

# Low-carbonization in Asian Cities through City to City Cooperation



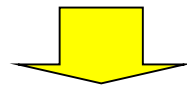
Environment Bureau, City of Kitakyushu

# Kitakyushu Asian Center for Low Carbon Society

Kitakyushu Asian Center for Low Carbon Society opened in June 2010.



Utilization of the environmental technologies developed through the solution of pollution problems and manufacturing processes, and the inter-city network established by international cooperation in the past



Accumulating **environmental technologies** in Kitakyushu City and throughout Japan, for building low carbon societies in Asia through environmental business skills



# Overview of the Kitakyushu Model

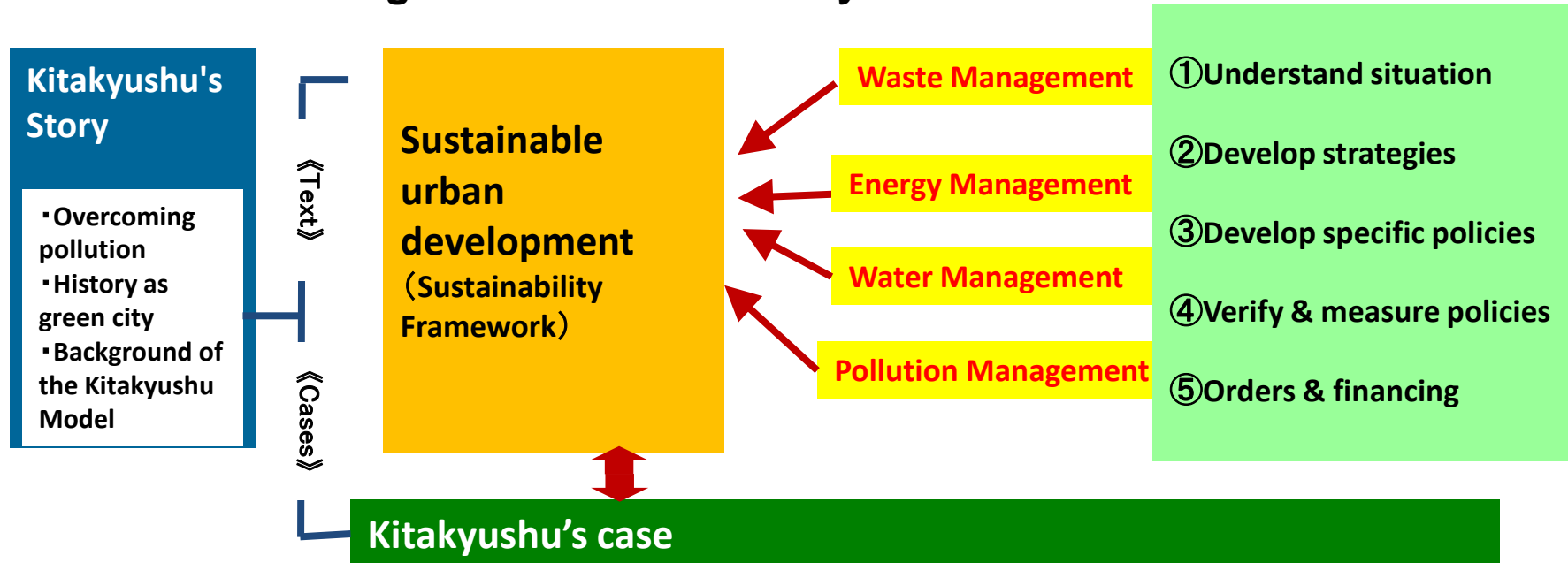
## 1. Objective of the Kitakyushu Model

- Kitakyushu, which faced and overcame pollution for the first time in Asia, became a leading environmental city in Japan.
- Kitakyushu is developing the Kitakyushu Model (support tool) that systematically arranges information on the technologies and know-how of Kitakyushu from its experience in overcoming pollution to its quest as an environmental city.
- Kitakyushu is utilizing the Kitakyushu Model to promote the export of customized infrastructure packages to cities overseas, and grow together with Asia.

## 2. Applications of the Kitakyushu Model

- Support tool to examine future ideal city image and for cities to take appropriate measures and procedures to achieve this.
- Support tool to examine management systems for waste, energy, water and sewage services, and environmental protection.
- Support tool to develop sustainable master plans that integrates waste, energy, water and sewage services, and environmental protection.

### — Organization of the Kitakyushu Model —



# Kitakyushu's Involvement in Large-Scale JCM Project Development

## Promotion of low-carbon development of entire cities using intercity cooperation

**Surabaya, Indonesia: 2<sup>nd</sup> largest city in Indonesia with a population of 3 million**

**<FY 2013- 2015> Low Carbon City Planning Project in Surabaya, Indonesia**

**Target areas: Energy, waste management, transportation, water resources**

**Participating Japanese companies: 13**



Green Sister City agreement signed(Nov 2012)

**Haiphong, Viet Nam: Major port city in Viet Nam with a population of 1.9 million**

**<FY 2014, 2015> Green Growth Promotion Plan of the City of Hai Phong**

**Target areas: Low-carbon city planning, energy, waste management, conservation of Cat Ba island**

**Participating Japanese companies: 10**



Sister city agreement signed (Apr 2014)

**Iskandar, Malaysia: 2<sup>nd</sup> largest economic zone in Malaysia**

**<FY 2014, 2015> GHG Emissions Reduction Project in Iskandar (Pasir Gudang)**

**Target areas: Waste-to-energy, energy savings and industrial waste recycling in Industrial Estate**

**Participating Japanese companies: 4**



Consultation with Mayor of Pasir Gudang City (Feb 2015)

**Rayong Province, Thailand: Major heavy chemical industrial zone in Thailand with 2 large industrial parks**

**<FY 2015> GHG Emissions Reduction Project in Rayong Province**

**Target areas: Waste-to-energy project, energy savings, total recycling of industrial waste at Industrial Zone**

**Participating Japanese companies: 4**



MOU signed with Department of Industrial Works (Dec 2014)

# Waste Management in Surabaya, Indonesia

International cooperation of composting household waste was started from 2004



- ✓ 30% reduction of waste
- ✓ Street decorated with flower
- ✓ Improvement of public environmental awareness

Building a relationship of trust

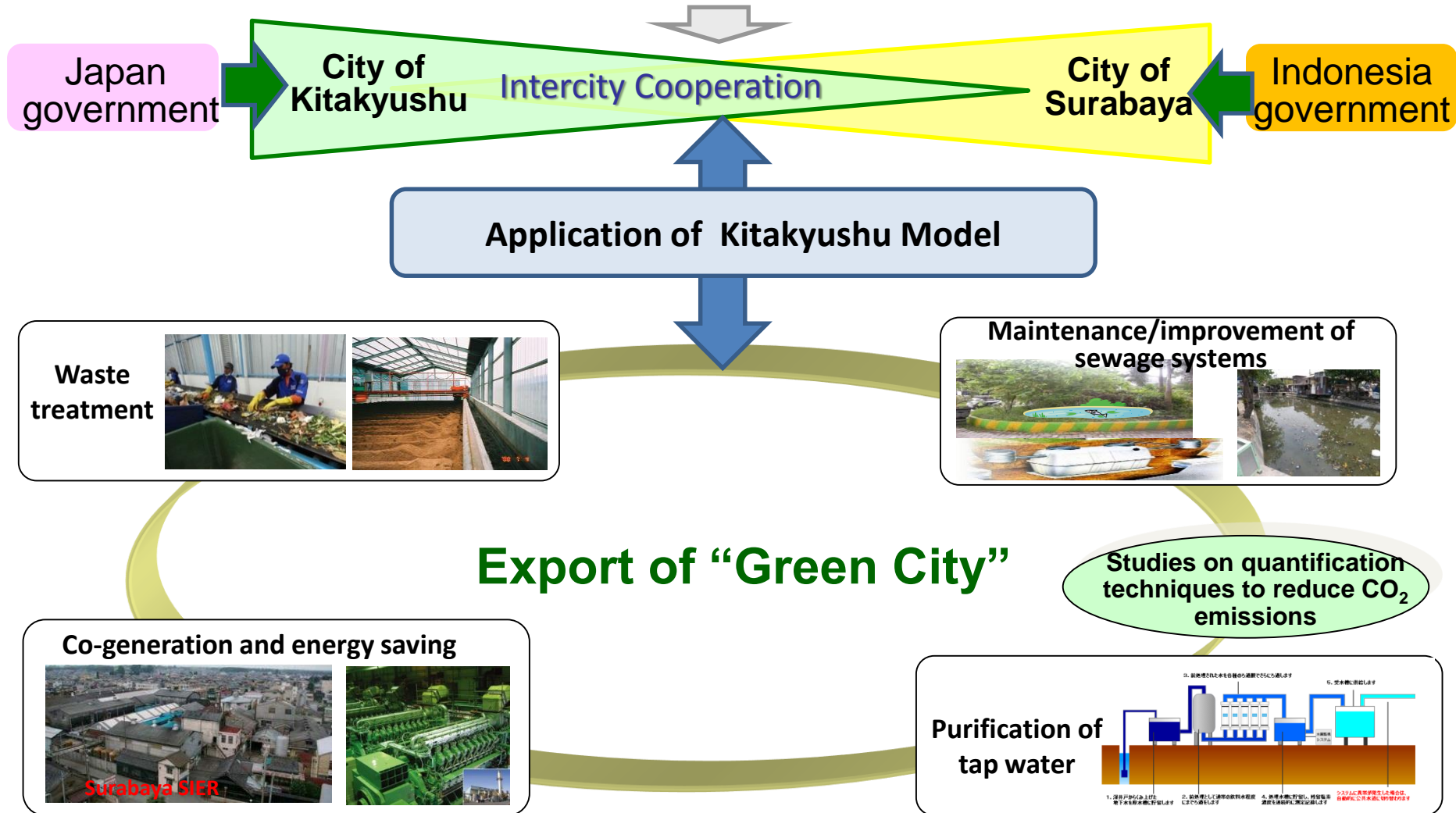


“Green Sister City” agreement was signed in November 2012 between Surabaya and Kitakyushu

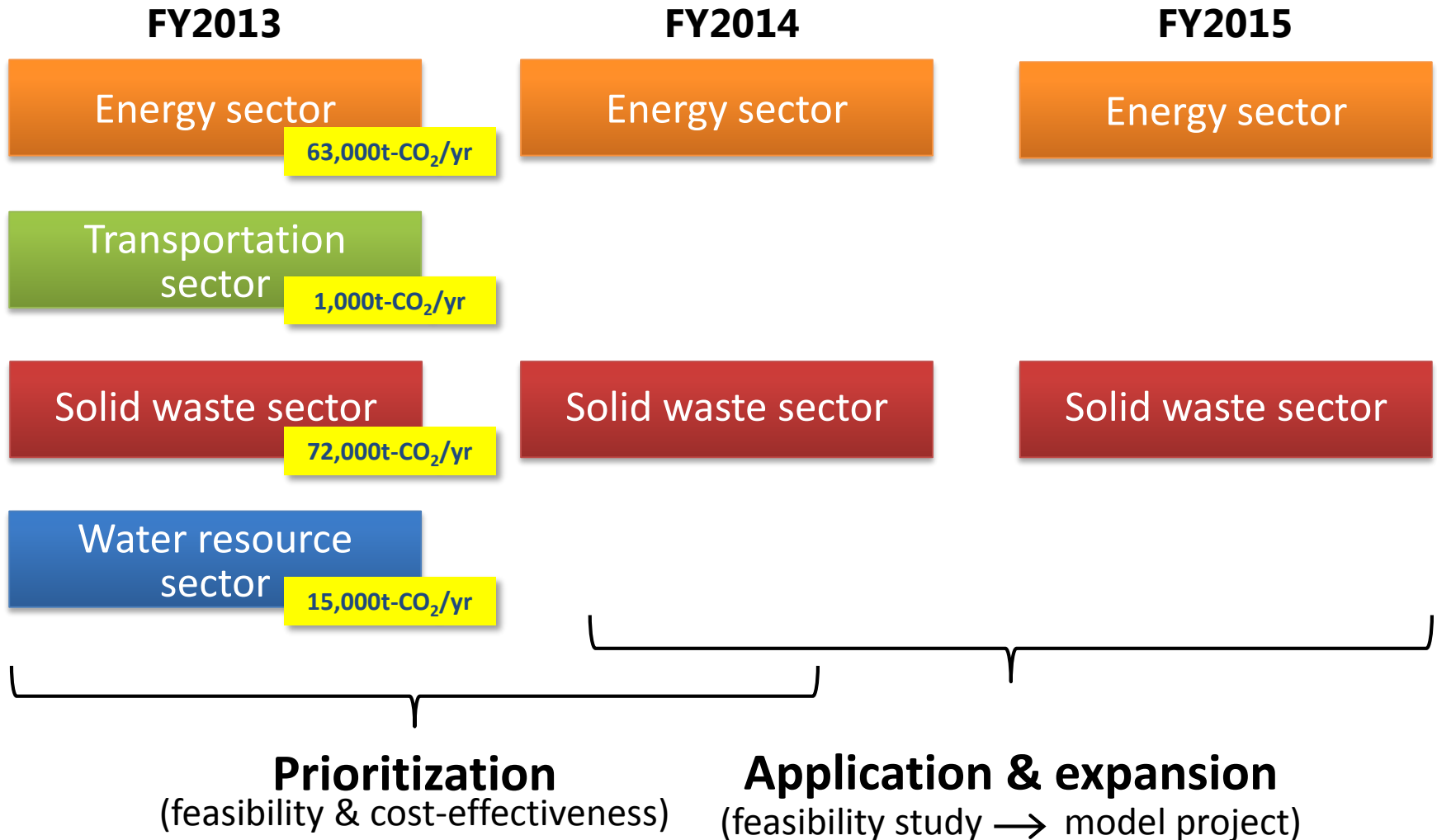
# Exporting “Green City” to Surabaya

## Development of a green city master plan

Reinforcing the foundation that is the source of growth  
(local governmental strength, civic-mindedness, technological strength)



# Transition of JCM ESC F/S in Surabaya





# Energy Saving in Commercial Establishments & Hotels

## Introduction of High-Efficiency Air Conditioner System

This project was adopted as one of the financing program for JCM model projects in FY2015.

- ✓ Participating company: NTT FACILITIES, INC.
- ✓ Target: Tunjungan Plaza in Surabaya, Indonesia
- ✓ Business expenses: about 230 million yen



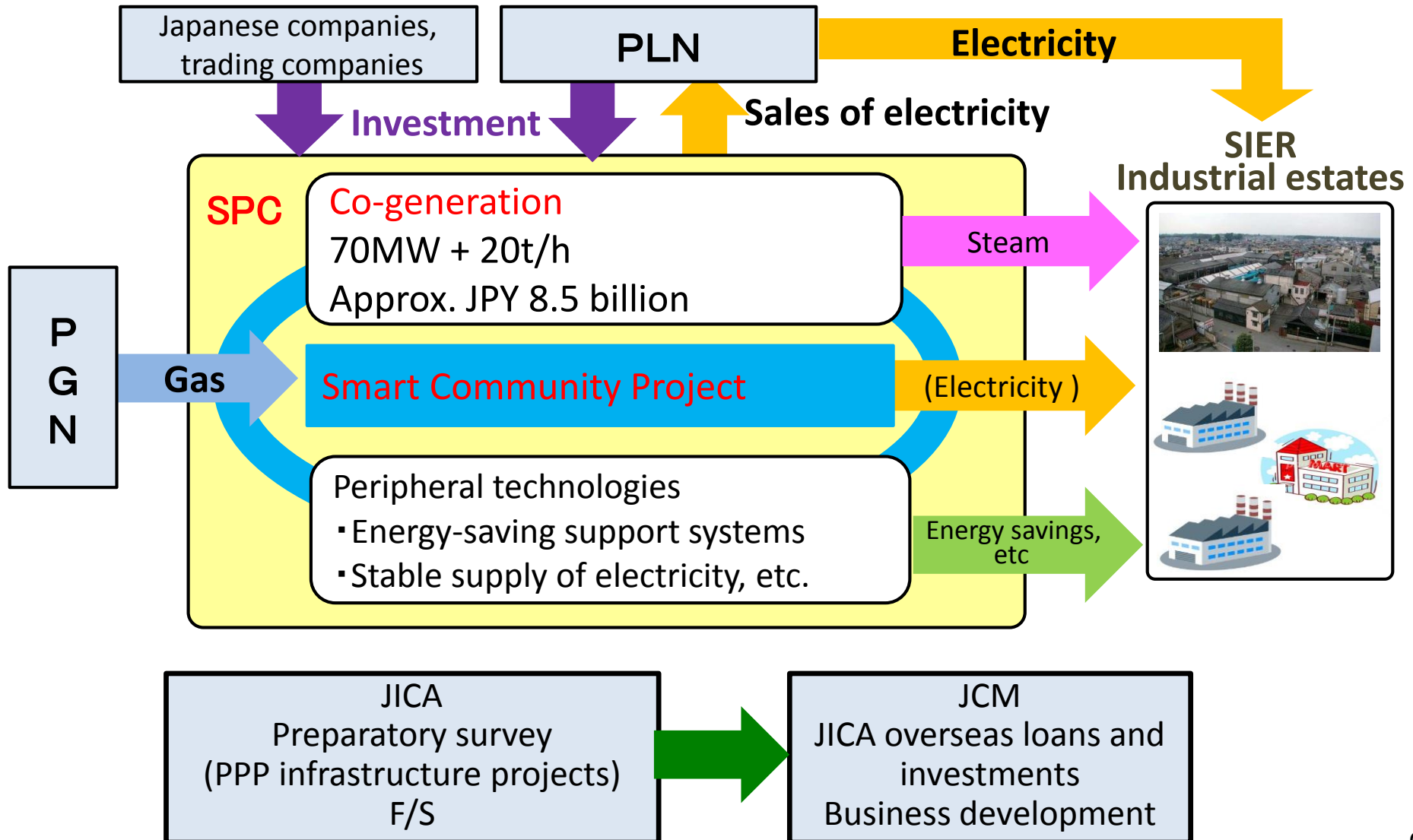
High-efficiency turbo, chiller, pumps, cooling towers, EMS



# Cogeneration(Combined Heat & Power) in Industrial Estates

Nippon Steel & Sumikin Engineering, Fuji Electric etc.

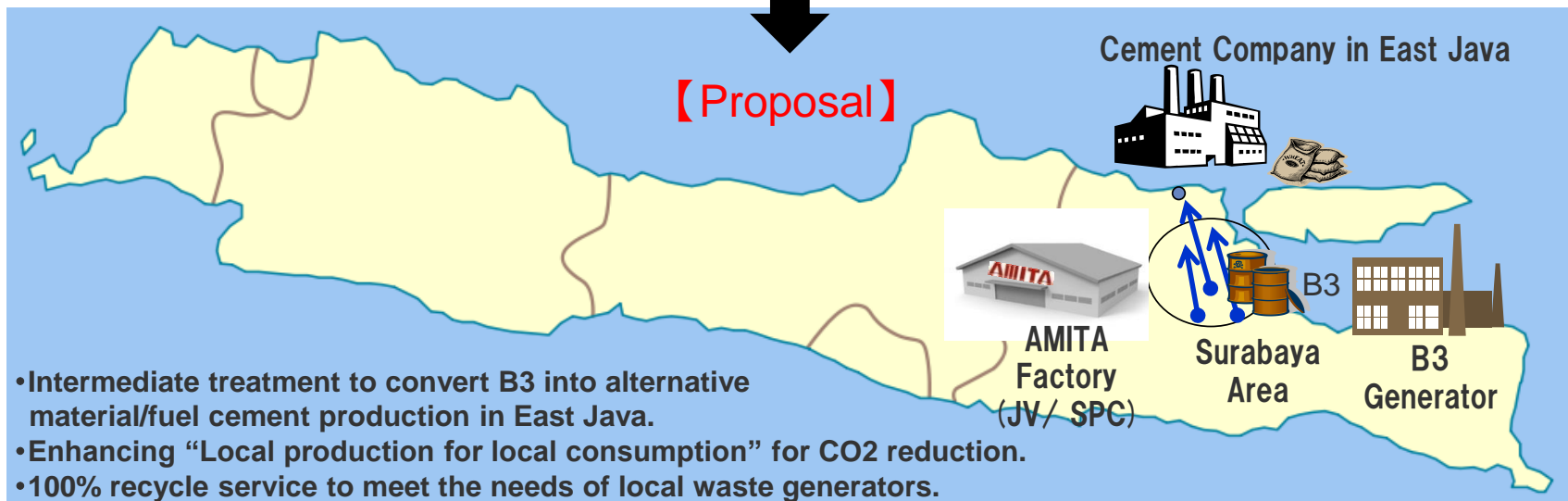
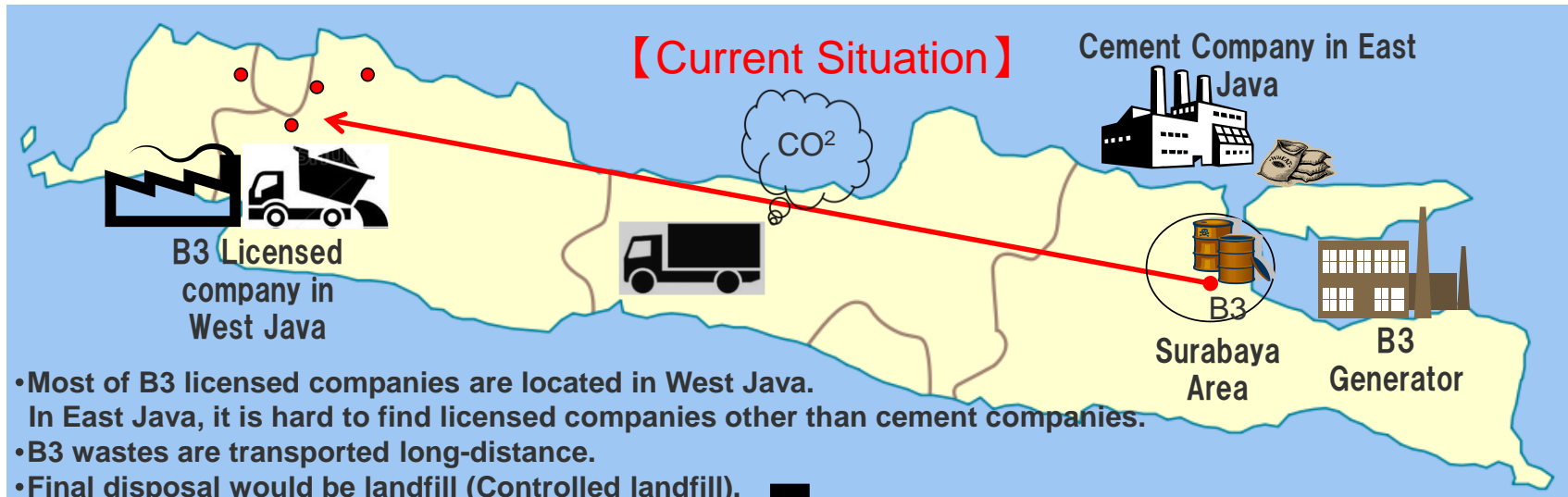
Overseas development of Kitakyushu Smart Community Project



# Utilization of Industrial Waste

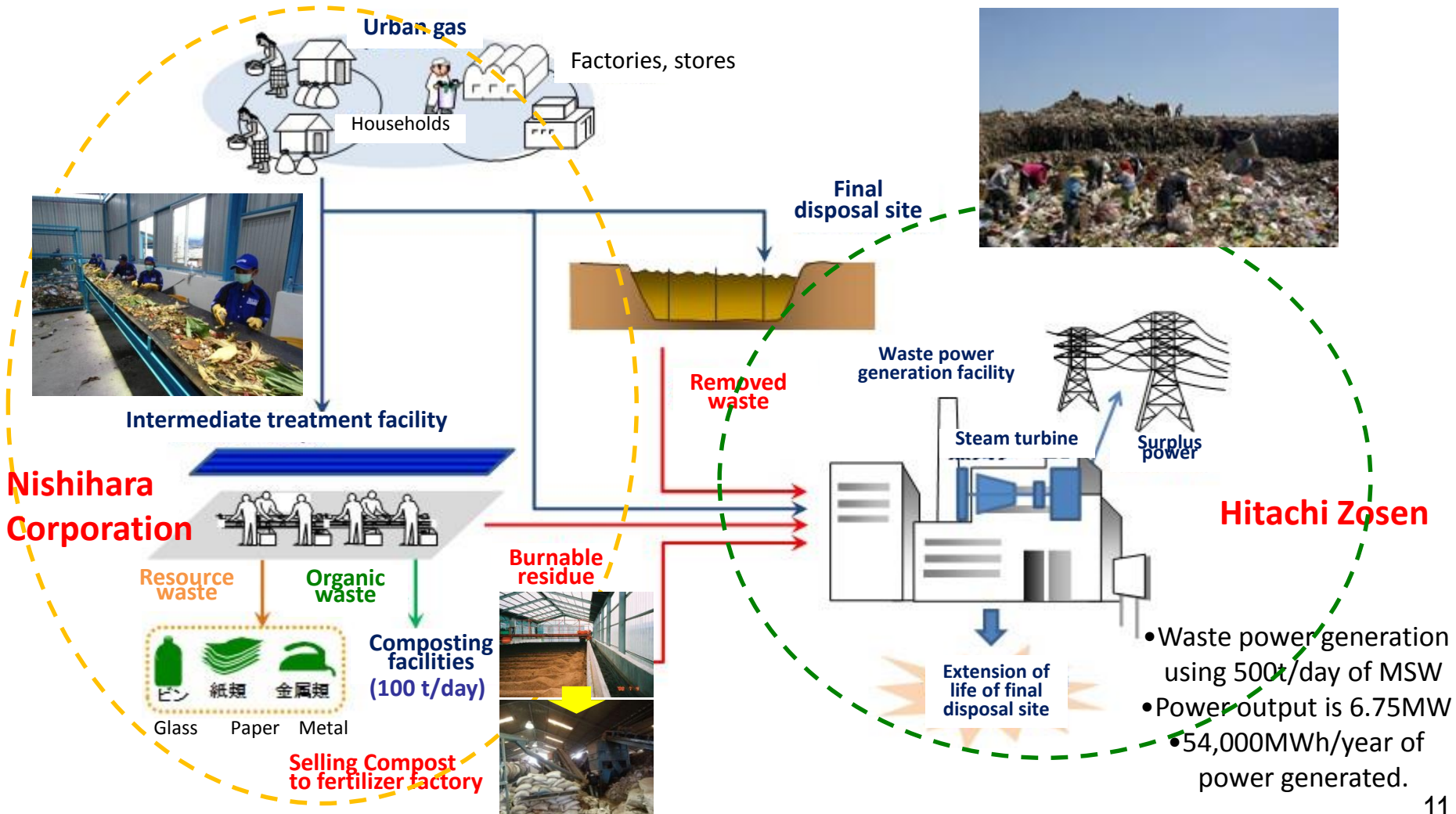
Utilizing the alternative fuel and resources from industrial waste in cement factory

## AMITA



# Waste Power Generation from Urban Waste

➤ By combining high-calorie waste (Separation and composting of residue, waste removed by Nishihara Corporation) and general urban waste, it is anticipated that 500t/day of 1,500-2,000kcal waste can be guaranteed.





# Policy Cooperation

## GREEN BUILDING AWARENESS AWARD



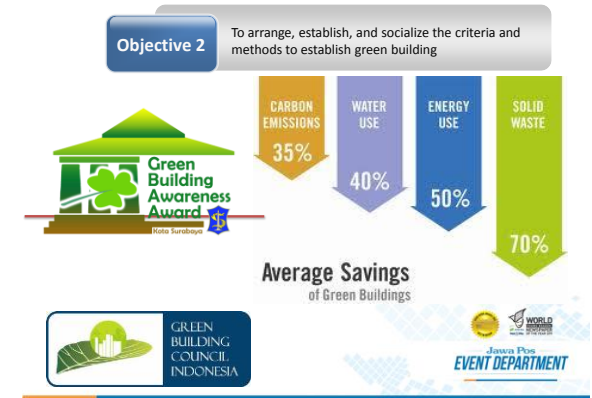
### SURABAYA

### Livable & Sustainable City

### Green City Master Plan

	<b>1 GREEN PLANNING AND DESIGN</b>	Spatial planning which maintain 30% area of Green Open Space from the total area of Surabaya .
	<b>2 GREEN OPEN SPACE</b>	Expansion and optimization of Green Open Space.
	<b>3 GREEN BUILDING</b>	The determination of green building development policy and infrastructure, the enforcement of Green Building Award.
	<b>4 GREEN TRANSPORT</b>	Application Planning of Rapid Mass Transportation in form of Monorail and Tram, provision of non-motorized vehicle network.
	<b>5 GREEN COMMUNITY</b>	Training of facilitators and env cadres, conducting Merdeka dari Sampah (Free from Waste) & Surabaya Green and Clean Event
	<b>6 GREEN WASTE</b>	Development of recycle and compost center, development of Benowo Disposal Area by using "waste to energy" technology
	<b>7 GREEN WATER</b>	Development of clean water network and potable water, wastewater network management and urban domestic waste
	<b>8 GREEN ENERGY</b>	Development of alt energy such as solar cell on public infrastructure, development of cogeneration power source in the industry

Source: City of Surabaya



### GREEN BUILDING AWARENESS AWARD TAHAPAN SELEKSI

#### SELECTION 1

- Out of 138 buildings, 59 buildings are nominated
- Hotel : 15 buildings
- Apartment : 13 buildings
- Mall : 13 buildings
- Office building : 18 buildings

#### SELECTION 2

- From the fulfillment of self assessment, 27 buildings are nominated
- Hotel : 10 buildings
- Apartment : 7 buildings
- Mall : 3 buildings
- Office building : 7 buildings

#### SELECTION 3

- From the presentation result, below are the 12 Awards Winnings
- Hotel 3 buildings : *Sheraton, JW Marriott, Mercure*
- Apartment 3 buildings : *Wanagore, Triloka, Cosmopolis*
- Mall 3 buildings : *Tanjung Plaza, Grand City, Lenmarc*
- Office Building 3 buildings : *Midland, Esa Sempurna, Gha Wankaya*



# Exchange with Haiphong City

## Friendship and cooperation agreement (May 2009)

### 1. Increase potential for participation in infrastructure business

- ✓ Conclude MOU for technical cooperation in water and sewage services
- ✓ Water quality improvement project (CLAIR)
- ✓ Program to improve water purification treatment processes (JICA)

### 2. Support overseas business activities of local companies

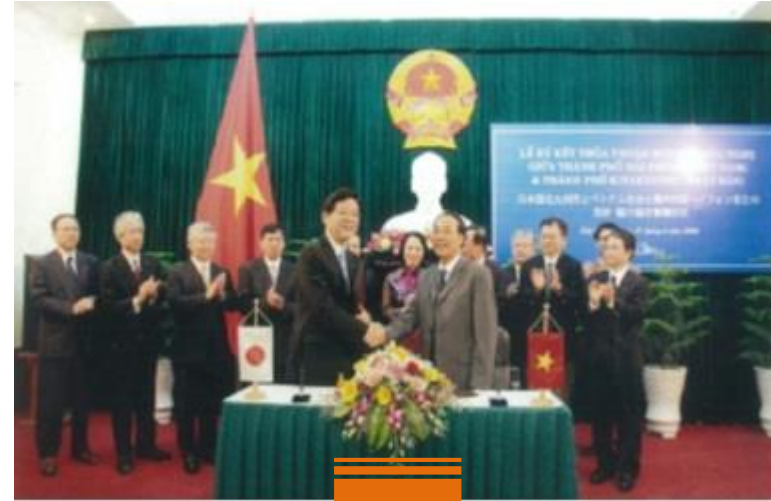
- ✓ Training for supporting industries in Haiphong (JICA)
- ✓ Matching services for small- and mid-sized companies (JETRO)

### 3. Promotion of cultural exchange

- ✓ Concert featuring music groups from Kitakyushu in Haiphong
- ✓ Local performances by traditional performance art groups

### 4. Training of human resources to act as a bridge between both cities

- ✓ Acceptance of six staff members from the local government as trainees



**Sister City Agreement concluded in April 2014**

# Green Growth Promotion Plan of the City of Hai Phong

Hai Phong is aiming to create a Green Port City through self-implementing actions





# Pilot Projects in “Green Growth Promotion Plan”

Waste	① Separation and composting of household waste
	② Waste Heat Recovery Power Generation & Utilization of Industrial Waste
	③ Recycling of E-Waste
Energy	④ Energy savings and introduction decentralized energy systems in factories & buildings
transportation	⑤ Introduction of low-emission buses
	⑥ Promotion use of public transportation
Cat Ba Island	⑦ Development of comprehensive resource recycling system
	⑧ Energy saving and introduction of renewable energy & EV buses in Cat Ba Island
Water & Sewage, Rainwater Drainage	⑨ U-BCF expansion project
	⑩ Handicraft village wastewater measures
	⑪ Introduction of sewerage registry system
Environmental Protection	⑫ Restoration of Tay Nam canal
	⑬ Development of air and noise monitoring systems
Green Production	⑭ Installation of high-efficiency furnaces in foundries
	⑮ Promotion of green agriculture



**Paris**, France



**Chicago**, U.S.A.



**Stockholm**, Sweden



**Kitakyushu**, Japan



**“Green Growth in Kitakyushu, Japan ”  
issued by OECD in 2013**

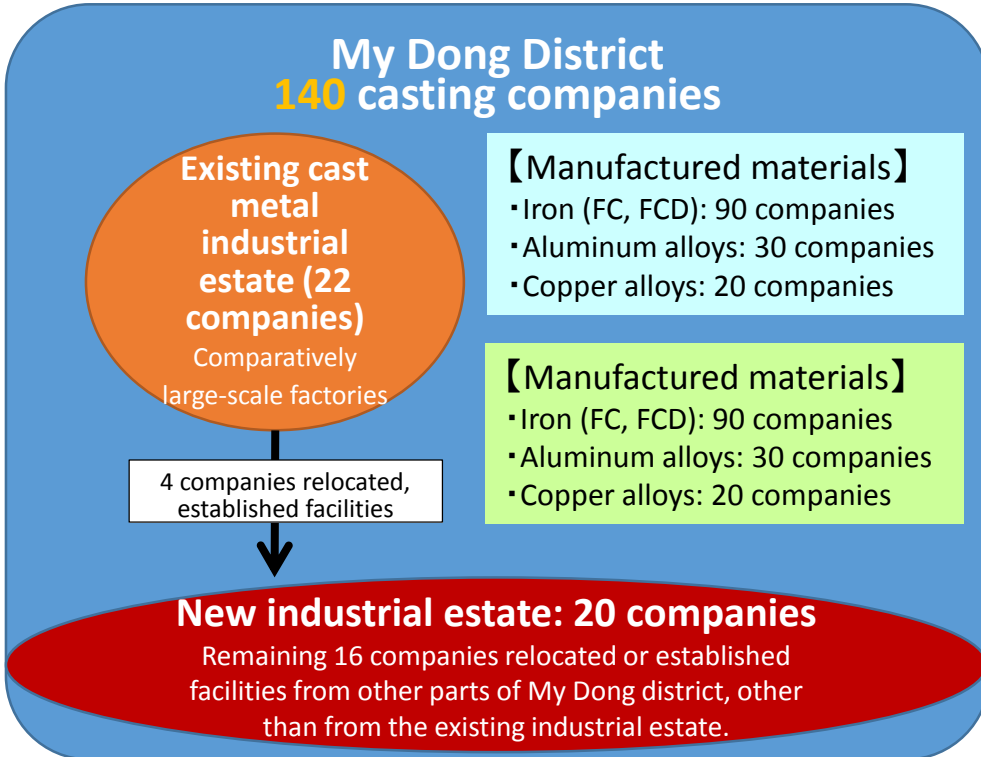
***Once a polluted industrial zone,  
Kitakyushu is now a modern industrial city  
pursuing green growth.***

**The OECD report is being made on ground that Haiphong  
City is positioned as the Green Growth City in Asia**

# Introduction of Highly-efficient Electric Furnaces in Iron Foundries

## Haiphong has the largest cluster of iron foundries in Viet Nam

With over a 1000-year history, the district of My Dong is referred to as the "cast metal village."



- ✓ Most factories (120) use coal furnaces. There are only 20 factories that use electric furnaces. Companies using coal furnaces want to introduce electric furnaces to improve quality and production, and cut costs.
- ✓ Most electric furnaces are made in China. Although inexpensive, there have been many cases of furnaces malfunctioning, excessive consumption of electricity, and short service life (about 8 years). Companies want to use Japanese electric furnaces. However, many companies have abandoned this idea because of the high cost.



### Effects from introduction of Japanese electric furnaces

Preconditions: Production amount (dissolved amount) :  
 ① (1 t+1t) × 1, (2t+2t) × 1, ② 2t × 1

**Reduce CO<sub>2</sub> emissions**

Conversion from Chinese electric furnaces:

① ~ 726 ton/Y (1t+1t) × 1, (2t+2t) × 1  
 ② ~ 242 ton/Y (2t × 1)

**Cost reductions**

Reduce electricity costs by converting from Chinese electric furnaces<sup>(1)</sup>

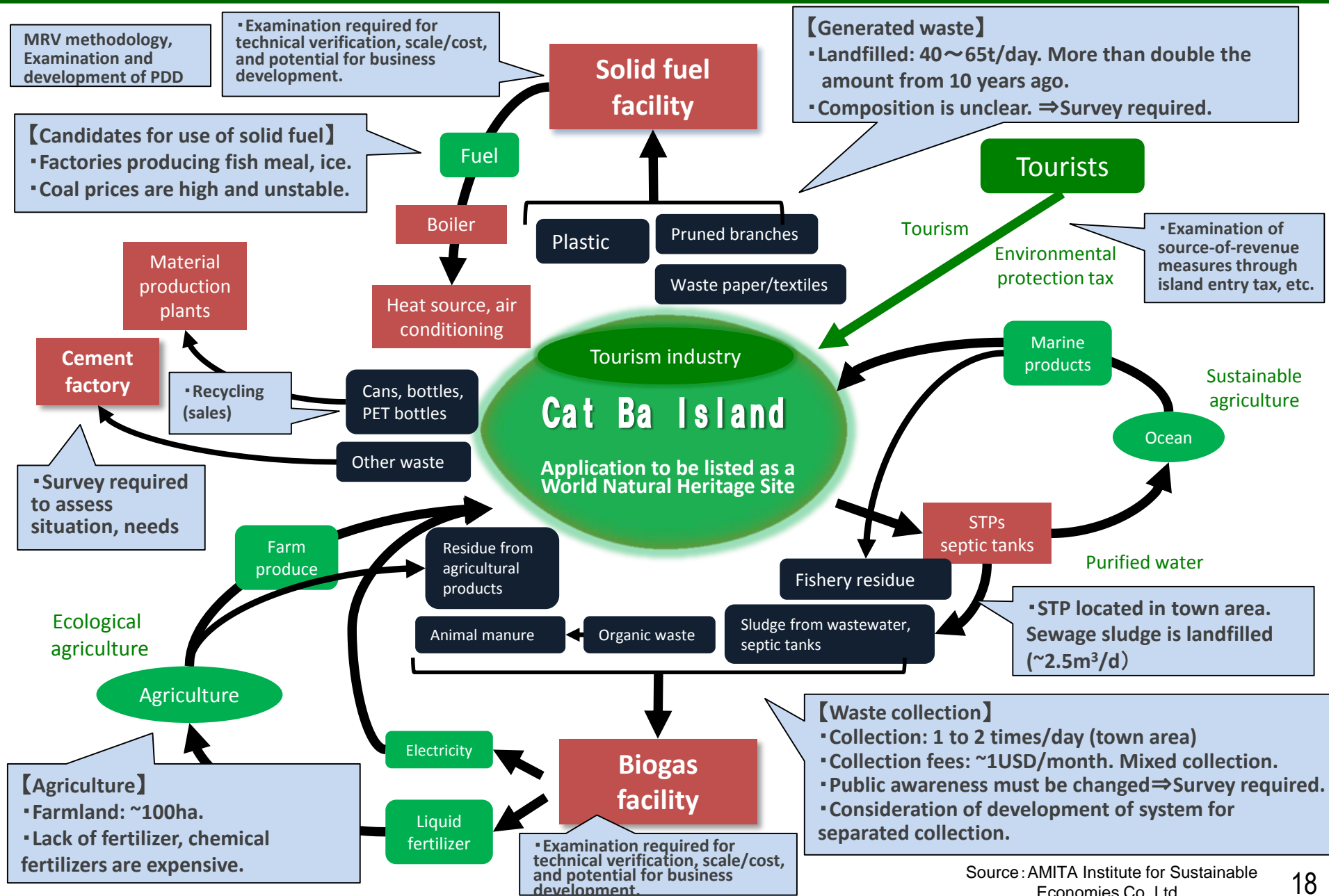
① ~ 52,275 USD/Y (First Year)  
 ② ~ 16,584 USD/Y (First Year)

**Recover capital in approx. 10 years**

Simple maintenance  
 No malfunctions  
 Long service life



# Development of Comprehensive Resource Recycling System on Cat Ba Island



# Waste Heat Recovery Power Generation & Utilization of Industrial Waste

Having the waste heat recovery power generation equipment installed and utilizing the alternative fuel and resources from industrial waste in VICEM HAIPHONG CEMENT



Waste emitters

Waste

Sludge, dust & soot, cinders, waste oil, waste solvent, waste acid, waste alkali, slag, used catalysts, metal waste, waste plastic, other



AMITA: Waste treatment operator

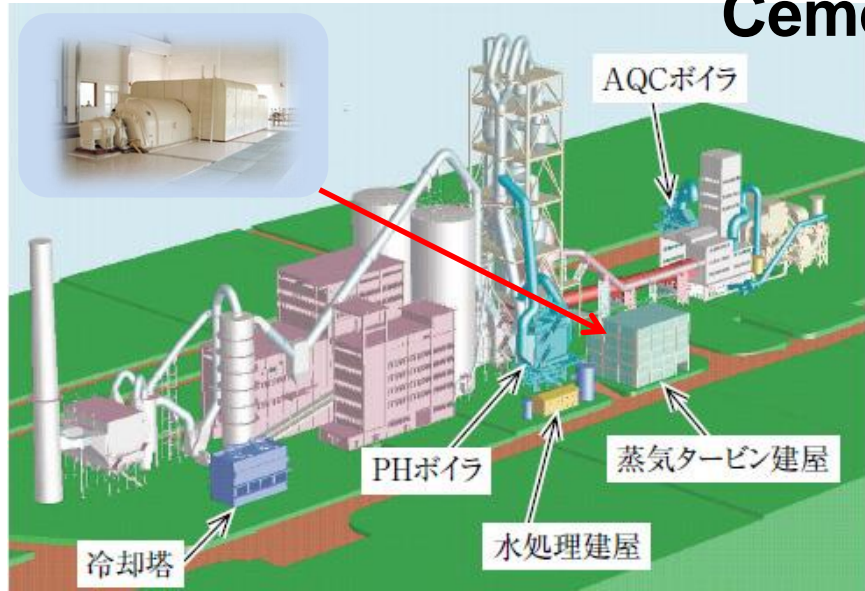
Blending

Alternative fuels /resources

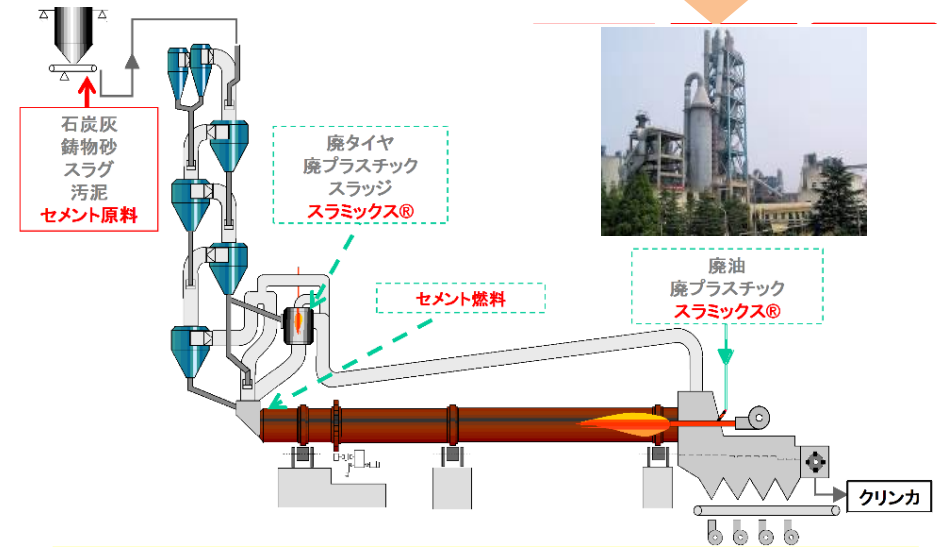


- ✓ Promoting the waste heat recovery power generation
- ✓ Raising the ratio of biomass as fuel

## Cement company Raising the effect of reducing the CO<sub>2</sub> emissions



Source :<https://www.khi.co.jp>



# Expansion of U-BCF Project

Kitakyushu is currently carrying out activities to expand the use of **the Upward Biological Contact Filtration (U-BCF) system** that is effective in improving the safety of tap water and has low operating costs.

## 【Step 1】

**JICA Grassroots Technical Cooperation Project (FY2010-2012)**

Establish U-BCF demo plant in Haiphong, Viet Nam.

## 【Step 2】

**Introduction of small-scale treatment plant (Dec 2013)**

Introduce U-BCF in Vinh Bao water purification plans (5,000m<sup>3</sup>/day).

Self-financed by Haiphong.

## 【Step 3】

**Introduction of full-scale treatment plant (FY2015-2017)**

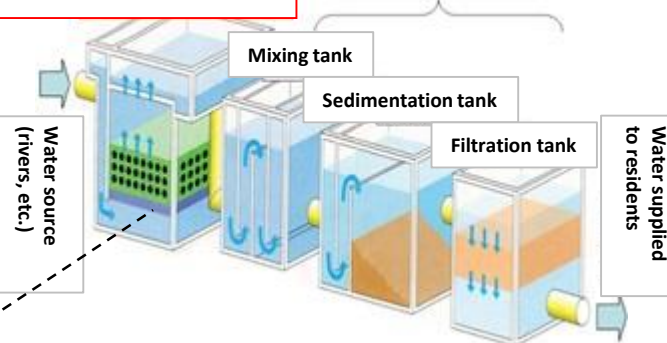
Introduce U-BCF in An Duong water purification plans (100,000m<sup>3</sup>/day).

Grant aid from JICA will be used.



**BCF Treatment Plant**

Traditional treatment plant



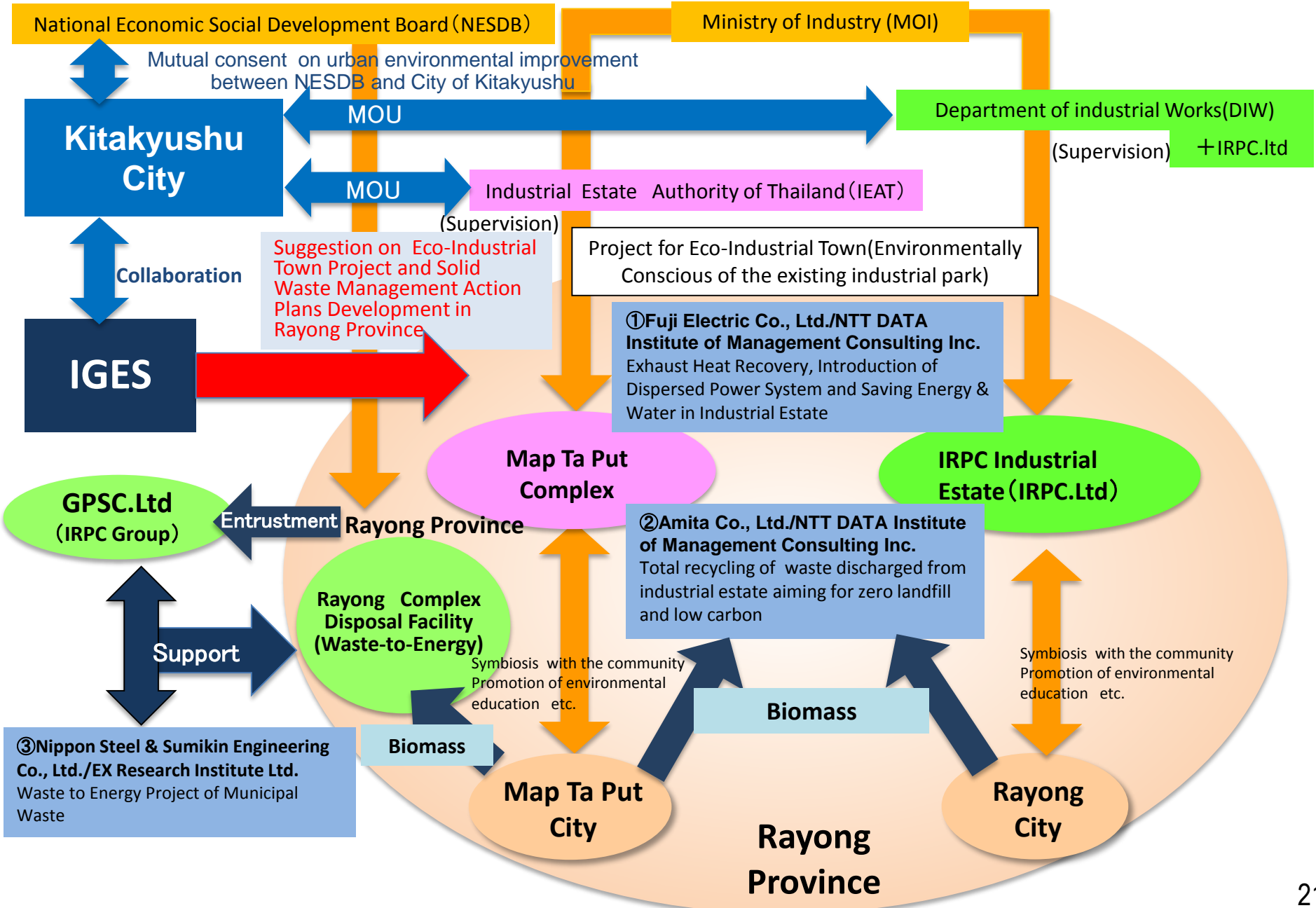
**Expand the use of the U-BCF system from within Haiphong to all areas in Viet.**

**Effective in reducing chlorine dosage (THM) with treatment of raw water using the purifying effects of microbes**  
Comparison with most common advanced water treatment technologies (activated carbon with ozone injection)

**• Construction costs: ~1/2 • Running costs: ~1/20**



# Kitakyushu & Rayong JCM Project Correlation Diagram



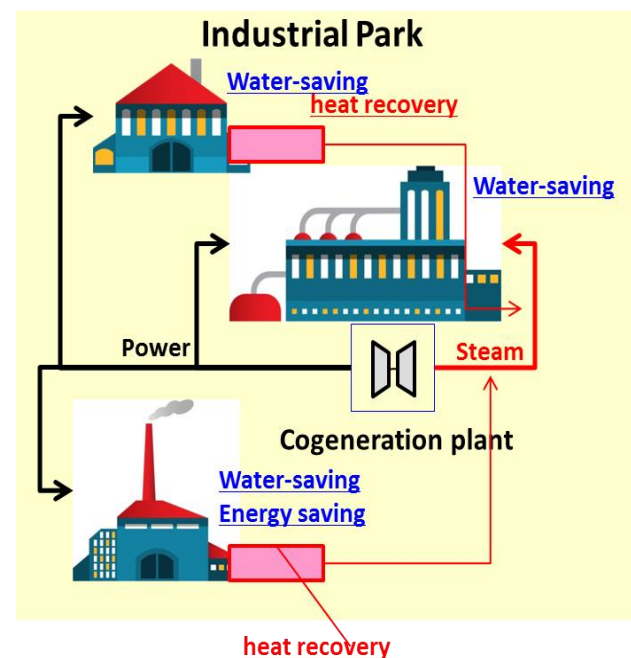
# Exhaust heat recovery, distributed power introduction and energy-saving and water-saving in industrial park

## Project summary

To establish an advanced model in industrial park towards the Eco-Industrial Town. The model achieves both reduction of energy costs and of CO2 emissions in cooperation of multiple factories by using technologies below: Waste heat recovery and utilization, distributed power introduce, water conservation.

● We held workshop to introduce the JCM system at the industrial park, mainly in companies that are interested, we are studying, such as the following.

	A company	B company
Business	Oil Refinery	Artificial sweetener manufacturing
Considering energy-saving technology	<ul style="list-style-type: none"> <li>① binary power generation</li> <li>② solar panels</li> <li>③ energy-saving air-conditioning equipment</li> </ul>	<ul style="list-style-type: none"> <li>① cogeneration system</li> <li>② energy-saving air-conditioning equipment</li> </ul>



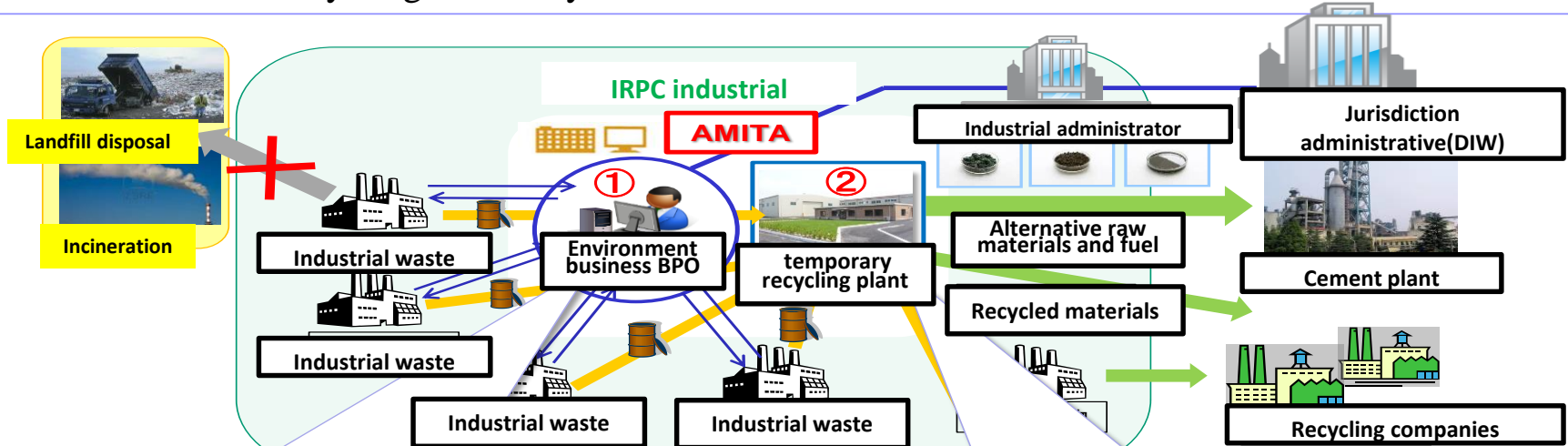
## Future work

● With the two companies and, calculation of such costs and payback period to energy-saving technology introduction, to perform the calculation of CO2 emission reductions, to carry out consultations towards the project realization

● In addition to the above, towards the excavation of newly of project implementation feasibility companies, individual company visits.

# Recycling industrial wastes with low carbon emission project

Aiming to establish advanced models for both reduction of waste disposal cost and reduction of CO2 emissions. By using the software, promote the optimal matching and usage of waste generated raw fuel. It achieve a total recycling of factory waste.



**① Environment business BPO**  
 Provides the mechanism responsible for the business associated with waste management.  
 (Management of waste generated information, negotiation of a waste processing and collection, negotiation of government)  
Efficient waste management, legal compliance, proper management, risk reduction

**② Temporary recycling plant**  
 analyzing the waste generated from industrial within companies, and formulated, and recycled to the alternative fuel that can be used in the cement industry.  
Proposal of optimal recycling method, Promotion of 3R

Implementation to reduce the environmental impact from soft and hard both sides

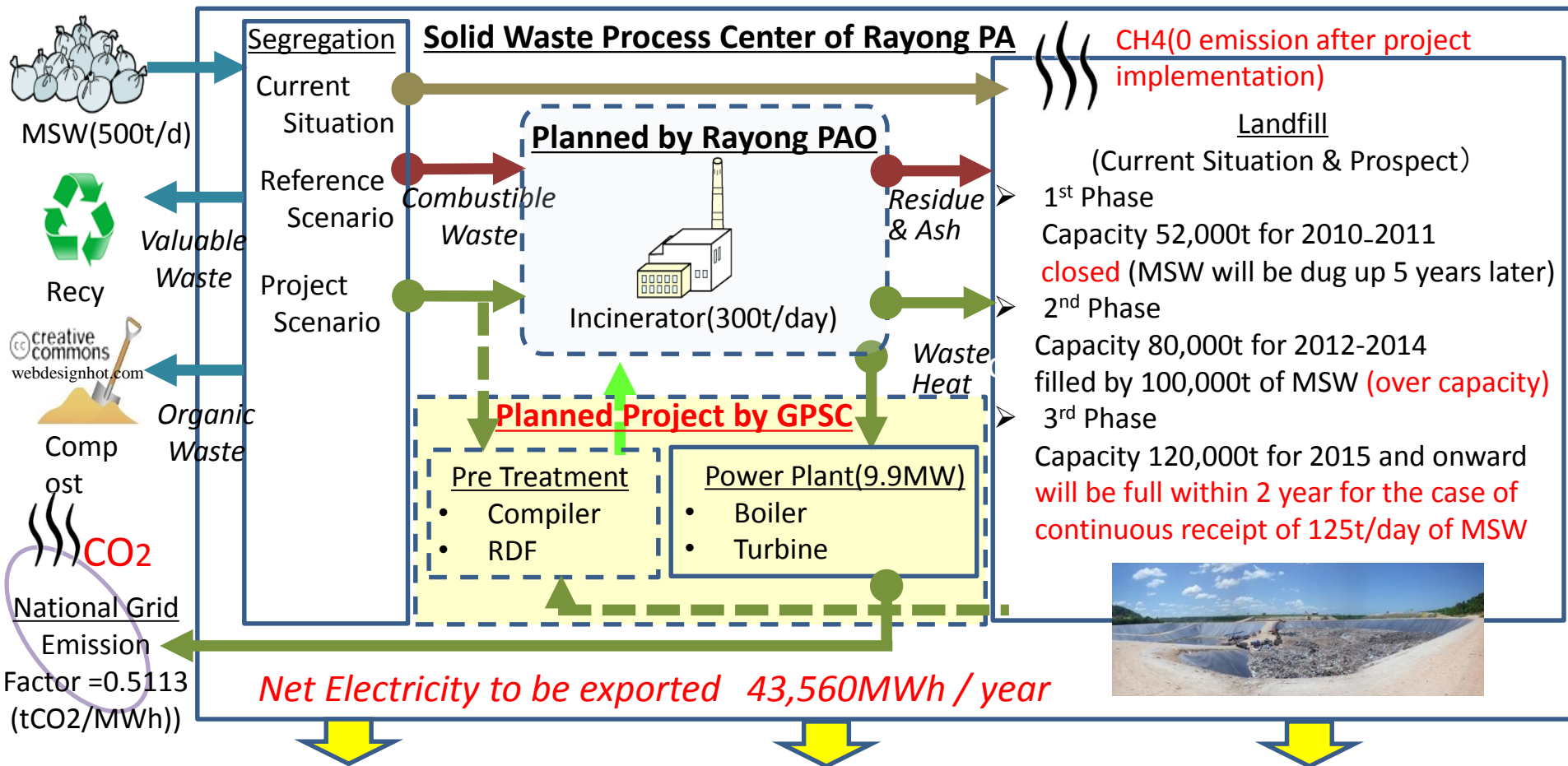
**Eco Town of the industrial park**

**Expected GHG emission reduction**

**approximately 1,169t/year**

date	partners	content
2015/5.19~22	• IEAT, DIW, IRPC	• Explanation and Discussion for JCM • Researching for waste management and recycle system
2015/6/29	• IEAT	• Workshop「Industrial waste recycling technology」
2015/7/13~17	• Japanese Companies in Thailand	• Explanation and discussion for JCM • Researching for waste management and recycle system
2015/9/4	• IRPC Industrial Park	• Workshop「Zero Emission in IRPC Industrial Park」
2015/10/21~29	• Companies in IRPC Industrial Park	• Researching for manifest system and waste sampling

# Waste to Energy from Solid Municipal Waste



**To achieve 22,272CO<sub>2</sub>/year of GHG emission reduction through employment of Japanese high efficient facility**

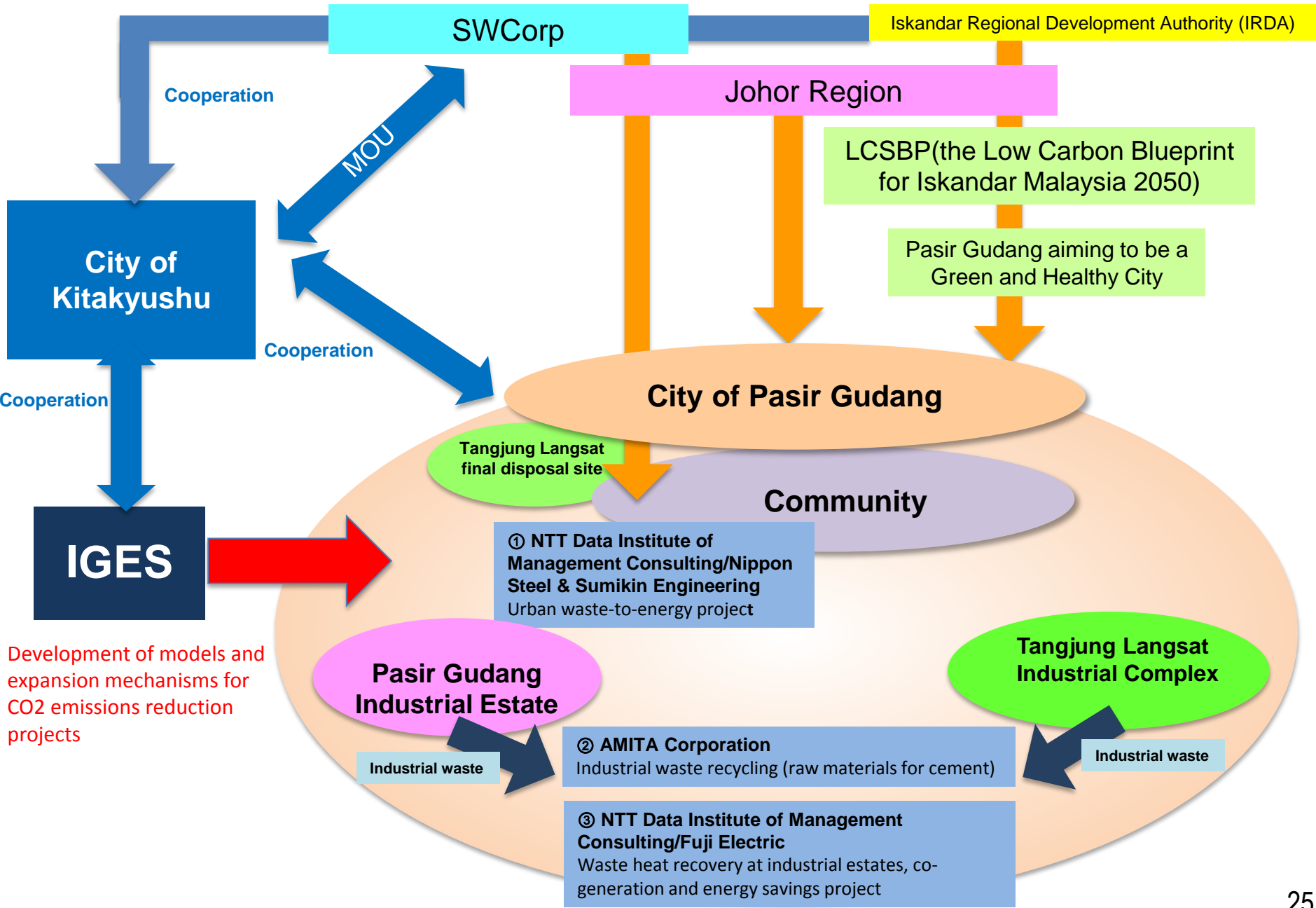
## Progress

- ✓ Contract with Rayong PAO (for project implementation)
- ✓ Establishment of Special Purpose Companies
- ✓ Land Preparation & Approval on Land Utilization
- ✓ Power Purchase Agreement with Electricity Authority
- ☐ Energy Permit (in process)
- ✓ Selection of Procurement Management Company
- ☐ Pre-Qualification for Interesting Parties as EPC (in process)
- ✓ Stakeholders Meetings
- ☐ Negotiation for JCM Registration (on going)





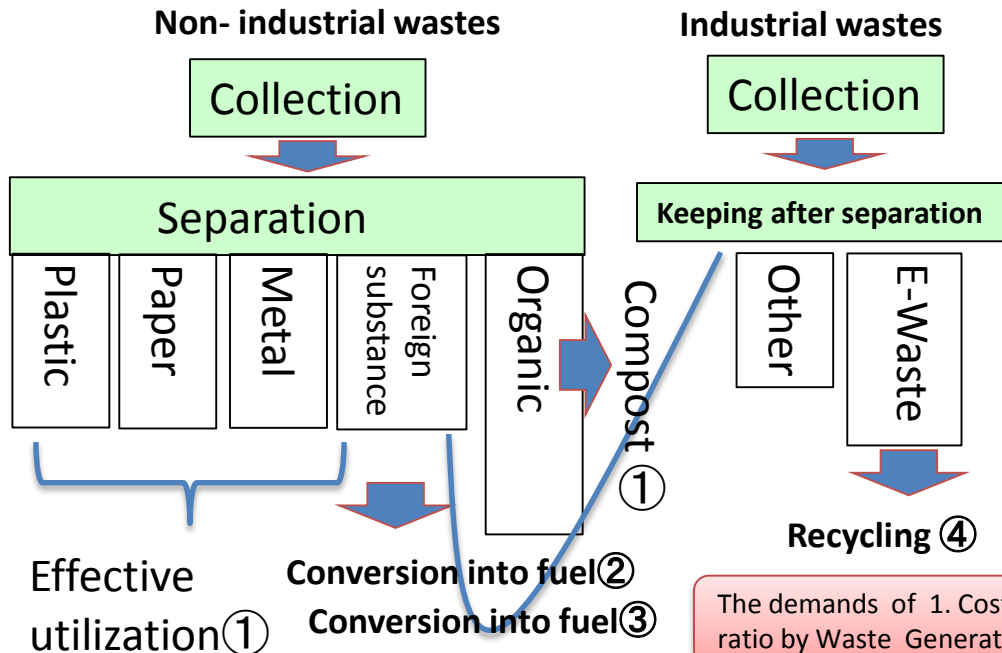
# Kitakyushu & Pasir Gudang JCM Project Correlation Diagram



# Low-carbon Type Industrial Waste Recycling and Municipal Waste to Energy

## Project summary

The project aims to realize waste power generation from non-industrial wastes and conversion of industrial wastes into cement raw materials as JCM business, which can be a model for sustainable waste control system, to improve current situations of wastes surpassing capacity of final disposal locations and to avoid environmental pollution. It attempts to reduce CO2 emission as well.



- Promotion separation of non-industrial wastes and use valuables such as metal, plastic, and paper effectively (①)
- Raw garbage (Organic) are converted into compost (①)
- Foreign substances left from separation are converted into fuel (Waste to Energy) (②)
- Industrial waste including toxic waste are converted into fuel (③)
- E-waste are reused, recycled or deposited properly including consideration of fluorocarbons (④)

The demands of 1. Cost Reduction 2. Appropriate Disposal 3. Achieve High Recycle ratio by Waste Generator is quite high. (Herewith attached analysis result of waste)

## Expected GHG emission reduction

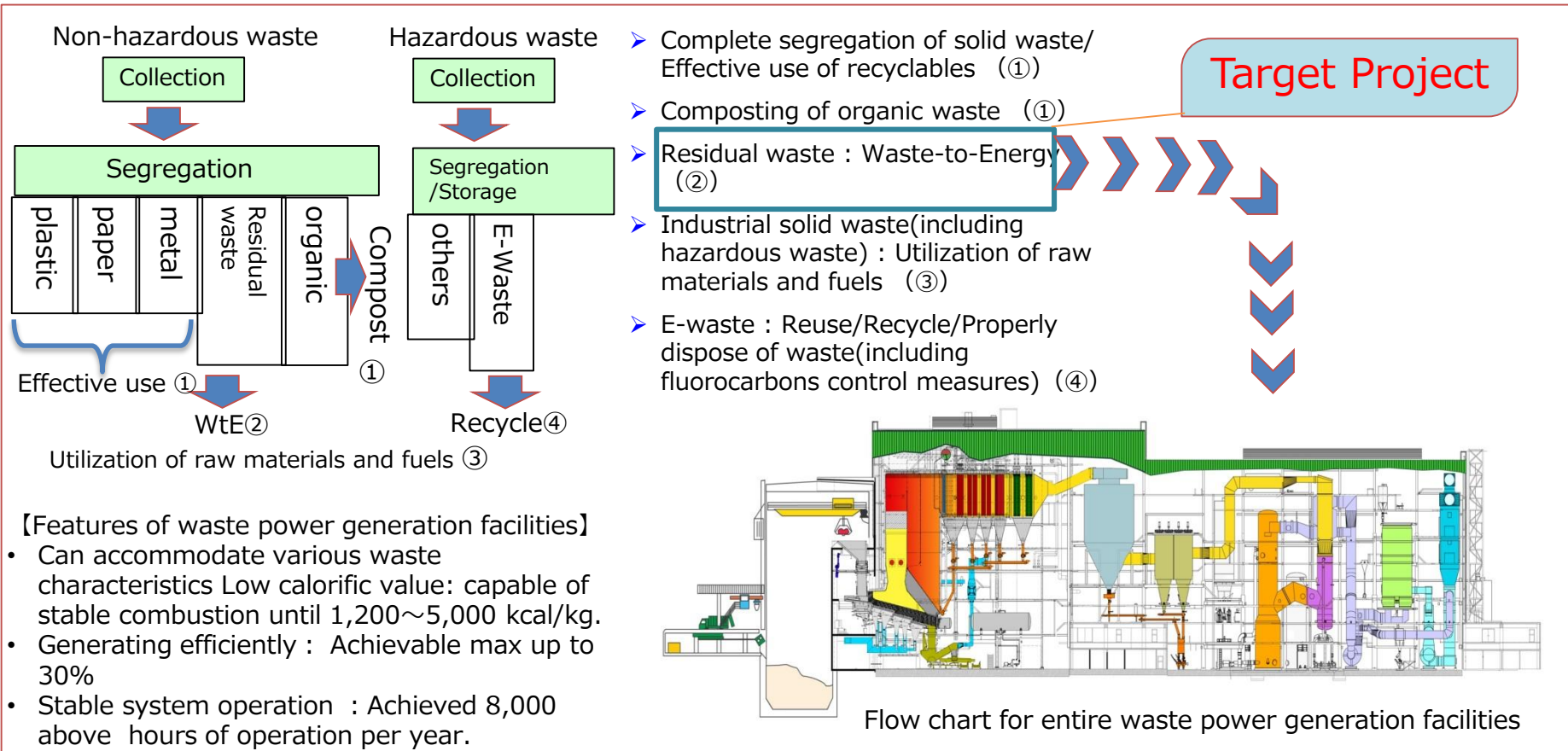
Approximately  
4,676t/year

No.	Waste Generator	Waste	cal/g (dry)	Moisture(%)	pH	SiO2(%)	Al2O3(%)	Fe2O3(%)	CaO(%)	Cl(%)
1	Chemical	Waste Catalyst	2,050	31.8	7	0.974	0.878	61.9	0.934	0.023
2	Oil and Fats	Scum	1,369	62.8	7	0.546	0.395	1.7	40.9	0.059
3	Oil and Fats	Wasted Clay	2,490	3.2	7	31.5	6.42	6.05	3.3	0.01
4	Oil and Fats	Waste Catalyst	4,648	0	7	20.2	0.348	1.27	0.17	0.192
5	Chemical	Sludge	2,701	55.1	7	0.739	35.9	0.408	1.01	0.777
6	Electric Device	Ni Sludge	219	38.8	7	0.244	0.283	0.135	0.662	0.069
7	Electric Device	Al Sludge	0	52.1	7	79.4	8.39	0.038	0.254	0.094

# General Waste Power Generation

## Project Summary

The aims of the project are: 1. To avoid shortage of final disposal sites and environmental pollution from those sites. 2. To achieve the reduction of CO2 emissions. 3. To pursue the commercialization of waste power generation of Non-hazardous waste as a model of sustainable waste management system.



## Main Activities

- ① Investigation of waster generated ② Study of facilities and equipment ③ Evaluation of economic

# Exhaust Heat Recovery, Cogeneration and Energy Saving in Industrial Zones

## Abstract of this Project

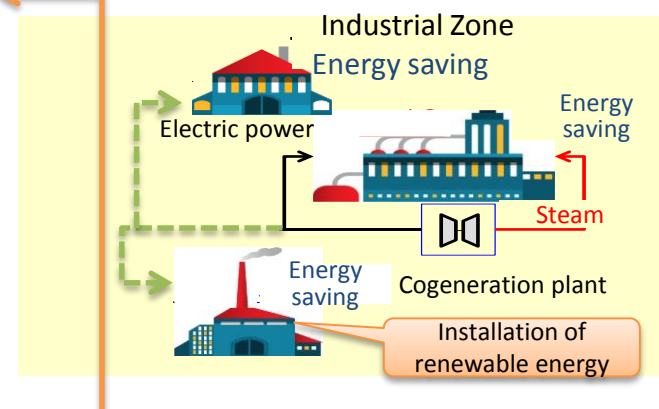
**[Target]** Industrial zones that emit huge amount of CO<sub>2</sub>

- For establishing leading models that can achieve both CO<sub>2</sub> emission reduction and energy cost reduction, energy saving, exhaust heat recovery and cogeneration, can be discussed from both side of demand and supply.

**[Current Status]** On-site survey and discussion is implemented for 2 Japanese companies that have energy saving projects .

	Chemical Factory "A"	Petrochemical Factory "B"
<b>Business</b>	Manufacturing of Epoxy resin	Manufacturing of Styrene monomer
<b>Possibility of energy saving project</b>	Some energy saving activities had been implementing, but further energy saving project in this factory has been consulting.	There is one energy saving project that had been stopped for discussion in the past, due to the cost performance.
<b>Target of Energy saving facilities</b>	<ul style="list-style-type: none"> <li>• Cooling compressor</li> <li>• Solar power generation</li> </ul>	<ul style="list-style-type: none"> <li>• Cogeneration</li> <li>• Economizer</li> <li>• LED lighting</li> </ul>
<b>Current Status for Consultation of Energy saving Business</b>	<ul style="list-style-type: none"> <li>• Renewal of compressors that make epoxy resin cool, has been consulting with facility manufacturing companies.</li> <li>• Installation of solar panels is also has been consulting in order to improve effect of thermal barrier and electric consumption saving of this factory.</li> </ul>	<ul style="list-style-type: none"> <li>• Installation of cogeneration and/or economizer has been consulting with Japanese engineering companies.</li> <li>• Renewal of LED lighting in this factory has been also consulting. Ongoing consultation has been implementing for realization of "whole energy saving factory."</li> </ul>

## Energy Audit in Leading Model Factory



Chemical Factory "A"



Onsite Photo

Petrochemical Factory "B"



Onsite Photo

## Future Process

Both 2 Japanese companies have "high potential" energy saving projects. Further consultation will be implemented while discussing on possibility of JCM scheme, and waiting and seeing the position of Malaysia toward JCM.



# Advantages of Intercity Cooperation (1)

## Advantages for businesses & local governments in Japan

### <Japanese businesses>

- ✓ Barriers to entry into overseas markets can be lowered because there is a relationship of mutual trust between municipalities.
- ✓ Technical proposals can be developed in line with master plans and other programs, as a result of involvement from the earliest stages of planning.
- ✓ Experiences and know-how of local governments in Japan, such as in waste, water, and sewage, can be used.

### < Japanese local governments >

- ✓ The successful business activities of Japanese companies overseas can lead to the stimulation of the local/regional economy.
- ✓ Quality solutions from Japanese companies can be provided for issues in partner cities.
- ✓ Comprehensive projects can be developed as a result of involvement from the earliest stages of planning.



# Advantages of Intercity Cooperation (2)

## Advantages for businesses & local governments in partner country



### <Businesses>

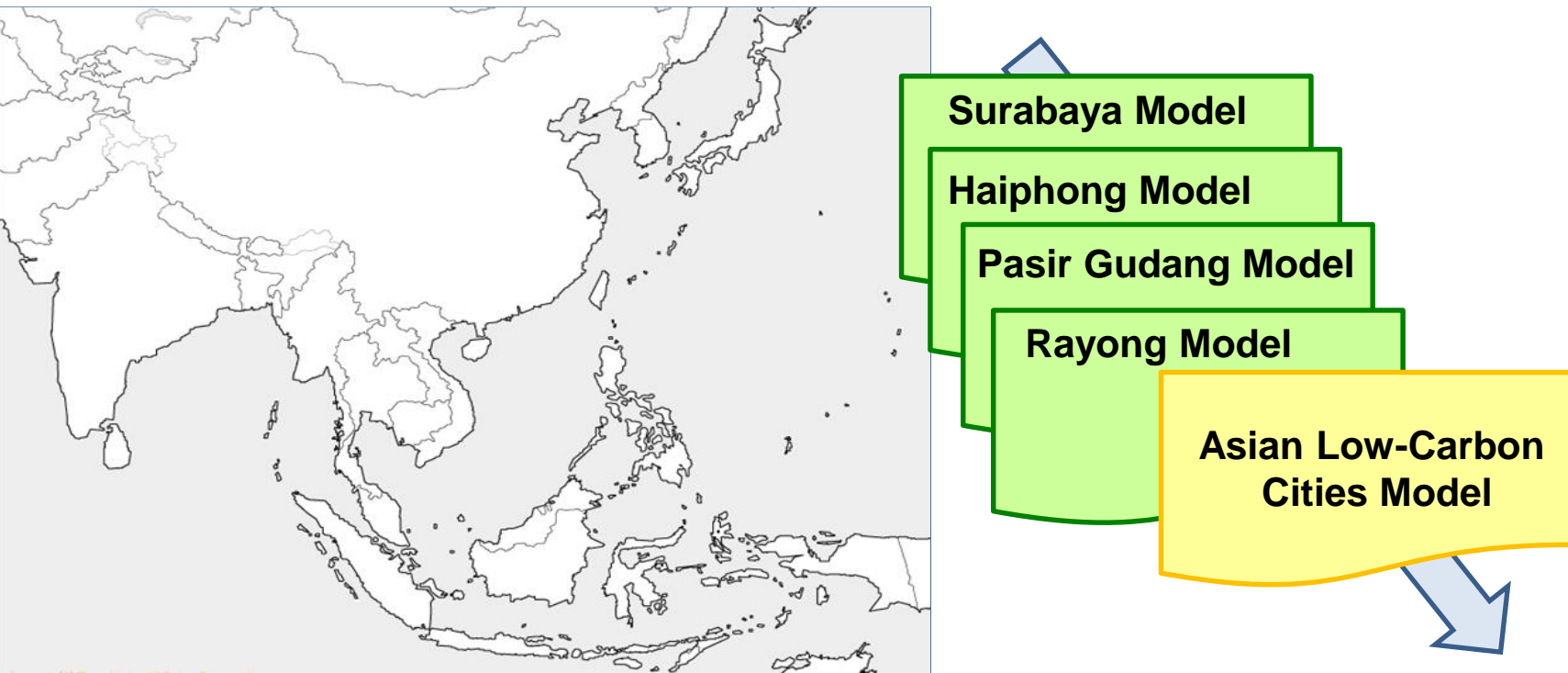
- ✓ Japan's low-carbon technologies can be introduced where there are reservations about costs through the application of the JCM.
- ✓ The introduction of Japanese technology can lead to a reduction in operating costs due to its durability and low failure rate.
- ✓ There is a sense of security when technology is introduced as a result of mutual support between cities.

### <Local governments>

- ✓ Objectives can be achieved at lower administrative costs with initiatives of the private sector in public-private partnerships (PPP).
- ✓ Reduction of CO<sub>2</sub> emissions can lead to the simultaneous mitigation of pollution and improvement in lifestyle quality.
- ✓ Long-term follow-up can be received through intercity cooperation.

# Future Prospects

- ✓ Develop models for “Citywide Low-Carbon Development” based on achievements in the cities of Surabaya and Haiphong, and expand models to other cities in Asia.
- ✓ Promote the creation of cross-field models and expand models to other cities in Asia (for example, recycling-type intermediate processing and waste-to-heat, waste heat recovery power generation and development of raw materials from industrial waste at cement factories, other).
- ✓ Through these activities, we will aim at making up an Asian Low-Carbon Cities Model.



# Thank you!



## Trying to live together in mutual prosperity

On developing international environmental business, our hope is to see the advancement of a uniquely Japanese approach, different from that of other countries, that will respect and bring joy to local residents.