City-to-City collaboration projects
between the City of Surabaya and the City of Kitakyushu City

Joint Crediting Mechanism (JCM) Feasibility Study in Surabaya, FY2015

"Establishment of Base for Low-Carbon Project Expansion in Surabaya"

NTT DATA Institute of Management Consulting, Inc
Kitakyushu Urban Center
Institute for Global Environmental Strategies
AMITA CORPORATION

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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.

Surabaya, Indonesia: 2nd largest city in Indonesia with a population of 3 million

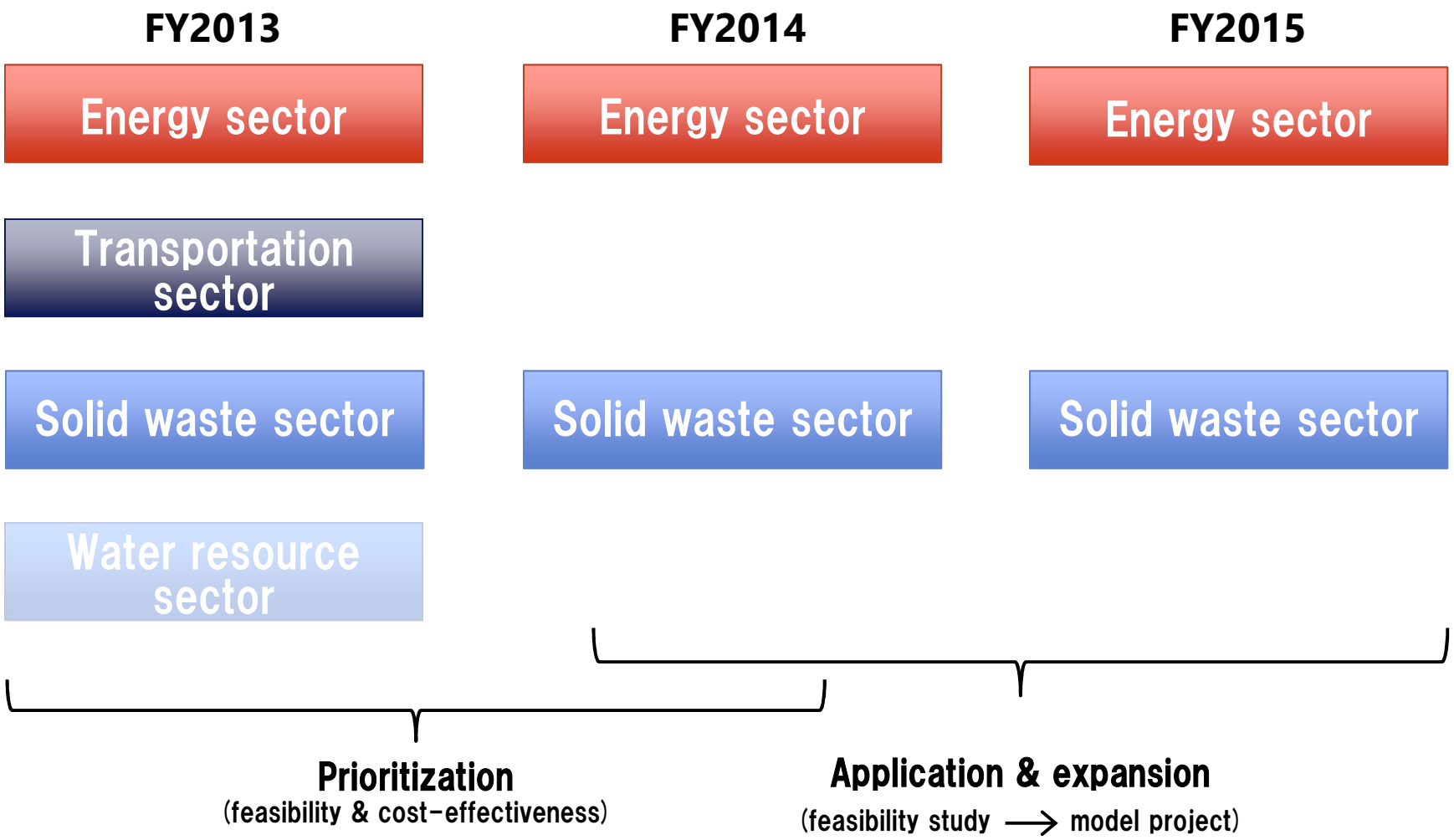
＜FY 2013- 2015＞ Low Carbon City Planning Project in Surabaya, Indonesia

Target areas: Energy, waste management, transportation, water resources Participating Japanese companies: 13

1. Overview of JCM FS

Transition of JCM FS in Surabaya

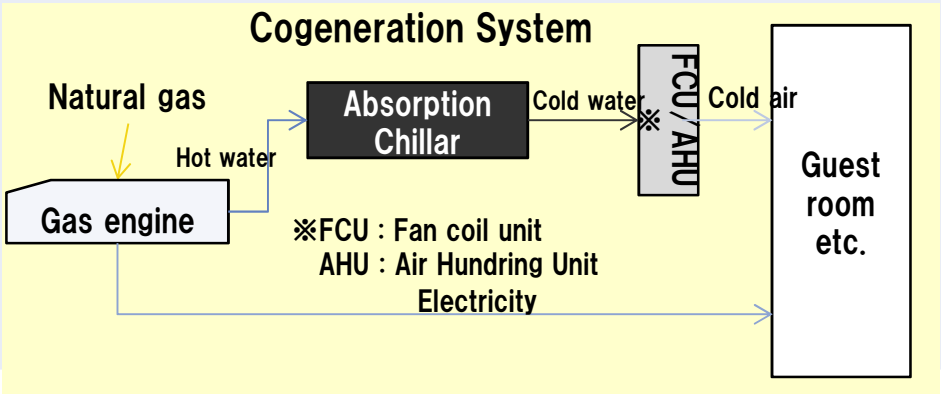
We have promoted JCM FS for 3 fiscal years so far. In this fiscal year, we have been discussing energy sector and solid waste sector. We decided to promote JCM project basically with the existing methodology, etc.



Outline

We try to promote the commercial based project of installing Energy Savings and Dispersed Generation technologies in feasible buildings etc. Moreover, in order to launch new projects and expand them widely, we try to do the activities targeted to real estate enterprise and hotel franchise etc., and also try to corporate with Surabaya city according to Green Building promoting policy.

Target facility	Energy Savings and Dispersed Generation
Hotel Office building Commercial building	High efficient chiller etc.



Main Activities

①Activity for realizing model project
②Activity for area expansion
③Corporation with policy for green building in Surabaya City

Embodiment and Realization of individual project

+

Developing the basement for area expansion in the Commercial Sector

1. Overview of JCM FS
Process of Research in Energy Sector

We not only promote commercialization of on-going projects started from the last fiscal year, but also commence the rollout our efforts from three points of view to scale up the project in this fiscal year.

Commercialization of on-going projects

○We conduct the developed and organized projects from the former years to introduce most appropriate technology, design optimal operation and lead the projects, in order to JCM financing program projects in light of each project's own challenges.

Project's Scale up with area expansion

Promotion to real estate (Owner) enterprises

○In order to conduct promotion of energy saving and CO2 reduction effort for newly developed and existing buildings, consultation for real estate (owner) enterprises in Surabaya city and neighboring area will be implemented.

○Promotion activities to the real estate (owner) enterprises not only having started consultation on JCM method application but also develop and organizing new targets will be implemented.

Promotion to hotel franchise etc.

○ In order to conduct promotion of energy saving and CO2 reduction effort for newly developed and existing hotel, consultation for hotel franchise enterprises etc. in Surabaya city and neighboring area will be implemented.

○Promotion activities to the hotel franchise not only having started consultation on JCM method application but also develop and organizing new targets will be implemented.

Corporation with policy for green building

○Green building certification policy have been started from last year by Green building association etc. Surabaya city and Sekolah Tinggi Teknik Surabaya are making an effort toward dissemination of Green building. Cooperating with these effort, we plan to pick up the certified or to be certified green buildings as candidates for JCM project site.

○Cooperation with GB Awareness Award (an Surabaya city's indoctrination program for wider recognition of GB started the last year) etc., developing the basis for collaboration with building owners interested in energy-saving and CO2 reduction will be implemented.

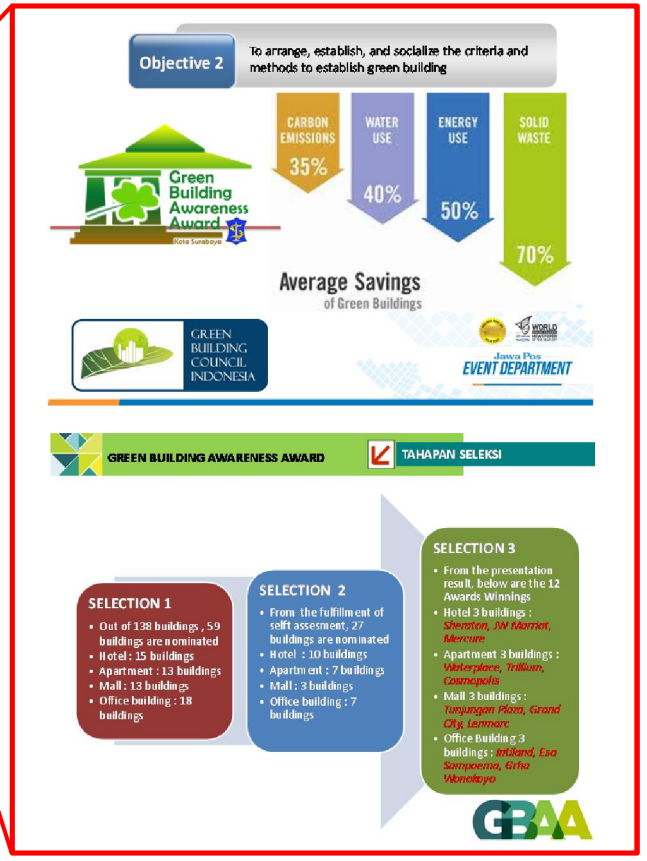
1. Overview of JCM FS
(reference) Surabaya Green Building Awareness Award

Surabaya City enforced Green Building Awareness Award (in FY2014) as part of their measurements to spread buildings being conscious of energy efficiency, etc. In this fiscal year, we discussed JCM FS based on this effort.

GREEN BUILDING AWARENESS AWARD

SURABAYA Livable & Sustainable City — Green City Master Plan

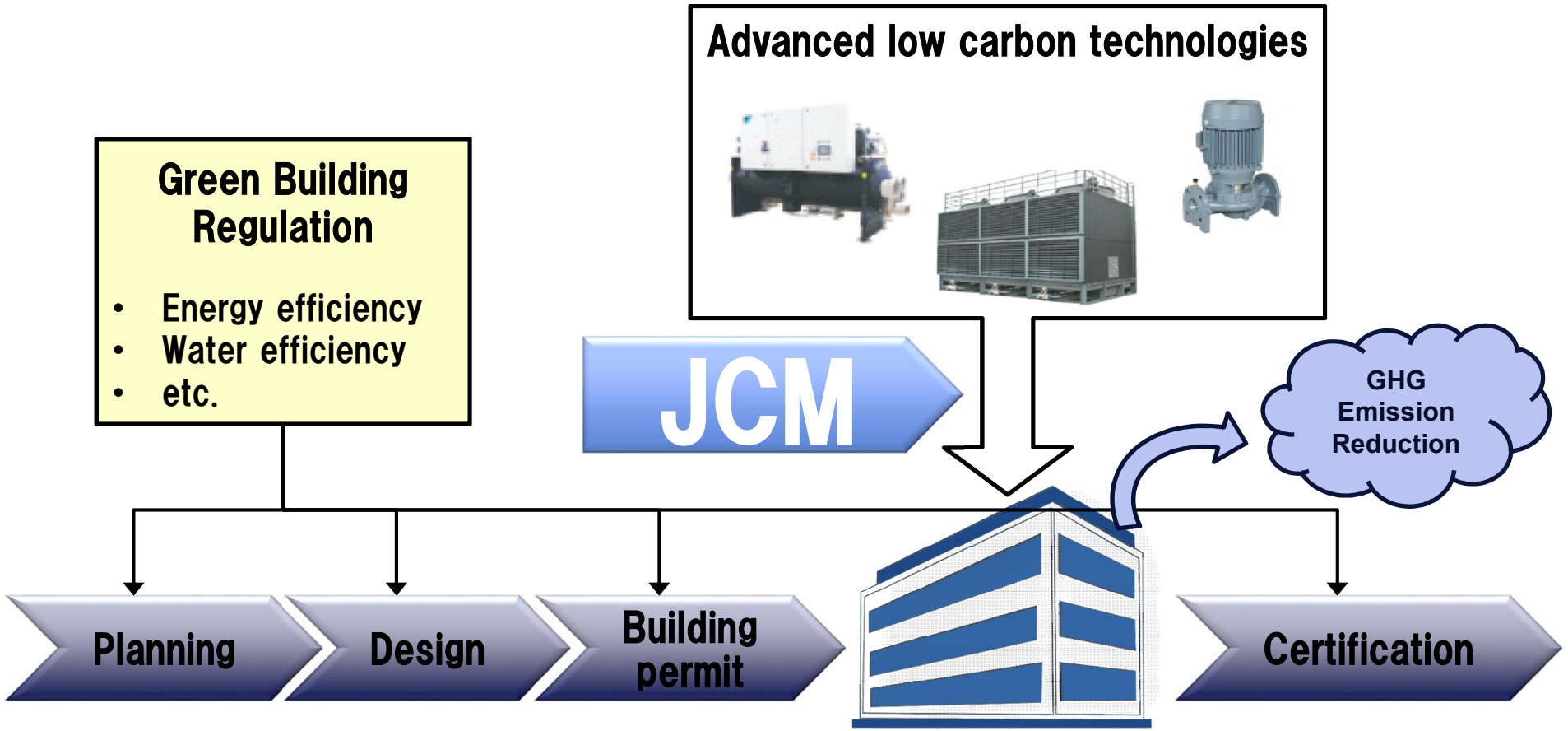
1 GREEN PLANNING AND DESIGN	Spatial planning which maintain 30% area of Green Open Space from the total area of Surabaya .
2 GREEN OPEN SPACE	Expansion and optimization of Green Open Space.
3 GREEN BUILDING	The determination of green building development policy and infrastructure, the enforcement of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



Source: City of Surabaya

1. Overview of JCM FS
(reference) Expected use of JCM

GBAA (Green Building Awareness Award) has been led by BAPPEKO so far, after FY2016, however, the initiative of GBAA will move to Cipta Karya and they will newly develop Green Building Regulation. It is expected that the needs of JCM subsidy for facilities will be increasing under this regulation because this may ask in the future all the buildings of new construction satisfied the energy saving requirements, etc.



1. Overview of JCM FS
Waste Sector

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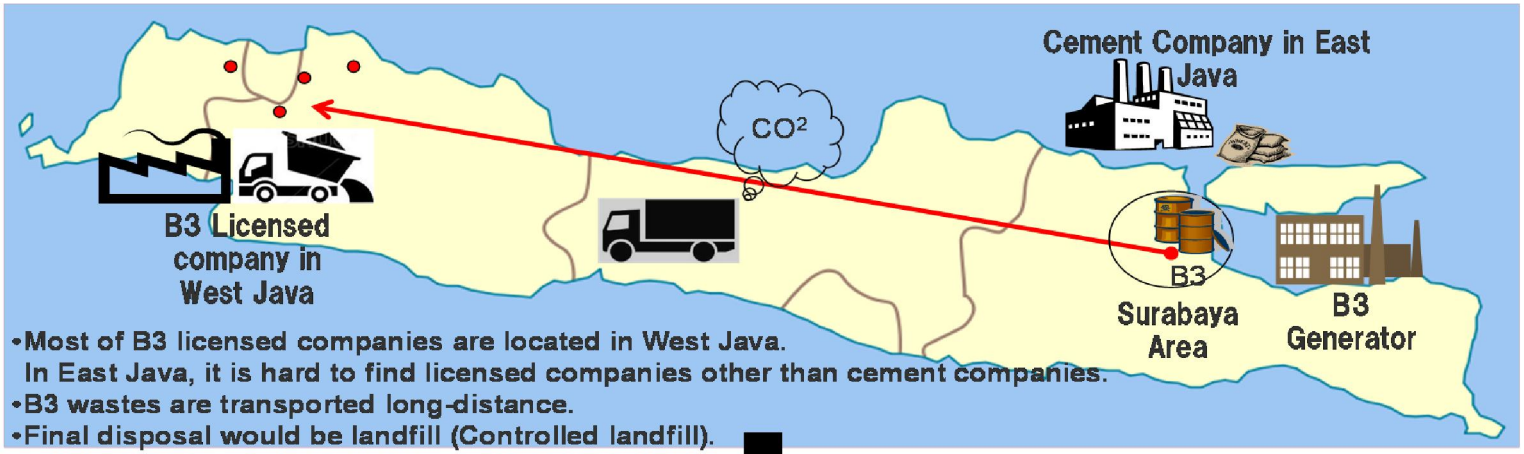
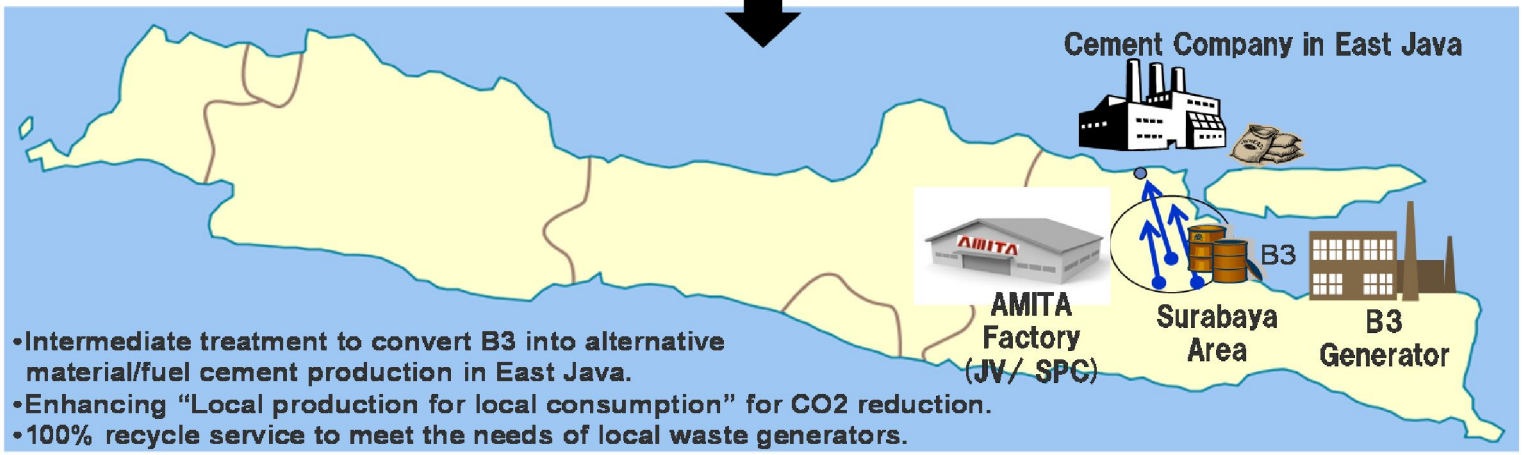
Objectives

- Promotion of B3 waste recycling as cement raw materials/fuels
- Development of an MRV methodology to quantify CO2 emission reduction by the proposed project

【Current Situation】



【Proposal】



Main Activities

① Activities for promoting early commercialization of the B3 waste recycling project
② Activities for quantification of CO2 emission reduction considering replacement of incineration, raised ratios of biomass inputs and shortened transportation distance

1. Overview of JCM FS
Project Image in waste sector

- Manufacture alternative cement raw materials/fuels derived from B3 waste to promote resource circulation which contribute to reduction of fossil fuel and natural resources consumption.
- Verify business feasibility utilizing JCM scheme based on the survey on CO2 emission reduction by the proposed project.

Mine

Natural resources and fossil fuel

CaO　SiO_2　Al_2O_3　Fe_2O_3　Coal

Generator

B3

AMITA

100% Recycle (Reuse)

Alternative raw materials

SlurMix ®　CRM

Cement Company

※CRM is used as alternative raw materials of SiO_2 and Al_2O_3

Landfill

Incineration

SlurMix®

CRM (Cement raw material)

2. Example of JCM Project realized through this study
Energy saving at a shopping mall by Introducing High efficiency turbo chiller

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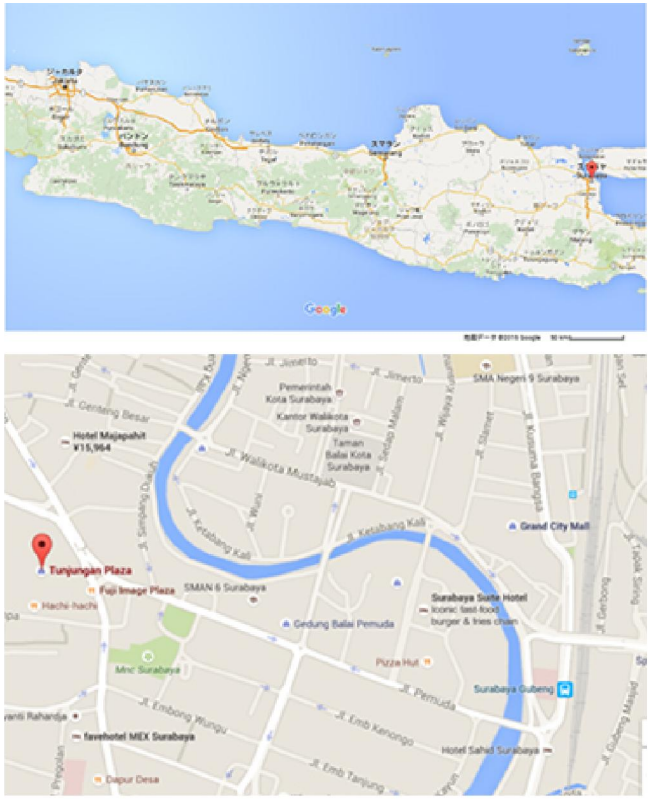
■Project Participant

(Japan) : NTT FACILITIES, INC., Project Participant
(Indonesia) : PT.PAKUWON JATI Tbk

■Map



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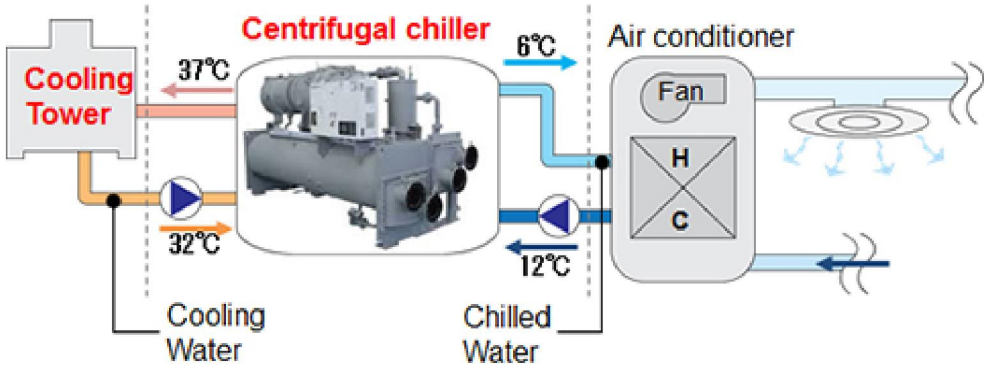
■Outline of GHG Mitigation Activity

The project aims to reduce electricity consumption in the shopping mall through introducing advanced & efficient Japanese centrifugal Chiller system.
The project is to replace existing central cooling system with high efficient centrifugal chiller with capacity of 966TR *4 sets and 569TR * 1 set in Pakuwon's shopping mall, Tunjungan Plaza, as well as to replace existing 8 cooling towers with efficient Japanese models.



Centrifugal chiller in the A/C system

■Expected GHG Emission Reductions

925 tCO2/ year

The GHG emission reductions are calculated based on the estimated electricity consumptions based on the conservatively estimated COP of a reference cooling system and a project COP of the centrifugal chiller as well as the grid emission factor.

2. Example of JCM Project realized through this study MRV Methodology and amount of CO2 emission reduction

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<Existing MRV Methodology (JCM)>

ID AM002 "Energy Saving by Introduction of High Efficiency Centrifugal Chiller"

■Calculation of reference emissions

$$RE_p = \sum_i \{EC_{PJ,i,p} \times (COP_{PJ,tc,i} \div COP_{RE,i}) \times EF_{elec}\}$$

RE_p : Reference emissions during the period p [tCO_2/p]

$EC_{PJ,i,p}$: Power consumption of project chiller i during the period p [MWh/p]

$COP_{PJ,tc,i}$: COP of project chiller i calculated under the standardizing temperature conditions [-]

$COP_{RE,i}$: COP of reference chiller i under the standardizing temperature conditions [-]

EF_{elec} : CO_2 emission factor for consumed electricity [tCO_2/MWh]

$COP_{RE,i}$

Cooling capacity /unit (USRt)	x<300	300≦x <450	450≦x <500	500≦x <700	700≦x <1,250
$COP_{RE,i}$	4.92	5.33	5.59	5.85	5.94

■ Calculation of project emissions

$$PE_p = \sum_i (EC_{PJ,i,p} \times EF_{elec})$$

PE_p : Project emissions during the period p [tCO_2/p]

$EC_{PJ,i,p}$: Power consumption of project chiller i during the period p [MWh/p]

EF_{elec} : CO_2 emission factor for consumed electricity [tCO_2/MWh]

Table. Outline of facilities introduced for the project

Items	Unit	Project chiller (made in Hitachi)	
Model No. Number. of Introduction	-	HC-F550GFG-SSCT (1 unit)	HC-F950GFG-SSCT (4 units)
Capacity	TR	569	966
Cooling Capacity (COP)	kW/TR	0.561 (COP:6.27)	0.560 (COP:6.27)
Operation Rate	%	100%	100%
Operation Hour	Hour/year	8,760	4,562.5
Power Consumption	kWh/year	2,908,122	2,566,855 (per unit)
Total Power Consumption	kWh/year		12,828,246

■CO2 emission:925(tCO2/year)

Reference Emission:11,650(tCO2/year)

Project Emission:10,725(tCO2/year)

3. Exporting “Green City” to Surabaya

We will continue to make effort to spread Green City in East-Asia, focusing on not only energy sector and solid waste sector but on other sectors, with the promotion of application of Kitakyushu Model.

Development of a green city master plan

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

Japan government

City of Kitakyushu — Intercity Cooperation — City of Surabaya

Indonesia government

Application of Kitakyushu Model

energy saving and Co-generation system

Waste treatment

Export of “Green City”

Studies on quantification techniques to reduce CO_2 emissions

Maintenance/improvement of sewage systems

Purification of tap water