FY2014 “Large-scale JCM Development Programme for Low Carbon Society in Asia”

Low Carbon City Planning Project in Surabaya, Indonesia

Final Report

March 2015

Institute for Global Environmental Strategies
City of Kitakyushu
NTT Data Institute of Management Consulting, Inc.
Nishihara Corporation
Hitachi Zosen Corporation
Amita Corporation

FY2014 "Large-scale JCM Development Programme for Low Carbon Society in Asia"

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Final Report

Summary

Background & Objective

This programme, which targets sectors with large GHG emissions in the City of Surabaya in Indonesia, aims to identify projects that can reduce emissions with assistance from Japan (in particular, CO_2 emissions from energy sources), and acquire JCM credits through the implementation of the programme. The results were used to help develop systems for local monitoring and quantification of emissions. The systems and policies necessary to expand these outcomes to the entire area are also being considered, and their adoption is being lobbied through consultations with related organizations and governmental authorities.

The low-carbon technologies of private companies, environmental management capacity and systems of local governments, and institutional analysis by research institutes and universities, as well as coordination among stakeholders was advanced with the long intercity cooperative relationships shared by cities in Japan (Kitakyushu) and cities overseas (Surabaya, Indonesia) forming the basis for the implementation of this programme.

Project Implementation Details

This programme is a continuation of the programme in FY 2013, and targets the energy and waste sectors.

<u>Energy sector</u>

In work carried out in FY 2013 on the introduction of energy savings in buildings and distributed power sources, the amount of electric power and fuel used in designated buildings in four areas, as well as potential CO_2 emission reductions, were calculated using base data, such as the amount of electric power and fuel consumed. Expected investment was also calculated, and consultations started with building owners about the detailed amount of investment needed. This fiscal year, work continued with detailed designs for equipment and the accuracy of CO_2 emission reductions was improved. The project proceeded to the application stage for an assistance scheme as an actual project, with the consensus of stakeholders on investments and other items.

In order to apply for assistance for CO_2 emission reduction technology and expand similar activities, after implementation of the project, a proposal was made for the establishment of a periodic reporting system for the amount of electric power consumed in buildings in

Surabaya, in association with Indonesia's regulations on energy consumption (Ministry of Energy and Mineral Resources, regulation 70/2009), so as to promote investment in energy-saving equipment related to designs for the Green Building Awareness Award promoted in Surabaya.

Excerpt from slides on the Surabaya Green Building Award (Source: City of Surabaya)

For the supply of heat and electricity (co-generation) to industrial estates, a plan for the construction of a 70 MW plant in Surabaya's SIER industrial estate was considered, from which CO_2 emission reductions of 190,000 tons/year are expected. Since the project scale is significant at about JPY 8.5 billion, investment and loans from JICA or ADB will be planned in order to implement the project.

Waste sector

In the waste sector, the project considered the reduction of the amount of general waste through intermediate treatment (separation, recycling, composting) and power generation from the incineration of waste residue from intermediate treatment, as well as the production of raw materials for cement from industrial waste (hazardous waste).

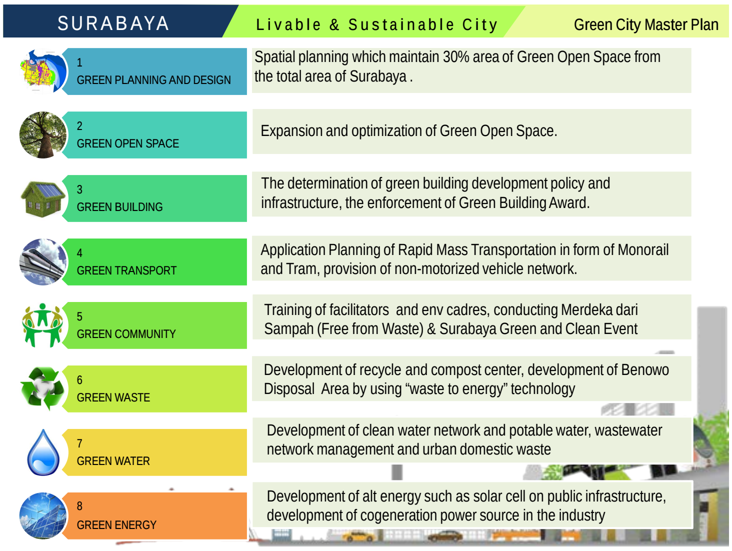
A model project on the intermediate treatment of 10-15 tons/day of general waste is currently being implemented by Nishihara Corporation in Surabaya as a project under the Ministry of Foreign Affairs and JICA, and a composting facility (treatment scale 20 tons/day) has been constructed. The project carefully reviewed the potential CO_2 emission reductions (from energy sources) through these activities, and aimed to develop MRV methodology and determine JCM project feasibility. Specifically, the project aims to construct and operate an intermediate treatment facility with a capacity of 150 tons/day (about 10% of the general waste generated in Surabaya), allow the facilities to develop in a business-like manner, and in the future, laterally expand the development of similar facilities outside of Surabaya for the large-scale reduction of waste disposed in Surabaya and surrounding areas.

The calorific value of waste residue (about 20%-30% of the entire amount) from intermediate waste treatment facilities is high, which is suitable for incineration power generation. A study was carried out on the calorific values of this waste residue and general waste, and the potential for incineration power generation was carefully examined. The project also studied the creation of joint ventures with management companies of final disposal sites and coordination with related organizations and governmental agencies to conduct incineration power generation.

The majority of industrial waste (hazardous waste) generated from factories and businesses outside of Surabaya is transported to treatment facilities in West Java, which is about 800 km from Surabaya. CO_2 emissions can be controlled through costs and fuel consumption related to transportation by using this waste effectively as raw materials for cement plants in the suburbs of Surabaya. Local cement plants already accept copper slag, blast furnace slag, and biomass waste as raw materials; however, the ratio (about one-third) is low when compared to cement plants in Japan, which indicates that there is room to accept new kinds of raw materials. In addition, according to interviews with local Japanese companies, compliance with laws and regulations related to the proper treatment of hazardous waste through the revision of Indonesia's laws on waste treatment has become stricter, and businesses that can properly treat such waste are in demand from the perspective of the responsibility of waste dischargers. Under these conditions, this fiscal year, the project continued to conduct field surveys and carried out a careful examination of the amount and composition of industrial waste from businesses (in particular, Japanese companies), treatment status and cost, energy consumption rates and CO_2 emission intensity of cement plants, construction costs for intermediate treatment plants in order to determine business feasibility, support systems of the central government, and conditions for project finance.

<u>Support for the creation of plan for the development of a low-carbon city</u>

As an activity that encompasses the formation of JCM projects in the above two sectors, support was also provided for the management of data to quantify GHG emission reductions and create policies for low-carbon development using this data. Specifically, city staff from Surabaya took part in a NAMA/MRV (measures for low-carbon city development) capacity improvement training course at JICA Kyushu (Kitakyushu) for three weeks between September 8 to 30, 2014 to improve capacity on the quantification of GHG emissions and develop policies for low-carbon development. The IGES Kitakyushu Urban Centre has supervised this training course since 2012, and city staff from Surabaya have taken part in two training courses in the past. This fiscal year, as an outcome of this training, a draft action plan was presented for the green development of Surabaya in accordance with Surabaya's Green City Master Plan (below figure) and the Local Action Plan for GHG Emission Reductions in East Java (RAD-GRK).



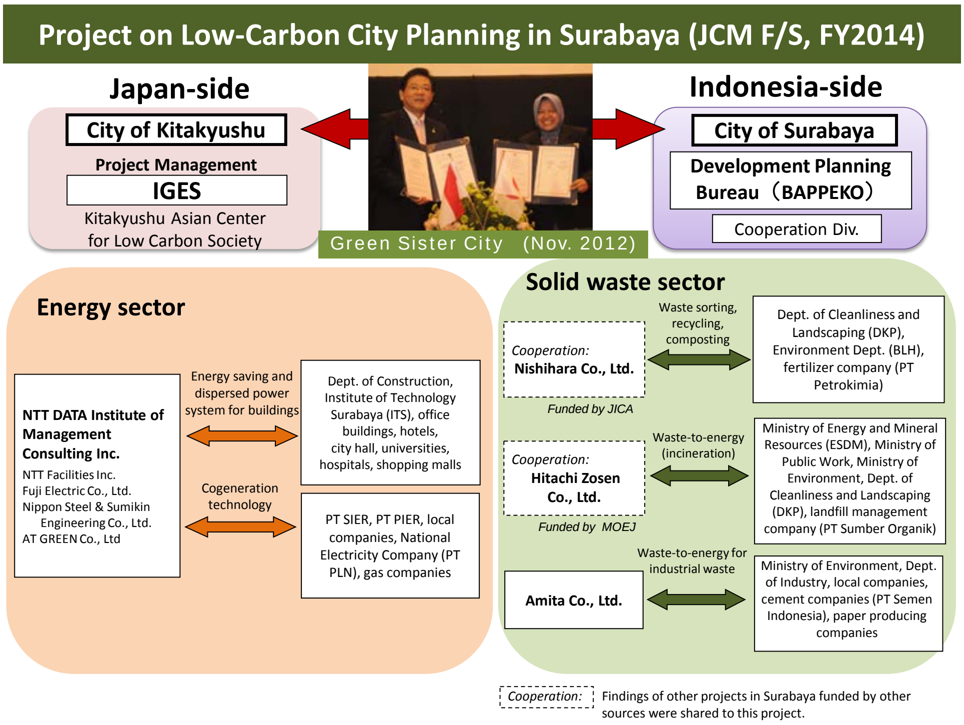
Overview of the Surabaya Green City Master Plan (Source: City of Surabaya)

Implementation System

As indicated in the project implementation system figure below, IGES was responsible for the overall coordination of the project and contact/coordination with Surabaya, in cooperation with the City of Kitakyushu.

NTT Data Institute of Management Consulting was in charge of the energy sector. With regard to energy savings in buildings, NTT Facilities was responsible for energy conservation assessments; Fuji Electric was in charge of facility/equipment design and proposals. The project on cogeneration was promoted with the cooperation of Nippon Steel & Sumikin Engineering Co., which has knowledge and experience on plant construction, and At Green Co. for related data surveys.

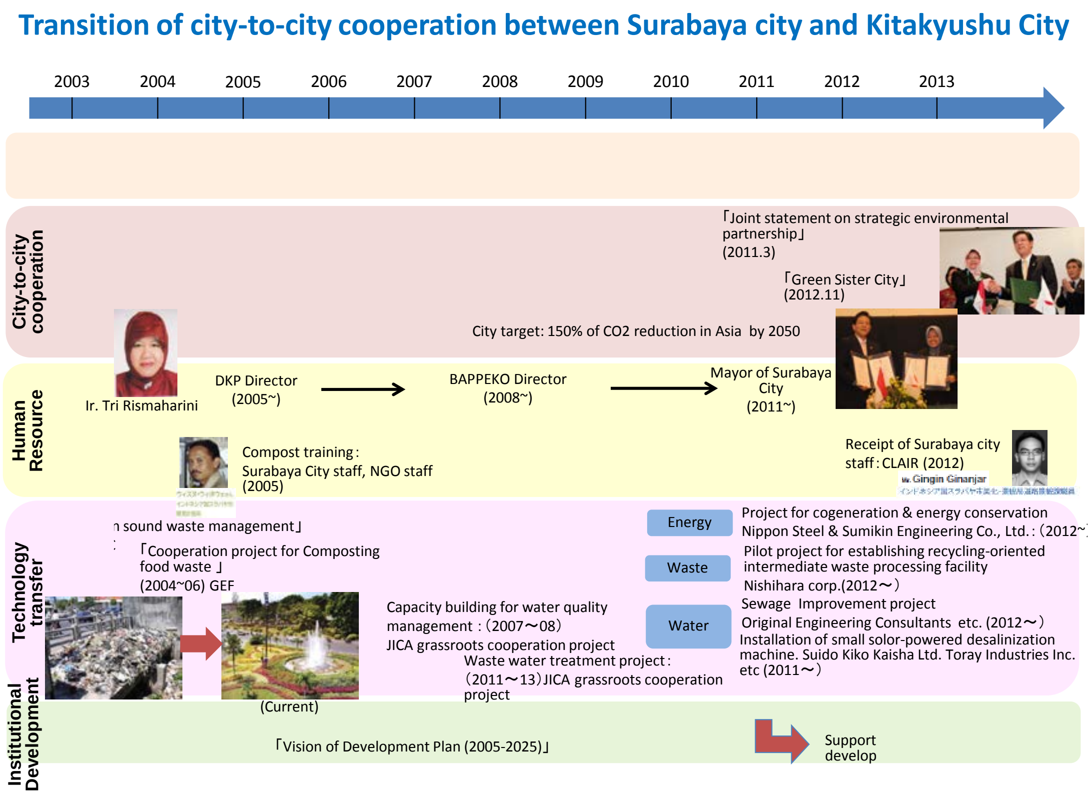
In the waste sector, Nishihara Corporation was responsible for the operation of the intermediate treatment facility for the separation, recycling, and composting of general waste (household waste). Hitachi Zosen was in charge of examining incineration power generation, and Amita Corporation was responsible for the reduction and effective use of waste through the production of raw materials for cement from industrial waste (hazardous waste).



Cooperation between Surabaya and Kitakyushu

The cities of Surabaya and Kitakyushu have maintained a cooperative relationship for over 10 years. In response to this, both cities agreed to continue to implement a number of cooperation projects as environmental sister cities in November 2012 (Figure 1.4). The cooperative relationship between these two cities is one feature of this project.

Various projects are implemented through the cooperative relationship of both cities with major results, including the expansion of compost activities in the city that started in 2004, which led to a 30% reduction in the amount of waste and contributed to beautifying and greening the city. The cities collaborated on projects to support capacity building for product quality management in the water sector (2007-2008), and a JICA project on the treatment of wastewater (2011-2013), as well as a cogeneration system (supply of heat and electricity) in the SIER industrial complex that is being promoted with the Japanese Ministry of Economy, Trade, and Industry in the energy sector.



Transition of city-to-city cooperation between Surabaya and Kitakyushu

Work Flow

This programme was implemented through the process below.

Stakeholders from all sectors took part in the 2nd Domestic Stakeholders Meeting in Kitakyushu and the Inception Meeting in Surabaya, as well as a seminar on project outcomes.

A session that introduced this programme was held at the Japanese pavilion during the Twentieth session of Conference of the Parties (COP20) to the United Nations Framework Convention on Climate Change (UNFCCC), in which one staff from IGES and the City of Kitakyushu took part and discussed the potential for the lateral development of the programme outcomes in Indonesia with members of the Indonesian government. In February, IGES participated in a reporting session on JCM projects organized by the Indonesia JCM Secretariat, at which the progress of the study was reported

Implementation Flow

Apr 2014 15 (Tue)	Adoption of programme, exchange of contracts Report on outcomes of last fiscal year's programme and this fiscal year's action plan to the Indonesia JCM Secretariat (in Tokyo)
13 May (Tue) 20 (Wed)	**1st Domestic Stakeholders Meeting (in Kitakyushu)** **Inception Meeting (in Surabaya)**
Jun	

22 Jul 23-24	Meeting on JCM (at Pacifico Yokohama) ISAP 2014 (at Pacifico Yokohama) ● Participation of JCM-related cities, including Surabaya
Aug	
1 Sep (Mon) 3 (Wed) 8-30	**Progress report meeting (in Surabaya, ~50 participants)** JCM Indonesia Domestic Stakeholders Meeting (in Tokyo) **JICA Training on NAMA/MRV (development of low-carbon city plan) (in Kitakyushu)** ● Participation of staff from Surabaya and Indonesian government (supervised by IGES)
3 Oct (Fri) 28-29	**2nd Domestic Stakeholders Meeting (in Kitakyushu)** **Workshop & seminar on JCM (at Pacifico Yokohama)** ● With participation of city staff from Surabaya
9 Dec (Tue) **Mid-Dec**	Session on introduction of Surabaya JCM project at Japan Pavilion at COP20 ● Participation of staff from IGES and Kitakyushu, cooperation with Indonesian government **Progress report**
Jan 2015 16 (Fri)	 Report on progress of programme to International Cooperation Office, Ministry of the Environment (Japan)
5 Feb (Thu) 11 (Wed)	**Workshop on Project Outcomes (in Surabaya, ~50 participants)** **JCM meeting organized by the Indonesia JCM Secretariat**
6 Mar (Fri) 20 (Fri)	**Submission of final report** Project reporting session on the JCM Indonesia project (in Tokyo)
Apr ~	Follow-up for next fiscal year, project formation

Study Results

Potential CO_2 Emission reductions & cost effectiveness

As indicated in the figure below, the results of a survey on potential CO_2 emission reductions from energy savings in hotels, commercial facilities, and office buildings showed a reduction potential of 5,600 t- CO_2/year in four buildings, with an initial investment of JPY 800 million. Costs related to emission reductions per one ton of CO_2 emissions are about JPY 50,000 to 200,000, divided by a depreciation period of 15 years and a subsidy rate of 50%, which results in cost effectiveness per the amount of subsidies of about JPY 1,700 to 7,000. This fiscal year, a project in Hotel B that has shown a strong interest in the installation of cogeneration facilities has been adopted as a JCM project feasibility study, and preparation is moving forward towards an application for assistance for CO_2 emission reduction technology.

Cogeneration projects in SIER and PIER industrial estates, both with power generation capacity of 70 MW and heat supply of 30 t/hour, are receiving support for business plans from both a state-operated electric power company (PLN) as the purchasing entity for electricity and PGN Co. as the source for gas supply. CO_2 emission reductions from the business feasibility of this project will be about 190,000 tons each year, with costs for initial investment at JPY 45,000/year per one ton of CO_2 emissions. When a depreciation period of 15 years and a subsidy of 50% is applied, the cost effectiveness of the project will be about JPY 1,500.

Results of F/S in FY2014: CO2 Emissions Reduction Potential

[ ] Including avoidance of methane emissions

Area		Contents	Emissions reduction potential (t-CO2/yr)	Project cost [USD 1,000]	1. Cost performance [USD /t-CO2/yr]	2. Cost performance per subsidy [USD/t-CO2]	Co-benefits (other impacts)
Energy	Energy saving in buildings (LED lights, A/C, BEMS, co-generation)	Hotel A	250	130	520	17 [15 yrs]	Reducing electricity consumption
		Hotel B	**3,600**	**4,000**	**1,100**	**37 [15 yrs]**	
		Commercial building A	1,600	3,400	2,100	70 [15 yrs]	
		Office building A	**200**	**350**	**1,800**	**60 [15 yrs]**	
	Heat and power supply (co-generation) at industrial zone	SIER (70MW, 30t/hr)	190,000	85,000	450	15 [15 yrs]	Energy saving, CNG utilization
		PIER (700MW, 30t/hr)	190,000	85,000	450	15 [15 yrs]	
Solid Waste	Waste separation, recycling, composting	150t/day capacity, reducing frequency collection vehicles	[8,300]	2,000-3,000	[240-360]	[13-20] [15 yrs]	Recycling, reducing landfill waste
	Waste-to-energy, incineration	500t/day capacity, power 9,330kW (4MPa x 400ºC)	30,200	50,000	160	53 [15 yrs]	Reducing landfill waste, resource efficiency
	Utilization of industrial waste	Liquid fuel: 5,000t/yr, Cement material: 24,000t/yr	6,200	3,400	550	30 [9 yrs]	Efficient use of hazardous waste

1. Cost performance = Project Cost / Emissions reduction potential
2. Cost performance per subsidy = Cost performance / expected useful life / 50% subsidy

With the operation of separation and composting facilities having a treatment capacity of 150 tons of waste daily, the CO_2 emission reductions will be about 8,300 tons per year, with costs for the reduction per one ton of CO_2 at about JPY 24,000 to 36,000/year when project costs are estimated at JPY 200 to 300 million. With a depreciation period for both facilities of 15 years and a 50% subsidy, the cost performance per subsidy will be JPY 1,300 to 2,000. However, all v emission reductions in this scenario are based on the control of methane, and therefore, it will be necessary to carefully consider CO_2 emissions from the reduction of fuel related to transport based on the reduction of waste in calculations for CO_2 emission reductions from petroleum sources.

With the operation of incineration power generation facilities with a potential treatment capacity of 600 tons per day, the CO_2 emission reduction effect will be about 40,000 tons per year as a result of fuel conversion for power generation. With an initial cost of JPY 6 billion, costs required to reduce one ton of CO_2 will be about JPY 150,000/year. With a depreciation period of 15 years and a subsidy of 50%, these costs will be about JPY 5,000. Waste with a lower calorific value (LCV) of 1,500 to 2,000 kcal/kg is required for incineration power generation, however, according to a waste quality analysis, it is possible to obtain a calorific value of about 1,700 kcal/kg by draining kitchen waste (about 1,300 kcal/kg) and mixing it with waste from commercial facilities and hospitals (about 2,000 kcal/kg).

The results of a careful examination on the production of raw materials from business waste shows that when operating facilities that produce 5,000 tons of alternative liquid fuels and 24,000 tons of raw materials for cement, about 6,200 tons of CO_2 emissions can be reduced in comparison to the regular use of coal fuel. With an initial investment of about JPY 340 million, costs related to CO_2 emission reductions will be JPY 55,000/year per one ton of CO_2. When a depreciation period of 9 years for the facility and a 50% subsidy are applied, these costs are about JPY 3,000.

A further careful examination of both business plans is needed, however, the costs related to the reduction of one ton of CO_2 emissions is roughly below JPY 200,000/year. With the application of a depreciation period and subsidies, that figure will be about JPY 1,500 to 7,000, and the plan would be able to be considered as a JCM project candidate.

Implementation Plan towards JCM Project Feasibility

As shown in the figure below on the implementation plan towards the JCM project feasibility for all projects, we can see that of all the project formation surveys being carried out, Hotel B is the fastest in terms of progress, and if a consensus with stakeholders can be reached, next fiscal year, this project can be expected to be implemented under the Ministry of the Environment's assistance project for CO_2 emission reduction technology. Other energy-saving projects will shift to project formation surveys as preparations are completed, and are expected to be implemented from FY 2016.

A rough consensus has been reached with stakeholders on cogeneration in industrial estates; however, the project scale is significant and requires a long-term contract. The project involves a number of stakeholders and it is expected that coordination on investment ratios and contract terms will take about two years. Therefore, it is anticipated that, in a realistic process, engineering, procurement, and construction (EPC) will start in FY 2017, and operations will start in FY 2019. The project plans to use JICA overseas investment and loan schemes to cover project costs, as well as the assistance project for CO_2 emission reduction technology of the Japanese Ministry of the Environment for the project segment on electric power generation.

Implementation Plan of JCM Pilot Projects

Area		Contents	Project cost [USD 1,000]	FY2015	FY2016	FY2017	FY2018 - 2019	Subsidy
Energy	**Energy saving in buildings**	**1 hotel**	**4,000**	**EPC**	**O&M, MRV**			MOEJ
		1 hotel, 1 commercial building, **1 office building**	4,300	P/S	**EPC**	**O&M, MRV**		
	Heat and power supply (co-generation) at industrial zone	SIER (70MW, 30t/hr)	85,000	Detailed F/S	P/S	**EPC**	**O&M in FY2019**	JICA & MOEJ
		PIER (70MW, 30t/hr)	85,000	Detailed F/S	P/S	**EPC**	**O&M in FY2019**	
Solid waste	**Waste separation, recycling, composting**	**150t/day capacity**	**2,000-3,000**	**EPC**	**O&M, MRV**			JICA & MOEJ
	Waste-to-energy, incineration	500t/day capacity, power generation: 9,330kW (4MPa x 400ºC)	50,000	Detailed F/S	P/S	**EPC**	**O&M in FY2019**	JICA & MOEJ
	Utilization of industrial waste	Liquid substitute fuel: 5,000t/yr Cement raw material: 24,000t/yr	3,400	Detailed F/S	P/S, **EPC**	**O&M, MRV**		MOEJ

* F/S: Feasibility Study P/S: Project Formulation Study MOEJ: Ministry of the Environment, Japan JICA: Japan International Cooperation Agency
EPC: Engineering, procurement and construction O&M: Operation and maintenance MRV: Measurement, reporting and verification

There are currently two facilities in operation in the waste sector: separation and recycling plant with treatment capacity of 15 tons/day (Super Depo) and a composting plant with a treatment capacity of 20 to 40 tons/day (Wonorojo area). The separation and recycling plant will be expanded and from next fiscal year, there are plans to construct a separation, recycling, and composting facility with a treatment capacity of 150 tons/day. In order to carry this out, this fiscal year, a business model will be established based on the sales of compost from the Wonorojo composting plant, and from next year, a project budget will be needed. The project budget is expected to use the Ministry of the Environment's assistance scheme for CO_2 emission reduction technology and grant assistance for project operation rights of the Ministry of Foreign Affairs, and will call for investment from Surabaya city and the Indonesian government.

With regard to incineration power generation, cooperation with Sumba Organic, which is commissioned to manage the final disposal site, will be promoted, and a careful examination of the power generation efficiency will be carried out though further analysis of waste quality. Contract details will be worked out with stakeholders, including Surabaya, and EPC will start in FY 2017, with operations to begin in FY 2019. Since the project scale is significant at about JPY 6 billion, the project plans to make use of both JICA's overseas investment and loan schemes and the Ministry of the Environment's assistance project for CO_2 emission reduction technologies.

Next fiscal year, an analysis of waste samples from businesses and the potential for establishing a joint company with a cement company will be examined within the context of the production of raw materials for cement from business waste, with an aim to carrying out a project formation survey and EPC in FY 2016, and starting plant operations in FY 2017. The project expects to use the assistance scheme of the Ministry of the Environment for CO_2 emission reduction technology for project funds.

Project on Low-Carbon City Planning in Surabaya:

Result-Sharing Workshop of the FY2014 JCM Feasibility Study

5 February 2015, BAPPEKO Surabaya

Toshizo Maeda, IGES

Project on Low-Carbon City Planning in Surabaya (JCM F/S, FY2013)

Japan-side

City of Kitakyushu

Project Management

IGES

Kitakyushu Asian Center for Low Carbon Society

Green Sister City (Nov. 2012)

Indonesia-side

City of Surabaya

Development Planning Bureau（BAPPEKO）

Intern'l Cooperation Div.

Energy sector 63,000t-CO2/yr

- NTT DATA Institute of Management Consulting Inc. (NTT Facilities Inc., Green Prop Co., Ltd, KPMG Azusa LCC,) — FS for energy saving and dispersed power system — Local companies, city hall, universities, hospitals, shopping malls, data centres etc.
- Cooperation: Fuji Electric Co., Ltd. Nippon Steel & Sumikin Engineering Co., Ltd. — Cogeneration technology — PT SIER, PT PIER, local companies, National Electricity Company (PLN)

Solid waste sector 72,000t-CO2/yr

- Cooperation: Nishihara Co., Ltd. — Waste sorting, recycling, composting — Dept. of Cleanliness and Landscaping (DKP), Environment Dept. (BLH)
- Hitachi Zosen Co., Ltd. — Waste-to-energy (incineration) — Ministry of Energy and Mineral Resources, Ministry of Public Work, Ministry of Environment
- Amita Co., Ltd. — Waste-to-energy for industrial waste — Local companies, cement company

Transportation sector 1,000t-CO2/yr

- ALMEC VPI Co., Ltd. — Public transportation, Improvement of traffic system for waste collection vehicles, low emission vehicles — Transportation Dept., bus and taxi companies, DKP

Water resource sector 15,000t-CO2/yr

- Matsuo Sekkei Co., Ltd. Kitakyushu City Waster and Sewer Bureau — Energy saving at water and sludge treatment plants — PDAM, Keputih sludge treatment plant, Industrial Estate Company (PT SIER)

Cooperation: Findings of other projects in Surabaya funded by other sources were shared to this project.

Potential CO2 emission reduction: Total 150,000t/year

Project on Low-Carbon City Planning in Surabaya (JCM F/S, FY2014)

Japan-side

City of Kitakyushu

Project Management

IGES

Kitakyushu Asian Center for Low Carbon Society

Green Sister City (Nov. 2012)

Indonesia-side

City of Surabaya

Development Planning Bureau（BAPPEKO）

Cooperation Div.

Energy sector

- NTT DATA Institute of Management Consulting Inc. (NTT Facilities Inc., Fuji Electric Co., Ltd., Nippon Steel & Sumikin Engineering Co., Ltd., AT GREEN Co., Ltd) — Energy saving and dispersed power system for buildings — Dept. of Construction, Institute of Technology Surabaya (ITS), office buildings, hotels, city hall, universities, hospitals, shopping malls
- Cogeneration technology — PT SIER, PT PIER, local companies, National Electricity Company (PT PLN), gas companies

Solid waste sector

- Cooperation: Nishihara Co., Ltd. (Funded by JICA) — Waste sorting, recycling, composting — Dept. of Cleanliness and Landscaping (DKP), Environment Dept. (BLH), fertilizer company (PT Petrokimia)
- Cooperation: Hitachi Zosen Co., Ltd. (Funded by MOEJ) — Waste-to-energy (incineration) — Ministry of Energy and Mineral Resources (ESDM), Ministry of Public Work, Ministry of Cleanliness and Landscaping (DKP), landfill management company (PT Sumber Organik)
- Amita Co., Ltd. — Waste-to-energy for industrial waste — Ministry of Environment, Dept. of Industry, local companies, cement companies (PT Semen Indonesia), paper producing companies

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		PIER (70MW, 30t/hr)	85,000	Detailed F/S	P/S	**EPC**	**O&M in FY2019**	
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	Utilization of industrial waste	Liquid substitute fuel: 5,000t/yr Cement raw material: 24,000t/yr	3,400	Detailed F/S	P/S, **EPC**	**O&M, MRV**		MOEJ

* F/S: Feasibility Study P/S: Project Formulation Study MOEJ: Ministry of the Environment, Japan JICA: Japan International Cooperation Agency EPC: Engineering, procurement and construction O&M: Operation and maintenance MRV: Measurement, reporting and verification

To continue the JCM F/S, we need Surabaya City's support to scale up the pilot projects…

Any progress on Green Building Awareness Award?

Any other Green City Initiatives?

S U R A B A Y A

GREEN BUILDING AWARENESS AWARD

2014

Final Report on the Survey of Energy Sector

February / 2015
NTT DATA INSTITUTE OF MANAGEMENT CONSULTING, Inc.
Socio & Eco Strategic Consulting Unit

NTT DATA

Outline of Project

Study plan in FY2014
…Energy Savings and Dispersed Generation in Buildings

This year, we plan to implement more detailed study at 4 target buildings in order to realize JCM project (applying for JCM financing program) in Surabaya. One project is adopted as another program (JCM Project Planning Study (PS)) for MOEJ this year and detailed study has been conducted.

Study plan in FY2014

	1) Examining business structure	2) Making detailed project plan	3) Examining implementation structure	4) MRV methodology, PDD drafting
Contents	•Examining the possible business structure •Examining the possibility of cooperation with Green Building policies in Surabaya city	•Selection of the solution providers, contractor, etc •Decision of specification of the equipments •Reaching basic agreement with JCM project	•Examining the project implementation structure •Preparing international consortium agreement for JCM project	•Developing MRV methodologies to be applied •Drafting PDD (Project Design Document)
Indonesian Organizations	•4 target buildings •BAPPEKO	•4 target buildings	•4 target buildings	•4 target buildings
Japanese Participants	•NTTD IOMC •NTT Facilities •Equipment Manufacturer	•NTTD IOMC •NTT Facilities •Equipment Manufacturer	•NTTD IOMC •NTT Facilities •Equipment Manufacturer	•NTTD IOMC

Cooperation with
Daikin (A/C), Hohkohsya (LED)
Azbil (BEMS), Fuji Electric (CHP)

Study plan in FY2014
…Combined Heat and Power in Industrial Estate

To realize CHP business in PIER, we plan to conduct cost and profitability analysis and negotiate with stakeholders to build consensus, as a next step.

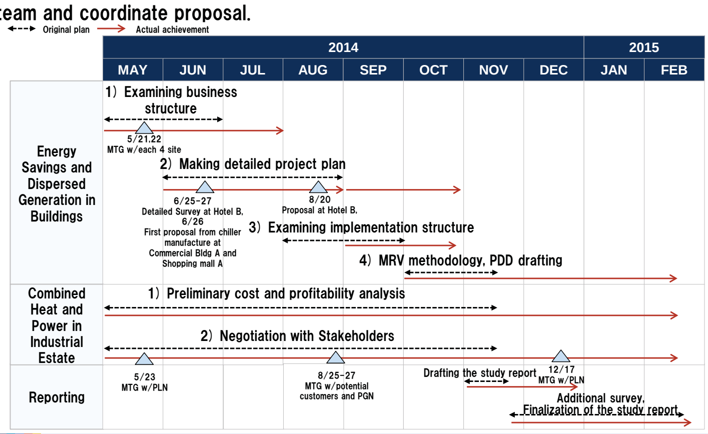
Study plan in FY2014

	1) Preliminary cost and profitability analysis	2) Negotiation with Stakeholders
Contents	•Examination of project implementation structure •Preliminary cost and profitability analysis	•Condition of Contract •Required approval for doing business, etc
Indonesian Organizations	•PT SIER •Customers	•PT SIER •PT PGN •Customers •PT PLN etc
Japanese Participants	•NTT DATA IOMC •NIPPON STEEL & SUMIKIN ENGINEERING •Fuji Electric	•NTT DATA IOMC •NIPPON STEEL & SUMIKIN ENGINEERING •Fuji Electric

Detailed study regarding needs, system planning, financial feasibility, and coordination among partners will be conducted in another program

Progress of the survey and future schedule

Some of the projects have entered into proposal phase. It takes time to organize the team and coordinate proposal.



Study site
…Energy Savings and Dispersed Generation in Buildings

Representative buildings in Surabaya are selected as study subject.

	Hotel A	Hotel B	Shopping mall A	Commercial Building A
Outline	•Member of US hotel chain •Managed by Indonesian Company •Energy saving target as global chain	•Managed by Indonesian company •Consist of one hotel and two commercial buildings	•Largest shopping mall in Surabaya managed by Indonesian Company	•One of the biggest commercial building in Surabaya •Owned by one of the largest media companies in Indonesia
Year of Completion	1996	1979 (Renovated in 1993)	1986 (Extended in 1991, 1996, and 2001)	1997
Floor Area	35,000m²	25,500m²	125,000m²	25,000m²
Floors	28 Floors	27 Floors	6 Floors above ground, 1 Floor below	21 Floors
Image				

Progress for Realization of Business

Hotel A

Progress

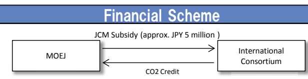
- Meeting (Hotel A, NTT)
  - They have already started 1st LED installation project (for halogen Lamp)
  - We plan to enter into 2nd LED installation project (for fluorescent lamp)
- (Continuing Discussion on Installment for fluorescent lamp)
- (Continuing Discussion on Cost, Merit and Business Model)

Technologies to be installed

LED lightings

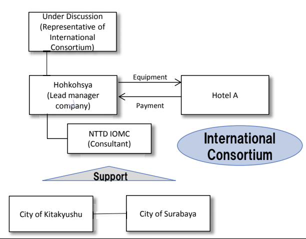
Source: Hohkohsya

Financial Scheme



Project implementation structure (tentative)

- Representative of International Consortium is under discussion
- Candidate Company as a vendor have already completed the detailed research of lighting system of Hotel A



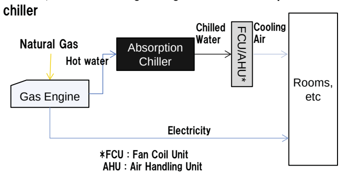
Hotel B

Progress

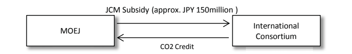
- 1st detailed survey (Hotel B, Fuji Electric, NTT)
- 2nd detailed survey and vendor meeting (Hotel B, Fuji Electric, Fuji Furukawa E&C, 2G, NTT)
- (Engineering work)
- 1st proposal meeting (Hotel B, Fuji Electric)
- Meeting with JCM secretariat
- (Discussion with Owner of Hotel)
- (Investment of Hotel Owner other than Subsidy is a problem to be solved)
- (Continuing the discussion with other Owner)

Technologies to be installed

Combined Heat and Power (CHP) System which consists of an 1,000 kW class gas engine and an absorption chiller

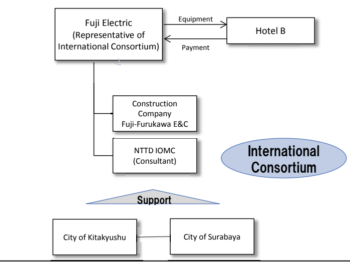


Financial Scheme



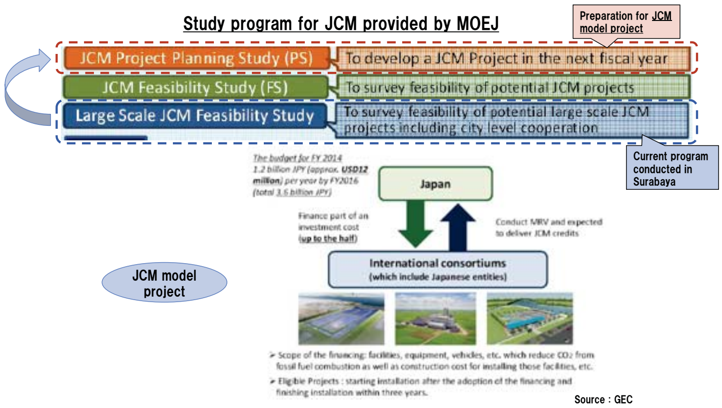
Project implementation structure (decided)

- Project Implementation Structure was established.
- International Consortium has applied PS and are conducting detailed research for Introducing the equipment.



Hotel B

Hotel B project is adopted as JCM Project Planning Study (PS) by MOEJ July, 2014.



Shopping mall A

Progress

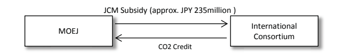
- Discussion on project procedure (NTT, Shopping mall A)
- 1st detailed survey and company introduction (Daikin, NTT, Shopping mall A)
- (Coordination with other vendors)
- 1st vendor meeting (Daikin, NTT, NTT GP)
- (Continuing Discussion on Cost, Merit and Business Model)
- (Planning to apply JCM Subsidy in FY 2015)

Technologies to be installed

High efficient centrifugal chiller, pump, cooling tower, and EMS

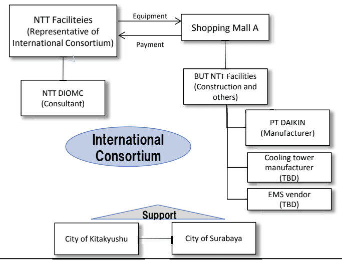
Source : Daikin, Ebara, Kuken

Financial Scheme



Project implementation structure (tentative)

- We have been discussing the Project Implementation Structure as below.
- When reach the agreement, we would like to go to next step.



Commercial building A

Progress

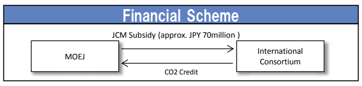
- 5/21 Discussion on project procedure (NTT, Commercial building A)
- 6/26 1st detailed survey and company introduction (Daikin, NTT, Commercial building A)
- (Coordination with other vendors)
- 8/29 1st vendor meeting (Daikin, NTT, NTT GP)
- (Discussion with Owner of Building on Cost, Merit and Business Model)
- (Owner of Building showed interest in JCM Scheme)
- (Continuing discussion on International Consortium and Preparing JCM Subsidy)

Technologies to be installed

High efficient chiller, pump cooling tower, and EMS

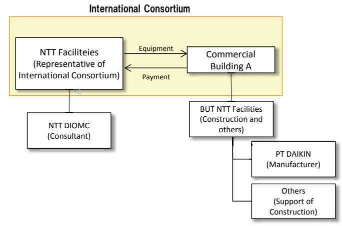
Source : Daikin, Ebara, Kuken

Financial Scheme



Project implementation structure (decided)

- Project Implementation Structure was established.
- International Consortium is in a preparation phase for Introducing the equipment with subsidy.



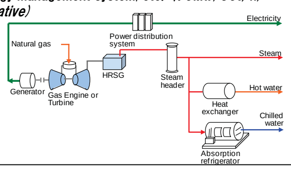
CHP in industrial estate

Progress

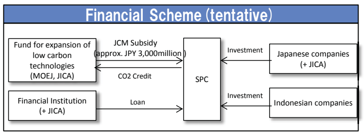
- Meeting with PLN (City of Kitakyushu, Nippon Steel & Sumikin Engineering, Fuji Electric, NTT)
- (Planning basic plan based on the last year's survey)
- Meeting with PT SIER, PGN, factories in PIER
- Meeting with PLN on the regulatory matter, the project implementation structure, especially the investment from Indonesia side and cost matter.
- Conditions such as long-term contract for procurement of Natural Gas, Sales of Electricity and Steam, Consideration for Natural Gas Price Fluctuation and others have to be solved for the business.

Technologies to be installed

CHP system which consists of gas turbine, steam turbine, energy management system, etc. *(70MW, 30t/h, tentative)*

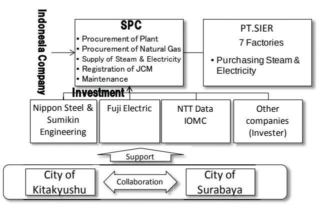


Financial Scheme (tentative)



Project implementation structure (tentative)

- Project Implementation Structure is now under discussion and consideration.
- Present Idea is as below.



Progress of MRV

Hotel A

Scale of the project (tentative)

	FY2015	FY2016	FY2017～
Initial investment	JPY 14 million	-	-
O&M cost	-	Under consideration	Under consideration
CO2 credit	-	100 tCO2	100 tCO2

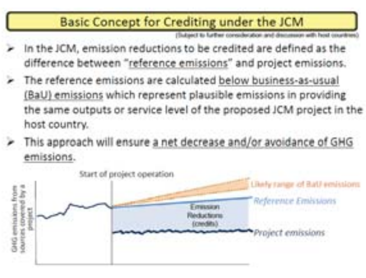
Outline of MRV methodology

Reference CO2 emissions is calculated by energy consumption of "*reference instrument*". Based on the survey result so far, LEDs are being widely diffused in Indonesia, so *LEDs are possibly regarded as not project instrument, but reference instrument.* We are afraid that LED project is not eligible as JCM project and would like to continue our research.

Project CO2 emissions is calculated by the actual electricity consumption of installed LEDs and grid emission factor. Reference CO2 emissions will be calculated by the actual electricity consumption data.

Reference

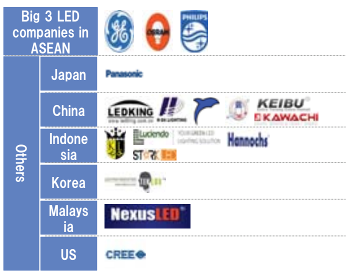
Basic concept of crediting



Source: MOEJ

Players in Indonesian LED market

Many companies come into LED market, which becomes more competitive.



Hotel B

NTT DATA

Scale of the project (tentative)

	FY2015	FY2016	FY2017～
Initial investment	JPY 300 million	-	-
O&M cost	-	JPY 10 million	JPY 10 million
CO2 credit	-	3,700 tCO2	3,700 tCO2

Outline of MRV methodology

Reference emissions are calculated based on the net amount of electricity generated by project gas engine and the amount of chilled water produced by project absorption chiller.
Reference emissions from chilled water production are calculated from the amount of electricity consumption equivalent to the heat capacity of chilled water produced by project absorption chiller which would be the same amount of chilled water as produced prior to the start of project activity.

The net emission reduction is ensured in the following manner:
1. The COP of reference chillers is conservatively set by referring to ID_AM002 "Energy Saving by Introduction of High Efficiency Centrifugal Chiller" which set this value conservatively.
2. If different capacities of chillers are installed in the project site, the COP value of the largest capacity chiller should be applied to ensure conservativeness.

Draft of MRV methodology is described as next page.

Assumed MRV for Hotel B（1/2）

NTT DATA

Reference Emission

$RE_p = RE_{elec} + RE_{cool}$

RE_p	Total reference emissions during a given period p	(tCO2/p)
RE_{elec}	Reference emissions from consumption of grid or captive electricity during a given period p	(tCO2/p)
RE_{cool}	Reference emissions from the production of chilled water during a given period p	(tCO2/p)

$RE_{elec} = EG_{p,\,net} * EF_{elec}$

$EG_{p,\,net}$	Amount of net electricity generated by gas engine generator which displaces grid or captive electricity during a given period p	(MWh/p)
EF_{elec}	CO_2 emission factor for electricity of regional grid system in Indonesia	(tCO2/MWh)

$RE_{cool} = EC_{RE} * EF_{elec}$

EC_{RE}	Amount of electricity consumption equivalent to the heat capacity of chilled water produced by project absorption chiller	(MWh/p)

Assumed MRV methodology for Hotel B（2/2）

NTT DATA

Project Emission

$PE_p = PE_{gen,p} + PE_{aux,p}$

PE_p	Total project emissions during a given period p	(tCO2/p)
$PE_{gen,p}$	Project emissions from natural gas consumed by gas engine generator during a given period p	(tCO2/p)
$PE_{aux,p}$	Project emissions from electricity consumed by auxiliary equipment of CHP during a given period p	(tCO2/p)

$PE_{gen,p} = FC_{PJ,p} * NCV_p / 10^6 * CEF * 44 / 12$

$FC_{PJ,p}$	Amount of natural gas consumed by CHP during a given period p	(m^3/p)
NCV_p	Net calorific value of natural gas consumed	(MJ/m^3)
CEF	Default emission factor of natural gas	(tC/TJ)

$PE_{aux,p} = \Sigma(EC_{aux,\,i,\,p} * EF_{elec})$

$EC_{aux,\,i,\,p}$	Amount of electricity consumed by auxiliary equipment i of CHP during a given period p	(MWh/p)

Shopping mall A

NTT DATA

Scale of the project (tentative)

	FY2015	FY2016	FY2017～
Initial investment	JPY 470 million	-	-
O&M cost	-	Under consideration	Under consideration
CO2 credit	-	4,100 tCO2	4,100 tCO2

Outline of MRV methodology

In this project, pump, cooling tower and EMS have the possibility to be installed with chillers. Considering the emission reduction potential, we will focus the CO2 emission reduction of chillers.

Reference CO2 emissions are calculated by amount of electricity consumption by reference chillers. ID_PM002「Energy Saving by Introduction of High Efficiency Centrifugal Chiller」will be referred.

Project CO2 emissions are calculated by electricity consumption amount of new chillers.

Commercial building A

NTT DATA

Scale of the project (tentative)

	FY2015	FY2016	FY2017～
Initial investment	JPY 140 million	-	-
O&M cost	-	Under consideration	Under consideration
CO2 credit	-	200 tCO2	200 tCO2

Outline of MRV methodology

Reference CO2 emissions is calculated by amount of electricity consumption by reference chillers. ID_PM002「Energy Saving by Introduction of High Efficiency Centrifugal Chiller」will be referred（to be revised for screw chillers）. Project CO2 emissions is calculated by electricity consumption amount of new chillers.

Draft of MRV methodology is described as next page

CHP in industrial estate

NTT DATA

Scale of the project (tentative)

	FY2017	FY2018	FY2019～
Initial investment	JPY 4,500 million	JPY 4,500 million	-
O&M cost	-	-	JPY 700 million
CO2 credit	-	-	114,000 tCO2

Outline of MRV methodology

Reference CO2 emissions is calculated by electricity consumption, gas consumption, and electricity supply amount for PLN. These are calculated based on actual energy supply amount from CHP plant. Project CO2 emissions is calculated by amount of gas consumption of CHP plant.

Assumed MRV methodology for CHP Project

NTT DATA

Reference Emission

$$RE_y = RE_{EL,y} + RE_{HT,y}$$

$RE_{EL,y}$: CO2 emission generated from electricity consumed by each user in reference scenario（tCO_2/y）
$RE_{HT,y}$: CO2 emission generated from steam consumed by each user in reference scenario（tCO_2/y）

$$RE_{EL,y} = \sum_j \sum_i \left(EL_{RE,j,i,y} \cdot EEF_{RE,i,y} \right)$$

$EL_{RE,j,i,y}$: Electricity consumption at user i supplied by Co-generation system j (MWh)
$EEF_{RE,i,y}$: CO2 Emission Factor of electricity at user i in reference scenario (tCO_2/MWh)

$$RE_{HT,y} = \sum_j \sum_i \left(SC_{RE,j,i,y} \cdot (100/\varepsilon_{ST,i}) \cdot CEF_{i,k} / 12 * 44 \right)$$

$SC_{RE,j,i,y}$: Steam consumption at user i supplied by Co-generation system j (TJ)

$\varepsilon_{ST,i}$: Efficiency of steam generator i in reference scenario (%)

$CEF_{i,k}$: Carbon emission factor of fuel k consumed for steam generation by user i (tC/TJ)

Project Emission

$$PE_y = \sum_j \left(F_{j,y} \cdot NCV_{j,y} \cdot CEF_{c,j,y} / 12 * 44 \right)$$

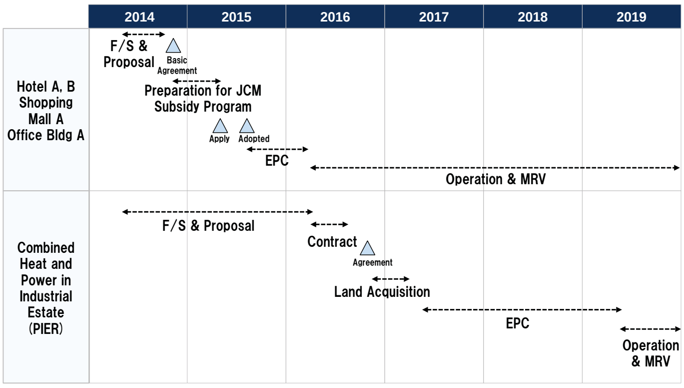
$F_{j,y}$: Natural gas consumption by co-generation system j（mass or volume units）
$NCV_{j,y}$: Calorific value of natural gas consumed by co-generation system j (TJ/mass or volume units)
$CEF_{c.j,y}$ Carbon emission factor of natural gas consumed by co-generation system j (tC/TJ)

Future Plan

Future Plan / Schedule

NTT DATA

At present, we plan to start operation of JCM project at one building in 2016.
CHP project in PIER will take more time to be implemented.



Future Plan / Assumed Obstacles

NTT DATA

- ◆A way to handle Credit Risk
- ◆Agreement on Sharing the Initial Investment
- ◆A way to handle Long-term Contract project such as Supplying Combined Heat & Power

NTT DATA
Global IT Innovator

ECO MANAGEMENT SURABAYA

Indonesia Surabaya Recycle Business Proposals

- Treatment sustained at low cost
- Safe and hygienic work environment
- Promotion of efficient recycling

SURABAYA
KITAKYUSHU-CITY
BEETLE
NISHIHARA.Co.,Ltd

ECO MANAGEMENT SURABAYA

Outline

ECO MANAGEMENT SURABAYA

1.1 Outline of Business

- After the operation of “Super Depo (Intermediate treatment facility)” and “Compost center”, we would like to develop the new business “Neshihara model”.
- “Nishihara model” aims to integrate the function of “Super Depo” and “Compost center” into one large facility. The facility will accept 150 tons/day of MSW(Municipal Solid Waste)

Tipping fee Rp100/kg

Households / Offices
MSW

“Nishihara” (150 tons/day)
“Intermediate treatment facility” and “Compost center”

Sorting

Organic waste ⇒Composting — Sell (1kg=Rp300)

Valuables(10～15%) ⇒Sorting — Sell (1kg=Rp500)

Others(25～30%)

TPA Benowo

Waste sent to the final disposal site will be 30% (70% reduction),

*Amount of MSW will be the excess of the waste treated by PT Sumber Organik.

Profit

- Surabaya can reduce the amount of waste sent to TPA by tipping fee and land offer.
- Other profits are “GHG emission reduction”, “hiring Waste pickers” and “contribution to agriculture by providing compost”.

ECO MANAGEMENT SURABAYA

1.2 Project system of survey

- Nishihara Corporation (Beetle) conduct this survey as future business entity.
- City of Kitakyushu supports the survey and future business, based on the Green Sister City agreement with Surabaya city.

Project system

SURABAYA

Proposal

BEETLE Nishihara Corporation

IGES Support

NTT DATA IMC Support

Advices /Policy proposal

City of Kitakyushu

supports the survey and future business

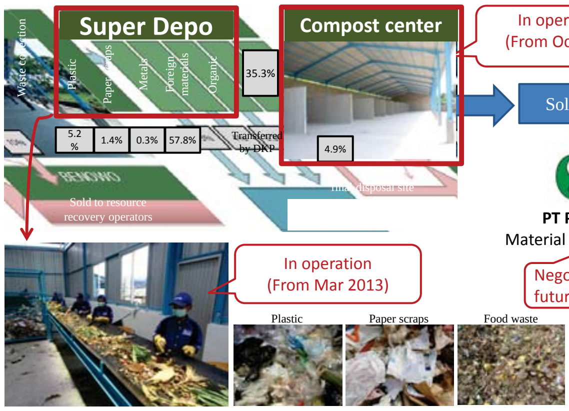
ECO MANAGEMENT SURABAYA

Current Progress

ECO MANAGEMENT SURABAYA

2.1 Current progress

- Operating “Super Depo” and “Compost center”



In operation (From Oct 2014)

Sold to farmers

PT Petro Kimia
Material of Petro Organik

In operation (From Mar 2013)

Negotiation about future cooperation

ECO MANAGEMENT SURABAYA

2.2 Super Depo [1]

- Nishihara constructed “Super Depo” on March 2013.
- With support from DKP, Nishihara dispatched a stuff to operate “Super Depo”.
- “Super Depo” was handed over to Surabaya City on September 1, 2014.
- In clean and efficiently equipped facility, workers sort valuables (plastics/papers) from MSW, and organic waste to be composted is collected.
- Super Depo hire ex-waste pickers as workers.

ECO MANAGEMENT SURABAYA

2.3 Super Depo [2]

Super Depo visitors	
Indonesian	857
Japanese	139
Other forefingers	41
TOTAL	1037

- From March 2013, 1037 persons visited “Super Depo” to learn the importance and practice of sorting MSW.
- From Indonesia, persons in charge of public sectors, University and High school student visited “Super Depo”, the number of domestic visitor is 857.
- From Japan, we accept 139 person, including Vice ministers of Min of Environment and other public sectors. In addition various TV shooting teams came and produced TV programs.
- From Laos, Malaysia, Vietnam, Thailand, Australia and France, we accepted 41 visitors.

2.4 Compost center

- From October 2014, Nishihara is operating “Compost center” at Wonorejo.
- The facility accept the organic waste sorted and collected at “Super Depo”
- As a treatment of organic waste which accounts for 60% of MSW, Organic fertilizer will be manufactured from organic waste and sold to Petro Kimia.

- By operating “Super Depo” and “Compost center”, we can demonstrate the function of “Nishihara Model”, MSW reduction by sorting and composting organic waste.

Schedule of the project

3.1 Schedule of business

2013 Demonstration of Waste sorting
=>Super Depo (at a scale of 10~15 tons MSW/day).

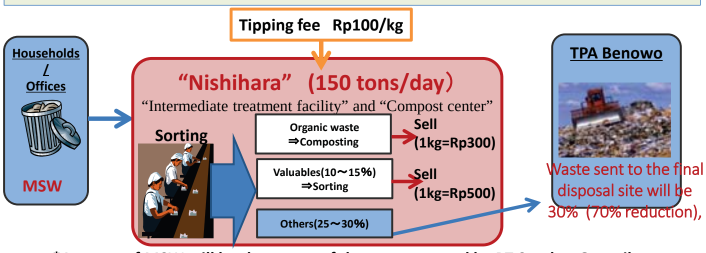
2014 Demonstration of Composting
=>Wonorejo Composting center
- ✓operate the compost production line.
- ✓accept 10 tons of organic waste per day

2015~ Operation of Wonorejo Compost center
=>After the demonstration project, we operate Wonorejo Compost center under MOU/Contract with Surabaya city.

2016~ Large facility of Waste separation and Composting “Nishihara model”
=> Facility at a scale of 150 tons/day

3.2 Outline of Business

- After the operation of “Super Depo (Intermediate treatment facility)” and “Compost center”, we would like to develop the new business “Neshihara model”.
- “Nishihara model” aims to integrate the function of “Super Depo” and “Compost center” into one large facility. The facility will accept 150tons/day of MSW(Municipal Solid Waste)

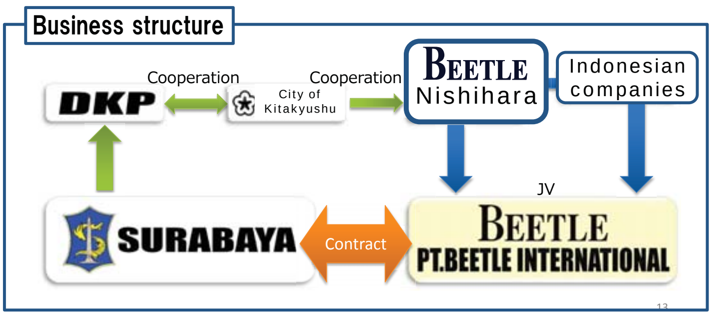


*Amount of MSW will be the excess of the waste treated by PT Sumber Organik.

Profit
- Surabaya can reduce the amount of waste sent to TPA by tipping fee and land offer.
- Other profits are “GHG emission reduction”, “hiring Scavengers” and “contribution to agriculture by providing compost”.

3.3 Business structure

- Nishihara will establish “PT. BEETLE INTERNATIONAL” with Indonesian companies.
- Under the contract/MOU of MSW management with Surabaya city, Nishihara will develop the business, accepting 150tons/day of MSW and sell valuables (Plastics, Papers and Compost).



3.4 Income and expense

- In terms of the business feasibilities, the scale of facility will be “150t/day of MSW”.
- The net operating income of Rp458 Million per month, or Rp5.5 Billion per year, will be expected. (not including the initial cost)

Business Feasibility (per month)			
Income	Selling Materials (Plastics etc, Rp500/kg)	150t/day×30%(proportion of the material)×500Rp/kg×25days	Rp563 Million (¥5.6 Million)
	Selling Compost as fertilizers(Rp300/kg)	150t/day×51%(proportion of organic)×60%(reduction by composting)×300Rp/kg×25days	Rp344 Million (¥3.4 Million)
	Tipping fee (Rp100/kg)	150t/day×100Rp/kg×25days	Rp375 Million (¥3.8 Million)
Expense	Dumping at TPA Benowo (Rp100/kg)	150t/day×25%(Others 20%+Residuals of composting 5%)×100Rp/kg×25days	Rp93.7 Million (¥0.9 Million)
	Running Cost (Electricity, Fuel etc)	*Average of 15%(increasing rate)×10years	Rp100 Million (¥1 Million)
	Labor Cost	180 workes×Rp3.5Million *Average of 15%(increasing rate)×10years	Rp630 Million (¥5.25 Million)
Net income (Income – Expense)			Rp458 Million/Month(¥4.6 Million)

JCM Methodology and GHG reduction

4.1 MRV Methodology / Cost performance

MRV Methodology and GHG reduction

- MRV Methodology for Composting is almost finalized.
- We are preparing the specification of the plant and PDD of this project.

Cost Performance

- The cost performance will be ¥24,000- 36,000 (per t-CO2/year), from the assumption that Initial cost is ¥200 - 300 million Yen (=Rp 20 - 30 billion) and , The amount of GHG reduction is 8,300 t-CO2/year
  - Initial cost : ¥200 - 300 million Yen (=Rp 20 - 30 billion) (MSW:150t/day)
  - GHG reduction : around 8,300 t-CO2/year *Only avoidance of methane generation
  - Cost Performance : ¥24,000- 36,000 (per t-CO2/year, =Rp 24,00,000 - 3,600,000) = ¥200 - 300 million Yen (=Rp 20 - 30 billion) / 8,300 t-CO2/year

ECO MANAGEMENT SURABAYA

4.2 GHG reduction potential

- We calculated the GHG reduction potential from 3 patters:
  1. Large facility with Separation and Composting (150tons/day of MSW) ×1
  2. Large facility with Separation and Composting (150tons/day of MSW) ×6
  3. Whole potential for compost in Surabaya

	1.Large facility with Separation and Composting X1	**2.Large facility with Separation and Composting X6**	**3.Potential in Surabaya city**
Amount of Waste(MSW) & Organic waste	150t/day(MSW) 77t/day(Organic)	900t/day(MSW) 462t/day(Organic)	2,642t/day(MSW) 1,855t/day(Organic)
Reference GHG emission(RE)	13,252t-CO2/year	79,510t-CO2/year	256,062t-CO2/year
Project GHG emission(PE)	4,900 t-CO2/year	29,400 t-CO2/year	94,790t-CO2/year
GHG reduction	**8,352 t-CO2/year**	**50,110 t-CO2/year**	**161,272t-CO2/year**

ECO MANAGEMENT SURABAYA

Image of Next Step

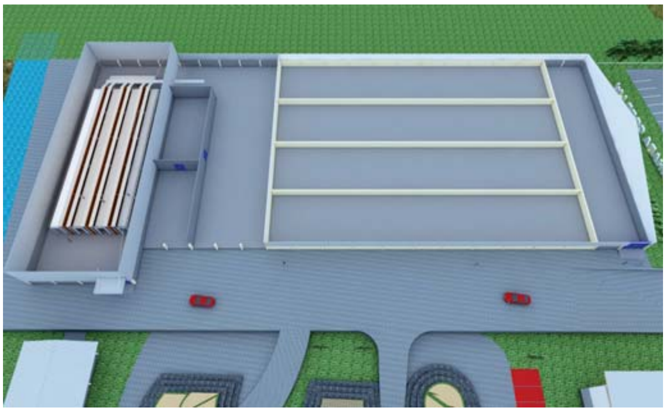
ECO MANAGEMENT SURABAYA

5.1 Bio park by "Nishihara"

- This ARCHITECTURAL PERSPECTIVE DRAWINGS shows the image of Large facility with Separation and Composting (150tons/day of MSW) .
- The site will be at Wonorejo.

ECO MANAGEMENT SURABAYA

5.2 Recycling zone



ECO MANAGEMENT SURABAYA

5.3 Seminar rooms / Education zone

Feasibility Study for "Energy-from-Waste Plant" in Surabaya, Republic of Indonesia

February 2015
Hitachi Zosen Corporation

1.Outline

Project : Feasibility Study for "Energy-from-Waste Plant" in Surabaya, Republic of Indonesia

Type of Waste : Municipal Solid Waste (MSW)

Technology : Energy from Waste
(Generating electricity from incineration plant)
Sorting Waste, Composting organic waste

Plant Scale : 600t/day

Outline of Business : Hitachi Zosen (Hitz) will construct an "Energy-from-Waste Plant (Incinerator) " at a suburban area of Surabaya (ex:TPA Benowo).
: MSW with calorific values around 1,500-2000 kcal will be incinerated.
: The incinerator has a function as a power station, by the heat recovery.
: The electricity will be sold to the national grid.

Benefits : Decrease the amount of waste landfilled by 90%
: Decrease environmental impacts, such as leachate problem, etc.
: Function as a power plant
- Output capacity 8.8MW (70,000MWh/year)
- 11MW including captive consumption

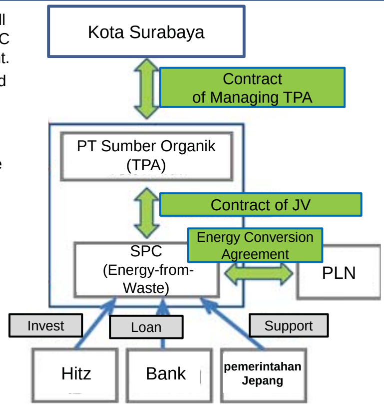
: Reduction of GHG (approx. 40,000 ton-CO2/year)

2. Project system of survey

- Hitz conduct this survey as the future business entity.
- City of Kitakyushu, the green sister city of Surabaya supports this project.
- From Kitakyushu, Kitakyushu City Environmental Preservation Association and Nishihara Corporation join the project as well.
- NTT Data IMC participate in this project to support the whole survey.

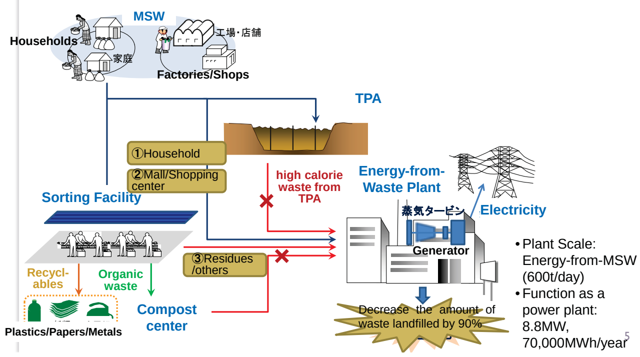
3. Business structure

- Business of Hitz will not only sell plants, but also establish an SPC for the power plant management.
- PT Sumber Organik (PTSO) and Hits expect to establish an SPC for the business in Surabaya.
- PTSO is entrusted for the waste management at TPA by the Surabaya City.
- PT SO is developing future business including a solution by the "Energy-from-Waste".
- To manage a waste-to-energy project, sophisticated and experienced "know how" is required.
- Hitz has such "know how" from practical experience all over the world.



4. Image of future business

- Expected calories are 1,500kcal/kg or higher to operate the energy-from-waste plant.
- To estimate the calories, we conducted composition surveys of MSW from "1.Households", "2. Shopping malls" and "3.Residues from the Sorting Facility".
- We found that we can collect 600t/day of MSW and adjust them to have calories of 1,500kcal or higher from waste from "1.Households" and "2. Shopping malls".



5. Composition of MSW for Waste to Energy

- "1.Households" (540t/day) and "2. Shopping malls" (60t/day) will be supplied to the Energy-from-Waste facility.
- The total amount of MSW input will be 600t/day (1. + 2.) and the estimated average calorie is 1,360kcal/kg.
- After draining the water content from the input MSW by 15% at the pit of the facility, the calorie of MSW will be higher than 1,700kcal/kg.

◆Waste from Households
-Calorie : 1,300 kcal/kg
-Amount: 540t / day

+

◆ Waste from Mall/Shopping center
-Calorie :2,000 kcal/kg
-Amount:50t / day

◆Waste from Hospital*
-Calorie :2,000 kcal/kg
-Amount:10t / day

*the calorie is assumed as same as waste from Shopping malls.

600t/day

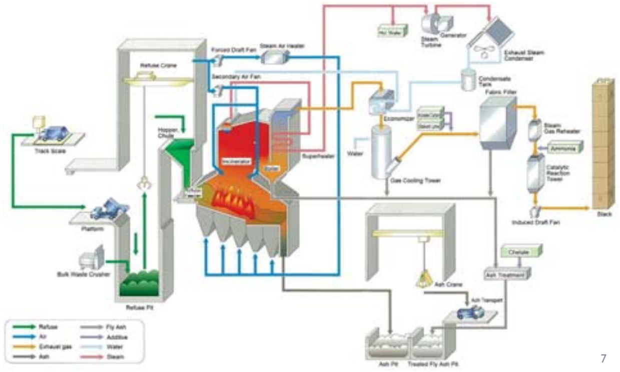
MSW input (600t/day)

Composition (%)	paper	12.4
	fiber	6.8
	plastic	22.0
	rubber	0.5
	wood	8.5
	garbage	23.6
	metal	0.9
	glass	0.0
	china, stone	2.7
	others	22.6
Three components (%)	water content	51.5
	combustible content	37.0
	ash content	11.6
calorific value (kcal/kg)		1360
calorigic value (kJ/kg)		5680

After draining the moisture, the calorie will be higher than 1700kcal/kg.

6. Feasibility of Energy from Waste

- We made sure that 600t/day of MSW with 1500kcal/kg or higher could be collected.
- The IRR of the project will be around 15%, from the assumption that the initial cost is ¥ 6 billion (=Rp 600 billion), Tipping fee is ¥1,200 /t (=Rp120,000/t) and FIT(Fed in Tariff) of Waste to Energy by MSW is ¥14.5/kWh (=Rp1,450Rp/kWh).



7. MRV Methodology / Cost performance

MRV Methodology and GHG reduction

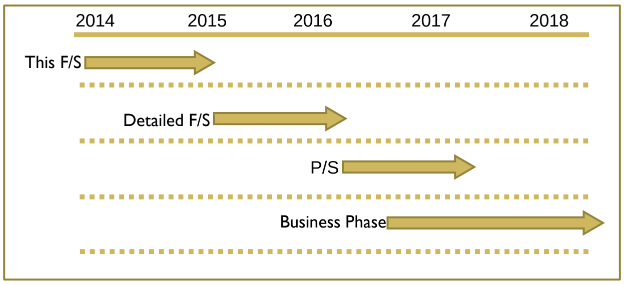
- MRV Methodology and PDD for Waste to Energy is finalized.
- The amount of GHG reduction will be around 40,000 t-CO2/year.

Cost Performance

- The cost performance will be ¥150,000 (per t-CO2/year), from the assumption that Initial cost is ¥6 billion Yen (=Rp 600 billion) and , The amount of GHG reduction is 40,000 t-CO2/year
- Initial cost : ¥6 billion Yen (=Rp 600 billion)
(MSW:600t/day, Capacity:8.8MW, Generated energy : 70,000MWh/y)
- GHG reduction : around 40,000 t-CO2/year
- Cost Performance : ¥150,000 (per t-CO2/year, =Rp15,000,000)
= ¥6 billion Yen (=Rp 600 billion) / 40,000 t-CO2/year

8. Future schedule

- Hitz will conduct a detailed F/S in 2015.
- In 2016, Hitz plans to conduct a P/S.
- In parallel with the P/S, Hitz will prepare for the start of the Energy-from-Waste business.
- It will take at least 2years from FEED (Front End Engineering Design) to operation after commissioning.

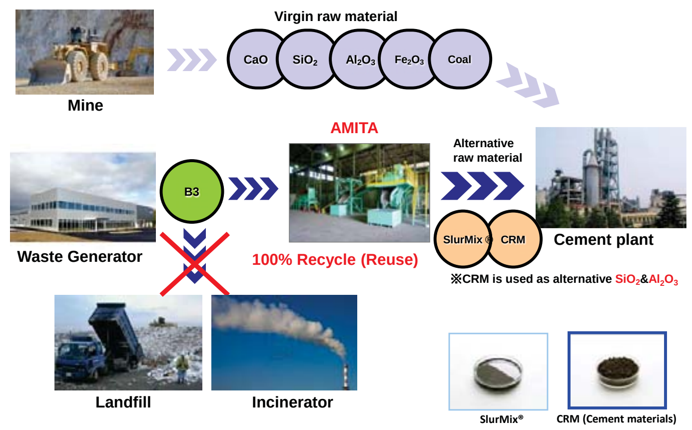


FY2014 Survey on the Potential for Large-Scale JCM Project to Create a Low-Carbon Society in Asia
Project to Support Formulation of Low-Carbon Urban Planning for Surabaya, Indonesia

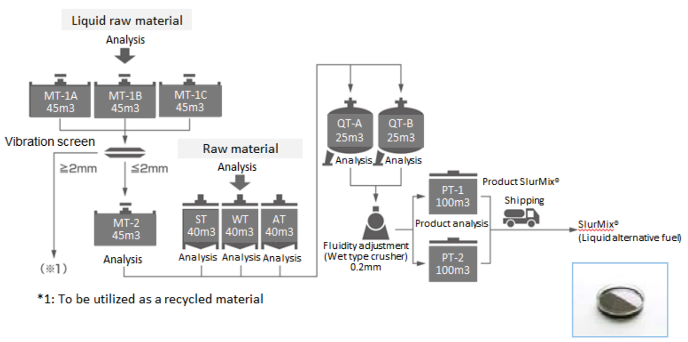
(Industrial Waste Sector)

AMITA CORPORATION

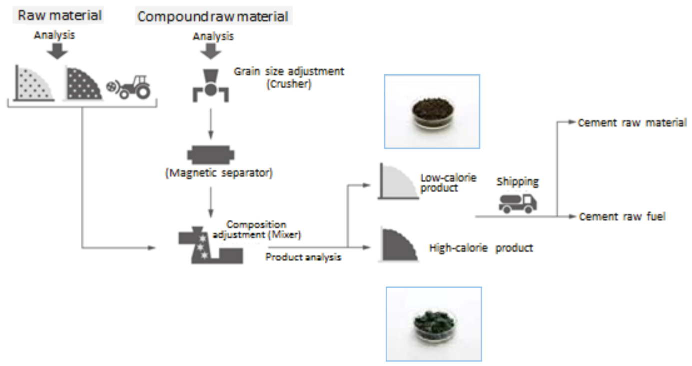
Business Concept ～Waste Reuse in Cement Plant～



Recycling Line (1) SlurMix®



Recycling Line (2) Cement Raw Material

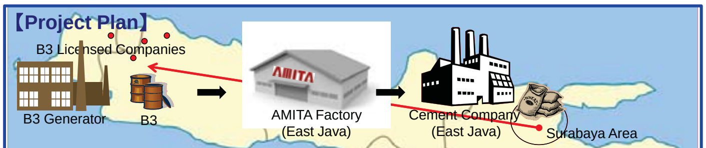


Outline of the Project

【Current Situation】

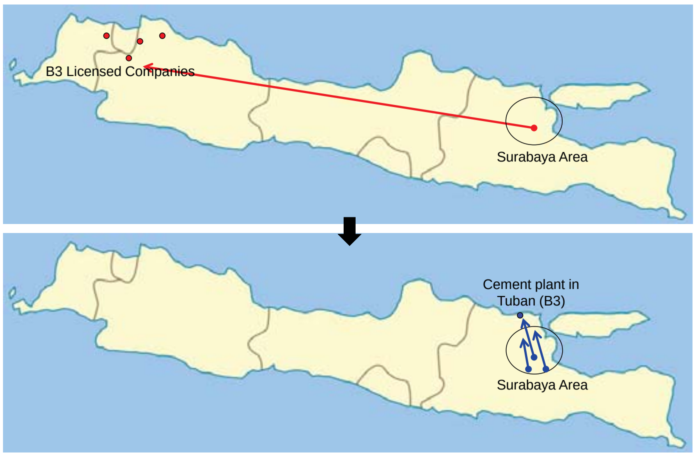
・Most of B3 licensed companies (on treatment) are located in West Java.
In East Java, it is hard to find licensed companies other than cement companies.
・B3 wastes are transported long-distance.
・Final disposal would be landfill. (Controlled landfill)

【Project Plan】

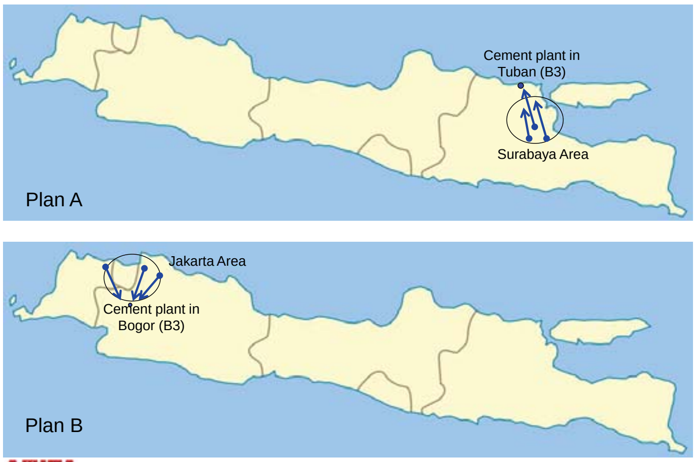


・Intermediate treatment to convert B3 into alternative material/ fuel for cement production in East Java.
・Enhancing "Local production for local consumption" in environment field for CO_2 reduction.
・ 100% recycle service for the needs of local waste generators.

Outline of the Project



Outline of the Project



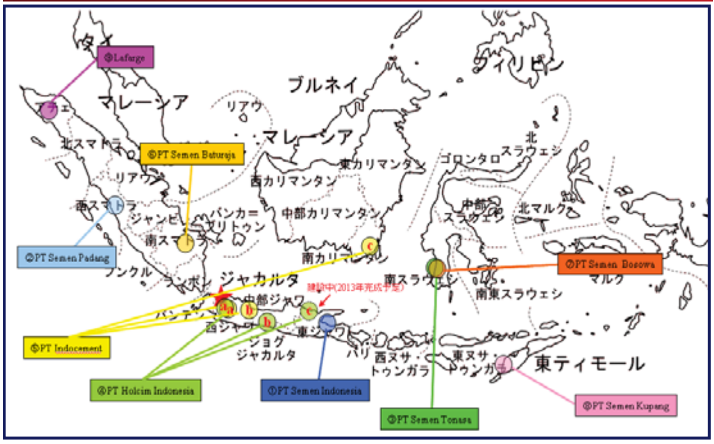
Survey Items

【1】Baseline Survey
(Possibility of the waste acceptance at Cement Makers)
・Interviewing Cement Association and cement companies
→Recycling rate of cement industry is limited, accordingly, Indonesian cement industry has huge capacity for recycling.
→There is intention to accept B3 waste, though facility is not enough.

【2】Market Survey
・Visiting 67 waste generators, made survey & collected 37 samples of B3
→Most of waste generators burden high transportation cost to East Java.
→Most of B3 are simply either landfilled or incinerated.
→CRM analysis simulation based on 37 samples meet the standard of waste acceptance criteria in cement industry.

【3】Feasibility Study
(F/S for establishment of intermediate treatment factory)
→All of cement companies are interested in the PJ though not yet agreed for JV agreement.
→Not only cement companies but B3 licensed waste treatment companies are also interested in the PJ.

Baseline Survey (Cement Factory Map)



Baseline Survey (Waste Utilization in Indonesia and Japan)

	Indonesia	Japan
Population	230,000,000	128,000,000
Area	1,910,931 km^2	377,930 km^2
Industrial waste generation	7,000,000 t / year	400,000,000 t / year
Cement production	57,738,716 t / year (2013)	59,300,000 t / year (2012)
Waste recycled amount by cement industry	- t / year	28,523,000t / year
Waste consumption rate in cement industry	?-kg / cement 1t	481 kg / cement 1t

Findings

・Waste consumption rate is not available even at Indonesia Cement Association. The rate of one cement plant is approx. 88 kg /1t of cement, which is 18% of that of Japan.
Accordingly, Indonesian cement industry has huge capacity for recycling.
・Many foreign cement companies are investing in Indonesia and will be a severe competitive market.

Market Survey (Questionnaire)

Kepada penanggung jawab pengelolaan limbah

AMITA CORPORATION
Juni 2014

AMITA adalah sebuah perusahaan Jepang terkemuka yang bergerak dalam bidang daur ulang limbah industri (http://en.amita-hd.co.jp/).
Saat ini, AMITA CORPORATION bekerja sama dengan pemerintah Jepang (Kementerian Lingkungan Hidup) dan terlibat dalam sebuah proyek, yaitu "Proyek Tata Kota Rendah Karbon di Surabaya, Indonesia". Dalam proyek ini, kami melakukan riset mengenai situasi terkini di Indonesia dalam hal penggunaan limbah industry sebagai material / bahan bakar alternatif.
Kami akan sangat berterima kasih jika anda berkenan untuk menjawab beberapa pertanyaan di bawah ini yang akan membantu kami untuk memahami situasi di negara anda.

Questionnaire (Daftar Pertanyaan)

Q1. Limbah yang dihasilkan di pabrik anda?
① Sebutkan limbah utama yang dihasilkan di pabrik anda. (Beberapa jawaban)

Jenis Limbah	Jumlah	B3	Metode pengolahan / pembuangan	Biaya Pengolahan
☐ a. Limbah Minyak	( )t/bulan	☐ Ya ☐ Sedikit ☐ Tidak	☐ 1. Insinerasi di tempat milik sendiri ☐ 2. Dikirim ke produsen semen ☐ 3. Digunakan untuk pupuk ☐ 4. Insinerasi dilakukan oleh pihak lain ☐ 5. Tempat Pembuangan Akhir /TPA (PPLi) ☐ 6. TPA (di tempat lain) ☐ 7. Digunakan untuk bahan bakar ☐ 8. Lain-lain ( )	( ) yen / kg ☐ Termasuk ongkos angkut ☐ Tidak termasuk ongkos angkut
☐ b. Limbah Asam	( )t/bulan	☐ Ya ☐ Sedikit ☐ Tidak	☐ 1. Insinerasi di tempat milik sendiri ☐ 2. Dikirim ke produsen semen ☐ 3. Digunakan untuk pupuk ☐ 4. Insinerasi dilakukan oleh pihak lain	( ) yen / kg ☐ Termasuk ongkos angkut

Market Survey（CRM Simulation chart）

No	Waste Generator (Industrial-Classified)	Type	B3	Form	Amount (ton/m)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)	CaO (%)	Total Heavy metal (%)	Cl (%)	Moisture (%)	Calorie (kcal/kg)
1	Food	Coffee grounds	×	Sludge	600	0.2%	0.1%	0.0%	0.3%	0.019%	0.026%	78.2%	5720kcal
2	Food	Dry coffee grounds	×	Sludge	300	0.1%	0.1%	0.1%	0.1%	0.073%	0.007%	77.0%	5527kcal
3	Food	Sludge	×	Sludge	150	1.6%	11.9%	0.3%	0.7%	0.020%	0.407%	85.7%	3516kcal
4	Casting	Al dust A	○	Powder	6	2.1%	64.3%	0.4%	0.1%	0.010%	1.660%	0.0%	614kcal
5	Casting	Al dust B	○	Powder	6	1.5%	35.1%	0.3%	0.8%	0.407%	3.960%	0.0%	759kcal
6	Electronical component	Si sludge	○	Sludge	20	12.8%	3.4%	0.6%	43.9%	0.018%	0.028%	38.8%	183kcal
7	Electronical component	Si liquid waste	○	Liquid	6	65.7%	0.2%	1.4%	0.0%	0.069%	0.000%	0.0%	3921kcal
8	Chemical	Sludge	○	Sludge	5	0.6%	0.2%	0.8%	1.7%	0.021%	0.051%	7.6%	3793kcal
9	Electronical equipment	WWTP sludge	○	Sludge	4	51.2%	7.7%	1.4%	6.0%	0.349%	0.887%	58.1%	280kcal
10	Electronical equipment	Waste glass	○	Solid	50	58.5%	2.2%	0.8%	6.6%	0.923%	0.013%	0.0%	0kcal
11	Musical instrument	Paint Waste	○	Powder	1	0.6%	1.7%	0.0%	0.0%	0.036%	0.013%	36.9%	6743kcal
12	Automobile part	WWTP sludge	○	Sludge	10	4.0%	37.4%	0.8%	9.0%	0.214%	0.055%	70.8%	130kcal
13	Automobile part	Paint Waste	○	Powder	1	11.1%	0.3%	0.1%	6.6%	1.192%	0.041%	0.0%	3652kcal
14	Automobile part	Paint dust	○	Powder	10	0.7%	0.1%	0.1%	0.0%	0.006%	0.128%	0.0%	4777kcal
15	WWTP	WWTP sludge	○	Sludge	200	18.6%	8.5%	5.9%	4.3%	2.402%	0.138%	60.9%	2107kcal
16	Night soil treatment	Night soil sludge	×	Sludge	960	4.5%	2.0%	1.0%	2.5%	0.340%	0.111%	83.4%	4307kcal
		total			2329t	4.0%	2.7%	1.0%	2.7%	0.399%	0.14%	78.70%	4577kcal

Reduction of GHG (1)

GHG reduction amount in case of using alternative fuel as replacement of coal.

Base line Emission	①	GHG generated by coal mining	395t- CO_2/Year
	②	GHG generated by transportation from coal mine to cement plant	18t- CO_2/Year
	③	GHG generated by coal combustion in cement production	25,337t- CO_2/Year
	④	GHG generated by B3 transportation from waste generator to landfill site	7,598t- CO_2/Year
	⑤	GHG generated by B3 incineration	–
		Base Line Emission Total	**33,348t- CO_2/Year**
Project Emission	⑥	GHG generation by B3 transportation from waste generator to PJ plant	1,140t- CO_2/Year
	⑦	GHG generated by recycling operation in PJ plant	261t- CO_2/Year
	⑧	GHG generated by CRM transportation from PJ plant to cement plant	18t- CO_2/Year
	⑨	GHG generated by CRM combustion in cement production	25,734t- CO_2/Year
		Project Emission Total	**27,152t- CO_2/Year**
GHG Reduction Amount (Base Line Emission - Project Emission)			**6,197t- CO_2/Year**

Reduction of GHG (2)

◇Issues to be considered when calculating GHG reduction amount

・ No available emission factor for the calculation of GHG emission on utilizing(burning) alternative fuel
⇒Emission factor of RDF and waste oil was applied tentatively, however the composition and property of alternative fuel is not necessarily similar to that of RDF and waste oil.
・ SlurMix® and CRM are composed of different types of wastes and is composition is not always stable.
⇒It is not realistic to set a specific emission factor of SlurMix® and CRM

There is a notion that GHG emission from utilization of alternative fuel from wastes shall be off-set as that indirectly contribute to reduce GHG emission from landfill and incineration of wastes (※)

(※)World Business Council for Sustainable Development (WBCSD) "Cement CO_2 and Energy Protocol: CO_2 and Energy Accounting and Reporting Standard for the Cement Industry (ver.3)"

【Reference】 Estimated GHG reduction amount when the GHG emission from utilizing(burning) SlurMix® and CRM is not counted

SlurMix® Production	5,000t/year	
SlurMix® Heat Value	3,350kcal/kg	Average
Coal (fuel coal) Heat Value	5,700kcal/kg	Based on the result of survey
Substituted Amount	Approx.2,938t/year	
Coal (fuel coal) CO_2 Emission Factor	2.409t-CO_2/ t	
CO_2 Emission Reduction Amount	**Approx. 7,079t-CO_2/year**	Substituted amount * CO_2 Emission Factor

Reduction amount by utilizing SlurMix®

CRM Production	24,000t/year	
CRM Heat Value	1,800kcal/kg	Average
Coal (fuel coal) Heat Value	5,700kcal/kg	Based on the result of survey
Substituted Amount	Approx. 7,579t/year	
Coal (fuel coal) CO_2 Emission Factor	2.409t-CO_2/ t	
CO_2 Emission Reduction Amount	**Approx.18,258t-CO_2/year**	Substituted amount * CO_2 Emission Factor

Reduction amount by utilizing CRM

Co-benefit of the PJ

◇Reduction of fossil fuel and natural resources consumption

◇Appropriate and transparent treatment of B3 by introducing 100% recycle, Promotion of better environment management

◇Contribution to achievement of higher recycling rate that waste generator set as their target

◇Life extension of final disposal site
(consistent with government policy)
⇒Reduction of Methane gas emission,
Reduction of environmental burden of surrounding area

◇Establishment of a healthy recycle market

Investments and Cost Effectiveness

	Project Cost	CO_2 Emission Reduction	Cost-effectiveness (t- CO_2/ year)
Liquid Fuel (Slurmix®) Plant (Capacity approx. 5,000t/ year)	Approx. Rp. 36,000,000,000	Approx. 6,197- CO_2/year	Approx. Rp. 5,800,000
CRM (Fuel) Plant (Capacity approx. 24,000t/ year)			

(※) In case GHG emission from utilizing(burning) SlurMix® and CRM is not counted, cost-effectiveness is calculated approx. 10,648yen/t

Project Finance

◇ JCM subsidy by MOEJ

◇Implementation Schedule

FY2015
- Selection of local partner
- Consensus between relative administration
- Fund rasing

FY2016
- JV contract with local partner
- Related application for license

FY2017
- Plant construction, Start operation

2014 Feasibility Study on JCM Large Scale Project Formulation for realization of Low Carbon Society in Asia

Summary report for "Supporting Project for developing low carbon city planning in Surabaya city, Indonesia"

NTT Data Institute of Management Consulting, Inc.

Contents

1 Background and purpose of this project

1.1 Purpose and coverage of this project

Surabaya, as a local government in Indonesia, is interested in building advanced low carbon society, and has been positively acting for realization of low carbon in energy sector. Last year, we conducted the initial feasibility study there on combined heat and electricity supply service in an industrial estate and on energy saving and dispread generation in buildings. Through this study, we have selected PIER industrial estate as a major candidate which has a possibility of expansion for combined heat and power business that has been considered as a system for CO2 reduction in SIER industrial estate. Moreover, as for energy saving and dispread generation in buildings, we have chosen four major candidate sites for its implementation. In those sites, we have conducted diagnosis for energy saving and submitted first proposals for business realization of JCM projects.

This year, as for the combined heat and electricity supply service, we will continue rough evaluation on systems which can be installed and economic evaluation to realize the service in PIER industrial estate. For energy saving and dispread generation in buildings, we will conduct some detailed researches in the sites, where we did the business feasibility study last year, to realize the business of JCM projects and to apply for JCM subsidies.

The sites we have conducted the project this year are as follows.

Figure 1. Summary of the project sites

	Hotel A	Hotel B	Shopping mall A	Commercial Building A
Outline	• Member of US hotel chain • Managed by Indonesian Company • Energy saving target as global chain	• Managed by Indonesian company • Consist of one hotel and two commercial buildings	• Largest shopping mall in Surabaya managed by Indonesian Company	• One of the biggest commercial building in Surabaya • Owned by one of the largest media companies in Indonesia
Year of Completion	1996	1979 (Renovated in 1993)	1986 (Extended in 1991, 1996, and 2001)	1997
Floor Area	35,000m²	25,500m²	125,000m²	25,000m²
Floors	28 Floors	27 Floors	6 Floors above ground, 1 Floor below	21 Floors
Image				

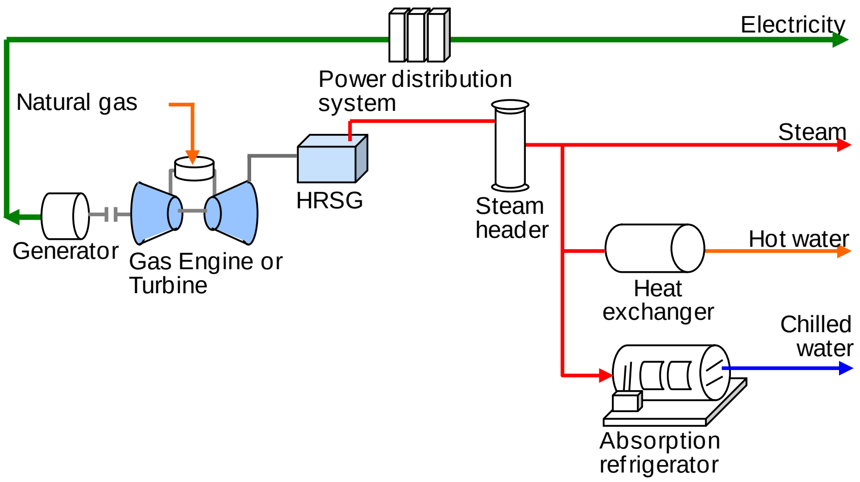
1.2　Technology planned to be installed and relevant regulations

①　Combined heat and electricity supply service in industrial estates

①-1 Technology planned to be installed

As for the combined heat and electricity supply service, co-generation is the technology planned to be installed. Specific facilities for the installation are a gas turbine, a steam turbine, and a waste heat boiler.

Figure 2.　Image of the co-generation



①-2 Relevant regulations

Electricity business including both generation and transmission of electricity in Indonesia is dominated by PLN (Perusahaan Listrik Negara). In 2009 the new electricity regulation has loosen the restrictions for other electricity suppliers. Since then, the permission for conducting electricity business can be issued by a state if the business is within the state, and if the business is not within the state but within the city, the permission can be issued by the city. Also for the electric power charge, the new regulation allows local governments to set the charge rate under permission from the local assembly for areas where the governments are in charge of. This change has given more chances for electricity business　to other companies including both public and private. However, since PLN still has a priority right for the business, if this project plans to operate the combined heat and electricity supply service in the area where PLN has their business in, it will be necessary to ask for the permission for the service from PLN.

Following these changes from the Indonesian national government, Surabaya city has laid down the regulations (PERATURAN WALIKOTA SURABAYA NOMOR 60 TAHUN 2011) and prepared the system to accept electricity business operated by other compnies within the city. PLN also has been changing their stance into more positive toward accepting other companies for electricity business due to deterioration in their business and delay of opening new sources of electricity, and the current electricity situation that the demand is beyond the supply. In addition, Indonesia Ministry of Energy and Mineral Resources announced that the new system on consignment of electricity in January 2015. Considering this situations in Indonesia, it seems that Indonesian environment of electricity has been going thorough major changes recently and the society has been moving forward more positive toward accepting private electricity distributors.

②Energy saving and dispread generation in buildings

②-1 Technology planned to be installed

Technology planned to be installed in each project area for energy saving and dispread generation in buildings is below.

Figure 3. Technology planned to be installed in the areas

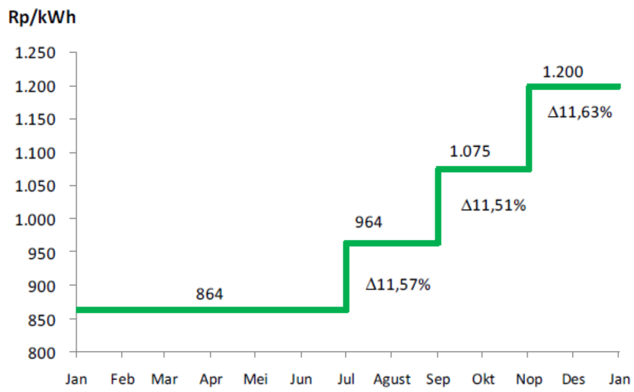
Project sites	Technology planned to be installed
Hotel A	LED lighting
Hotel B	Co-generations system (it consists of a gas engine, an absorption chiller and it provides both electricity and chilled water)
Shopping mall A	High efficiency air conditioning facility (it includes a centrifugal chiller, a pump, a cooling tower)
Commercial building A	High efficiency air conditioning facility (it includes a centrifugal chiller, a pump, a cooling tower)

② -2 Relevant regulations

Current Indonesian Regulation on Energy Conservation is based on regulation No.70 which is implemented in 2009. This regulation mentions clear definitions of role of the government, obligations for energy users, labeling, subsidiaries for audit costs, and rules for implementing incentives. The obligations for energy users are applied for heavy consumers of energy that use over 6,000ton of oil include appointment of an energy administrator, preparation of energy saving programme, and regular checkup on energy usage by within or qualified outside organizations. Also, the national government has been suddenly raising the electric power charge to cut subsidies to electric companies, which is becoming very huge. In 2014, the price rise has expanded its coverage to civilian business and household although it covered only industrial sector before the year. Regarding those situations, the needs of energy saving in Indonesia seem to be growing. (Rrefer to the figure below)

Figure 4. Example of rise of electric power charge supplied by PLN in 2014

(For industrial usage I-3、targeting unquoted companies)



(Source: PLN document)

2 Results of the study

2.1 Greenhouse gas (especially energetic origin CO2) emission reduction possibility

①Combined heat and electricity supply service in industrial estate

Through the study conducted last year, 7 factories in PIER industrial estate are chosen as the candidates for the service, yet thorough this years' study, another factory has been added to the candidates. Thus there are now 8 factories as candidates in total.

Figure 5. Estimated demands in PIER industrial estate

Company	Steam demand (Maximum※)	Electricity demand (Maximum※)
Factory A	16 t/h	1.7 MW
Factory B	8 t/h	0.3 MW
Factory C	5 t/h	6.3 MW
Factory D	3 t/h	4.2 MW
Factory E	2 t/h	0.5 MW
Factory F	2 t/h	0.5 MW
Factory G	1 t/h	N/A
Factory H	1 t/h	N/A
Total	38 t/h (average demand：30t/h)	13.5 MW

※Some data are estimated

(Source: Results from the study last year)

In addition to examination of the consumers in the industrial estate, we have considered a scheme which would be able to provide PLN with a major part of electricity supplied by the combined heat and electricity supply service to secure the stable source of earnings. From our study, the best scheme is to provide the industrial estate with approximately 15MW electricity and approximately 30t/h steam, and PLN with approximately 55MW electricity from 70MW, 30t/h co-generation. Operating condition, energy consumption, and energy supply quantity are referred to the figure below.

Figure 6. Estimated operation condition of the co-generation system

item	value
Operating days/year	300days
Gas consumption/year	4,425,225 MMBTU (122,851,262 Nm^3)
Electric power selling /year	501.4 GWh
Steam supply/year	232,968ton (572.6 TJ)

According to the condition above, we have estimated the possible amount of greenhouse gas emission reduction. The amount is the difference calculated as the emission amount from this project scenario minus the mission amount of the reference scenario. The reference scenario applied here is electricity supplied from grid power and steam supplied from a natural gas boiler. The project scenario is the case using the co-generation system for combined heat and electricity supply service and calculated from natural gas consumed in the scenario.

The calculation result is below.

○<u>Reference emission of electricity</u>（[Electric power selling/year from co-generation] ×[Emission factor of grid power]）:

408,139.6 tCO2 / year

○<u>Reference emission of steam</u>（[Steam supply/year] ×[Emission factor of natural gas]÷[Boiler efficiency]×44 ÷12）:

443,834.3 tCO2 / year

○<u>Project emission</u>（[Gas consumed by co-generation system/year] × [Consistency of natural gas] × [Calorific power of natural gas] ×[Emission factor of natural gas] ×44 ÷12）:

253,161.2 tCO2 / year

○<u>Emission reduction</u>（[Reference emission] − [Project emission]）:

190,673.1 tCO2 / year

② Energy saving and dispread generation in buildings

②-1 Hotel A

For Hotel A, following the result from the research last year, Japanese lighting company A conducted a walk through research and prepared the first proposal under the theme of shifting all the existing lightings in the hotel into LED lightings. As a result, it turned that there is an opportunity to shift lightings currently installed in the hotel into LED lightings. The result details are below.

Figure 7. Lightings can be shifted into LED lightings

Lightings installed	Amount
Tube fluorescent 36W	1,794 units
Tube fluorescent 18W	710 units

Lighting spec company A proposed for installation in Hotel A is below.

Figure 8. Lighting spec proposed for installation

	LED lightings (alternative for tube fluorescent 36W)	LED lightings (alternative for tube fluorescent 18W)
Consumed power	18W	9W
Lumen	1,800 lm	900 lm
Lux	420 lux	320 lux
Operating life	40,000hours	40,000hours
Cap time	G13	G13
Length	1199.4mm	595mm

We had discussion with Hotel A about shifting tube fluorescent lights into LED lightings as a JCM project aiming to realize it as a business. However, Hotel A has been promoting rather shifting halogen lightings into LED lighting to tube fluorescent lighting and thus their budget for shifting fluorescent into LED lighting has not been negotiated within the hotel yet. Regarding this situation, we currently have been waiting for the decision on this matter by Hotel A.

Amount of greenhouse gas emission reduction is calculated as it follows.

{ ([Consumed power of tube fluorescent 38W] -[Consumed power of LED lighting(alternative for tube fluorescent 36W)]) ×[Units of LED lighting(alternative for tube fluorescent 36W)]} × [Lighting time/year] /10^{-6}× [Emission factor of grid power]＋{ ([Consumed power of tube fluorescent 18W] -[Consumed power of LED lighting (alternative for tube fluorescent 18W)]) ×[Units of LED lighting (alternative for tube fluorescent 18W)]} × [Lighting time/year] / 10^{-6}×[Emission factor of grid power]

= <u>256.1 tCO2 / year</u>

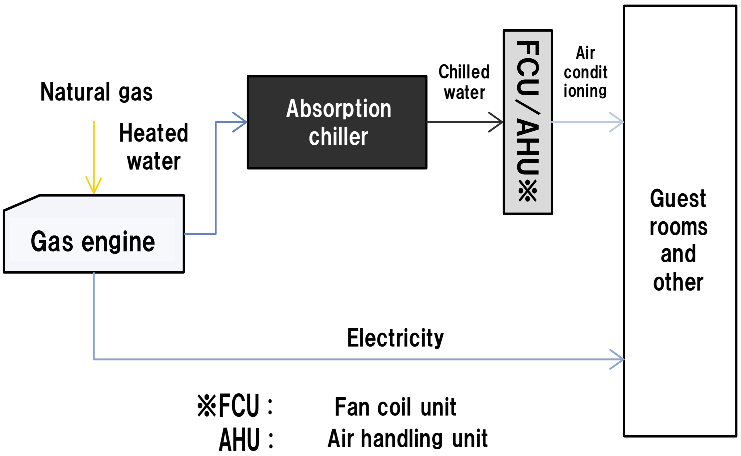
However, since the amount of CO2 emission reduction used for the calculation above is estimation from reduction effect of consumed power, there is a possibility that this amount of CO2 emission reduction can be much lowered, for instance if ID_PM004 "Installation of LED Lighting for Grocery Store" is applied for the calculation as JCM methodology. In this methodology, LED lighting is set as a reference facility and efficiency of the facility is fixed as over 100lm/W.

②-2 Hotel B

For Hotel B, Fuji Electrics conducted the detailed research including system design. Through the first discussion, Hotel B has showed much interest in co-generation system, thus we applied for JCM project planning study 2014 with Hotel B and Fuji Electrics using the co-generation system. In July 2014, it was accepted as "Co-generation system installation in hotels" and continued to prepare for realization of the business. However, it turned that Hotel B was not able to join the business due to a matter of their budget preparation, thus this co-generation system currently has been considering other hotels in Surabaya city as its project site.

The technology planned to be installed and being proposed at the current stage is the same as Hotel A; installation of co-generation system consists of 1,000kW range gas engine and absorption chiller which will provide electricity and chilled water in the hotel.

Figure 9. Scheme of energy supply from co-generation system



Based on the detailed discussion with Hotel B and Fuji Electrics, amount of greenhouse gas emission reduction is estimated. Parameters used for the calculation can be referred below. Reference scenario applied is a case that electricity is supplied from grid power and chilled water is supplied from a centrifugal chiller which is a reference facility. Project scenario is a case that the co-generation system will provide both electricity and heat which is calculated from consumed natural gas and consumed energy by other attached facilities.

Figure 10. Parameters used for the calculation

Item	Value
Production of electricity from gas engine	10,080 MWh
Electricity consumption/year by gas engine	454 MWh
Production of chilled water from absorption chiller	1,398,600 t
Average temperature of chilled water for absorption chiller (inlet)	12 ℃
Average temperature of chilled water for absorption chiller (outlet)	7 ℃
Natural gas consumption/year by gas engine	2,283,120 m^3
Calorific power of natural gas	37 MJ/m^3 [1]
Electricity consumption/year by facilities attached to co-generation system	1,042 MWh
Emission factor of grid power	0.814 tCO2/MWh [2]
Centrifugal chiller COP as reference	4.92 [3]
Emission factor of natural gas	15.3 tC/TJ [4]

The calculation result is below.

○Reference emission of electricity ([Production of electricity/year from gas engine] - [Electricity consumption/year by gas engine]) ×[Emission factor of power grid]) :

7,835.6 tCO2 / year

○ Reference emission of chilled water { {[Production of chilled water/year from absorption chiller] ×[Specific heat of water]× ([Average temperature of chilled water for absorption chiller (inlet)]- [Average temperature of chilled water for absorption chiller (outlet)]) / (3.6×10^{-3})} /[Centrifugal chiller COP as reference] }×[Emission factor of grid power]

1,345.9 tCO2 / year

○Project emission ({[Natural gas consumption/year by co-generation system]×[Calorific power of natural gas] $\times10^{-6}\times$ [Emission factor of natural gas] ×44 ÷12}+ [Electricity consumption/year by facilities attached to co-generation system] ×[Emission factor of grid power]) :

5,522.9 tCO2 / year

○Emission reduction ([Reference emission] − [Project emission]) :

3,658.6 tCO2 / year

②-3 Shopping mall A

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[1] Date shared by PGN

[2] JCM Project : ID001 Energy Saving for Air-Conditioning and Process Cooling by Introducing High-efficiency Centrifugal Chiller PDD より引用

[3] ID_AM002 “Energy Saving by Introduction of High Efficiency Centrifugal Chiller”

[4] 2006 IPCC Guidelines for National Greenhouse Gas Inventories

For Shopping mall A, Japanese air-conditioning facility manufacturer has submitted the proposal following to the research result from last year. The proposal aims to make the existing air-conditioning facilities including a chiller, a pump, and a cooling tower more efficient. In this proposal, the chiller the shopping mall A already has will be replaced with a centrifugal chiller, thus regarding only the chiller, ID_AM002 "Energy Saving by Introduction of High Efficiency Centrifugal Chiller" which has been already accepted as the JCM methodology, can be applied in this project as well. Changing the pump and cooling tower cannot be expected much reduction, thus this project will only focus on the chiller. Based on the proposal from the Japanese air-conditioning facility manufacturer A and utilizing the monitoring sheet which is provided in ID_AM002, estimation of greenhouse gas emission reduction a year resulted in 1,615 tCO2.

② -4 Commercial building A

For Commercial building A, Japanese air-conditioning facility manufacturer also has submitted the proposal following to the research result from last year. The proposal aims to make the existing air-conditioning facilities including chiller, pump, and cooling tower more efficient. The system that has been already installed is air-cooling, but the proposal includes installation of water-cooling centrifugal chiller. Commercial building A showed much interest in this proposal and therefore discussion has been held with the commercial building A to switch the air-cooling chiller with the water-cooling centrifugal chiller for higher efficiency. As well as the project with shopping mall A, the project with commercial building A will only focus on changing the chiller. JCM methodology that has been already accepted ID_AM002 "Energy Saving by Introduction of High Efficiency Centrifugal Chiller" is considered to be applied as well. Based on the proposal prepared by the Japanese air-conditioning manufacturer and utilizing the monitoring sheet from which is provided in ID_AM002, estimation of greenhouse gas emission reduction a year resulted in 200 tCO2.

Commercial building A has been requesting a proposal for installation of a water-cooling chiller to York, which is a manufacturer for the chiller commercial building A is currently using. Commercial building A is supposed to make a decision after comparing the proposals from both the Japanese manufacturer and York. At the current stage, Japanese stakeholders have been continuing the discussion aiming to organize an international consortium having Japanese construction company A as the representative of and to apply for the JCM model project.

2.2 Methodology for measuring greenhouse gas emission and monitoring system

For ①combined heat and electricity supply service in an industrial estate and ② energy saving and dispread generation in buildings, we have examined a methodology for measuring greenhouse gas emission and monitoring system. More specifically, 1)Eligibility criteria, 2)Parameters that should be set before applying the project registration, 3)Setting reference emission and its calculation, 4) Project emission calculation, 5) Setting methodology for monitoring are examined as the methodology for measuring greenhouse gas emission for PIER industrial estate, Hotel A, Hotel B, Shopping mall A, and Commercial building A.

2.3 Estimation of operating expenses and cost benefit performance

①Combined heat and electricity supply service in an industrial estate

With the data available at the current stage, initial analysis of economic performance is conducted. The initial investment is estimated at approximately 85 hundred million Japanese Yen. Its breakdown can be referred below.

Figure 11. Breakdown of the initial investment

Item	Amount (hundred million JPY)
Co-generation related equipments	Approx. 30
Electricity receiving facility	Approx. 7
Community grid/stem pipe laying cost	Approx. 13
Construction and transportation cost	Approx. 21
Design cost and other	Approx. 14
Total	Approx. 85

Energy selling price for consumers are set based on selling electricity linked with PLN price and some discount is applied, also prices of heat and steam are also discounted at a fixed rate from the price paid for the boiler that have been currently used. Estimated profit and loss can be referred to the table below. IRR within 15 years are calculated as approximately 10%.

Figure 12. Average profit and loss for 15 years

●15 years average PL			unit:BIDR
Sales			579
	Steam		51
	Electricity		528
Cost			537
	Fixed cost		161
		Depreciation cost	56
		Maintenance cost	40
		Employment cost	3
		Lease interest	37
		Other expenses	25
	Variable cost		377
		Fuel for electricity generation	377
Ordinary profit			41
	Tax paid		10
Net income			31

In this project, usage of "Fund for low carbon technology growth" is considered. In a case that the project successes in receiving 30 hundred million Japanese Yen as the subsidy, which covers 30% of the total cost for this project, cost-benefit performance of CO2 reduction and the subsidy amount can be as follows.

Figure 13. Cost-benefit performance of CO2 reduction and the subsidy (PIER industrial estate)

Item	Value	Calculation
Cost-benefit performance in a single year	15,733.7 tCO2/JPY	Amount subsidized÷CO2 emission a year
Cost-benefit performance in the project period (15years)	1,048.9 tCO2/JPY	Amount subsidized÷ (CO2 emission a year×15years)

②Energy saving and dispread generation in buildings

②-1 Hotel A

Operating cost when 1,794 units of LED lightings that is alternative for tube fluorescent 36 and 710 units of LED lighting that is alternative for tube fluorescent 18W are installed is approximately 13 million Japanese Yen. Rough payback period is expected to be 13 years when the subsidy is applied. The subsidy is expected to be approximately 7 million Japanese Yen which covers a half of the operating cost. Cost-benefit performance of CO2 reduction is as follows.

Figure 14. Cost-benefit performance of CO2 reduction and the subsidy (Hotel A)

Item	Value	Calculation
Cost-benefit performance in a single year	27,333.1 tCO2/JPY	Amount subsidized÷CO2 emission a year
Cost-benefit performance in the project period (15years)	1,822.2 tCO2/JPY	Amount subsidized÷ (CO2 emission a year×15years)

However, since the amount of CO2 emission reduction used for the calculation above is estimation from reduction effect of consumed power, there is a possibility that this amount of CO2 emission reduction can be much lowered in a case ID_PM004" Installation of LED Lighting for Grocery Store" is applied for the calculation as JCM methodology. In this methodology, LED lighting is set as a reference facility and efficiency of the facility is fixed as over 100lm/W.

②-2 Hotel B

For Hotel B, installation of 1,000kW range co-generation system which provides electricity and chilled water is considered. Operating cost of this installation at this stage is estimated at approximately 4 hundred million Japanese Yen. (Breakdown: approximately 90 million JPY for a gas engine, 40 million JPY for chiller and instrumentation facility, 80 million JPY for engineering construction and piping, 80 million JPY for electricity facility, 40 million JPY for monitoring system/local arrangement/engineering, 40 million JPY for VAT) IRR of this project (15 years) is based on the case with the subsidy at 2 hundred million JPY which covers a half of the total operating cost and expected to be 19%. The payback period is estimated to be 5 years. Cost-benefit performance of CO2 reduction is below.

Figure 15. Cost-benefit performance of CO2 reduction and the subsidy (Hotel B)

Item	Value	Calculation
Cost-benefit performance in a single year	54,665.7 tCO2/JPY	Amount subsidized÷CO2 emission a year
Cost-benefit performance in the project period (15years)	3,644.4 tCO2/JPY	Amount subsidized÷ (CO2 emission a year×15years)

③ -3 Shopping mall A

For Shopping mall A, renewing the existing air-conditioning facility including chiller, pump, and cooling tower is considered. Estimated operating cost at the current stage is approximately 340 million Japanese Yen. (Breakdown: approximately 230 million JPY for chiller, approximately 20 million JPY for cooling tower, approximately 31 million JPY for pump, approximately 25 million JPY for piping construction, approximately 34 million JPY for other expenses including personnel cost) Approximately

5,600,000kWh/year of reduction of electricity usage is expected from renewing facilities and thus rough payback period is estimated to be 5.5 years without the subsidy. If realization of JCM business only focuses on a chiller and successes to receive 120 million Japanese Yen which covers a half of the operating cost, the rough payback period will be shortened into 3.7 years. Cost-benefit performance of CO2 reduction is as follows.

Figure 16. Cost-benefit performance of CO2 reduction and the subsidy (Shopping mall A)

Item	Value	Calculation
Cost-benefit performance in a single year	74,303.4 tCO2/JPY	Amount subsidized÷CO2 emission a year
Cost-benefit performance in the project period (15years)	4,953.6 tCO2/JPY	Amount subsidized÷ (CO2 emission a year×15years)

④ -4 Commercial building A

For commercial building A, replacing an existing air-conditioning facilities including chiller, pump, cooling tower with a water cooling chiller has been considered. The estimated operating cost at the current stage is approximately 80 million Japanese Yen. (Breakdown: approximately 35 million JPY for chiller, approximately 6 million JPY for cooling tower, approximately 8 million JPY for pump, approximately 16 million JPY for piping construction) Approximately 2,000,000kWh/year of reduction of electricity usage is expected from renewing facilities and thus rough payback period is estimated to be 3.8 years without the subsidy. If realization of JCM business only focuses on a chiller and successes to receive 13 million Japanese Yen which covers a half of the operating cost, the rough payback period will be shortened into 3.0 years. Cost-benefit performance of CO2 reduction is as follows.

Figure 17. Cost-benefit performance of CO2 reduction and the subsidy (Commercial building A)

Item	Value	Calculation
Cost-benefit performance in a single year	65,000 tCO2/JPY	Amount subsidized÷CO2 emission a year
Cost-benefit performance in the project period (15years)	4,333.3 tCO2/JPY	Amount subsidized÷ (CO2 emission a year×15years)

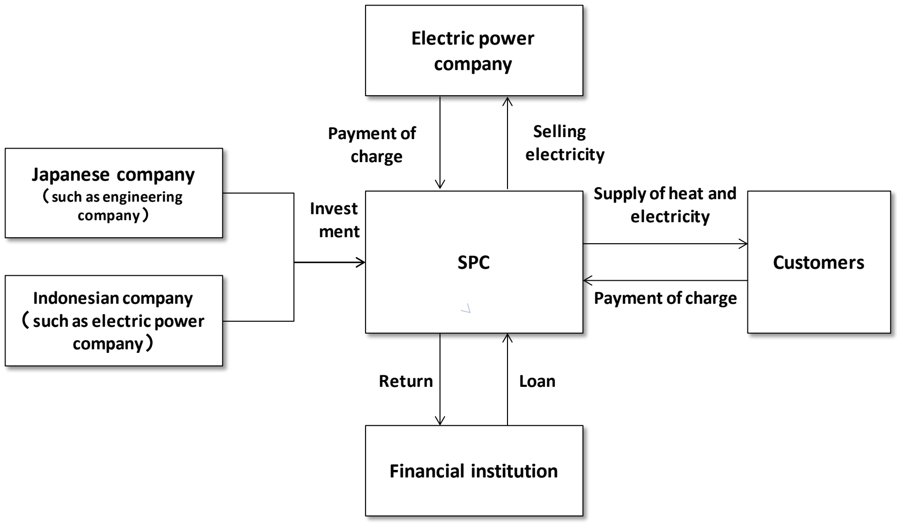
3 Plan for business realization

3.1 Business size and project implementation system

① Combined heat and electricity supply service in an industrial estate

For the size of the business, approximately 85 hundred million Japanese Yen is expected as the initial investment. Subsidies such as JICA coordination fund with JCM and overseas lending from JICA are expected to be applied. Tentative project implementation scheme can be referred below.

Figure 18. Tentative project implementation system (PIER industrial estate)

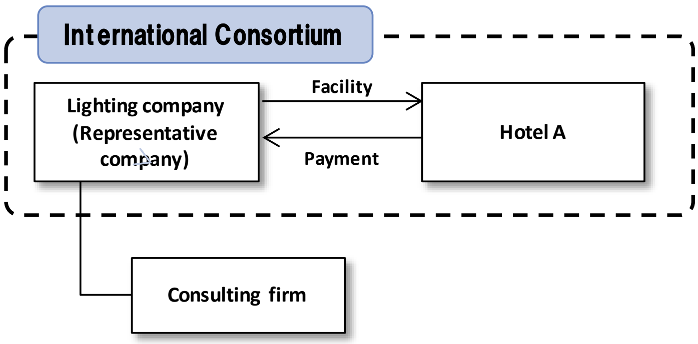


② Energy saving and dispread generation in buildings

② -1 Hotel A

For the size of the business, approximately 13 million Japanese Yen is expected as the initial investment. Subsidies for JCM model project is expected to be applied. Tentative project implementation scheme expected can be referred below. A lighting company will be a representative of the international consortium and a constructing company will conduct the construction in the area. A consulting firm will support the consortium including registration of the project, monitoring, validation and verification. Hotel B will be the operator for the facility installation and will conduct monitoring in the area.

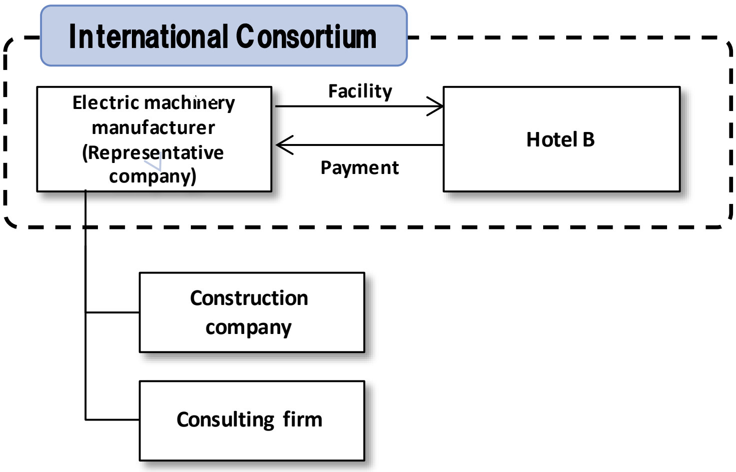
Figure 19. Tentative project implementation system (Hotel A)



② -2 Hotel B

For the size of the business, approximately 40 million Japanese Yen is expected as the initial investment. Subsidies for JCM model project is expected to be applied. Tentative project implementation scheme can be referred below. For this project, Hotel B which is the initial project site can no longer join the consortium due to a lack of their budget, the similar system has been considered to install to a different hotel in Surabaya city.

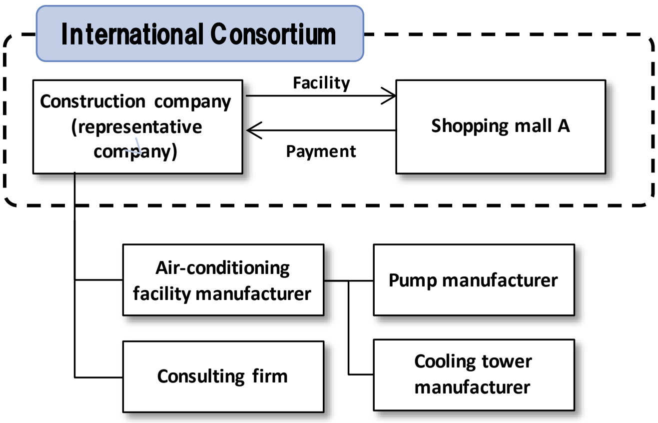
Figure 20. Tentative project implementation system (Hotel B)



③ -3 Shopping mall A

For the size of the business, approximately 3.4 million Japanese Yen is expected as the initial investment including renewing chiller, pump, and cooling tower. Among the facilities, only chiller is expected to register as a JCM project and its operating cost is estimated at approximately 2.3 hundred million Japanese Yen. Utilizing a subsidy for JCM model project is expected to be applied as financial support scheme. Tentative project implementation scheme can be referred below.

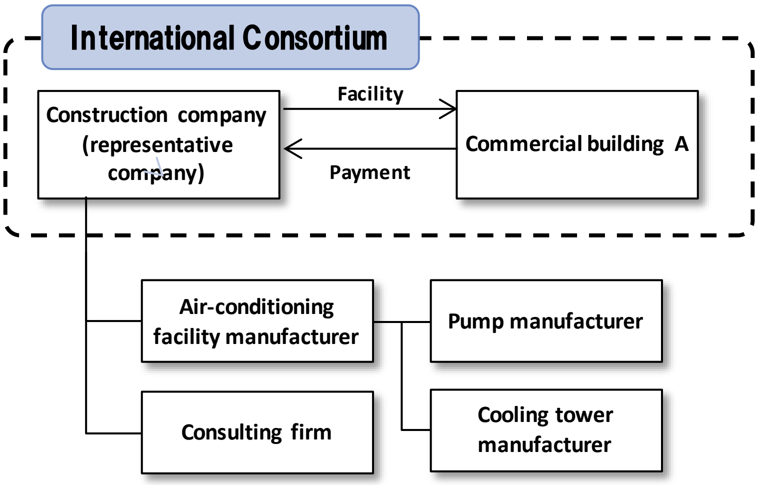
Figure 21. Tentative project implementation system (Shopping mall A)



②-4 Commercial building A

For the size of the business, approximately 80 million Japanese Yen is expected as the initial investment including renewing chiller, pump, and cooling tower. Among the facilities, only chiller is expected to register as a JCM project and its operating cost is estimated at approximately 35 million Japanese Yen. Utilizing a subsidy for JCM model project is expected to be applied as financial support scheme. Tentative project implementation scheme can be referred below.

Figure 22. Tentative project implementation system (Commercial building A)



3.2 Steps toward promoting business realization (obstacles, demands, and etc.)

The following is needed to promote realization of JCM business

① <u>Measures to lower initial investment</u>
② <u>Improvement of diagnosis for energy saving</u>
③ <u>Policy recommendation toward stable gas supply</u>

Feasibility Study of the Recycle Business in Surabaya City, Republic of Indonesia

Nishihara Corporation

1. Introduction and Key Findings

1.1 Introduction

This study aims at analyzing and evaluating a recycle business model for MSW management in Surabaya city. Nishihara Corporation (hereafter Nishihara) began operating "Super Depo" (Intermediate treatment facility) from March 2013 and "Compost Center" is in operation since October 2014.Based on the experience of operating these two facilities, Nishihara would like to develop further recycle business in Surabaya and Indonesia.

1.2 Project system of Survey

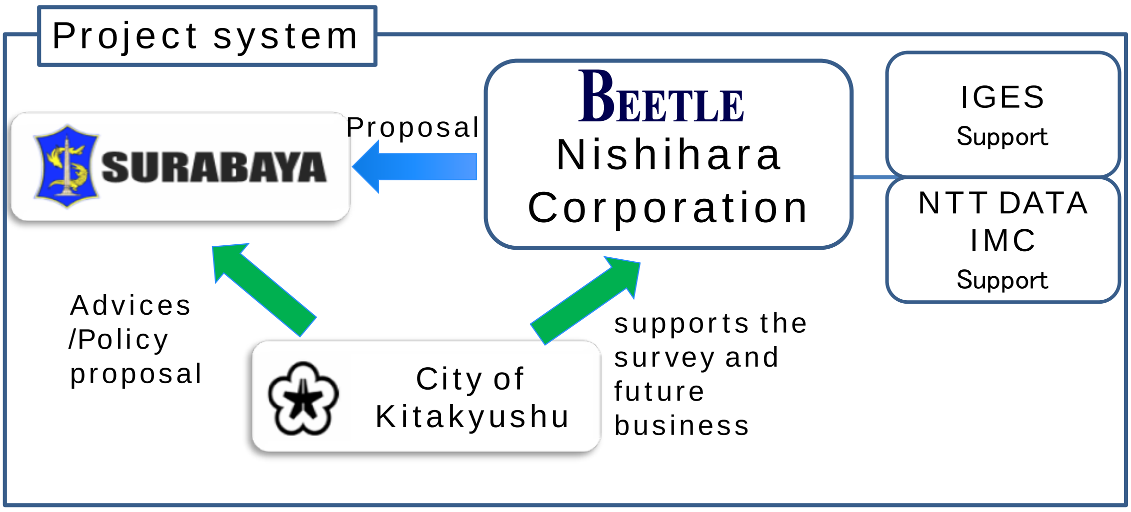


Figure 1. Project system and participants

Nishihara conducts this survey as future business entity. City of Kitakyushu supports the survey and future business, based on the Green Sister City agreement with Surabaya city. IGES and NTT DATA IMC support the survey, regarding policy surveys, business model and so on.

2. Current Progress

2.1 Super Depo

Nishihara constructed "Super Depo" on March 2013. With support from DKP, Nishihara dispatched a stuff to operate "Super Depo". After the management of Nishihara for 1 year and 5 months, Super Depo" was handed over to Surabaya City on September 1, 2014. In clean and efficiently equipped facility, workers sort valuables (plastics/papers) from MSW, and organic waste to be composted is collected. Super Depo hire ex-waste pickers as workers.

Figure 1. Super Depo

From March 2013, 1,037 persons visited “Super Depo” to learn the importance and practice of sorting MSW. From Indonesia, persons in charge of public sectors, University and High school student visited “Super Depo”, the number of domestic visitors is 857. From Japan, we accept 139 persons, including Vice ministers of Ministry of Environment and other public sectors. In addition various TV shooting teams came and produced TV programs. From Laos, Malaysia, Vietnam, Thailand, Australia and France, we accepted 41 visitors.

Figure 2. Visitors to Super Depo

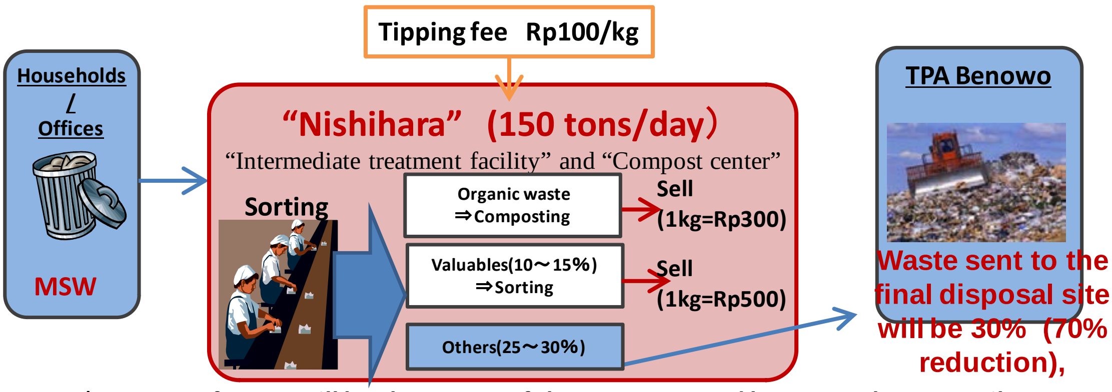
2.2 Composting Center

From October 2014, Nishihara is operating “Compost center” at Wonorejo. The facility accepts the organic waste sorted and collected at “Super Depo”. As a treatment of organic waste which accounts for 60% of MSW, Organic fertilizer will be manufactured from organic waste and sold to Petro Kimia, a manufacturer of fertilizers. By operating “Super Depo” and “Compost center”, we can demonstrate the function of “Nishihara Model”, MSW reduction by sorting and composting organic waste.

Figure 3. Compost center

3. Future Business

3.1 Business Model



*Amount of MSW will be the excess of the waste treated by PT Sumber Organik.

Figure 4. Business model

After the operation of “Super Depo” and “Compost center”, we would like to develop the new business “Neshihara model”. “Nishihara model” aims to integrate the function of “Super Depo” and “Compost center” into one large facility. The facility will accept 150tons/day of MSW. Surabaya can reduce the amount of waste sent to TPA by tipping fee and land offer. Other profits are “GHG emission reduction”, “hiring Scavengers” and “contribution to agriculture by providing compost”.

3.2 Business Structure

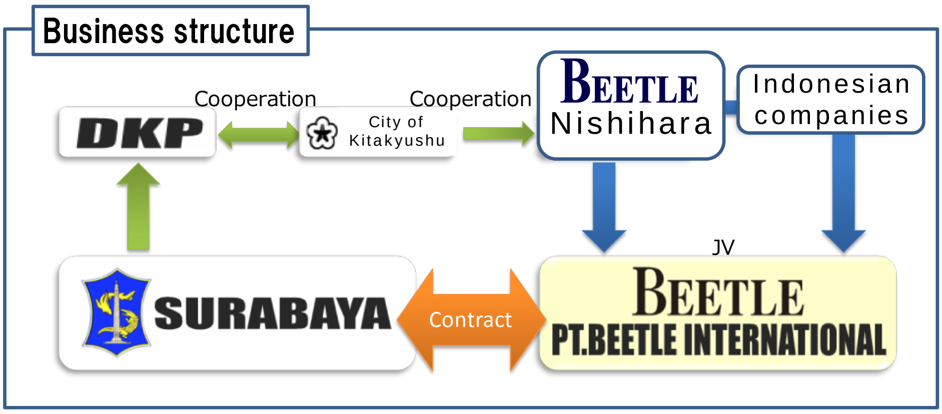


Figure 5. Business structure

Nishihara will establish “PT. BEETLE INTERNATIONAL” with Indonesian companies. Under the contract/MOU of MSW management with Surabaya city, Nishihara will develop the business, accepting 150tons/day of MSW and sell valuables (Plastics, Papers and Compost).

3.3 Income and Expense

Table 1. Income and expence

Business Feasibility (per month)			
Income	Selling Materials (Plastics etc, Rp500/kg)	150t/day × 30%(proportion of the material) × 500Rp/kg × 25days	Rp563 Million (¥5.6 Million)
	Selling Compost as fertilizers(Rp300/kg)	150t/day × 51%(proportion of organic) × 60%(reduction by composting) × 300Rp/kg × 25days	Rp344 Million (¥3.4 Million)
	Tipping fee (Rp100/kg)	150t/day × 100Rp/kg × 25days	Rp375 Million (¥3.8 Million)
Expense	Dumping at TPA Benowo (Rp100/kg)	150t/day × 25%(Others 20%+Residuals of composting 5%) × 100Rp/kg × 25days	Rp93.7 Million (¥0.9 Million)
	Running Cost (Electricity, Fuel etc)	*Average of 15%(increasing rate) × 10years	Rp100 Million (¥1 Million)
	Labor Cost	180 workes × Rp3.5Million *Average of 15%(increasing rate) × 10years	Rp630 Million (¥5.25 Million)
Net income (Income – Expense)			Rp458 Million/Month(¥4.6 Million)

In terms of the business feasibilities, the scale of facility will be “150t/day of MSW”. We expect the net operating income will be Rp. 458 Million per month, or Rp5.5 Billion per year (not including the initial cost). Even if we achieve that amount of net operating income above, it will be difficult for us to bear the initial cost independently in terms of business feasibility.

3.4 Schedule

Figure 6. Future schedule

From 2014 to 2015 Nishihara will manage Compost Center as a demonstration project. In parallel with the demonstration project, Nishihara would like to begin the operation of Compost center as business under the contract / MOU with Surabaya City in 2015. And from 2016, Nishihara will begin the large scale of commercialized business.

3.5 Images of the future Business]

These ARCHITECTURAL PERSPECTIVE DRAWINGS shows the image of Large facility with Separation and Composting (150tons/day of MSW) . The site will be at Wonorejo.

Figure 7. Top view of the facility

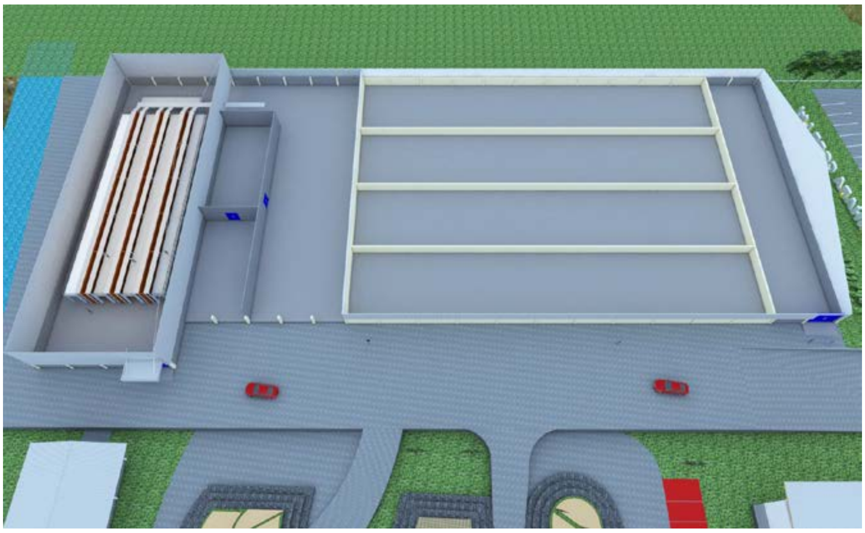


Figure 8. Recycling zone (Left: Sorting zone, Right: Composting zone)

Figure 9. Seminar rooms / Education zone

4. MRV Methodology / Cost performance

4.1 GHG reduction

MRV Methodology and PDD for Composting are finalized.

4.2 Cost Performance

The cost performance will be ¥24,000- 36,000 (per t-CO_2/year), from the assumption that Initial cost is ¥200 - 300 million Yen (=Rp 20 - 30 billion) and , The amount of GHG reduction is 8,300 t-CO_2/year.

-Initial cost : ¥200 - 300 million Yen (=Rp 20 - 30 billion)
（MSW:150t/day)

-GHG reduction : around 8,300 t-CO_2/year
*Only avoidance of methane generation

-Cost Performance : ¥24,000- 36,000 (per t-CO_2/year, =Rp 24,00,000 - 3,600,000)
= ¥200 - 300 million Yen (=Rp 20 - 30 billion) / 8,300 t-CO_2/year

Feasibility Study for “Energy-from-Waste Plant” in Surabaya, Republic of Indonesia

Hitachi Zosen Corporation

1. Outline of the Project

1.1 Background

In Indonesia, although there should be accordance to the law against municipal waste open dumping and a similar law that orders the foreclosure of final dumping sites within 5 years of operation, regional governments are still restricted financially and are unable to come up with tangible resolutions. In addition, organic waste accounts for 60% to 70% of the total municipal solid waste (MSW), however effective utilization and reduction of the organic waste are challenges that need to be considered.

Here, Hitachi Zosen (Hitz) would like to propose a system which generates electricity from the heat of incinerating MSW, what we call “Waste to Energy” technology. Mainly, we should aim to target municipalities with a greater ratio of organic wastes and Waste to Energy will minimize the amount of wastes going to final dumping sites and reduce greenhouse gas emissions.

1.2 Outline of the project

Hitz would like to propose a Waste to Energy project to Surabaya city. Waste to Energy can generate electricity from incineration plant. The waste to be incinerated is MSW. In the business phase, Hitz will construct “Waste to Energy” Plant at existing TPA Benowo. MSW with calorie over 1,500kcal will be incinerated. And Hitz will provide the electricity to the national grid.

Regarding the profits, Hitz can point out following 4 points, or 1. Decrease the amount of landfill (amount will be 10%, decreased by 90%), 2. Decrease the environmental impact (leachate etc), 3. Function as a power plant (Capacity: 8.8MW, Amount of electricity to provide 70,000MWh/year) 4. Reduction of GHG (40,000 tons CO2/year).

1.3 Organization

The figure shown below is Project system of survey. Hitz conduct this survey as future business entity. City of Kitakyushu, the green sister city of Surabaya supports this support. From Kitakyushu, Kitakyushu City Environmental Preservation Association and Nishihara Corporation will support the project as well. NTT Data IMC participates in this project to support the whole survey.

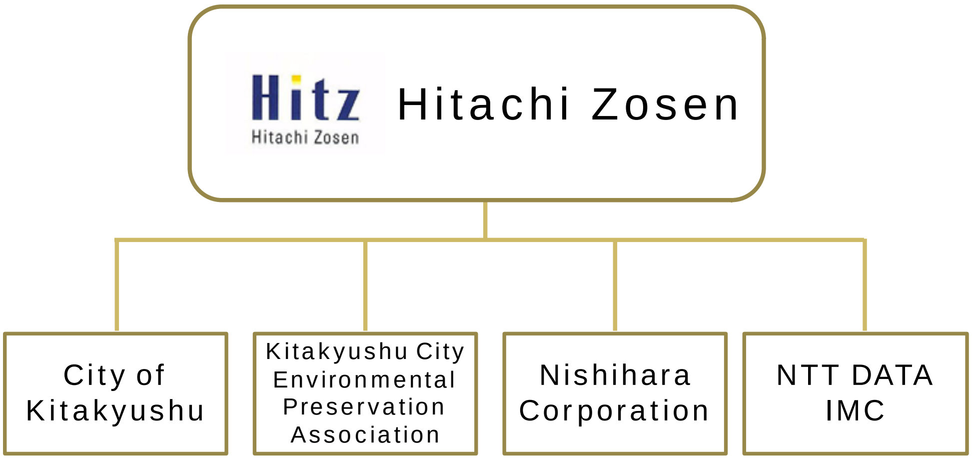


Figure 1. Organization of the survey

2. Future Business

2.1 Business model

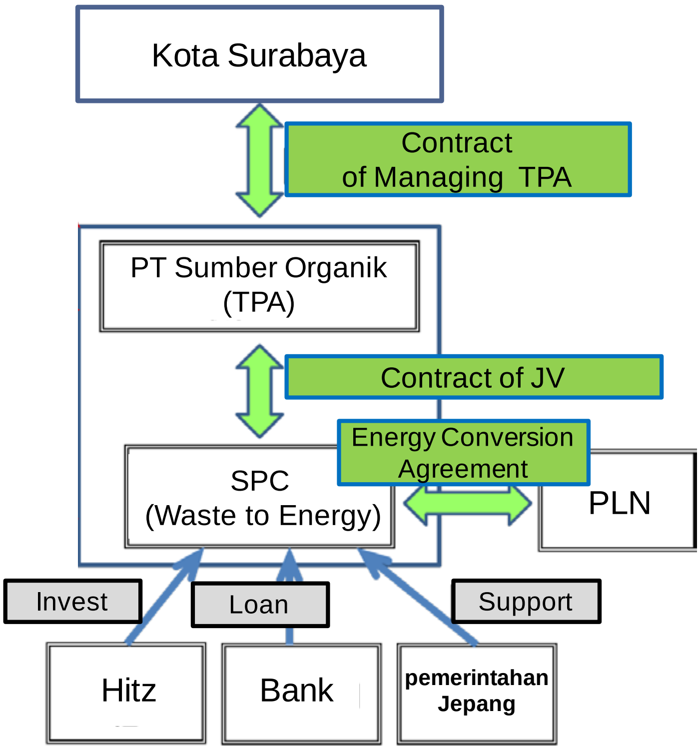


Figure 2. Business model of the business

The figure above shows the business model. Business of Hitz will not only sell plant, but also establish SPC to start power plant management and sell the electricity. Hitz and PT Sumber Organik (PTSO) will establish “SPC” for the Waste to Energy business in Surabaya. PTSO manage TPA Benowo with the contracts with Surabaya city. The contract including the development of Waste to Energy and PTSO is considering future waste solution including Waste to Energy. To manage Waste to energy project, sophisticated and experienced “know how” is required. Hitz has such “know how” from practical experience all over the world.

2.1 Image of the business

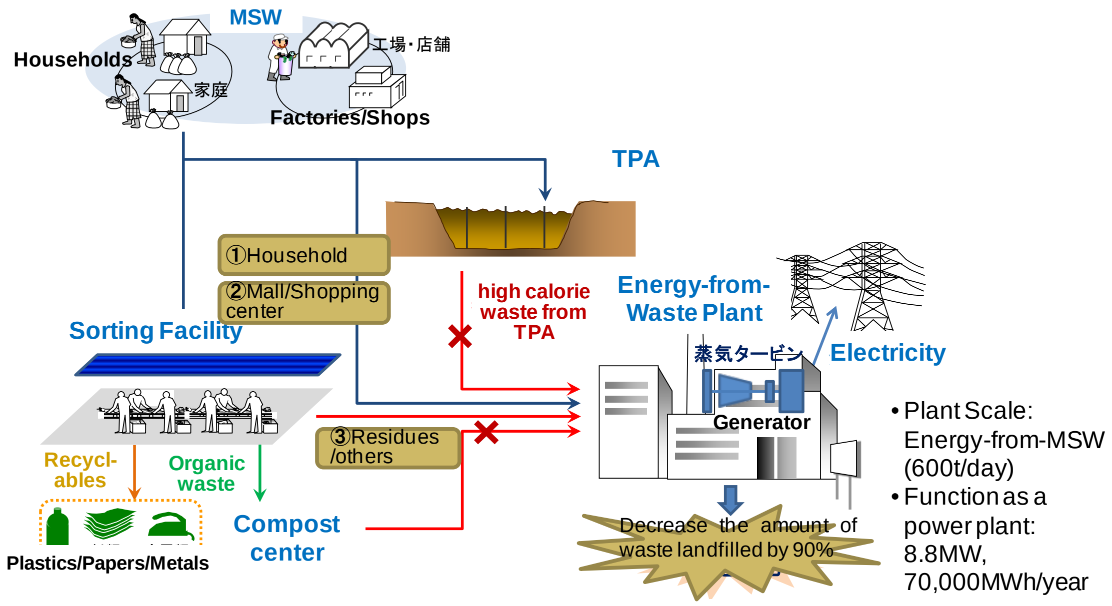


Figure 3. Image of the business

The figure above shows the image of the business in terms of flow of the waste. The calorie to manage Waste to Energy is around 1,500kcal at least. To assure the calorie, we conducted composition surveys of MSW from "1.Households", "2. Mall/Shopping center" and "3.Residues / others of Sorting Facility". We found that we can collect 600t/day of MSW with 1,700kcal or higher form "1.Households" and "2. Mall/Shopping center".

3. Composition Survey

3.1 Outline

We conducted composition surveys of MSW from "1. Households", "2. Mall/Shopping center" and "3.Residues / others of Sorting Facility".

Waste sampling was conducted twice at TPA Benowo and Nishihara Super Depo in August and November 2014, for the dry and wet seasons, respectively, followed by the laboratory analysis at the Department of Environmental Engineering, ITS.

The sampling and analysis methodology is based on the guideline published by the Ministry of Environment, Japan. The guideline document of the methodology was shared with PT Sumber Organik (PTSO).

（http://www.env.go.jp/hourei/syousai.php?id=11000013）

The calorific values (Hl) were estimated using the following formula:

$$Hl = 45V - 6W \quad (kcal/kg)$$

where,

V : Combustible content (%), W : Water content (%)

Table 1. Survey Schedule

a) Dry season

Date	Sampling
Aug 19th	Sampling of the Super Depo residue →Wet weight measurement at ITS
Aug 20th	Sampling of household waste at TPA Benowo →Wet weight measurement at ITS
Aug 21st	Sampling of shopping mall waste at TPA Benowo →Wet weight measurement at ITS

Date	Laboratory Analysis
Aug 19-26	Drying of the samples for more than 5 days in the oven →Measurement of the dry weight and calculation of the water content
～Oct 5th	Storage of samples at ITS laboratory
Oct 6-10	Lab work for the analysis

b) Wet season

Date	Sampling
Nov 11th	Sampling of the Super Depo residue →Wet weight measurement at ITS
Nov 12th	Sampling of household and shopping mall waste at TPA Benowo →Wet weight measurement at ITS

Date	Laboratory Analysis
Nov 11-17	Drying of the samples for more than 5 days in the oven →Measurement of the dry weight and calculation of the water content
～Nov 30th	Lab work for the analysis

Table 2. Sample List

a) Dry season

Sample Name	Source	Weight of sampled waste before reduction
①Household	Depo Penjaringan Sari Depo Pondok Indah Benowo Depo Lidah Wetan Perumahan Permata Sawira Lidah Kulon	Approx. 200kg in total from 4 trucks
②Mall	Jembatan Merah Plaza	Approx. 100kg in total from 1 truck
③Super Depo	Residue of waste sorting at the Super Depo	Approx. 100kg

b) Wet season

Sample Name	Source	Weight of sampled waste before reduction
①Household	Depo Tambak Asri Depo Kampung Simo Hilir Depo Griya Citra Asih	Approx. 150kg in total from 3 trucks
②Mall	Jembatan Merah Plaza	Approx. 100kg in total from 1 truck
③Super Depo	Residue of waste sorting at the Super Depo	Approx. 100kg

3.2 Results of waste quality and composition analysis

The data of waste quality and composition are summarized in Table 3.

Table 3. Waste quality and composition

Item		Household		Shopping mall		Super Depo	
		Dry season	Wet season	Dry season	Wet season	Dry season	Wet season
Composition（%）	Paper	15.3	5.6	29.5	29.5	38.9	23.5
	Fiber	8.3	2.8	27.9	8.6	8.9	8.4
	Plastic	22.0	21.1	27.9	23.6	20.2	27.3
	Rubber	1.0	0.1	0.4	0.6	0.0	0.1
	Wood, leaves	9.1	8.3	7.7	5.8	13.1	9.8

	Garbage	19.6	30.2	3.2	19.7	8.1	3.1
	Metal	1.9	0.0	0.4	1.0	0.1	0.0
	Glass	0.1	0.0	0.0	0.0	0.0	0.0
	China, stone	3.0	3.0	0.0	0.0	0.3	1.1
	Others	19.7	28.9	3.0	11.2	10.4	26.7
Three components（%）	Water content	53.4	51.2	33.3	54.2	54.4	58.1
	Combustible content	36.7	34.7	61.5	37.3	38.5	37.0
	Ash content	9.9	14.1	5.2	8.5	7.1	4.9
Lower calorific value (kcal/kg)		1330	1250	2570	1360	1410	1320
Lower calorific value (kJ/kg)		5570	5250	10750	5670	5890	5510

3.4 Observation of waste dumping

Field observation of dumped waste contents was conducted at TPA Benowo dumping sites on August 20th, 21st, October 7th and 9th in order to identify emission sources of waste with high calorific values. It was considered that waste from some shopping malls, hospitals and the port may have high calorific values.

Table 4. Surveyed trucks（16 trucks in total）

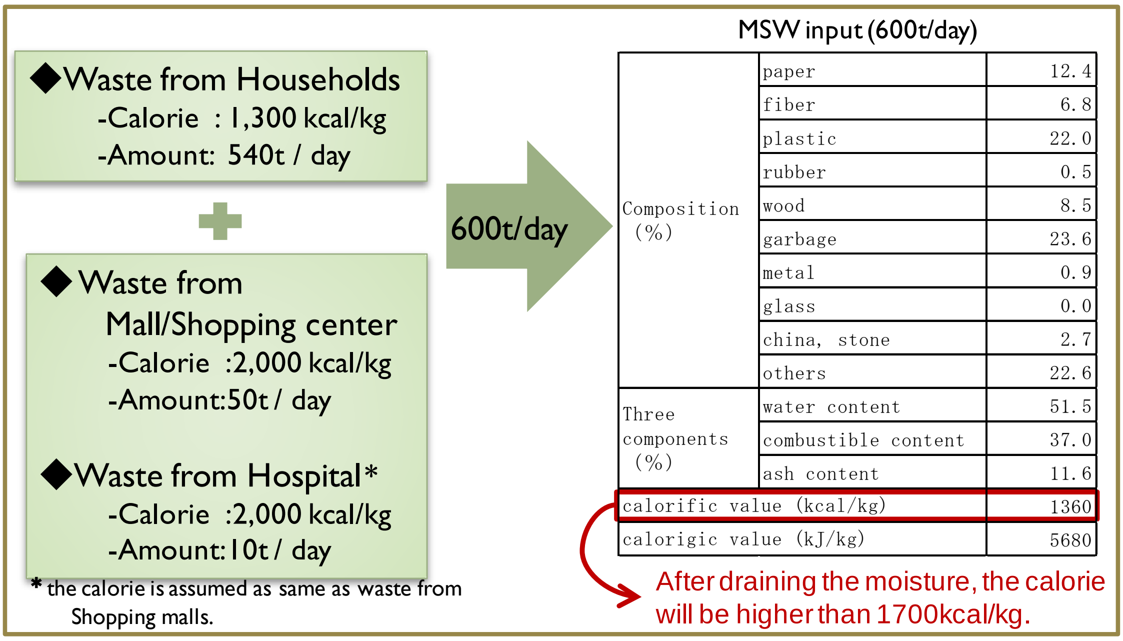
Source	Number
Shopping mall	6
Household	4
Market	1
Mix of household and market	1
Office	1
Hospital	1
Port (mainly leaves, wood)	1
Drainage channel	1

Interview survey with truck drivers

Observation of dumped waste

3.5 Conclusion from the composition survey

Based on the composition surveys and Observation of waste dumping, we specify the MSW to be transferred to Waste to Energygy. Or, “1. Households” (540t/day) and “2. Mall/Shopping center“ (60t/day) will be supplied to Waste to Energy facility. The amount of MSW is 600t/day (1. + 2.) and the calorie is 1,360kcal/kg. We squeeze the moisture from MSW at the pit of Waste to Energy facility, and the calorie of MSW will reach 1,700kcal/kg.



Composition (%)	paper	12.4
	fiber	6.8
	plastic	22.0
	rubber	0.5
	wood	8.5
	garbage	23.6
	metal	0.9
	glass	0.0
	china, stone	2.7
	others	22.6
Three components (%)	water content	51.5
	combustible content	37.0
	ash content	11.6
calorific value (kcal/kg)		1360
caloriqic value (kJ/kg)		5680

Figure 4. Compositoin and calorie of MSW for Waste to Energy

4. Feasibility of Waste to Energy

4.1 Technology

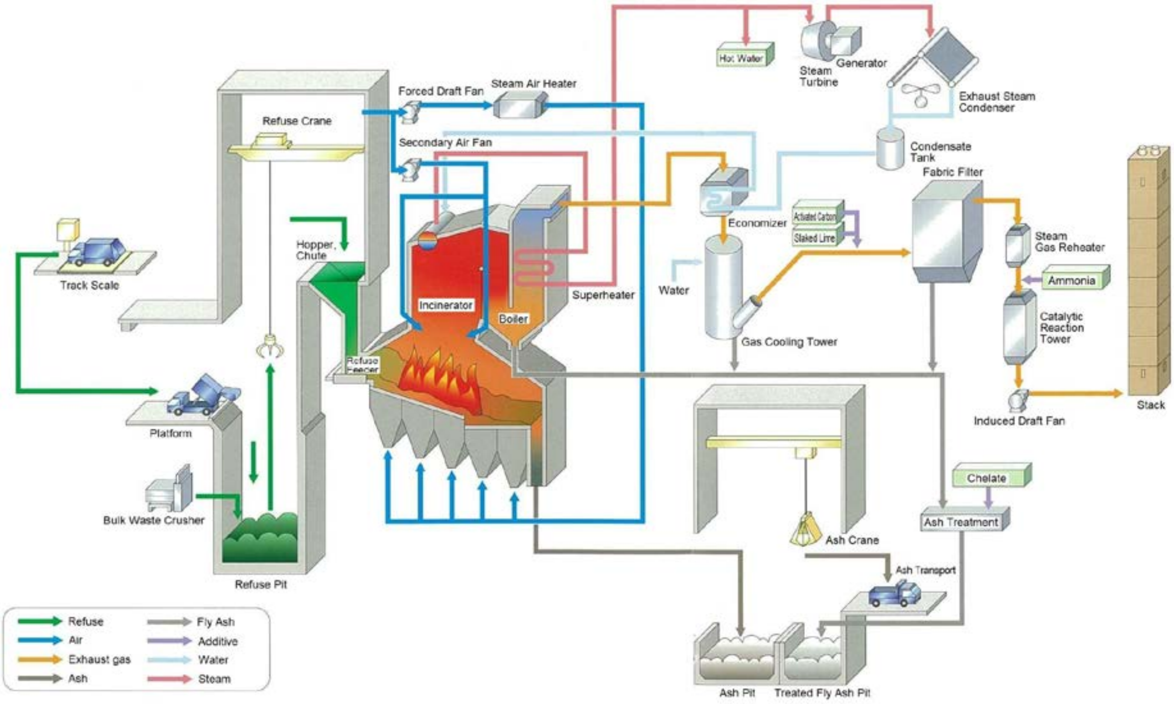


Figure 5.Waste to Energy facility

For the purposes of municipal waste incineration, the selection of power reactors ranges from fluidized bed incinerators, kiln incinerators and stoker incinerators, however considering the initial investment and the ability to secure funds from the generated electricity for stable operations, the stoker incinerator is selected as the best large-scale performer.

4.2 Feasibility

We made sure that 600t/day of MSW with 1,700kcal/kg could be collected. The IRR of the Waste to Energy will be around 15%, from the assumption that Initial cost is ¥6 billion Yen (=Rp 600 billion), Tipping fee is ¥1,200 /t (=Rp120,000 / t) and FIT(Fed in Tariff) of Waste to Energy by MSW is ¥14.5/kWh (=Rp1,450Rp/kWh).

5. MRV Methodology / Cost performance

5.1 MRV Methodology and GHG reduction

MRV Methodology and a draft of PDD for Waste to Energy are finalized. The amount of GHG reduction will be around 40,000 t-CO2/year.

5.2 Cost Performance

The cost performance will be ¥160,000 (per t-CO2/year), from the assumption that Initial cost is ¥5 billion Yen (=Rp 500 billion) and , The amount of GHG reduction is 30,000 t-CO2/year.

-Initial cost : ¥6 billion Yen (=Rp 600 billion)
（MSW:600t/day, Capacity:8.8MW, Generated energy : 70,000MWh/y)

-GHG reduction : around 40,000 t-CO2/year

-Cost Performance : ¥150,000 (per t-CO2/year, =Rp15,000,000)
= ¥6 billion Yen (=Rp 600 billion) / 40,000 t-CO2/year

6. Future Schedule

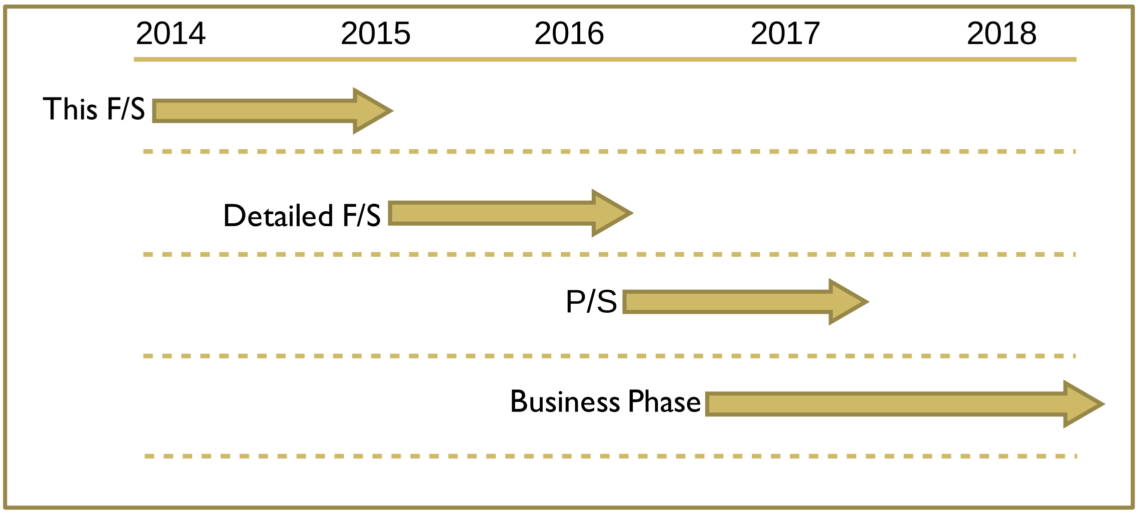


Figure 6. Image of the business]

Based on the result of this F/S, Hitz will conduct a detailed F/S in 2015. And in 2016, Hitz would like to a conduct P/S. In parallel with a P/S, Hitz will prepare for the Energy from Waste business. It will take at least 2years from FEED (Front End Engineering Design) to operation after commissioning.

FY2014 Survey on the Potential for Large-Scale JCM Project to Create a Low-Carbon Society in Asia
Project to Support Formulation of Low-Carbon Urban Planning for Surabaya, Indonesia

Summary Report on Industrial Waste Sector

Amita Corporation

1. Project Objectives and Applicable Field

To manufacture alternative raw materials and fuel primarily for the cement manufacturing industry from industrial waste, including toxic wastes (B3 waste), reduce fossil fuel and natural resource use by promoting resource recycling, and survey the effects of greenhouse gas emission reductions gained from these efforts, and to simultaneously verify the potential of projects that utilize JCM.

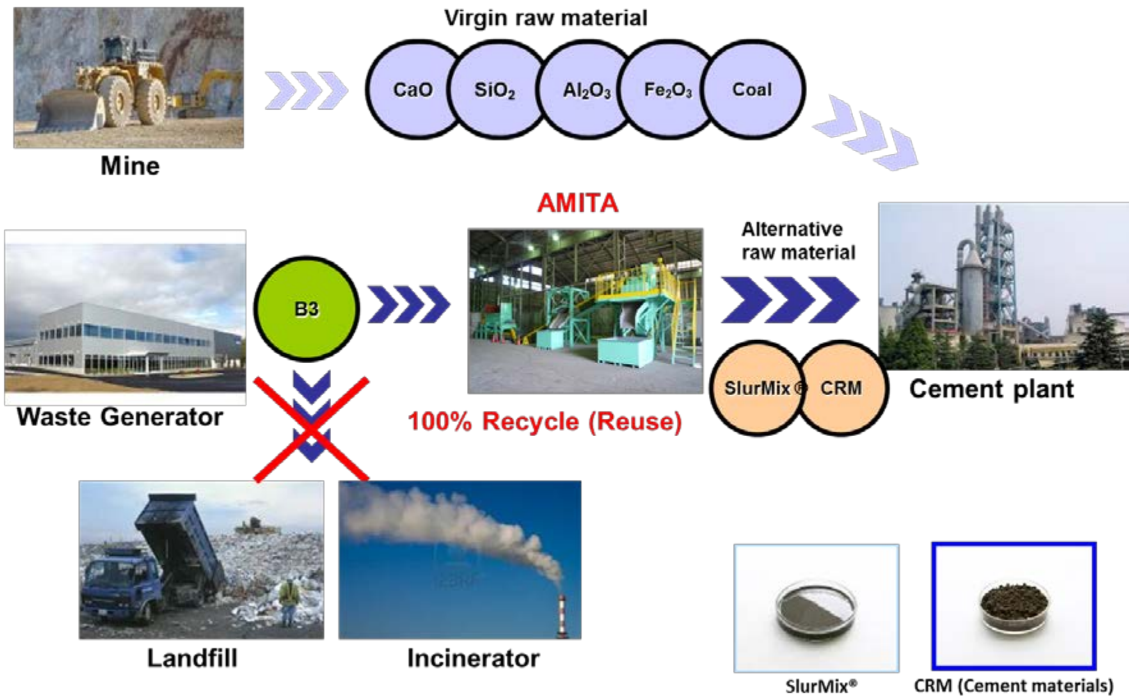


Figure 1 (Project Visual Outline)

2. Applied Technology

Since our founding in 1977, Amita Corporation has recycled resources to manufacture above-ground resources, such as raw cement materials, alternative fuels, and raw metal materials, from a broad-variety of over 4,000 kinds of industrial wastes using 'blending' process technology. We have an annual recycling output of approximately 140,000 tons.

Our liquid alternative fuel, Suramix®, is an easy-to-handle alternative fuel that uses waste oil, oil sludge and waste solvents that could only be disposed of by incineration up to this point, and combines, homogenizes and emlusifies them to meet with the specifications of the user. It is used chiefly in the calcination process in cement plants as an alternative fuel to coal in calcination furnaces and rotary kilns. The cinders that result from its use as an alternative fuel are used in the raw cement material, allowing for complete recycling with no secondary waste. Additionally, Suramix® is also used as an alternative fuel to heavy oil by ferrous and non-ferrous manufacturers, lime manufacturers and paper manufacturers.

CRM (cement raw material), is a solid alternative source fuel, blended using solid industrial waste, such as sludge, cinders and soot, to meet the specifications of the user. CRM raw materials with low heat values are used primarily as alternative raw materials to clay in cement plants, and CRM fuel with high heat values are used in calcination furnaces in the calcination process. Similar to Suramix®, the post-combustion cinders are mixed with the raw material, thus allowing for the complete recycling of resources with no secondary waste.

3. System of Execution Survey and Procedures

This survey was undertaken by Amita Corporation with the assistance of the city of Kitakyushu and the Institute for Global Environmental Strategies (IGES). The survey procedures were as follows.

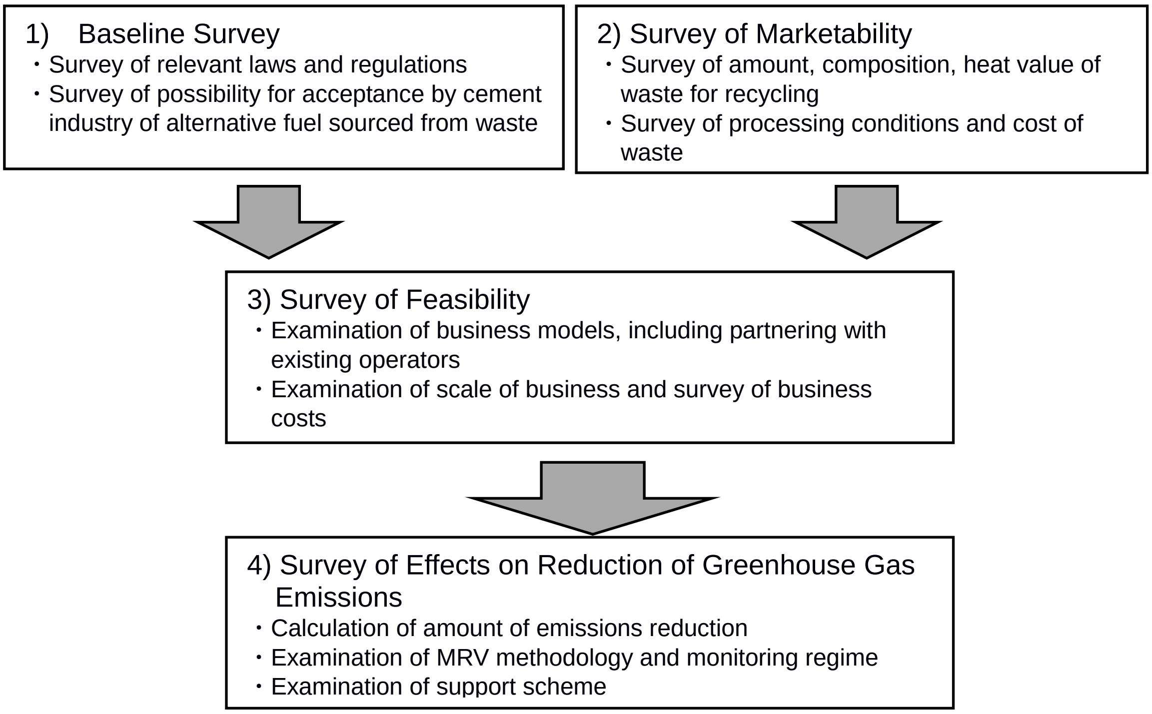


Figure 2 System of Execution Survey

4. Survey Results

1) Survey of Relevant Laws and Regulations

Industrial waste in Indonesia is defined by Indonesian regulations on toxic waste management (#18 1999) as 'residue produced through business activity.' Toxic wastes with any explosive, flammable, reactive, poisonous, polluting or corrosive content are referred to as B3 wastes (Limbah Bahan Berbahaya dan Beracun), and the processing of such must be consigned to a licensed operator. The amount generated is increasing due to revitalized economic activity, while accurate statistics could not be located, it is estimated that there is an annual output of 7 million tons. B3 wastes fall under the jurisdiction of the B3 Management and Regulating Bureau of the Ministry of Environment (Kementrian Lingkungan Hidup), and the licensing authority is also held by the same Bureau. In revision to the Act on Waste Management made in 2008 (#18 2008), promotion of the effective use of wastes was appended to qualitatively improve public sanitation and the environment and utilize as energy resources waste in the household sector, the non-household sector, and special waste (harmful household solid wastes, waste from natural disasters, construction waste, wastes that cannot be processed using current technology, and irregularly-produced wastes). Specifically, new goals and obligations were indicated for waste producing operators, processing companies and transport companies regarding the reduction of waste (setting of goals, introduction of environmental technology, promotion of environmental products and the 3Rs, application of rewards/punishments for achievements in waste reduction) and the processing methods of waste (sorting of waste, collection of waste and transport to processing facilities, final processing to safe environmental media).

2) Survey of Cement Companies

We obtained the latest Indonesia Cement Association data on production and sales amounts.

Chart 1 Starting Year of Operations and Production Amount (1000s of tons) of Cement Manufacturers

Source: Indonesia Cement Statistic

Company Name	Operation Start Year	Cement Production Capacity	Shareholder
Semen Gresik Group			
PT. Semen Padang	1910	6,300	Government: 51.01%; other: 48.99%
PT. Semen Gresik	1957	11,300	
PT. Semen Tonasa	1968	6,700	
PT. Holcim Indonesia	1975	8,700	Holderfin 80.64%; other: 19.36%
PT. Indocement	1975	18,600	Birchwood 51%; other: 49%
PT. Semen Baturaja	1980	2,000	Government:76.24%; other: 23.77%
PT. Lafarge Cement	1982	1,600	Lafarge 99.9%; other: 0.01%
PT. Semen Kupang	1984	396	Government: 100%
PT. Semen Bosowa	1999	5,400	National Private Company 100%
Total		60,996	

Additionally, the Waste Acceptance Criteria (WAC) used by the cement industry in Indonesia are more stringent in all values than the WAC stipulated by Malaysia and Vietnam, and the role of intermediate processing (blending) of waste being evaluated for operability by this survey will be extremely important (This kind of intermediate processing company is collectively referred to in Indonesia as a 'Platform'). In actuality, cement companies and B3 processing companies engage in intermediate processing (blending) of waste to manufacture and reuse raw fuel that fulfills the WAC. However, as far as this survey could confirm, there are only around 4 companies in Indonesia, and in terms of constructing a waste resource recycling framework in the future, we surmise that these will further grow in importance.

3) Survey of Marketability (Survey of Waste-Producing Operators)

To survey the current conditions of waste production of B3 waste and recycling needs among waste-producing operators, we had the East Java Japan Club (EJJC), comprising 40 companies, and the Jakarta Japan Club (JJC), comprising 328 companies, fill out a questionnaire. There was a low response rate with only 24 companies responding.

We statistically compiled the responses from the 24 companies into a chart. The total amount of waste generated by the 24 companies was 1,900 tons, with approximately 90 kinds of waste. Simple averaging yields that one company generates 79 tons of waste per month (950 tons per year), and there are 21 tons of waste generated per waste type. The most common processing method is burying the waste, with incineration as the second most common method. Further, there were sporadic cases of a portion of waste being consigned for recycling into fuel etc.

Moreover, due to the extremely low response rate of the questionnaire, we visited the companies to directly collect information and sample the B3 waste. Ultimately, we visited 67 companies and took 37 samples. We analyzed the contents of the samples as the Himeji Recycling Plant Laboratory using an energy dispersive x-ray fluorescence spectrometer. The estimated value of CRM (fuel series) calculated using a weighted average based on the 37 samples was within the WAC used by Indonesian cement companies. Moreover, upon inquiring with cement company A regarding the possibility of accepting Suramix® manufactured in Japan, a product sample of CRM (fuel series) and the analyzed value, a positive response was received from all three. There are regulations that the heat value of liquid alternative fuels sourced from B3 waste must be 2,500kcal/kg or more, and this standard was also met.

4) Survey of Candidate Partners

We are evaluating the establishment of a joint venture with a cement company, however, as stated above, the demand for cement in Indonesia is extremely high, and the first priority of a cement company in these conditions will be the stable production of cement. Cement companies are aware of using raw fuel for cement from waste and are gradually expanding acceptance amounts of waste; however, they tend to prioritize their current stable production rates and have concerns about the effect this will have on their cement quality, thus, with the exception of some foreign cement companies, there is little positive movement towards actively accepting waste. Therefore, further negotiations are required to establish a joint venture with a cement company. On the other hand, there are companies among local waste processing operators who indicate an interest in manufacturing raw fuel for cement, and, while we will continue to prioritize the evaluation of a joint venture with a cement company, the option still remains to work with a waste processing company.

5. MRV Methodology for Measuring Greenhouse Gas Emission Amounts

At the current time there exists no usable methodology regarding the reduction of greenhouse gases through the acceptance of alternative raw fuel sourced from multiple industrial waste products, and there are no internationally-established universal handling techniques for alternative raw fuel in calculating greenhouse gas emission amounts.

There is an inventory formula and project formula for calculating greenhouse gas emission amounts; for this calculation we used a baseline scenario project formula. In the following, we calculated the 'baseline emissions amount' for the emission amount should we not undertake this project, and we calculated the 'project emissions amount' for the emission amount should we undertake this project.

Precondition①

We set the Suramix® to be manufactured in this project to 5,000 tons/year, and the CRM fuel series to 24,000 tons/year.

Precondition②
The heat value for the coal used in the baseline scenario was set at 5,700kcal/kg, upon interviewing companies.

Precondition③
The heat value for Suramix® to be manufactured in this project is 3,350kcal.kg, and the heat value of the CRM fuel series was set at 1,800kcal/kg (based on average values).

Chart 2 Greenhouse Gas Emissions Reduction Amount

Baseline Emissions Amount	①	Greenhouse gas generated during mining of coal	395 tons CO_2/year
	②	Greenhouse gas generated during transportation from coal mine to cement plant	18 tons CO_2/year
	③	Greenhouse gas generated with the combustion of coal during cement manufacturing	25,337 tons CO_2/year
	④	Greenhouse gas generated during transportation of B3 waste from emission producer to landfill	7,598 tons CO_2/year
	⑤	Greenhouse gas generated during incineration of B3 waste	-
		Total Baseline Emissions Amount	33,348 tons CO_2/year
Project Emissions Amount	⑥	Greenhouse gas generated during transportation of B3 waste from emission producer to manufacturing plant	1,140 tons CO_2/year
	⑦	Greenhouse gas generated during recycling process at manufacturing plant	261 tons CO_2/year
	⑧	Greenhouse gas generated during transportation of alternative fuel from manufacturing plant to cement plant	18 tons CO_2/year
	⑨	Greenhouse gas generated accompanying combustion of alternative fuel during cement manufacturing	25,734 tons CO_2/year (0 tons CO_2/year)
		Total Project Emissions Amount	27,152 tons CO_2/year (1,419 tons CO_2/year
Amount of Greenhouse Gas Emissions Reduction (Baseline Emissions Amount – Project Emissions Amount)			6,197 tons CO_2/year (31,929 tons CO_2/year)

*The values inside the parentheses represent the scenario where no consideration is given to greenhouse gases generated accompanying the combustion of alternative fuel sourced from waste.

The CO_2 and Energy Determination Reporting Standards for the Cement Industry, the Cement CO_2 and Energy Protocol, Protocol Handbook, version 3 published by the Cement Sustainability Initiative (CSI) of the World Business Council for Sustainable

Development (WBCSD) indicates that the use of waste as alternative raw fuel indirectly results in a reduction in greenhouse gases that may have been otherwise emitted through burying or incinerating the waste, and, depending on the regional conditions, this can offset CO_2 emitted with the burning of raw fuel sourced from waste. Based on this indication, CO2 emitted with the burning of alternative fuel can be thought to be outside of the range of the project emissions amount, and we support this indication.

We used the following method to calculate the emissions amount which takes into account the greenhouse gas emissions amount accompanying the combustion of the CRM fuel series and Suramix®.

The emissions coefficient necessary for calculating greenhouse gas emissions amounts with the combustion of both the CRM fuel series and Suramix® are both unknown at this point, and the measurement of and setting for such are not easy. Therefore, we used the emission coefficients for similar alternative fuels generally published right now, and we adopted a method for calculation. We use the RDF coefficient for the CRM fuel and the coefficient of waste oil for Suramix®.

Chart 3 RDF, Waste Oil Emissions Coefficient

Emission Coefficient for RDF	0.775 tons- CO_2/ton	
Emission Coefficient for Waste Oil	2.92tons- CO_2/ton	The emission coefficient for waste oil (2.63 tons – CO_2/kl) is converted to ton/kl. The converted coefficient is 0.9 (ton/m3).

*Emission coefficient uses the default values of #14-15, page 12, Article 3 and #3 of the appendix to the Ministerial Ordinance on Calculation.

The raw material waste contained in the CRM fuel series chiefly comprises sludge, waste plastic, cinders, waste oil, soot, glass/concrete/ceramic shards, slag etc. The raw material waste contained in Suramix® primarily contains sludge, waste oil, waste alkali, spent acid, waste plastic etc. Therefore, since raw material waste is contained in waste material sourced from fossil fuels/non-fossil fuels, we sorted the waste contained in the CRM and Suramix® and calculated the ratio.

Chart 4 Ratio of Fossil Fuel-Sourced Waste Contained in CRM Fuel Series, Suramix®

Ratio of Fossil Fuel-Sourced Waste Contained in CRM Fuel Series	63%
Ratio of Fossil Fuel-Sourced Waste Contained in Suramix®	96%

*Calculated from actual amount of raw material waste accepted in 2013 at Himeji Recycling Plant, Amita Corporation

There are several issues with the above calculation method. Firstly, since there is currently no usable emissions coefficient, we provisionally used the emissions coefficients for RDF and waste oil as the emissions coefficients of the CRM fuel series and Suramix®, but the similarities in composition and properties are not necessarily that close. For example, the average heat value of RDF is approximately 3,500kcal/kg, while the heat value for the CRM fuel series averages out to 1,800kcal/kg. Also, in contrast to the 3,350kcal/kg average heat value for Suramix®, the heat value for waste oil is estimated to be 6,000kcal/kg or more. Despite the large different in heat value for Suramix®, since the established emissions coefficient of waste oil is larger than fuel coal, the more that it is used, the less greenhouse gas emission reductions there are.

Moreover, since alternative fuel is manufactured in this project by blending wastes of multiple, differing types, the ratio of fossil fuel-sourced waste is not always consistent, making the regulating of the emissions coefficient difficult. Further, consideration must be given that waste emission sources do not overlap when the emission amounts arising from the disposal of waste generated by our company are counted as the amount of greenhouse gas emissions accompanying our activities, and when the reduction amounts that arise through the use of alternative fuel at the cement company user end are counted. Regarding these points, we are aware that these issues will require attention in the future.

6. Estimate of Project Costs and Cost-Effectiveness

The costs of operating this project are estimated to be as follows; however, these costs will require close future examination. The estimated CO_2 reductions below are values that take into account the CO_2 emission reductions when burning the CRM fuel series and Suramix®, and not taking these into consideration, the cost-effectiveness would be approximately 10,648 yen per ton of CO_2 per year.

Chart 5 Estimate Project Costs and CO_2 Emission Reduction Amounts, Cost-Effectiveness

	Operation Costs (Equipment Introduction Costs)	CO_2 Emission Reduction Amount	Cost-Effectiveness (tons of CO_2 per year)
Suramix® Plant (Production Capacity approx. 5,000 tons/year)	Approx. 340 million yen	Approx. 6,197 tons CO_2/year	Approx. 54,865 yen
CRM Plant (Production Capacity approx. 24,000 tons/year)			

7. Secondary Effects (co-benefits)

We can expect various co-benefits through this project from promoting the recycling of waste. Firstly, the use of Suramix® is linked to a reduction in the use of fossil fuels. Also, in addition to the CRM fuel series having a heat value that makes it viable for use as an alternative fuel, it can also be used as a clay substitute in raw cement material, and, therefore, contributes to a reduction in the use of natural resources.

The blending that our company carries out allows for the 100% recycling of waste, and the alternative raw fuel for cement is used in its entirety in the cement manufacturing process without the generation of secondary residue. This processing method is clear-cut, and can guarantee a highly appropriate and transparent method for processing waste. Therefore, compared to the status quo of simply incinerating and burying, which are the primary means while also being simultaneously unclear as an ultimate solution to waste, there are anticipated effects towards promoting a lessening of the burden on the environment and promoting better environmental management. Moreover, providing appropriate and transparent waste processing and improving the recycling rate are both issues that foreign firms, including Japanese firms, in particular, must deal with when entering Indonesia, and that a project that offers solutions for these issues will prompt a further increase in foreign investment.

Also, the life cycle of final waste disposal sites can be extended through avoiding the burying of waste, or the burying of ash left over from incineration. Currently in Japan, as a result of the cement industry accepting approximately 28.5 million tons of waste and by-products annually, it has been provisionally calculated that final waste disposal sites have had their life cycles extended by 8 years, and it has been reported that there are major contributions to lessening the burden on the environment by increasing the amount accepted by the cement industry (based on FY2012 results). In addition, it is estimated that extending the life cycle of final waste disposal sites would be linked to a reduction of methane gas emissions, while also contributing to lessening the burden of the final waste disposal site on the surrounding environment. And since the Republic of Indonesia laws regarding waste management were revised in 2008 (#18 2008) burying waste through open dumping has been prohibited in principle as a means of final disposal, this would also contribute to achieving these policies of the government.

This project is a model to allow cement companies to earn recycling costs through the acceptance and processing of B3 waste. In other words, since this will lead to a new way to generate revenue for cement companies, this can become an incentive for cement companies to actively accept B3 waste. Should this project model permeate the market, appropriate pricing will be established based on market principles and a sound recycling market will form. The formation of a sound recycling market will lead to the establishment of a clear processing flow, which will lead to the elimination of improper processing.

8. Monitoring System

Issues to be monitored and monitoring methods are as follows.

Chart 6 Calculation Index

Issues to be Monitored	Monitoring Method Examples	Monitoring Frequency
Supply weight of waste-sourced fuel after initiating the project	・Measuring with a gravimeter ・Invoicing at the time of supply	Total for a given period
Heat value of waste-sourced fuel after initiating the project	・Based on specifications of cement company receiving delivery ・Calculate average value upon sample analysis at the time of shipment	Calculate by a given period
Amount of Fuel used in transport of waste after initiating the project	・Use value (fuel cost) supplied from transport company	Once per year
Emission coefficient of fossil fuels used in transport of waste after initiating the project	・Use default value	Use of newest value at time of verification
Amount of electricity used in processing of alternative fuel from waste after initiating the project	・Calculate based on invoice received from electric supply company	Total for a given period
Emission coefficient of electricity used in processing of alternative fuel from waste after initiating the project	・Use default value	Use of newest value at time of verification
Amount of kerosene and diesel used in processing of	・Calculate based on invoice received from fuel	Total for a given period

alternative fuel from waste after initiating the project	supply company	
Emission coefficient of kerosene and diesel used in processing of alternative fuel from waste after initiating the project	・Use default value	Use of newest value at time of verification
Ratio of fossil fuel-sourced waste contained in waste-sourced fuel after initiating the project	・ Calculate based on shipment receiving chart	Calculate by a given period
Emission coefficient of alternative fuel used by necessary equipment after initiating the project	・Default value of emission coefficient for similar waste-sourced fuel will be used for the time being	Use of newest value at time of verification

9. Execution Plan to Bring Project to Operability

We have received responses from local cement companies that they would like to actively push forward with the acceptance of raw fuel while examining the production conditions going into the future, so we continue to give priority to evaluating a joint venture with a cement company; however, the option also remains of working with a local company that is licensed in processing B3 waste. We have already received promising responses regarding collaboration from three licensed processing companies.

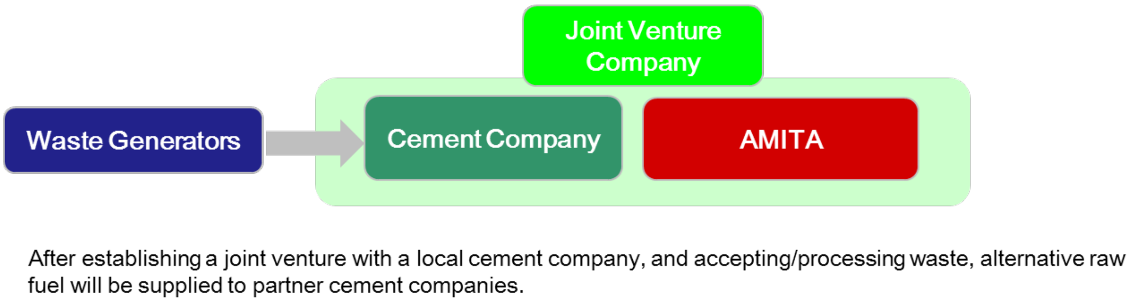


Figure 3 Pattern of Project Execution System

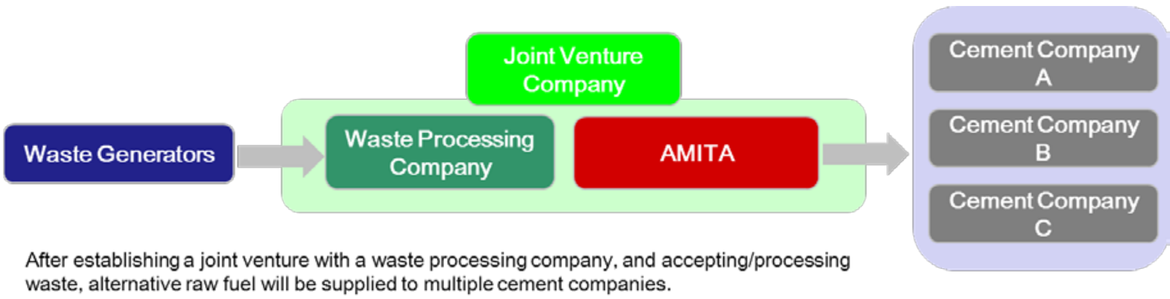


Figure 4 Pattern of Project Execution System (Option)

10. Necessary Measures to Promote Operability of Project (Issues, Requests)

In this year's survey, we examined the current status of emissions producers and cement manufacturers, and carried out continual sampling of B3 waste, and while confirming the recycling needs of both of these parties, it was also confirmed from visits to B3 waste processing companies that there is operating potential in the manufacture of cement raw fuel. And, while we have narrowed down local candidate partners, we have not yet arrived at any formal agreements, thus necessitating further investigation into the terms of collaboration.

The necessary measures to take to promote the operability of this project in the future are indicated in the following two points.

1) Using the Indonesian government to assess the current state of environmental damage from illegal dumping and activities to promote the spread of cement recycling as a countermeasure against this

Disputes are increasing due to environmental damage from causes like illegal dumping and air pollution; there are 47 cases in 2012 and 70 cases in 2013 of disputes where the Ministry of Environment has taken administrative measures. There are reports of environmental polluters paying out 1.1 billion IDR (approx. 11 million yen) in 2012 and 1.3 billion IDR (approx. 12.9 million yen) in 2013 as compensation for environmental damage. The criminal regulations on violations of environmental standards has also been strengthened in recent years, with criminal penalties of as much as 3 billion IDR (approx. 30 million yen) for non-compliant management of B3 waste by emission producers, and as much as 3 billion IDR (approx. 30 million yen) for illegal dumping of B3 waste. We were not able to identify the contents of illegally dumped waste in this survey, but there is a high possibility that the mass-generated waste contains numerous amounts of material that can be processed into cement raw fuel (in actuality, there is a great amount of illegally-dumped waste in Japan and Southeast Asia that is processed by cement companies). Considering the environmental damage brought about through illegal dumping, and the increasing crackdown on illegal dumpers, we believe the function and role of intermediate processing into cement raw fuel would be large as a countermeasure against this. There is also a provision in Article 27 of the Republic of Indonesia Law regarding Waste Management, revised in 2008 (#18 2008) that allows for the individual or collaborative action of municipal governments in provinces and cities in the management of waste, and this also allows for partnerships with waste management operators. This presents the possibility of evaluating the prospect of collaborating with a municipal government on this project in some circumstances.

2) Easing of WAC established by Indonesian Government

As stated above, the WAC of cement companies established by the Indonesian government are extremely strict in comparison to other Southeast Asian countries. This is likely due to the effects of volatile substances and the heavy metal content contained in natural resources sourced from minerals, such as limestone, clay and iron source, and used as raw materials by cement companies. In promoting the project to manufacture cement raw fuel in the future, it is important that Japan communicates case studies and experience, such as our long-cultivated environmental technology and technical expertise, and that we provide a forum to evaluate the easing of acceptance standards. The appropriate monitoring of the movement and use of waste will be particularly needed. However, in the promotion of cement recycling, it may likely become an issue that cement manufacturing companies will feel responsible for the quality of their cement and, as long as the cement product is managed within the manufacturing standards, they may set waste acceptance standards too high.

11. Future Plans

As stated above, the emission reduction effects may vary greatly in this project depending on how CO_2 emissions accompanying the combustion of alternative fuel manufactured by our company are assessed. However, this project can greatly contribute through its secondary effects, and considering those effects, we would like to continue this project operability survey as a JCM large-scale project feasibility study. Should operability be deemed possible as a result, we aim to work out the acceptance conditions in detail with a cement company or a B3 waste processing company, conduct a final FS survey with the collaborating company, establish a joint venture by 2016, receive proper licensing authority and begin plant operations by 2017.

FY2015:
- Continue detailed F/S
- Secure operating partner company and negotiate terms
- Specifically evaluate introduction of equipment to cement company
- Evaluate quality of accepted alternative fuel
- Carefully examine investment cost of local equipment
- Establish agreements with relevant administrative authorities
- Establish capital procurement scheme
(JCM equipment assistance project and other fund-raising)

FY2016
- P/S
- Joint-venture contract with project partner companies
- Application procedures for licensing approval

FY2017
- Construct plant/begin operations