MOE

FY 2015 Feasibility Studies on Joint Crediting Mechanism Projects towards Environmentally Sustainable Cities in Asia

Report on

"JCM projects development (energy efficiency, and waste and waste water) under the Bangkok Master Plan on Climate Change, and study on financial and other facilitation schemes for introducing low carbon technologies"

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(Overseas Environmental Cooperation Center, Japan)

Feasibility study on JCM projects development (energy efficiency, and waste and waste water) under the Bangkok Master Plan on Climate Change, and study on financial and other facilitation schemes for introducing low carbon technologies

As of 18th March, 2016
Overseas Environmental Cooperation Center

Contents

I. Summary of Operations

1. Purpose of Operations

The Bangkok Metropolitan Administration (BMA), the local government of Bangkok, and the capital of Thailand, has been making active efforts to address climate change, starting with the Bangkok Declaration on Climate Change Mitigation in 2007. The Bangkok Metropolitan Administration Action Plan on Global Warming Mitigation (BMA Action Plan 2007-2012) is a comprehensive plan covering the following 5 areas (1) development of public transportation and improvement of transportation systems, (2) encouragement of the use of alternate fuels, (3) improvement of electric power use in buildings, (4) improvement of waste and wastewater treatment and (5) greening measures.

Moreover, the new Bangkok Metropolitan Master Plan on Climate Change 2013-2023 was completed under a technical cooperation project of the Japan International Cooperation Agency (JICA) and approved in July, 2015 by the governor of Bangkok. The new master plan covers 5 areas: (1) sustainable transportation measures, (2) promotion of measures for energy saving and renewable energy, (3) measures for wastes and wastewater, (4) urban greening, and (5) adaptation planning.

Meanwhile, in October 2013, the City of Yokohama and BMA signed a memorandum of understanding concerning urban development in Yokohama and Bangkok to further deepen cooperation between the municipalities and take concrete actions for urban development in such fields as environment and low carbon. As the agreement includes provision of technical advice from Yokohama in such fields as energy management, waste management and sewage management for sustainable development in Bangkok, it contributes to the establishment and implementation of the above-mentioned BMA Master Plan on Climate Change.

The above mentioned JICA technical cooperation aims to support the making of the Master Plan and consolidate the implementation system of the plan. Based on the aim above, a feasibility study on “Joint Crediting Mechanism Projects towards Environmentally Sustainable Cities in Asia” was conducted in last fiscal year 2014 with considerations for preparing business funds for implementation of the Master Plan and building the foundations for a low carbon society via technical transfer.

Based on the cooperation between Yokohama city and BMA, we identified items to develop JCM projects, dispatched a low-carbon technology mission, which was mainly

composed of companies participating in the Y-PORT[1] and YSPA[2] and implementing an energy saving diagnosis at the hospital run by BMA in the feasibility study in last fiscal year 2014. Through the study, we recognized good potential for JCM projects in three sectors: energy sector including public and private hospitals and a food processing plant located in Bangkok, waste management sector including incineration plants and plants for intermediate waste treatment, and waste water management sector.

In addition, Japan and Thailand signed a bilateral document to start the Joint Crediting Mechanism (JCM) on 19th November, 2015 and development of JCM projects development will be speeded up.

Considering the above background, we conducted two studies in this fiscal year: a "Study on JCM projects development in the sector of energy efficiency, waste management and waste water treatment", which was based on outcomes of the feasibility study in last fiscal year 2014, and a "Study on identification candidates to form JCM projects" to develop JCM projects in the early stage to enable the implementation of the Master Plan.

[1] Y-PORT: Yokohama Partnership of Resources and Technologies, which is an international technical cooperation project through a public-private partnership that harnesses Yokohama's technology and know-hows to contribute to the emerging countries

[2] YSBA: Yokohama Smart Business Association, which operates various projects such as introduction of renewable energy, energy management of households, buildings and local communities and next generation transportation systems through the collaborating of Yokohama city and the private sector.

2. Contents of Feasibility Study

Based on the Bangkok Master Plan and outcomes of the feasibility study in last fiscal year 2014, the following studies were implemented. Details of studies are shown below.

- Development of JCM projects in the sector of energy efficiency, waste management and waste water treatment
- Identification of candidates to form JCM projects

(1) Development of JCM projects in the sector of energy efficiency, waste management and waste water treatment

Based on the feasibility study in last fiscal year 2014, we found that there were immediate needs and potential for improvement of energy cost reduction and GHG mitigation in the sector of energy efficiency, waste management and waste water treatment. We conducted studies for each sector to develop these potentials.

(a) Study of energy efficiency

In this study, we mainly conducted the following three activities. Details of studies are shown in each chapter.

- Elaborating on a plan for applying programme approach for building energy efficiency and financial scheme for introducing low carbon technologies
- Elaboration on introducing energy saving code such as CASBEE as eligibility criteria of JCM methodology
- Elaborating on a plan for comprehensive energy saving in industrial park

(i) Elaborating on a plan for applying programme approach for building energy efficiency and financial scheme for introducing low carbon technologies

We found that public and private hospitals in Bangkok showed strong interests in implementing scheme to cut energy cost and mitigate GHG by renewing boilers and chillers etc., and introducing ESCO [3] service in their buildings. We conducted preliminary works, including formulating an international consortium among private companies both Japanese and Thai, and strengthening a system for providing indirect supports, to develop JCM projects smoothly after Thailand joins the Joint Crediting Mechanism (JCM) shortly. In Particular, we selected sites for implementing the model ESCO project among public hospitals under the BMA, considering installation of equipment in their hospitals without value oriented public bidding.

On the other hand, we proposed “Expanding Green Hospital Concept” via the

[3] ESCO: Energy Services Companies. It provides a comprehensive energy solutions including designs and implementation of energy savings projects, retrofitting, energy conservation, energy infrastructure outsourcing, power generation and energy supply, and risk management. And the energy saving effect is guaranteed by operating companies.

installation of energy efficiency equipment as the JCM project to be conducted in the 5th sub group.

(ii) Elaboration on introducing energy saving code such as CASBEE as eligibility criteria of JCM methodology

BMA officials were strongly interested in the evaluation scheme for energy performance scheme, CASBEE, during the discussions of the Master Plan, and they strongly required making consideration for installing CASBEE to the implementation of the Master Plan. Taking into account of the situation above, we considered how Yokohama's experience in implementing CASBEE could be transferred to and used in Bangkok.

(iii) Elaborating on a plan for comprehensive energy saving in industrial park

In addition to the hospital's needs, we also recognized the feasibility of installing energy-saving equipment, a high-efficiency boiler, a high-efficiency chiller and an air compressor, into a food processing plant in an industrial estate located near Bangkok.

In this study, we surveyed the possibility of comprehensive energy saving at the plant as well as the possibility of energy saving mentioned above with a view to implementing project development more effectively while also further reducing CO2.

(b) Study of waste management

Based on last year's feasibility study, we conducted study on two projects for the realization: "Elaborating on JCM projects at incineration plants in Bangkok" and "Study on actual situation of landfill site, waste collecting system and administration/regulations in Thailand".

(i) Elaboration on JCM project at incineration plants in Bangkok

We found that rules for public bidding apply to the installation of new equipment in public institutions in Bangkok. With public bidding, the life cycle cost of equipment with a long lifespan is not considered, just the initial cost of its installation. In addition, we discovered that the criteria for safety, environment, and technology features, including energy efficiency and durability at the installation site had not been determined yet.

Considering the above agendas, we conducted policy dialogues between Yokohama city and BMA, based on the task force in the Master Plan, to formulate common understanding on the installation of incineration, and share the information and knowledge of waste management service in Yokohama city.

(ii) Study on actual situation of landfill site, waste collecting system and administration/regulations in Thailand

Based on the outcomes of the field survey last year, we realized the possibility of installing semi-carbonization technology, which generates biomass energy-pellets from general waste, to a vast residential area located near Bangkok. This technology was developed by Finetech Co. Ltd., which has participated in the feasibility study since last year, and the technology not only reduces energy usage but also reduces general waste.

The study considered how this technology could be installed in the residential area via the JCM scheme and how anticipated waste reduction from using this technology and utilization of regenerated energy in the residential area would achieve carbon neutrality.

The garbage generated from residential areas accounts for around half the amount of the waste generated in Bangkok. Considering this situation, the study also looked at the guidelines at national level, and rules on implementing those guidelines at local government level related to the general waste collection system, including final landfill sites, in Thailand.

(c) Study of Waste Water Management

The feasibility of installing energy efficiency equipment into new and existing public institutions handling waste water management was considered in this study. Data concerning low-carbon and low-cost technologies use by Japanese companies were shared with BMA, and installation feasibility was considered

(2) Identification of candidate to form JCM projects

Based on the fiscal study last year, we investigated whether or not the potential projects could be aligned with Japan's low-carbon technology (in particular, companies that would participate via Y-PORT). We also considered the institutional requirements of JCM, in order to consider commercialization.

After going through the above process, we identified some highly feasible candidates for JCM projects among the above inspected projects, and developed proposals for MRV[4] schemes, etc. More specifically, we collected necessary data and other information concerning specs and standards of the target technologies and examined settings of baseline and reference scenarios.

In addition to the above studies, we conducted policy dialogs for each sector, a low

[4] MRV: Measurement, Reporting and Verification of GHG emission.

carbon technology workshop and a matching session with concerned parties, and training in Japan, which included practical learning programs for all Thai participants, in order form them to view the low-carbon society in Yokohama city and technologies that Y-PORT members have.

3. Overview of the Bangkok Master Plan on Climate Change 2013-2023

(1) Climate Change Policy of the Kingdom of Thailand

The Kingdom of Thailand has been setting Five-Year National Economic and Social Development Plans (NESDP) as a national mid-term development plan since 1961. Since the Seventh National Development Plan, the government of Thailand is focusing on "sustainable development" in the way in which economic and social development and resources and environmental conservation are harmonized. The government highlights the importance of developing low-carbon-society that is resilient to climate change in the Eleventh NESDP (2012-2016) issued in October 2011 under one of the sixth focal areas "Strategy for Managing Natural Resources and Environmental toward Sustainability".

The Royal Government of Thailand has been working on climate change issues based on the NESDP. In 1994, the country ratified the United Nations Framework Convention for Climate Change (UNFCCC) and established Sub-Committee on Climate Change for international negotiations and policy planning (was subsequently changed to National Climate Change Committee in 2006 putting the Prime Minister as a chairman). In January 2008, the cabinet approved the "National Strategy on Climate Change Management (2008-2012)".

Against this background, in November 2014, the NCCC endorsed key policy directions, which were authorized by the Cabinet, including endorsement of the Thailand Climate Change Master Plan (2012-2050), and the Thailand Nationally Appropriate Mitigation Actions (NAMAs), as well as preparation for an agreement for the Joint Crediting Mechanism (JCM) with Japan. In October 2015, Thailand submitted Intended Nationally Determined Contribution (INDC) as mitigation policy after 2020 responding to request from the UNFCCC. In addition, in November 2015, Ms. Tamayo Marukawa, Minister of the Environment, Japan and H.E. General Surasak Karnjanarat, Minister of Natural Resources and Environment, The Kingdom of Thailand signed the bilateral document of the Joint Crediting Mechanism (JCM) in Tokyo. Now Japan and Thailand are preparing to establish the Joint Committee and launch the JCM scheme between two countries.

(2) Climate Change Policy of Bangkok Metropolitan Administration (BMA)

As for a local government, Bangkok Metropolitan Administration (BMA) has been setting ambitious strategies on climate change. In 2007, BMA with cooperation of 35 institutional stakeholders adopted "Bangkok Declaration on Mitigation of Climate Change" and started activities related to climate change policies. BMA prepared the BMA Action Plan on Global Warming Mitigation 2007-2012 which aims to reduce its emission at least 15% by 2012 compared to the projected baseline of business as usual. Under the declaration, BMA has been undertaking five initiatives as follows: (i) Expand mass transit and improve traffic system, (ii) Promote the use of renewable energy, (iii)

Improve building electricity consumption efficiency, (iv) Improve solid waste management and wastewater treatment efficiency, and (v) Expand park area.

BMA evaluated the implementation of the BMA Action Plan 2007-2012, and drafted more holistic climate change long-term plan "Bangkok Master Plan on Climate Change 2013-2023" (BMA Master Plan 2013-2023) in July 2015 under the JICA technical cooperation project the Bangkok Master Plan on Climate Change 2013-2023.

(3) Overview of the Bangkok Master Plan on Climate Change 2013-2023

The Bangkok Master Plan on Climate Change 2013-2023 covers the whole geographical area of BMA, in the following 5 sectors:

- Environmentally sustainable transport,
- Energy efficiency and alternative energy,
- Efficient solid waste management and wastewater treatment,
- Green urban planning
- Adaptation planning

Quantification of GHG emission, mitigation targets, mitigation measures and MRV methodologies of each sectors were elaborated under the master plan. Figure 1-1 [5]shows GHG emission in 2013 and BAU emission and mitigation targets in 2020 of 5 sectors.

Based on advices from Ministry of Environment, Japan, approach for the study was discussed that it is necessary to proceed not only "Bottom-up approach" for developing JCM projects but also "Top-down approach" for specifying sectors from higher important policies. Proposed mitigation measures of (2) Energy efficiency and alternative energy sector and (3) Efficient solid waste management and wastewater treatment sector which are targeted by this study are shown in table 1-1, 1-2 and 1-3.

[5] Reference: Bangkok Master Plan on Climate Change 2013 - 2023

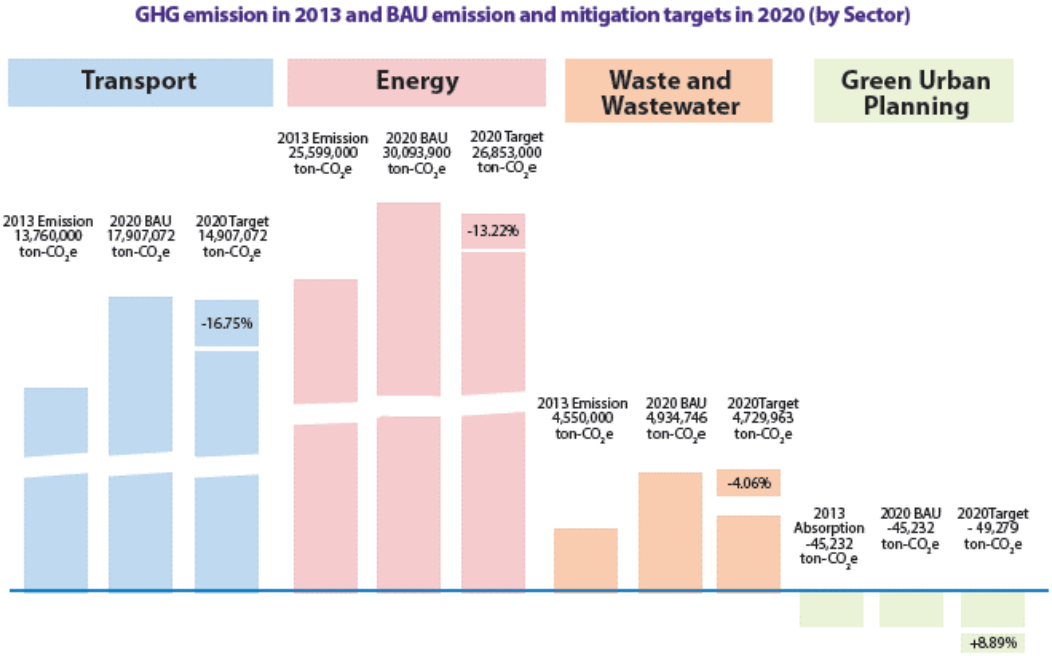


Figure 1-1 GHG emission in 2013 and BAU emission and mitigation targets in 2020 (by sector)

Table 1-1 Proposed mitigation measures of energy sector

Category			Possible mitigation measures (countermeasures)	
1. BMA government buildings & facilities	1.1 Energy saving renovation/repair work for existing facilities	1.1.1 General tasks	1)	Developing systematic schedules of retrofitting BMA's existing building for appropriate management of energy
			2)	Systematic implementation of energy saving retrofitting works of BMA's existing building
			3)	Selection of model project for energy saving renovation work Intensive adoption of top-runner appliances
			4)	Energy saving requirements for retrofitting works of BMA facilities and setting of high-level of energy efficiency Acquisition of certification for energy saving renovation work (CASBEE or LEED etc.)
			5)	Consideration of renovation work, extension work, conversion at the time of facilities update (maximum utilization of existing stocks)
			6)	Efficient retrofitting/renovation work for energy saving by introducing private capital know-how
		1.1.2 Improving insulation performance (renovation technique)	1)	Introduction of thermal barrier roof coatings
			2)	Improving external insulation and waterproofing
			3)	Introduction of roof greening
			4)	Improving heat insulating window (high heat insulating glass such as low-e pair glass)
			5)	Improving heat insulating window (thermal barrier film)
1. BMA government buildings &			6)	Controlling solar radiation heat by installing louver or eaves
		1.1.3 Cutting	1)	Replacing existing air-conditioning equipment by high-efficiency one

facilities		down air conditioning / ventilation load (retrofitting technique)	2)	Introduction of variable flow controller
			3)	Introduction of task ambient air conditioning system - controlled by motion/temperature sensor, timer etc.
			4)	Introduction of high-efficiency fan (total heat exchanger)
			5)	Introduction of cogeneration system
		1.1.4 Cutting down lighting load (retrofitting technique)	1)	Introduction LED lighting or fluorescent lamp
			2)	Introduction of task ambient lighting
			3)	Installing motion sensor lighting to bathroom, corridor or staircase
			4)	Daytime energy reduction by daylight sensor
		1.1.5 Energy reduction by water-saving	1)	Upgrading water saving sanitary appliances
			2)	Introduction of rainwater recycling system
			3)	Introduction of waste water recycling system (reuse as toilet bowl flushing water)
		1.1.6 Others	1)	Introduction of Solar power generation systems
			2)	Introduction of BEMS, building energy management systems
			3)	Replacing street lighting to LED
	1.2 Energy saving for new construction	1.2.1General tasks	1)	Constructing high energy efficiency building
			2)	Introducing requirements of certificate for new construction of BMA facilities (Energy standard such as CASBEE or LEED etc.)
	1.3 Information campaign	1.3.1 Conducting campaign to citizens	1)	Promoting environmental education at school
			2)	Support to exhibition of energy saving merchandise for BMA facility
			3)	Visualization of energy saving of BMA facility Notify saving energy activities by panel or monitor
			4)	Promoting "Green Curtain" installation at school to reduce air conditioning load
			5)	Holding workshop on energy saving repair work for public participation (schools, public facilities)
	1.3 Information campaign	1.3.2 Conducting campaign to the officials	1)	Raising preset cooling temperature
			2)	Award for saving energy activity
			3)	Turning off lightings during lunch break
			4)	Thorough power saving setting on PC or OA equipment
	1.4 Promotion of low carbon city	1.4.1 Model areas	1)	Setting up low-carbon model area, each fields top runner measure, intensive equipment investment
2. Civil Categories (Residential/ Commercial/ Industries)	2.1 Residential part	2.1.1 Promotion of energy saving house	1)	Promotion of low-carbon/energy saving detached house (Publicity of cost benefit from the viewpoint of low carbon community , backup exhibition, provide advertising spaces at BMA facilities
			2)	Facility equipment introduction promotion of energy saving house (LED lights, energy-saving air conditioning system or hot - water apparatus etc.)
		2.1.2	1)	Publicity of cost benefit by repair work for energy saving

		Promotion of energy saving repair work	2)	Promotion of repair work for energy saving: insulation upgrade by double glazing, heat barrier film, renew air conditioning device (subsidy system etc.)
		2.1.3 Promotion of energy saving home appliances	1)	Purchase promotion of energy saving home electric appliances (air conditioning, fridge, TV etc.)
		2.1.4 Promotion of energy saving measure	1)	Promote better understanding of air conditioner maintenance (conduct free cleaning)
		2.1.5 Others	2)	Promotion of solar panel installation （subsidy system or mediating installable roof)
	2.2 Commercial/ Business part	2.2.1 Promotion of energy saving building	1)	Incentive for constructing/repairing saving energy factory (tax reduction, subsidy, zero-interest finance etc.)
		2.2.2 Promotion of energy saving repair work for existing building	1)	Conducting energy saving inspection of public buildings
			2)	Promotion of ESCO business for existing buildings (Explaining ESCO business, advertisement promotion support, subsidy system for energy saving diagnostic)
			3)	Promotion of repair work for energy saving: insulation upgrade by double glazing, heat barrier film, renew air conditioning device (subsidy system etc.)
			4)	Publicity of cost benefit by Electricity Peak-Cut Introduction support for automatic control facility of Electricity Peak-Cut
		2.2.3 Promotion of energy saving measure	1)	Promotion of saving energy activity (publicity of cost benefit etc)
			2)	Raising preset cooling temperature at public buildings Turn off lightings during lunch break
			3)	Thorough power saving setting on PC or OA equipment
			4)	Award for saving energy activity
		2.2.4 Others	a	Promotion of solar panel installation （subsidy system or mediating installable roof)
	2.3 Industrial part 2-3. Industrial part	2.3.1 Promotion of energy saving factory	1)	Incentive for constructing/retrofitting saving energy factory (tax reduction, subsidy, zero-interest finance etc.)
		2.3.2 Promotion of energy saving repair work for existing factory	1)	Conducting energy saving inspection of factories
			2)	Promotion of repair work for energy saving (subsidy system etc.)
			3)	Publicity of cost benefit by Electricity Peak-Cut Introduction support for automatic control facility of Electricity Peak-Cut
		2.3.3 Promotion of energy saving measure	1)	Promotion activity for factory's energy saving technique (for SMEs)
			2)	Commendation for saving energy activity
		2.3.4 Others	1)	Promotion of Solar Energy （subsidy system or mediating installable roof)

			2)	Promotion of beneficial use of factory exhaust heat

Table 1-2 Proposed mitigation measures of waste sector

Category	Measure
1. Waste generation	1.1 Promoting participation on waste reduction and separation at source
	1.2 Reducing the amount of plastic waste
2. Waste collection and transportation	2.1 Improving fuel efficiency of waste collection and transportation system
3. Intermediate treatment	3.1 Promoting utilization of organic waste
	3.2 Constructing waste-to-energy incineration facility
	3.3 Constructing Waste segregation plant
4. Final disposal	4.1 Installing environment- friendly landfill system

Table 1-3 Proposed mitigation measures of wastewater sector

Category	Measure
1. Wastewater generation	1.1 Promoting reduction of water usage at house
	1.2 Promoting collection of wastewater tariff
2. Wastewater collection	2.1 Feasibility study for construction of separated sewerage collection system
	2.2 Implementing separated sewerage collection system
	2.3 Constructing separated sewerage collection system
3. Wastewater treatment	3.1 Improving operation and equipment of existing WWTPs
	3.2 Constructing new energy efficient WWTPs
4. Sludge treatment	4.1 Promoting utilization of sludge
5. Water reuse	5.1 Promoting water reuse

II. JCM projects development in the sector of energy saving, waste management and waste water treatment

1. Energy saving sector

(1) Summary of the study

Based on the outcomes of feasibility study in last fiscal year 2014, we conducted "Elaboration on applying Program approach for building energy efficiency and program support scheme with private finance", "Elaboration on introducing energy saving code such as CASBEE as eligibility criteria of JCM methodology" and "Elaboration on comprehensive energy saving in the industrial plant"

We had several policy dialogues and a small study session to install low carbon equipment in public hospitals with Thai side. In addition, on-sight visiting of buildings where implemented ESCO projects and an explanation of the JCM scheme and the Financing Programme for JCM Model Projects were given to the public hospital and the Industry Estate.

(2) Schedule of the study

(a) Policy dialogues

Based on the partnership between Yokohama and Bangkok, we conducted several policy dialogues and a small study sessions to implement ESCO projects and develop JCM projects in public hospitals. Participants for the discussions are technical experts from Yokohama city and private companies, and OECC as Japanese side, on the other hand, officials form Department of Environmental Office: DOE and Fiscal Policy Office :FPO and Bangkok public hospitals. DDS and FPO as Thai side. The discussion schedule is shown in Table 2-1.

Table 2-1 The Schedule of the energy efficiency dialogue between Yokohama city and BMA

Date	Venue	Participants	Contents
Jul. 13th 12:30~15:40	Ballroom2, S31 Sukhumvit-Hotel	DOE, Yokohama city, OECC	-Yokohama's experience and knowledge of ESCO program were shared with BMA and other Thai agencies through presentation and discussion. Also from Thai side, green procurement regulation and situation of ESCO business in

			Thailand was introduced to Japanese side. -It was discussed that introduction of energy saving measurements (ESCO program and CASBEE scheme) in BMA public facilities.
Sep. 29th 9:00~9:30	2nd floor, meeting room 1, DOE	DOE, OECC	-The draft agenda and preparation for the next dialogue was explained to BMA officials and discussed with them.
Oct. 27th 13:30~15:30	2nd floor, meeting room 1, DOE	Department of Public Works (DPW), Department Energy Alternative Development and Efficiency (DEDE), Yokohama city, OECC	-DEDE introduced the overview of ESCO program and relevant governmental policies in Thailand. - The DPW explained the issues and challenges for implementing ESCO projects in public facilities of BMA. -Yokohama's experience and knowledge of how they installed ESCO program to public facilities were shared with BMA side. -Implementation of ESCO Model project in public hospitals was discussed.
Nov. 25th 10:00~12:00	2nd floor, meeting room 1, DOE	DOE, DPW, FPO, TGO, BMA public hospitals, Yokohama city, OECC, A company	-The overview and benefits of building energy efficiency and ESCO were presented by the City of Yokohama and A company. - Some challenges and

			possible solutions for utilizing ESCO, including how to apply the rules of public procurement and contracts were shared and discussed among the Bangkok and Japan side.
Jan. 20th 10:00~12:00	BMA2, 6th floor, meeting room	DOE, DPW, The FPO, Yokohama city, OECC	-To success of implementing ESCO projects, increased motivation, appropriate goal settings based on the analysis and successful experience in short term were suggested as main factors. -Information of procurement processes in BMA public facilities were shared among Japan side.

(b) On-site visits

In parallel, we visited buildings where ESCO projects have been implemented, and several facilities that have high feasibility of installing low carbon equipment and implementing ESCO projects. The visiting schedule is shown as follows.

Table 2-2 The schedule of the visits related to the energy efficacy sector

Date	Venue	Participants	Contents
Sep. 28th 14:00~15:30	P hospital	OECC	-The OECC proposed the expanding of "Green hospital concept" with implementing JCM project in the large hospital group A with P hospital, and discussed about its possibility.
Oct. 26th 10:00~12:00	P hospital	OECC	-The OECC proposed the expanding of "Green

			hospital concept" with implementing JCM project in the large hospital group A with Dr. Yongyuth, Phayathai hospital.
Nov. 23th 10:30~11:30	P hospital	OECC, Yokohama city	-The OECC proposed to the CEO of 5th sub-group, Mr. Att , that the expanding of "Green hospital concept" with implementing JCM project in the group.
Nov. 26th 13:30~16:00	QSNICH	DPW, Yokohama city, OECC	-Their way to success of the ESCO project was explained to the participants, and Q & A session was also conducted to understand detailed project implementation.

(3) Elaborating on a plan for applying programme approach for building energy efficiency and financial scheme for introducing low carbon technologies

(a) Summary of the study

Considering to the outcomes of feasibility study in last fiscal year 2014, replacement needs of equipment in public and private hospitals, and the fact that "energy efficiency in buildings" is one of the targeting sector of the Master Plan[6], We conducted the study to develop JCM projects at an early date for public and private hospitals.

(i) Study of public hospitals

There are some benefits for implementing ESCO project: 1) comprehensive energy saving in the building is able to archive via replacement old machine, 2) installing high efficiency equipment and inverter control, the effect of energy reduction via the project is granted by ESCO company, and 3) investment cost of equipment is paid by ESCO company and energy saving surplus account is returned to the ESCO company.

On the other hand, if we will install new equipment to public hospitals, we need go through the public bidding as one of the public procurement process. And the CAPEX[7]

[6] Refer to table 1-1 Proposed mitigation measures of energy sector
[7] CAPEX: The cost for installed equipment

is key factor for make a decision of the budding, so low carbon equipment, which is comparatively expensive than general one, is not appropriate for the installation under the public bidding.

Therefore, we considered implementation of the ESCO project in public hospitals as the archiving way of its comprehensive energy saving as well as avoiding way of the value oriented public bidding.

In particular, we had a Q and A session by DEDE including explanation of implementing ESCO pilot projects in Thailand and its agendas, and visited to QSNICH which has implemented ESCO project in the hospital and has same procurement system of BMA. Moreover we discussed feasibility of implementing ESCO projects in the public hospitals with concerned parties including ESCO companies and public hospital themselves etc. In the discussion, we considered analysis of the success in QSNICH hospital and the draft plan of implementing ESCO project in T hospital based on the energy study in last fiscal year 2014. Table 2-3 shows outline of the ESCO project in QSNICH and the tentative plan of the ESCO project in T hospital.

Table2-3 Outline of the ESCO project in QSNICH and the tentative plan of the ESCO project in T hospital

	QSNICH	T hospital (1st Op.: Full retrofitting and installation)	T hospital (2nd Op.: Partial retrofitting and installation)
Equipment	- "Ozone generator for Cooling tower water treatment installation" for Water cooled chiller air condition system.	-Change old lighting bulb to LED lighting bulb -Installation of VWV control for air condition system primary pump and condensing pump -Installation of heat pump for hot water system -Change old package air condition to high efficient package air condition	-Change old lighting bulb to LED lighting bulb -Installation of VWV control for air condition system primary pump and condensing pump -Installation of heat pump for hot water system
Investment Cost (baht)	1,979,500	42 million	8.2 million

Saving Energy Cost (baht /year)	0.6 million	4.61 million	1.68 million
Pay Back Period (year)	3.06	9.1	4.9

Visits of the study tour

We implemented the study tour in the city of Yokohama with participation of officials of public hospitals that are candidate of implementing ESCO pilot study on the end of October, 2015. In the study tour, they visited to fasciitis in Yokohama city that have implemented ESCO project, and explanation of the project implementation and its agendas were done by staff of the facilities. The detail is mentioned in the chapter IV-2.

Small study session with public hospitals

We conducted a small study session of implementing ESCO project with staff of public hospitals. Implementation of ESCO project, its benefits and preparations for the project including energy study were explained to the participants. Moreover the outcome of energy study in last fiscal year 2014 and draft plan of ESCO project in the T hospital were presented by ESCO company A.

(ii) Study of the private hospital

Officials of P hospital requested us to develop a plan for energy saving based on the BMA Maser Plan and to promote CSR activities in the 5th sub-group of large hospital group. A group has 43 hospitals and is divided for 5 sub-groups. P hospital belongs to the 5th sub-group, and the 5th sub-group has 9 hospitals. Among the 5th sub-group, P hospital and S hospital have been engaged in the energy saving activities as “Green Hospital”. In this study, considering the above situation, we suggested installing energy saving equipment to hospitals in the 5th sub-group via the Financial Program for JCM Model Projects, and discussed of its implementation to expand energy saving activities among the 5th sub-group.

(b) Outcomes of the study

(i) Study of public hospitals

Yokohama city explanation of ESCO implementation and suggestions for Bangkok. This presentation enabled Bangkok officials to better understand ESCO business. Conducting study tour with officials of the public hospitals and a small study seminar were suggested in the policy dialogue and we carried out them. This activities motivated Bangkok officials for the ESCO installation on their facilities. In addition, the visit to

the hospital where ESCO project has been implemented accompanying staff members of DPW, and discussions for ESCO implementation with concerned parties were done by BMA officials.

In the discussion, it was explained by DEDE that there are 4 agendas in implementing ESCO project in public facilities in Bangkok: several years contract, repayment of excess electric bugged by energy saving, the procurement rule of public bidding based on the initial cost, and long payout time because of cheap electricity cost.

They also commented that because of the limited budget of BMA, it would be better to implement ESCO project with Shared Saving type: ESCO pays for entire cost of implementation and facility administrator pays constant rate from the reduction by energy-saving.

In addition, there was 3 key success factors of the ESCO project in QSNICH: the project scale is small enough to use self-finance for the implementation, management level were very impressive to energy save and implementation of the project, they were able to obey the rule of procurement using equipment made in Thai for the project.

And they shared common perceptions that there were 6 agendas for the ESCO implementation: because of the procurement rule it is difficult to contract for several years, payment of saving cost to ESCO companies is difficult for the public facility administration, considering procurement rule for ESCO projects, luck of funds to implement ESCO project, and low carbon technology is expensive in general, so it is not appropriate for the public bidding judged from the initial cost, and needs of continuous discussions to solve these agendas.

BMA also commented that generally the subsidy is pained after the implementation, however it would be better for advanced payment considering the procurement rule of BMA. For the finance preparation, we need consider several finance schemes showed in figure 2-1. In the past case study, cooperating with Denmark, BMA used special measurement for installing equipment to the public. We need continues discussion with the task force for the installing and survey for outstanding case studies.

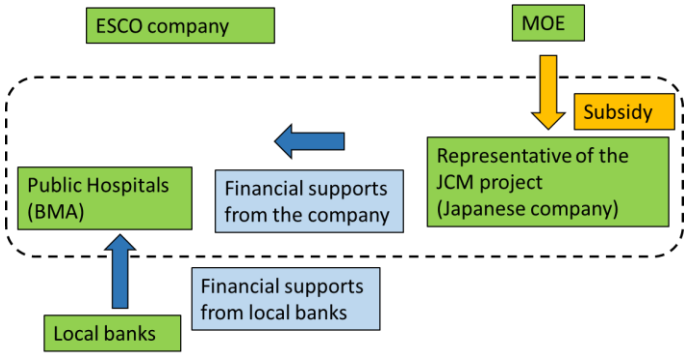


Figure 2-1 Financing Scheme for the JCM project

(ii) Study for the private hospital

We gained the approval of our suggestion: comprehensive energy saving plan for the model hospital as expanding of the "Green Hospital" from the CEO. First, high efficiency equipment such as air-conditioning and LED etc., are installed to buildings of the model hospitals in the 5th of a group to save energy, and then we increase the number of hospitals that install high efficient equipment among A group.

Especially, we discussed "Program Approach" [8] how to bundle each energy saving projects among the 5th sub-group with taking into account "Programmer of Activities" under CDM scheme and, "CDM programme of Activities".Generally, investment decision is determined at the committee where the CEO of the each sub-group has key role, so in this case it would be better to bind each projects by formulating a task force under the committee.

Installing equipment in the each hospitals are different, so for the project monitoring, it would be better to record and manage of GHG reduction data in each hospital with using on-line monitoring systems and supporting of ESCO companies that provide energy management services. After that, grouping reduction data in each hospital together for one, sub-group level, is enable us accurate measurement and cut-off of monitoring cost. Using data on the monitoring system is appropriate for the project verification.

Based on the discussion, preparation of the energy study, including reduction target setting and estimation of reduction cost, has been arranged by the ESCO company A. In addition to the energy study, we need determination of the model hospital and installed equipment for projects development. Moreover A group realized that educational activities for energy saving in the hospitals are one of the key factors for success of increasing "Green Hospital", and requested for some supports of educational activities to us. We need extra discussion to implement the project as well as support for educational activities in the future.

[8] Bundling several small projects together to increase amount of total GHG reduction

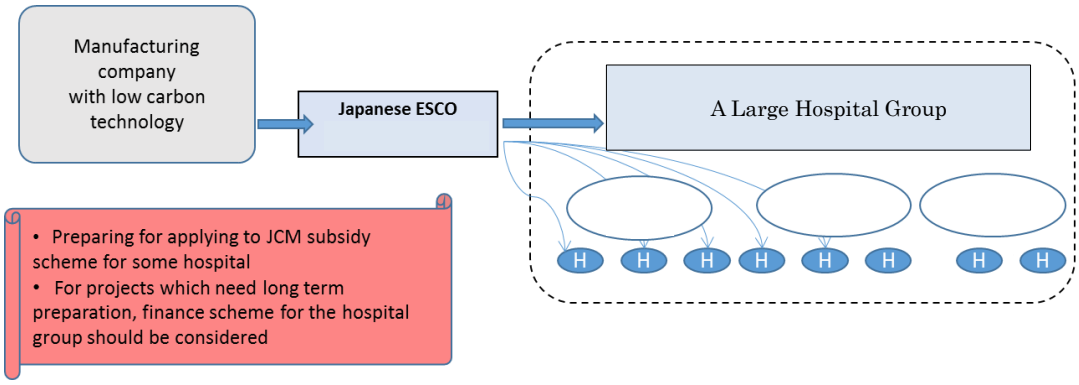


Figure 2-2 Elaboration of applying "Program approach for building energy efficiency" and program support scheme with private finance (Hospital) in A group

(4) Elaboration on introducing energy saving code such as CASBEE as eligibility criteria of JCM methodology

(a) Summary of the study

BMA is considering to introduce program for evaluating environmental performance of public buildings and it is listed as one of mitigation measure in the Bangkok Master Plan on Climate Change 2013-2023[9].

Meanwhile, it is expected that such program for evaluating environmental performance of buildings can be adopted as eligibility criteria of JCM methodology regarding energy saving of buildings. In this study, BMA officials in charge of public works developed an understanding about CASBEE (Comprehensive Assessment System for Built Environment Efficiency) which developed in Japan through the study tour and the study meeting. It was also studied that situation of relevant similar programs for evaluating environmental performance of buildings in Thailand.

As results of the study, it was clarified that CASBEE and similar evaluation programs can be used as reference for energy efficient facility in case of installing such facilities in building. For example, installation of high efficient boiler or chiller compared to regular one in the market achieves certain GHG reduction required for JCM project. But generally that kind of market research takes time and it is possible to use reference value defined in the evaluation programs.

Intangible measurements of CASBEE such as energy management method are unsuitable for specifying the reference but it can be used for necessary item to be

[9] Refer to table 1-1 Proposed mitigation measures of energy sector

considered or be dealt as eligibility criteria of JCM methodology.

It is also important to consider reference value with utilizing LEED[10] and TREES because those programs have been becoming popular in Thailand.

(b) Implementation of site visit of the study tour and the study meeting

(i) Site visit of the study tour

BMA officials visited Japan in the end of October 2015 for the study tour. The participants observed some buildings in and around Yokohama city which are certified as CASBEE certification scheme and learned energy saving measures and evaluation of environmental performance of buildings. Details of the site visits, see section IV - 2.

(ii) Study meeting with department of public works of BMA

Information of CASBEE was provided to officials of department of public works (DPW). Following information of CASBEE was provided to DPW officials, overview of CASBEE series, unique evaluation index called "BEE (Built Environmental Efficiency)", labeling of environmental performance using graphic charts, cases of utilizing CASBEE by local governments, incentives for certified buildings or owners.

It was studied in the meeting and by follow-up e-mail questionnaires that situation of relevant similar program in Thailand such as TREES (Thai's Rating of Energy and Environmental Sustainability) which is also a program for evaluating environmental performance of buildings.

(c) Outcomes of the study

(i) Utilization and dissemination of programs for evaluating environmental performance of building in Thailand

Since late 2000's, third party certification programs for evaluating environmentally considered building generally called "Green Building" began to spread gradually in Thailand. At present, there are several tens of commercial buildings mainly in Bangkok which voluntarily obtained certification for their environmental performance. At present, most of certified buildings are using LEED (Leadership in Energy and Environmental Design) which developed by U.S. Green Building Council (USGBC) and most popular program of its kind in the world.

In the meantime, development and operation of domestic programs for evaluating environmental performance of building have been proceeded recently in Thailand. TREES (Thai's Rating of Energy and Environmental Sustainability) [11] is developed by Thai Green Building Institute (TGBI) which was established jointly by Association of

[10] Website: [http://www.gbj.or.jp/leed/]
[11] Website: [http://www.tgbi.or.th/intro.php]

Siamese Architects under Royal Patronage and Engineering Institute of Thailand under HM the King's Patronage. BMA is recently implementing a measure utilizing TREES in order to promote dissemination of green buildings and a number of certified buildings is increasing and TREES is expanding its presence[12].

It seems that LEED is referred in developing TREES and 2 programs similar to each other for their structure of evaluation methodology. It has been developed 3 types of program according to evaluating subject and phase of building life cycle: TREES-NC (New Construction), LEED-CS (Core & Shell), TREES-EB (Existing Building). TREES evaluates buildings by total scores and classifies its certification in 4 phases: from highly evaluated "Platinum", "Gold", "Silver" and "Certified". There are 8 categories as for evaluation index: 1) Building Management, 2) Site and Landscape, 3) Water conservation, 4) Energy and atmosphere, 5) Material and resources, 6) Indoor environmental quality, 7) Environmental protection, 8) Green innovation in design.

Apart from TREES, following 2 programs for evaluating environmental performance of building have been developed and operated recently. But the number of cases using those programs is quite small compared to cases using LEED and TREES.

1) TEEAMS (Thailand's Energy and Environmental Assessment Method): It is a program according to the "Ministerial Regulation Prescribing the Type and Size of Buildings and Standards, Rules and Procedures for Designing Energy Conservation Buildings 2009" simply called "Green Building Code" and developed by Ministry of energy and Chulalongkorn University

2) DGNB/TASC: It is developed by Thailand Association for Sustainable Construction (TASC) with corporation by German Sustainable Business Council (DGNB) and German Company for International Cooperation (GIZ). This program is based on DGNB Certification System originally developed and operated by DGNB to be applied in Thailand adjusted to its situation.

(ii) Utilization of program for evaluating environmental performance of building by BMA

It is defined to give incentives to environmentally superior buildings which are certified by TREES in "The Ministerial Regulation on The Bangkok Comprehensive Plan 2013" regarding urban planning of Bangkok in order to promote dissemination of green buildings in Bangkok. Specifically, it is defined to give bonus of ratio of total floor space which is determined responding to site space of the building. Bonus is decided by 4 phases of TREES certification from 5% to 20% as following: platinum (5%), gold (10%),

[12] Actual achievements of 2013: LEED（50 registered, 21 certified）, TREES（17registered, 1certified）[http://www.solidiance.com/whitepaper/thailands-green-building-goals-aspirations-vs-realities.pdf]

silver (15%), certified (20%)[13].

(iii) Potential for utilizing CASBEE by BMA

In this study, CASBEE was introduced to officials of DPW and strong interest was shown in the point of view of considering policies to increase building stock with better environmental performance from now on.

Meanwhile, as BMA has already introduced the measure utilizing TREES regarding implementation of its urban planning, at this moment it is less likely that BMA newly utilizes other programs for evaluating environmental performance of buildings such as CASBEE. Officials of DPW showed opinion that BMA will more likely to continue to utilize TREES.

From the above situation, it is expected that BMA continues to consider measures based on TREES to be consistent with present measures. Therefore it seems appropriate that unique evaluation index adopted by CASBEE can be considered as complementing elements of energy saving code and eligibility criteria of JCM methodology.

[13]The Bangkok Comprehensive Plan 2013: [http://cpd.bangkok.go.th:90/web2/NEWCPD2556/The%20Bangkok%20Comprehensive%20Plan%202013_a4_pdf.pdf]

(5) Elaborating on a plan for comprehensive energy saving in industrial park

(a) Summary of the study

Advancement of Japanese manufacturing companies is thriving in Thailand. Their productive activities have been done at their own plants and industrial estate.

In this study, we had discussions with H industrial estate on referral from Ministry of Industry in Thailand which was participated to the Low Carbon Technology workshop at this feasibility study to surveyed feasibility of comprehensive energy saving via the JCM at the plants of Japanese companies in the industrial estate.

(b) Outlines of the study

In this study, we visited H industrial estate three times including monthly meeting of Japanese companies. In the meeting we gave explanations for the JCM scheme, the Financing Programme for JCM Model Projects and developments of comprehensive energy saving projects in the industrial estate. There are limited subsidies for energy saving activities in abroad, so conducting comprehensive energy savings via the Financing Programme for JCM Model Projects in their plants are appropriate as energy saving activities above mentioned. Most of them are minor business companies, so it would be considered energy saving not only for the each company but also for the industrial estate comprehensively.

In response to the above comments, we had discussions with H company that provide management service of wastewater and waste in the industrial estate. We need considerations of project management way of potential sites in the future.

2. Waste management sector

(1) Summary of the study

Following studies were implemented based on the results from previous feasibility study in fiscal last year 2014: 1) Study and elaboration on developing JCM project at waste incineration plant, 2) Study on actual situation of landfill site/system of collecting waste/administration and regulations in Thailand, 3) Elaboration on waste management JCM project at residential district of Royal Thai Air Force. Policy dialogues were held with participated by DOE, FPO, experts from Yokohama city and companies in Yokohama and site visits for waste management facilities were also conducted.

(2) Schedule of the study

(a) Policy dialogues

Policy dialogues regarding waste management were implemented several times based on the inter-city cooperation between BMA and Yokohama city according to following schedule.

Table 2-4 Schedule of policy dialogues regarding waste management

Date	Venue	Participants	Contents
7/15 9:00-10:00	BMA 2	DOE, Yokohama city, JFE Engineering, M company, OECC	Experience/knowledge of Yokohama regarding Waste to Energy measure was shared. Advanced technologies of waste management were also introduced by Japanese companies.
9/29 11:00-11:30	BMA 2	DOE, Yokohama city, JFE Engineering, OECC	Study on incineration plant being constructed (Phase 1 project) was conducted and procedure for further elaboration was discussed.
10/27 11:00-13:00	BMA 2	DOE, Yokohama city, JFE Engineering, M company, OECC	WtE technologies and waste segregation/recycle measures were introduced. Necessity for considering entire waste management including waste segregation and waste incineration.
11/24	BMA 2	DOE, Yokohama city,	Regulation on exhaust gas

10:00-12:30		JFE Engineering, M company, S company, OECC	from waste incineration and disclosure to citizens in Yokohama was introduced. Further study on Incineration plants constructed in Bangkok was conducted as well.
1/19 10:00-12:00	BMA 2	DOE, Yokohama city, JFE Engineering, M company, S company, OECC	Package proposal of waste management measures was explained by Yokohama and relevant companies.

(b) Site visits

Site visits at intermediate treatment facilities, waste land fill site and model district of waste segregation were conducted in order to clarify actual waste management in Bangkok in parallel with the policy dialogues according to following schedule.

Table 2-5 Schedule of site visits regarding waste management

Date	Venue	Participants	Contents
10/30 11:00-13:00	On Nut intermediate treatment facility	Yokohama city, OECC	Study on actual waste treatment in On Nut intermediate treatment facilities was conducted.
11/23 13:00-15:30	On Nut intermediate treatment facility	Yokohama city, M company, S company, OECC	Additional study on facilities not observed in previous study was conducted. (Separation and composting etc.)
11/25 15:00-16:30	Panomsarakham landfill site	Yokohama city, M company, S company, OECC	Study on situation of Panomsarakham landfill site and power generation by methane were conducted.
1/18 13:00-15:00	Suan Luan district	Yokohama city, M company, S company, OECC	Study on waste segregation activity at Suan Luan district was conducted.

1/19 15:30-16:30	Chatuchack district	Yokohama city, M company, S company, OECC	Study on waste segregation activity and a base of waste collection trucks at Chatuchack district was conducted.

(3) Study and elaboration on developing JCM project at waste incineration plant

(a) Overview of the study

BMA is considering and implementing measures regarding waste segregation/recycle forward its utilization and construction of waste incineration plant with aiming to reduce waste emission and landfilling which became serious issue recently in Bangkok. In this study, existing measures considered by BMA were investigated and knowledge/experiences of Yokohama city and companies in Yokohama regarding waste management were shared with BMA. Finally it was also discussed to refer draft proposal introduced by Japanese side in measures of BMA.

(b) Results of the study

(i) Situation on implementation of constructing waste incineration plant in Bangkok

At present, general waste and industrial waste are not distinguished in Bangkok and wastes emitted from households and business places are collected and treated by BMA under its direct administration. Amount of waste emission is approximately 10,000 ton/day and firstly are gathered at 3 intermediate treatment facilities and part of the waste are composted or are formed as Refuse-Derived Fuel (RDF) but most part of the waste are reshipped in large trucks and transported to 2 landfill sites out of Bangkok. Remaining of the landfill site counted until 2020 but it is not regarded enough capacity against increasing waste and limit of the capacity are pointed out recently.

Prayuth administration inaugurated in 2014 declares to enforce measures regarding waste issues as one of 11 priority matters, so local governments such as BMA are required to implement concrete measures. From this circumstances, BMA changed existing policy direction and proceeding constructing new waste incineration plant but it seems that it will take certain time until the completion. Therefore, BMA intends to achieve waste reduction through waste segregation and enforcing function of intermediate treatment facility as preliminary step.

According to the “BMA Solid Management Plan2015-2019” which planned by BMA, it is aiming to achieve 7 % reduction of waste emission from households by 2019 through

full implementation of waste segregation and installment of waste segregation facility. In addition, as long-term target, it is aimed to reduce waste in half by installing new incineration plants. (*Information based on hearing study with DOE)

Following figure shows simple image of waste reduction plan of BMA.

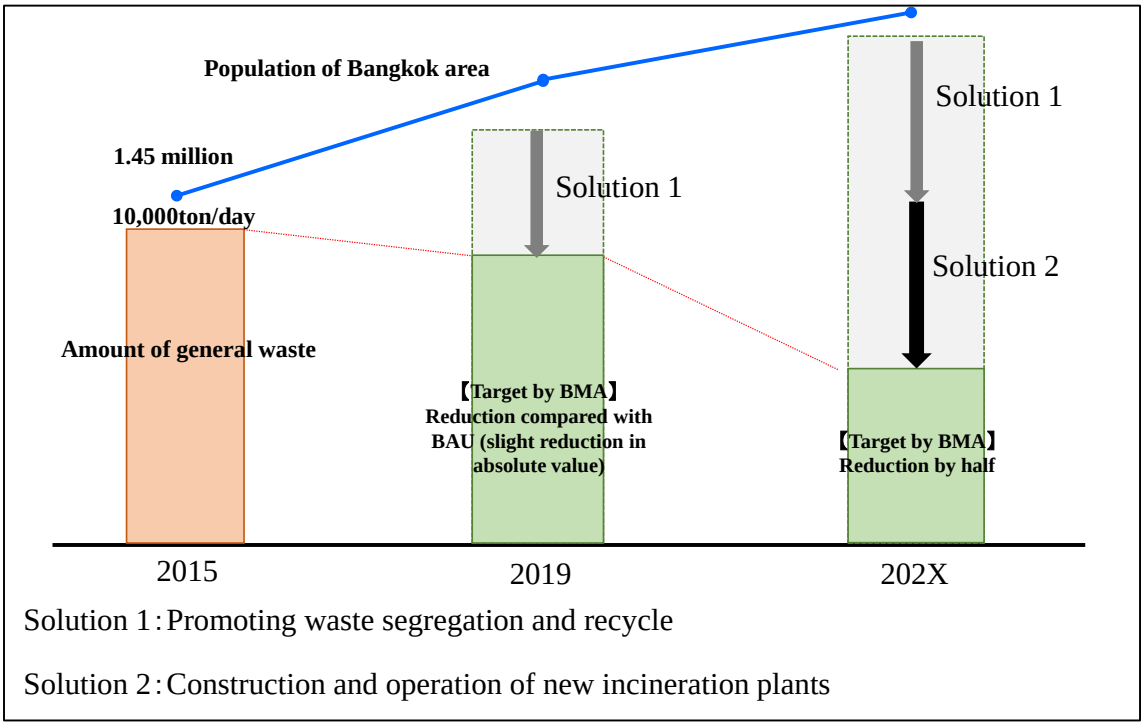
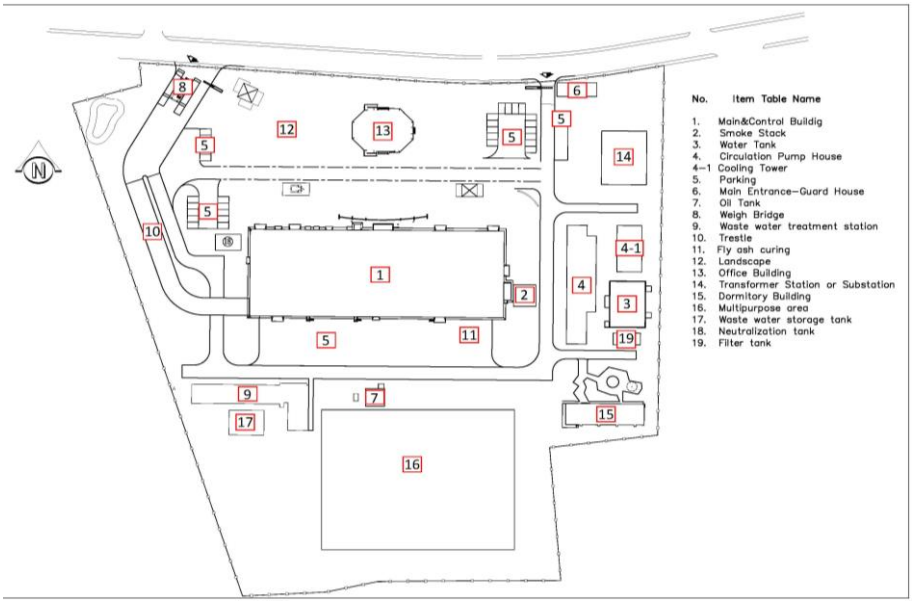


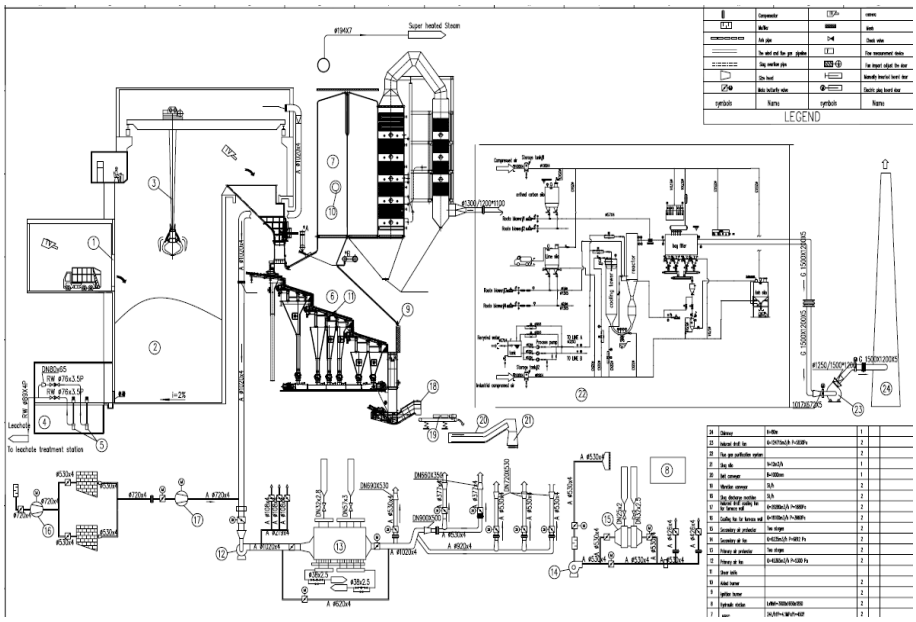
Figure 2-3 Image of waste reduction plan of BMA

Regarding construction of new waste incineration plants, it is planned to proceed "phase 1 project" and "phase 2 project" in 2 steps. Phase 1 was contracted by Chinese company and the construction had been completed in 2015 and it is expected to start trial operation from 2016.

Expected specification of phase 1 project is as following:

Venue	Site of Nongkham intermediate treatment facility
Operation	Trial operation from 2016
Treatment capacity	Input: 300 ton/day
Power generation capacity	8MW (over 5MW power generation capacity is required in the specification)
Constructing cost	9600 million BHT (Utilizing private investment)
Operating	Tipping fee for waste treatment: 970BHT/ton (BMA pays to the

Cost	operator) BMA obtain revenue from selling electricity to the grid.
Contract & Operating period	Contract period: 20 years After 20 years contract, it is defined that the facility will become BMA's property.
Specification for bidding	Disclosed on the internet but only in Thai language. (Foreign companies generally translate it by themselves)
Drawing of completed facility	
Layout of the site	

System chart	

Also specification of the phase 2 project may be elaborated with considering situation of operating the phase 1 project and analyzation. Expected treating capacity is 2,000 ton/day and expected GHG reduction can be calculated as following.

(tCO2e/year)

GHG reduction	**609,128**
Reference emission of GHG	**1,011,610**
CH4 emission from landfill sites	535,450
CO2 emission from power plants	476,160
Project emission of GHG	**402,482**
CO2 emission from incineration	350,898
N2O emission from incineration	26,322
CO2 emission from facilities in the plant	23,808
CO2 emission from combustion assistant fuel	1,454

【Calculation conditions】

Input of waste: Municipal Solid Waste (MSW)

Treating capacity: 2,000 ton/day

Power generating capacity: 40 MW

Operating days: 310 days/year

* Other conditions are set as same as the waste to energy project in Yangon city implemented by JFE Engineering.

(ii) Construction of common understanding through knowledge/experience sharing by Yokohama city and relevant companies

It is necessary to establish standards regarding safety, environmental performance, energy efficiency and durability for construction of waste incineration plant. In the policy dialogues, cases of Yokohama were explained and construction of common understanding over waste management by local government and concept for installing incineration plant was attempted.

Specifically, regulation on exhaust gas from waste incineration and disclosure to citizens in Yokohama was introduced as shown in following table.

Table 2-6 Regulation values and target values of exhaust gas at Kanazawa incineration plant

Item	Unit	Target value	Regulation value※
Dust	g/m^3	0.01	0.04
Hydrogen chloride (HCl)	ppm	15	26
Sulfur oxide (SOx)	ppm	15	319
Nitrogen oxide(NOx)	ppm	30	50
Dioxins (DXNs)	$ng\text{-}TEQ/m^3$	-	0.1

※Values of Dusts, HCL, NOx defined by "横浜市生活環境の保全等に関する条例"
Values of Sox defined by "大気汚染防止法" *Converted from K value
Values of DXNs defined for Kanazawa plant under "ダイオキシン類対策特別措置法"

平成27年度 ごみ焼却工場ダイオキシン類調査結果

ごみ焼却工場の排出ガス、ばいじん処理物、焼却灰、排水処理施設処理水、排水処理汚泥、汚水系公共下水排出水及び雨水系公共用水域排出水のダイオキシン類濃度は、いずれも法に基づく排出基準値及び処理基準値を下回りました。また、工場敷地内土壌のダイオキシン類濃度についても、環境基準値を下回りました。

毒性等価係数はWHO-TEF(2006)を使用し、毒性等量を計算する場合は定量下限未満の数値は「0」として計算しています。

1 排出ガス調査結果　2 ばいじん処理物調査結果　3 焼却灰調査結果　4 排水処理施設処理水調査結果
5 排水処理汚泥調査結果　6 土壌調査結果　7 汚水系公共下水排出水調査結果　8 雨水系公共用水域排出水調査結果

1 排出ガス調査結果

排出ガス中のダイオキシン類濃度範囲は 0.00000048 ～ 0.050 ng-TEQ/m^{3}Nで、法に基づく排出基準値 1 ng-TEQ/m^{3}N(金沢工場は 0.1 ng-TEQ/m^{3}N)を下回りました。

(単位:ng-TEQ/m3N)

工場名	号炉	平成27年度	
		採取日	測定結果
保土ケ谷	1	通年稼動停止	—
	2	通年稼動停止	—
	3	通年稼動停止	—
都筑	1	5/25	0.0042
	2	整備中	—
	3	7/31	0.050
鶴見	1	6/1	0.000014
	2	6/29	0.00028
	3	8/27	0.000013
旭	1	6/16	0.0020
	2	7/30	0.0062
	3	9/15	0.00079
	1	8/3	0.000048

Figure 2-4 Disclosure of measurement on the website (Dioxins) [14]

(iii) Further consideration and procedure

BMA has just started trial operation of the phase 1 project recently, so specifications of the phase 2 project is still under consideration. Under this circumstances, it was requested by DOE in the policy dialogues for JEE Engineering and Yokohama city to conduct study and analyzation on implementation of the phase 1 project and also preparing proposal for the phase 2 project.

It is expected that the phase 2 project will be launched at earliest after 2017 after finalization of the specifications. It is considered that it is effective to continue long term discussion and proposition in order to proceed JCM project development with the phase 2 project.

In addition, as results of studying entire waste management policy and its implementation in Bangkok, it was clarified that BMA is considering comprehensively waste management policy including waste segregation, recycle and incineration for the purpose of total waste reduction. For example, from the view of enforcing functions of intermediate facility, it is expected to consider most effective measures by installing material recovery facility and incineration plant. Therefore, it is considered that it can

[14] Resources&Wastes Circulation Bureau on results of dioxin emission facts from waste incineration plants(Japanese only)
(http://www.city.yokohama.lg.jp/shigen/sub-data/data/tyosa/dxns/20160104152818.html)

be more successful to make packaged proposal considering entire waste management based on the inter-city cooperation between Bangkok and Yokohama in order to increase possibility of installing the facility by relevant company.

Specifically, it is expected to elaborate a packaged project proposal of incineration process and segregation process as shown in following figure. This packaged project proposal was already introduced to BMA in the policy dialogue and it is planned to proceed further elaboration of detail in following study.

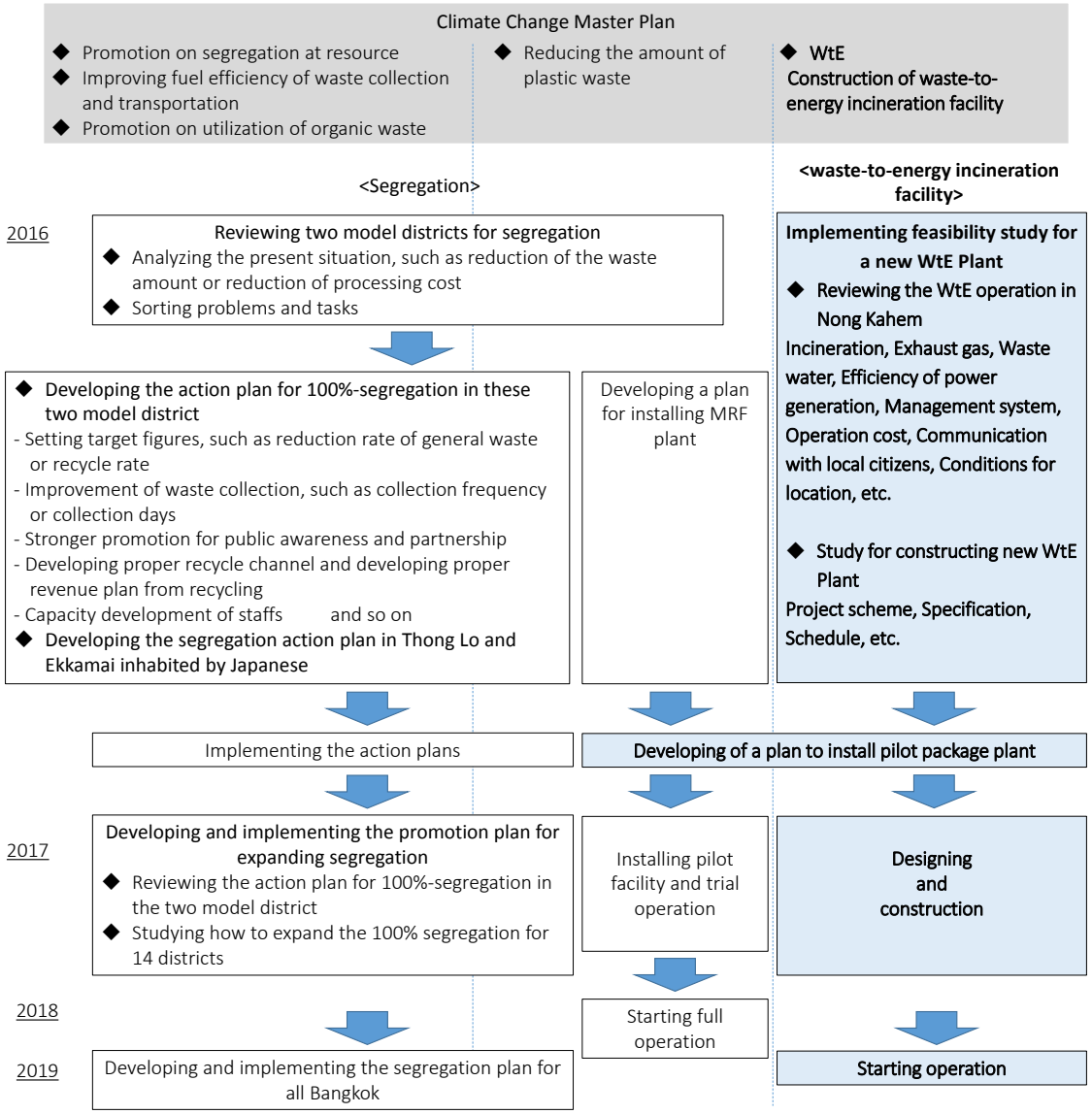


Figure 2-5 Proposal for packaged project of waste management（Draft roadmap）

(4) Study on actual situation of landfill site, waste collecting system and administration/regulations in Thailand.

Visited at the large commercial facilities: "G facility" and "I facility" in Bangkok and conducted study on waste management process.

Collected waste from each floors are gathered in backyard and simplified segregation are done by manual work in G facility. Dust boxes are set at each floors and calling for waste segregation but various wastes are mixed in actual and re-segregated for plastic, paper, can, glass, metals etc. in backyard. Segregated plastic, paper, can, glass, metals are collected by BMA and transferred to 3 intermediate treating facilities[15] at Saimai, Nongkham and On nut. Transferred wastes are separated in general waste, hazard waste, recyclable waste, etc. and transferred to 2 landfill sites located in neighboring provinces.

Organic waste are put in 2 volume reduction and solidification facilities in backyard (Figure 2-5). Capacity of each facility is 15 ton. Purpose of the facility is to dehydrate organic waste which are high moisture waste. These are products of a Japanese company.

Figure 2-6 Volume reduction and solidification facility for temporary storage of organic waste

Treated waste are collected by BMA and transferred to landfill sites.

Studied on an intermediate treatment facility at Saimai area which was constructed by a Japanese company as per request from BMA (Figure 2-7). As previously mentioned, the waste are collected from G facility and some parts of waste are took by waste pickers to be sold/recycled before entering the intermediate treatment facility. At the intermediate facility, some recyclable or valuable wastes are segregated and remains are treated by compactor and loaded in containers. Finally, container trucks transfer the

[15] The treatment process is done by Mechanical-biological waste treatment.

wastes to the landfill site located 40km away.

Figure 2-7 Intermediate treatment facility at Saimai

At present, there are only 2 waste incineration plants officially at Phuket and Samui in Thailand excluding small scale incinerator for hazard waste. There is no waste incineration plant in and around Bangkok and most of waste are landfilled.

According to recent statics, annual total waste generated in urban areas is 15 million ton and 600 g/day, person. It is higher especially in Bangkok which is biggest city in Thai, so average is 1,000g/day, person. From collected waste, 20% are recycled. Also, 7 million ton of waste are illegally dumped per year.

(5) Elaboration on waste management JCM project at residential district of Royal Thai Air Force

(a) Summary of the study

Finetech Co., Ltd. participated "Second low carbon technology mission" of the feasibility study in last fiscal year during 27th January to 30th January. Meeting with a unit of Royal Thai Air Force (RTAF) in charge of environment and renewable energy was held at Don Mueang air base with cooperation of P company who is a partner company of this study in Thailand in order to obtain beneficial information for JCM project development and needs from Thai side.

Mr. Surasak Meemanee vice-admiral who is top officer of administrative office of the base and other members in charge of introducing renewable energy participated the meeting. Technology of recycling unused biomass based on JCM scheme was explained discussed. RTAF requested proposal of functionally-distributed facility which can treat organic waste at emission source emitted from 5,000 households in residential area 5 ton/day.

Considering the above facts, Finetech Co., Ltd. elaborated a proposal of recycling treatment with using mainly "Torrefaction" technology of Finetech Co., Ltd..

Figure 2-8 Meeting with RTAF members

Participated members from RTAF teamed up as section of promoting introduction of renewable energy in the base with Mr. Surasak Meemanee vice-admiral as a leader of the team.

There is educational facility of displaying renewable energy technologies in the base. Meanwhile, Finetech Co., Ltd. explained concept of "Smart Green Park" [16]as per request by Mr. Surasak Meemanee and RTAF members showed strong interest on this.

Figure 2-9 Interactive educational facility of renewable energy

[16] Smart Green Park (Registered trademark of Finetech Co., Ltd.): Show case site of community aiming to operating in off-grid as much as possible by managing it with monitoring/control functions utilizing renewable energy and relevant technology developed by Finetech Co., Ltd.

Figure 2-10 "Smart Green Park"

Renewable energy and biomass energy technology developed in "Smart Green Park" enable stable operation of facilities associating with grid power by monitoring/control with SCADA control technology. Specifically, "Smart Green Park" has following power generation facilities: 1) Mega PV plant, 2) Waste-to-Energy plant using residue of coffee (biomass gas power generation), 3) Torrefaction: Converting unused biomass including organic waste to fuel, Other: Floating PV plant, small hydrogen power plant, small wind power plant.

According to discussion with RTAF members, problem of rise in population and urbanization with economic development is becoming apparent in Thailand. Infrastructure development and environmental measures can't keep up with the problems and expanding. Specifically, waste management problem is serious in Bangkok and its surrounding area with 900 million population with approximately 10,000 ton waste emission per day. It is important to improve waste management in emission resources and reduce waste brought to waste treatment facility especially at place like residential area of the air force where management system is well arranged.

Measures described above are equally important in industrial parks locating around Bangkok because of following reasons: 1) For energy infrastructure, it is indispensable to construct self-contained distributed electricity system in sole industrial park. 2) Technology/idea of recycle emitted waste and reusing it as energy is really important in view of effective utilization of limited land. 3) It is possible to proceed horizontal development of this model to ASEAN area started from this activity. It was also commented that it is desirable to place the project of JCM scheme in "Smart Green Park".

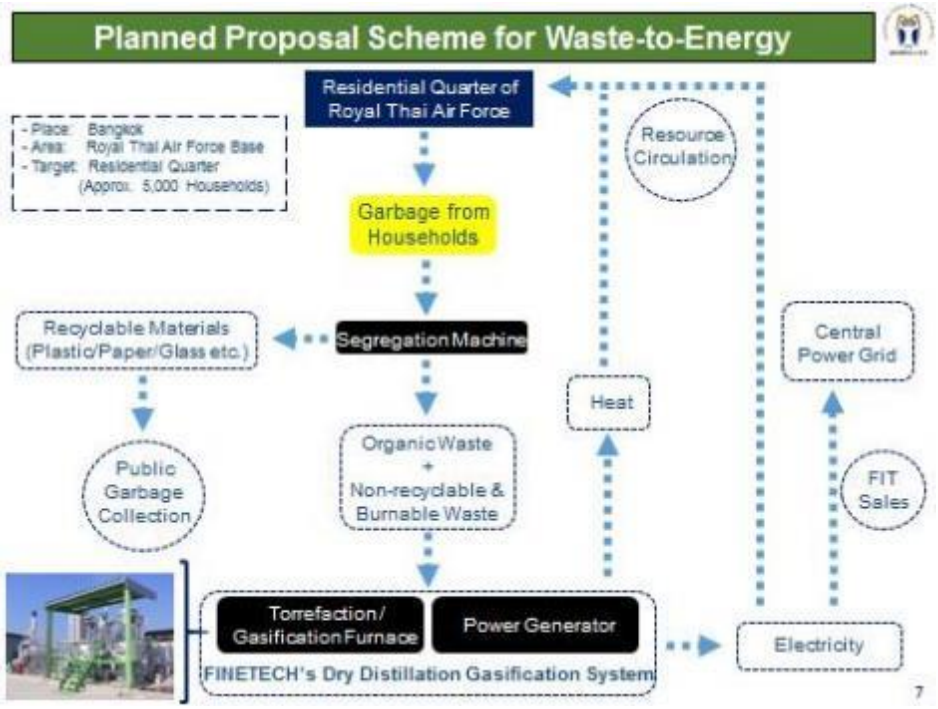


Figure 2-11 Proposed process of recycle/power generation of facility

(b) Results of the study

As described above, discussion between Finetech and RTAF conducted and the recycling/power generation system of various unused biomass was proposed to RTAF as a possible JCM project development by this study. The project expected to manufacture biomass fuel alternative to fossil fuel from organic waste emitted by residential area of the air force and reusing with gasification power generation. (Figure 2-10)

Both Fintech and RTAF intend to continue discussion on this project. It is expected that introduction of the technology through this study contributes to raise practical level of independent environmental measures and pushing sustainable development in Thailand.

Based on the meetings and site visits, examination of manufacturing biomass fuel was conducted using sample of organic waste emitted from the residential area at Fintech plant in Japan. Continuing negotiation and arrangement with RTAF will be proceeded based on results of the examination.

(i) Schedule for project development

It is necessary to prepare basic design for collaborating units for treating waste from residential area and conduct pilot project for actual project development with considering result from the examination on single unit. It is also necessary to obtain permission from central/local government for constructing power generation plant. Therefore it will take

about 1 year for preparation before the construction and will take about 2 years until its completion.

(ii) Amount of CO2 reduction and cost performance

Capacity of xxx system is 5 to 6 time larger than PV power generation system. Estimating average annual electricity consumption from a household in RTAF is 1,800kWh[17] and its total is 9 million kWh, it is expected that the facility to be installed may be capacity of 500kW to 1 MW. CO2 reduction is expected to be 4000 to 5000 CO2/year with the emission factor 0.554 t-CO2/MWh [18] provided by TGO. Cost performance for CO2 reduction can be calculated under ¥10,000/t-CO2.

(iii) Issues for JCM project development

It is necessary to harmonize with various measures against urbanization problems under expansion of economy in Thailand for the project development especially collaboration with other waste management measures. Reduction of waste brought to landfill site is shown as a higher vision by Thai government. Both material and thermal recycle will be implemented under this vision. RTAF basically agrees with proposed technologies and system but it is necessary to discuss with relevant stakeholders. According to the mention by RTAF, issues relating with xxx is complicated and it is firstly necessary to discuss with relevant administration about institutional structure for the project implementation.

[17] Reference: National Statistic Office of Thailand
[18] Reference: the emission factor for the CDM project, reported by TGO

3. Waste Water Treatment Sector

(1) Summary of the study

We conducted policy dialogues and on-site visits with experts of Yokohama city, Japanese company which have low carbon technology, and DDS which takes responsibility of waste water management in Bangkok. The purpose of this study was introducing waste water management equipment and facilities to waste water treatment plants that cover several communities and plants for local community in Bangkok.

(2) Schedule of the study

(a) Conducing policy dialogues

We conducted several policy dialogues based on the partnership between Yokohama and Bangkok. The composition of dialogue is technical experts from Yokohama city and private companies, and OECC as Japanese side, on the other hand officials form DDS and FPO as Thai side. The meeting schedule is shown in Table 2-7.

Table 2-7 Schedule of policy dialogues in the waste water sector

Date	Place	Participants	Contents
Sep. 29th 10:00~10:30	2nd floor, room1, DDS	DOE, OECC	-The draft agenda and preparation for the next dialogue was explained to BMA officials and discussed with them.
Oct. 29th 13:30~15:30	2nd floor, room1, DDS	DDS, FPO, Yokohama city, OECC	-Water quality management and funding policy/system of the waste water management in BMA were explained to the Japanese sides. -Wastewater treatment in the City of Yokohama was introduced to BMA. -It was discussed that how to implement the JCM projects and apply the Financing Programme for JCM Model Projects for the wastewater management equipment/services in Bangkok.

Nov. 24th 12:30~15:30	2nd floor, room1, DDS	DDS, FPO, Yokohama city, OECC	-OECC explained about outline of the JCM scheme such as scope of project, process of application, size of subsidy etc. -DDS explained about overview of 12 "Community WWTPs" in Bangkok. -In order to find potential JCM project in Community WWTPs, DDS will study the GHG reduction potential in there and continue information sharing of JCM scheme with OECC by Email until next policy dialogue in January. - Yokohama city explained about their sewerage system focusing on budgetary arrangement, charge collection system and measures for cost reductions etc.
Jan. 20th 13:30~15:30	2nd floor, room1, DDS	DDS, FPO, Yokohama city, OECC, UBA, AMCON	-DDS introduced wastewater treatment plants which have feasible plans for replacement of facilities. - Received there explanation, the feasibility study for replacements of facilities were discussed at the meeting.

(b) On-site visits

In parallel, we visited several scale of wastewater management plants in Bangkok to understand current situation of these plants and its operation. The visiting schedule is shown as follows.

Table 2-8 Schedule of on-site visits in the waste water sector

Date	Place	Participants	Contents
10/28	Bang Sue	DDS, Yokohama	-GETCo explained about

13:30~15:00	Environmental Education and Conservation Center	city, OECC, Global Environmental Technology Co.,Ltd (GETCo)	the overview of the Bang Sue environmental education and conservation center. - It was asked about the capacity and coverage of the Bang Sue facility, technique and system of the facility, contract process for operator from Japanese side.
11/26 9:00~12:00	Community WWTP : Thung Song Hong, Lak Si	DDS, Yokohama city, OECC	- We visited to Tung Song Hong2 WWTPs, and studyed the process of wastewater treatment with “activated sludge”. - We visited to Tung Song Hong1 WWTPs, and studyed the process of wastewater treatment with “aerated lagoon” process.
1/19 13:00~13:40	Dindaeng Water Environment Control Plant	DDS, Yokohama city, OECC, UBA, V company	-We visited to Dindaeng Water Environment Control Plant, owned by BMA and operated by UBA, and studyed the feasibility of developing JCM projects.
1/19 14:00~14:40	Community WWTP : Huay Khwang	DDS, Yokohama city, OECC, V company	-We visited to Huay Khwang, owned and operated by BMA, and studyed the feasibility of developing JCM projects.

(c) Outcomes of the study

We surveyed feasibility of developing JCM project for wastewater treatment plants via policy dialogues with Yokohama city and DDS and visiting of wastewater treatment plants. BMS owns 8 large scale plants of wastewater treatment that covers several

communities. 6 plants of them are operated by private companies with 5 year contract and remains are operated by BMA. On the other hand, BMA also owns and operates 12 small scale plants of community waste water treatment, called Community WWTs.

We founded that the plants of Community WWTs needs replacements of equipment because of its age: most of them were built 20~30 years ago on average. DDS reported that they are intended to sign a MOU with Japanese companies N and M, to conduct JCM feasibility study: replacement of old equipment/facilities to Rom Kla Community WWT, which have been implemented by METI Japan. For remains community, they would like to replacement of old equipment via using other subsidy program including the Financing Programme for JCM Model Projects. Table 2-9 shows 8 large scale plants of wastewater treatment and Table 2-10 shows 12 Community WWTs in Bangkok[19].

Table 2-9 8 large scale plants of wastewater treatment
(* visited plants)

large scale plants of wastewater	Served Population (person)	Process Treatment	Flow Design (m3/day)
Si Phraya	120,000	Contact Stabilization A.S.	30,000
Rattanakosin	70,000	Two Stage A.S.	40,000
Din Daeng*	1,080,000	A.S.	350,000
Chong Non Si	580,000	Cyclic A.S.	200,000
Nong Khaem	520,000	Vertical Loop Reactor A.S.	157,000
Thung Khru	177,000	Vertical Loop Reactor A.S.	65,000
Cha Tu Cchak	432,000	Cyclic A.S.	150,000
Bang Sue*	223,990	Step Feed A.S.	120,000

Table 2-10 12 Community WWTs owned/operated by BMA
(* visited plants)

Community WWTs	Served Population (person)	Process Treatment	Flow Design (m3/day)
Bang Na	8,280	Oxidation ditch	1,300
Hua Mark	9,940	Stabilization Pond	2,000
Bon Kai	2,200	Extended AS	400

[19] Reference: Policy dialogue documents provided by DDS

Klong Chan	36,000	Activated Sludge	6,500
Klong Toey	7,200	Completely mixed AS	1,200
Rom Kla	19,000	Extended AS	3,800
Bang Bua	8,000	Pump to Chatuchak WWTP	1,200
Huay Kwang*	16,800	Conventional AS	2,400
Ram Indra	4,060	Extended AS	800
Tung Song Hong1*	15,000	Aerated Lagoon	3,000
Tung Song Hong2*	5,500	Activated Sludge	1,100
Tha Sai	8,280	Oxidation ditch	1,300

If these old equipment will replaced via the Financing Programme for JCM Model Projects, long term monitoring during life period will be needed. Considering avobe, DDS commented that if new equipment will be installed to the plants via the Financial Programme, it would be better for the plants which are owned and operated by BMA. In the above case, the Thai partner of international consortium would be BMA, and then we should consider the issue of the value oriented public bidding, as we mentioned in the energy saving study. The low carbon equipment is not appropriate for the price-oriented public bidding, because of its higher price compared to usual one.

One the other hand, when we install equipment to plants operated by private companies, BMA will contract with a private company with a condition of the provision: installed equipment via the JCM scheme do not allow to replace during its life period, thus we are able to monitor the installed equipment during its life period. In this case installation of equipment should be same time as contract renewal. In the above case, we will able to make a B to B contract with BMA's permission, thus we avoid the step of public building. And the Thai partner of the international consortium should be BMA as owner of plants and the private company as operator of plants.

To promote JCM projects development, we need some solutions to avoid value oriented bidding to install equipment for the public operated plants. On the other hand, for the private operated plants, we need some candidate sites that have renewable plans of equipment. In addition to the above findings, BMA requested developing update scheme of two old public plants via the discussions and technological sharing from experts of Yokohama city and companies. Moreover BMA and Private companies in Thai have a high interest to the dehydrator of A company, and they had business discussion to install

the machine.

We need extra studies and discussions about installing sites and technologies to realize the plans that had been discussed at this feasibility study. Concerning the above, implementing the feasibility study in next fiscal year for its realization is under way.

III. Identification of candidates to form JCM projects

1. Summary of the study

We have taken studies for JCM projects candidates that were developed in the feasibility study in last fiscal year 2014 for its realization. In addition, we conducted the Low Carbon Technology seminar and Matchmaking session, and provided opportunities to share the information of the JCM project development among both Japanese and Thai concerned parties which have high interest for the project development. As preparation for the above-described Low Carbon Technology seminar and Matchmaking, we carried out studies of hearing and questionnaire to all concerned parties, and collected necessary data and information including specs and standards of the target technologies, expected amount of reduction and bugged plans etc. Based for the collected information, we conducted the matchmaking effectively.

We identified and listed up highly feasible candidates of developing JCM projects via implementation of the Low Carbon Technology seminar and Matchmaking, and took follow-up studies for developing the funding scheme, reduction cost, implementation structure and schedule for implementation.

We set a schedule for two projects among above projects: "Program approach" for building energy efficiency at a large hotel group by introducing BEMS[20] system, and Hybrid roof-top PV system implementation project for applying the Financing Programme for JCM Model Projects in the next fiscal year which is temporally scheduled at the middle April. Moreover, we examined settings of baseline and reference scenarios and developed proposals of MRV schemes, etc. to prepare for the application.

In addition to the above operations, we visited to some companies that have high potential for installing low carbon facilities and equipment such as U-PCL, and give an explanation of the JCM and the Financing Programme for JCM Model Projects for them, and studied their needs via hearing.

The last study in January, we had a meeting with TGO which is the JCM secretariat of Thailand, and presented JCM project candidates that were identified from the feasibility study this year and give an explanation of tentative schedule for projects development in near future. During the meeting, TGO commented that cooperating with Yokohama city, they are able to conduct public awareness activities, such as conducting matchmaking with Japanese company, and dispatch information of the JCM toward Thai. In particular, TGO expected to continues information sharing from Japanese side, so that they are able to support for the early realization of B to B JCM projects.

[20] BEMS: The system of management energy usage in the buildings to cut down energy consumption by managing the operations of equipment.

2. Outcomes of the study

(1) Summary of JCM project candidates that have high feasibility for its implication

We found the four JCM projects candidates with high feasibility for its implication via implementation of the Low Carbon Technology seminar and Matchmaking, and have considered its realization for each project. The outlie of each project are shown in the list below: table 3-1. Especially, we set a schedule of applying for the Financing Programme for JCM Model Projects in the next fiscal year in two projects among the list : "Program approach" for building energy efficiency at a large hotel group and Hybrid roof-top PV system implementation project.

Table 3-1 JCM projects plans that have high possibility for its implication

Title	"Program approach" for building energy efficiency at a large hotel group	Program approach" for building energy efficiency at hospitals group	Project development of west to energy for waste disposal of public facilities	Hybrid roof-top PV system implementation project	Introducing high efficiency equipment, sludge hydrate etc., for the waste water treatment facilities in Bangkok.
Thai Participants	E group	A group	RTAF	T company	The waste water treatment facilities in Bangkok.
Japanese Participants	P company, A company	A company	Finetech Co., Ltd.	Finetech Co., Ltd.	V company
Facilities /technologies	High-efficient chiller, VWV control of pumps, LED lighting	Chiller, Boiler etc	PV system with demand control, EMS system	PV panel, Power Control System, Energy Management System	Sludge hydrate etc.

Expected CO2 reduction (t-CO2/year)	Around 2,000	3,000 t-CO2/year	4000~5000	2,000	TBC
Schedule of the meetings	-Installing equipment and formulating the international consortium were considered at the third and fourth study. -Energy study was conducted and some potentials for energy reduction were founded. -Necessary procedure and documents for applying next the Financing Programme for JCM Model Projects and the schedule for preparation were calcified at the sixth study.	-The project outline was explained to the contact person of the P hospital at the fourth study. ・The project outline was explained to the CEO of the 5th sub-group and got a green light for implementation at the fifth study. -Scheduling and the preparation for the energy study were started by A company.	-Project development have been under consideration continually since the last fiscal study. -The details are shown at chapter Ⅱ.2.(5).	-Proposed site and installing equipment were considered between Finetech and T company from October. -Necessary procedure and documents for applying next the Financing Programme for JCM Model Projects and the schedule for preparation were calcified from January. -Consultation for the GEC was done in the middle of March.	- We founded out the needs of replacement of facilities, screws and belt-press, in the 6th study. -DDS and private management companies had interest to the sludge hydrate system of V company. -We need extra considerations for financial support to the replacement.

・Consultation for the GEC was done.				

(2) “Program approach for building energy efficiency” and program support scheme with private finance

(a) Summary of the Project

The E group PLC is a property developer, and they develop luxury hotels, office buildings and shopping center in the central area of Bangkok. This project aims to reduce energy usage and CO2 emission of 5 hotels that belongs to E group via installing high efficiency equipment, such as inverter, chiller and LED etc.

The energy survey for the above buildings have already done, and prospected CO2 reduction is 2,058t-CO2/year in 5 hotels, yet each building have few amount of CO2 reduction. Cost for reduction would be 3,800 yen/t-CO2 with 15 years and per 50% subsidy and 2,300 yen/t-CO2 with15 years and per 30% subsidy. It is considered that conducting comprehensive energy management including energy shifting at all buildings by network system in the future.

(b) Project Structure

International consortium member is P LTD. as a representative of this project, A company as ESCO company, InterAct as support for drafting JCM metrology and E group as Thai partner. Some companies in Yokohama city are expected for providing equipment.

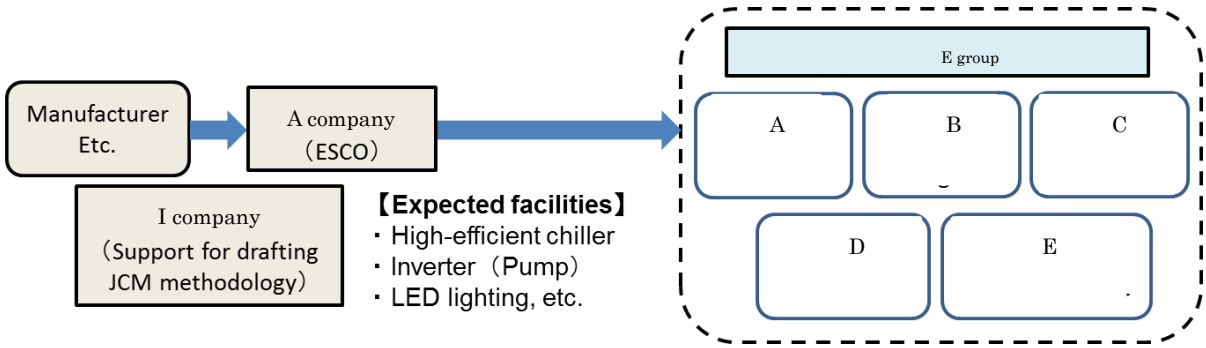


Figure 3-1 Project structure: “Program approach for building energy efficiency” and program support scheme with private finance

(c) Development of Proposals of MRV methodology

A MRV methodology (proposal) and PDD for the project were prepared, and the outline of them are presented in Appendix 2.

(3) Roof-top PV System with Demand Control Implementation Project

(a) Project contents

T Ltd is one of the paint giant in Thailand which manufactures paints for automobiles and vessels, and the company leads the ASEAN painting industry.

In addition, T Ltd. has built up significant achievements for the core projects including industry estates, mineral oil refineries, petrochemical plants, power-generating plants and cement plants etc.

They have large scale paint factories in the industry estate which goes 3KM southward from Suvarnabhumi International Airport. Project for installing of hybrid roof-top PV solar system at the factories is already under way. The project has three phases, Gen.1 to Gen.3, and proposed production of electricity is around 4MW in total. Installing the equipment with around 1.5MW of power generation capacity to the plants is scheduled in the first phase.

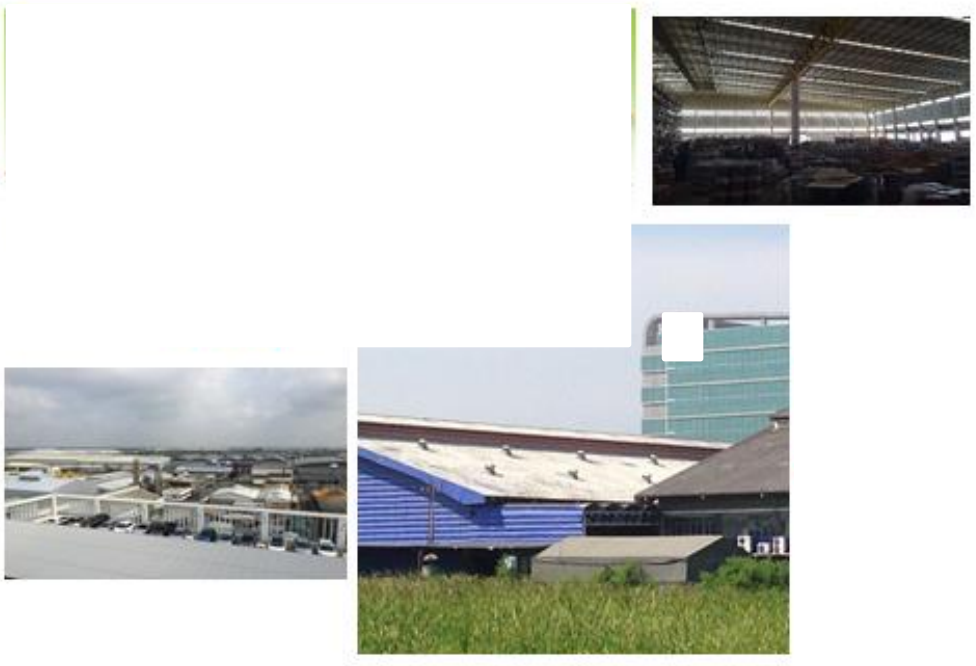


Figure 3-2 T Ltd. factories located near Bangkok

The project installing roof-top PV system with demand control and usage of its generated electricity as an alternative power supply in the factories are proposed as a JCM project through discussions with T Ltd, Fintech, one of the implementing member of this feasibility study, and P Ltd., which is partnering company of Fintech. In addition,

the installing of small wind power generator is under the way. Based on the installation, reducing electricity from existing power supply and its CO2 emission will be archived.

There are painting materials with inflammability and its storages in the factories of T Ltd., so it is reduce the use of firearms in there. Therefore the factories of T Ltd. have electric service vehicles and relatively large terminals for electricity storage.

T Ltd. aims to smart usage of energy in the factories with the linkage of the roof-top PV system, and the installations on the A building and the C building are scheduled at the first stage. Details are refers in Figure 3-3, Figure 3-4, Figure 3-5.

Figure 3-3 Buildings installed PV systems at the first stage

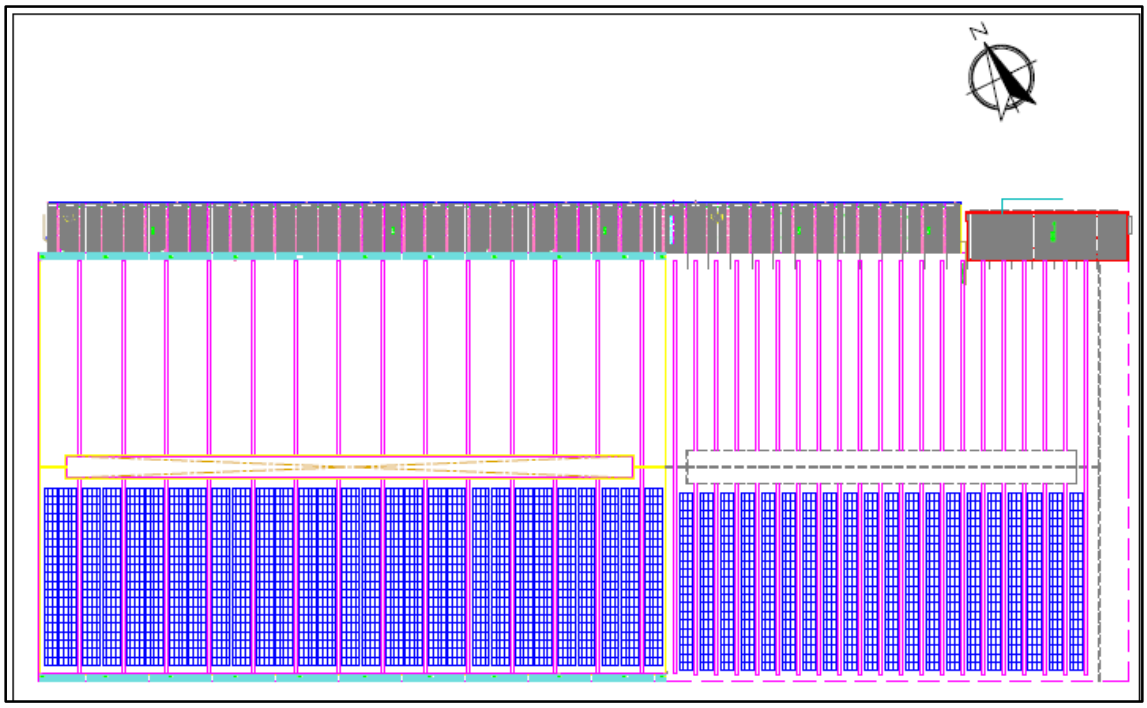


Figure 3-4 Solar panels on the building A

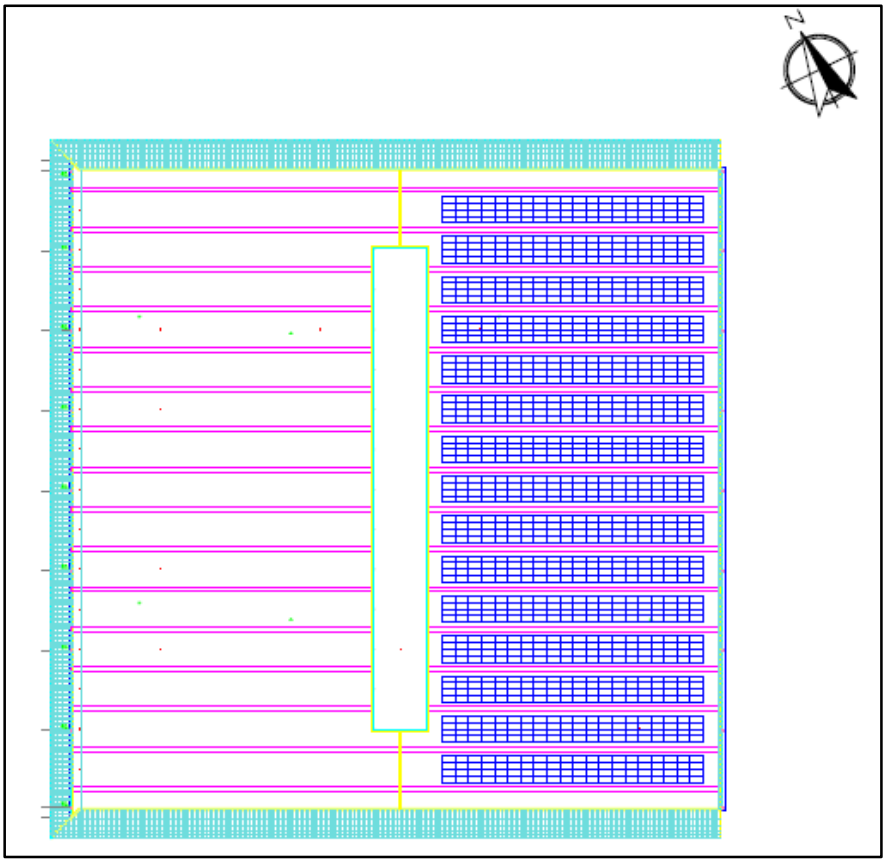


Figure 3-5 Solar panels on the building C

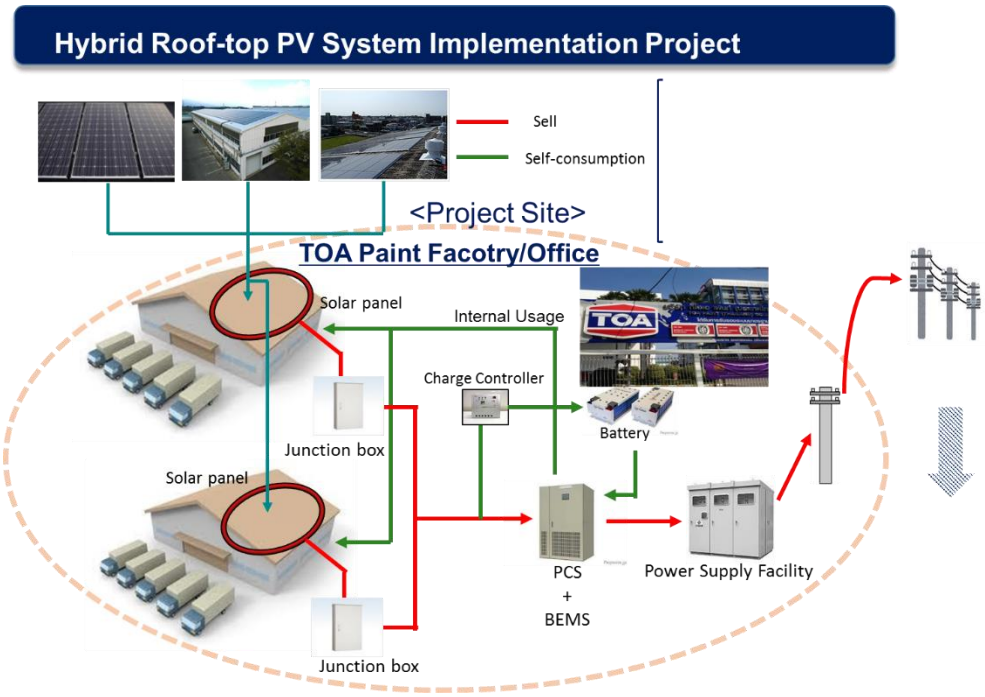


Figure 3-6 Project concept

(b) Project structure

International consortium member is Finetech, take a role of a representative and energy management for this project, T Ltd. and P company, as participants from host country, and installing equipment produced by Y-PORT participating company are considered as well.

(c) Proposed CO2 reduction

Proposed CO2 reduction is shown in the below.

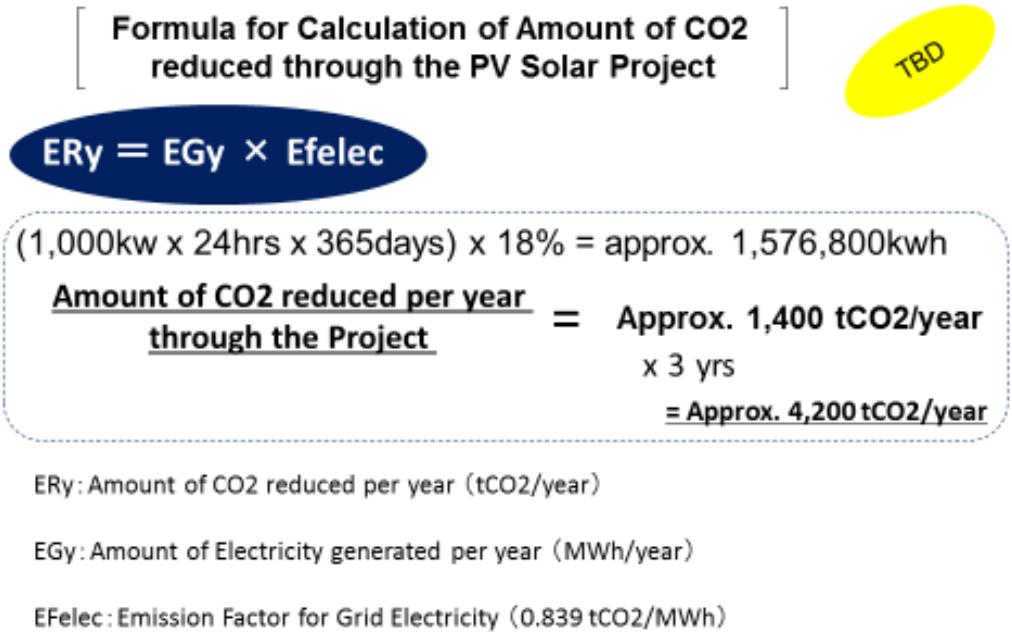


Figure 3-7 Proposed CO2 reduction: Roof-top PV System with Demand Control Implementation

(d) Future project process

Finetehch have already explained the needs of formulating the international consortium and the MRV system to concerned parties for the implementation of the project. In addition, it was explained to T Ltd. that the restriction of reconstruction are applied for the buildings that will be installed PV systems during useful time of the installed equipment.

For the preparation of developing the project, we need additional operations as below:

(i)

Having discussions with concerned parties to prepare the submission of application for the Financing Programme for JCM Model Projects

(ii)

Having discussions to formulate the international consortium with concerned parties, and to prepare the financial support for project implementation with mainly P company.

(iii)

Developments for a solid system in the T Ltd.to implement the project including MRV etc.

IV. Implementation of Low Carbon Technology workshop and Matchmaking session and Study tour in Japan

1. Implementation of Low Carbon Technology workshop and Matchmaking session

(1) Summary of the Low Carbon Technology workshop and Matchmaking session

BMA, the City of Yokohama, and the OECC held the Low Carbon Technology workshop and Matchmaking session at S31 Sukhumvit Hotel from July 13th to 15th. Based on the cooperation between Thai and Japanese concerned parties, promoting JCM projects development was main purposes of this workshop and matchmaking.

Besides, policy dialogues between BMA and Yokohama city in particular sectors and site visits related to the JCM projects were held in parallel.

We conducted presentations of the JCM and the Financing Programme for JCM Model Projects, policy dialogues and site visits during 3 days. Approximately 90 people from BMA, Yokohama city, Japanese companies, Thai Companies, and among others attended the workshop and the session.

Table 4-1 Schedule for the Low Carbon Technology Workshop and Matchmaking session

13th July: Work-Shop/ Business-meeting, G to G meeting

Room1		Room2	
Time	Content	Time	Content
	Work shop	AM	
9:30-9:50	Opening remarks (BMA and		
9:50-	Yokohama City)		
10:00	Photo session (All		
10:00-	participants)		
10:30	Explanation of the JCM, focusing on road-map of JPY2015, organizing an international consortium and		
10:30-	formulating an 'Energy		
11:00	efficiency group alliance'. (OECC)		
11:00-			
11:30	Presenting case study of the JCM project that was conducted in JPY2014 with		

	OECC's support.(OECC) Presenting case study of the professional check focusing on the Energy-Efficiency.(A company)		
11:30- 12:30	**Lunch**	11:30- 12:30	Lunch
12:30- 14:00	**Closed Meeting** (BMA and Yokohama City) Closed Meeting focusing on the ESCO.	**PM**	Match-making session -Promoting exchange of information and ideas through free discussion. Around 10 Japanese organization desks are placed with Thai-Japanese interpreters, and Thai participants are welcome to visit these desks for discussing information in more detail.

14th July: Individual sightseeing

Time	Content
9:00- 11:00	Departure from hotel in Bangkok
11:00- 14:00	Site visit @ Infinit Green, Eastern Seaboard Industrial Estate
14:00- 17:00	Back to the hotel

15th July: Individual Business matching (Thai companies – Japanese companies)

Time	Content
9:00	**Closed Meeting** (BMA and Yokohama City) Closed Meeting focusing on the waste disposal.

(2) List of the participant

As shown in Table 4-2 below, 15 Japanese companies participated in the Low Carbon Technology workshop and Matchmaking session.

Table 4-2 List of Japanese Participants in the Low Carbon Technology workshop and Matchmaking session

Company No.	Field
1	Consulting (Waste-to-Energy, MSW, biomass, biogas project, JCM, CDM)
2	Sludge Treatment / Sludge handling / Wastewater Treatment / Energy Saving
3	Environmental Solution Services and Others
4	(1) Industrial Waste Processing (2) Fluff fuels producing from waste plastics (3) Producing wooden chips for boiler fuels (4) Sales of Solar power system
5	Environment/Water Treatment
6	Green Energy & Resource Recovery Technology
7	Engineering and Construction
8	Air Conditioning Chiller, VRF air conditioning
9	Air Conditioning; Electrical Engineering; Eco-Friendly Solutions; Mechanical & Electrical Engineering Contractor
10	Boiler -Once Through Steam Boiler -Hot Water Heater

11	Financial services
12	Energy Saving　Solution Building Energy Management System (BEMS)(ESCO)
13	Waste to Energy Plant
14	Manufacturing
15	Waste to Energy

(3) Outcomes of the holding of the Low Carbon Technology Workshop and Matchmaking session study tour

Approximately 90 people from BMA, the City of Yokohama, Japanese companies, Thai Companies, among others, attended the meeting. At the beginning of the workshop, Ms. Swanna Jungrungrueng, Deputy Director General, Development of Environment, BMA and Mr. Toru Hashimoto, Director of Development Co-operation Department International Affair Bureau, the City of Yokohama expressed their expectations about 2nd phase of the promotion of climate change mitigation measures and technology transfer through the JCM scheme in Thailand. Following the speech of opening remarks, 3 topics; In-depth explanation of the JCM, Case study of the JCM project supported by OECC and, the professional check focusing on the Energy-Efficiency, are presented by OECC and A company. These presentation promoted understanding of procedure and requirements of applying for the subsidies, formulating “International consortium” and preparation for the implementation of JCM projects. In addition, OECC proposed “the formulating EE alliance” for smooth cooperation with persons involved to conduct JCM projects in the workshop and let them join to the EE alliance via follow-up form.
Follow the workshop, we held a matchmaking session. Here, the participating all Japanese companies, held a booth to introduce their business to Thai companies and exchange information.

After 3 days session, OECC conducted follow-up of their progress situation via sending questionnaires, having face to face meeting and using mailing list for the alliance. Please refer to the some significant comments below for the outcome of the matchmaking session.

Table 4-3 The outcome of the matchmaking session

Company No.	Progress
1	We considered supporting JCM projects making as consultant.
2	We had meetings of introducing waste water system to the H industry.
3	We explained RDF producing machine and W to E project with S company.
4	We proposed a joint examination for the quality improvement of RDF to S company.
5	We explained our technologies to B company.
6	-We proposed resource recovery technology to E company. -We proposed our Gasification System with Power Generation Function to B company.
7	We considered taking a part of a coordinator between Japanese companies and Thai companies.
8	We prepared for the 2nd call of the the Financing Programme for JCM Model Projects.
9	We had a discussion of introducing ventilations with W company.
10	We prepared the bidding scheduled in September at T hosilital, G hospital, C hospital to installing our boiler.
11	We considered to be the representative of international consortium.
12	We discussed our indirect support, providing our EMS services and technologies etc.
13	We had a meeting with S company to introduce waste energy facilities.
14	Some companies had our W to E technology, and we considered them individually.
15	Same as No.8

The Low Carbon Technology Workshop and Matchmaking session

(4) Individual site visits

Japanese participants visited I Ltd. that conducts PV projects in the Saraburi and Eastern Seaboard Industrial Estate where low carbon technologies might be introduced. During visit they had a productive discussion related to their technologies, visited facilities etc.

(a) I Ltd

- The overview of their project, renewable energy and manufacturing biomass products, and the CDM project that they implemented before were explained to the Japanese participants and had Q and A session.

-After presentation session, the participants visited to the solar panel site at their office.

Visit to Eastern Seaboard Industrial Estate

Visit to I company

(b) Eastern Seaboard Industrial Estate

-Overview of Industrial parks operated by H company was introduced to Japanese participants focusing on waste and waste water facilities because participants came from that sector.

-It was agreed that all participants of this visit will continuously share information regarding feasible JCM projects

2. Implementation of Study tour in Japan

(1) Summary of the study tour in Japan

The study tour was conducted in October 2015 for the purpose of enforcing relationship between Thai and Japanese companies/organizations and raising motivations for introducing low carbon technologies which will lead to JCM projects development in Thailand.

11 participants (BMA:6, BMA hospitals:4, renewal energy investment company:1) were invited to the study tour and were separated in following 2 courses:

- Course 1: Energy efficiency and saving of building and plant
- Course 2: Waste and wastewater management

(2) Schedule of the study tour

The study tour was conducted from 19th, October 2015 to 23rd, October 2015 during 5 days.

【Course 1: Energy efficiency and saving of building and plant】

Date	Time	Program	Location
18th Oct	17:55	Arriving Haneda airport	Tokyo
	20:30	Arriving hotels	Yokohama
19th Oct (All)	09:00-09:30	Hotels→@Business Center Kannai	Yokohama
	09:30-10:30	**Kick-off meeting**	Conference room
(BMA:2)	10:30-11:00	@Business Center Kannai →Pacifico Yokohama	
	11:00-12:30	**Attending MOEJ JCM Workshop**	Pacifico
	12:30-13:30	Lunch	Yokohama
	13:30-17:20	**Attending MOEJ JCM Workshop**	
	17:20-18:00	Pacifico Yokohama→Hotels	Pacifico
	18:00	Arriving hotels	Yokohama
(Hosp:4)	10:30-11:30	@Business Center Kannai →Azbil Fujisawa Techno Center	
	11:30-13:00	Lunch	Fujisawa city
	13:00-17:00	**Visiting Azbil Fujisawa Technology Center**	Azbil Fujisawa Technology Center
	17:00-18:00		
	18:00	Azbil Fujisawa Technology Center→Hotels Arriving hotels	
20th Oct	08:30-09:30	Hotels→Minato Mirai Center Building	Yokohama
	09:30-12:00	**Visiting Minato Mirai Center Building**	Minato Mirai Center Building
	12:00-13:00	Lunch, Minato Mirai Center Building→InterContinental	
	13:00-16:00	**Attending Yokohama Asia Smart City Conference**	InterContinental

	16:00-16:30	InterContinental→Hotels Arriving hotels	
21st Oct	8:30-09:30	Hotels→Yokohama Sports Medical Center	Yokohama
	09:30-12:00	**Visiting Yokohama Sports Medical Center**	Yokohama Sports Medical Center
	12:00-13:00	Lunch	Yokohama
	13:00-14:00	Yokohama Sports Medical Center→Nissan Stadium	Nissan Stadium
	14:00-16:00	**Visiting Nissan Stadium**	
	16:00-17:00	Nissan Stadium→Hotels Arriving hotels	
22nd Oct	08:00-09:00	Hotels→Yokohama City University Hospital	Yokohama
	09:00-11:00	**Visiting Yokohama City University Hospital**	Yokohama City University Hospital
	11:00-12:00	Yokohama City University Hospital→Hotels	Yokohama
23rd Oct	07:30-11:20	Hotels→Haneda airport	Tokyo

【Course 2: Waste and wastewater management】

Date	Time	Program	Location
18th Oct	17:55	Arriving Haneda airport	Tokyo
	20:30	Arriving hotels	Yokohama
19th Oct	09:00-09:30	Hotels→@Business Center Kannai	Yokohama
	09:30-10:30	**Kick-off meeting**	Conference room
	10:30-12:00	**Lecture: Waste to Energy technology (JFE Engineering)**	
	12:00-12:30	@Business Center Kannai →Pacifico Yokohama	
	12:30-13:30	Lunch	Pacifico
	13:30-17:20	**Attending MOEJ JCM Workshop**	Yokohama
	17:20-18:00	Pacifico Yokohama→Hotels	Pacifico
	18:00	Arriving hotels	Yokohama
20th Oct	09:00-09:30	Hotels→JFE Engineering	Yokohama
	09:30-11:30	**Visiting the Tsurumi fluorescent lamp recycling plant, incineration plant**	JFE Engineering
	11:30-13:00	Lunch, JFE	
	13:00-16:00	Engineering→InterContinental	
	16:00-16:30	**Attending Yokohama Asia Smart City Conference**	InterContinental
		InterContinental→Hotels Arriving hotels	
21st Oct	9:00-10:00	Hotels→Yokohama North Sludge Treatment Center	Yokohama
	10:00-12:00	**Yokohama North Sludge Treatment Center**	Yokohama North Sludge Treatment Center
	12:00-13:00		

	13:00-15:00 15:00-16:00	Yokohama North Sludge Treatment Center→ Lunch, Yokohama Kanazawa plant **Visiting Yokohama Kanazawa plant** Yokohama Kanazawa plant→Hotels Arriving hotels	Yokohama Kanazawa plant
22nd Oct	09:00-10:00 10:00-12:00	Hotels→Mansei Recycle Systems **Visiting Mansei Recycle Systems**	Yokohama Mansei Recycle Systems
	12:00-13:00	Mansei Recycle Systems→Hotels	Yokohama
23rd Oct	07:30-11:20	Hotels→Haneda airport	Tokyo

(3) List of participants

1 person from department of public works and 5 persons from BMA public hospitals participated in the "course 1" and 3 persons from department of Environment and 1 person from department of drainage and sewerage and 1 person from the investment company participated in the "course 2". Name and title of participants are shown in following tables.

【Course 1: Energy efficiency and saving of building and plant】(6 persons)

Name-Surname	Title
Mr. Tawatchai Napasaksri	Chief of Building Engineering Sub-division Department of Public Works, BMA
Mr. Nattapong Mephokkit	Deputy director of BMA General Hospital
Ms. Busakorn Nualyong	Deputy Director Taksin Hospital, BMA
Ms. Suppaya Chiewroongroj	Deputy Director Luangpho Thaweesak Hosptial, BMA
Ms. Ladda Huiprasert	Deputy Director Wetchakarunrasm Hospital, BMA
Ms. Kumjong Wongthai	Registered Nurse Ratchapipat Hospital,BMA

【Course 2: Waste and wastewater management】(5 persons)

Name-Surname	Title
Ms. Wannipa Wongyara	Sanitation Technical Officer, Department of Environment, BMA
Mr. Jirathep Thaochoo	Electrical Engineer Department of Environment, BMA
Mr. Kasame Thepnoo	Sanitation Technical Officer Department of Drainage

	and Sewerage, BMA
Ms. Natnares Macharoen	Environmentalist Department of Environment, BMA
Mr. Thanomsin Chanjirajit	Project Engineer, Engineering Section, Prime Road Group Co., Ltd

(4) Program and results of the study tour

【Conferences regarding Inter-city cooperation】

(a) JCM Inter-city Cooperation Workshop (Ministry of Environment, Japan)

6 Participants from BMA attended the "JCM Inter-city Cooperation Workshop" which hosted by Ministry of Environment, Japan and listened to afternoon sessions: 1) Activities toward JCM project development-Learning from Successful case of JCM finance program-, 2) Discussion toward promoting low carbon society.

This workshop targeted Japanese local governments, Asian local governments and relevant companies/organizations who are involved in the feasibility study of JCM project development under Inter-city cooperation supported by MOEJ. In the afternoon session, some cases of inter-city cooperation were explained by Japanese local governments and successful projects of JCM finance program were introduced by companies and then, the participants discussed on how to successfully implement JCM projects.

(b) The 4th Asia Smart City Conference 2015 (City of Yokohama)

All the participants attended the "4th Asia Smart City Conference 2015" hosted by City of Yokohama and listened to afternoon session. Representatives from Asian cities and experts of town/community development were invited to the session. In the session, results of 4 thematic meeting in the morning were reported and discussed by panelists. 4 themes are following: 1) City to city cooperation towards sustainable urban development, 2) Roles of city leaders to attract good involvement of private sector, 3) Co-create urban solutions through smart technologies, 4) Indices to facilitate sustainable urban development

【Course 1: Energy efficiency and saving of building and plant】

(c) Lecture & Site visit: Azbil Fujisawa Technology Center

The participants visited Azbil Fujisawa Techno Center which is a base of R&D of Azbil Corporation. There is a space of products introduction regarding building automation technologies and participants learned Building Energy Management System (BEMS) through lecture and demonstration. Mechanism of ESCO business provided by Azbil was

also explained. In addition, participants visited an office building which acquired CASBEE certification of S rank and observed actual facilities and systems regarding energy saving technologies.

Lecture

Demonstration of BEMS

(d) Lecture & Site visit: Minato Mirai Center Building

The participants visited "Minato Mirai Center Building" which was constructed by Taisei Corporation in 2010. Minato Mirai Center Building is an office building which has superior environmental performance and acquired S rank of CASBEE Yokohama certification program. The participants observed structures and facilities contributing high energy efficiency and the architecture who designed the building explained concept of the building. Participants learned basic concept of energy saving of the building such as reduction of lighting energy by using natural lighting system and reduction of heating load by using exhaust heat from air conditioner.

Eco-void & Natural lighting system

Lecture

(e) Lecture & Site visit: Yokohama Sports Medical Center

The participants visited Yokohama Sports Medical Center and Tokyo Gas Corporation who is implementing ESCO project at this facility lectured on their ESCO project. Firstly, basic mechanism and situation of ESCO business in Japan was introduced. Next,

renovation of facilities/systems and results of energy saving achieved by ESCO project was explained. Participants learned about energy interchange among facilities in the site, gas-cogeneration system, utilization of exhaust heat by heat source equipment and ESCO project as well.

Comparison of new & old boilers

Utilization of exhaust heat

(f) Lecture & Site visit: Nissan Stadium

The participants visited a multi-purpose stadium called “Nissan Stadium” located in Shin-Yokohama Park and observed its facilities. Person in charge of facility management from Yokohama city introduced overview of the stadium and Azbil Corporation who is implementing ESCO project at the stadium lectured on their ESCO project. Participants also observed and learned about utilization of recycled wastewater and energy saving by using wastewater heat as heating source.

Heat exchanger for wastewater heat

Lecture

(g) Lecture & Site visit: Yokohama City University Hospital

The participants visited Yokohama City University Hospital and studied its ESCO project. Japan Facility Solution Corporation who is implementing the ESCO project introduced overview of ESCO project and installed facilities and systems. The

Participants also observed energy management system, boiler, heat pump, chiller etc..

Facilities

Lecture

【Course 2: Waste and wastewater management】

(h) Lecture: Waste to Energy technology (JFE Engineering)

Waste to Energy technology was introduced by JFE Engineering Corporation. Process of energy generation and safety of the technology was explained such as air quality or possibility of construction in urban area as technical aspect and also overview of products provided by JFE Engineering. From technical aspects, the participants learned about measurements against air pollution such as removal of NOx, SOx and control of bad smell and consideration to citizens living around waste incinerator such as consultation before construction and activities contributing to region.

Lecture

Group photo with lecturer

(i) Lecture & Site visit: Tsurumi fluorescent lamp recycling plant and incineration plant (JFE Kankyo Corporation)

The participants visited JFE Kankyo Corporation and observed “Tsurumi fluorescent lamp recycling plant” and the incineration plant called “Yokohama Eco Clean”. Tsurumi fluorescent lamp recycling plant is one of the largest scale of its kind such as segregating

mercury, glass and metal from fluorescent lamp. Method of extraction, control and treatment of mercury were explained by administrator of the plant. This plant consists of the incineration and melting system combining a kiln/stoker-type furnace and kiln-type ash-melting furnace and it has ability of treating various wastes such as sludge, waste plastics and PCB. It was explained that flow of waste treatment from collection to incineration and treatment of remaining ash. The participants asked about tipping fee of waste treatment and process of recycling.

Front of the plant

Lecture & observation

(j) Lecture & Site visit: Yokohama North Sludge Treatment Center

The participants visited "Yokohama North Sludge Treatment Center" which is conducting power generation by using wastewater sludge. JFE Engineering which is the administrator of power generator introduced overview of the facility and SPC established for investments to the center. The participants also observed facilities such as the power generator and heat exchanger.

Lecture

Front of the digestion tank

(k) Lecture & Site visit: Yokohama Kanazawa plant (Resource recycling facility)

The participants visited "Yokohama Kanazawa plant" of resource recycling facility. It was explained that waste incineration facility, operation state and resource recycling.

The participants also observed the control room and treatment of wastes.

Lecture

Group photo with staffs of the facility

(l) Lecture & Site visit: Mansei Recycle Systems Co., Ltd.

The participants visited recycling facility of Mansei Recycle Systems Co., Ltd.. Project conducted by Mansei Recycle Systems in Cebu city in Philippine was explained as a successful case of newly introduced waste recycle system in South Asia. The participants also observed facility for manufacturing of board and chip from timber waste and fluff fuel from waste plastics.

Lecture

Group photo in front of the facility

V. Presentations of the international conferences and workshops

The OECC presented summary of this feasibility study including outline, outcomes, and future activities in the international conferences and workshops. In addition, activities conducted by Yokohama city and the cooperation between Yokohama city and BMA were presented in several conference with support of OECC, making presentation documents, dispatching technical experts etc. Tables 5-1 shows outline of presentations.

Table 5-1 Presentations of the international conferences and workshops

Date	Place	Participants	Contents
May, 2015	Y-PORT Working Venue: Yokohama city	OECC	Implementing the Bangkok Master Plan on Climate Change 2013-2023 via conducting JCM project developments and its potentials of participation of Y-PORT member.
December, 2015	COP21 side event of Japan pavilion Venue: Paris	OECC	JCM Project Opportunities under the Bangkok Master Plan on Climate Change
January, 2016	the JCM City to City Collaboration, Institute for Global Environmental Strategies	Yokohama city and BMA	JCM project developments based on the City to City Collaboration
March, 2016	7th High Level Seminar on Environmentally Sustainable Cities Venue: Hanoi	Yokohama city (Mr. Tetsuya Nakajima, Executive Director for Development Cooperation, International Affairs Bureau)	Outcomes and future activities of JCM project developments based on the City to City Collaboration

Appendex 1

Dcuments of Policy Dialogue:

Energy Efficency Sector

- A presentation document of Yokohama city:

City of Yokohama Energy-saving of public facilities (ESCO program)

- A prsesentation document of BMA:

Presentation on Learning from ESCO project implementation at QSNICH and Potential for ESCO pilot project development at public hospitals of BMA

Tentative translation

City of Yokohama
Energy-saving of public facilities
(ESCO program)

29 oct 2015 Bangkok

City of Yokohama, Housing and Architecture Bureau, Preservation Promotion Division
Yuichi Honda

OPEN YOKOHAMA

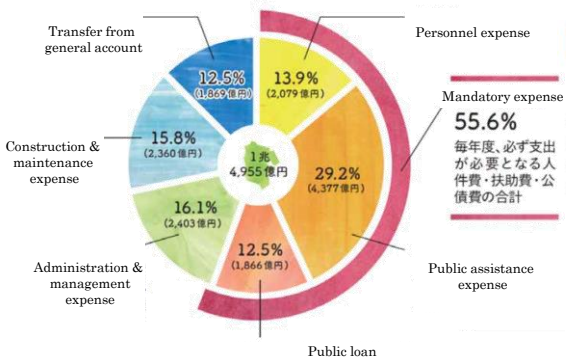
At first・・・
(What I'm going to introduce today.)

* **1. *Circumstances of public facilities***
* **2. *"Program to promote energy-saving of public facilities"***
* **3. *Method of ESCO project and effectiveness***
* **4. *Etc.***

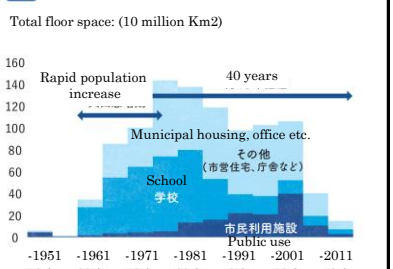
OPEN YOKOHAMA

1－1．Circumstances of public facilities
（Budget & Status of facilities construction）

○*Budget of Yokohama city*

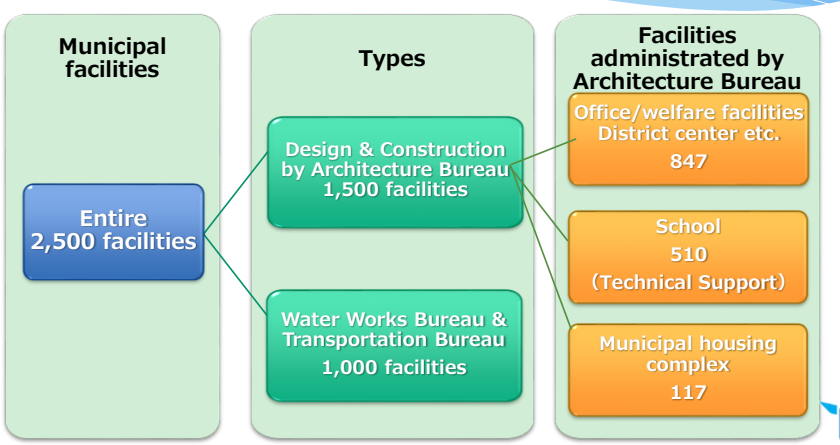


Status of construction of public facilities



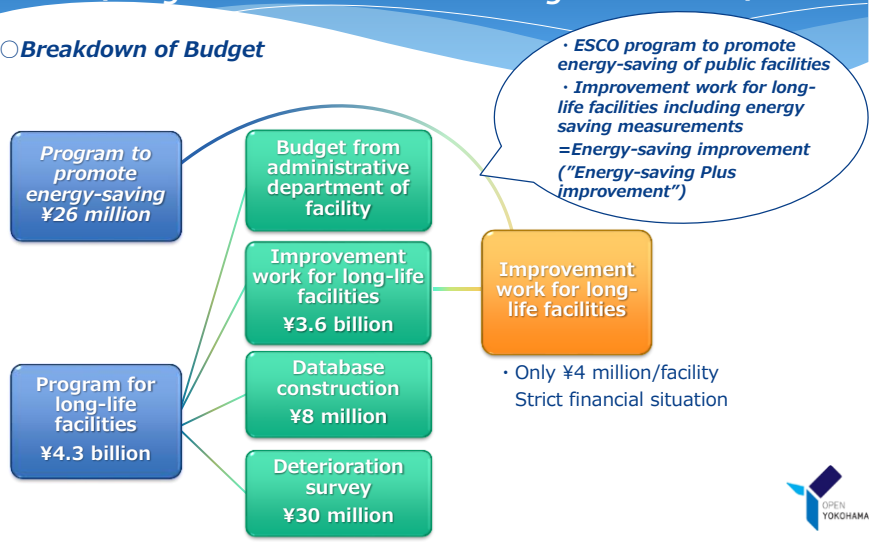
1－2．Circumstances of public facilities
（*Types of public facilities*）

○*Administration & usage of facilities*



2－1．"Program to promote energy-saving of public facilities"
(Budget of Measurement for long-life facilities)

○**Breakdown of Budget**



・Only ¥4 million/facility
Strict financial situation

2－2．"Program to promote energy-saving of public facilities" ("Energy-saving Plus Improvement")

○**"Energy-saving Plus Improvement"**

* *Reducing energy consumption (electricity, fuel etc.) by adding energy-saving measurements for the improvement work for Long-life facility*

○**Results (Number of Energy-saving Improvement works)**

FY 2012	FY 2013	FY 2014	FY 2015	FY 2016
3	5	10	13	Expecting more

LED lighting

High efficient absorption water cooling heating machine (Top-runner type)

Inverter pump

Inverter

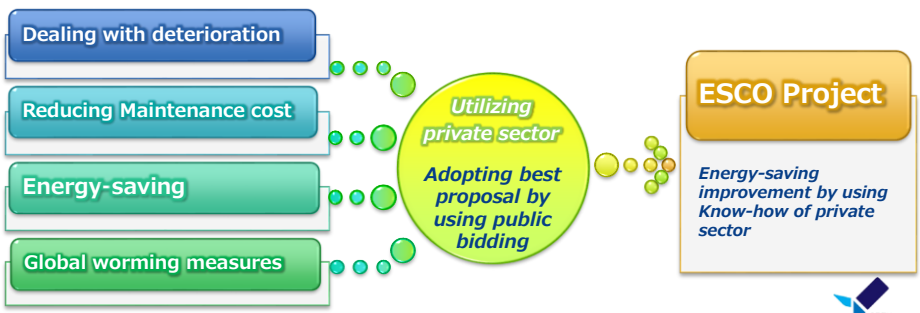
2－3．"Program to promote energy-saving of public facilities" (ESCO Project)

○ESCO Project

○ESCO Project: Energy Service Company Project

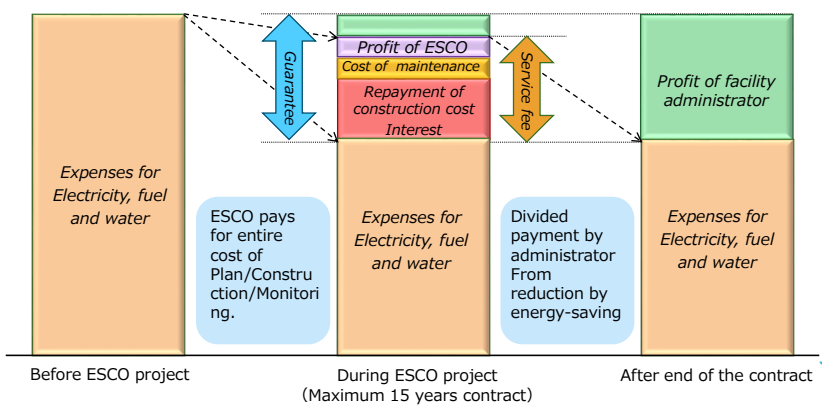
Achieving and guaranteeing energy-saving without harming existing environment by providing comprehensive services for energy-saving of Plants and buildings.

ESCO service fee paid by part of energy-saving cost



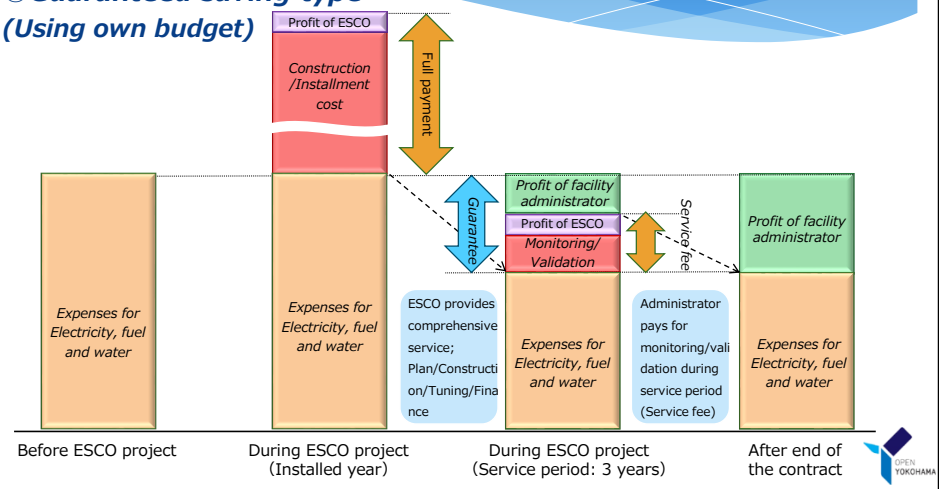
3－1．Method of ESCO project and effect (Shared saving & Guaranteed saving)

○Shared saving type (Using private fund)



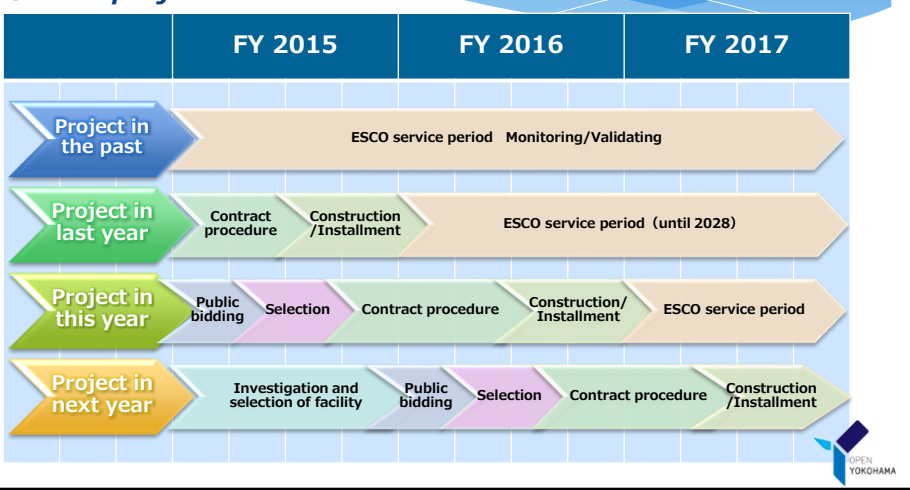
3－2．Method of ESCO project and effect
(Shared saving & Guaranteed saving)

○Guaranteed saving type
(Using own budget)



3－3．Method of ESCO project and effect
(Steps to introducing ESCO project)

○ESCO project schedule



3－4．*Method of ESCO project and effect (Results of ESCO project)*

○*Results of introducing ESCO project*

FY 2003	FY 2004		FY 2005		FY 2006		FY 2007		FY 2008		FY 2009	FY 2010		FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Model PJ	1st PJ	2nd PJ	3rd PJ	4th PJ	5th PJ	6th PJ	7th PJ	8th PJ	9th PJ	10th PJ	11th PJ	12th PJ	13th PJ	14th PJ	15th PJ	16th PJ	17th PJ	18th PJ
○南部病院(Hospital)	○障害者スポーツ文化センター横浜ラポール ○総合リハビリテーションセンター ○総合保健医療センター(Medical sports center)	○松風学園(School)	○戸塚センター(District center)	○こども科学館(Science museum)	○中区総合庁舎(General Office) ○関内ホール(Event Hall) ○技能文化会館(Culture center)	○中央図書館(Library) ○歴史博物館(Museum)	○市大木原生物研究所(Laboratory)	○青葉区総合庁舎(General Office) ○都筑区総合庁舎(General Office) ○横浜国際プール(Swimming pool)	○市大福浦キャンパス(Campus of City University)	○栄区総合庁舎(General Office)	○横浜国際総合競技場(Stadium)	○市民病院(Hospital)	○神奈川区総合庁舎(General Office)	○鶴見区総合庁舎(General Office)	○男女共同参画センター横浜(Center) ○吉野町市民プラザ(Community plaza)	○栄公会堂・栄スポーツセンター(Public hall, Sports center)	○港北区総合庁舎(General Office)	○永田地区センター(District center)

3－5．*Method of ESCO project and effect (Effectiveness of ESCO project)*

○*Effects of ESCO project*

	Results of FY 2014		
	Estimate ※1	Result ※2	Acheivement
Number of facilities	24	24	—
Energy reduction	21.2%	25.5%	120%
Cost reduction	¥620,125 thousand／year	¥690,575 thousand／year	111%
CO_2 reduction	14,938ton／year	16,469ton／year	110%

※1 *Estimated reduction of contract*
※2 *Result of final year is referred for finished project*

○*Other effects of ESCO project*

- ***Feature: It is required for proposer to include at least one company whose headquarter locates in Yokohama city in the consortium in order to let companies in Yokohama participate not only major companies from outside.***
- ***It is also useful for supporting development and activation of companies in Yokohama***
- ***ESCO projects are able to utilize subsidy schemes which can't be used by general improvement work***

3 – 6. Method of ESCO project and effect
(Utilizing governmental subsidy schemes)

○Utilizing governmental subsidy schemes

Subsidy Rate (Case of Yokohama city)

Major subsidy schemes

- 1 / 3 Subsidy of supporting business for rational use of energy
- 1 / 3 Subsidy of promoting introduction of innovative energy saving technology on residence/building (Net Zero Energy Building Demonstration program)
- 1 / 3 Subsidy promoting introduction of high-efficient energy system on residence/building
- 1 / 3 Subsidy of cooperation promoting of energy-saving by Energy supplier initiative
- 1 / 2 Subsidy of measures for suppressing CO2 emission

4. etc
(Introduction of ESCO projects in Yokohama)

○Receiving site visits

* *We are receiving many site visits to let more people know about ESCO projects in Yokohama city.*

City of Yokohama
Energy-saving of public facilities
29 Oct. 2015 Bangkok

City of Yokohama, Housing and Architecture Bureau, Preservation Promotion Division
Yuichi Honda

OPEN YOKOHAMA

Presentation on
Learning from ESCO project implementation at QSNICH and Potential for ESCO pilot project development at public hospitals of BMA

OECC
Overseas Environmental Cooperation Center,Japan

The 4rd Policy dialogue in Energy sector in BMA – January 20th, 2016

Department of Public Works, BMA

Table of Contents

QSNICH site visit of Yokohama, OECC and BMA officers on 26 November 2015

1 Learning from ESCO project implementation at QSNICH

- Queen Sirikit National Institute of Child Health (QSNIH) ("Children's Hospital" old name) is renowned for providing medical treatment to children and Training & research center of children treatment which is under Ministry of Public Health.
- No. of Beds: 449 beds
- Personal: 1,520 persons
- Out patient: 368,326 cases/year
- In patient: 16,303 cases/year

1 Learning from ESCO project implementation at QSNICH

- ESCO project of QSNICH was "Ozone generator for Cooling tower water treatment installation" for Water cooled chiller air condition system.
- Problems before installation:
  - Low Chiller Efficiency
  - Legionella pathogens found in Cooling tower
- Benefit of installation
  - Cooling tower water is cleaner and better in heat exchange (reduce energy use for chiller)
  - Disinfection of Cooling tower water

1 Learning from ESCO project implementation at QSNICH

- ESCO contract type of QSNICH Project: Guarunteed Saving, investment by hospital budget in 2013

Guarunteed saving conditions in contract as follows:

1. Using approach temperature measurement guarantee at full load chiller functions " not more than the approach temperature after thoroughly tube cleaning of the system plus 2 degrees Fahrenheit"

2. Bank guarantee deposit will be 5% of total cost of the ozone equipment for cooling tower water treatment and in case of guarantee failure, it will be used to pay for all corrective expenses

3. Monitoring of approach temperature will be done in every months by company service teams

1 Learning from ESCO project implementation at QSNICH

- **Operation and Maintenance by ESCO company included**

1. 24 hours monitoring Ozone system through GPRS/ 3G internet
2. Correction of break down maintenance will be done within 72 hours
3. Preventive maintenance and ozone measuring and all energy related variables in every 4 months

1 Learning from ESCO project implementation at QSNICH

Saving and pay back from ESCO Ozone generator equipment in QSNICH

- Saving: Electricity + water filling + chemical agents + Condenser cleaning

= 509,063.44 + 18,768 + 100,000 + 20,000

= 647,831.44 bahts/year

- Investment cost= 1,979,500 bahts
- Pay back period = 1,979,500 / 647,831.44

= 3.06 years

1 Learning from ESCO project implementation at QSNICH

1. Why QSNICH ESCO project implementation is successful?

(1) Use own budget and Small size project (not more than 2 million baht)

(2) Strong ambition of Hospital administrator in energy saving (only one hospital of Ministry of Public Health that conducted ESCO project)

(3) Use domestic product that is cheaper price compared with imported foreign countries product. (followed Lowest Price based procurement for Thai government agencies)

1 Learning from ESCO project implementation at QSNICH

2. Can BMA implemented ESCO pilot project followed QSNICH ESCO Guarunteed saving type project or not, what are the problems?

(1) Lack of budget, For example, Taksin hospital need to invest 42 million baht of full retrofitted equipment for energy saving project which is larger budget than QSNICH ESCO project, and this project is difficult in budget request from BMA

(2) Question about JCM can be applied with guarunteed saving ESCO project or not

1 Learning from ESCO project implementation at QSNICH

2. Can BMA implemented ESCO pilot project followed QSNICH ESCO Guarunteed saving type project or not, what are the problems? (continue)

(3) Difficult to use top-runner equipment because it is higher price compared with normal equipment (Need to follow Lowest Price based procurement for Thai government agencies)

2 Proposed contract type and candidate facilities for ESCO pilot project of BMA

- **BMA has limited in the budget for initial investment, So Share saving contract is suitable.**
- **Proposed ESCO pilot project is the project of renovation of Taksin hospital for energy saving**
- **Azbil (Thailand) company has already checked energy use, identified the menu of energy saving options and suggested two options of ESCO project for Taksin hospital**

2 Proposed contract type and candidate facilities for ESCO pilot project of BMA

1st Option: Full retrofitting and installation, Energy saving menu included

- Change old lighting bulb to LED lighting bulb
- Installation of VWV control for air condition system primary pump and condensing pump
- Installation of heat pump for hot water system
- Change old package air condition to high efficient package air condition
  - Investment cost: 42 million baht
  - Saving energy cost: 4.61 million baht/year
  - Pay Back period: 9.1 years

2 Proposed contract type and candidate facilities for ESCO pilot project of BMA

2nd Option: Partial retrofitting and installation, Energy saving menu included

- Change old lighting bulb to LED lighting bulb
- Installation of VWV control for air condition system primary pump and condensing pump
- Installation of heat pump for hot water system
  - Investment cost: 8.2 million baht
  - Saving energy cost: 1.68 million baht/year
  - Pay Back period: 4.9 years

3 Problems of ESCO program implementation in BMA

- Can not sign contract for long duration such as 7 or 10 years
- ESCO project may be arranged as turnkey project or Public Private Partnership Project, which need cabinet resolution for allowing to conduct project
- Can not pay surplus of utility budget from energy saving to ESCO company, need to send surplus budget back to Department of Finance

3 Problems of ESCO program implementation in BMA

- Need to identify the procurement method, which is suitable with ESCO program (Price/Performance based > Lowest Price based) and suitable ESCO project regulatory method for government agencies
- Low price of electricity in Thailand, cause long return period of ESCO project investment or ESCO project is not cost-effective for investment.

Appendex 2

Dcuments of Policy Dialogue:

Waste Management Sector

- A presentation document of Yokohama city:

Waste treatment of Yokohama

- Prsesentation documents of BMA:

รายงานความคืบหน้าการก่อสร้างโรงงานเตาเผามูลฝอยขนาด 300ตันต่อวันที่ศูนย์กาจัดมูลฝอยหนองแขม

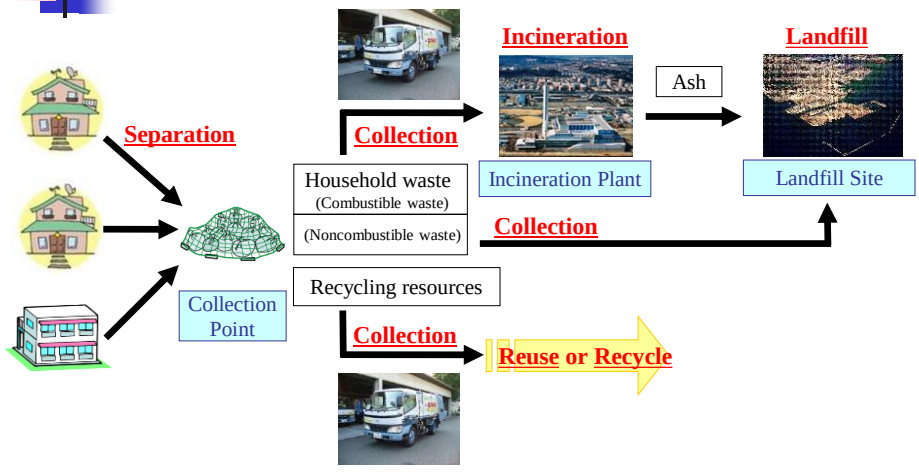
Thailand Holistic Waste Management in BangkokContents

Waste treatment of Yokohama

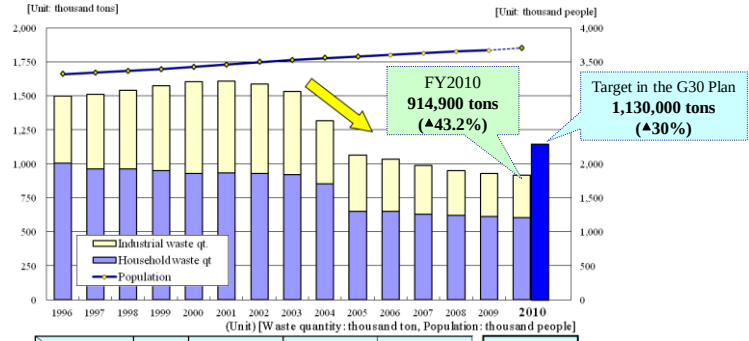
City of Yokohama Profile

Population	3,712,170 (as of April.1, 2015)
Households	1,638,946 (as of April.1, 2015)
Frequency of garbage collection	Household waste (Combustible waste), Dry-cell batteries, Noncombustible waste, Spray cans : Twice a week Cans, Bottles, PET bottles, Small metal items, Plastic containers and packaging : Once a week Used paper, Used cloth : collection by resource recovery groups Oversize objects : upon request (collection for a fee)
Collection sites	75,783(as of end of March, 2015)

Flow treatment of household waste and recycling resources



Transition and Target of the quantity of garbage



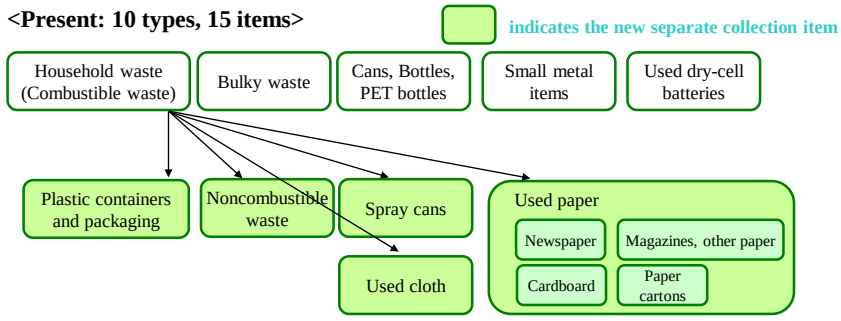
(Unit) [Waste quantity: thousand ton, Population: thousand people]

Fiscal year	2001	2008	compared to 2001	2009	compared to 2001	2010	compared to 2001	2010 (goal) G30 Plan	compared to 2001
Garbage qt.	1,609	949	▲ 41 %	930	▲ 42 %	915	▲ 43 %	1,130	▲ 30 %
Household waste	935	618	▲ 34 %	611	▲ 35 %	603	▲ 35 %		
Industrial waste	674	331	▲ 51 %	318	▲ 53 %	312	▲ 54 %		
Population	3,462	3,651	5 %	3,672	6 %	3,707	7 %	3,707	7 %

Efforts to Reduce Household Waste
- Expansion of Separate Collection Items -

<Past: 5 types, 7 items>

<Present: 10 types, 15 items>



Publicity and explanation to Citizens

- **Separation briefing session**: About 11,000 times (FY2004 & 2005)
- **Educational campaign in front of train stations** : About 600 times (FY2004 & 2005)
- **Early morning education in collection point** : About 3,300 times (FY2004 & 2005)
- **Garbage left behind due to non-separation** : About 10,900 times/day (FY2009)

Separation briefing

Educational campaign in front of the stations

Early morning educational instruction

Efforts to Reduce Business Waste
- Inspection of Collected Garbage at Plants -

- The inspection of collected waste at incineration plants became stricter from Dec. 2003.
- A self-propelled waste inspection device was introduced at all plants.
- If the collected garbage contains a large volume of inappropriate waste and recyclable waste such as used paper, the garbage collection company is instructed to take it back.

Inspection of collected business waste

Waste inspection device

Rate of collection trucks inspected

FY2009	85% (164,095 trucks)
FY2010	89% (176,847 trucks)

Excerpted
from The Bangkok Master Plan of Climate Change

Tite	W1.1 Promote participation on waste reduction and separation at source
Details	a) Enhance public awareness and partnership on waste management through public relation and campaigns b) Expand community based solid waste management (CBM) c) Promote partnership with the private sector in the management of solid waste at source
Implementation schedule	Short to long term (2013-2023)

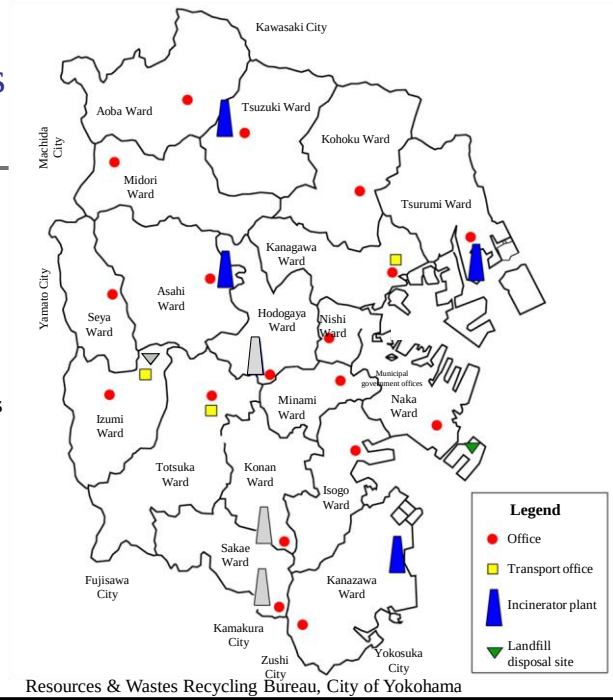
Title	W1.2 Reduce the amount of plastic waste
Details	a) Encourage cloth bags and bio-packing use instead of plastic bags b) Promote plastic waste separation for recycling c) Promote manufactures and trader to reduce packaging and foam
Implementation schedule	Mid to long term (2016-2023)

Excerpted from The Bangkok Master Plan of Climate Change

Title	W3.2 Construct waste-to-energy incineration facility
Implementation schedule	Short to long term (2013-2023)

Facilities layout

- Collection offices
  18 in the city
  (1 in each ward)
- Transport offices
  3 in the city
- Incineration plants
  4 in the city
  (2 plants: closed
  1 plant : stopped)
- Landfill site
  1 in the city
  (1 site: closed)

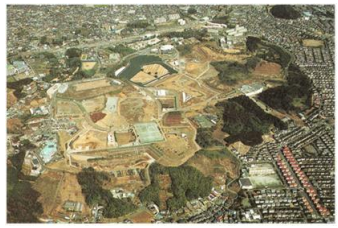


Incineration Plants and Landfill Sites

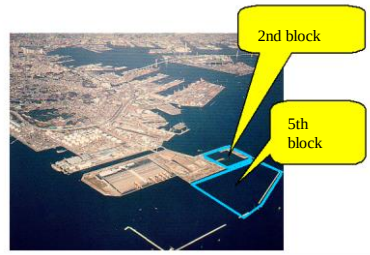
- Incineration Plants

	Tsurumi	Asahi	Kanazawa	Tsuzuki
Started in	Apr. 1995	Apr. 1999	Apr. 2001	Apr. 1984
Treatment capacity	1,200 t/day	540 t/day	1,200 t/day	1,200 t/day

- Landfill Sites



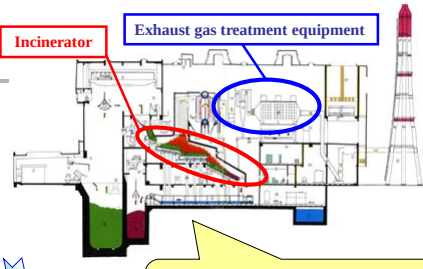
Shinmeidai Disposal Site (~Mar. 2011)



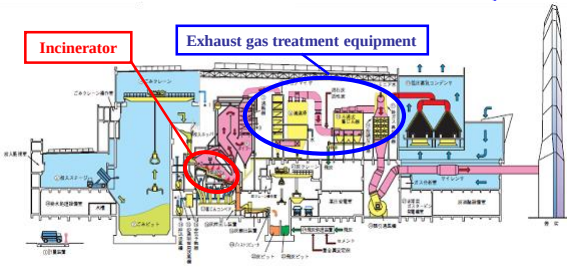
Minami-Honmoku Final Disposal Site

Transition of System of Incineration

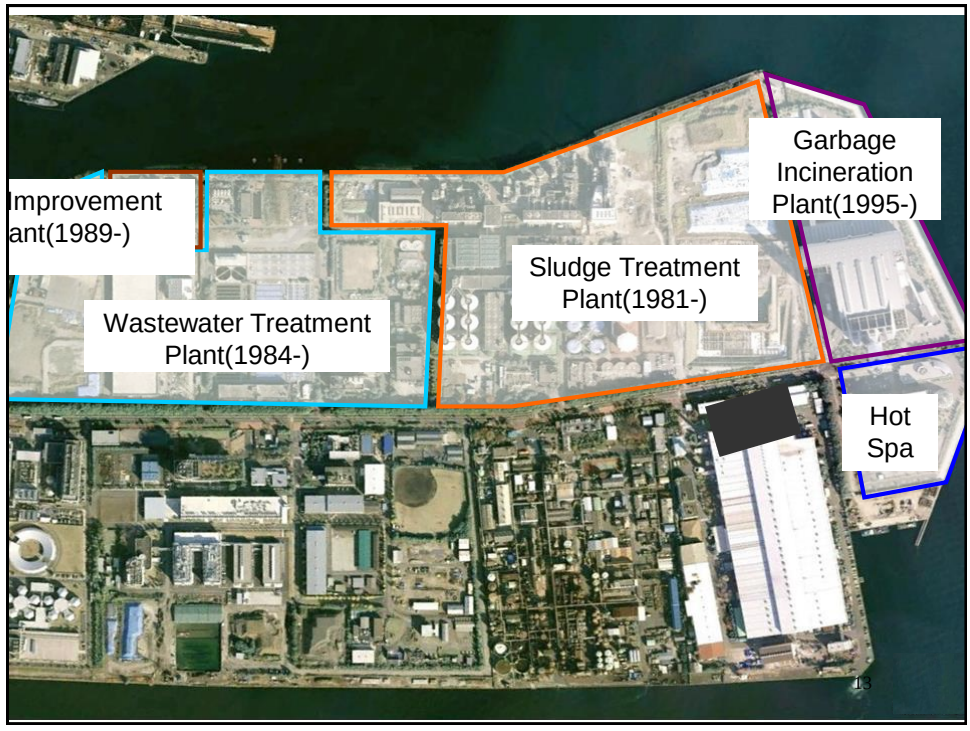
1929, Takigashira plant
- Batch furnace (fixed grate)
- Simple exhaust gas treatment equipment for only fly ash



1973, Asahi plant
- Continuous mechanized furnace
- Exhaust gas treatment equipment



2001, Kanazawa plant
- Continuous mechanized furnace
- Sophisticated e Exhaust gas treatment equipment
- Bottom ash melting facilities
- High-efficiency power generation equipment



Digestion Gas (Bio Mass Gas)

Northern Sludge T.Plant

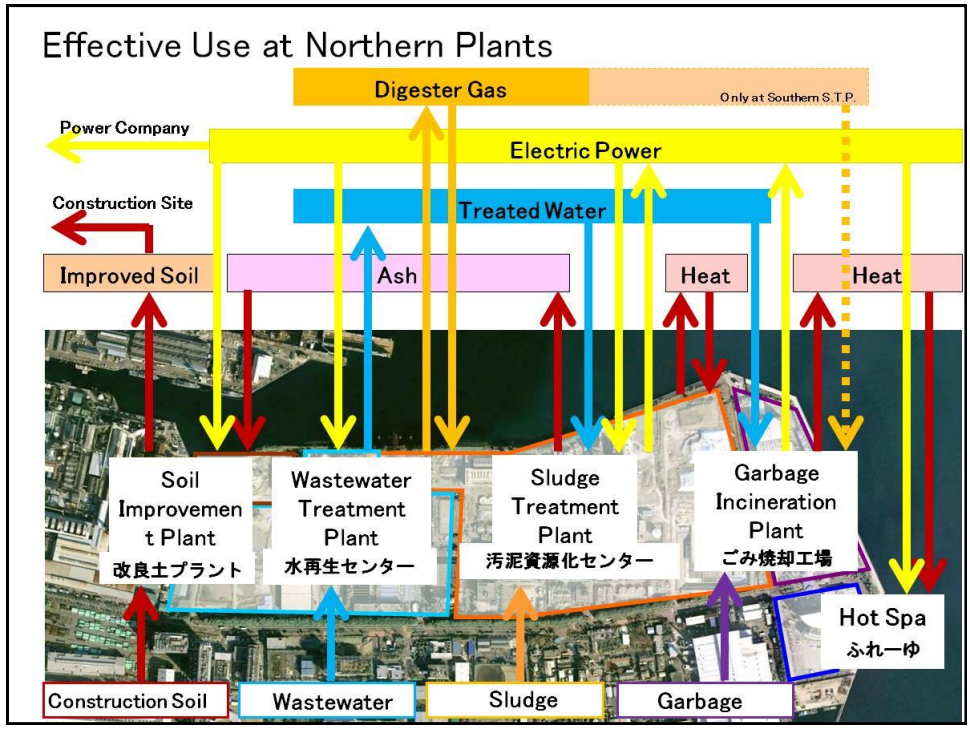
12 Egg Shaped Digestion Tanks

Digestion gas emission：
17,000,000㎥N/year

Southern Sludge T.Plant

9 Egg Shaped Digestion Tanks

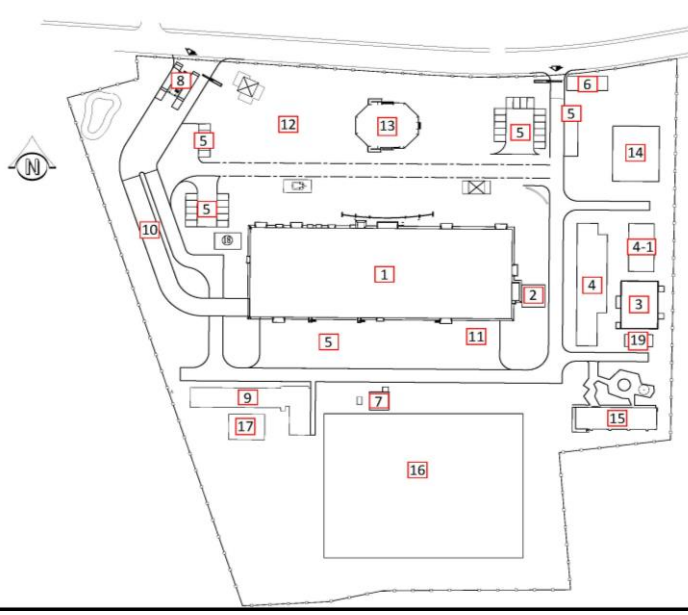
Digestion gas emission：
12,000,000㎥N/year


Effective Use at Northern Plants
Digester Gas
Only at Southern S.T.P.
Power Company
Electric Power
Construction Site
Treated Water
Improved Soil
Ash
Heat
Heat
Soil Improvement Plant
改良土プラント
Wastewater Treatment Plant
水再生センター
Sludge Treatment Plant
汚泥資源化センター
Garbage Incineration Plant
ごみ焼却工場
Hot Spa
ふれーゆ
Construction Soil
Wastewater
Sludge
Garbage

รายงานความคืบหน้าการก่อสร้างโรงงาน เตาเผามูลฝอยขนาด 300 ตันต่อวัน ที่ศูนย์กำจัดมูลฝอยหนองแขม


MUNICIPAL SOLID WASTE INCINERATION POWER PLANT

แผนผังโครงการ



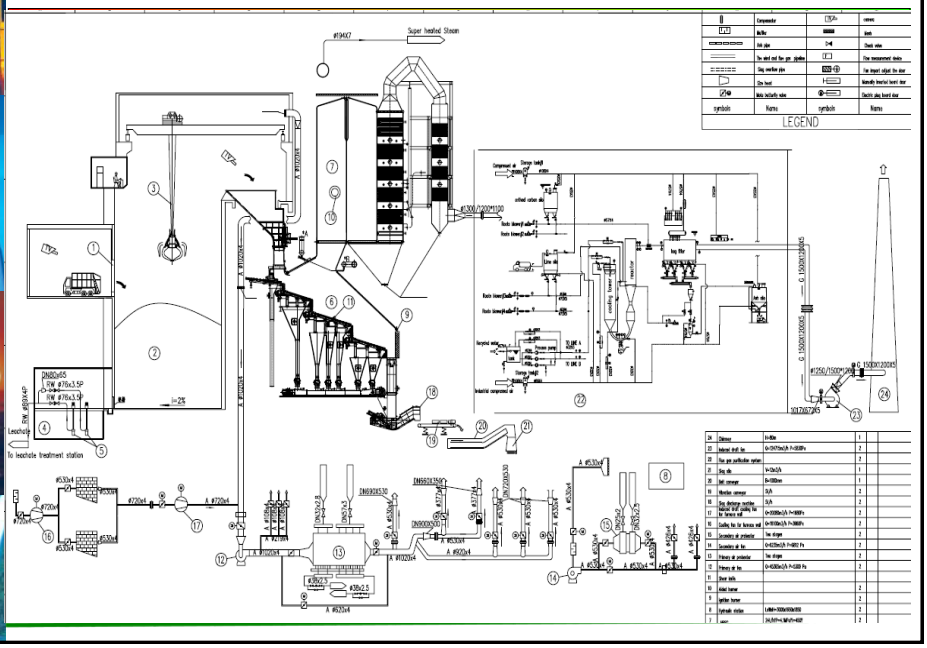
No. Item Table Name

1. Main&Control Buildig
2. Smoke Stack
3. Water Tank
4. Circulation Pump House
4-1 Cooling Tower
5. Parking
6. Main Entrance-Guard House
7. Oil Tank
8. Weigh Bridge
9. Waste water treatment station
10. Trestle
11. Fly ash curing
12. Landscape
13. Office Building
14. Transformer Station or Substation
15. Dormitory Building
16. Multipurpose area
17. Waste water storage tank
18. Neutralization tank
19. Filter tank

องค์ประกอบต่างๆ ของโครงการ

- อาคาร Main & Control Building
- อาคารบำบัดน้ำเสีย (Waste Water Treatment Building)
- อาคารเครื่องชั่ง (Weight Bridge)
- อาคารหอพัก (Dormitory Building)
- อาคารสำนักงาน (Office Building)
- ระบบน้ำโรงงาน (Plant Water System)
- สะพานทางลาด (Trestle)
- งาน Smoke Stack
- งานติดตั้งเครื่องจักร และระบบอื่นๆ

ระบบเตาเผา



สรุปความก้าวหน้าโครงการ

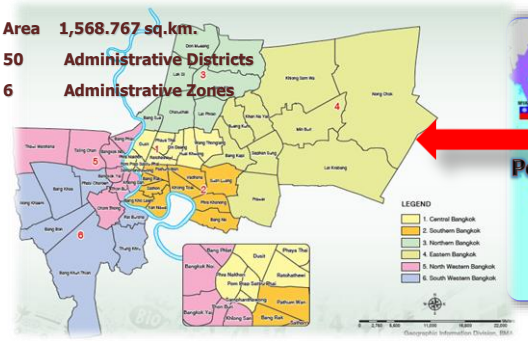
- ความก้าวหน้าทั้งโครงการ 97%

Holistic Waste Management in Bangkok

Department of Environment
Bangkok Metropolitan Administration
Bangkok, Thailand

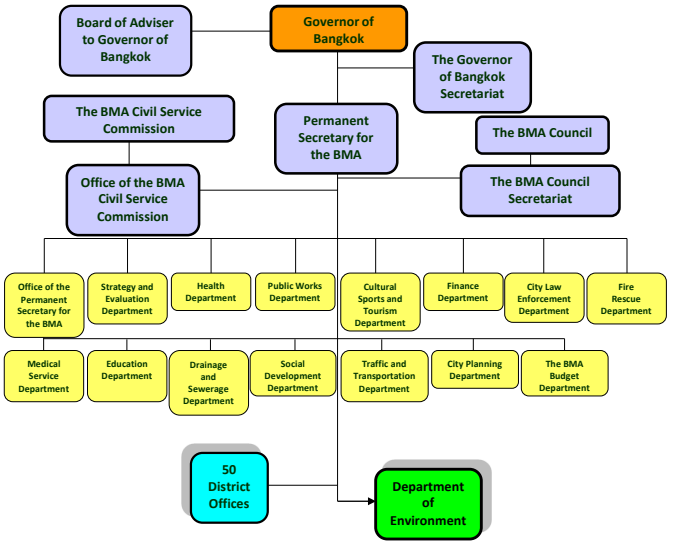
Contents

Introduction of Bangkok



❖ **Populations**	Registered	5.7 million persons (2014)
	Non Registered	~ 4 million persons
❖ **Houses**		2.67 million houses (2014)
❖ **Density Populations**		3,626 persons/km^2 (2014)
❖ **Average Ground Level**		+0.50 to +1.50 m MSL
❖ **Temperature**		17.6 - 39.3˚C
❖ **30-year Average Annual Rainfall**		1,648 mm
❖ **Length of the Chao Phraya river in Bangkok**		35 km

Bangkok Metropolitan Administration



50 Administrative Districts
6 Administrative Zones
62 City Councilors

15 Departments
68 Health centers
38 Youth centers
438 BMA schools
612 BMA buildings

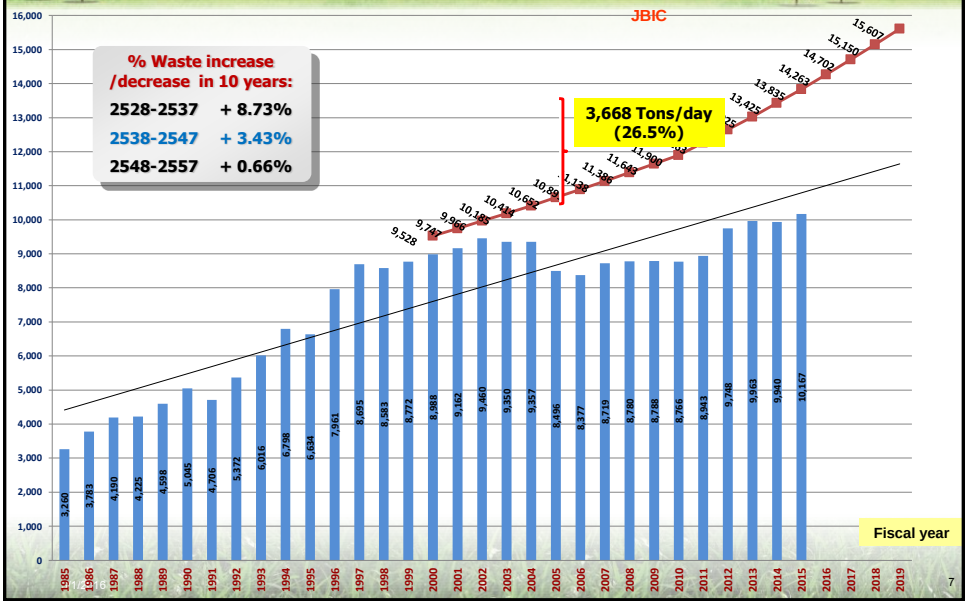
Personnel : 97,292 persons (2014)
- Officers : 22,055 persons
- Teachers : 16,087 persons
- Permanent Employees : 39,325 persons
- Temporary Employees : 19,825 persons

Fact Sheet

Waste Collection	
General waste	9,940 tons/day (2014)
	88% disposed by sanitary landfill 12% treated by composting
Infectious waste	30 tons/day by incinerator

Waste Personnel	
Waste collection drivers	2,587 persons
Waste collection workers	7,591 persons
Sweepers	9,042 persons
Waste tow volunteers	311 persons
Waste tow communities	279 communities
waste collection trucks	1,856 trucks (1,438 hired trucks)
Waste collection boats	66 boats

Waste Situation in Bangkok

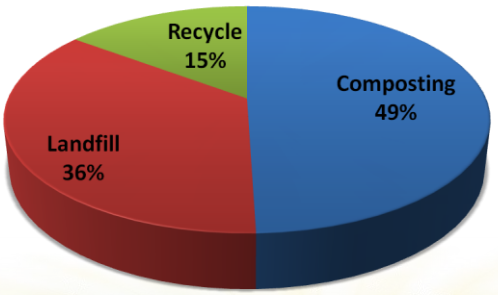


The utilization of waste in 2015

Recyclable waste (3,088 tons/day)	• Public /Enterprises • Junk shop • Waste pickers	
Food waste (400 tons/day)	• Promote waste separation at source to district offices , communities and enterprises	
Branches and yard waste (150 tons/day)	• District office services branches trimmer and announced the appointment time to collect branches waste	 Composting Plant
Bulky waste (30 tons/day)	• District office service to collect the bulky waste and appointment time to collect	District office repair and sorting bulky waste for recycle

Waste Composition in Bangkok (2015)

% Waste Composition



Composting	**49.51 %**
- Food waste	42.48 %
- Woods and leaf	7.03 %
- etc.	0.0 %
Recycle	**14.76 %**
- Recyclable paper	2.99 %
- Recyclable Plastic	4.94 %
- Foam	1.45 %
- Glasses	3.78 %
- Metal	1.60 %
Landfill	**35.73 %**
- Paper	8.95 %
- Plastic	17.93 %
- Feather and rubber	1.98 %
- Rag and textile	4.58 %
- Rock and ceramic	0.58 %
- Bone and shell	1.71%

*** Data from October 2014 – May 2015**

Solid Waste Management in Bangkok

Waste Management in Bangkok

Education

R&D

Public Relation

Waste Minimization

Waste Collection and Transportation

Waste Treatment and Disposal

3R

Reduce
To use things with care to reduce the amount of waste generated

Reuse
To repeat use of items or parts of items

Recycle
To use waste as resources

Waste Reduction & Separation at source

REDUCE

- Separation at Source
- Composting / Biogas
- Reduce Packaging
- Use less – Waste less

3R

REUSE

- Transforming Recycle Materials to New Products Contest
- Reuse Packaging
- Use both sides of paper

RECYCLE

- Sup Thawee – Boon Thawee Recycle
- Zero baht shop
- Waste Bank
- Waste separation in office building

Waste Minimization

Encouraging solid waste reduction and separation via various media

Launch the activities in target groups and disseminate to the public

The district offices promote in their areas

Waste minimization

The Project of Recycle 360 ^{0}C

Utilization of Organic Waste and Yard Waste

Zero Baht Shop

Promote the public participation in solid waste management.

Developing Waste Management Systems in District Offices

Project on transforming recycle materials to new products contest

The Project on the public participation in Solid Waste and Wastewater Management by Communities

Waste minimization

Community Based Solid Waste Management (CBM)

506 communities during 2009-2014

- 377 communities
- 115 institutions
- 12 enterprises
- 2 markets

- 506 communities (24.63% of all communities) during 2009-2014
- Reduce solid waste 25%

Waste minimization

Utilization of Organic Waste and Yard Waste

Liquid Organic Fertilizer and Bio Fertilizer Processing Method

- Encourage communities to produce fertilizer from organic wastes
- Reduce organic and yard waste 400 tons/day

Water+ Molass + Organic waste

↓

Fermenting solution

Leaving it for 7 days the mixture solvent can be use.

Waste minimization

Solid Waste and Environment Management Project in BMA school

Implementation

- Established learning centres for solid waste management in 30 schools under the BMA
- Enhance capacity of selected schools personnel and relevant BMA officers for environmental management
- Reduce the amount of organic waste and recyclable waste about 27,228 kg (302.5 kg/day in 3 months)

Waste minimization

The Project of Recycle 360°

- To promote waste reduction at sources
- Partnership with Coca-Cola Foundation (Thailand) and The Federation of Thai Industries (FTI)
- Solid waste reduction in total 41 % - organic waste 29.6 %
  - recyclable waste 11.6 %

Waste minimization

Zero baht shop

Baht Shop

TIPMSE ร้านนี้ใช้วัสดุรีไซเคิลแทนเงินสด

- What is "Zero Baht Shop"?
  - ✓ The concept by Thailand Institute of Packaging and Recycling Management for Sustainable Environment, the Federation of Thai Industries (TIPMSE)
  - ✓ To promote a concept where recycled materials are used in exchange for necessary goods and services

Implementation

- Total recyclable waste 44,778 tons/year (122.7 tons/day)
- Total income 9,300 Baht/month (~260 $)

Waste minimization

The Project on the public participation in Solid Waste and Wastewater Management by Communities

- Promote the public participation in solid waste and wastewater management by communities
- Implemented in 190 places, 14 districts
  (55 communities, 45 schools, 29 religious places, 61 commercial buildings)

Waste minimization

Developing Waste Management System in District Offices

- Separate recyclable and organic waste to utilization and separate household hazardous waste to disposal

The Roof Top Vegetable Garden on District Building

Reuse shop

Waste minimization

- **Project on transforming recycle materials to new products contest**
  - Project on receiving donation of used things and turn into useful material
  - Develop the recycle products to business

Waste minimization

Develop waste reduction and separation in BMA City Hall 1 and 2

- Set up the campaign for encouraging BMA officials in the reduction and waste separation
- Determine the place for waste separation



Waste minimization

Evaluating and Ranking the Standard of district office

- Determine indicator of waste reduction and utilization for district offices
- Distribute the successful case to other district offices




Waste Collection by Type

Appointment Time

- Collection is operated around 08.00 p.m. – 03.00 a.m. everyday and completed by 06.00 a.m.

Types of waste collection

- Food waste ⇨ Daily or every other day based on location
- Recyclable waste ⇨ Every Sunday
- Hazardous waste ⇨ 1st and 15th of month

Waste Treatment and Disposal

Transfer Stations and Sanitary Landfill Sites

Waste Treatment and Disposal

Flow of Waste Treatment and Disposal

Municipal Solid Waste
10,000 tons/day

HW & HHW

Sai-Mai Transfer Station (2,400 tons/day) (24%)

Nongkham Transfer Station (3,600 tons/day) (36%)

On-Nuch Transfer station (3,100 tons/day) (11%)

HW

Sanitary Landfill

LFG
50% CH_4

HHW

Secured landfill

Electricity

Sanitary Landfill

LFG
50% CH_4

HW

Composting plant (1,100 tons/day)

Compost

Infectious Waste
34 tons/day

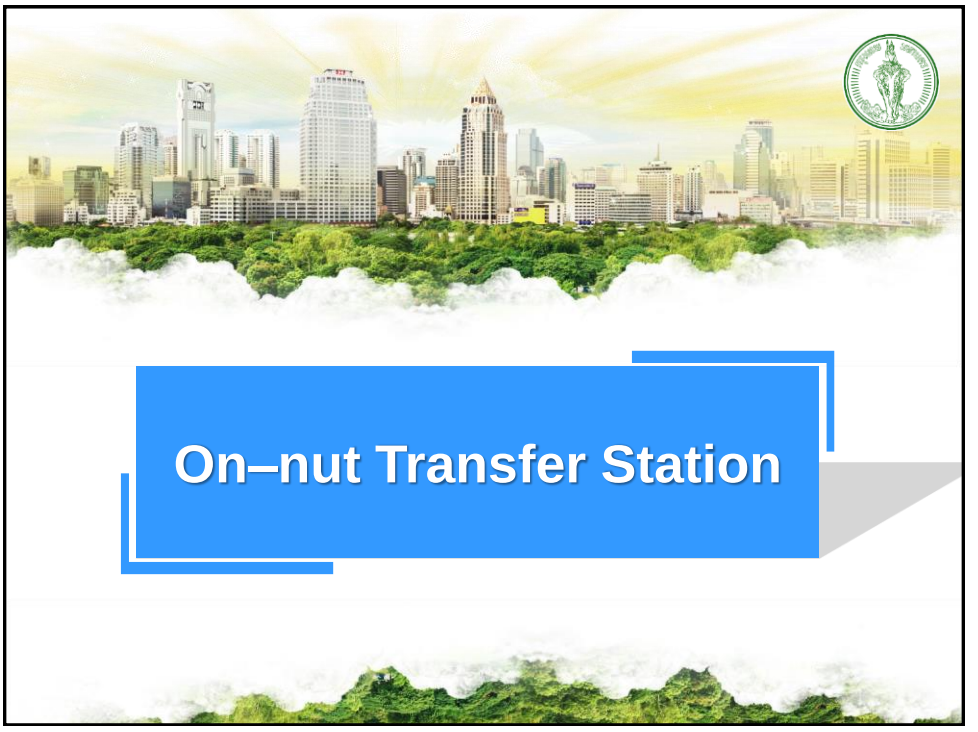
Collect and Dispose by Krungthep Thanakom Co., Ltd.

Incinerator At On-Nuch Disposal center

Ash Landfill

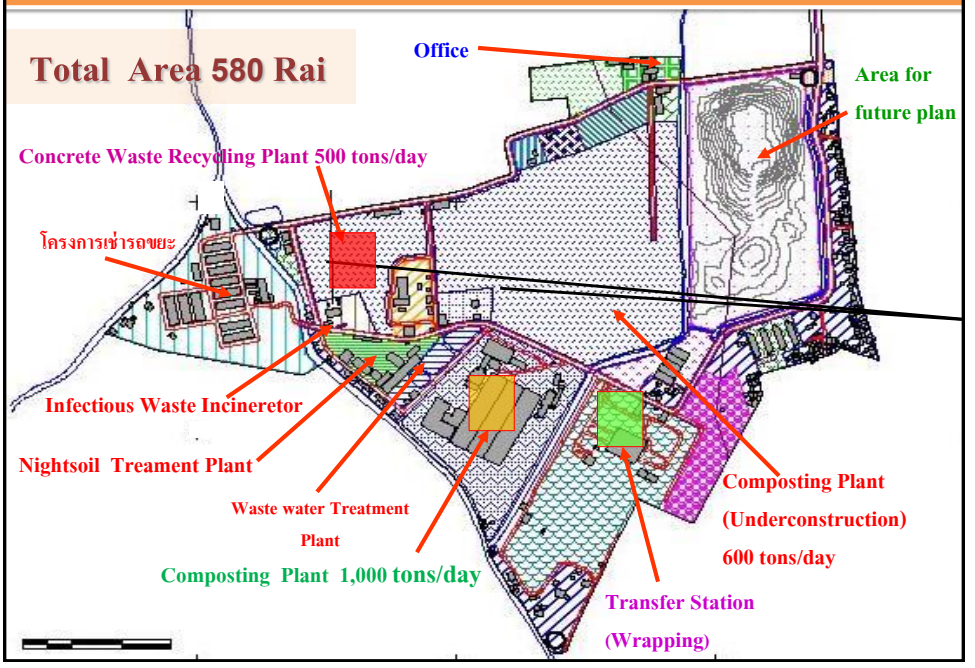
HW = Household Waste
HHW = Household Hazardous Waste

27



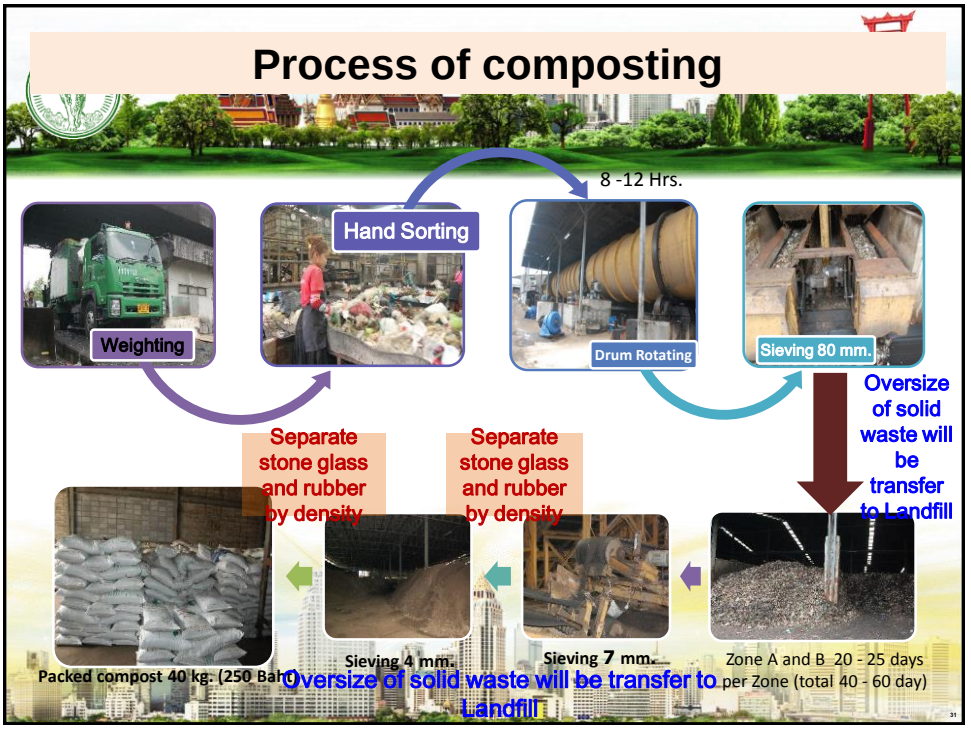
On–nut Transfer Station

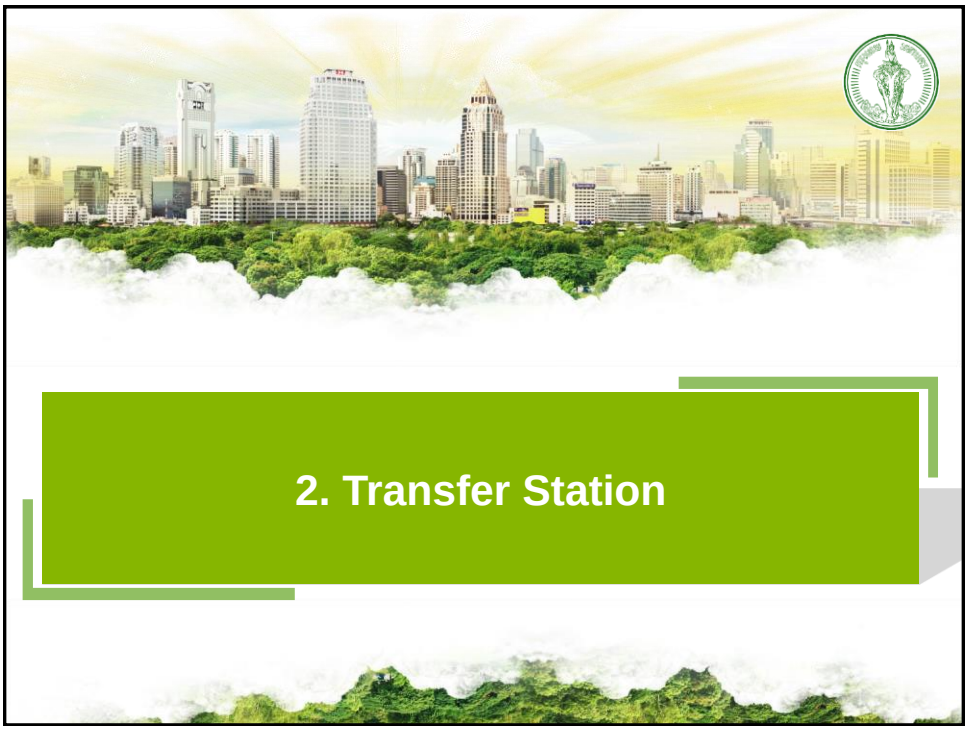
Landused map at On-nuch Transfer Station



1. Composting Plant

Process of composting





2. Transfer Station

Transfer Station

Scale

Receiving Terminal
(Closed System)

Compactor Process

Transfer by conveyer

Hydraulic compactor
(High pressure)

Tight with wire

Transfer Station

Wrapping with plastic
(Horizontal – Vertical)

Solid Waste 1 m^3 (～ 1 ton)
(Disposal Cost 794 Baht/Ton)

Solid Waste Transfer Process

Load to the truck

Total weight
～ 47 tons
(17-20 bales)

Cover solid waste
and transfer to sanitary
landfill
(60 trucks)

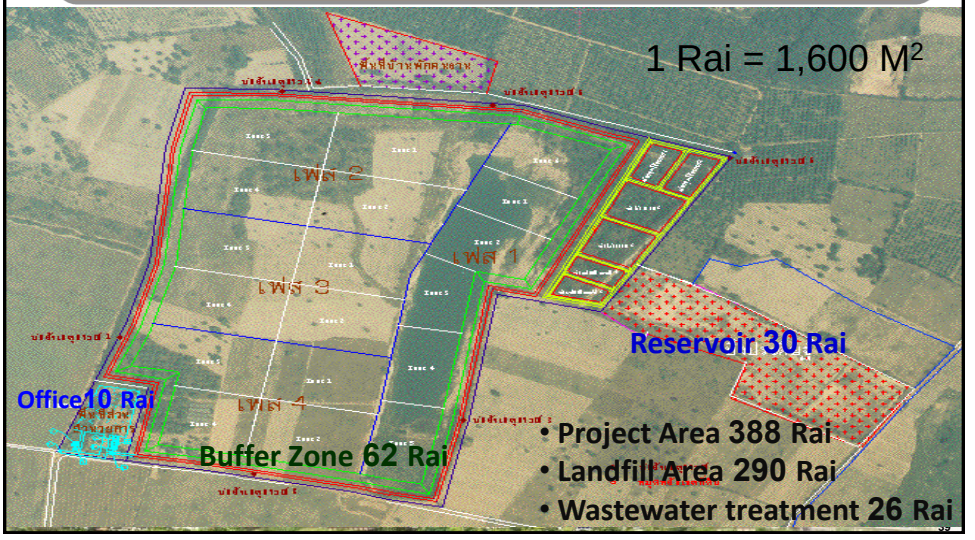
Solid Waste Transfer Process

Transfer to landfill 90 Km. (Panomsarakam, Chachoengsao)	Take out from the truck	Arrange to landfill 1 layer ~ 6 meters

3. Sanitary Landfill

Waste Treatment and Disposal

Map of Sanitary Landfill Sites



Waste Treatment and Disposal

Construction of Landfill

Foundation Compact | Leachate Collecting System | Compaction Testing | HDPE liner 1.5 mm.

Waste Treatment and Disposal

Construction of Landfill


HDPE Leakage Double check


Geotextile


Anaerobic Pond


Stabilization Pond

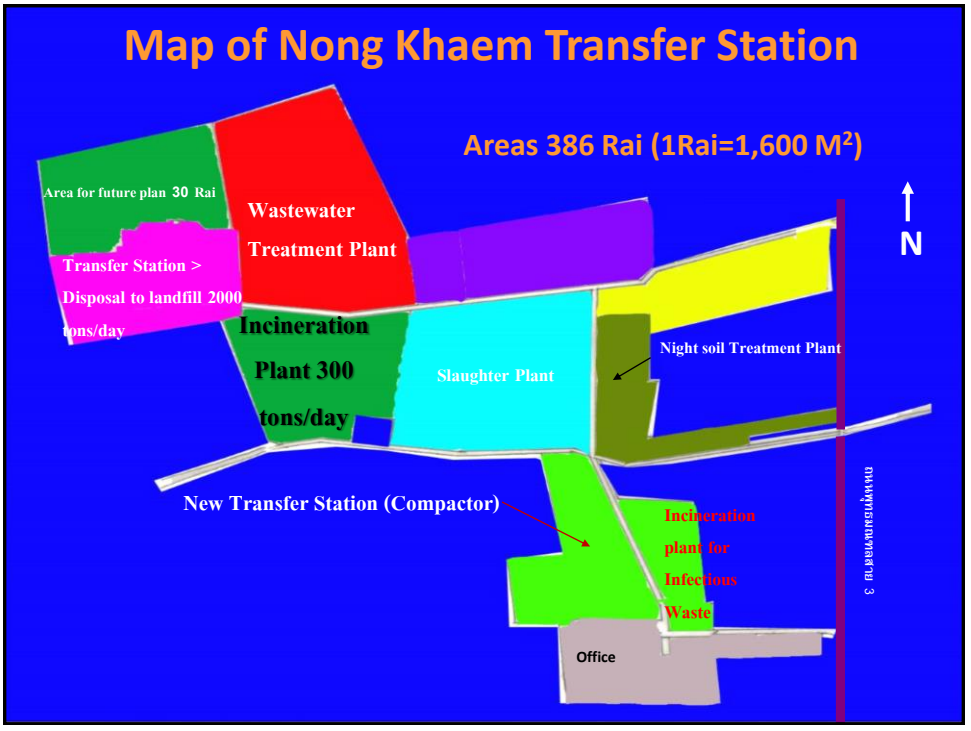
Waste Treatment and Disposal

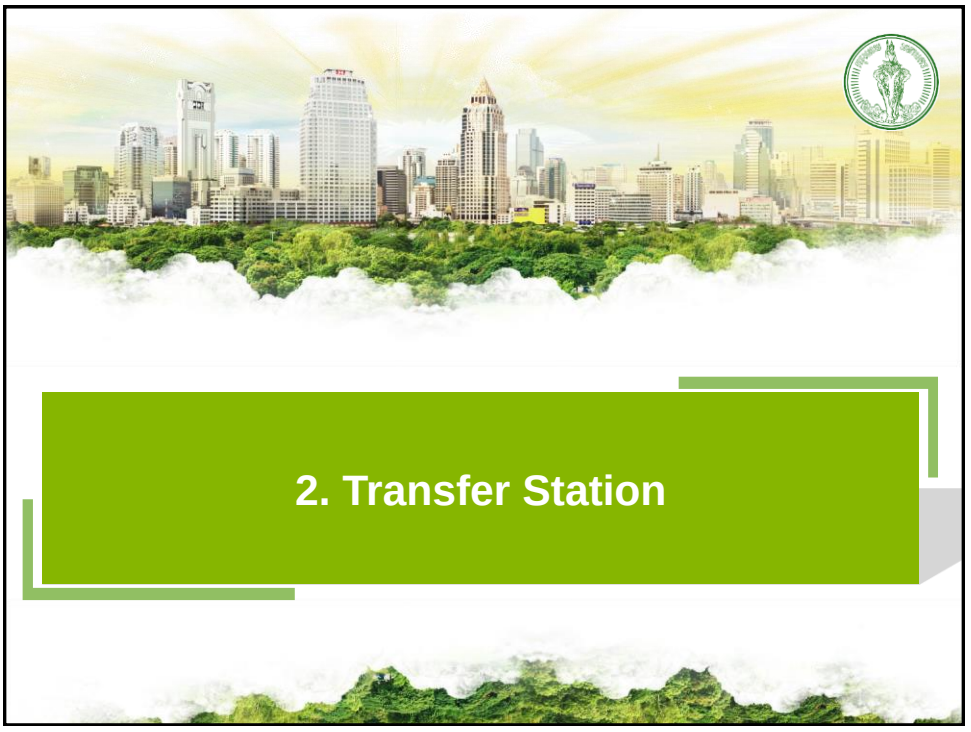
Final Cover of Sanitary Landfill




Gas Collection	Final cover with Monitoring System	Plantation	Electric Generation 2 MW

Nong Khaem Transfer Station


Map of Nong Khaem Transfer Station
Areas 386 Rai (1Rai=1,600 M²)
Area for future plan 30 Rai
Wastewater Treatment Plant
Transfer Station > Disposal to landfill 2000 tons/day
Incineration Plant 300 tons/day
Slaughter Plant
Night soil Treatment Plant
N
New Transfer Station (Compactor)
Incineration plant for Infectious Waste
Office
ถนนพุทธมณฑล 3


2. Transfer Station

Nong Khaem Transfer Station

Scale	Transferring	Receiving Terminal
(Collection Truck from Household)		

Solid Waste Transportation

Scale	Collection truck	Scale before leaving to Landfill (40 Trucks)

Sanitary Landfill Process

Container Loading | Transfer to Landfill | Compact and Daily Cover

3. Sanitary Landfill

Sanitary Landfill

Total 5 layers ~ 15 M. (3 meters per layer)

Kampaengsan District Nakhon Pathom Province

Each layer will be covered with 30 cm. daily cover

3. Incinerator

Solid waste to energy project

(By incineration system 300 tons/day at Nongkhaem Transfer Station)

Incineration 300 tons/day

Implementation

- The disposal process by incinerator will be eco-friendly approach
- Generate the electric by waste to energy process approximately 5 MW/day.

- Time 20 years
- Stokers (250 tons/day x2)
- BOT process
- In the recently, 91% construction
- Expected to be completed in October 2015

Special Type of Waste Management

Special Type of Waste Management

1. Hazardous waste
2. Infectious waste
3. Construction and demolition waste
4. Yard waste

1) Hazardous waste collection

Special compartment for hazardous waste

Amount of hazardous waste
615 tons / year or 1.68 ton/day
(In 2014)

Hazardous waste truck (22 Districts)

Hazardous waste disposal

Collecting point

Transport to disposal at landfill
(Samut Prakarn province)
by Akkhie Prakarn company

2) Infectious waste collection

by Krungthep Thanakom company

- ❖ 2,286 health care services (in 2014)
- ❖ Amount of Infectious waste 32 tons/day
- ❖ 22 trucks of infectious waste collection
- ❖ 100 staffs of infectious waste collection and disposal

Infectious waste disposal

Infectious Waste Incinerator
At On-nut Transfer Station
Capacity 15 tons /day (x2)
Total 30 tons /day

Infectious Waste Incinerator
At Nong Khaem Transfer Station
Capacity 10 tons /day (x2)
Total 20 tons /day

3) Concrete Waste Recycling System (500 tons/day)

Construction Waste and Demolition Waste

4) Fertilization from yard waste and Night soil sludge

Grinder for yard waste

Branch scraps and night soil sludge

Proportion 2:1

Grinded fertilizer for packaging

40 days fermented yard waste

Fertilizer mixing

Fertilization Plant from yard waste and Night soil sludge 50 and 30 tons / day

At On-nut and Nong Khaem Transfer Station

Strategies of Solid Waste Management

BMA's Solid Waste Management Plan (2015 - 2019)

Follow the National Roadmap

Solid Waste and Hazardous Waste Management

Solid Waste and Hazardous Waste Management

1	2	3	4
Dispose Accumulated Solid Waste	Create an Appropriated pattern of Solid waste and Hazardous Waste Management	Set up the measure for Solid waste and Hazardous Waste Management	Discipline people to the sustainable management

BMA's Solid Waste Management Concept "Waste as a Resource"

BMA's Framework for Solid Waste Management

" Increase the Eco-friendly Solid Waste Management System from waste collection, transfer lead to waste to energy by appropriate technology clean and modern"

Vision

Waste as a resource

Encourage 3R concept by promote Public Participation and Eco-Friendly Technology

Strategies for SWM Plan of Bangkok

Strategy 1 Increase the efficiency of solid waste and hazardous waste management
- Promote 3Rs concept
- Encourage hazardous and e-waste separation
- Develop efficiency of waste collection
- Use Eco-friendly Technology

Strategy 2 Set up the discipline by public participation on SWM
- Enforce law and registration
- Encourage economic measure
- Promote Public Participation

Strategy 3 Integrate SWM system
- Set up SWM plan by public participation
- Apply IT for SWM

Strategy 4 Increase the capacity building of SWM of BMA
- Develop Knowledge and skill among BMA's staff
- Encourage SWM attitude
- Seeking cooperation

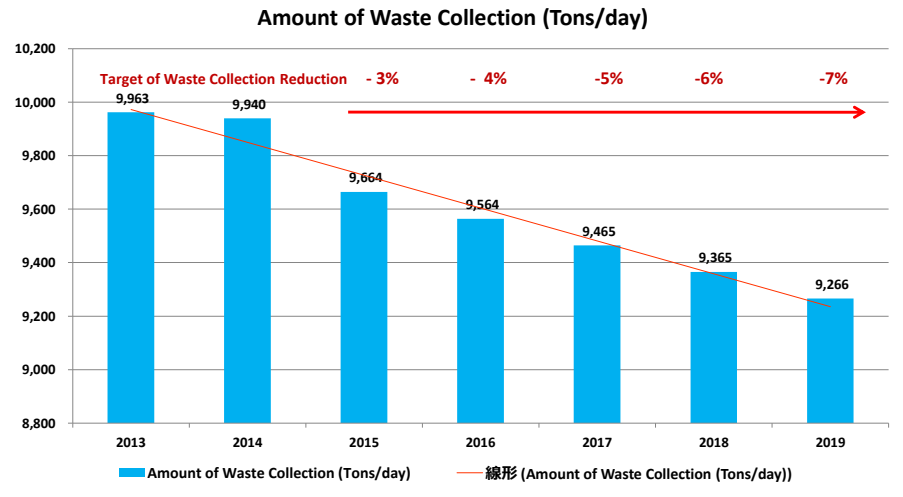
Strategy 5 Research and develop knowledge and technology for SWM
- Promote R&D
- Develop SWM innovation

SWM Plan of Bangkok (2015 – 2019)

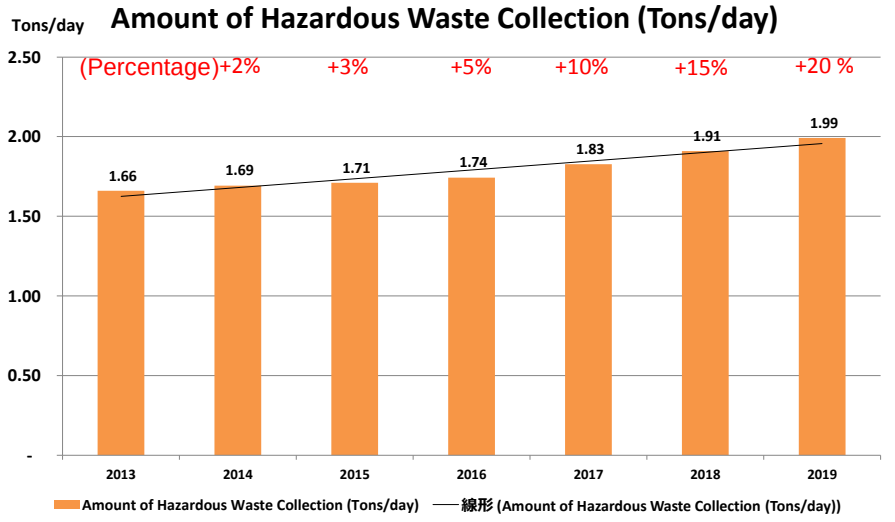
Key Target

- To reduce the amount of waste collection from household up to 7 % in 2019 (Base year in 2013)
- To increase the amount of hazardous waste collection from household up to 20 % in 2019 (Base year in 2013)
- To increase the amount of waste disposal by appropriate technology for utilization up to 30% (Base year in 2013)

Reduce the amount of waste collection from household up to 7 % in 2019 (Base year in 2013)

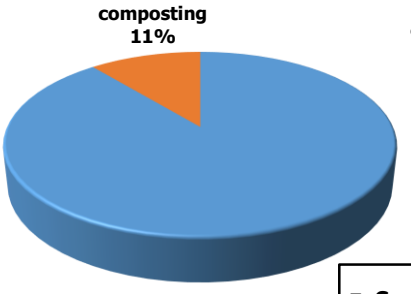


Increase the target of hazardous waste collection from household up to 20 % in 2019 (Base year in 2013)

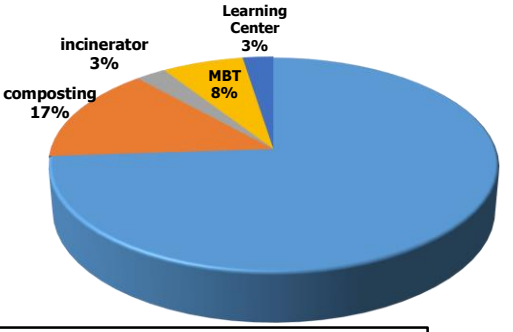


Increase the amount of waste disposal by appropriate technology for recyclable waste up to 30% (Base year in 2013)

In 2013 ,The amount of solid waste were collected 9,963 tons/day



increase the amount of waste disposal by appropriate technology for utilization up to 30% (2,989 tons/day)



- Composting 1,700 tons/day (17%)
- Incinerator 300 tons/day (3%)
- MBT 800 tons/da (8%)
- SWM Learning Center 300 tons/day (3%)

Total 3,100 tons/day

Future Plan for
BMA's Solid Waste Management

Solid Waste management Initiatives

- Waste reduction and separation at source
- Improve fuel efficiency of waste collection and transportation systems
- Promote utilization of organic waste
- Construct waste-to-energy incineration facility
- Construct waste segregation plant
- Install environmentally friendly landfill system

Bangkok's Solid Waste Management Plan (20 years)

Transfer Station	Technology for SWM	Capacity (t/d)	Fiscal Year 58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
Nong Khaem	Landfill	2,000	←	→	←	-	-	-	จ้างเหมาต่อ	·	-	-	→										
	Incinerator	300		←																			→
On-Nut	Landfill	1,800	←										→	←	-	-	-	จ้างเหมาต่อ	-	-	→		
	Composting Plant	1,100	←		→	←	-	-	จ้างเหมาต่อ		-	-	→										
	Composting Plant	600	สร้าง+ทดสอบ			←							→										
	Mechanical Biological Waste Treatment (MBT)	800		FS	สร้าง+ทดสอบ	←																	→
Sai Mai	Landfill	1,700	←										→	←	-	-	จ้างเหมาต่อ		-	-	→		

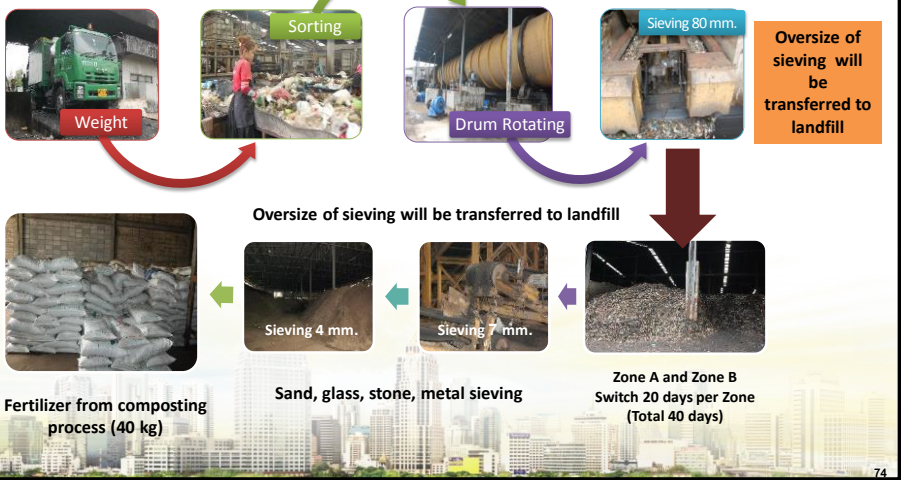
Future Plan

Feasibility Study of Waste to Energy Technology for solid waste disposal
Capacity 2,000 tons: Electric generation not less than 33 MW
Electric Generation not less than 43 MW (According to the plan)

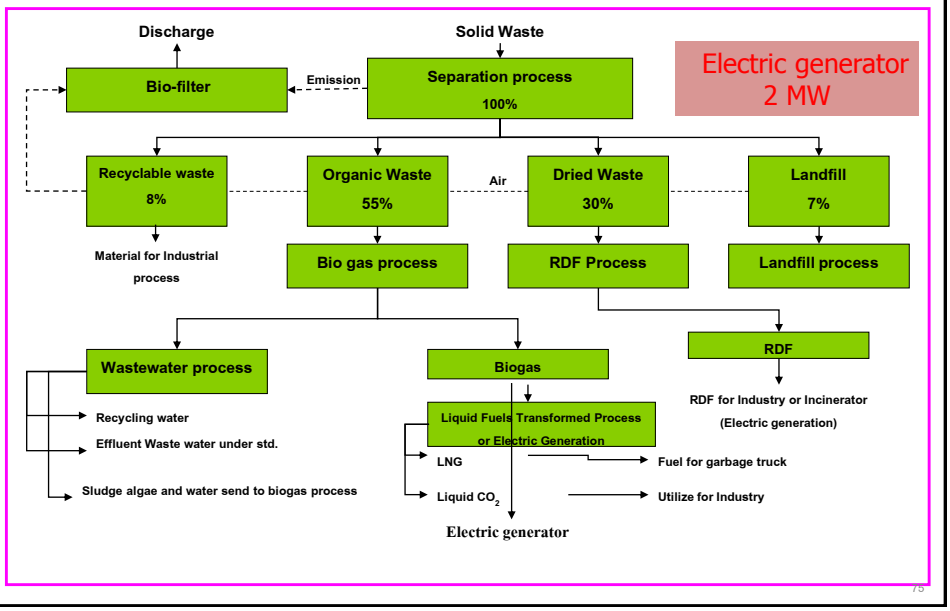
Composting Plant

Composting from Organic Waste

- 1,200 tons/day
- Fertilizer ~ 300 tons/day



3) Mechanical Biological Treatment : MBT



BMA's Solid Waste Management Plan by Eco-friendly technology

Solid waste to energy project

(By incineration system 300 tons/day at Nongkhaem Transfer Station)

- The disposal process by incinerator will be eco-friendly approach
- Generate the electric by waste to energy process approximately 8 MW/day.

- Time 20 years
- BOT process

Thank you for your attention

Appendex 3

Dcuments of Policy Dialogue:

Wastewater Management Sector

- A presentation document of Yokohama city:

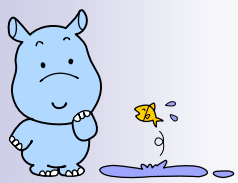
Sewerage project in Yokohama city

- A prsesentation document of BMA:

Community Wastewater Treatment Plant

Tentative translation

Sewerage project in Yokohama city



2013, March 6th

City of Yokohama, Environmental Planning Bureau, Sewerage Project Promotion Division

1 Accounting of sewerage project in Yokohama

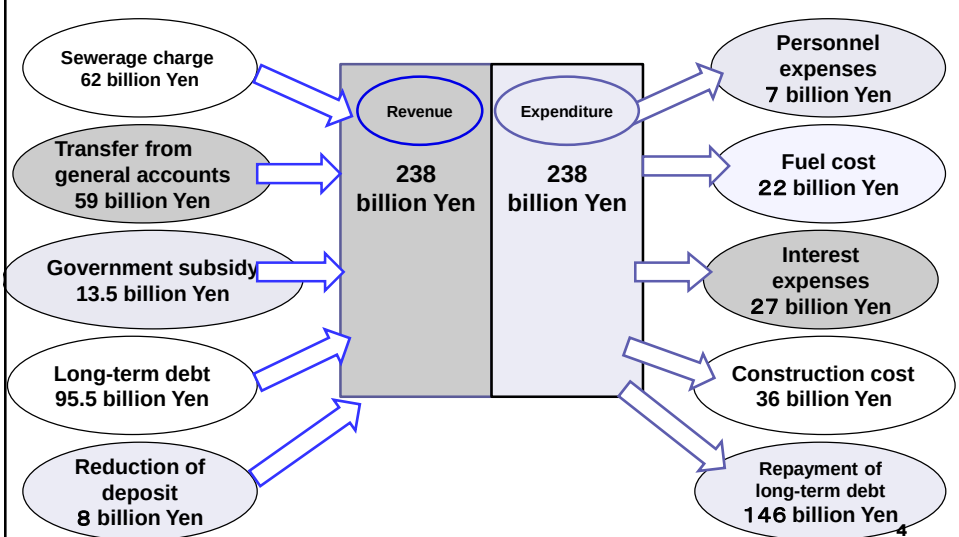
OPEN YOKOHAMA

◆ Implementation body of sewerage project in Yokohama

- Environmental Planning Bureau of Yokohama city implements the project.
  Number of staffs working for sewerage project
  ＜FY 2011 settlement data＞　804 staff

- But [Account of sewerage project] is used which follows cooperating account (special account) apart from general accounts

Cash flow of sewerage project in Yokohama in 2010



Important

Fundamental principle for expenses of sewerage

(Public expense for rainwater - Private expense for sewage)

Expense for treating rainwater = municipal tax (General accounts)

Treatment rainwater as natural phenomenon paid by transfer from general accounts

Expense for treating sewage = Sewerage charge

Treatment of sewage paid by sewerage charge from users according to "Polluter Pays Principle"

Breakdown of maintenance cost

While sewerage facilities operated by local government as their own business, national government is responsible for promoting sewerage project and subsidize it.

Municipal loan is used except governmental subsidy.
As athe verage life of sewerage facilities is about 40 years, long term loan (About 30 years) is used to maintain equality between generations.

Breakdown in 2011 (Unit: Million Yen)

Government subsidy	13,751
Municipal loan	18,131
Part of users charge	1,540
Total expenses	33,422

2 Sewerage charge

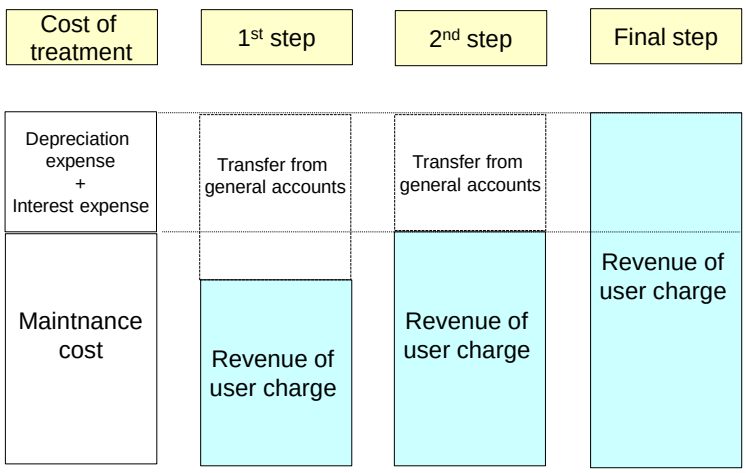
Unit price of sewerage

【General wastewater】
（1 month）

Progressive charge
||
More wastewater
↓
More expensive unit price

Wastewater （1 month）		Price updated in 2005 Unit price （Yen）
m^3 0～8	（Basic charge）	630
9～10	Per 1m^3	20
11～20	〃	118
21～30	〃	173
31～50	〃	234
51～100	〃	264
101～200	〃	299
201～500	〃	341
501～1,000	〃	389
1,001～2,000	〃	416
2,001～	〃	472

Image of cost recovery of sewage treatment



Generally

Amount of city water consumption = Amount of wastewater emission

（Measuring wastewater increases management cost etc. which increase users payment as a result. Therefore, the amount of city water consumption can be regarded as the amount of wastewater emission.)

水道・下水道使用水量等のお知らせ
Information about your current water consumption and discharge.

様

お客様番号(お問合せ番号)

今回ご使用水量 42㎥
Units of Water
請求予定金額 9,880円
Next Bill
お支払方法:口座振替 振替予定日 21年 4月13日

(今回使用分内訳)	水道料金	下水道使用料
料金(税込)	5,632円	4,248円
内消費税等相当額	268円	202円

ご使用年月 21年 2月～21年 3月
今回検針 21年 3月18日 指示数 252㎥
前回検針 21年 1月19日 指示数(－) 210㎥
前年同期使用水量 5㎥
用途:家事用 下水区分:処理 区域

通信欄 インターネットによる「水道の使用開始・中止」の申込受付を行なっています。アドレスはhttp://www.city.yokohama.jp/me/suidou/index.html

Meter inspection slip
once per 2 months for every house

⇩

Calculation of users charge and collection work are outsourced to waterworks bureau
（Collection work is outsourced according to the outsourcing rule in Yokohama）

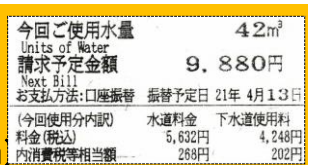
Sewage charge of household

Example case: 4 people household
(Charge for 2 month)

◆ City water consumption=42㎥
(water consumption = sewage emission)

◆ Sewage charge 4,200yen ⇒ 2,100yen/month

◆ Water charge 5,700yen ⇒ 2,850yen/month



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＜Trial calculation＞

Monthly revenue 350,000yen/month;

Sewage charge／Revenue ＝ 0.6%

(Sewage＋City water charge)／Revenue ＝ 1.4%

Payment method for water & wastewater

1 **Payment by bill（Period:20 days）**

Bank, post office, convenience store

2 **Bank account transfer**

13th or 29th in a month after inspection

3 **Credit card**

Credit settlement day

4 **Other（Organization, group）**

End of the month

◆Exception for payment◆

Basic charge (630yen /month)

- Single parent household
- Handicapped etc.

Publicly assisted households are not included.

Certification for reduction

- For the case that the sewerage reduced compared to city water use is able to be certified

Cost for treatment of rainwater

Expense for treating rainwater = municipal tax (General accounts)

Concept for payment

2011	（542 million US $）
Separated	100%
Combined	70%

3 Toward the sound management

Purpose of making mid term management plan

Playing a role of sewerage project, it is necessary to operate efficiently because financial independence is required as publicly owned company

⇓

Mid term management plan indicates targets and measures regarding policy and fiscal management for 3 to 5 years

It is considered 3 to 5 years period is appropriate for the mid term plan with considering change of social environment

Mid term management plan of 2011 Management target

Soundness

Reducing outstanding stock of income bond and promoting the soundness of finance

Outstanding stock of income bond

FY 2011 949.4 billion yen

⇒ FY 2013 target 883.2 billion yen（▲66.2 billion yen）

Profitability

Maintaining constant income and reducing cumulative deficit

Cumulative deficit

FY 2011 23 billion yen

⇒ FY 2013 target 20.5 billion yen（▲2.5 billion yen）

◆Maintenance and management cost ◆

【Personnel expense ratio of Maintenance & management cost 】 (Million Yen)

Personnel expenses	7,006
Maintenance & management	105,662
Ratio	**6.6%**

About maintenance & management cost

- Equipment cost (Repairing, power, outsourcing)
- Personnel expenses (Salary, retirement income)
- Depreciation expenses
- Interest expenses (Interest of income bond)

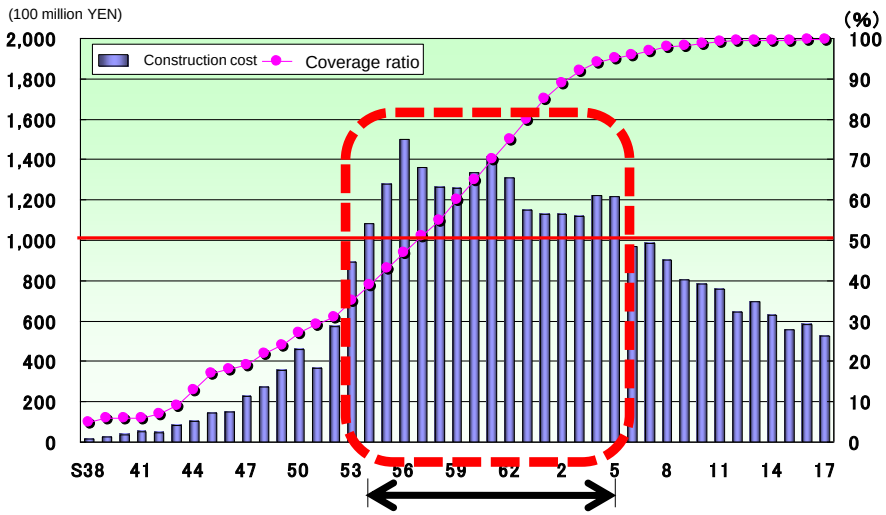
◆Measures for reducing maintenance & management cost◆

Equipment cost ・・・Repairmen cost reduced
(Subsidy increased)
・・・Outsourcing increased
(Cleaning & inspection, other outsourcing)

Personnel expense・・・Reducing staffs by outsourcing

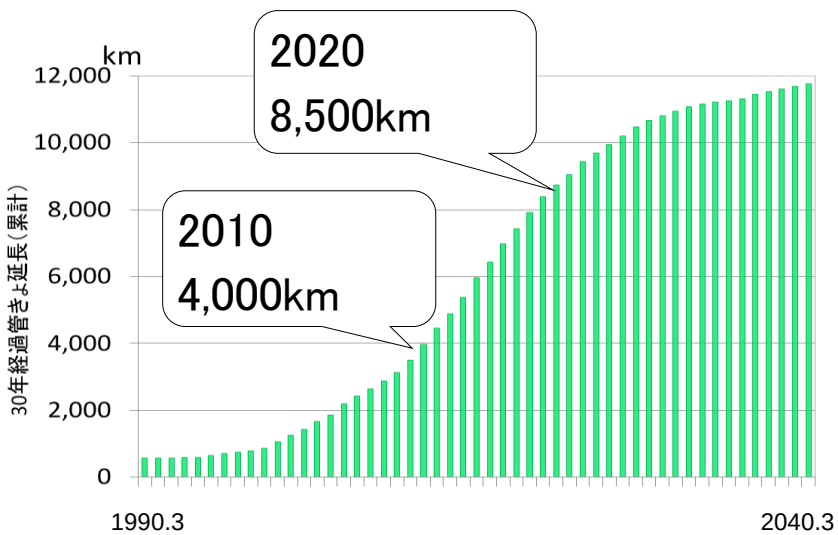
Interest expense・・・outstanding stock reduced (New income bond reduced)
Renewal for high interest (Using governmental scheme)

Shift of Sewage coverage and construction cost in Yokohama

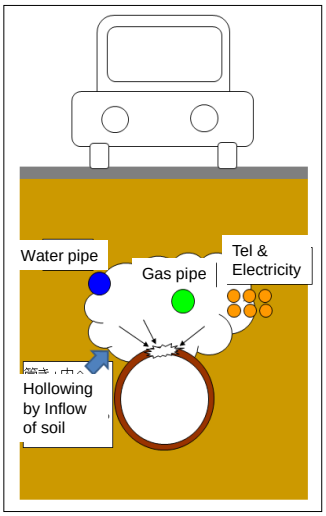


Over 100 billion Yen/year of construction cost during 15 years (1979～1993)

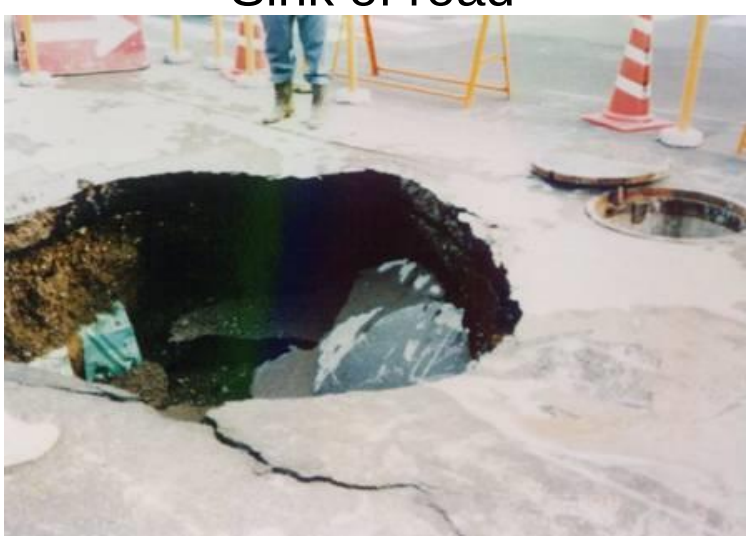
Extend of 30 year aged pipeline



Degradation of sewage pipe

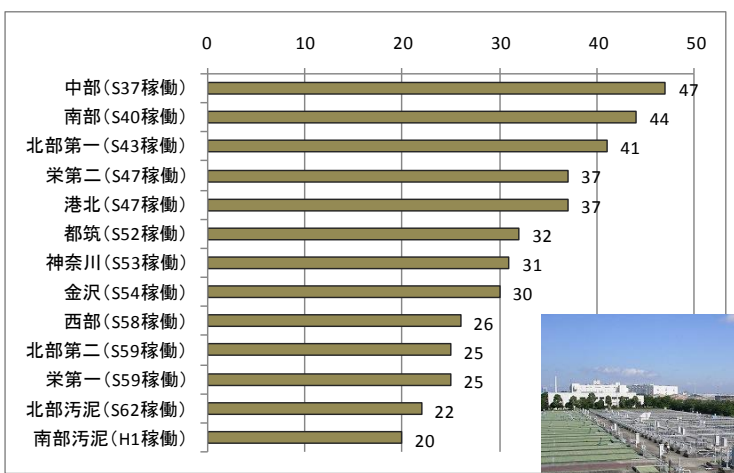


Sink of road



Secondary damage

Duration of water treatment center



Degradation of concrete structure

Revenue from users charge

	Mid term plan 2007				Mid term plan 2011		
Year	2007	2008	2009	2010	2011	2012	2013
Plan	638	638	636	635	614	610	606
Result	637	627	616	621	605		

Main challenge for next mid term management plan (2014～)

Implementing “stock management” with comprehensive Renewal, repairmen and maintenance of facilities

Image of equalization of operational cost

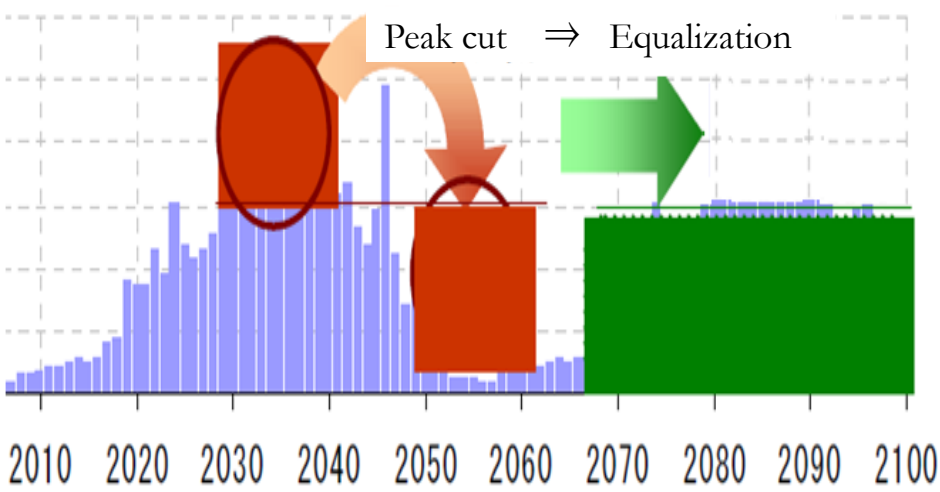
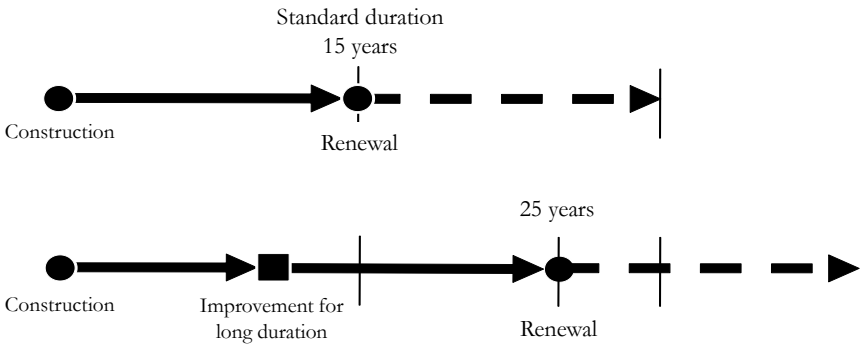


Image of long duration measures

Mechanical electrical equipment
Case: Standard duration = 15 years



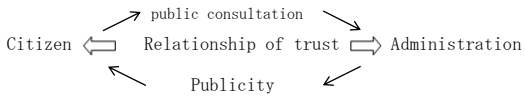
4 Publicity and public consultation

◆ Publicity and public consultation ◆

【Purpose of administrative body】

・ building successive good relationship between administrative and citizen

Structure of publicity and public consultation
～Building good relationship with better communication～



Environmental study
by municipal staff

Finance publicity

Home Page
（Kids page）

Welcome to

Drainage and Sewerage Department

Bangkok Metropolitan Administration

Community Wastewater Treatment Plant

November 24, 2015

Department of Drainage and Sewerage
Bangkok Metropolitan Administration, Thailand

Outline

Section 1

- Bang Na
- Hua Mark
- Bon Kai
- Klong Chan
- Klong Toey
- Rom Klao

Section 2

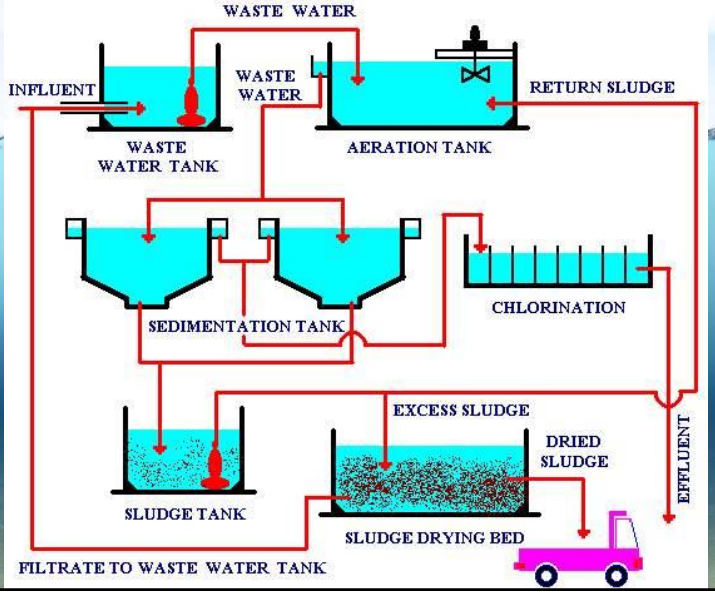
- Bang Bua
- Huay Kwang
- Ram Indra
- Tung Song Hong1
- Tung Song Hong2
- Tha Sai

1.Bang Na WWTP

Served Population (Person)	**8,280**
Process Treatment	Oxidation ditch
Flow design (m3/day)	1,300

Bang Na

Flow diagram of Bang Na

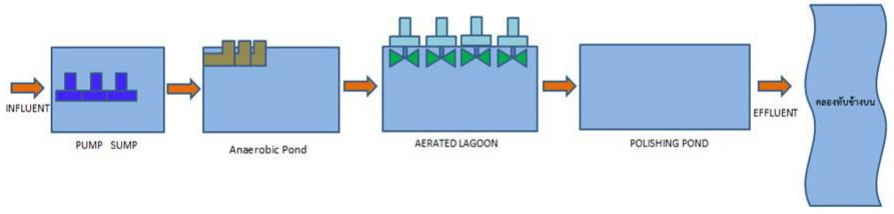


2.Hua Mark WWTP

Served Population (Person)	**9,940**
Process Treatment	Stabilization Pond
Flow design (m3/day)	2,000

Hua Mark

กระบวนการบำบัดน้ำเสีย
(flow diagram)
โรงควบคุมคุณภาพน้ำหัวหมาก

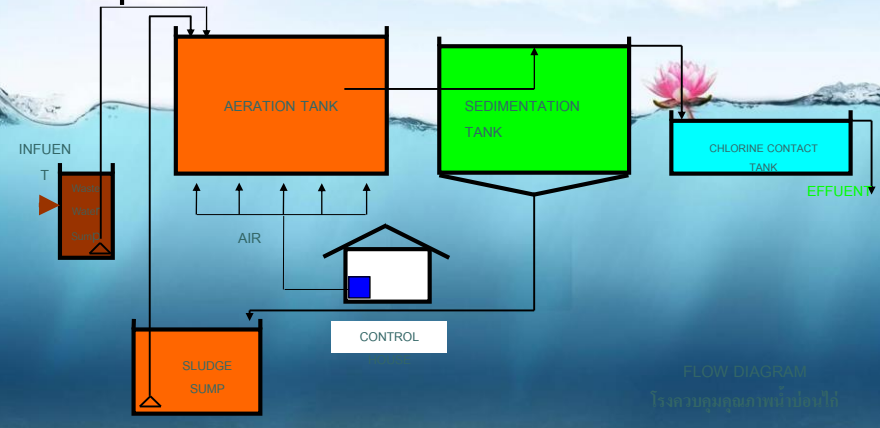


3. Bon Kai WWTP

Served Population (Person)	**2,200**
Process Treatment	Extended AS
Flow design (m3/day)	400

Bon Kai

Flow diagram of Bon Kai



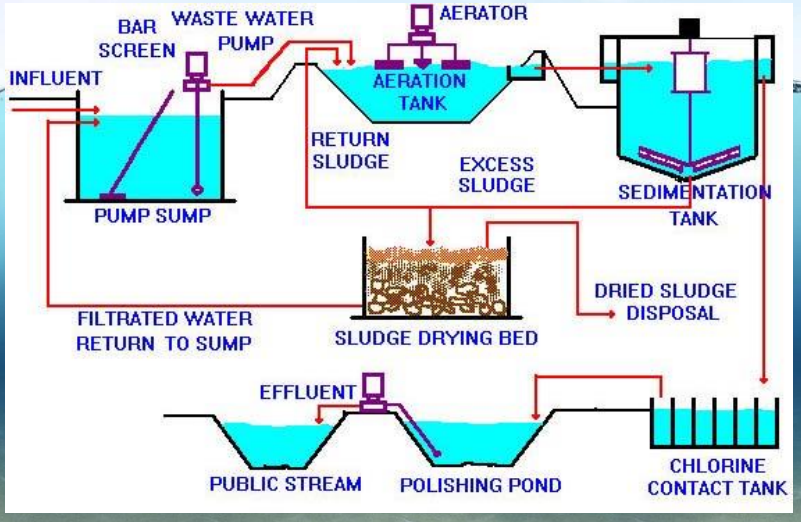
FLOW DIAGRAM
โรงควบคุมคุณภาพน้ำบ่อนไก่

4. Klong Chan WWTP

Served Population (Person)	**36,000**
Process Treatment	Activated Sludge
Flow design (m3/day)	6,500

Klong Chan

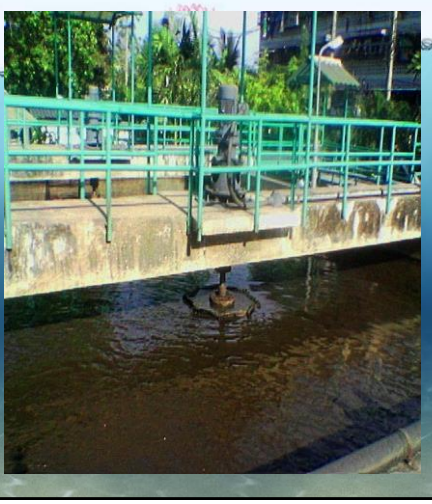
Flow diagram of Klong Chan



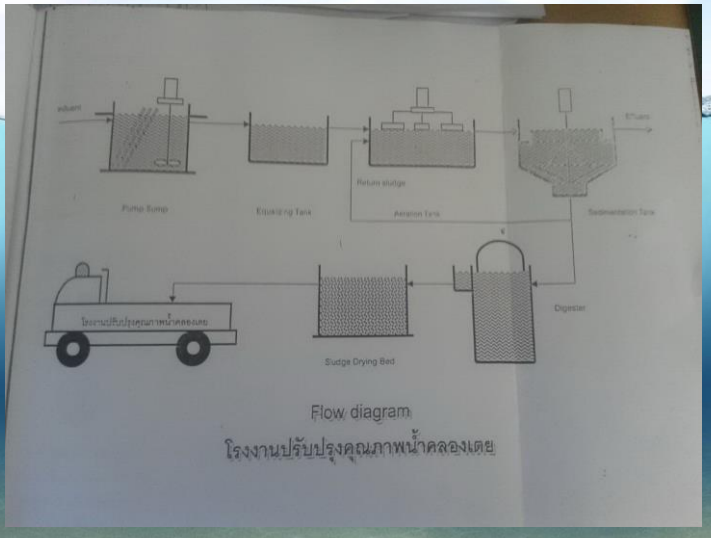
5. Klong Toey

Served Population **(Person)**	**7,200**
Process Treatment	Completely mixed AS
Flow design (m3/day)	1,200

Klong Toey



Flow diagram of Klong Toey

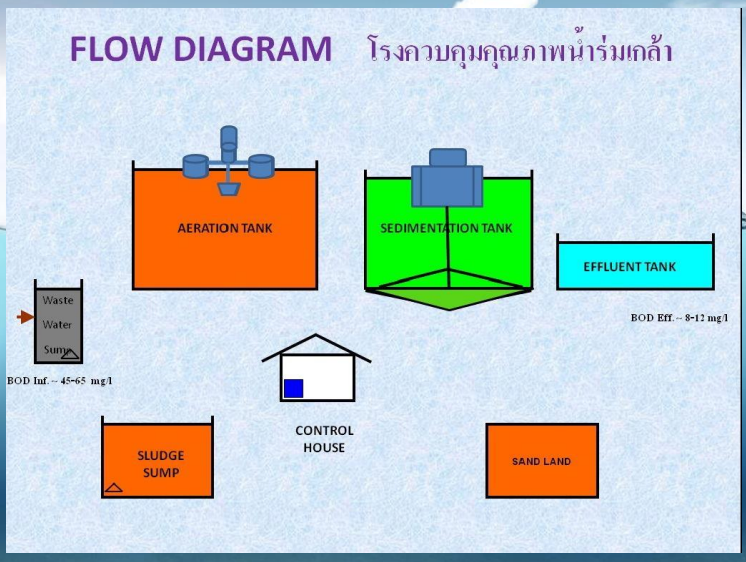


6. Rom Kloa WWTP

Served Population (Person)	**19,000**
Process Treatment	Extended AS
Flow design (m3/day)	3,800

Rom Kloa

FLOW DIAGRAM โรงควบคุมคุณภาพน้ำร่มเกล้า



Water Quality (year 2014)

	BOD (mg/L)			SS (mg/L)		
	Inf	Eff	Remove (%)	Inf	Eff	Remove (%)
Bang Na	94	4	94.5	98	7	92.7
Hua Mark	69	6	90.6	64	15	76.5
Bon Kai	200	4	98.4	180	6	97.0
Klong Chan	114	8	93.1	62	18	71.2
Klong Toey	153	8	94.6	117	10	91.4
Rom Kloa	66	9	86.3	70	22	67.9

Section 2

Section 2

- **Bang Bua**
- **Huay Kwang**
- **Ram Indra**
- **Tung Song Hong1**
- **Tung Song Hong2**
- **Tha Sai**

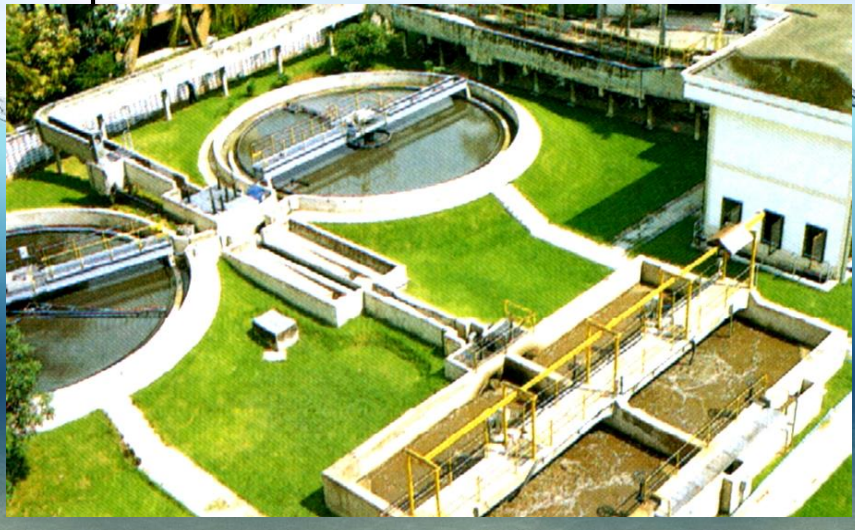
7. Bang Bua WWTP

Served Population **(Person)**	**8,000**
Process Treatment	Pump to Chatuchak WWTP
Flow design (m3/day)	1,200

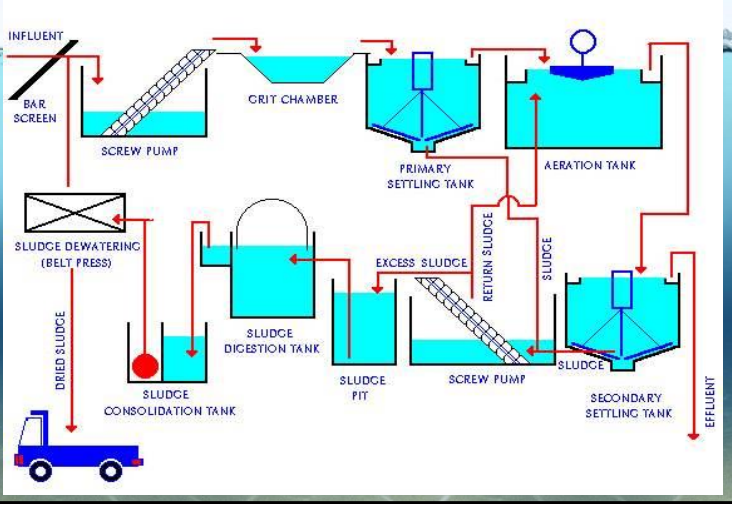
8. Huay Kwang

Served Population (Person)	**16,800**
Process Treatment	Conventional AS
Flow design (m3/day)	2,400

Huay Kwang



Flow diagram of Huay Kwang

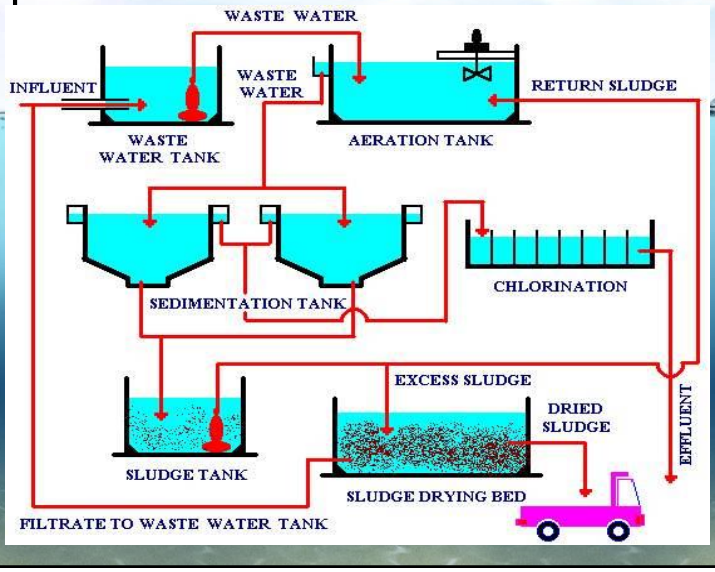


9. Ram Indra WWTP

Served Population (Person)	**4,060**
Process Treatment	Extended AS
Flow design (m3/day)	800

Ram Indra

Flow diagram of Ram Indra

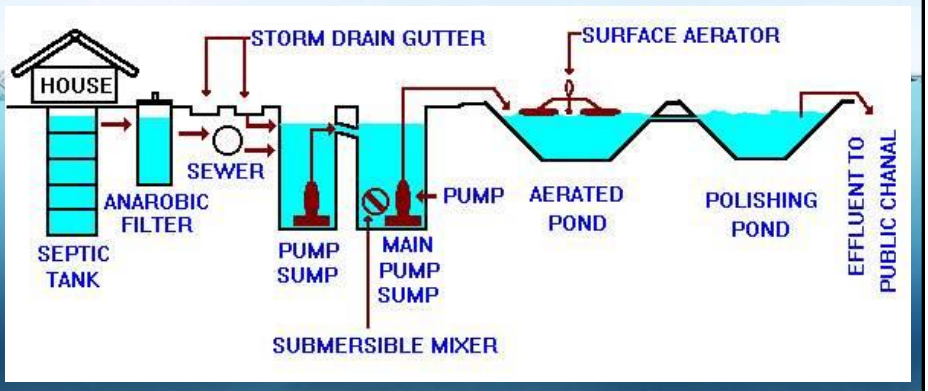


10. Tung Song Hong 1 WWTP

Served Population (Person)	**15,000**
Process Treatment	Aerated Lagoon
Flow design (m3/day)	3,000

Tung Song Hong 1

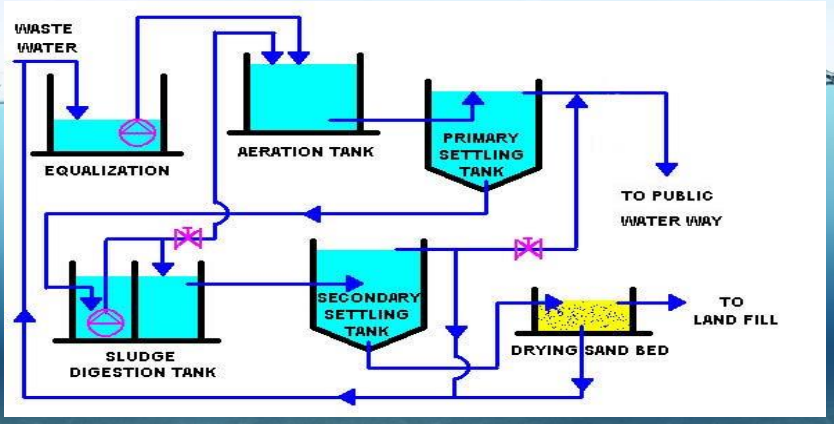
Flow diagram of Tung Song Hong 1



11. Tung Song Hong 2

Served Population (Person)	**5,500**
Process Treatment	Activated Sludge
Flow design (m3/day)	1,100

Flow diagram of Tung Song Hong 2



12. Tha Sai WWTP

Served Population (Person)	**8,280**
Process Treatment	Oxidation ditch
Flow design (m3/day)	1,300

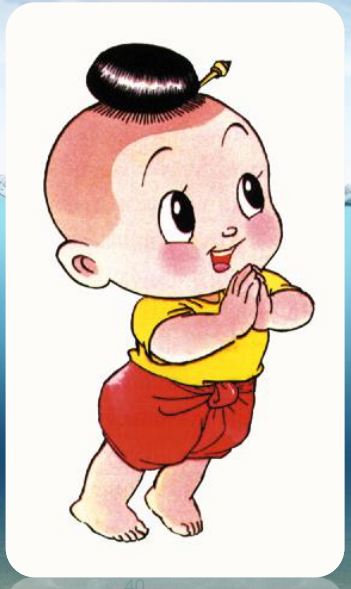
Tha Sai WWTP

Water Quality (year 2014)

	BOD (mg/L)			SS (mg/L)		
	Inf	Eff	Remove (%)	Inf	Eff	Remove (%)
Bang Bua	174	-	-	-	-	-
Huay Kwang	81	5	93.6	52	6	88.6
Ram Indra	69	5	92.6	43	6	85.6
Tung Song Hong 1	45	10	78.7	45	17	63.2
Tung Song Hong 2	148	4	96.6	76	6	92.1
Tha sai	45	3	93.1	31	5	83.4

Equipment in Community WWTP

- Sewage pump
- Belt screen
- Aerator
- Return sludge pump
- Sludge feed pump



Thank you for your attention

Appendix 4

"Program approach for building energy efficiency in the E group via introducing high efficiency equipment"

- JCM Proposed Methodology
- JCM Project Design Document

JCM Proposed Methodology Form

Cover sheet of the Proposed Methodology Form

Form for submitting the proposed methodology

Host Country	Thailand
Name of the methodology proponents submitting this form	I company
Sectoral scope(s) to which the Proposed Methodology applies	3. Energy demand
Title of the proposed methodology, and version number	Comprehensive energy saving at building (Hotel etc.), Version 1.0
List of documents to be attached to this form (please check):	☐The attached draft JCM-PDD: ☐Additional information
Date of completion	2016.2.15

History of the proposed methodology

Version	Date	Contents revised
1.0	2016.2.15	First edition

A. Title of the methodology

Comprehensive energy saving at building (Hotel etc.), Version 1.0

B. Terms and definitions

Terms	Definitions
BEMS	Building Energy Management System: System for facility management and energy saving control and also supporting improvement of environmental and energy performance at building by energy management.

C. Summary of the methodology

Items	Summary
GHG emission reduction measures	Achieving reduction of electricity consumption and CO_2 emission by installing BEMS and other energy saving technologies.
Calculation of reference emissions	Reference emissions are calculated by "Build up method" or "Comprehensive method" with multiplying reference electricity consumptions and grid CO_2 emission factor. Build up method is calculation for each facilities/equipment installed. Reference electricity consumptions are obtained by past data of project participant, ex-ante measurement or calculation method. Comprehensive method is adopted in case of being unable to clarify electricity consumption of facilities and only able to clarify electricity consumption of entire power system.
Calculation of project emissions	Project emissions calculated by "Build up method" or "Comprehensive method" as same as reference emissions.

Monitoring parameters	Build up method - Electricity consumption [MWh/p] of facilities/equipment (i) during period (p) after the project implementation - Operating time [hours/year] of facilities/equipment (i) in year (y) including period (p) after the project implementation Comprehensive method - Reference electricity consumption [MWh/p] of entire power system of the building or power system including all the facilities/equipment. - Operating time [hours/year] of the building (i) in year (y) including period (p) after the project implementation

D. Eligibility criteria

Criterion 1	Target scope of facilities includes hotel, office building, commercial facility such as shopping mall, hospitals and governmental office etc..
Criterion 2	Achieving reduction of electricity consumption and CO2 emission by installing BEMS (Building Energy Management System) and other energy saving technologies.
Criterion 3	Replacement for LED lighting, replacement for high efficient chiller and installation of Variable Water Volume (VWV) control etc. are regarded as Energy saving technologies
Criterion 4	Possible to monitor electricity consumption of the facilities/equipment or the entire building after the project implementation.
Criterion 5	There is no significant expansion/contraction of the building which influence energy consumption during project implementation.

E. Emission Sources and GHG types

Reference emissions	
Emission sources	GHG types
Electricity consumption of facilities/equipment	CO_2
Project emissions	
Emission sources	GHG types
Electricity consumption of facilities/equipment	CO_2

F. Establishment and calculation of reference emissions

F.1. Establishment of reference emissions

Reference emission is defined as amount of GHG emitted from existing equipment without installations of the equipment of the scheme. One or other of following 2 methods will be adapted depending on available data.

1. Build up method

In case of being able to clarify electricity consumption of facilities to be replaced, build up method should be adopted. Reference emission is defined as amount of GHG emitted from existing equipment without installations of the equipment of the scheme. The reference emission of the each equipment will be calculated by multiplying the electricity consumption by emission factor of electricity. And the total reference emission amount is total of all facilities/equipment.

The reference electricity consumption can be obtained by past data, ex-ante measurement, or calculation method. The length of past data must be at least 1 year. The ex-ante measurement must be conducted at least 60 days in cool season when energy load is considered low, considering the conservativeness.

If the reference electricity consumption can't be calculated by the past data or the measurement data, it can be estimated by energy efficiency of the equipment reported by manufacturer etc. and the project electricity consumption.

And the reference electricity consumption is corrected by appropriate activity data such as operating time of the equipment.

E.g. (Reference electricity consumption) × (Operating time of the equipment after the project)/ (Operating time of the equipment before the project).

2. Comprehensive method

In case of being unable to clarify electricity consumption of facilities and only able to clarify electricity consumption of entire power system, comprehensive method must be adopted. The reference emission amount defined as amount of GHG

emitted from existing equipment without installations of the equipment. The reference emission amount will be calculated by multiplying the reference electricity consumption by emission factor of the electricity. The reference electricity consumption will be set by the past data or the measurement data before the project. Length of past data must be at least a year. The measurement data should be measured at least a year. Considering conservativeness, selecting a month with lowest electricity consumption and multiplying 12 month for calculating annual electricity consumption. And the reference electricity consumption is corrected by appropriate operating time of the equipment as same as build up method.
Moreover, in case of using comprehensive method, it is necessary to show that there are no equipment or activities that influence the project energy consumption or, if there are some equipment or activities influencing the project, it is necessary to prove that the influence is small enough to be ignored.

F.2. Calculation of reference emissions

1. Build up method
(In case of being able to clarify electricity consumption of facilities to be replaced.)

The reference emission is calculated according to the following formula. However, in case of being unable to apply the formula for certain equipment, the reference emission is calculated as following.
①Formula shown in appendix
②Using formula defined in other approved methodologies. (Used methodology must be specified in PDD)
③Proposing new formula which will applicable for the facilities/equipment. (The methodology must be specified in appendix)

$$RE_p = \sum_i \left[EC_{RF,i} \times EF_{CO2,elec} \times \alpha_{p,i}\right]$$

$EC_{RF,i}$: Reference electricity consumption of facilities/equipment (i) [MWh/p]
$EF_{CO2,elec}$: CO_2 emission factor of grid power system [tCO_2/MWh]
α_p : Correction factor of activity fluctuation
i : Facilities/equipment (i)

In case of being unable to obtain appropriate measured value for $EC_{RF,i}$, it can be estimated by formula below.

$$EC_{RF,i} = \frac{EC_{p,i}}{1-\eta_i}$$

$EC_{p,i}$: Electricity consumption of facilities/equipment (i) during (p) after the project implementation [MWh/p]
η_i : Estimated energy saving effect of the facilities/equipment

Correction factor of activity fluctuation is defined as following. Following case is an example regarding operating time as an index for activity data. Other indices can be used as activity data in some cases.

$$\alpha_{p,i} = \frac{T_{p,i}}{T_{HS,i}}$$

$T_{HS,i}$: Maximum of operating time of facilities/equipment for 3 years before project implementation [hours/year]
$T_{p,i}$: Operating time [hours/year] of facilities/equipment in year (y) including period (p) after the project commencement

2. Comprehensive method
(In case of being unable to clarify electricity consumption of facilities and only able to clarify electricity consumption of entire power system.)

$$RE_p = EC_{RF,total} \times EF_{CO2,elec} \times \alpha_p$$

$EC_{RF,total}$: Reference electricity consumption of entire power system of the building or power system including all the facilities/equipment [MWh/p]
$EF_{CO2,elec}$: CO_2 emission factor of grid power system [tCO_2/MWh]
α_p : Correction factor of activity fluctuation

Correction factor of activity fluctuation is defined as following. Following case is an example regarding operating time as an index for activity data. Other indices can be used as activity data in some cases.

$$\alpha_p = \frac{T_p}{T_{HS}}$$

T_{HS} : Maximum of operating time of building for 3 years before project implementation [hours/year]
T_p : Operating time of building in year (y) including period (p) after

the project commencement [hours/year]

G. Calculation of project emissions

1. Build up method
(In case of being able to clarify electricity consumption of facilities to be newly installed.)

The project emission is calculated according to the following formula. However, in case of being unable to apply the formula for certain equipment, the project emission is calculated as following.
① Formula shown in appendix
② Using formula defined in other approved methodologies. (Used methodology must be specified in PDD)
③ Proposing new formula which will applicable for the facilities/equipment. (The methodology must be specified in appendix)

$$PE_p = \sum_i \left[EC_{p,i} \times EF_{CO2,elec}\right]$$

$EC_{p,i}$: Reference electricity consumption of facilities/equipment (i) [MWh/p]
$EF_{CO2,elec}$: CO_2 emission factor of grid power system [tCO_2/MWh]
i : Facility/equipment (i)

2. Comprehensive method
(In case of being unable to clarify electricity consumption of facilities and only able to clarify electricity consumption of entire power system.)

$$PE_p = EC_{p,total} \times EF_{CO2,elec}$$

$EC_{p,total}$: Reference electricity consumption of entire power system of the building or power system including all the facilities/equipment [MWh/p]
$EF_{CO2,elec}$: CO_2 emission factor of grid power system [tCO_2/MWh]

H. Calculation of emissions reductions

1. Build up method
$ER_p = RE_p - PE_p$
ER_p : CO_2 emission reduction during period (p) [tCO_2/p]
RE_p : Reference emission during period (p) [t-CO_2/p]
PE_p : Project emission during period (p) [t-CO_2/p]

2. Comprehensive method
Considering possibility for CO_2 reduction caused by external factors, maximum value of CO_2 reduction achieved by the project is set as 20% of reference emission.
$ER_p = \min(RE_p - PE_p, 0.2 \times RE_p)$

I. Data and parameters fixed *ex ante*

Parameter	Description of data	Source
Build up method		
$EC_{RF,i}$	Reference electricity consumption of facilities/equipment [MWh/p]	Past data of project participant, ex-ante measurement or calculation method. Past data: At least data during 1 year must be used. Ex-ante measurement: Considering conservativeness, conducting minimum 60 days measurement during cool season when energy load of building is estimated lower. Calculation data: Calculated by energy saving effect of facilities/equipment set in advance and electricity consumption after the project implementation.
Comprehensive method		
$EC_{RF,total}$	Reference electricity consumption of entire power system of the building or power	Past data of project participant, ex-ante measurement. Past data: At least data during 1

	system including all the facilities/equipment [MWh/p]	year must be used. Ex-ante measurement: Conducting at least 1 year measurement. Considering conservativeness, selecting a month with lowest electricity consumption and multiplying 12 month for calculating annual electricity consumption.
Common		
$EF_{CO2,elec}$	CO_2 emission factor of grid power system [tCO_2/MWh]	i) Lately announced value or ii) Average of all power source
η_i	Estimated energy saving effect of the facilities/equipment	Conservative value based on measurement by manufacturer etc. (Result must be based on measurement conducted in same type and size of building.)
$T_{HS,i}$	Maximum of operating time of facilities/equipment for 3 years before project implementation [hours/year]	Recorded value by project participant
T_{HS}	Maximum of operating time of building for 3 years before project implementation [hours/year]	Recorded value by project participant

Reference: Monitoring parameter

Parameter	Description of data	Source
Build up method		
$EC_{p,i}$	Electricity consumption of facilities/equipment (i) during (p) after the project implementation [MWh/p]	Electricity meter (monthly tabulation)
$T_{p,i}$	Operating time [hours/year] of facilities/equipment in year (y) including period (p) after the project commencement	Recorded value by project participant (monthly tabulation)

Comprehensive method		
$EC_{p,total}$	Reference electricity consumption of entire power system of the building or power system including all the facilities/equipment [MWh/p]	Electricity meter (monthly tabulation)
T_p	Operating time of building in year (y) including period (p) after the project commencement [hours/year]	Recorded value by project participant (monthly tabulation)
Common		
$\alpha_{p,i}$	Correction factor of activity fluctuation	Calculated value

Appendix 1 Calculation for CO_2 reduction: High efficient chiller

(1) Reference CO_2 emission

$$RE_p = \sum_i \left[EC_{p,i} \times \frac{COP_{PJ,i}}{COP_{RE,i}} \times EF_{CO2,elec} \times \alpha_{p,i} \right]$$

RE_p	: Reference emission during period (p) [t-CO_2/p]
$EC_{p,i}$	: Project electricity consumption of chiller (i) [MWh/p]
$COP_{PJ,i}$	: COP of chiller (i) to be installed by the project
$COP_{RE,i}$	: COP of reference chiller (i)
$EF_{CO2,elec}$	: CO_2 emission factor of grid power system [tCO_2/MWh]
α_p	: Correction factor of activity fluctuation
i	: Chiller (i)

(2) Project CO_2 emission

$$PE_p = \sum_i \left[EC_{p,i} \times EF_{CO2,elec} \right]$$

PE_p	: Project emission during period (p) [t-CO_2/p]
$EC_{p,i}$	: Project electricity consumption of chiller (i) [MWh/p]

(3) CO_2 Emission reduction

$$ER_p = RE_p - PE_p$$

ER_p	: CO_2 emission reduction during period (p) [tCO_2/p]

Reference: Joint Crediting Mechanism Approved Methodology ID AM002"Energy Saving by Introduction of High Efficiency Centrifugal Chiller"

Appendix 2 Calculation for CO_2 reduction: LED

(1) Reference CO_2 emission

$$RE_p = \sum_i \left[EC_{p,i} \times \frac{\eta_{PJ,i}}{\eta_{RE,i}} \times EF_{CO2,elec} \times \alpha_{p,i} \right]$$

RE_p	: Reference emission during period (p) [t-CO_2/p]
$EC_{p,i}$	: Project electricity consumption of lighting equipment (i) [MWh/p]
$\eta_{PJ,i}$	: Luminous efficiency of lighting equipment (i) to be installed by the project
$\eta_{RE,i}$	: Luminous efficiency of reference lighting equipment (i)
$EF_{CO2,elec}$	: CO_2 emission factor of grid power system [tCO_2/MWh]
α_p	: Correction factor of activity fluctuation
i	: Lighting equipment (i)

(2) Project CO_2 emission

$$PE_p = \sum_i \left[EC_{p,i} \times EF_{CO2,elec} \right]$$

PE_p	: Project emission during period (p) [t-CO_2/p]
$EC_{p,i}$	: Project electricity consumption of lighting equipment (i) [MWh/p]

(3) CO_2 Emission reduction

$$ER_p = RE_p - PE_p$$

ER_p	: CO_2 emission reduction during period (p) [tCO_2/p]

Reference: Joint Crediting Mechanism Approved Methodology ID_AM005"Installation of LED Lighting for Grocery Store"

JCM Project Design Document Form

A. Project description

A.1. Title of the JCM project

Program approach for building energy efficiency in the E group via introducing high efficiency equipment

A.2. General description of project and applied technologies and/or measures

This project aims to reduce CO2 emission of 5 hotels that belongs to 5 hotels via installing high efficiency equipment, such as VWV control, chiller and LED etc. Introduced equipment are shown in the below.

No. of Sub-project		①	②	③	④	⑤
Hotel		A	B	C	D	E
Equipment	LED	○	-	-	-	-
	Heat control	○ (VWV control of 1st pump)	○ (VWV control of 1st pump)	○ (VWV control of 1st pump)	○ (VWV control of 1st pump)	○ (VWV control of 1st pump)
	High efficiency chiller	○	-	-	-	-
	Condensate control	○ (VWV Control)	○ (VWV Control)	○ (VWV Control)	○ (VWV Control)	○ (VWV Control)
	Distribution pump	○ (VWV control of 2nd pump)	○ (VWV control of 2nd pump)	○ (VWV control of 2nd pump)	-	-

A.3. Location of project, including coordinates

Country	Thailand
Region/State/Province etc.:	Sub-project① : Bangkok Sub-project② : Bangkok Sub-project③ : Pattaya

	Sub-project④ : Pattaya Sup-project⑤ : Bangkok
City/Town/Community etc.:	Sub-project① : Klongtoey Sub-project② : Rajdamri Road Sub-project③ : Chonburi, Banglamung, Nongprue Sub-project④ : Chonburi, Banglamung, Nongprue Sub-project⑤ : Pathumwan

A.4. Name of project participants

Kingdom of Thailand	E group
Japan	P company

A.5. Duration

Starting date of project operation	October, 2016
Expected operational lifetime of project	Ten years

A.6. Contribution from developed countries

This project applies the Financing Programme for JCM Model Projects supported by MOE and will receive financing support of, 50% of initial cost at a maximum, in exchange of JCM credits. Technology transfer, running machines and capacity building will be conducted by P company with local companies.

B. Application of an approved methodology(ies)

B.1. Selection of methodology(ies)

Selected approved methodology No.	Comprehensive energy saving in the commercial buildings
Version number	Version 1.0
Selected approved methodology No.	
Version number	
Selected approved methodology No.	
Version number	

B.2. Explanation of how the project meets eligibility criteria of the approved methodology

Eligibility	Descriptions specified in the	Project information

criteria	methodology	
Criterion 1	Target scope of facilities includes hotel, office building, commercial facility such as shopping mall, hospitals and governmental office etc..	Target scope of facilities is hotel buildings.
Criterion 2	Achieving reduction of electricity consumption and CO2 emission by installing BEMS (Building Energy Management System) and other energy saving technologies.	Comprehensive energy reduction project by installing BEMS (Building Energy Management System) and other energy saving technologies.
Criterion 3	Replacement for LED lighting, replacement for high efficient chiller and installation of Variable Water Volume (VWV) control etc. are regarded as Energy saving technologies	Installed energy saving technologies are LED lighting, replacement for high efficient chiller and installation of Variable Water Volume (VWV) control etc.
Criterion 4	Possible to monitor electricity consumption of the facilities/equipment or the entire building after the project implementation.	Monitoring of electricity consumption of the facilities/equipment is possible.
Criterion 5	There is no significant expansion/contraction of the building which influence energy consumption during project implementation.	There is no significant expansion/contraction of the building which influence energy consumption during project implementation.

C. Calculation of emission reductions

C.1. All emission sources and their associated greenhouse gases relevant to the JCM project

Reference emissions	
Emission sources	GHG type
Electricity usage of the facilities/equipment in the targeting hotels	CO_2
Project emissions	
Emission sources	GHG type
Electricity usage of the facilities/equipment in the targeting hotels	CO_2

C.2. Figure of all emission sources and monitoring points relevant to the JCM project

Sub-project ① : A hotel

Sub-project ② : B hotel

Sub- project ③ : C hotel

Sub project ④ : D hotel

Sub project ⑤ : E hotel

C.3. Estimated emissions reductions in each year

Year	Estimated Reference emissions (tCO_{2e})	Estimated Project Emissions (tCO_{2e})	Estimated Emission Reductions (tCO_{2e})
2016	4,060.6t-CO_2	3,546.2t-CO_2	514.4t-CO_2
2017	16,242.3t-CO_2	14,184.6t-CO_2	2,057.7t-CO_2
2018	16,242.3t-CO_2	14,184.6t-CO_2	2,057.7t-CO_2
2019	16,242.3t-CO_2	14,184.6t-CO_2	2,057.7t-CO_2
2020	16,242.3t-CO_2	14,184.6t-CO_2	2,057.7t-CO_2
Total (tCO_{2e})			8,745.2t-CO_2

D. Environmental impact assessment	
Legal requirement of environmental impact assessment for the proposed project	The rest is omitted.

E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

The rest is omitted.

E.2. Summary of comments received and their consideration

Stakeholders	Comments received	Consideration of comments received
The rest is omitted.	The rest is omitted.	The rest is omitted.

F. References

Reference lists to support descriptions in the PDD, if any.

Annex

Revision history of PDD		
Version	Date	Contents revised
1.0	March, 2016	

Appndex 5

Implementation of the Low Carbon Technology workshop, Matchmaking session and Study tour in Japan

- List of participants :

The Low Carbon Technology workshop, Matchmaking session and Study tour in Japan

- Presentatin docments of OECC:

JCM Project Opportunities under the Bangkok Master Plan on Climate Change

Presenting case study of the JCM project that was conducted in JPY2014 with OECC's support

（1）低炭素技術ワークショップ･マッチング参加者リスト

1）13 日ワークショップタイ側参加者

JCM WORKSHOP			
Low - Carbon Technology mission in Bangkok through Joint Crediting Mechanism (JCM)			
13th July 2015　at 9:00 AM BALLROOM 2 (5TH FLOOR, S31 SUKHUMVIT HOTEL)			
No.	**Organization**	**Name**	**Title**
ลำดับ		ชื่อ	ตำแหน่ง
1	Taksin Hospital	Mrs. Kanthima Thangvuthi	Director of Taksin Hospital
		นางกันธิมา ธันยาวุฒิ	ผู้อำนวยการโรงพยาบาลตากสิน
		Mrs. Busakorn Nualyong	Deputy Director of Taksin Hospital
		นางบุษกร นวลยง	รองผู้อำนวยการโรงพยาบาลตากสิน
		Mr.Sooksan Jinhirun	Electrician,Taksin Hospital
		นายสุขสันต์ จินหิรัญ	นายช่างไฟฟ้าชำนาญงาน
2	Sirinthorn Hospital	Mr.Wanchai Iamsri	Technician professional level, Sirinthorn Hospital
		นายวันชัย เอี่ยมศรี	
3	Klang Hospital	Mr.Nattapong Kongpol	Techician professional level, Klang Hospital
		นายณัฐพงษ์ กองพล	
		Mr.Kttidech Tadthaisong	General Techician,Experience lv.
		นายกิตติเดช ถาดไธสง	โรงพยาบาลหลวงพ่อทวีศักดิ์ ชุตินฺธโร อุทิศ
4	Bangkok Hospital	Mr.Akasak Suwanna	Engineer, Bangkok Hospital
		นายเอกศักดิ์ สุวรรณา	
5	Phyathai 2 International Hospital	Ms.Narissara Ronnarongrit	Service Support Division Manager, Phyathai 2 International Hospital

6	The Siam Cement Group	Ms.Somying Panyacheevita	Engineer SCG
		นางสาวสมหญิง ปัญญาชีวิตา	
7	Infinite Green Co.ltd.	Mr.Johnny Ko	Managing Director, Infinite Green Co.ltd.
8	Wan Thai Foods Industry	Mr.Narong Pengpool	Engineering Manager , Wan Thai Foods Industry
		นายณรงค์ เพ็งพูล	ผู้จัดการฝ่ายวิศวกรรม
		Mr.Kriskorn Yooa	Environmental Control Manager, Wan Thai Foods Industry
		นายกฤษกร อยู่เอ	ผู้จัดการฝ่ายควบคุมสิ่งแวดล้อม
9	Global Utilities Services Co.Ltd.	Mr.Varanon Laosuwan	Marketing communication manager Global Utilities Services Co.Ltd.
		นายวรานล เหล่าสุวรรณ	
10	PEA ENCOM International Co.,Ltd.	Mr.Yongyut Photong	Project Manager PEA ENCOM International Co.,Ltd.
		นายยงยุทธ โพธิ์ทอง	
		Mr.Supan Thonprom	Project Engineer PEA ENCOM International Co.,Ltd.
		นายสุพรณ ต้นพรม	
11	PTT Public Company Limited	Dr.Nattasith Chiarawatchai	HSE officer PTT
		ดร.ณัฐสิทธิ์ เจียรวัฒน์ชัย	
		Mr.Naruechai Koonthong	HSE officer PTT
		นายนฤชัย คูณทอง	
12	Energy Saving Products co.ltd	Mr.Lumpool Ounruan	Managing Director, Energy Saving Products co.ltd
		นายอำพูล อุ่นเรือน	
		Ms.Uraiphan Sirichatchai	General Manager,Energy Saving Products co.ltd

		นางสาวอุไรพรรณ ศิริชาติชัย	
13	Blue Sky Technology Services co.ltd.	Mr.Praphakorn Charoenwipasjet นายประภากร เจริญวิภาสเจต	Sales Manager Blue Sky Technology Services co.ltd.
		Mr.Natthapong Doungkaew นายณัฏฐพงษ์ ดวงแก้ว	Sales Engineer Blue Sky Technology Services co.ltd.
14	SCB	Mr.Wasutana Pattanathaworn นายวสุธนา พัฒนถาวร	AVP,Building Operation ,SCB
		Mr.Tanongsak Sothon นายทนงศักดิ์ โสทน	Buiding Operations&Maintaenace,SCB

２）14 日視察

The Participants for the site visiting 14th July, 2015

Wan Thai Foods Industry Co.,Ltd.

No.	Organization name	Name
1	Thai Takasago Co., Ltd.	Takafumi Doudou
2	Thai Takasago Co., Ltd.	Kouji Fujishiro
3	OECC	TBC
4	Yokohama City	TBC

Infinite GreenCo.,Ltd

No.	Organization name	Name
1	Eight-Japan Engineering Consultants Inc.	Taisuke Odera
2	Mitsubishi Heavy Industries Asia Pacific Pte. Ltd.	Toru Nakajima
3	Mitsubishi Heavy Industries, Mahajack Air Conditioners Co. Ltd	Mitsunobu Karasawa
4	Mitsubishi Heavy Industries, Mahajack Air Conditioners Co. Ltd	Ekachai Lertjiaranai
5	OECC	TBC
6	Yokohama City	TBC

Hemaraj Land & Development

Car1:

No.	Organization name	Name
1	AMCON Inc.	Youichi Hirose
2	AMCON Inc.	Buntaro Shiono
3	FINETECH CO., LTD	Motoyuki Okada
4	FINETECH CO., LTD	Kikuo Sagawa
5	JFE	Hirofumi Hamayotsu

6	OECC	TBC
7	Yokohama City	TBC

Car2:

No.	Organization name	Name
1	OECC	TBC
2	Mansei	Takeshi Konishi
3	Mansei	Yasuhiko Hisano
4	JUSTEC Corporation	Koutarou Doi
5	JUSTEC Cooperation	Yoshiaki Murota
6	Yokohama City	TBC

（２）訪日研修参加者リスト

List of the study tour

18-23, October, 2015

		Name	Organization, Company/Job title	Group
BMA	1	Mr. Tawatchai Napasaksri	Chief of Building Engineering Sub-division, Department of Public Works, BMA	Energy
	2	Ms. Wannipa Wongyara	Sanitation Technical Officer, Department of Environment, BMA	Waste and Waste water management
	3	Mr. Jirathep Thaochoo	Electrical Engineer Department of Environment, BMA	Waste and Waste water management
	4	Mr. Kasame Thepnoo	Sanitation Technical Officer Department of Drainage Sewerage, BMA	Waste and Waste water management
	5	Mr. Nattapong Mephokkit	Deputy director of BMA General Hospital	Energy
	6	Ms. Natnares Macharoen	Environmentalist Department of Environment, BMA	Waste and Waste water management
Hospital	7	Mrs.Busakorn Nualyong	Deputy Director, Taksin Hospital	Energy
	8	Mrs.Suppaya Chiewroongroj	Deputy Director, Luangpho Thaweesak Chutinutaro Uthih Hospital	Energy
	9	Mrs.Ladda Huiprasert	Deputy Director, Wetchakarunrasm Hospital	Energy
	10	Ms. Kumjong Wongthai	Registered Nurse, Rachaphiphat Hospital	Energy
PRC	11	Mr. Thanomsin Chanjirajit	Project Engineer, Engineering Section, Prime Road Group Co., Ltd	Waste and Waste water management

JCM Project Opportunities under the Bangkok Master Plan on Climate Change

September 2015

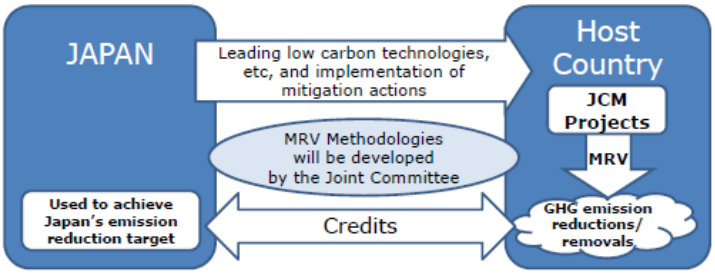
Overseas Environmental Cooperation Center , Japan (OECC)

Out line of the Presentation

- ✓ Basic concept of the JCM and the Background
- ✓ Outline of the Feasibility Study in FY 2015
- ✓ Financing Programme for JCM Model Projects by MOE
- ✓ Formulating Projects
- ✓ Japanese Entities

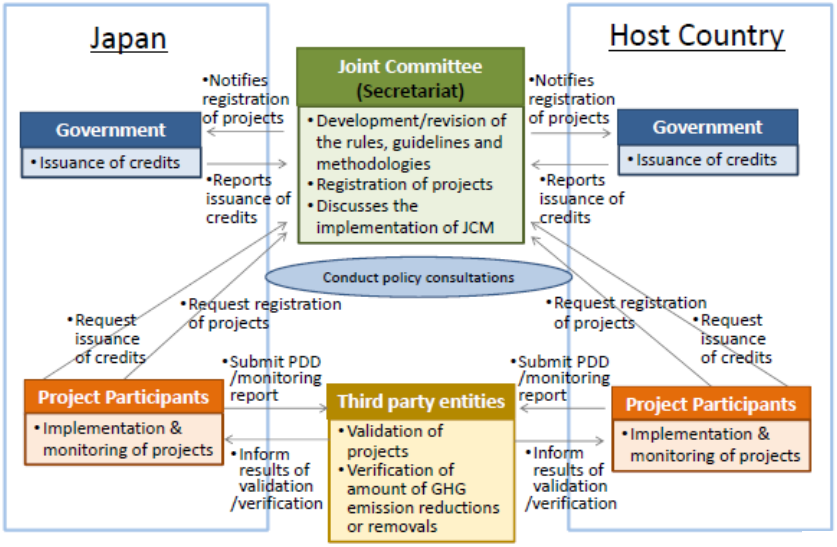
Basic Concept of the JCM

- Facilitating diffusion of leading low carbon technologies, products, systems, services, and infrastructure as well as implementation of mitigation actions, and contributing to sustainable development of developing countries.
- Appropriately evaluating contributions from Japan to GHG emission reductions or removals in a quantitative manner, by applying measurement, reporting and verification (MRV) methodologies, and use them to achieve Japan's emission reduction target.
- Contributing to the ultimate objective of the UNFCCC by facilitating global actions for GHG emission reductions or removals, complementing the CDM.



Refer to "Financing Programme for JCM Model Project"

Scheme of the JCM



Refer to "Financing Programme for JCM Model Project"

Background: JICA Technical Cooperation Project for BMA Master Plan on Climate Change 2013-2023

Objectives

(1) Drafting a Bangkok Master Plan on Climate Change 2013-2023
(2) Capacity development for the implementation of the Master Plan

City of Yokohama

Yokohama Partnership of Resources and Technologies

- **Know-how to low carbon development**
- **Environmental technology**

Inter-City cooperation

Dr. Vallop Suwandee, Chairman of the Advisors to the Governor of BMA (right) and Ms. Fumiko Hayashi, Mayor of Yokohama City (left), are signing the inter-city cooperation agreement

BMA

Climate Change Master Plan

- **Energy**
- **Transport**
- **Waste management**
- **Turban Green Planning**
- **Adaptation**

Focal Areas of Cooperation

(1)Energy management, public transport, waste and wastewater etc.
(2)Participation by the private sector, academia, and local communities
(3)Call for participation by the Thai and Japanese Government and international organization for their support
(4)Information sharing

Background: Towards implementation of Bangkok Master Plan

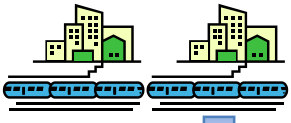
[Level 1]

Bangkok Master Plan on Climate Change 2013-2023

Policy development & Capacity-buildling

BMA

[Level 2]



Sustainable Development & Technical Cooperation

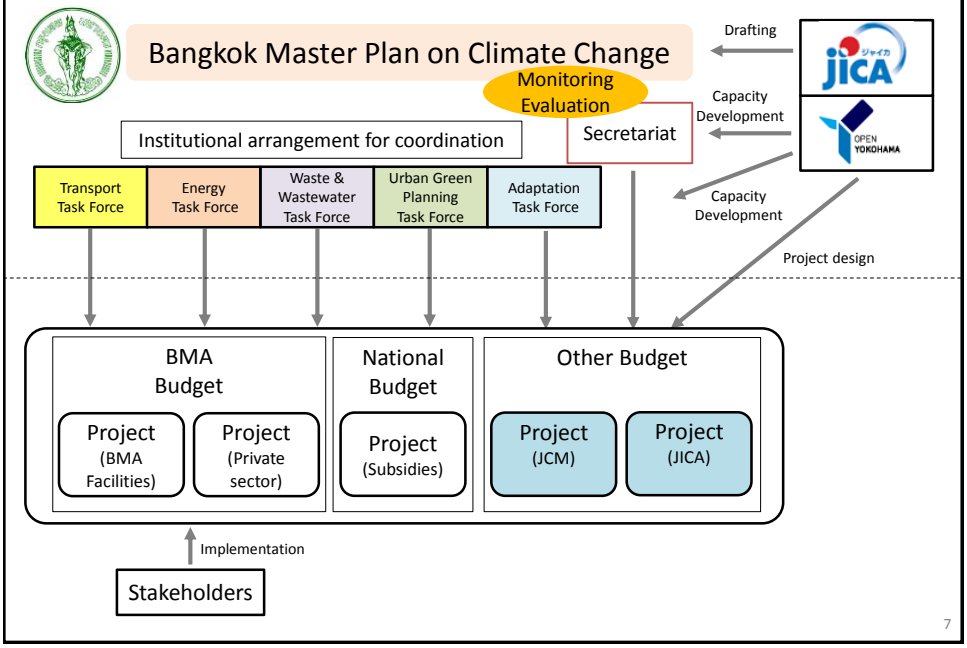
[Level 3]

Sustainable Development

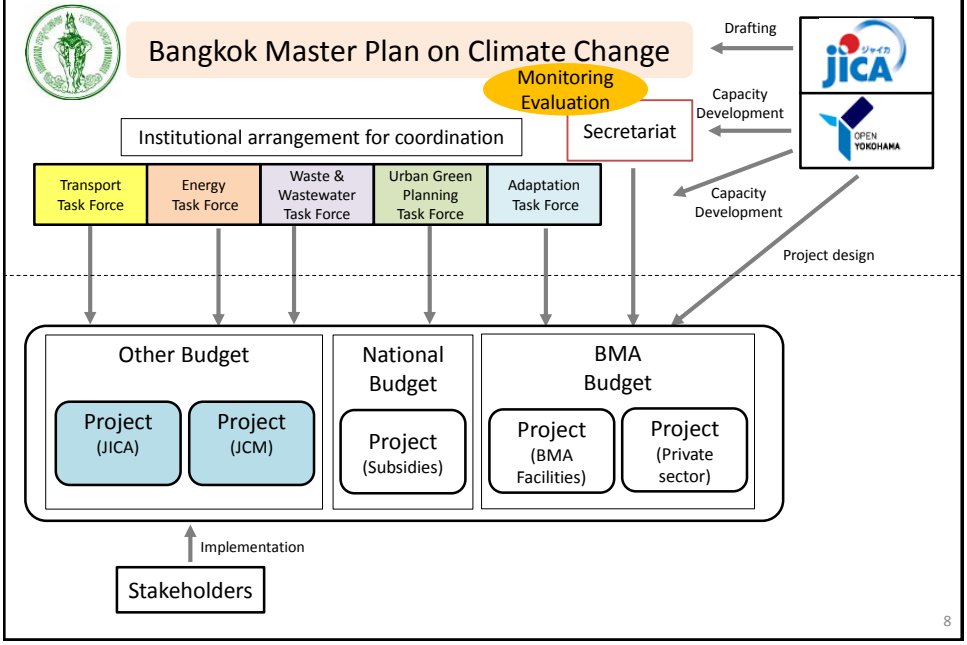
Mobilizing advanced technology and incentives **(Utilizing the support programs for the JCM projects by MOEJ)**

Public/Business — Business

Background:Towards implementation of Bangkok Master Plan

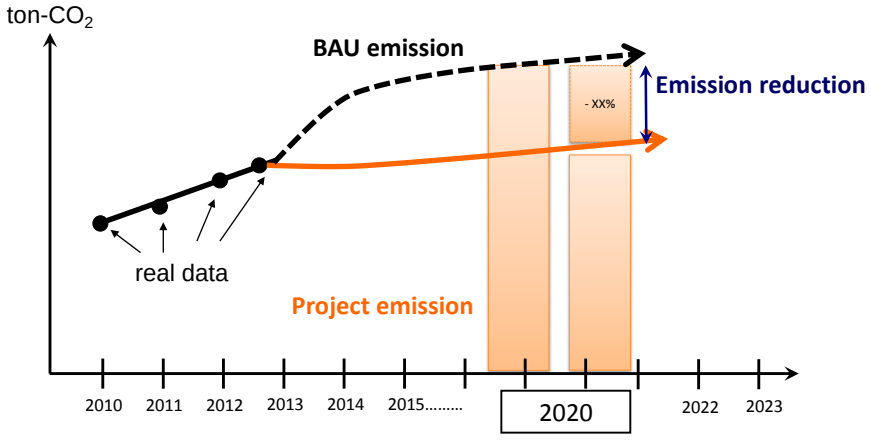


Background:Towards implementation of Bangkok Master Plan



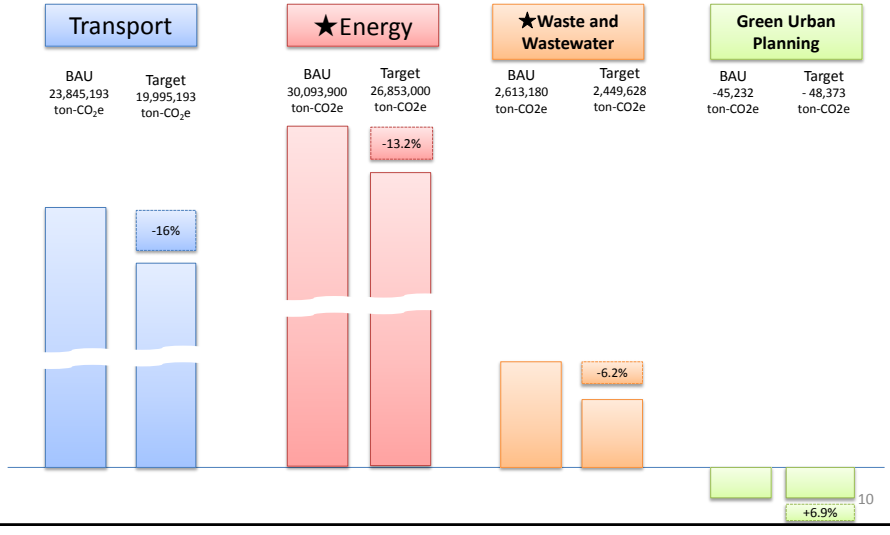
Background: Bangkok Master Plan

BMA, representing a leading City of Southeast Asia and the world, in partnership with national government ministries and agencies, the City of Yokohama, and OECC, takes proactive measures to mitigate and adapt to climate change in the short, mid, and long term.



Background: Scope and emissions reduction goals

(1) Environmental Sustainable Transport; (2) Energy Efficiency and Alternative Energy; (3) Efficient Solid waste management and Wastewater Treatment, (4) Green Urban Planning; and (5) Adaptation planning.



Outline of Feasibility Study in FY 2015

- ✓ **Study Name :** JCM projects development (energy efficiency, and waste and waste water) under the Bangkok Master Plan on Climate Change, and study on financial and other facilitation schemes for introducing low carbon technologies
- ✓ **Objective :** To identify and select potential projects that can reduce CO2 emission and support the implementation of the Bangkok Master Plan on Climate Change
- ✓ **Period:** April 2015 to February 2016
- ✓ **Target sectors:** energy efficiency, and waste and waste water
- ✓ **Study participants:** Overseas Environmental Cooperation Center, Japan (OECC) , Yokohama City, finetech inc., InterAct Inc., JFE Engineering Corporation
- ✓ *Financial support for the study is provided by the Ministry of the Environment, Japan

Structure of the Feasibility Study in FY 2015

Study on Energy efficiency, Waste & Waste water sector

Bangkok Metropolitan Administration, City of Yokohama, TGO,DEDE, (Secretariat) OECC, InterAct

Energy Efficiency Group Alliance
(Y-PORT Members and Private Sector in Bangkok)

- Cluster1 : ESCO Companies, Engineering Service Companies
- Cluster 2 : Energy Efficiency project owners
  (Owners and sites are Indentified)
  BMA hospitals, Private hospitals
  Industrial Parks
- Cluster3 : Finance and trading companies

Expected Outputs

- ✓ Realization of JCM projects of hospitals (subsidy program etc.)
- ✓ Elaboration of applying "Program approach for building energy efficiency" and program support scheme with introduction of private finance
- ✓ Introduction of Energy Code such as CASBEE
- ✓ Developing JCM project in Industrial Parks

Bangkok Metropolitan Administration, City of Yokohama, (Secretariat) OECC, InterAct

Waste Project Development
(Y-PORT Members and Private Sector in Bangkok)

- Cluster1 : J corporation
  (JCM project at large-scale incineration plant)
- Cluster 2: F corporation
  (Waste disposal of public facilities)
- Cluster 3: Project Development (wastewater)
  (Low carbon tech. for a new waste water treatment plant planed by BMA)

Expected Outputs

- ✓ Realization of JCM projects (subsidy program etc.)
- ✓ Elaboration of JCM project plans at incineration plants in Bangkok and other administrative procedure
- ✓ Project development of JCM for waste water plants

Study on Potential JCM projects

(Y-PORT Members and Private Sector in Bangkok)

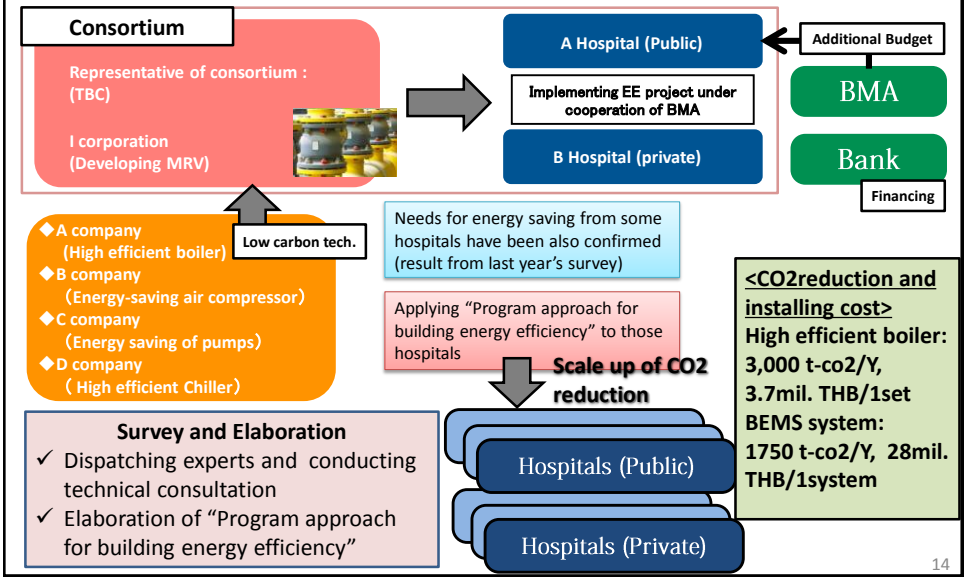
- ✓ Elaboration of JCM projects which identified by last year's survey
- ✓ Technical consultation and by Japanese experts and data collecting which is useful for JCM project development

Tentative Schedule of the Feasibility Study in FY 2015

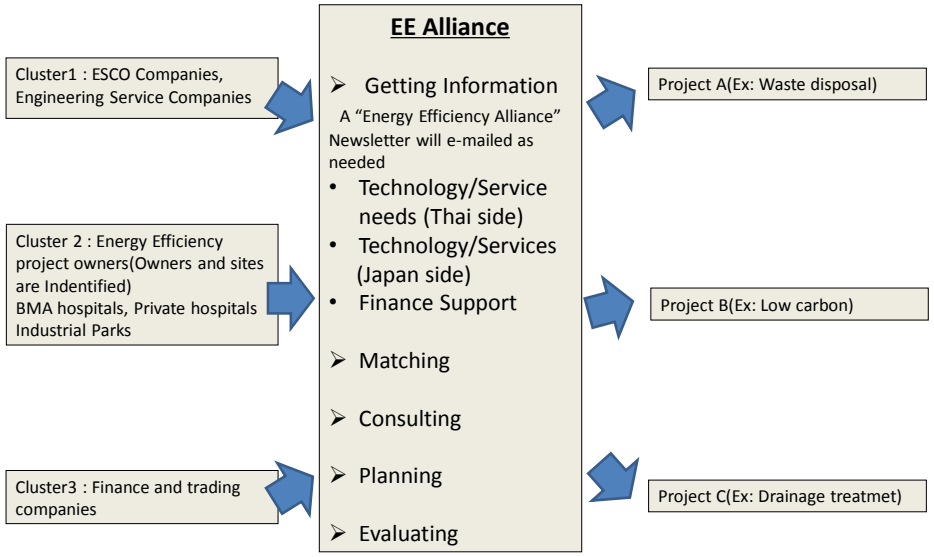
Japanese FY 2015	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Study on Energy Efficiency and Waste & Wastewater sector		•Preliminary activity		・the 1st mission		・Study on application of Program of Activities		・Study on application of Program of Activities		・Stakeholders Conference ・Final seminar		
Study on Potential JCM Project		•Project identification		・the 1st mission		•Promoting understanding for JCM		・Dispatch of experts/Technical consultation ・Study on MRV/PDD development		・Final seminar		
Entire (JICA BMA Master Plan on Climate change)		3rd JCCC/SC Study launch (4/24)		Final JCCC/SC Master Plan Publication Open seminar								Study end (3/4)

Visit in Bangkok　Study tour in JP　JICA Master Plan

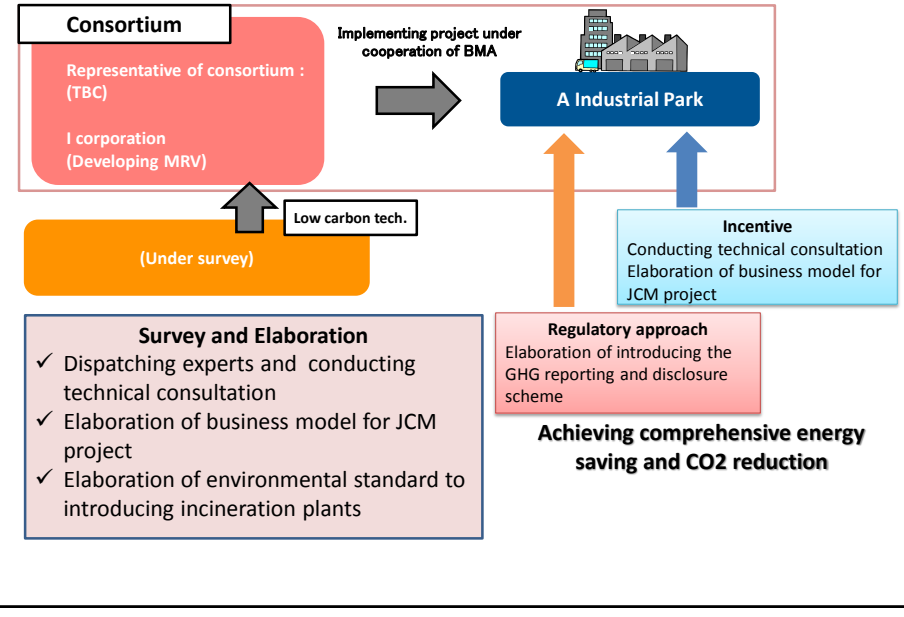
Energy efficiency sector : Elaboration of applying "Program approach for building energy efficiency" and program support scheme with introduction of private finance



Benefits of Formulating EE Alliance



Energy efficiency sector : Elaboration of comprehensive energy saving in the industrial park



Waste & Waste water sector : Elaboration of JCM project plans at incineration plants in Bangkok and other administrative procedure

Consortium

Representative of consortium : (TBC)

I corporation (Developing MRV)

Implementing project under cooperation of BMA

Incineration plant

<CO2reduction >
High efficient boiler, furnace, turbine:

Low carbon tech.

◆J corporation
Stoker type incinerator
Large-scale boiler
Steam turbine

Survey and Elaboration

- ✓ Capacity development of operational skill by regional government
- ✓ Elaboration of environmental standard to introducing incineration plants
- ✓ Elaboration of business model for JCM project

Yokohama

- ➢ Experience of policy implementation of waste disposal measures
- ➢ Knowledge of operation and maintenance of facility

OPEN YOKOHAMA

BMA

J corporation

- ➢ Technical knowledge

Political and Technical dialogue

- ✓ construct common understanding for waste disposal and introduction of incineration plants

Waste & Waste water sector : Project development of JCM for waste disposal of public facilities

Consortium

Representative of consortium : (TBC)

I corporation (Developing MRV)

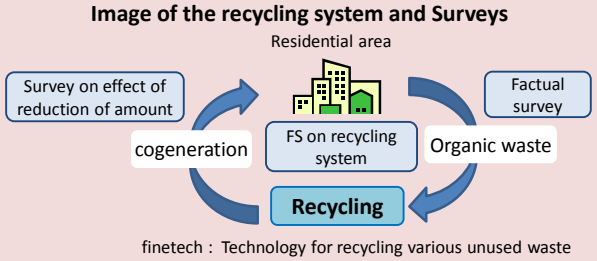
Implementing project under cooperation of BMA

Waste disposal site

Low carbon tech.

◆F corporation
Technology for recycling various unused waste

Image of the recycling system and Surveys



finetech : Technology for recycling various unused waste

Other survey and elaboration

- ✓ Survey on pickup system of general waste in Thailand and in central and regional governments

Survey on potential JCM projects development

Current status

(1) Needs from Thailand companies clarified last year's survey

(2) GHG reduction measures proposed under BMA Master Plan on Climate Change

≪BMA≫

Public and Private entities in BMA

Dispatch of experts

- Conducting technical consultation as a incentive
- Collection of data useful for JCM project development

- Giving priority to decision maker of facility installation

Study tour in Japan

≪Yokohama≫

Y-PORT, YSBC Members

Technical experts (from Private sector and regional government with Low carbon tech.)

Expected output

(1) Clarifying compatibility of tech., requirements of JCM scheme

(2)Finding GHG reducing PJ→Clarifying Feasibility of JCM project development

Financing Programme for JCM Model Projects by MOE

*The draft budget for FY 2015 2.4 billion JPY (approx. **USD24 million**) per year by FY2017 (total 7.2 billion JPY)*

※Budget will be fixed after approval by the Parliament

Government of Japan

Finance part of an investment cost (**up to the half**)

Conduct MRV and expected to deliver at least half of JCM credits issued

International consortiums (which include Japanese entities)



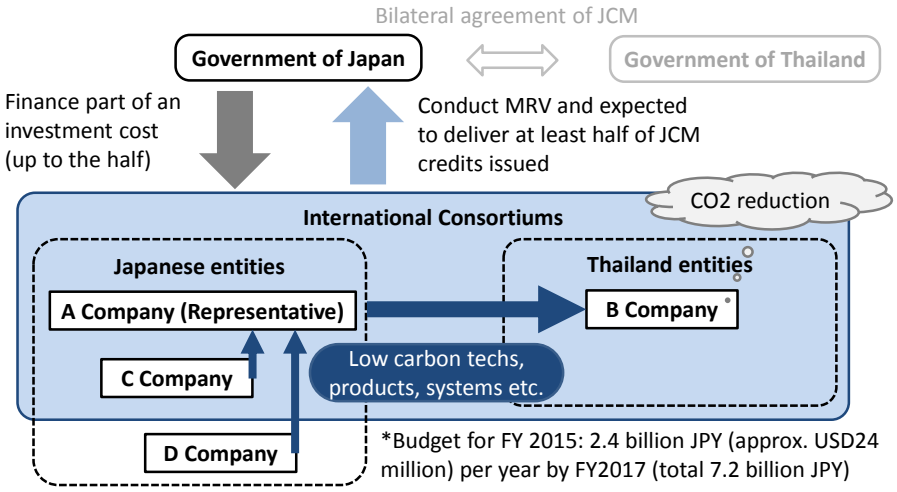
- Scope of the financing: facilities, equipment, vehicles, etc. which reduce CO_2 from fossil fuel combustion as well as construction cost for installing those facilities, etc.
- Eligible Projects : starting installation after the adoption of the financing and finishing installation within three years.

Countries that take a priority for the financing programme

- Countries with which Japan has signed on bilateral documents and counties which the determination of the sign on bilateral documents has been done.
  Mongolia, Bangladesh, Ethiopia, Kenya, Maldives, Viet Nam, Lao PDR, Indonesia, Palau, Cambodia, Mexico, Thai. (as of 20th April, 2015)

Refer to "Financing Programme for JCM Model Project"

Financing Program for JCM Model Projects by MOEJ



- Scope of the financing: facilities, equipment, vehicles, etc. which reduce CO2 from fossil fuel combustion as well as construction cost for installing those facilities, etc.
- Eligible Projects : starting installation after the adoption of the financing and finishing installation within three years.

Steps to realize JCM projects and applying the support programme

Necessary steps to formulate JCM project

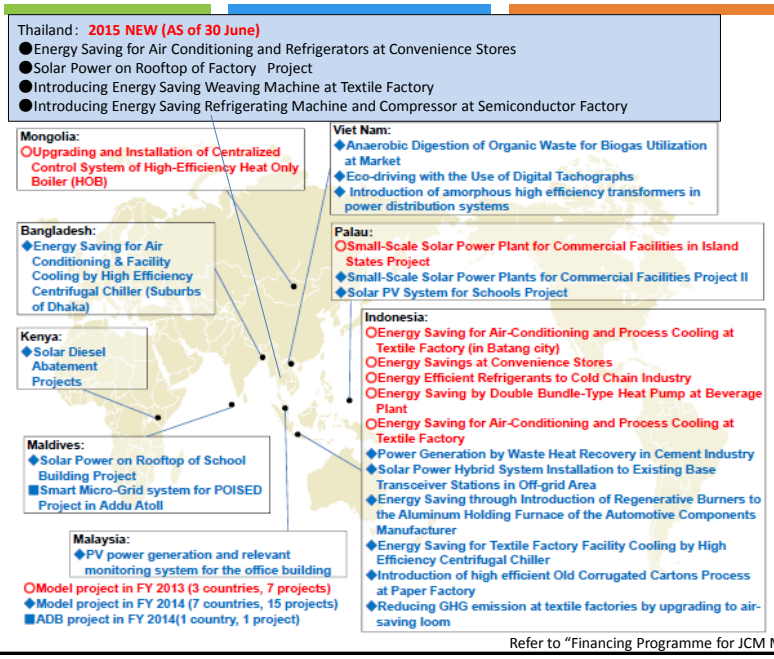
- Finding appropriate technology
- Finding business partners
- Developing a financial plan
- Developing a MRV plan
- Developing a JCM project proposal
- Forming International Consortium
- Application and registration
- Installation of facilities
- Finance by MOEJ

MRV

Actions and supports can be provided by Feasibility Study in FY 2015

- Study Tour in Japan
- Study mission in Bangkok
- Dispatch of experts
  (Conducting technical consultation)
- Support for developing JCM methodology and MRV

JCM Financing Programs in 2013, 2014,2015 by MOEJ



Refer to "Financing Programme for JCM Model Project"

Japanese entities

Companies	Contents
AMCON INC	Sludge Treatment / Sludge handling / Wastewater Treatment / Energy Saving
Mansei Recycle Systems Co., Ltd.	Industrial Waste Processing / Fluff fuels producing from waste plastics/Producing wooden chips for boiler fuels/Sales of Solar power system
FINETECH Co., Ltd.	Green Energy & Resource Recovery Technology
JFE Engineering Corporation	Environmental Solution Services and Others
Takasago Thermal Engineering Co., Ltd	Air Conditioning; Electrical Engineering; Eco-Friendly Solutions; Mechanical & Electrical Engineering Contractor
Mitsubishi Heavy Industries, Ltd	Air Conditioning
Eight-Japan Engineering Consultants Inc	Consulting(Waste-to-Energy, MSW, biomass, biogas project, JCM, CDM)
Elmo Tech Co., Ltd.	Engineering and Construction
Azbil (Thailand) Co.,Ltd.	Energy Saving Solution/Building Energy Management System(BEMS)(ESCO)
TAKUMA	Waste to Energy Plant
JUSTEC Corporation	Environment/Water Treatment
ORIX Corporation	financial services group
Mitsubishi Heavy Industries Environmental & Chemical Engineering Co., Ltd.	Waste to Energy
NIPPON THERMOENER (THAILAND) CO.,LTD.	Boiler and Hot water heater

Thank you

Contact：bangkok@oecc.or.jp

Presenting case study of the JCM project that was conducted in JPY2014 with OECC's support

Overseas Environmental Cooperation Center (OECC)
Masayoshi Futami

Outline

1. Introduction
2. JCM Projects Finding cooperation Programme
3. Approaches
4. Potential projects of JCM
5. Summary

Outline

1. Introduction

Capacity Building Programmes & Feasibility Studies by MOE

Capacity Building Programmes

Region

Asia, Africa, Latin America, and Small Island countries

Activities

Consultations, workshops, seminars, training courses and study tours, etc.

Scope

Facilitating understanding on the JCM rules and guidelines, enhancing capacities for implementing MRV

Target

Government officials, private sectors, candidate for validation & verification entities, local institutes and NGOs

Feasibility Studies

Objective

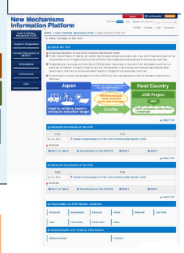
Elaborating investment plan on JCM projects, developing MRV methodologies and investigating feasibility on potential JCM projects,

Type of studies

JCM Project Planning Study (PS)	To develop a JCM Project in the next fiscal year
JCM Feasibility Study (FS)	To survey feasibility of potential JCM projects
Large Scale JCM Feasibility Study	To survey feasibility of potential large scale JCM projects including city level cooperation

Reports

Available at GEC (Global Environment Centre Foundation) website <URL: http://gec.jp >



Outreach

New Mechanisms Information Platform website provides the latest information on the JCM <URL: http://www.mmechanisms.org/e/index.html>

1. Introduction

Financing Programme for JCM Model Projects by MOE

The draft budget for FY 2015
*2.4 billion JPY (approx. **USD24 million**) per year by FY2017*
(total 7.2 billion JPY)

※Budget will be fixed after approval by the Parliament

Government of Japan

Finance part of an investment cost (**up to the half**)

Conduct MRV and expected to deliver at least half of JCM credits issued

International consortiums
(which include Japanese entities)



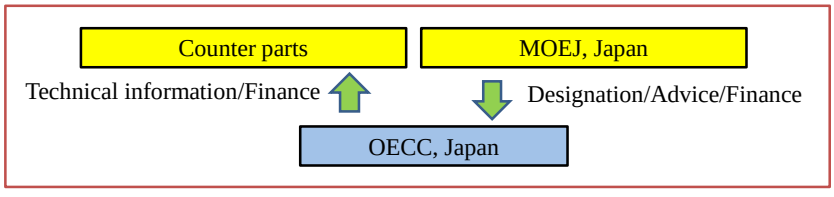
- Scope of the financing: facilities, equipment, vehicles, etc. which reduce CO_2 from fossil fuel combustion as well as construction cost for installing those facilities, etc.
- Eligible Projects : starting installation after the adoption of the financing and finishing installation within three years.

Government of Japan

Outline

2. JCM Projects Finding cooperation Programme

The JCM Projects Finding cooperation Programme is conducted between Counter parts of 5 countries and the Ministry of the Environment, Japan (MOEJ) through an implementing organization, Overseas Environmental Cooperation Center, Japan (OECC). The aim is finding candidates of high performance low carbon technologies and JCM projects in accordance with local needs.



Country	Counter Parts
Vietnam	- Ministry of Natural Resources and Environment - Institute of Meteorology, Hydrology, and Environment
Mongolia	Ministry of Environment, Green Development and Tourism
Lao PDR	Ministry of Natural Resources and Environment of
Bangladesh	The Department of Environment

Outline

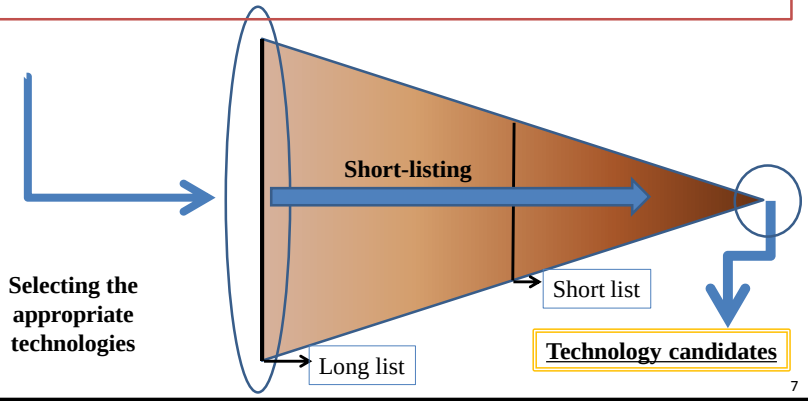
3. Approaches

(1) Technology and Corporate surveys

Long-listing process

✓Surveying on needs and potentials of GHG mitigation technologies based on the surveys in Japan and documents review (TNA, SNC, etc)

✓Interview with certain stakeholders like government bodies, local corporations, International donors and collecting technology information. Create a "long list".



3. Approaches

(2) Formation support of JCM projects

We dispatched Japanese specialists to host countries in order to study and diagnose installation feasibility of the selected technologies as well as consider MRV.

Energy saving diagnostic in Mongolia

Tapioca factory in Lao PDR

3. Approaches

(2) Promoting formation of JCM projects

Based on those studies, we selected promising Japanese and host-country companies, technologies and products. Then we screened each of the individual conditions to select appropriate financial options, data collection to develop JCM project.

- Technical categories
- Targeted technologies and products
- Candidate business operators in Japan and host countries
- Estimated cost of introduction
- Investment process and finance options
- Emissions reduction potential of GHG
- Schedule
- MRV




3. Approaches

(3)Workshop and Japan study tour

We held workshops participating private companies of Japan and the local JCM potential project owners in hosting countries in order to promote dissemination of low-carbon technologies and JCM

Workshop in Lao PDR

Japan tour with Bangladesh colleagues

Outline

1. Introduction
2. JCM Projects Finding cooperation Programme
3. Approaches
4. Potential projects of JCM
5. Summary

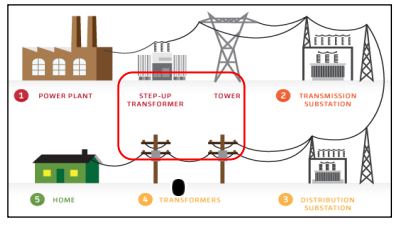
4. Potential projects of JCM

Introduction of Amorphous high efficiency transformers in power distribution systems

Project Owner: (Japan) Yuko Keiso Co., Ltd., (Vietnam) EVN Southern Power Corporation

Outline of GHG Emission Reduction Activity

GHG emission reduction can be realized by introducing amorphous high efficiency transformers in the transmission and distribution network of southern Vietnam .
It enables to reduce losses of transmission



Amorphous high efficiency transformer

Expected GHG Reductions

623 tCO2/year

← Reference Emission（RE_y）
− Project Emission （PE_y）
＝Emission Reduction（ER_y）

← ・Reference Emission : **971tCO_2e/year**
・Project Emission : **348 tCO_2/year**
・Emission Reduction : **623 tCO_2/year**

Sites of Project

The transmission and distribution network in southern Vietnam(EVN Southern Power Corporation)

4. Potential projects of JCM

Big advantage in Technology

- **Impact of GHG emissions reduction** well acknowledge internationally.
- The Japanese metal maker has a major share (**more than 90% share** in the world market)

Matching

- Identified **strong business interest & well skilled** in the production
- well understand the benefit of technology (**=strong demand**)

Other key elements

- **Taking advantage of using JCM financial support**
- **Face-to-face** approaches
- **Experts in the technology and methodology** within the team

Etc…

4. Potential projects of JCM

【Toyota Air Jet loom】

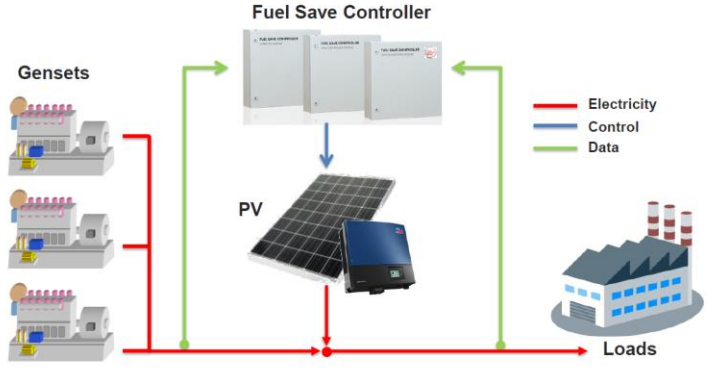
Supplier : Toyota Tsusho
Buyer : Bangladesh company
Emission Reduction : 1500 t CO_2

Toyota industry Cooperation

4. Potential projects of JCM

【 Introduction of PV-diesel hybrid system 】

Supplier： Kyocera Cooperation
Buyer： YKK Bangladesh Co Ltd
Emission Reduction： 300 t CO_2

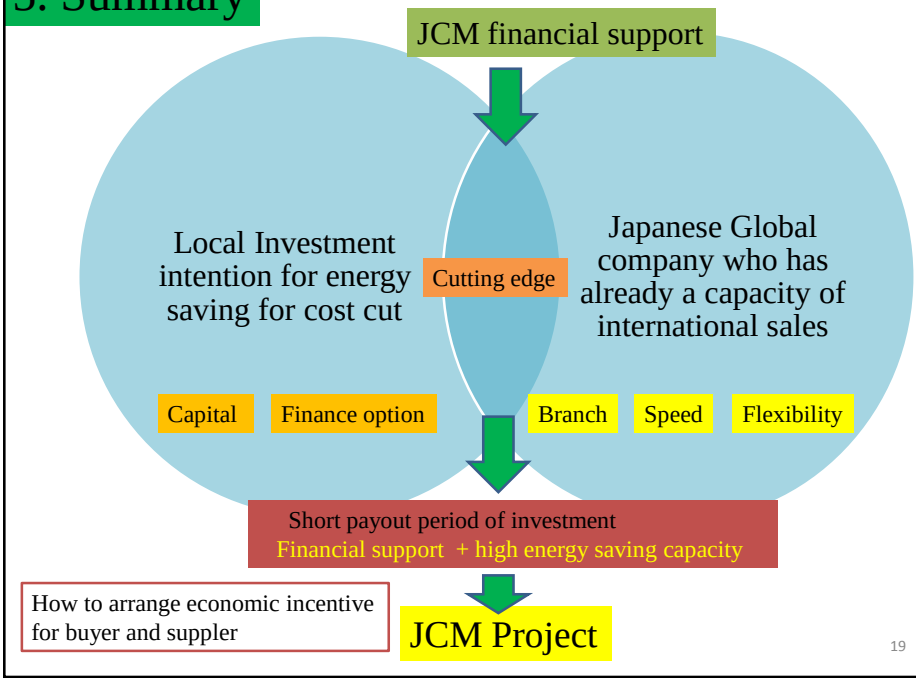


Kyocera Cooperation

Outline

1. Introduction
2. JCM Projects Finding cooperation Programme
3. Approaches
4. Potential projects of JCM
5. Summary

5. Summary



OECC

Fin

Appndex 6

Presentation Documents of International Conferences and Workshops

- A presentation document of COP21:

JCM Project Opportunities under the Bangkok Master Plan on Climate Change

JCM Project Opportunities under the Bangkok Master Plan on Climate Change

December 2015

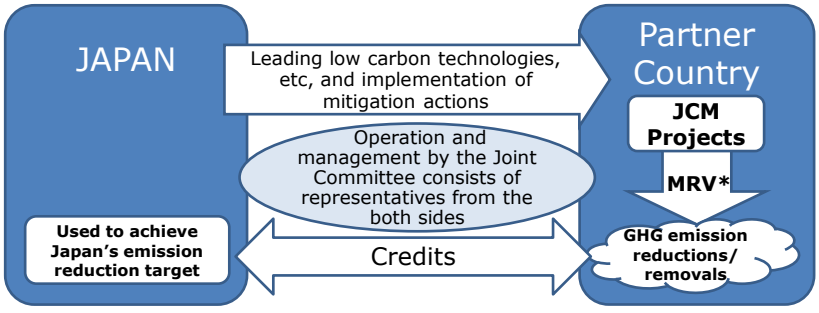
Overseas Environmental Cooperation Center , Japan (OECC)

Out line of the Presentation

- ✓ Basic concept of the JCM and the Background
- ✓ Outline of the Feasibility Study in FY 2015
- ✓ Financing Programme for JCM Model Projects by the MOEJ
- ✓ Formulating Projects
- ✓ Japanese Entities

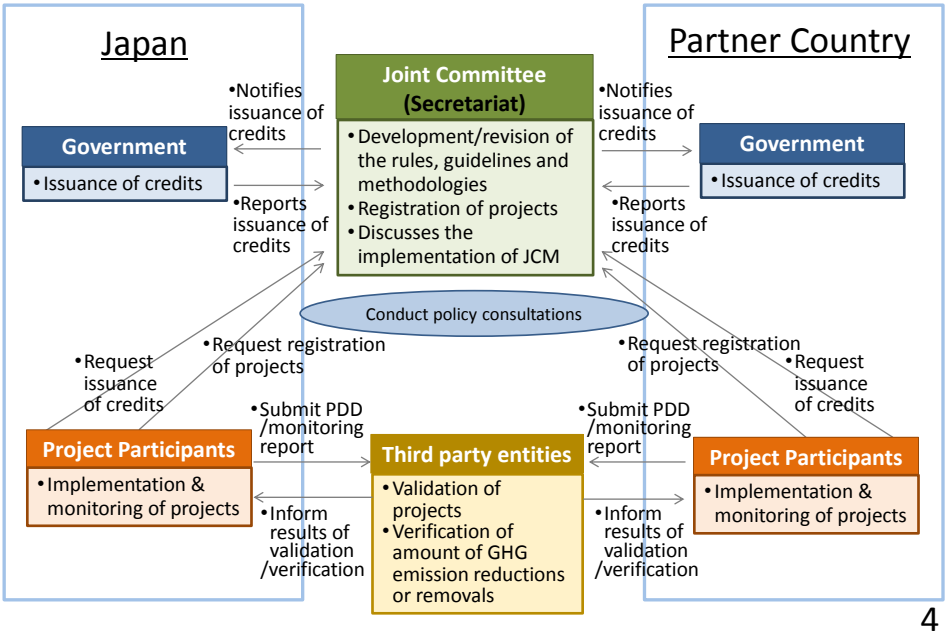
Basic Concept of the JCM

- Facilitating diffusion of leading low carbon technologies, products, systems, services, and infrastructure as well as implementation of mitigation actions, and contributing to sustainable development of developing countries.
- Appropriately evaluating contributions from Japan to GHG emission reductions or removals in a quantitative manner and use them to achieve Japan's emission reduction target.
- Contributing to the ultimate objective of the UNFCCC by facilitating global actions for GHG emission reductions or removals.



*measurement, reporting and verification

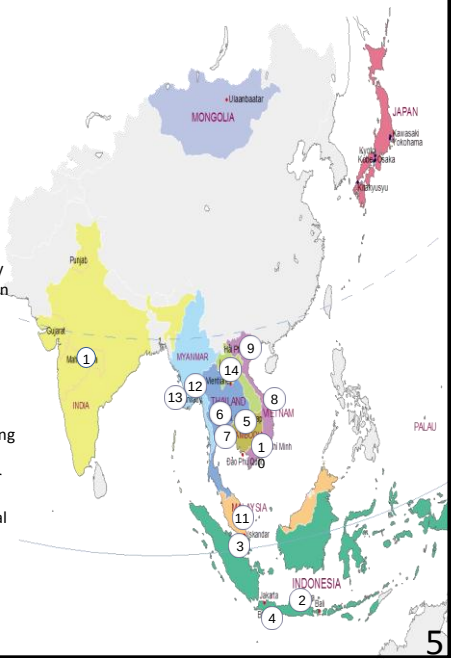
Scheme of the JCM



FY2015 Feasibility studies for city to city collaboration project by MOEJ

Project List

1. Promotion of low carbon city by properly developing material recycling systems in Bengaluru City（Bengaluru City）
2. Establishment of Base for Low-Carbon Project Expansion in Surabaya(Surabaya)
3. Project for Developing JCM projects under city-to-city collaboration between Yokohama city and Batam city(Batam)
4. Project for Low Carbon Society Development under Collaboration between Bandung City and City of Kawasaki(Bandung City)
5. Project for Developing Low-carbon Tourism Cities through the Joint Crediting Mechanism in Siem Reap (Siem Reap)
6. JCM projects development (energy efficiency, and waste and waste water) under the Bangkok Master Plan on Climate Change, and study on financial and other facilitation schemes for introducing low carbon technologies (Bangkok)
7. Promotion of Decarbonizing of Municipal Waste Management and Ecological Industrial Town in Rayong Prefecture (Rayong Pref.)
8. JCM Feasibility Study in Da Nang through "Technical Cooperation for Sustainable Urban Development" with Yokohama City (Da Nang)
9. The whole city low carbonization in Hai Phong City (Hai Phong)
10. Ho Chi Minh City – Osaka City Cooperation Programme for Developing Low Carbon City(Ho Chi Minh)
11. Establishment of Base for Low-Carbon Project Expansion in Iskandar (Iskandar)
12. Study for building a sustainable low carbon city around the industrial zone in Pathein city, Ayeyarwady Division, Myanmar(Pathein)
13. JCM Project Formulation Study through City-to-City Collaboration in Yangon(Yangon)
14. Programme for the Establishment of Low-Carbon Historic City in Vientiane, based on City-to-City Cooperation between Vientiane Capital and Kyoto City(Vientiane Capital)



Background: JICA Technical Cooperation Project for BMA Master Plan on Climate Change 2013-2023

Objectives

(1) Drafting a Bangkok Master Plan on Climate Change 2013-2023
(2) Capacity development for the implementation of the Master Plan

City of Yokohama

OPEN YOKOHAMA

Yokohama Partnership of Resources and Technologies

- **Know-how to low carbon development**
- **Environmental technology**

Inter-City cooperation

Dr. Vallop Suwandee, Chairman of the Advisors to the Governor of BMA (right) and Ms. Fumiko Hayashi, Mayor of Yokohama City (left), are signing the inter-city cooperation agreement

BMA

Climate Change Master Plan

- **Energy**
- **Transport**
- **Waste management**
- **Turban Green Planning**
- **Adaptation**

Focal Areas of Cooperation

(1)Energy management, public transport, waste and wastewater etc.
(2)Participation by the private sector, academia, and local communities
(3)Call for participation by the Thai and Japanese Government and international organization for their support
(4)Information sharing

Background: Towards implementation of Bangkok Master Plan

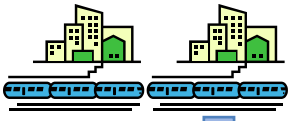
[Level 1]

Bangkok Master Plan on Climate Change 2013-2023

Policy development & Capacity-buildling

BMA

[Level 2]



Sustainable Development & Technical Cooperation

[Level 3]

Sustainable Development

Mobilizing advanced technology and incentives **(Utilizing the support programs for the JCM projects by MOEJ)**

Public/Business ⟷ Business

7

Background:Towards implementation of Bangkok Master Plan

Bangkok Master Plan on Climate Change

Drafting

Monitoring Evaluation

Capacity Development

Secretariat

Institutional arrangement for coordination

Capacity Development

Project design

Transport Task Force	Energy Task Force	Waste & Wastewater Task Force	Urban Green Planning Task Force	Adaptation Task Force

BMA Budget		National Budget	Other Budget	
Project (BMA Facilities)	Project (Private sector)	Project (Subsidies)	Project (JCM)	Project (Private)

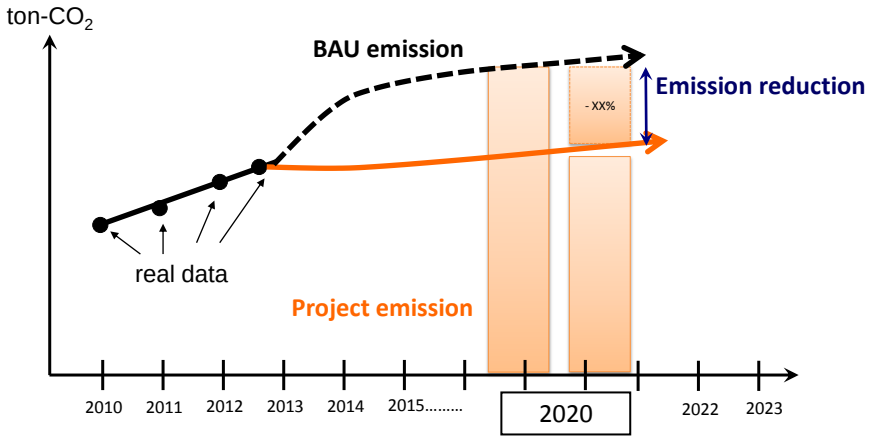
Implementation

Stakeholders

8

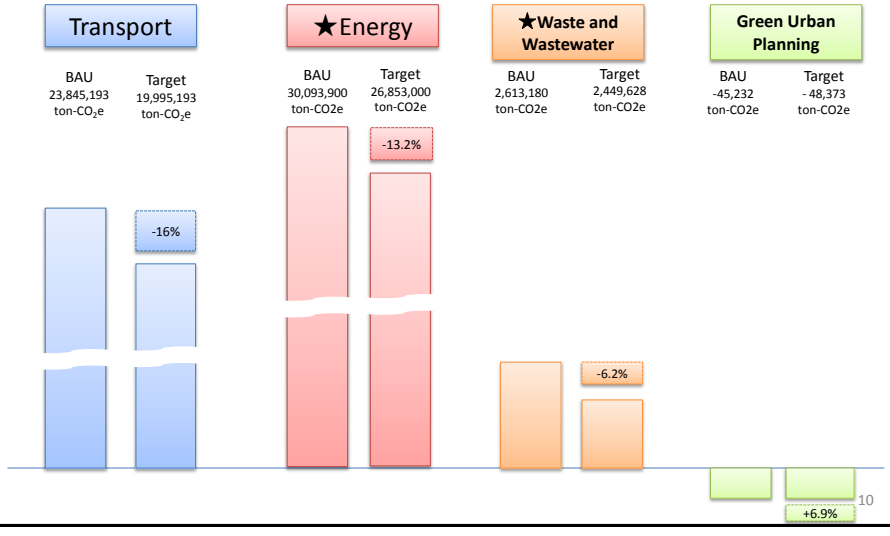
Background: Bangkok Master Plan

BMA, representing a leading City of Southeast Asia and the world, in partnership with national government ministries and agencies, the City of Yokohama, and OECC, takes proactive measures to mitigate and adapt to climate change in the short, mid, and long term.



Background: Scope and emissions reduction goals

(1) Environmental Sustainable Transport; (2) Energy Efficiency and Alternative Energy; (3) Efficient Solid waste management and Wastewater Treatment, (4) Green Urban Planning; and (5) Adaptation planning.



Outline of Feasibility Study in FY 2015

- ✓ **Study Name**: JCM projects development (energy efficiency, and waste and waste water) under the Bangkok Master Plan on Climate Change, and study on financial and other facilitation schemes for introducing low carbon technologies
- ✓ **Objective**: To identify and select potential projects that can reduce CO2 emission and support the implementation of the Bangkok Master Plan on Climate Change
- ✓ **Period:** April 2015 to February 2016
- ✓ **Target sectors:** energy efficiency, and waste and waste water
- ✓ **Study participants:** Overseas Environmental Cooperation Center, Japan (OECC) , Yokohama City, finetech inc., InterAct Inc., JFE Engineering Corporation
- ✓ *Financial support for the study is provided by the Ministry of the Environment, Japan

Structure of the Feasibility Study in FY 2015

Study on Energy efficiency, Waste & Waste water sector

Bangkok Metropolitan Administration, City of Yokohama, TGO,DEDE, (Secretariat) OECC, InterAct

Energy Efficiency Group Alliance
(Y-PORT Members and Private Sector in Bangkok)

- Cluster1 : ESCO Companies, Engineering Service Companies
- Cluster 2 : Energy Efficiency project owners (Owners and sites are Indentified) BMA hospitals, Private hospitals Industrial Parks
- Cluster3 : Finance and trading companies

Expected Outputs

- ✓ Realization of JCM projects of hospitals (subsidy program etc.)
- ✓ Elaboration of applying "Program approach for building energy efficiency" and program support scheme with introduction of private finance
- ✓ Introduction of Energy Code such as CASBEE
- ✓ Developing JCM project in Industrial Parks

Bangkok Metropolitan Administration, City of Yokohama, (Secretariat) OECC, InterAct

Waste Project Development
(Y-PORT Members and Private Sector in Bangkok)

- Cluster1 : J corporation (JCM project at large-scale incineration plant)
- Cluster 2: F corporation (Waste disposal of public facilities)
- Cluster 3: Project Development (wastewater) (Low carbon tech. for a new waste water treatment plant planed by BMA)

Expected Outputs

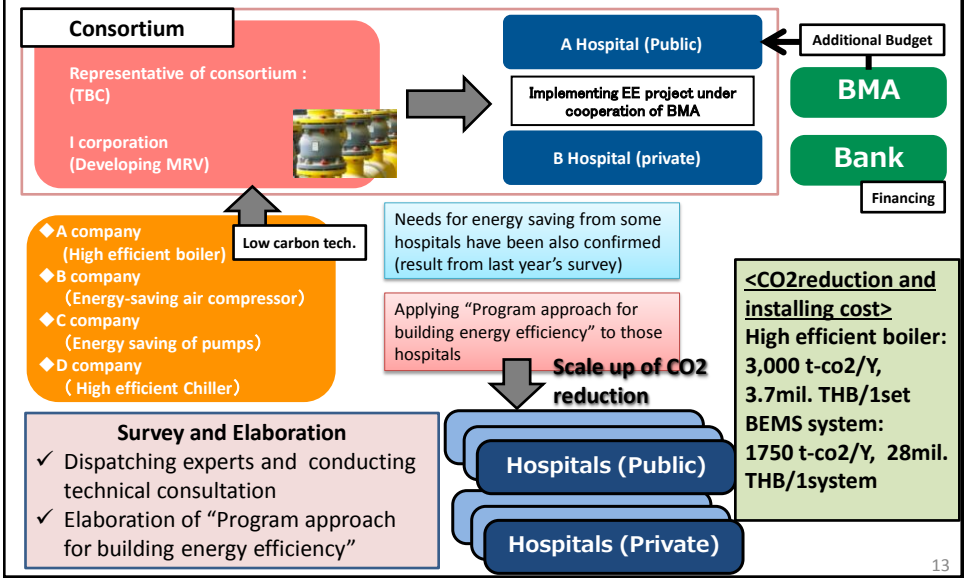
- ✓ Realization of JCM projects (subsidy program etc.)
- ✓ Elaboration of JCM project plans at incineration plants in Bangkok and other administrative procedure
- ✓ Project development of JCM for waste water plants

Study on Potential JCM projects

(Y-PORT Members and Private Sector in Bangkok)

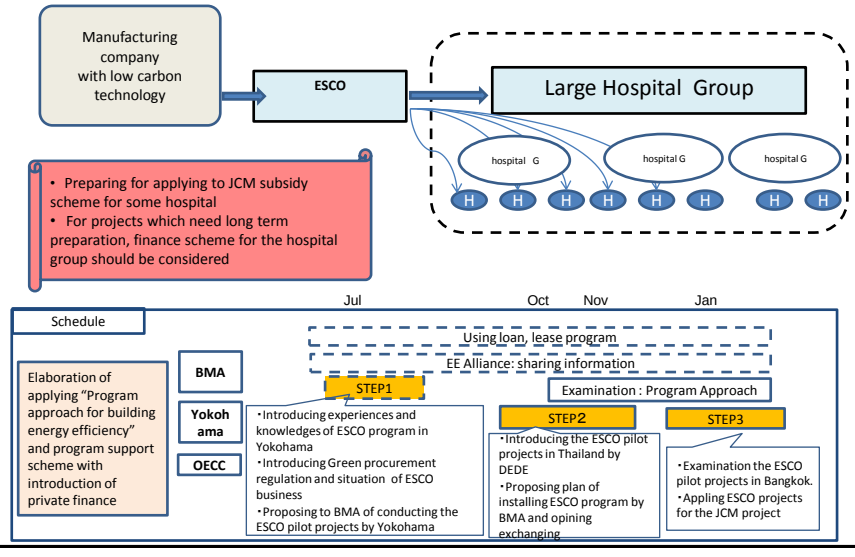
- ✓ Elaboration of JCM projects which identified by last year's survey
- ✓ Technical consultation and by Japanese experts and data collecting which is useful for JCM project development

Energy efficiency sector : Elaboration of applying “Program approach for building energy efficiency” and program support scheme with introduction of private finance



Expanding Green Hospital Concept

Energy efficiency : Elaboration of applying “Program approach for building energy efficiency” and program support scheme with private finance (Hospital)



Energy efficiency sector : Elaboration of comprehensive energy saving in the industrial park

Consortium

Representative of consortium : (TBC)

I corporation (Developing MRV)

Implementing project under cooperation of BMA

A Industrial Park

Low carbon tech.

(Under survey)

Incentive
Conducting technical consultation
Elaboration of business model for JCM project

Regulatory approach
Elaboration of introducing the GHG reporting and disclosure scheme

Survey and Elaboration

- ✓ Dispatching experts and conducting technical consultation
- ✓ Elaboration of business model for JCM project
- ✓ Elaboration of environmental standard to introducing incineration plants

Achieving comprehensive energy saving and CO2 reduction

Waste & Waste water sector : Elaboration of JCM project plans at incineration plants in Bangkok and other administrative procedure

Consortium

Representative of consortium : (TBC)

I corporation (Developing MRV)

Implementing project under cooperation of BMA

Incineration plant

<CO2reduction >
High efficient boiler, furnace, turbine:

Low carbon tech.

◆J corporation
Stoker type incinerator
Large-scale boiler
Steam turbine

Survey and Elaboration

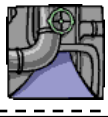
- ✓ Capacity development of operational skill by regional government
- ✓ Elaboration of environmental standard to introducing incineration plants
- ✓ Elaboration of business model for JCM project

Yokohama

- ➢ Experience of policy implementation of waste disposal measures
- ➢ Knowledge of operation and maintenance of facility

J corporation

- ➢ Technical knowledge



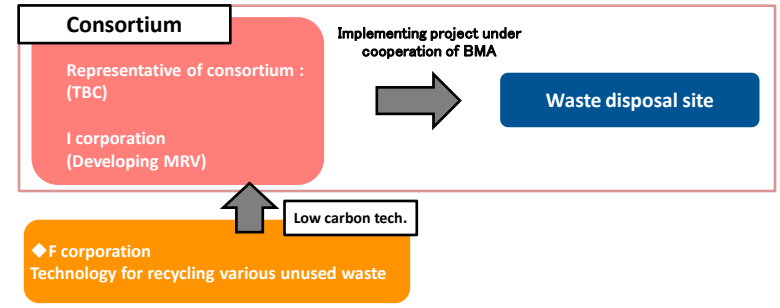
OPEN YOKOHAMA

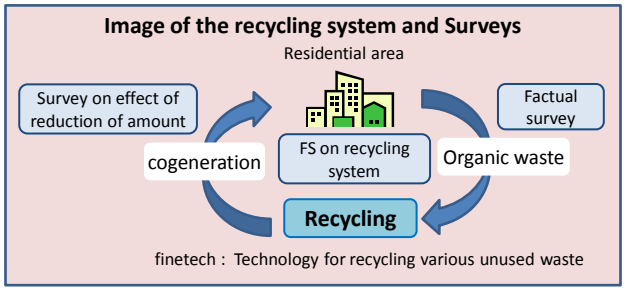
BMA

Political and Technical dialogue

- ✓ construct common understanding for waste disposal and introduction of incineration plants

Waste & Waste water sector : Project development of JCM for waste disposal of public facilities





Other survey and elaboration

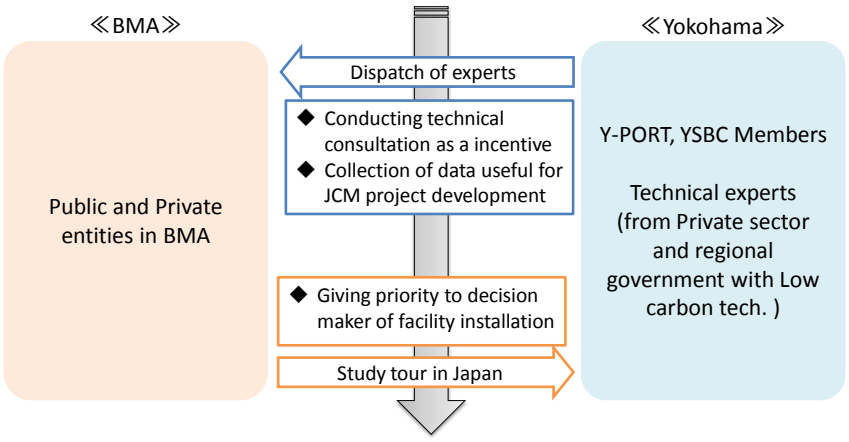
✓ Survey on pickup system of general waste in Thailand and in central and regional governments

Survey on potential JCM projects development

Current status

(1) Needs from Thailand companies clarified last year's survey

(2) GHG reduction measures proposed under BMA Master Plan on Climate Change



Expected output

(1) Clarifying compatibility of tech., requirements of JCM scheme

(2)Finding GHG reducing PJ→Clarifying Feasibility of JCM project development

Financing Programme for JCM Model Projects by MOEJ

The budget for FY 2015
*2.4 billion JPY (approx. **USD24 million**) per year by FY2017*
(total 7.2 billion JPY)

Government of Japan

Finance part of an investment cost (**up to the half**)

Conduct MRV and expected to deliver at least half of JCM credits issued

International consortiums
(which include Japanese entities)



- Scope of the financing: facilities, equipment, vehicles, etc. which reduce CO_2 from fossil fuel combustion as well as construction cost for installing those facilities, etc.
- Eligible Projects : starting installation after the adoption of the financing and finishing installation within three years.

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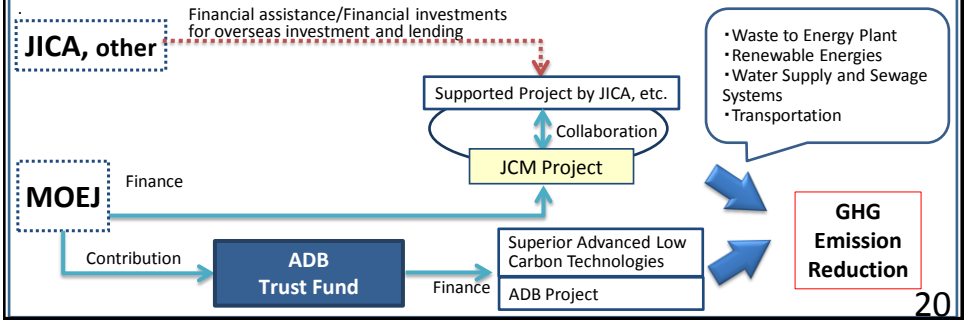
Support Program Enabling "Leapfrog" Development (Finance/ADB) by MOE

Collaborative Financing Programme	ADB Trust Fund (JF JCM)
Budget for FY 2015[Budget for FY2014]	Budget for FY 2015[Budget for FY2014]
1.8 billion JPY (approx. USD18 million) per year by FY2018 (total 7.2 billion JPY) [4.2 billion JPY]	*1.8 billion JPY (approx. USD18 million)[1.8 billion JPY]*
Scheme: To finance the projects which have the better efficiency of reducing GHG emission in collaboration with other projects supported by JICA and other governmental-affiliated financial institute.	Scheme: To provide the financial incentives for the adoption of the advanced low-carbon technologies which are superior in GHG emission reduction but expensive in ADB- financed projects.
Purpose: To expand superior and advanced low-carbon technologies for building the low carbon society as the whole city wise and area wise in the wider fields, and to acquire credits by the JCM.	Purpose: To develop ADB projects as the "Leapfrog" developments by the advanced technologies and to show the effectiveness of the JCM scheme by the acquisition of credits of the JCM.



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Thank you!