

The Outline of the JCM FS Description

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

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

“Establishment of Base for Low-Carbon Project Expansion in Surabaya(Surabaya)”

NTT DATA Institute of Management Consulting, Inc.

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List of Abbreviations (Terms and definitions)

Terms	Definitions
Centrifugal chiller	A centrifugal chiller is a chiller applying a centrifugal compressor. It is commonly used for air-conditioning with huge cooling load, e.g., buildings, shopping malls or factories etc.
Cogeneration system	Cogeneration system is a system which generates and utilizes heat and power simultaneously from same primary energy source.
B3 waste	Hazardous and Toxic waste. Every kind of waste containing hazardous and/or toxic substances which could directly or indirectly pollute the environment and/or endanger human health because of their characteristics and/or concentrate and/ or quantity.

1. Project background

The City of Kita-Kyushu has a great deal of know-how for developing leading environmental city from its experience in overcoming pollution and has promoted various measures including low-carbon project. The City promotes the export of that kind of know-how as infrastructure package to abroad. As part of the activities, the City has promoted Low Carbon City Planning Project in many cities in the East-Asia and also in Surabaya City, Indonesia, they are promoting the project through Kitakyushu Model.

(Figure) Green Sister City between Surabaya City and Kitakyushu City



Kitakyushu Model and its applications are as follows:

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.

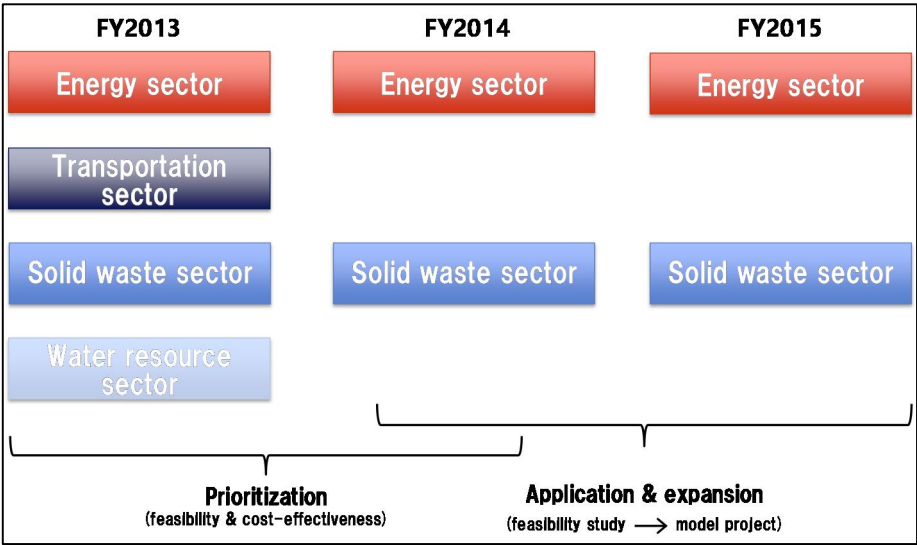
In Indonesia, an insufficient supply capacity of state-owned power companies has caused unstable power quality. And also an infrastructure building of waste treatment and water processing etc. doesn't catch up to the rapid economic growth in Indonesia. Therefore, the kitakyushu Model has a potential to improve these situation, leading to environmentally sustainable society over the entire country.

2. Objective of the FS

NTT Data of Institute of Management Consulting, Inc. is supporting overseas expansion of Kitakyushu Model in cooperation with the City of KitaKyushu, the institutions, and the corporates in the region.

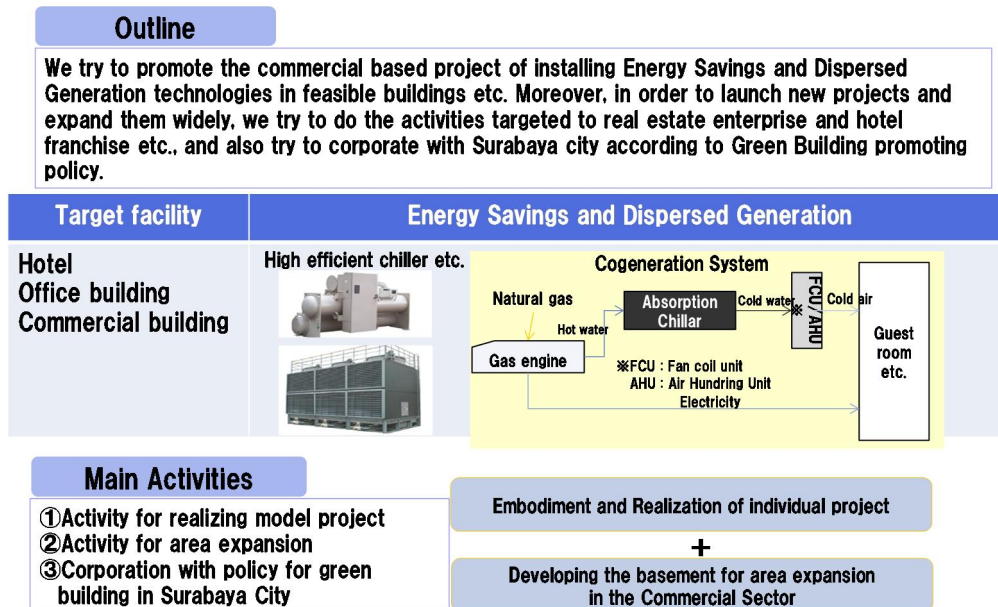
We have promoted JCM FS for 3 fiscal years so far. In this fiscal year, we have been discussing energy sector and solid waste sector. We decided to promote JCM project basically with the existing methodology, etc.

(Figure) Transition of JCM FS in Surabaya



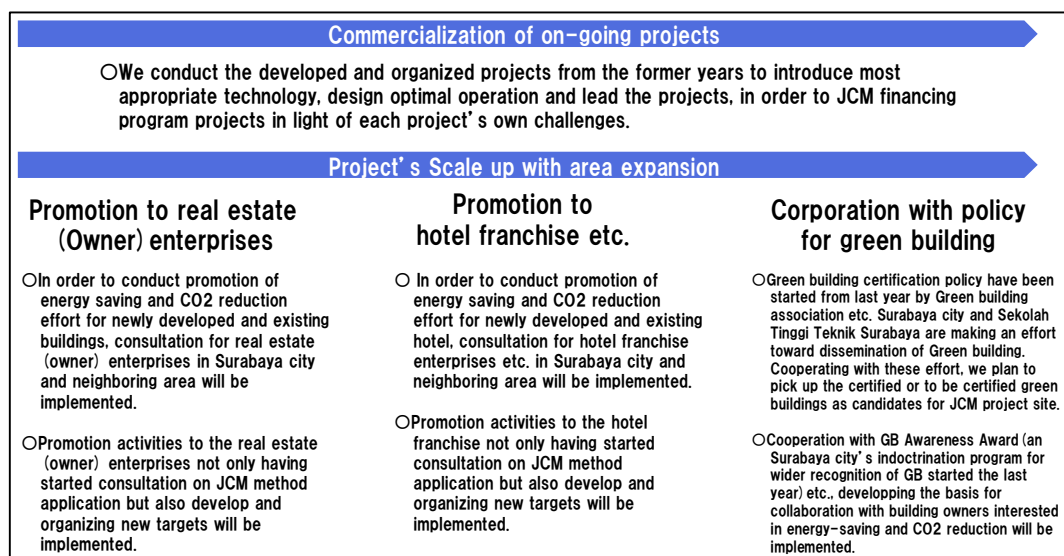
As for energy sector, we will promote the following activities:

(Figure) Energy Sector: Overview of JCM FS



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.

(Figure) Energy Sector: Discussion about horizontal development of the project



In regard to energy sector, we will discuss the related regulations. In Surabaya City, Green Building Awareness Award has realized low carbonation and tree planting of the buildings. 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.



(Figure) Expected use of JCM(in the future)

GBAA (Green Building Awareness Award) has been led by BAPPEKO so far, after JY2016, 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

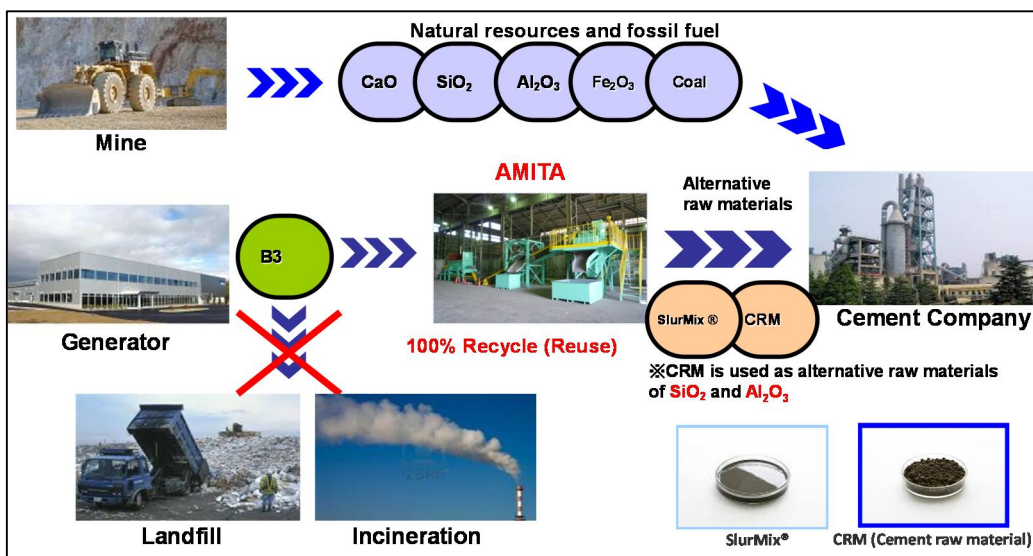
under this regulation because it may ask all the buildings of new construction satisfied the energy saving requirements, etc.

Next, as for solid waste sector, we have promoted the following activities. Through the measure to B3 waste and a shortening of its transportation distance currently in problem in Surabaya, we discuss a plan to promote CO₂ emission reduction. With this activity, we will develop hazardous B3 waste recycling. By the efficiency of treatment process, it is expected that we will realize CO₂ emission reduction and creation of economic value.

Specifically, following effects will be expected.

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.

(Figure) Waste Sector: Project Image



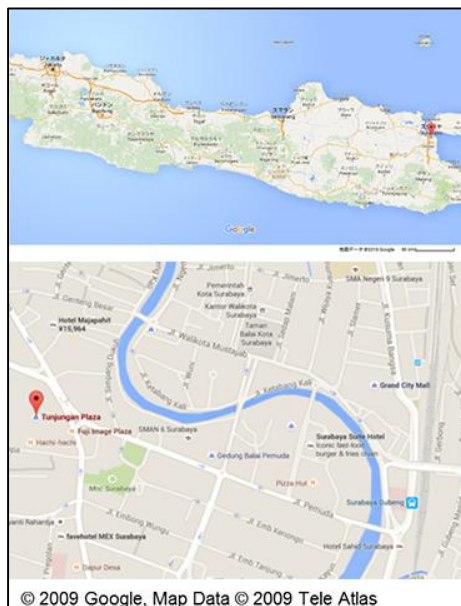
The purpose of this FS is to aim for the CO₂ emission reduction through the above.

3. Project description: Example of JCM Project realized through this study

Now, we'd like to introduce energy saving at a shopping mall by Introducing High efficiency turbo chiller as one concrete project for the FS. This is a project in energy sector and the first JCM project in Surabaya at a shopping mall called Tunjungan Plaza.

a. Project location

Country	Republic of Indonesia
Region/State/Province etc.:	East Java province
City/Town/Community etc:	Surabaya



b. Project Participant

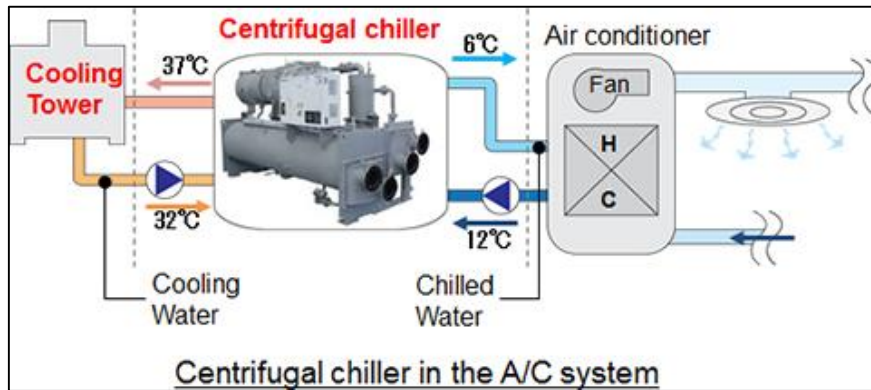
(Japan): NTT FACILITIES, INC., Project Participant

(Indonesia): PT.PAKUWON JATI Tbk

■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.

(Figure) Images for Turbo Chiller



■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. This project is proceeding with the mutual understanding of a joint committee between Japan Government and Indonesian Government that we should use existing MRV Methodology as a JCM project and the outline of the Methodology is as below.

■MRV Methodology and amount of CO₂ emission reduction

➤ 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 [tCO₂/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} : CO₂ emission factor for consumed electricity [tCO₂/MWh]

➤ Calculation of project emissions

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

PE_p : Project emissions during the period p [tCO₂/p]

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

EF_{elec} : CO₂ emission factor for consumed electricity [tCO₂/MWh]

➤ **Calculation of emissions reductions**

$$ER_p = RE_p - PE_p$$

ER_p : Emission reductions during the period p [tCO₂/ p]

RE_p : Reference emissions during the period p [tCO₂/ p]

PE_p : Project emissions during the period p [tCO₂/ p]

➤ **Data and parameters fixed ex ante**

The source of each data and parameter fixed *ex ante* is listed as below.

Parameter	Description of data	Source																		
$COP_{RE,i}$	<p>The COP of the reference chiller i is selected from the default COP value in the following table in line with cooling capacity of the project chiller i.</p> <table><tr><th colspan="6">$COP_{RE,i}$</th></tr><tr><th>Cooling capacity /unit (USRt)</th><th>$x<300$</th><th>$300\leq x<450$</th><th>$450\leq x<500$</th><th>$500\leq x<700$</th><th>$700\leq x<1,250$</th></tr><tr><td>$COP_{RE,i}$</td><td>4.92</td><td>5.33</td><td>5.59</td><td>5.85</td><td>5.94</td></tr></table>	$COP_{RE,i}$						Cooling capacity /unit (USRt)	$x<300$	$300\leq x<450$	$450\leq x<500$	$500\leq x<700$	$700\leq x<1,250$	$COP_{RE,i}$	4.92	5.33	5.59	5.85	5.94	<p>The default COP value is derived from the result of survey on COP of chillers from manufacturers that has high market share. The survey should prove the use of clear methodology. The $COP_{RE,i}$ should be revised if necessary from survey result which is conducted by JC or project participants every three years.</p>
$COP_{RE,i}$																				
Cooling capacity /unit (USRt)	$x<300$	$300\leq x<450$	$450\leq x<500$	$500\leq x<700$	$700\leq x<1,250$															
$COP_{RE,i}$	4.92	5.33	5.59	5.85	5.94															

The outline of technologies utilized specifically in the project is as follows:

(Table) Outline of facilities introduced for the project

Items	Unit	Project chiller	
Model No.	-	HC-F550GFG-SSCT	HC-F950GFG-SSCT
(Number. of Introduction)		(1 unit)	(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

i. Contribution to Indonesian Sustainable Development

In preparation for the future energy demand increase, Indonesia must effectively utilize precious domestic natural resources. Also, they need to discuss the situation of electrical power shortage problems. In this case, the project aims to reduce electricity consumption in the shopping mall through introducing advanced & efficient Japanese centrifugal Chiller system.

j. Proposed implementation schedule

August, 2015: Start of Project

May, 2016: EPC Completion

July, 2016: Registration under JCM

k. Capacity building to the host country

Capacity building is carried out under the following two aspects; 1) JCM MRV concept understanding and 2) monitoring system usage methods. We will conduct Capacity building in these 2 points through making specific projects.

4. The result of the study

We have discussed wider dissemination of projects, especially in energy sector and waste sector through our activities until this fiscal. Therefore, we have realized a specific JCM project in energy sector. In addition, as for the horizontal development, we have confirmed the needs of wider dissemination of the project by approaching and promoting to real estate (Owner) enterprises and hotel franchise, etc.

In waste sector, we have been convinced that there would be business opportunities in basically private sector.

5. Conclusion and Next Steps

Based on the result of the study, 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.

(Figure) Images for Export of Green City

