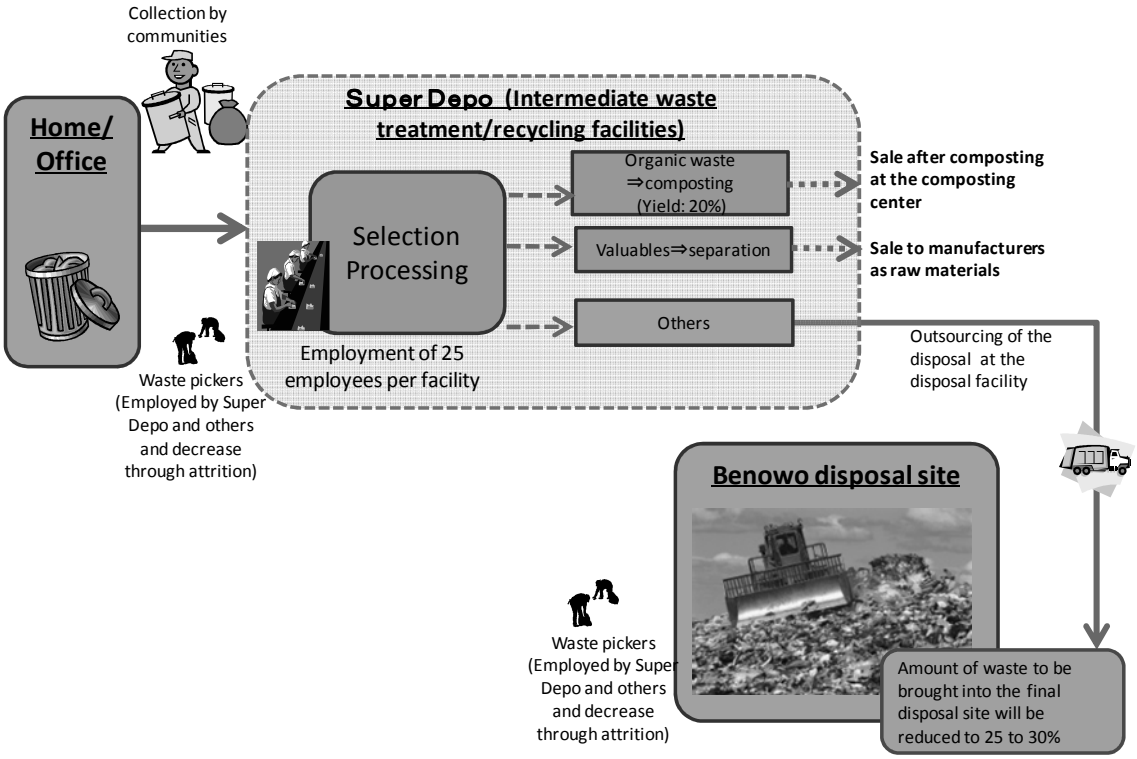
Introduction

In large cities of Southeast Asian countries, such as Republic of Indonesia (hereafter Indonesia), the capacity of final disposal sites for domestic waste (which refers to waste from household; the term “waste” hereafter refers to domestic waste, unless otherwise specified.) is insufficient, due mainly to the steep rise in consumption as a result of the synergistic effect of the increase in population and economic development.

The population is decreasing in Japan and the market for recycling businesses will shrink accordingly. And in Southeast Asia, there is a greater possibility to contribute to waste problems of cities through the application of recycling businesses based on the technologies fostered in Japan.

Kitakyushu City, where Nishihara Corporation is based, has promoted inter-city cooperation with Surabaya City, Indonesia. The aim is to reduce waste and build low carbon cities in collaboration. With the cooperation of both cities, Kitakyushu City currently expects that private companies take part in environmental businesses in Surabaya City.

Against this background, this survey is intended to confirm the feasibility of the project and on-site applicability of the project’s technology. And we will make an optimum proposal for the waste treatment/recycling systems.



Project scheme

I. Description of the current situation and development needs of the concerned development issues in the surveyed country

1. Development issues

In Indonesia, central government agencies in charge of waste policies are the Ministry of Public Works (PU) and the Ministry of Environment (KLH).

With regard to the operation from the collection of waste from each home to the transportation of waste, departments, such as Department of Cleanliness and Gardens of each municipal government (regency or city), take charge of the provision of necessary facilities. Systems for intermediate facilities are under the jurisdiction of municipal governments.

For responsibilities related to waste issues, the Ministry of Environment works at promoting the 3Rs and reducing waste and introduces related policies.

In February 2010, “National Medium-term Development Plan (RPJM)” outlining the basic policy for the national development in Indonesia from 2010 to 2014 was put into effect. In the plan, specific implementation programs for waste disposal were established mainly by the Ministry of Environment and the Ministry of Public Works under the theme of the 3R (Reduce , Reuse and Recycle).

A basic legal system for waste disposal management in Indonesia is ACT OF THE REPUBLIC OF INDONESIA NUMBER 18 YEAR 2008 REGARDING WASTE

MANAGEMENT. This law explicitly states, “Every body is prohibited to waste handling by open dumping system at final processing site.” Specific provisions under this ban will be determined according to the rules and regulation of local governments such as regencies and cities. As TRANSITIONAL PROVISIONS, the law also states, “Local government shall close the final waste processing site with open dumping system for a maximum 5 (five) years after the enactment of this Act.”

2. Japan’s ODA policies for Indonesia

Japan’s ODA policies for Indonesia are summarized in “Country Assistance Program for the Republic of Indonesia.”

As for JICA projects, 1. West JAVA Regional Solid Waste Treatment and Final Disposal and 2. Enhancement of Urban Development Management in the Mamminasata Metropolitan Area, can be presented. Both of the cases are characterized by the goals of not only providing the final disposal site, but also of achieving reduction in the amount of waste through intermediate disposal and promotion of the 3Rs. This matches the aforementioned policies for Indonesia, and the assistance that meets the local needs is being provided.

3. Analysis of other donors

For Indonesia, Japan is the largest donor and, for Japan, Indonesia is the largest ODA recipient on the basis of accumulated total. In recent years, there has been a significant record of assistance from Australia.

From the viewpoint of waste disposal management, the countries giving large amounts of aid are not necessarily the donors for waste projects. Those involved in waste-related projects are only Japan (JICA), Germany (German Credit Institute for Reconstruction, KfW), the Netherlands and the World Bank. Waste problems in Indonesia can be a relatively “new” development issue which was explicitly recognized by the Indonesian government in the 2008 Waste Management Act.

II. Possible applicability of the SME's products and technologies, and prospects for future business development

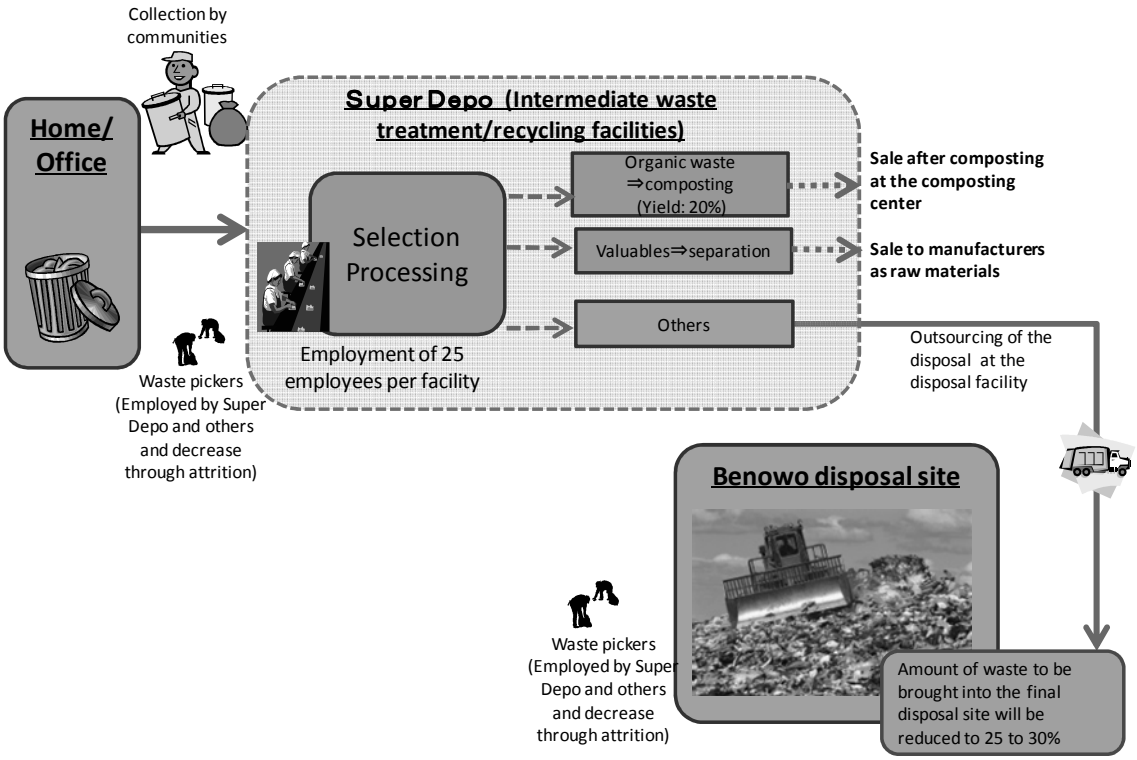
1. Waste collection system in Surabaya City

In Surabaya City, the project’s demonstration field, all collected domestic waste is currently carried into the final disposal site for landfill disposal via Depos (intermediate facilities). The Ministry of Public Works of the central government was responsible for the construction of the final disposal site. The rest of the project, including the procurement of the site for intermediate

facilities, their operation, waste transportation, costs for the operation of the final disposal site are in charge of the Surabaya City Department of Cleanliness and Gardens (DKP). However, as the amount of general waste continues to rise due to the population growth and economic development, the final disposal site has reached the limit of its disposal capacity.

2. Planned framework of the project

Depo, which has the function of intermediate facility will be upgraded to "Super Depo," which will have the function of intermediate facility for recyclable waste. Super Depo will have the functions of efficiently separating and recycling valuables and organic materials, through which the amount of waste transported and disposed of to the final disposal site is expected to be reduced to around 25%. The organic materials such as garbage separated at Super Depo are planned to be sold to organic fertilizer manufacturers after composting process.



Possible project scheme (Re-published)

III. Verification of adaptability of the SME's products and technologies to the surveyed Country

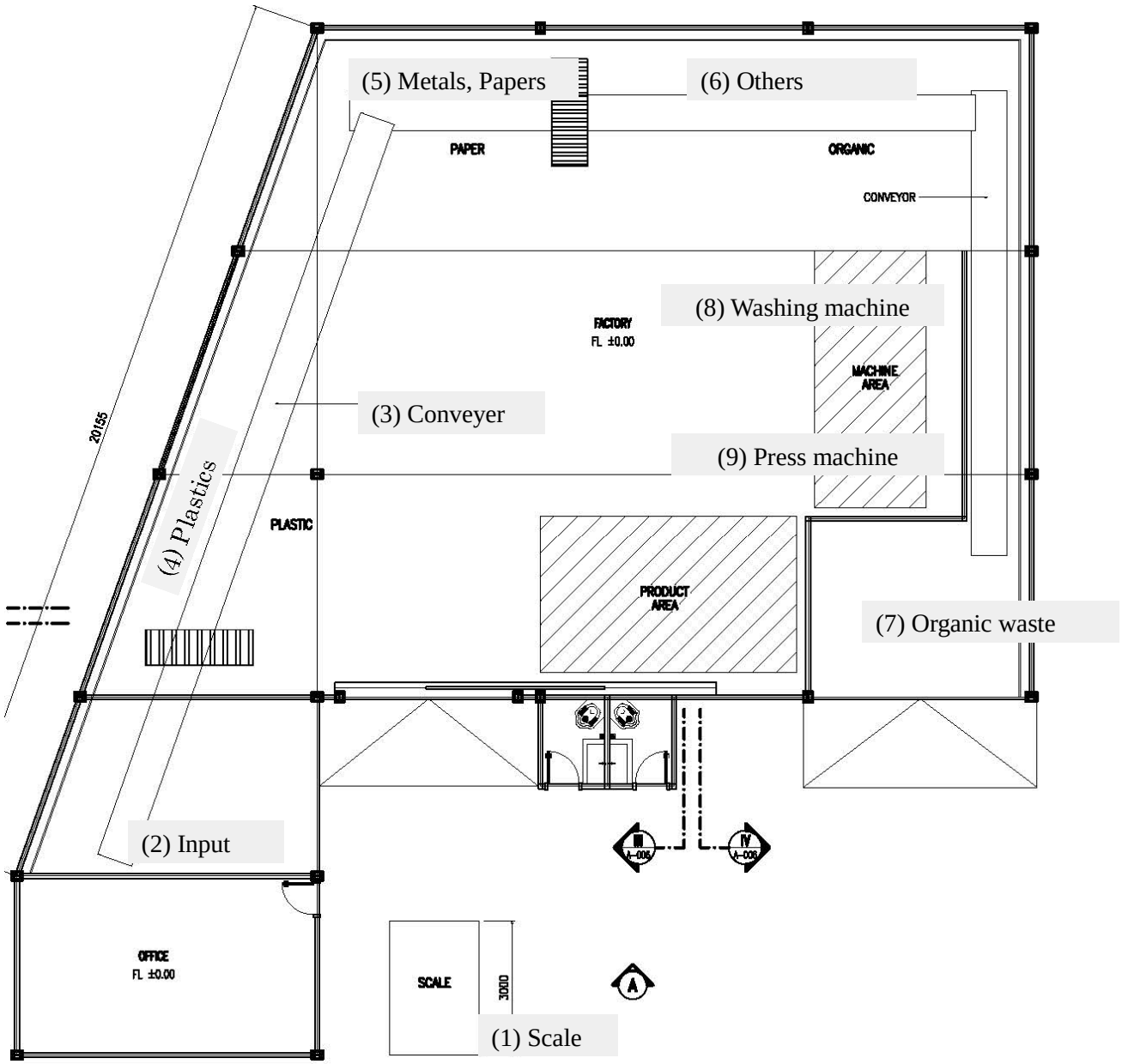
1. Outline of the demonstration and pilot survey

The figure shown below is the design and facilities of the Sutorejo Super Depo. Among the several Depo facilities presented by the Surabaya government, the Sutorejo facility which had sufficient area was selected as a project site. The full-scale construction began in December 2012, the commissioning started on February 10, 2013 and the opening ceremony was celebrated on March 8.

The period for the pilot demonstration was set for five days from March 15 to 18 (March 17 was off as it fell on Sunday), during which data was collected. During the pilot demonstration, the pilot project was implemented by assigning 25 personnel for waste separation.

2. Results of the verification of adaptability of the SME's products and technologies to the surveyed Country

After minor adjustments during the verification stage, the facilities (1) to (9) were found to work without problems. The washing machine (8) and press machine (9) would be unnecessary for the intermediate facility of this size. The expansion of the facility size and the provision of multiple facilities require further consideration for installing these facilities. As for the separation personnel, a request for the work was made based on the description (10).



Design and equipment ((1) – (9)) of Sutorejo Super Depo

(1) Scale

A scale that can measure waste with a two-wheeled cart was installed. The amount of waste that are brought in every day and the amount of waste separated were recorded to analyze the composition of waste.

(2) Input

The waste in a two-wheeled cart is carried into the conveyer using a basket. Not only the input of waste, but also the removal of large waste items are operated here.

(3) Conveyer

The conveyor is 48 m long. In consideration of the size of the site, three conveyers were placed in the “U” shape (19 m, 15 m and 14 m). Three motors were mounted to the three conveyors.

(4) Plastics

Plastics are separated into 1) transparent and white plastic, 2) colored plastic 3) transparent PET bottles and 4) hard plastics. The workers pick each plastics put into collection boxes on the gauge.

Transparent and white plastics and colored plastics are sold after the compression process. Transparent PET bottles are sold after being packed into flexible containers. Hard plastics are further separated by type.

(5) Metals, Papers

In this zone, 1) metals such as cans and 2) used paper are collected. Glasses are transported to the final disposal site as foreign objects, because they are rarely included in waste and a certain amount is required for sale.

(6) Others

Other objects than plastics, metals and used paper and large organic waste were collected here. Other objects and large organic waste will be transported to the final disposal site.

(7) Organic waste

Organic waste remains after picking valuables such as plastic, metals and paper, other objects and large organic waste. A disposer that crushes organic waste into pieces of certain size was installed at the tail of the conveyer. The organic waste that passed through the disposer is transported to the composting center. By separating and crushing only organic waste which comprises more than 60% of waste, the burdens on the process to composting can be reduced and fertilizers of good quality can be manufactured.

(8) Washing machine

The collected plastics are washed with water in the washing machine to remove dirt in anticipation of improved quality in outputs and the resulting improvement in prices. As a drainage treatment facility, a three-layer separation tank was installed.

(9) Press machine

The volume of the collected plastics can be reduced by compression in order to improve transport efficiency. The machine consists of a hydraulic cylinder driven by a motor. It can compress 400 kg of plastics and used paper per hour.

(10) Capacity Building

A decision was made to ask the former Depo waste pickers to work at Super Depo. The workers were asked to ensure that they 1) wear the uniform, 2) keep systems and equipment organized and clean, 3) comply with the work rules (such as work hours) and 4) observe the rules for the distribution of profits from sales of valuable products.

Training for the separation work using the conveyers was carried out before demonstration. The focus of the training was initially placed on ensuring the completion of operations assigned to each worker by slow moving conveyors.

3. Results of the waste composition survey and the examination of profitability

The results of the waste composition survey were as follows. Valuables accounts of 12.5%, organic materials for 62.2% and the waste that goes to the final disposal site for 25.3%.

Composition survey results

Period of survey: March 13 to March 18, 2013
* Data for five days excluding Sunday (March 17, 2013)

Carried-in data	Mar. 13	Mar. 14	Mar. 15	Mar. 16	Mar. 18	TOTAL	Average/day
Amount carried in (kg)	4,556	3,641	4,987	4,045	5,019	22,248	4,449.6
Number of workers	26	26	26	26	26	130	26.0
Number of two-wheeled carts	15	10	13	13	16	67	13.4

Waste data	Mar. 13	Mar. 14	Mar. 15	Mar. 16	Mar. 18	TOTAL	Average/day
Transparent/white plastics (kg)	385	409	50	44	52	940	188.0
Colored plastics (kg)	409	77	113	75	122	796	159.2
Transparent PET bottles (kg)	193	0	14	66	78	351	70.2
Hard plastics (kg)	165	0	38	14	32	249	49.8
Paper (kg)	204	87	38	45	73	447	89.4
Foreign objects (kg)	1,462	1,232	1,126	866	947	5,633	1,126.6
Garbage (kg)	1,738	1,836	3,608	2,935	3,715	13,832	2,766.4

Composition (%)	
Transparent/white plastics	4.23%
Colored plastics	3.58%
Transparent PET bottles	1.58%
Hard plastics	1.12%
Paper	2.01%
Foreign objects	25.32%
Garbage	62.17%

Valuables 12.51%
Final disposal 25.32%
Organic materials 62.17%

Based on the composition survey, profitability was examined.

(1) Pattern 1. Profitability of Super Depo alone

In the case of Super Depo alone, it was assumed that processing fees will be paid to Surabaya City for the final disposal, because separated organic materials cannot be sold as they are. In that case, the costs for processing organic materials pushed up the processing costs to 1.2 yen/kg. Also, with this pattern, only 12.5% of waste will be reduced.

(2) Pattern 2. Profitability of Super Depo and the composting center

A simulation of constructing and operating “Super Depo and the composting center” was conducted with the assumption that separated organic materials can be composted and sold as raw materials for producing fertilizers. The results showed that the processing costs were 0.4 yen/kg, even including the compost manufacturing costs in addition to the initial costs and running costs. Although the sales price of organic fertilizers was set conservatively based on the results of interview, the processing costs were found to be realistic. If Surabaya City outsources the operation of the facilities to us at the tipping fee of 1 yen/kg which is the same as the fee for

the current waste disposal, the figures turn positive.

(3) Pattern 3. Profitability of the large-scale intermediate facility and composting center

Depos that have a certain amount of area can be converted into Super Depo; however, when looking at the existing 177 Depo locations, it was found that there are no sufficient sites that have the area similar to that of Sutorejo. With that in mind, a simulation of constructing a facility in the city's suburb which is ten times as large as Super Depo and has the functions of both the large scale intermediate facility and composting center was conducted.

With this pattern, it is assumed that economies of scale works and the initial costs and the labor costs for workers per unit will be 70% compared to the case of "Super Depo and the composting center". While utility costs required per unit were assumed to remain unchanged. As a result, a profit of 0.2 yen is generated each time the waste of 1 kg is processed. In theory, if eight facilities of this kind are constructed, the waste of 1,200 ton/day from Surabaya City will be processed and the amount of waste carried into the final disposal waste can be reduced up to 25%.

It is ideal to implement this project in Surabaya City by combining the patterns 2 and 3. The initial costs required for processing the general waste of 1,200 tons a day in Surabaya City are estimated to be 1.4 billion yen (the large-scale intermediate facility + the composting center × 8 locations) to 2.0 billion yen (Super Depo + the composting center × 80 locations).

By utilizing our proprietary know-how, Nishihara Corporation will be able to obtain operating profit from the operation of these facilities outsourced by the city. It is realistic to undertake the operation at the waste processing cost of 1 yen/kg, which is the same as the previous cost, or at the tipping fee of 1.19 yen/kg which is the same as the fee for the operation outsourced by PT Sumber Organik.

IV. Expected development impact and effect on business development of the proposing SMEs in the surveyed country(ies) through proposed ODA projects

1. Development issues for Surabaya City

In Surabaya City, the Keputih final disposal site was closed in 2001. In the same year, the Benowo final disposal site of 27 hectares was constructed at a cost of 65 billion rupiah (650 million yen). However, the site reached its full capacity after seven years and was expanded to 34.7 hectares.

At the Benowo final disposal site, waste is disposed by open dumping. The results of the

feasibility study conducted by Surabaya City in 2008 showed that, even in the simulation in which the amount of waste for final disposal was reduced to one third of the current level to 400 tons/day and 12,000 tons/month, the final disposal site is expected to reach the limit of its capacity in 2014. However, the amount of waste for final disposal has not been reduced, and the final disposal site has actually reached its processing limit.

2. Contributions of the proposed project in solving the development issues

The project discussed profitability in Chapter 3, which combines the recycling intermediate facility (Super Depo and a large-scale facility) and composting centers, can serve as an effective solution to these issues. From the results of the pilot project, the amount of waste brought into the final disposal site can be reduced by 75% by introducing this kind of solution.

If the waste of 1,200 tons a day and 438,000 tons a year could have been processed by operating “Super Depos & composting centers” and “the large-scale intermediate facility & composting centers”, the amount of waste to be finally disposed of will be reduced to 25%, or 328,000 tons a year. Surabaya City can reduce the operating costs of 9,854.4 million rupiahs (98.54 million yen) /year for the final disposal site.

The initial costs required for the construction of the facilities will be 1.4 to 2.0 billion yen. Also, the implementation of the project can create new employment opportunities for about 1,440 to 2,400 people.

In addition to the reduction in the amount of waste for final disposal, it is also expected that there will be the effect of reducing methane gas emitted due to the generation of organic matters as a result of open dumping. Methane gas is reported to have 21 times as much greenhouse effect as CO_2; therefore, the reduction of methane gas can contribute to Indonesia’s target of reducing greenhouse gas emissions by 26% compared to BAU (Business as usual) case by 2020. The reduction of greenhouse gas is also expected to play a significant role as a project for the new Joint Crediting Mechanism / Bilateral Offset Credit Mechanism (JCM/BOCM), which contributes to the reduction of greenhouse gases proposed by Japan.

The promotion of the use of organic fertilizers is a policy led by the Ministry of Agriculture. In addition to the yearly increase in the amount of subsidies for organic fertilizers, facilities for manufacturing organic fertilizers are also being introduced. Since the amount of organic fertilizers produced is insufficient, the manufacturing of organic fertilizers derived from organic waste also contributes to Indonesia’s policy to promote organic agriculture.

V. Proposals for formulating ODA projects

1. Outline of ODA projects

In order to implement this project as an ODA project, specific proposals will be presented regarding the implementation of “Super Depo & composting center” and “the large scale intermediate facility & composting center,” taking into consideration the profitability discussed in Chapter 3 and the contributions to the development issues examined in Chapter 4. The facilities to be presented will be the combination of “Super Depo + composting center” and “the large scale intermediate facility + composting center”.

With regard to loan aid, a five-year plan will be proposed for Surabaya City, with the scale that can process the whole amount of waste of 1,200 tons/day generated from the city. The total project cost for this case will be about 2.5 billion yen (2.0 billion yen for facilities, 0.5 billion yen for survey and capacity building).

With regard to grant aid, the operation of five “Super Depo + composting center” and one “large-scale intermediate facility + composting center” will be proposed as a model for waste processing in regional cities of Indonesia, which can contribute to various development issues facing not only Surabaya City, but also the entire Indonesia. The total project costs will be approximately 400 million yen (300 million yen for facilities and 100 million yen for survey and capacity building).

In both cases, the counterpart of the projects is the Ministry of Public Works. After the implementation of the projects, the operation of the facilities will be undertaken by Surabaya City and the operating costs of the facilities will be paid by the Indonesian government and Surabaya City government. Surabaya City will ensure smooth operation of the facilities by outsourcing the operation to private business operators.

The following provides the outline and background that are common to both projects.

(1) The background and outline of the project

In Republic of Indonesia (hereafter Indonesia), domestic waste (mainly discharged from home) is disposed by open dumping (piling up of waste at disposal sites without preprocessing), however, due to the economic development and growth of population, final disposal sites are reaching their processing limits. The government of Indonesia established a law regarding waste management in 2008 in which it declares the closure of final waste processing sites with open dumping system by 2013. Further, the implementation of programs regarding waste management by the Ministry of Environment and the Ministry of Public Works also set forth in the 2010 – 2014 National medium-term Development Plan.

In response to this situation, a project for reducing waste by way of providing intermediate waste processing facilities and composting centers will be implemented as a project that contributes to Indonesia’s target of reducing waste. One of the reasons for Indonesia not being able to implement waste processing measures at present is the issue of cost. It is expected that

the amount of waste disposed of by open dumping will be significantly reduced by introducing expensive large-scale facilities, however, the cost to be borne by Indonesia and local governments will be enormous. Compared to previous methods, this project is able to reduce waste at affordable initial investments and running costs.

Specifically, by providing the function of intermediate level waste processing and the function of composting center to the existing general waste intermediate facilities, the project will construct and operate two types facilities, the ones that can process the general waste of 15 tons a day (consisting of Super Depo and the composting center) and the others that are built in suburban areas and have the functions of intermediate processing and composting center with which the general waste of 150 ton a day can be processed.

The project will be implemented in Surabaya City, Indonesia. Surabaya City is the second largest city in Indonesia and one of the largest cities in Southeast Asia with the population of 2.8 million. In Surabaya City, approximately 1,200 tons of general waste a day is finally disposed of by open dumping. A plan developed by the city aims to reduce this general waste to one third before final disposal, and to operate final disposal sites until 2025 by expanding the area of the sites. However, effective solutions for realizing this plan are in the stage of examination. Surabaya City achieved results including reduction of waste from 1500 tons/day in 2005 to 1150 tons/day in 2008 through the implementation of composting projects using the composting system and is recognized as an environmentally sustainable city. By implementing this project in Surabaya, a city with an established reputation, a model plan for Indonesia's waste policies can be effectively presented to Indonesia.

Expected effects of the development include: 1. reduction in the amount of waste for final disposal; 2. creation of employment opportunities; 3. contributions to Indonesia's policy for organic agriculture; and 4. reduction in greenhouse gas emissions. For 1, waste to be dumped can be reduced to 25%. For 2, regular employment opportunities can be provided for waste pickers who belong to the informal sector where valuables are collected from waste for sale. For 3, organic fertilizers obtained from general waste can contribute to the policy promoted by Indonesia to shift from chemical fertilizers to organic fertilizers. For 4, by reducing methane gas emitted from open dumping, contributions can be made to the target of reducing greenhouse gas emissions to 26% compared to BAU by 2020 declared by Indonesia. The reduction of greenhouse is also expected to play a significant role as a project for the new oint Crediting Mechanism / Bilateral Offset Credit Mechanism (JCM/BOCM) proposed by Japan, which contributes to the reduction of greenhouse gases.

The project is largely divided into 1) construction of facilities and 2) capacity building for the operation of facilities. For both categories, JCC (Joint Coordination Committee) will develop a system for local implementation. 1) will be led by the Ministry of Public Works and 2) will be

implemented by the Ministry of Public Works and Surabaya City. Assistance from Japan will include the participation of experts, local governments and private companies with specialized knowledge in the intermediate waste processing and composting.

After the implementation of the project, facilities will be operated by Surabaya City, and the costs for the operation of facilities will be borne by the government of Indonesia and Surabaya City government. Surabaya City will ensure smooth operation of the facilities by outsourcing the operation to private companies.

2. Outline of other ODA projects

Other ODA schemes related to this project include technical cooperation and Grant Assistance for Grassroots Projects. These can be implemented to address problems emerged after the project.

If similar intermediate processing facilities and composting centers are constructed and operational plans for such facilities are implemented by the Indonesian Government following the implementation of this project, we can undertake the task of capacity building.

The pilot project revealed that the making of organic fertilizers from organic waste and sale of these fertilizers hold the key to the profitability of the project. By utilizing “Non-project grant aid by SME's Technologies, Ministry of Foreign Affairs” and “Feasibility Survey for Disseminating SME's Technologies to Developing Countries, JICA”, we would like to implement a project for verifying the manufacturing of organic fertilizers using organic waste as raw materials. More specifically, we would like to examine costs and operation for manufacturing composts that meets the criteria of fertilizer manufacturers, by operating composting centers for organic waste separated from the existing Super Depo. Discussion on this project is in progress with Surabaya City government, and an agreement has been obtained for the provision of appropriate sites and assistant personnel.

3. Outline of other ODA projects

“Enhancement of Urban Development Management in the Mamminasata Metropolitan Area” (South Sulawesi Province) as a loan aid project and “West JAVA Regional Solid Waste Treatment and Final Disposal” as a grant aid project are being implemented in Indonesia.

Both projects are for the implementation of intermediate waste processing focusing on the steps near the final disposal including the separation of valuables. The intermediate processing and composting which were introduced in our proposal and which take place in the stages near the source of waste will reduce costs for intermediate processing at final disposal sites.

（Feasibility Survey and Pilot Project）
Republic of Indonesia
Pilot Project on Intermediate Waste Treatment / Recycling in Surabaya, Indonesia

SMEs and Counterpart Organization

- Name of SME：Nishihara Corporation
- Location of SME：Kitakyushu City, Fukuoka
- Survey Site・Counterpart Organization：Surabaya City

Concerned Development Issues

- The capacity of final disposal sites for domestic waste is insufficient in cities, due mainly to the increase in population and economic development.
- Indonesia government have a plan to prepare the waste management program such as 3R.

Products and Technologies of SMEs

- Intermediate waste treatment / recycling facility
  →Select domestic wastes by hands. Plastics and papers are sold, organic waste is processed to organic fertilizer by composting, and the amount of disposed waste will be decreased to 25%.
- The know-how of operation and process (hire informal sector as workers)

Proposed ODA Projects and Expected Impact

- ODA program: “Intermediate Waste Treatment / Recycling & Compost center” (grant or loan)
- Impact 1: the amount of disposed waste will be decreased to 25%
- Impact 2: Job opportunities for informal sector (waste pickers/scavengers)
- Other Impact: GHG reduction (prevent Methane creation), contribution to organic agriculture (organic fertilizer)

Future Business Development of SMEs

- Propose the model of “Intermediate Waste Treatment / Recycling “ to cities in Indonesia and Southeast Asia.
- Outsourcing business from municipality. Obtaining profits by selling plastics/papers and organic fertilizer as well as tipping fee from municipality.