FY2015 Undertaking Commissioned by the Ministry of the Environment

# Feasibility Study on FY2015 Large-Scale JCM Project for Realizing Low-Carbon Development in Asia

（JCM Feasibility Study in Da Nang through "Technical Cooperation for Sustainable Urban Development"  with Yokohama City）

## Commission Report

March 2016

City of Yokohama（Y-PORT Center）
Institute for Global Environmental Strategies
Mizuho Information & Research Institute, Inc.
Osumi Co., Ltd.

# Summary

## Needs Assessment

**【Overview】**

The purpose of this needs survey is to promote Da Nang's full transition to low-carbon city status, thereby supporting its ongoing development as an eco-city. The first step in this process was to identify capital investment demands at production plants, hotels, and other target facilities in order to put together potential Joint Crediting Mechanism (JCM) projects that could be realized over the shorter or longer term (Ouput 1). In addition, we proposed the Joint Crediting Mechanism as a way of achieving the project goals in the Da Nang urban development action plan being formulated with the help of JICA and the City of Yokohama, a move that will encourage low-carbon development through the broad-based rollout of JCM projects in the city (Output 2). In this way, our survey has supported Da Nang's full transition to low-carbon city status, both on the ground in terms of the formulation of specific JCM projects and strategically in the form of inputs.

**【Overview of activity output】**

- Output 1

The cities of Yokohama and Da Nang worked together in conjunction with relevant Da Nang agencies to gather information—mostly from production plants and hotels in the city—and come up with a long list of companies that could potentially reduce their energy use. The listed companies were then asked to complete a brief questionnaire, which was used to narrow down targets for the JCM project formulation survey. JCM project formulation and implementation workshops were also held to spread awareness of JCM and JCM support frameworks among Da Nang companies as well as solicit their participation. Interviews were scheduled with companies identified in the brief questionnaire as being a good fit for JCM projects as well as with those demonstrating interest during the workshop, resulting in a short list of JCM project candidates. Finally, the companies on the short list were given a survey with the goal of formulating JCM projects; this was followed by the creation of an action plan. The JCM project candidates are listed in the table below.

| Company | Equipment to install | Estimated initial investment cost | Estimated reduction in $CO^2$ emissions ($tCO^2$/year) | Estimated years to ROI (without assistance) | Cost benefit per $tCO^2$/year (without subsidies) |
|---|---|---|---|---|---|
| Company A (seafood processing) | Boiler and generator upgrades | JPY 44–48.3 million yen | 764 | 8.7–9.6 years | JPY 3,796–4,177 |
| Company B (textiles) | LED lighting | About JPY 19–46 million | 378–519 | 1.7–5.8 years | JPY 4,300–15,200 |
| Company C (paper) | Cogeneration system | About JPY 300 million | 5,012 | 3.2 years | JPY 4,620 |
| Company G (seafood processing) | Refrigerators | About JPY 163 million | 1,400 | 8.2 years | JPY 8,980 |
| Company H (steel) | Biomass gasification fuel system | About JPY 200 million | 7,000 | 1.5 years | JPY 4,080 |

Any future action plans will require further consideration of the technical, financial, and operational aspects (including the formation of international consortia) for each project; for this reason, we are looking at carrying out JCM feasibility studies and other inquiries based on city partnerships in the upcoming fiscal year while maintaining close communication with the candidates listed in the above table.

■ Output 2

As a way to encourage the broad-based rollout of JCM projects, the Joint Crediting Mechanism (JCM) is being brought up in discussions on the Da Nang urban development action plan, which is being formulated with the help of JICA and the City of Yokohama. JCM is being proposed as a way to enrich the conversation on updating the city's vision for energy efficiency and low-carbon operations as well as a means of actually implementing its energy-saving and carbon-reduction projects. The upcoming Da Nang urban development action plan consists of six major crosscutting actions, and the Strategic Plan for a new "Environment City" Manifesto to be formulated is expected to state Da Nang's energy efficiency and low-carbon development goals in no uncertain terms. At the same time, Da Nang is looking towards JCM as a way to successfully introduce incineration facilities under its environmental/waste management initiatives, one of the six major programs. By tying the survey into discussions on the urban development action plan in this way, we assisted greatly in moving the conversation forward on low-carbon development throughout the city.

# Water Supply Survey

**【Overview】**

This study conducted an examination on updates to the latest, low-carbon, energy-saving pumps based on the energy-saving and low-carbon needs of facilities, such as pumps in the water treatment plants of Danang Water Supply One Member Limited Company (DAWACO), as well as an examination of topic management based on procedural processes and financials. These needs were clarified in the FY 2013 feasibility study in Da Nang City on Official Development Assistance (ODA) cooperation projects of the Ministry of Foreign Affairs (feasibility study on proposal for energy-saving assessments and measures using simple measurements and promotion of environmental education in Da Nang City).

(Figure 2. Pumps identified in this study with potential as JCM model projects)

| Target facility | Old Cau Do Water Treatment Plant (Level 1) | New Cau Do Water Treatment Plant (Level 2) |
|---|---|---|
| Number of pump facilities | 3 | 6 |
| Pump efficiency | (Current) 50.5% (when 2 pumps are in operation) →(New) 83% (when 2 pumps are in operation) | (Current) 63.3% (when 5 pumps are in operation) →(New) 86% (when 5 pumps are in operation) |
| Capacity (m3/hr) | (Current) 2,154→(New) 2,375 | (Current) 9,590→(New) 11,600 |
| Estimated project cost | Slightly less than JPY 200 million total | |
| GHG emission reduction effect (calculated) | 118 t/year | 481 t/year |

**【Overview of activity output】**

The following outputs have been achieved through this study.

- Output 1: Identification of water treatment plants that have potential as JCM projects and determination of technical specifications for pumps

Through facility inspections and interviews with related stakeholders, the study confirmed that, of the numerous water treatment plants in Da Nang (old Cau Do Water Treatment Plant, new Cau Do Water Treatment Plant, San Bay Water Treatment Plant, and An Trach Water Plant), updates to pumps in the old Cau Do Water Treatment Plant and the new Cau Do Water Treatment Plant were the most suited to being developed as JCM model projects. The study also determined the specifications needed for energy-saving pumps that are the most optimal for DAWACO's needs, and that also have potential as JCM model projects.

- Output 2: Resolution of issues from a cost perspective related to the introduction of pumps towards the development of JCM model projects

The study confirmed the self-financing capacity of DAWACO and clarified the possibility of updating pumps without the need for additional financial support measures if the subsidy rate for JCM technical assistance is about 40% or higher.

- Output 3: Solutions for problems from a procedural perspective, including tender

The study confirmed that, if investment is at the levels mentioned above (Output 2) for JCM technical assistance, it is possible to facilitate "Nominated Tendering" in tenders for pump updates through the Da Nang People's Committee (DPC) and the Department of Planning and Investment (DPI).

【Future schedule for technical assistance projects, other】

The following is a draft schedule for project development and is scheduled to be proposed under FY 2016 technical assistance projects.

(Figure 3. Plan for future schedule)

| | FY2016 1 Q | FY2016 2Q | FY2016 3Q | FY2016 4Q |
|---|---|---|---|---|
| Technical specs of pumps | Detailed design | | | |
| Proposal on procedures | Proposal | | | |
| Agreement between cities | Da Nang approval | | | |
| Application for the JCM Model Project | | Application and result | | |
| Implementation of new pumps | | | Detailed design | Construction and starting of pump usage |
| Preparation of MRV | | | Detailed design | Implementation |

# 1 Table of Contents

# 2 Study Overview

## 2.1 Overview of Da Nang City

### 2.1.1 Socio-economic conditions

Da Nang, the fourth largest city in Viet Nam, is one of five centrally governed cities and is located in the eastern end of the East-West Economic Corridor, which stretches from Myanmar to Laos. The city has an area of 1,283 $km^2$ and a population of 992,800 people (2014). Da Nang has been attracting attention as a central part of the nation's economy in the south-central part of the country, such as its position as the third largest port in the country (Da Nang Port).

The city has undergone remarkable economic development as a major economic and cultural urban area in the central region of Viet Nam. Da Nang is also promoting environmentally-friendly urban development to revitalize the tourism industry, one of the country's major industries. In 2008, Da Nang issued an environmental city declaration, and was awarded the ASEAN Environmentally Sustainable City (ESC) Award in 2011. While willing to lead as an eco-city, Da Nang is increasingly recognizing the importance of considering issues from an environmental perspective, including an expanded emphasis on water, which is associated with industrial clusters, rapid population growth, and expansion of tourism development that all go hand-in-hand with economic development. These urban challenges are clearly illustrated in the "Study on the Integrated Development Strategy for Danang City and Its Neighboring Areas in the Socialist Republic of Vietnam (DaCRISS)," a study on a master plan for Da Nang created by JICA in 2010.

### 2.1.2 Governmental organization & roles

The governmental body of Da Nang is called the Da Nang City People's Committee (DPC). The DPC is made up of various supervisory departments, including the Department of Investment and Planning (DPI), Department of Foreign Affairs (DOFA), Department of Industry and Trade, Department of Natural Resources and Environment, and the Department of Transportation, for example. In addition, the Da Nang Committee of Response to Climate Change (CRCC) examines upper level policies for climate change.

### 2.1.3 Implementation of climate change measures and environmental considerations

Viet Nam has achieved remarkable economic growth (growth rate of about 6% each year), and with this, energy consumption has also increased. The importance of energy conservation and energy efficiency has risen as evidenced by the high cost of electricity, which is about JPY 10/1 kWh. Viet Nam enforced the Law on Economical and Efficient Use of Energy in 2011 and is promoting the development of a green growth strategy (National Green Growth Strategy, 2011-2020).

In the water sector, the importance of safe water supply throughout the country was recognized in 2007, and the decision to require water supply companies to formulate water safety plans was made in 2008. In Da Nang, a road map for the development of water project plans was created by DAWACO in cooperation with JICA, which included the urgent issues of expanding facilities associated with the increase in water purification needs, as well as proper facility maintenance and management.

## 2.2 Intergovernmental cooperation

### 2.2.1 Past history

In April 2013 Da Nang signed a Memorandum of Agreement on Technical Cooperation for Sustainable Urban Development with the City of Yokohama, under which activities are being promoted to address various urban issues through intercity cooperation. In November 2015, Da Nang opened a representative office in Yokohama as a symbol of the good intercity relationship between both cities and is continuing to strengthen intercity cooperation.

As part of these efforts, Da Nang, JICA, and Yokohama held discussions in earnest following the establishment of the Da Nang Urban Development Forum in December 2014 to discuss the action plan for the full-scale implementation of DaCRISS. To date, the forum has been held twice in Da Nang (December 2014 and May 2015), at which the selection and priority setting of six major cross-sectoral action plans and six major programmes were made. Plans were formulated based on discussions on future priority projects in Da Nang, using six major projects for infrastructure development that were published by Yokohama City in 1965 (three overall development projects and three transport infrastructure projects, i.e. Minato Mirai 21, Kohoku New Town, Kanazawa Land Reclamation Development). A detailed examination of the urban development action plan in Da Nang was conducted at the 3rd Da Nang Urban Development Forum (August 2015, Yokohama) and 4th Da Nang Urban Development Forum (December 2015, Venue: Da Nang). The outcomes of the discussions on the urban development action plan will be written up in a final report by March 2016.

(Figure 2-1. Plans discussed at the Da Nang Urban Development Forum)

| 6 Major Cross-cutting Actions |
|---|
| ① Development of comprehensive and sustainable urban development strategies |
| ② Development of new industrial strategies |
| ③ Strategic manifest to update and implement Da Nang's environmental city declaration |
| ④ Creation of sustainable fiscal management mechanisms |
| ⑤ Creation of comprehensive human resources development systems |
| ⑥ Strengthening of controls for land use and development |
| **6 Major Programmes** |
| ①Environmental measures (Improvement/expansion of sewerage facilities, water supply) |
| ② Port project |
| ③ Introduction of public transport |
| ④ Improvement of city center |
| ⑤ Construction of New Town |
| ⑥ Disaster prevention measures |

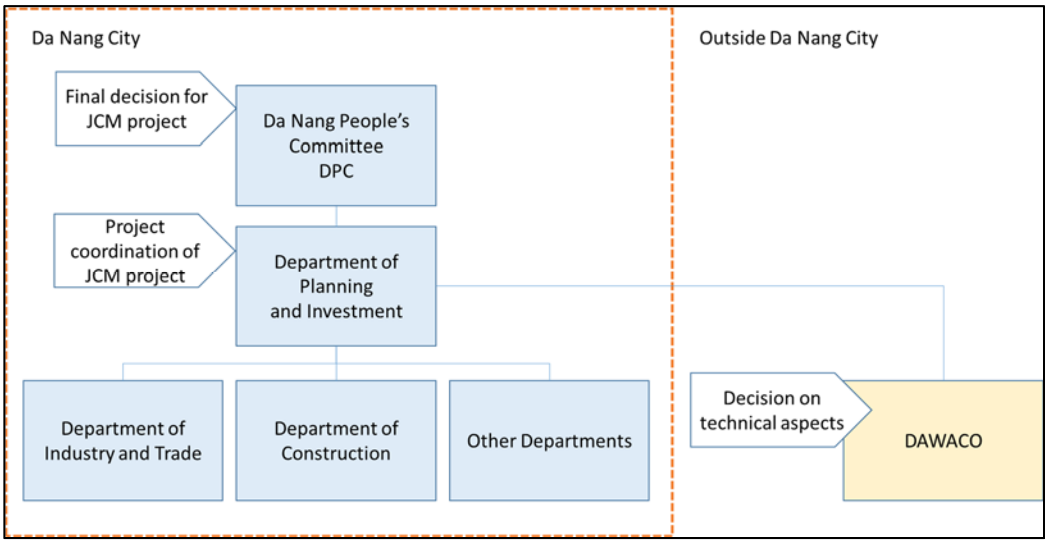
At the 1st Da Nang Urban Development Forum, which was held in December 2014, a request was made by Mr. Nguyen Ngoc Tuan, Vice Chair of the Da Nang People's Committee to Yokohama for strengthened support to achieve sustainable urban development. The 2nd Da Nang Urban Development Forum held in May 2015 confirmed priority settings in the Da Nang Urban Development Action Plan, and “environmental measures” were selected as the area for cooperation. This includes the improvement and expansion of water and sewage facilities, as well as waste supply projects.

In addition to the strong cooperative relationship between the two cities through the Da Nang Urban Development Forum in the area of water supply, in particular, cooperation activities will use those networks developed by the Yokohama Waterworks Bureau with water supply organizations in the central and southern region of Viet Nam that have been developed over the years through JICA projects and other programmes. The Yokohama Waterworks Bureau plans to further strengthen its relationship with the region in the future to improve capacity for water supply projects and technical capacity in Viet Nam, and in accordance with this, the relationship with the Danang Water Supply One Member Limited Company (DAWACO) that has been developed to date will be further strengthened as well. This will have important implications in the smooth study of mechanisms that can be developed using these priority policies in the “Feasibility Study on FY2015 Large-Scale JCM Project for Realizing Low-Carbon Development in Asia” (JCM Feasibility Study in Da Nang through "Technical Cooperation for Sustainable Urban Development" with Yokohama City).

A distinguishing part of the Da Nang Urban Development Forum is that action is not limited only to intercity cooperation; the forum also promotes public-private partnerships and calls for the active participation of the private sector. The two cities are actively working to promote the participation of companies as part of support measures by Yokohama for the development of overseas infrastructure projects by local cities in Yokohama, as well as support by Da Nang for the development of industries through the introduction of technology by Japanese companies to local companies in Da Nang. This is based on the cooperation element of “encouraging the participation of private businesses and academic institutions that have knowledge and experience on environmentally-friendly urban development.” Of the six major programmes, the JCM intercity cooperation F/S aims at concrete JCM model project and actual business development under (1) “environmental measures.” In this way, the outcomes of the JCM intercity cooperation F/S will be able to offer feedback to priority plans and policies to be actively promoted by both cities for actual JCM model project development.

### 2.2.2 Details of local governmental cooperation

A distinctive point of intercity cooperation with Da Nang is that support has already been provided for the development of cross-departmental systems in order for Da Nang to effectively implement policies. It was important to coordinate the development of this system based on measures with the Da Nang People's Committee since there had been no cross-departmental or committee system in place in the departments of Da Nang. During the time that counterparts from Yokohama served in the Da Nang Department of Foreign Affairs, smooth communication with counterparts in Japan was enabled by creating a focal point of contact for compilation and coordination, as well as JCM model projects in the Department of Planning and Investment. The reform of this structure within the government administration was possible because of the equal partnership between both local governments and will have large implications for JCM intercity cooperation.




(Figure 2-2. Roles of each department in the JCM Feasibility Study in Da Nang)

In addition to the strong systems of the two cities, especially in relation to water supply, the Yokohama Waterworks Bureau has concluded Memorandums of Understanding with three water management organizations in the central and southern part of Viet Nam, including DAWACO, since August 2009. In July 2015, a new

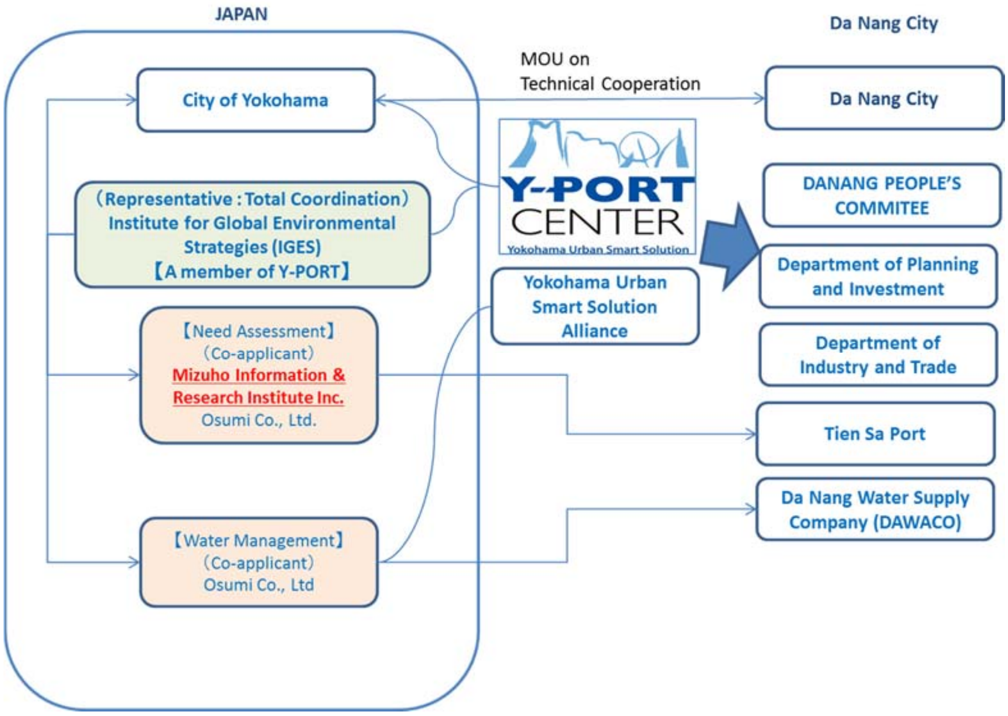
Memorandum of Understanding was concluded on “strengthening relationships to improve water supply and technological capacity in Viet Nam” (July 2015 to September 2018), and intercity cooperation will play an important role in studies on water supply in this project through the promotion of the development of JCM model projects.

### 2.2.3 Da Nang City’s commitment to JCM intercity cooperation

In this way, the success of JCM technical assistance can be unified through intercity cooperation in priority policies, in addition to JCM intercity cooperation F/S with the promotion of the participation of the private sector in both cities. During the final field survey in January 2016, both Vice Chair Tuan and Vice Director Thanh from DPC welcomed the proposal for JCM technical assistance, and the study team received their request to proceed expeditiously. In particular, as studies on the updates for pumps at water treatment plants are accelerating with an eye on the development to JCM model projects, Vice Chair Tuan emphasized that the success of JCM technical assistance projects in updating pumps in water treatment plants could become a stepping stone for JCM model project development in Da Nang.

## 2.3 About the study team

This study was carried out as part of the Yokohama Y-PORT Center project based on cooperation with the Yokohama Development Cooperation Division, International Affairs Bureau, with the entire project coordinated by the Institute for Global Environmental Strategies (IGES). In this study, Mizuho Information & Research Institute Co., Ltd. carried out needs assessments and IGES coordinated the study on water supply. In addition, Osumi Co., Ltd., a local company in Yokohama, performed technical assessments through local field surveys on the needs assessment and water supply areas of the study. In addition to the team members, advice was received from Ebara Vietnam, Inc. as an expert organization for technical considerations regarding updates to pipes in the water supply study.




(Figure 2-3: Relationship between the study team and counterparts in Da Nang)

- **Yokohama City (Y-PORT Center)**

Since January 2011, Yokohama has been involved in the promotion of Y-PORT, which is an “international technical cooperation project through public-private partnerships that utilizes the resources and technologies of Yokohama” that aims at supporting overseas development for local companies and finding solutions to urban issues in emerging economies. In April 2015, the management of Y-PORT was transferred from Yokohama’s Co-Governance and Creation Office, International Technical Cooperation Division, Policy Bureau to Yokohama’s Development Cooperation Division, International Affairs Bureau, which was established as the first international affairs bureau in Japan. In May of that same year, Yokohama launched the Y-PORT Center, which is responsible for the promotion of international cooperation, and a platform was created to promote the development of overseas infrastructure business through public-private partnerships with the participation of Yokohama, IGES, the CITYNET Yokohama Project Office and local companies carrying out joint projects. The Y-PORT Center carries out the development and expansion of projects in order to meet the increasing number of requests for assistance from cities in emerging economies. Participation in the JCM intercity cooperation study (F/S) is one of its initiatives.

- **Institute for Global Environmental Strategies (IGES)**

As a member of Y-PORT since its establishment in May 2015, IGES has been involved in supporting low-carbon and sustainable urban development in cities in emerging countries through the promotion of public-private partnerships. IGES has also been engaged in multiple JCM intercity cooperation F/S. The cities of Hai Phong and Kitakyushu (Kitakyushu Asian Center for Low Carbon Society) are also carrying out studies as part of intercity cooperative initiatives in Viet Nam. In Viet Nam, IGES has also carried out capacity building for the central government on JCM procedures and commissioned work to support the development of measurement, reporting and verification (MRV) systems. IGES took the lead for this project by coordinating the progress and results of the entire study and updating low-carbon products for water supply.

- **Mizuho Information & Research Institute**

Mizuho Information & Research Institute has received requests to implement a number of climate-change related studies to date, and in particular, has compiled information about the needs assessment for this project based on the institute's long-history of experience in studies related to energy savings and renewable energy. Mizuho Bank, a group company, has established branches in the cities of Hanoi and Ho Chi Minh, and has been involved in capital and business alliances with Vietcombank, Viet Nam's largest state-owned commercial bank. Mizuho has a strong understanding of local issues and is also familiar with local environmental issues.

- **Osumi Co., Ltd.**

Osumi Co., Ltd. is a member of the Yokohama Urban Smart Solution Alliance which is promoted by Y-PORT, and has carried out simple energy-saving assessments locally through a FY 2013 feasibility study in Da Nang City on Official Development Assistance (ODA) cooperation projects of Ministry of Foreign Affairs (feasibility study on proposal for energy-saving assessments and measures using simple measurements and promotion of environmental education in Da Nang City). Osumi has also built a relationship with DAWACO and has gained an understanding of local needs. In this study, Osumi was responsible for technical analysis and technical proposals in both the needs assessment and water supply areas of the study.

## 2.4 Survey results

(Figure 2-4. Schedule of 1st mission)

| Date | | Water Supply | Needs Assessment |
|---|---|---|---|
| Sep 14 (Mon) | AM | Kick-off meeting with DPC, DPI | |
| | PM | Meeting with stakeholders from Japanese Business Association in Da Nang | |
| Sep 15 (Tue) | AM | Meeting with DAWACO<br>Site visit to Cau Do Water Plant | Meeting with DOT |
| | PM | Meeting with University of Science & Technology | Meeting with Da Nang Port Corporation<br>Meeting with Seafood Service Zone |
| Sep 16 (Wed) | AM | Meeting with DOIT | |
| | PM | Site visits to water treatment plants | Meeting with Industrial Zone Management Board and DAIZICO<br>Presentation at Board Meeting of JBA |
| Sep 17 (Thu) | AM | Meeting with DOC | |
| | | Meeting with Saigon Da Nang Joint Stock Investment Company,<br>Site visit to Hoa Khanh and Lien Chieu Industrial Zones | |
| | PM | Meeting with Department of Tourism<br>Wrap-up meeting for 1st mission with DPI | |

Between 14 September (Monday) and 17 September (Friday), kick-off meetings were held for both the water supply and needs assessment areas of the study. Along

with this, meetings were held in the water supply area of the study with DAWACO about the current state of water treatment plants, and site visits were carried out at the old and new Cau Do Water Treatment Plants, San Bay Water Treatment Plant, and An Trach Water Plant. In the needs assessment part of this study, interviews were conducted with the Da Nang Department of Planning and Investment, Department of Commerce and Industry, and Department of Culture, Sports, and Tourism, and information was collected related to the development of a long list of companies in Da Nang with JCM project development potential. Consultations were also carried out with the Da Nang Department of Planning and Investment, and preparation was carried out for the development of a simple questionnaire survey to select potential candidates for JCM project development, as well as a seminar on the promotion of JCM model project formulation and implementation to be held during the second field visit.

### 1. 2nd field visit (November 2015)

The second field visit was held from 2 November (Monday) to 6 November (Friday). In the water supply portion of the study, site visits to several water treatment plants, as well as repeated discussions with DAWACO were conducted, and the old and new Cau Do Water Treatment Plants were selected as the most optimal sites for the development of JCM model projects. In addition, necessary matters were shared with DAWACO about solutions towards the facilitation of JCM technical assistance. Technical specifications for pumps to be introduced in the old and new Cau Do Water Treatment Plants were also considered with the cooperation of Ebara Vietnam.

In the needs assessment area of the study, a workshop on JCM project formulation and implementation was held for candidate companies towards the development of JCM model projects, and interviews were held with JCM model project candidate companies for the development of a long-list of companies using the first site visit survey.

(Figure 2-5. Schedule of 2nd mission)

| Date | | Water Supply | Needs Assessment |
|---|---|---|---|
| Nov 2 | AM | Kick-off meeting with DPC, DPI | |

| | | | |
|---|---|---|---|
| (Mon) | | | Meeting with Company A (seafood processing) |
| | PM | Meeting with DOFA | Meeting with Company B (textiles) |
| Nov 3 (Tue) | AM | Interviews with Da Nang wastewater and sewage treatment companies | |
| | | | Meeting with Company C (paper manufacturing) |
| | PM | Meeting with public lighting company | Meeting with Company D (hotel) |
| Nov 4 (Wed) | AM | Workshop for facilitation of JCM Project Formulation & Implementation | |
| | PM | Site visit to water treatment plant | Meeting with Company E (dairy products) |
| | | Wrap-up meeting on 2nd mission with DPI (Part 1) | |
| Nov 5 (Thu) | AM | Workshop with DAWACO | Leave for Japan |
| | PM | Site visit to water treatment plant | |
| Nov 6 (Fri) | AM | Technical meeting with DAWACO | |
| | PM | Wrap-up meeting on 2nd mission with DPI (Part 2) | |

## 2. 3rd field visit (November 2015)

From November 23 (Monday) to 27 (Friday), the study team carried out technical meetings with JCM model project candidate companies and collected information and data as part of the needs assessment.

(Figure 2-6. Schedule of 3rd mission)

| Date | | Needs Assessment |
|---|---|---|
| Nov 23 (Mon) | AM | Meeting with DPI |
| | PM | Biomass site visit to companies in Da Nang |
| Nov 24 (Tue) | AM | Preparation for meetings & site visits |
| | PM | Meeting with Company A (seafood processing) |

| | | |
|---|---|---|
| Nov 25 (Wed) | AM | Biomass site visit to Company C (paper manufacturing) |
| | PM | Meeting with Company F (textiles) |
| Nov 26 (Thu) | AM | Meeting with Company B (textiles) |
| | PM | Firewood moisture survey of Company B (textiles) |
| | | Materials/information gathering from Company A (seafood processing) |
| Nov 27 (Fri) | AM | Biomass site visit to companies in Da Nang |
| | PM | Biomass site visit to companies in Da Nang |

### 3. Final field visit (January 2016)

A final field visit was carried out from 6 January (Wednesday) to 8 January (Friday). Under the water supply part of the study, the study team provided final recommendations to DAWACO (proposals for technical specifications on pump updates, proposals from procedural perspective, and proposals from financial perspectives). Under the needs assessment part of the study, the team provided an explanation of proposed details towards the development of JCM model projects for candidate companies and organized consultations on the action plan towards the development of JCM model projects, in addition to consultations with newly identified JCM model project candidate companies. In both areas, a final wrap-up meeting was held with DPC, DPI, and DAWACO, and information was shared about the steps towards the development of JCM model projects (water supply) and the project list of potential candidates for the development of JCM model projects (needs assessment).

(Figure 2-7. Schedule of final mission)

| Date | | Water Supply | Needs Assessment |
|---|---|---|---|
| Jan 6 (Wed) | AM | Kick-off meeting with DPI | |
| | | Final meeting with DAWACO | Meetings with Company B (textiles) and Company C |
| | PM | | |

| | | | |
|---|---|---|---|
| | | | (paper manufacturing) |
| Jan 7 (Thu) | AM | Meeting with wastewater and sewage treatment companies, site visits | Meeting with Company G (seafood processing) |
| | PM | Formal visit to DPC | Meeting with Company H (iron and steel) |
| Jan 8 (Fri) | AM | Preparation for final wrap-up meeting | Meeting and site visit to Company C (paper manufacturing) (reconfirmation) |
| | PM | Final wrap-up meeting on JCM intercity cooperation F/S with DPC/DPI/DAWACO | |

# 3 Needs Assessment

## 3.1 Overview of needs assessment

### 3.1.1 Background and objective of assessment

Vietnam's energy consumption has increased at a rate of 10% in recent years, outpacing the country's economic growth rate of 5–6%[1]. At the same time, power supply shortages are driving up electricity and fuel prices, making efficient energy use a pressing concern.

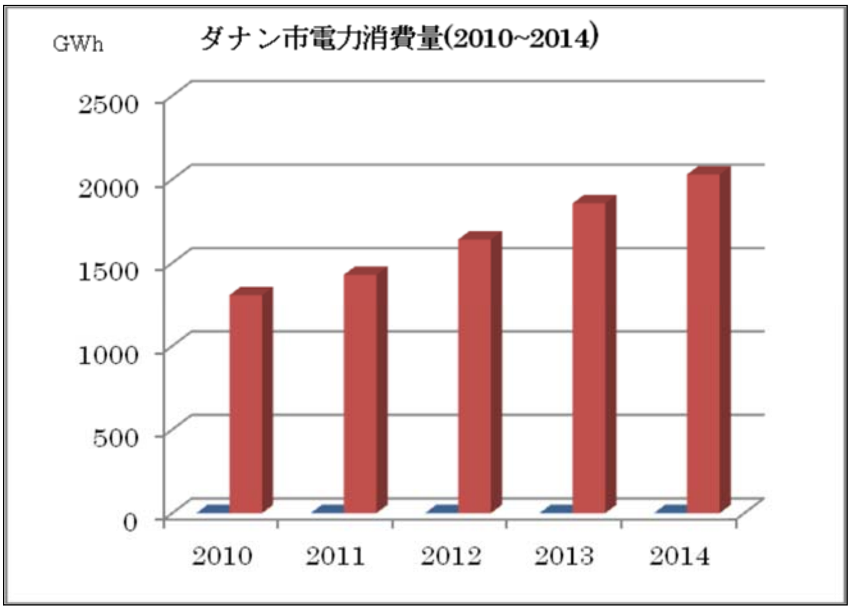
The government of Vietnam has been working to set up and execute energy efficiency policies and frameworks, enacting the Vietnam National Energy Efficiency Program (2006–2015) in 2006 and getting support from the Japan International Cooperation Agency (JICA) to put the Law on Economical and Efficient Use of Energy into force in 2011. In September 2015, Vietnam submitted an Intended Nationally Determined Contribution (INDC) outlining its 2021–2030 targets to the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, offering an 8% reduction in emissions by 2030, compared to a business-as-usual (BaU) scenario. Vietnam further proposed that greenhouse emissions could be cut by 25% conditional upon international support. It also appears as if the country is looking to ramp up its energy-saving measures on a local level.

In Da Nang, energy consumption has been increasing rapidly throughout the city since 2010, with 2010 consumption expected to nearly double in 2015. Greenhouse gas emissions are undoubtedly rising significantly as well. If we look at Da Nang energy consumption by sector, we find that construction and industry account for nearly half of the total, while residential consumption accounts for about a third. Consumption increased by an average of 16.7% and 10.0% annually in each of these two sectors over

[1] Detailed Plan Formulation Survey on the Support Project for the Establishment of an Energy Training Center in the Socialist Republic of Vietnam (JICA 2013)

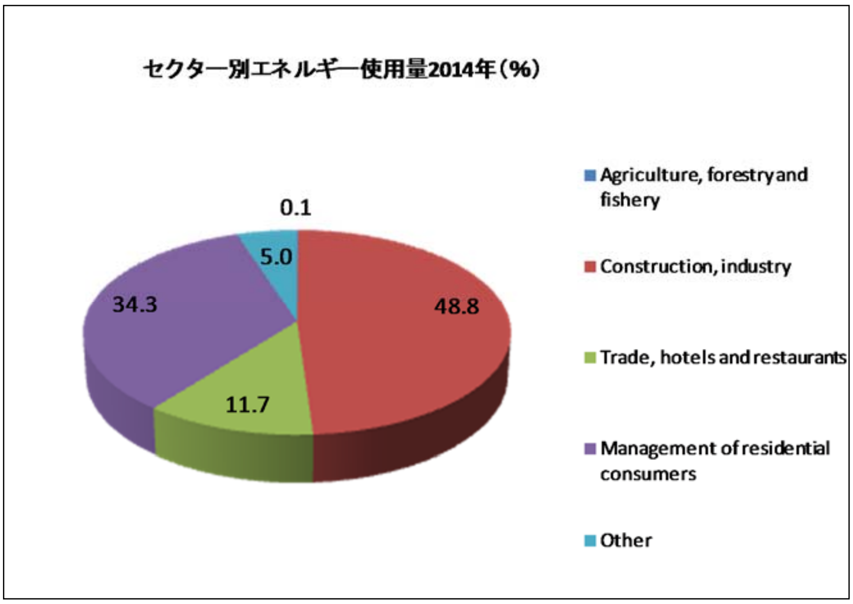
the four years between 2010 and 2014, greatly surpassing the average rate of economic growth (5.7%) during that same timeframe. Meanwhile, trade, hotels, and restaurants—the consumer-oriented sector that supports Da Nang's economic growth—accounts for more than 10% of the city's total energy consumption and is increasing at a brisk pace. Better energy efficiency and stricter climate change measures will be critical for the city going forward.

Though Da Nang does not have its own mitigation targets at this point, it did announce the Da Nang Eco-City Plan in conjunction with its eco-city declaration in 2008. The plan is set up to systematically move forward with its stated initiatives, defining three stages of green urban planning: 2008–2010, 2011–2015, and 2016–2020. Figure 3-4 lists the city's specific energy-saving targets (e.g. a 5–8% reduction in total energy consumption compared to a BaU scenario), greenhouse gas reduction policy (reducing emissions from key components (industries)), and policy for introducing renewable energy sources (promoting the use of natural sources like wind, solar, and hydroelectric power while setting up energy reuse models).




Source: Vietnam Ministry of Industry and Trade

(Figure 3-1. Changes in energy consumption in Da Nang (2010-2014))




Source: Vietnam Ministry of Industry and Trade

(Figure 3-2. Energy use in Da Nang by sector (2014))


Source: Vietnam Ministry of Industry and Trade

(Figure 3-3. Changes in energy consumption in Da Nang by sector (2010-2014))

(Figure 3-4. Da Nang Eco-City Plan: Overview )

| | |
|---|---|
| Enacted | 2008 |
| Purpose | Achieve eco-city status by 2020 |
| Details | 1. Reduce total energy consumption by 5–8% compared to current forecasts and socioeconomic development programs. Reduce corporate, government, and public total energy consumption by 11–12% over current forecasts.<br>2. Reduce greenhouse gases from essential components (industries)<br>3. Investigate industrial and municipal greenhouse gas emissions<br>4. Reduce the Air Pollution Index (API) to 100 or less<br>5. Secure controlled smoke and dust areas by 90% or more<br>6. Create 6 to 8 $m^2$ of green space per person in public municipal areas<br>7. Collect at least 90% of solid waste in water areas<br>8. Recycle at least 70% of solid waste<br>9. Promote the use of natural resources such as wind, solar, and hydroelectric power while setting up energy reuse models |

Source: Da Nang Eco-City Declaration

It was against this backdrop that the city of Yokohama signed a Memorandum of Understanding on technical co-operation in urban development with Da Nang in April 2013 in an effort to promote initiatives aimed at resolving various urban issues through municipal cooperation. As part of this agreement, Da Nang, JICA, and Yokohama set up the Da Nang Urban Development Forum to discuss an action plan that would translate the Integrated Development Strategy for Da Nang City and Neighboring Areas in Vietnam (DaCRISS) into concrete action. These discussions have since taken shape, and the parties expect to have a final report prepared on the matter by March 2016.

In this context, the purpose of this survey is to promote *Da Nang's full transition to low-carbon city status*, thereby supporting its ongoing development as an eco-city. In doing so, we hope to build on the partnership between Da Nang and Yokohama as well as the actual collaborative status of the two cities.

### 3.1.2 Overview of assessment

(1) Content

We carried out the following two actions in order to achieve the two main goals of the survey: (1) identify and formulate JCM projects (Output 1) and (2) support a broad-based rollout of JCM projects.

For the first output, the cities of Yokohama and Da Nang worked together in conjunction with relevant Da Nang agencies to gather information—mostly from production plants and hotels in the city—and come up with a long list of companies that could potentially reduce their energy use. The listed companies were then asked to complete a brief questionnaire, which was used to narrow down targets for the JCM project formulation survey. A JCM project formulation and implementation workshop was also held to spread awareness of JCM and the JCM support framework among Da Nang companies as well as solicit their participation. Interviews were scheduled with companies identified in the brief questionnaire as being a good fit for JCM projects as well as with those demonstrating interest during the workshop, resulting in a short list of JCM project candidates. Finally, the companies on the short list were given a survey with the goal of formulating JCM projects; this was followed by the creation of an action plan.

With the second output, supporting the broad-based rollout of JCM projects in Da Nang, discussions on future initiatives and policies on the Da Nang side were held after confirming the city's carbon reduction and energy-saving strategies. Currently, the Joint Crediting Mechanism (JCM) is being brought up and proposed to Da Nang in discussions on the city's urban development action plan, which is being formulated with the help of JICA and the City of Yokohama. JCM is being proposed as a way to enrich the conversation on updating the city's vision for energy efficiency and low-carbon operations as well as a means of actually implementing its energy-saving and carbon-reduction projects.

A specific list of survey action items is given below for the above two outputs.

**Output 1: Identify and formulate JCM projects**

Output 1-1. Identify capital investment needs

- Action 1-1: Create a long list of companies with energy-saving potential
- Action 1-2: Give the companies on the list a preliminary questionnaire

Output 1-2. Identify JCM project candidates

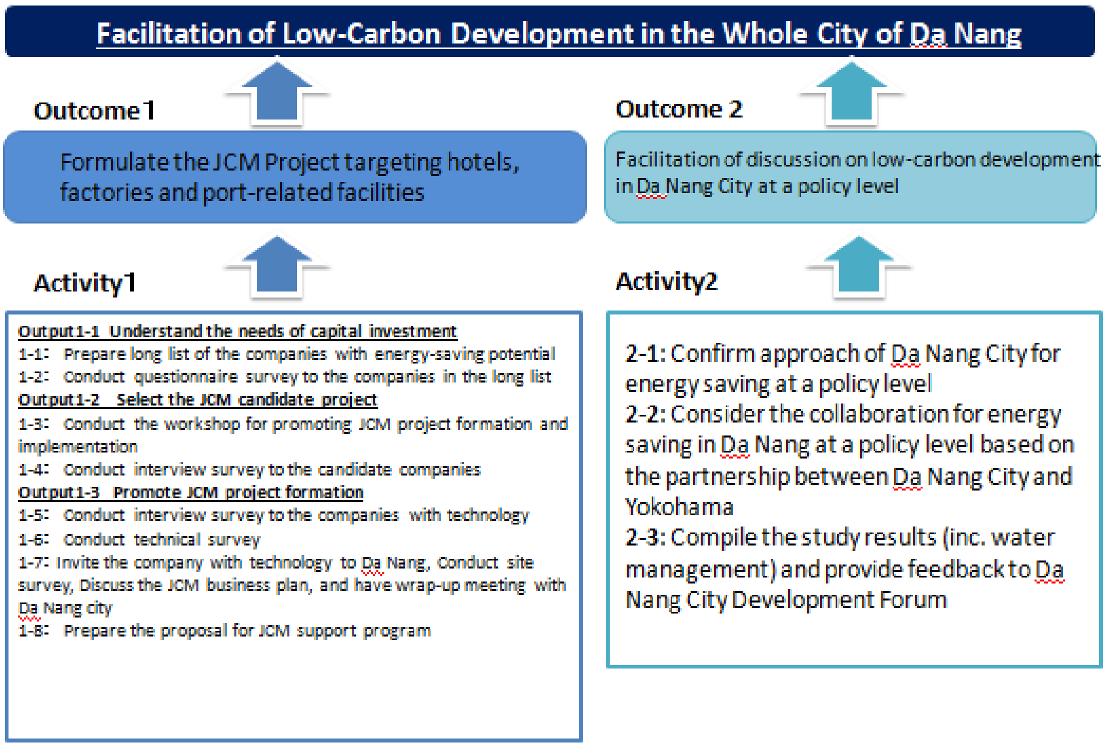
- Action 1-3: Hold workshop to support JCM project formulation and implementation
- Action 1-4: Interview companies identified as JCM project candidates

Output 1-3. Support JCM project formulation

- Action 1-5: Interview companies with technological resources
- Action 1-6: Consider technical aspects (simplified designs, project cost estimates, estimated $CO_2$ reduction potential, etc.)
- Action 1-7: Invite companies with technological resources to visit sites, tour target facilities, discuss the JCM project plan, hold a wrap-up meeting with Da Nang
- Action 1-8: Prepare for an FY2016 project proposal

**Output 2 Support broad-based rollout of JCM projects**

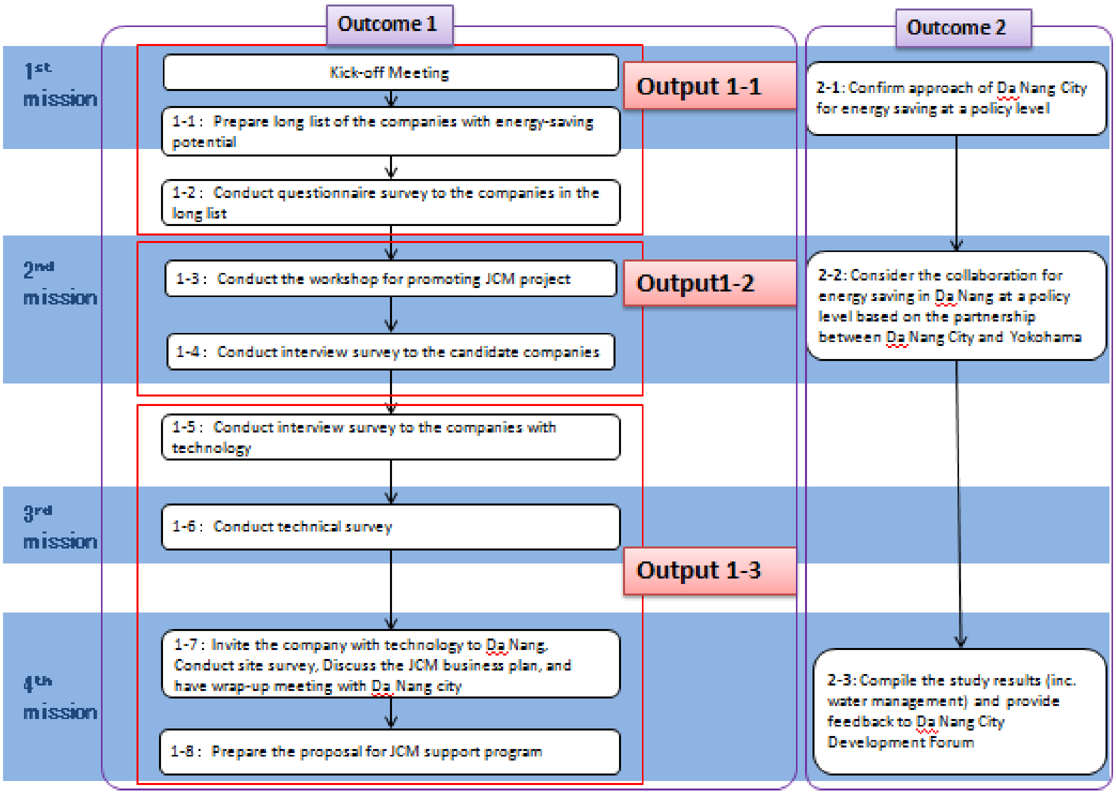
- Action 2-1: Confirm energy-saving initiatives in Da Nang at the policy level
- Action 2-2: Based on the results of 2-1, discuss the possibility of supporting those policies through Yokohama–Da Nang collaboration
- Action 2-3: Summarize general survey results (including in the water and sewage sector) and offer feedback during the Da Nang Urban Development Forum




（Figure3- 5. Needs survey: Action overview）

(2) Procedures

Figure 6 outlines the procedures used to implement the survey as described in section (1) above. Note that the first output (identify and formulate JCM projects) was implemented in three stages: (1) identifying capital investment needs, (2) identifying JCM project candidates, and (3) supporting JCM project formulation.




（Figure3- 6. Needs survey: Implementation procedures）

## 3.1.3 Implementation framework

### (1) Japan side

The Mizuho Information and Research Institute was responsible for setting up the implementation framework for the survey, taking charge of overall process implementation and management, which included considerations related to the formulation of Joint Crediting Mechanism projects. Osumi Co., Ltd primarily assisted with technical considerations related to JCM projects and potential CO2 reduction estimates. Finally, the Institute for Global Environmental Studies (IGES) handled the overall coordination and planning for both the waterworks survey and needs survey, while Yokohama supported individual coordination efforts with Da Nang based on the Memorandum of Understanding signed between the two cities.

(Figure 3-7. Japan-side implementation framework)

| Participant | Role |
|---|---|
| City of Yokohama | Assisting with various coordination efforts with Da Nang |
| IGES | Planning and coordination for the waterworks survey and needs survey |
| Mizuho Information and Research Institute | Overall survey process implementation and management, including JCM project considerations |
| Osumi | Technical considerations related to JCM products and potential $CO_2$ reduction estimates |

(2) Vietnam side

The Da Nang Department of Planning and Investment (DPI) took charge of the survey on the Da Nang side, coordinating and planning with related departments. Additional partner organizations included the Da Nang Department of Industry and Trade (DOIT), the Department of Culture, Sports and Tourism, the Department of Transportation, the Industrial Promotion Center run by the DOIT, the Da Nang Industrial and Export Processing Zones Authority (DIEPZA) under direct control of the Da Nang People's Committee, the Da Nang Industrial Zone Infrastructure Exploration and Development Company (DAIZICO) that operates under DIEPZA, and others. The Da Nang People's Committee (DPC) supervised overall survey operations.

(Figure 3-8. Vietnam-side implementation framework)

| Counterpart | Role |
|---|---|
| Da Nang People's Committee | Supervising overall survey operations |
| Da Nang Department of Planning and Investment (lead organization) | Overall supervision, coordination, and assistance |
| Other participating organizations | Providing information and various other forms of assistance |

### 3.1.4 Schedule

The activity schedule for the needs survey was as follows

（Figure 3-9. Needs survey implementation schedule）

| Survey schedule | Survey outline |
|---|---|
| Stage I on-site survey (September 2015) | – Hold kick-off meeting with involved Da Nang departments<br>– Gather information on Da Nang companies to create a long list of potential JCM project candidates<br>– Prepare to give basic questionnaires<br>– Prepare for workshop to support JCM project formulation and implementation to be held during phase II of the on-site survey |
| Tasks in Japan (September–October 2015) | – Tally up and analyze basic questionnaire responses<br>– Prepare for JCM workshop |
| Stage II on-site survey (Early November 2015) | – Hold workshop to support JCM project formulation and implementation<br>– Interview companies identified as JCM project candidates |
| Tasks in Japan (2015–January 2016) | – Meet and coordinate with companies having technological resources<br>– Consider JCM project formulation frameworks |
| Stage III on-site survey (Late November 2015) | – Hold technical conferences with JCM project candidates<br>– Gather and analyze information and data |
| Stage IV on-site survey (January 2016) | – Hold a wrap-up meeting<br>– Explain survey group proposals to JCM project candidates<br>– Consult on action plans with an eye to setting up JCM projects<br>– Consult with new JCM project candidates |
| Tasks in Japan (January–March 2016) | – Follow up with individual JCM project candidates<br>– Prepare a final report |

## 3.2 Needs survey results

This section lists individual results for each of the two survey outputs: (1) identifying and formulating JCM projects and (2) supporting broad-based rollout of JCM projects

### 3.2.1 Output 1: Identifying and formulating JCM projects

(1) Output 1-1. Identify capital investment needs among Da Nang companies）

We started by taking advantage of the partnership between Yokohama and Da Nang to obtain several lists with the help of related Da Nang agencies in charge of planning and other support functions. These included lists of companies consuming large amounts of energy, lists of companies located in industrial complexes, lists of mid-sized and large hotels[3], and so on. We then used the following three selection criteria (developed with an eye to JCM project formulation) to select fifty companies for our long list. The long list included 15 hotels, 28 production plants, and seven transport companies.

（Figure 3-10. Long list selection criteria）

| Survey target | Selection criteria | Reason |
|---|---|---|
| Production plants | Must be engaged in manufacturing rather than assembly work | These plants likely have significant energy conservation and $CO_2$ emissions reduction potential |
| Hotels | Must be a relatively old 3-star hotels (at least 50 rooms) | These hotels likely have significant energy conservation and $CO_2$ emissions reduction potential, and may be looking to renovate or upgrade their facilities |
| Transport companies | Companies recommended by the Da Nang Department of Transport | Specific to each recommendation |

We next teamed up with the Da Nang Department of Planning and Investment to

[3] According to information obtained from the City of Da Nang, there are 91 three-star hotels in the city with at least 50 rooms, 60% of which were constructed in 2012 or later, meaning that the majority are new hotels.

send a brief questionnaire to the fifty companies on our long list. The questionnaire covered the following items and was designed to identify potential JCM project candidates. Note that we were more interested in whether companies had an existing capital investment plan than in their desire to reduce energy consumption, since we felt that companies who already had a plan in place would more likely be a good fit in setting up a JCM project.

（Figure 3-11. Brief questionnaire: Overview）

| Survey target | Main question details |
|---|---|
| Production plants | Investment plan (desire to make one) with reasons and details, general company information (type of business, main products, annual production volume, main heat source, annual electricity usage/energy consumption etc.), equipment information (year installed, quantity, power consumption, etc.) |
| Hotels | Investment plan (whether the desire is there or not) with reasons and details, basic hotel facts (year completed (or rebuilt), number of floors, number of rooms, total floor area, annual electricity usage/energy consumption, etc.), hotel equipment information (year installed, quantity, power consumption, etc.) |
| Transport companies | Investment plan (desire to make one) with reasons and details, types of vehicles, vehicle capacity, types and amount of fuel used and usage rates, fuel efficiency of individual vehicles, etc. |

Twenty of the fifty companies responded to the brief questionnaire, with twelve of those indicating a desire to make capital investments. The twelve companies were in the seafood processing, papermaking, textile, electrical production manufacturing, food, hotel, or transport business, and those looking to upgrade mentioned equipment such as chillers, air conditioners, boilers, lighting, generators, water heaters

(2) Output 1-2: Identify JCM project candidates

① Identifying JCM project candidates using the brief questionnaire

According to the results of the brief questionnaire outlined above, there were twelve companies looking to make capital investments. Of those, the following five were identified as being better fits for a JCM project, based on information they gave in the questionnaire regarding their capital investment needs. With the help of the Da Nang Department of Planning and Investment, we were able to sit down with these five companies during the stage II on-site survey and confirm their suitability for JCM project formulation.

(Figure 3-12. JCM project candidates identified using the brief questionnaire)

| Company | Equipment targeted for JCM project | Details |
|---|---|---|
| Company A (seafood processing) | Boiler and generator | – Cans tuna, bonito, and other fish for export, primarily to Europe<br>– Wants to replace boiler due to capacity shortages as well as upgrade an aging generator |
| Company B (textiles) | LED lighting | – Manufactures and sews textiles. Mostly does business with Japan, Korea, South America, and Europe.<br>– Wants to upgrade to LED lighting to promote energy conservation |
| Company C (paper) | Production line | – Manufactures cardboard. Mostly does business with foreign companies.<br>– Concerned about capital investment in general as sales increase |
| Company D (hotel) | Air conditioning and other equipment | – Five-floor hotel with 170 rooms and a total floor area of 4,320 $m^2$. The entire building was renovated in 2004.<br>– Wants to renovate aging facilities |
| Company E (dairy products) | Boiler | – Manufactures milk, yogurt, and other dairy products<br>– Wants a new boiler |

Based on their desire to make capital investments as well as their potential to reduce CO2 and gain other benefits through equipment upgrades, we decided to target Company A (seafood processing), Company B (textiles), and Company C (papermaking) for further JCM project investigation, which included the introduction of Japanese technologies and test calculations for potential CO2 reductions. With Company D (hotel), the hotel building itself had deteriorated significantly and there was a need to upgrade various pieces of equipment, but we decided not to target it for further JCM project investigation since the company had the ability to renovate the building itself in the future. Although Company E (dairy products) needed to upgrade its boiler, it was also excluded from further investigation since it had already signed a contract to purchase steam from a steam supply company.

② Identifying JCM project candidates through the workshop

In order to give Da Nang companies and related government organizations a better understanding of the Joint Crediting Mechanism and support frameworks related to JCM projects, we held a JCM project formulation and implementation workshop on November 4, 2015 at Da Nang City Hall. Taking advantage of the partnership between Da Nang and Yokohama and with support from the Da Nang Department of Planning and Investment, we were able to invite more than twenty private and public companies along with members of the Da Nang municipal government for upwards of forty participants in total.

Participating private corporations included those working in the textile, hotel, cement, plastics, machinery, seafood processing, steel, packaging, papermaking, and dairy product industry, while public corporations included Da Nang Water Supply One Member Limited Company (DAWACO), the Da Nang Port Joint Stock Company, and Da Nang Wastewater Treatment Company. The private corporations that attended included those that responded to the brief questionnaire described above.

Participating members of the Da Nang government included the vice chairman of the Da Nang People's Committee as well as those from a variety of city agencies (the Department of Planning and Investment; Department of Industry and Trade; Department of Transportation; Department of Construction; Department of Culture, Sports, and Tourism; Climate Change Coordination Office; Industrial Promotion Center; and the Da Nang Center for Energy Conservation and Technology Transfer (a sub-organization of the Department of Science and Technology). Members of the Climate Change Coordination Office (which is controlled by the Vietnam Ministry of Natural Resources and the Environment) gave presentations on how JCM would work in Vietnam. See attachments 1 and 2 for workshop-related materials.

Interviews were also held with companies who contacted us following the JCM workshop to see if they would be a good fit for a JCM project. The following points were considered.

（Figure 3-13. JCM project candidates identified through the workshop）

| Company | Equipment targeted for JCM project | Details |
|---|---|---|
| Company F (textiles) | Production equipment | − Manufactures textiles. Mostly does business with Europe and Japan.<br>− Wants to invest in production equipment. |
| Company G (seafood processing) | Peripheral equipment | − Manufactures canned fish and other seafood. Mostly does business with companies within Vietnam. Headquartered in Hanoi.<br>− Wants to invest in refrigeration units and other peripheral equipment |

Company F ended up not being a good candidate for a JCM project due to their capital investment schedule. Company G contacted us during the final on-site survey, so we explored the possibility of a JCM project in terms of their desire to make capital investments as well as their potential to reduce CO2 and gain other benefits through equipment upgrades.

③ Identifying JCM project candidates through other means

To further identify JCM project candidates, we reached out individually to industries that looked like a good fit but who didn't return the brief questionnaire described above. We had an opportunity to interview the following steel company during the final on-site survey to confirm whether it would be a good JCM project candidate as well.

（Figure 3-14. JCM project candidates identified through other means）

| Company | Equipment targeted for JCM project | Details |
|---|---|---|
| Company H (steel) | Production equipment | − Manufactures steel used for building construction by large corporations in Da Nang. Mostly does business in Vietnam.<br>− Wants to invest in refrigerators and other production equipment. |

We had an opportunity to interview Company H (steel) during the final on-site survey, so we explored their suitability for a JCM project in terms of their interest level in energy-saving capital investment as well as their potential to reduce CO2 and gain other benefits through equipment upgrades.

(3) Output 1-3: Support JCM project formulation

The five companies selected in (2) above were investigated further to encourage the formation of a JCM project.

（Figure 3-15. Companies targeted for further JCM project investigation）

| | Company |
|---|---|
| 1 | Company A (seafood processing) |
| 2 | Company B (textiles) |
| 3 | Company C (papermaking) |
| 4 | Company G (seafood processing) |
| 5 | Company H (steel) |

① Potential Japanese technologies for introduction

We next surveyed documentation on Japanese companies in possession of technologies that met the needs of the JCM project candidates selected in (2) and sat down with them for face-to-face interviews. The table below lists the Japanese technologies that we thought would be a good match for the equipment that the JCM project candidates were looking to introduce.

（Figure 3-16. Japanese technologies potentially suited to JCM project candidates）

| Equipment | Japanese technology |
|---|---|
| Steam-powered generators or biomass gasification power generation systems | ● To help reduce carbon and conserve energy, Japanese production plants efficiently recover energy from even small amounts of low-pressure steam. Japan has developed compact steam generators as a way to utilize this recovered energy to generate electricity or as a source of drive power. Kobe Steel and IHI are key manufacturers of this kind of equipment.<br>● The SteamStar MSEG Series from Kobe Steel introduces a displacement screw and generates 160 kW of electricity from 3.2 t/h of steam with 50% better efficiency than an axial turbine. It can also generate electricity efficiently and seamlessly over a wide range of fluctuations in steam flow.<br>● Woody biomass gasification systems generate electricity by turning woody biomass or similar materials into a gas using a gasification agent, such as water vapor or oxygen, so that they can be used to generate electricity and usable heat. In Japan, engineering companies and industrial furnace manufacturers are working to make this kind of technology more practical. The Street Design Corporation, a research and development company in Yokohama, has succeeded in producing a compact, portable gasification power generation system.<br>● The Street Design product is highly versatile in terms of organic material inputs, with the ability to convert a wide range of resources into energy—everything from plastic to discarded tires, food waste, domestic animal waste, paper fibers, timber offcuts and other woody materials, and more. |
| LED lighting | ● LED lights have become a hot commodity in recent years, and Japanese manufacturers have been working to differentiate their products based on a more detailed understanding of customer needs—offering high-ceiling models, fixtures with built-in bulbs, dimmable models, and more.<br>● Panasonic sells a built-in bulb product it developed using optical design technologies that allow it to light a 300-degree arc—virtually the same area as an incandescent bulb. Sharp is rolling out a pink LED said to promote healing and restful sleep.<br>● Rohm Co., Ltd. has developed LED with 190lm/W and tube-type LED with high efficiency |
| More energy-efficient OCC lines for papermaking | ● Japanese papermaking plants are third in the world in paper and cardboard production after the US and China. The equipment manufacturers and engineering companies for these plants have developed their own expertise on production processes and energy conservation.<br>● We have an example of a past JCM project that involved the old corrugated cartons (OCC) process used in papermaking, where used cardboard is fashioned back into raw material. |
| Steel equipment | ● Regenerative burners are gaining popularity as a low-carbon, energy-saving technology for various industrial furnaces, which are big energy consumers used in the steel manufacturing process. Regenerative burners have a set of two burners that |

| | |
|---|---|
| | alternate between burning and exhaust modes in short intervals in order to effectively utilize exhaust heat. This advanced Japanese technology was developed under a NEDO project to develop high-performance industrial furnaces (1993–1999). |
| Refrigeration equipment | ● Advances are being made in high-efficiency refrigeration in Japan as the country's the cold food chain develops. Key manufacturers include Mayekawa MFG, Ebara Refrigeration & Systems, and Hitachi Appliances.<br>● The NewTon system by Mayekawa MFG is a high-efficiency system that uses natural refrigerants and a unique heat exchange method that combines ammonia and $CO_2$. This allows for highly efficient operation to address the given cooling load. Power is optimally reduced based on each load, allowing for a power savings of 20% or more compared to conventional refrigeration systems. |

② Further JCM project investigation

Through additional interviews and on-site inspections, we were able to get a good sense of the equipment technologies that candidate companies were looking to invest in. At the same time, we conducted initial surveys on factors that would be important in JCM project formation, such as evaluating reduction potential. Finally, we used this information to make equipment upgrade proposals in line with JCM project concepts. Key findings are listed below.

- Company A (seafood processing)

| | |
|---|---|
| Capital investment demands | Increase the capacity of the existing coal boiler (currently 0.8 t) to 1.5 t in anticipation of rising demand for company products. Upgrade aging generators. |
| JCM project details (planned) | − Project scope (planned)<br>• Reconfigure existing coal boiler (to enable use of biomass pellets as fuel)<br>• Add a biomass boiler<br>• Install a steam turbine<br>− Estimated project size: JPY 48.3 million<br>− Years to ROI: 9.6 (4.6 years with a 50% equipment subsidy)<br>*Note: Coal boiler used for reference*<br>− Estimated reduction in $CO_2$ emissions: 764 $tCO_2$/year<br>− Proposal benefits:<br>Reduce operations and maintenance costs (boost energy conversion efficiency, cut fuel and electricity costs) and ensure a power source during blackouts<br>− Proposal drawbacks:<br>Increased overall project costs, yet with a shorter ROI than with a coal boiler. We therefore propose making use of the existing boiler. |
| Conference notes and other items | − During the investigation, we proposed introducing a biomass boiler to upgrade from the coal boiler (fuel conversion) as well as a generator system (steam turbine) to make use of the steam it produces.<br>− Although the company welcomed our proposal, the estimated project scope meant that we had to plan a JCM project to install a new 0.7- |

| | |
|---|---|
| | ton biomass boiler and steam turbine generator as well as renovate an existing 0.8-ton boiler (so that it could use biomass fuel).<br>– Furthermore, during the final mission, Company A also requested a technical inquiry into the installation of a biomass gasification generator system and asked that we compare it to the plan proposed above. We are therefore considering carrying out this investigation while making use of the feasibility studies and other city partnership inquiries to be conducted in the upcoming fiscal year. |

- Company B (textiles)

| | |
|---|---|
| Capital investment demands | Change 6,000 lights in the plant to 18-watt LEDs to conserve energy and make the facility more environmentally friendly |
| JCM project details (planned) | Proposal 1<br>– Project scope (planned)<br>Switch to D-shaped LEDs (combined fixture and light)<br>– Estimated project size: JPY 37–46 million<br>– Years to ROI: 3.6–5.8 (1.8–2.9 years with a 50% equipment subsidy)<br>*Note: Vietnamese LEDs used for reference*<br>– Estimated $CO_2$ reduction: 380–500 $tCO_2$/year<br>– Proposal benefits:<br>• About 48% more energy efficient than Vietnamese LEDs<br>• High Ra (color rendering index) despite high efficiency<br>• D-shaped lights focus all light downward, and can therefore achieve the same brightness as tube lighting with fewer fixtures<br>• Long life (in Japanese operating environments)<br>– Proposal drawbacks:<br>Increased overall project costs<br><br>Proposal 2<br>*Note: At Company B's request, we conducted a supplemental study on LED tubes (LED lights only) so that the existing lighting fixtures could be used.*<br>– Project scope (planned)<br>Switch to LED tube lighting<br>– Estimated project size: JPY 19–23 million<br>– Years to ROI: 1.7–2.7 (0.9–1.3 years with a 50% equipment subsidy)<br>*Note: Vietnamese LEDs used for reference*<br>– Estimated $CO_2$ reduction 400–500 $tCO_2$/year |
| Conference notes and other items | – After investigating both D-shaped and tube lighting, Company B indicated that they would like to consider the pros and cons of installing the Japanese technology. Since the request was made during the final mission, we have not yet proposed the above tube LED plan.<br>– We also need to consider the installation of a control system if we are going to formulate a JCM project, for the purpose of post-project monitoring.<br>– If JCM project discussions move forward, we will need to hold a separate conference on bidding as this is a partially state-owned |

| | |
|---|---|
| | company.<br>– We will continue to consider JCM project formulation while carefully reviewing the cost effectiveness of $CO_2$ reductions. |

- Company C (papermaking)

| Capital investment demands | Save energy in the production line consuming the most power |
|---|---|
| Conference notes | – Our investigation team presented JCM project case studies related to OCC lines<br>(Company C commentary)<br>• The proposed OCC line is the best option, since we it offers processes that we don't have but need in order to improve paper quality (double-disk refiner (DDR) process and accompanying fine screening process). On the other hand, it will not be easy to introduce the line due to high equipment installation and the running costs.<br>• Though it is a separate process from the OCC line, we would like to improve our paper rolling system.<br>• We are also hoping to install a cogeneration system to make use of the steam in the plant, as the production lines consume a lot of power. However, we have no knowledge about this technology and have not discussed its introduction in any detail.<br>• We are looking at ways to treat the 200–300 kg/day of sludge that our plant produces.<br>– It became clear during the course of the conference that Company C is extremely interested in installing a cogeneration system and wants to conduct additional technical surveys. Therefore, we are looking at doing the related and proposals as part of the feasibility studies and other city partnership inquiries to be conducted in the upcoming fiscal year.<br>– As for sludge treatment, Company C is also very interested in a power generation system that uses the sludge for fuel. We will likewise consider implementing an investigation on this topic in the next fiscal year. |

- Company G (seafood processing)

Company G is a fish cannery that also manufactures other types of processed seafood. They requested a meeting with us during the final mission, during which they expressed an interest in setting up a JCM project for their refrigerators and other equipment. Due to the timing, we have not yet conducted a detailed investigation. However, they have firm equipment investment plans in place and a strong desire to make use of JCM equipment subsidies, so we are looking to carry out further investigations as part of our city partnership feasibility studies next fiscal year.

- Company H (steel)

Company H manufactures steel for construction. It has a maximum production capacity of 400,000 tons and currently produces 250,000. The company expressed interest in setting up a JCM project during the final mission, so we have not yet had time to conduct a detailed investigation. However, the company is a major energy consumer in Da Nang city with a strong desire to invest in energy efficiency. It also has a future capital investment plan in place that includes switch the power source for its rolling process from coal to electricity and taking steps to trap the heat generated in its production processes. They are good candidates for substituting biomass for a portion of their coal or for installing equipment, such as operational lids for their melting furnaces. For this reason, we are looking at we are carrying out further investigations as part of our city partnership feasibility studies next fiscal year.

### 3.2.2 Output 2: Support broad-based rollout of JCM projects

Our survey team met with relevant government agencies in Da Nang to discuss policies, plans, projects, and so on related to reducing carbon and conserving energy in the city. The results of those interviews are listed in the table below. Note that although we sat down with the Da Nang Department of Planning and Investment, we were told that the Department of Industry and Trade was in charge of policies related to reducing carbon and conserving energy and that other departments had the information we were looking for. We were therefore asked to direct our inquiries to these agencies.

（Figure 3-17. Energy-saving and carbon reduction efforts in Da Nang）

| Interviewee | Efforts |
|---|---|
| Department of Culture, Sports and Tourism | Developing a system to evaluate eco-hotels (though $CO_2$ is not included in the evaluation). Three companies have already been evaluated. |
| Department of Industry and Trade | Evaluating and monitoring energy usage at major energy-consuming companies based on Vietnam's energy conservation laws. The department is also asking target companies to submit diagnostic results, plans, and reports on energy efficiency. |
| Department of Transport | Implementing the Bus Rapid Transit (BRT) Project under phase two of the Sustainable City Development Project sponsored by the World Bank. |
| Da Nang Port Joint Stock Company | Used their own funds to invest in converting one of their small cranes into a diesel-electric hybrid in order to improve fuel efficiency and better the |

| | |
|---|---|
| | environment. |

Through our meetings with the above municipal agencies, we learned that while several of them were moving ahead with initiatives to promote energy conservation and carbon reduction, these efforts were not necessarily tied to an overall vision that guided municipal policy decisions and ensured consistency across the board. In order for Da Nang to consistently implement policies and budgets to promote energy-efficient, low-carbon development, it will need to create a un overarching policy and plan that builds shared awareness of municipal vision and targets across its different departments. As Da Nang puts together the urban development action plan being formulated with the help of JICA and the City of Yokohama, it is for these reasons that we are asking the government to consider JCM projects as a means of enriching the conversation on updating its vision for energy efficiency and low-carbon operations in the city as well as a means of actually implementing its energy-saving and carbon-reduction projects.

A Strategic Manifest for Renewing and Achieving the Eco-City Declaration is being discussed as one of six crosscutting actions to be included as part of the Da Nang urban development action plan, and it is expected to state Da Nang's energy efficiency and low-carbon development goals in no uncertain terms as the city moves to carry out detailed updates of its upcoming Eco-City Declaration. At the same time, Da Nang is looking towards JCM as a way to successfully introduce incineration facilities as a waste management project, which falls under the environmental initiatives that make up one of the six major programs. By tying the survey into discussions on the urban development action plan in this way, we assisted greatly in moving the conversation forward.

## 3.3 Potential JCM projects: Overview

This section provides the results of the initial discussions on the potential JCM projects that were identified during the course of our investigation.

3.1 Company A (seafood processing)

The following two project options were considered for Company A, who wanted to increase the capacity of their existing coal boiler from 0.8 to 1.5 tons and upgrade their aging generator. Note that because the company indicated during the final mission that they wanted to consider introducing a biomass gasification generator system, we are going to consider investigating this possibility while making use of our city partnership feasibility studies next fiscal year.

(1) Option 1

Option 1 involves reconfiguring the existing 0.8-ton coal boiler into a biomass boiler of the same capacity while adding a 0.7-ton biomass boiler, bringing total boiler capacity to 1.5 tons. Additionally, we would install a steam turbine to convert production steam into electricity. The project proposal framework is outlined below.

| | |
|---|---|
| Project scope | − Reconfigure existing coal boiler into a biomass boiler<br>− Add a biomass boiler<br>− Install a steam turbine |
| Estimated project size | JPY 48.3 million |
| Years to ROI | 9.6 (4.6 years with a 50% equipment subsidy)<br>*Coal boiler used for reference* |
| Estimated reduction in $CO_2$ emissions | 764 $tCO_2$/year |
| Cost efficiency of $CO_2$ reductions* | JPY 4,177 per $tCO_2$ (without subsidy)<br>JPY 2,089 per $tCO_2$ (with 50% subsidy) |
| Methodologies and concepts | − Project boundaries: Steam boiler and generator equipment<br>− Reference: Establishing a new 1.5-ton coal boiler and dispose of the existing 0.8-ton coal boiler to generate 1.5 tons of steam that can be used in plant processes (such as sterilizing raw materials). Purchasing power needed on the site from the electrical grid.<br>− Project: With an eye to generating 1.5 tons of steam for use in plant processes (such as sterilizing raw materials), reconfigure the 0.8-ton coal boiler into a biomass boiler while adding a new 0.7-ton boiler, for a total capacity of 1.5 tons. Generate electricity |

| | |
|---|---|
| | using the steam produced, using an equivalent amount of low-energy steam for sterilization and other tasks.<br>– Key factors in greenhouse gas reduction calculations: (1) increase in energy conversion rate for coal used in the boiler, (2) amount of coal use avoided due to the switch to biomass fuel (3) amount of electricity not purchased from the grid (equivalent to the amount of power generated at the plant)<br>– Technological requirements included in eligibility criteria: (1) biomass co-combustion technologies after reconfiguring existing boiler, (2) steam turbine power generation technologies (or technologies packaged with (1)) |

**Using biomass pellets as biomass fuel*

【Formulas used to estimate CO2 reduction】

◆ Coal replaced with biomass

- Amount of steam required x operational time x net steam enthalpy ÷ boiler efficiency x carbon discharge coefficient × molecular weight of $CO_2$ / atomic weight of carbon = amount of $CO_2$ emissions
- 694 kg/h × 2700 h/year × 2616 kJ/kg ÷ 0.75 × 25.8 kgC/GJ × 44 / 12 = 618 $tCO_2/y$

◆ Grid power replaced with self-generated power

- Units of power generation × operational time x grid emissions coefficient* = amount of $CO_2$ emissions
- 100 kW × 2700 h/year × 0.5408 $tCO_2/MWh$ = 146 $tCO_2/y$

◆ Total $CO_2$ emissions = amount saved from replacing coal with biomass + amount saved from replacing grid power with self-generated power

- Total $CO_2$ emissions = 618 tCO2/y + 146 tCO2/y = 764 tCO2/y

**Grid emissions coefficient taken from the 2015 IGES report*

(2) Option 2

Option 2 involves increasing the capacity of the existing coal boiler and reconfiguring it so that it uses biomass pellets as fuel. Additionally, we would install a steam turbine to convert production steam into electricity. The project proposal framework is outlined below. Note that this proposal was brought up by Company A during final mission discussions, so a more detailed investigations till needs to be done on the pros, cons, and costs associated with refurbishing the boiler.

| | |
|---|---|
| Project scope | – Reconfigure existing coal boiler to expand capacity<br>– Reconfigure existing coal boiler into a biomass boiler<br>– Install a steam turbine |
| Estimated project size | JPY 44.0 million |
| Years to ROI | 8.7 (4.1 years with a 50% equipment subsidy)<br>*Coal boiler used for reference* |
| Estimated reduction in $CO_2$ emissions | 764 $tCO_2$/year |
| Cost efficiency of $CO_2$ reductions* | JPY 3,796 per $tCO_2$ (without subsidy)<br>JPY 1,899 per $tCO_2$ (with 50% subsidy) |
| Methodologies and concepts | – Project boundaries: Steam boiler and generator equipment<br>– Reference: Establishing a new 1.5-ton coal boiler and dispose of the existing 0.8-ton coal boiler to generate 1.5 tons of steam that can be used in plant processes (such as sterilizing raw materials). Purchasing power needed on the site from the electrical grid.<br>– Project: With an eye to generating 1.5 tons of steam for use in plant processes (such as sterilizing raw materials), reconfigure the 0.8-ton coal boiler into a biomass boiler while adding a new 0.7-ton boiler, for a total capacity of 1.5 tons. Generate electricity using the steam produced, using an equivalent amount of low-energy steam for sterilization and other tasks.<br>– Key factors in greenhouse gas reduction calculations: (1) amount of coal use avoided due to the switch to biomass fuel (2) amount of electricity not purchased from the power station hooked up to the grid (equivalent to the amount of power generated at the plant)<br>– Technological requirements included in eligibility criteria: (1) biomass co-combustion technologies after reconfiguring existing boiler, (2) steam turbine power generation technologies (or technologies packaged with (1)) |

**Using biomass pellets as biomass fuel*

【Formulas used to estimate CO2 reduction】

See above

### 3.2 Company B (textiles)

The following two project options were considered for Company B, who wanted to switch 6,000 of the lights in its plant to LEDs. Note that because the company put forth additional requests during the final mission, we have not yet proposed the second option to them. Note also that we are going to reconsider the necessity of a JCM project framework in this case from the perspective of the cost efficiency of the proposed CO2 reductions.

(1) Option 1

Option 1 involves replacing 6,000 lights in the production plant with D-shaped LEDs. A lighting control system would also be introduced in light of JCM project considerations.

| | |
|---|---|
| Project scope | – Install D-shaped LEDs (combined fixture and light)<br>– Install a control system |
| Estimated project size | JPY 37–46 million |
| Years to ROI | 3.6–5.8 (1.8–2.9 years with a 50% equipment subsidy) |
| Estimated reduction in $CO_2$ emissions | 378–498 $tCO_2$/year |
| Cost efficiency of $CO_2$ reductions* | JPY 9,200–15,200 per $tCO_2$ (without subsidy)<br>JPY 4,600–7,600 per $tCO_2$ (with 50% subsidy) |
| Methodologies and concepts | – Project boundaries: Lighting<br>– Reference: Vietnamese LEDs<br>– Project: Install Japanese LEDs as well as control devices tailored to the brightness level at the site<br>– Key factors in greenhouse gas reduction calculations: (1) reduction in the number of LEDs needed to produce equivalent lumens (light generation side) (2) increase in energy efficiency per LED unit (light generation side) (3) amount saved through brightness-driven LED lighting control (lighted side). Quantification methods for quantify (3) must be discussed.<br>– Technological requirements included in eligibility criteria: (1) threshold values for lumen value per LED unit, (2) threshold values for electric power consumption unit per LED unit, (3) technological elements needed for in control technologies |

【Formulas used to estimate CO2 reduction】

◆ Reference amount of $CO_2$ emissions

- LED power x number of LEDs needed to achieve desired brightness x operational time x $CO_2$ discharge coefficient = amount of $CO_2$ emissions
- 36 W/light × 4815 lights × 8280 h/year × 0.5408 $tCO_2$/MWh = 776.2 $tCO_2$/y

◆ Project amount of $CO_2$ emissions

- LED power x number of LEDs needed to achieve desired brightness x operational time x $CO_2$ discharge coefficient = amount of $CO_2$ emissions
- Standard: 39.3 W/light × 2261 lights × 8280 h/year × 0.5408 $tCO_2$/MWh = 397.9 $tCO_2$/y
- Improved: 39.3 W/light × 2261 lights × 8280 h/year × 0.5408 $tCO_2$/MWh x 0.7 = 278.5 $tCO_2$/y

*Note: To prevent an increase in project costs, we decided to forego an automatic lighting control system in favor of a manual ON/OFF system operated by the person responsible for energy efficiency, based on illumination meters appropriately distributed on each floor.*

- ◆ Total $CO_2$ emissions = reference $CO_2$ emissions – project $CO_2$ emissions
  - Standard: 776.2 $tCO_2$/y – 397.9 $tCO_2$/y = 378.3 $tCO_2$/y ≈ 378 $tCO_2$/y
  - Improved: 776.2 $tCO_2$/y – 278.5 $tCO_2$/y = 497.7 $tCO_2$/y ≈ 498 $tCO_2$/y

(2) Option 2

Option 2 also involves replacing 6,000 lights in the production plant with Tube LEDs. A lighting control system would also be introduced in light of JCM project considerations.

| | |
|---|---|
| Project scope | – Install tube LEDs<br>– Install a control system |
| Estimated project size | JPY 29–36 million |
| Years to ROI | 1.7–2.7 (0.9–1.3 years with a 50% equipment subsidy) |
| Estimated reduction in $CO_2$ emissions | 408–519 $tCO_2$/year |
| Cost efficiency of $CO_2$ reductions* | JPY 4,300–6,700 per $tCO_2$ (without subsidy)<br>JPY 2,200–3,400 per $tCO_2$ (with 50% subsidy) |
| Methodologies and concepts | – Project boundaries: Lighting<br>– Reference: Vietnamese LEDs<br>– Project: Install Japanese LEDs as well as control devices tailored to the brightness level at the site<br>– Key factors in greenhouse gas reduction calculations: (1) reduction in the number of LEDs needed to produce equivalent lumens (light generation side) (2) increase in energy efficiency per LED unit (light generation side) (3) amount saved through brightness-driven LED lighting control (lighted side). Quantification methods for quantify (3) must be discussed.<br>– Technological requirements included in eligibility criteria: (1) threshold values for lumen value per LED unit, (2) threshold values for electric power consumption unit per LED unit, (3) technological elements needed for in control technologies |

【 Formulas used to estimate CO2 reduction】

- ◆ Reference amount of $CO_2$ emissions
  - LED power x number of LEDs needed to achieve desired brightness x operational time x $CO_2$ discharge coefficient = amount of $CO_2$ emissions
  - 36 W/light × 4815 lights × 8280 h/year × 0.5408 $tCO_2$/MWh = 776.2 $tCO_2$/y

- Project amount of $CO_2$ emissions
  - LED power x number of LEDs needed to achieve desired brightness x operational time x $CO_2$ discharge coefficient = amount of $CO_2$ emissions
  - Standard: 24.0 W/light × 3421 lights × 8280 h/year × 0.5408 $tCO_2$/MWh = 367.7 $tCO_2$/y
  - Improved: 24.0 W/light × 3421 lights × 8280 h/year × 0.5408 $tCO_2$/MWh x 0.7 = 257.4 $tCO_2$/y

    *Note: To prevent an increase in project costs, we decided to forego an automatic lighting control system in favor of a manual ON/OFF system operated by the person responsible for energy efficiency, based on illumination meters appropriately distributed on each floor.*
- Total $CO_2$ emissions = reference $CO_2$ emissions – project $CO_2$ emissions
  - Standard: 776.2 $tCO_2$/y – 367.7 $tCO_2$/y = 408.5 $tCO_2$/y ≈ 408 $tCO_2$/y
  - Improved: 776.2 $tCO_2$/y – 257.4 $tCO_2$/y = 518.8 $tCO_2$/y ≈ 519 $tCO_2$/y

### 3.3 Company C (papermaking)

The table below outlines the JCM project proposal framework based on the results of our initial investigation into setting up a cogeneration system at Company C. The company wants to install the system to make use of the steam generated from the boiler it uses to dry paper. Note that the company is also very interested in a gasification power generation system that could generate electricity from the sludge and wood shavings it produces when making pulp, and that this proposal requires further technological study.

| | |
|---|---|
| Project scope | Install ten 160-kw electric turbines |
| Estimated project size | JPY 300 million |
| Years to ROI | 3.2 (1.6 years with a 50% equipment subsidy) |
| Estimated reduction in $CO_2$ emissions | 5,012 $tCO_2$/year |
| Cost efficiency of $CO_2$ reductions* | JPY 4,620 per $tCO_2$ (without subsidy)<br>JPY 2,310 per $tCO_2$ (with 50% subsidy) |

| | |
|---|---|
| Methodologies and concepts | – Project boundaries: Cogeneration system, steam boiler (if there is a difference between the two scenarios)<br>– Reference: (1) generate the necessary steam using the existing steam boiler and use it on site (2) purchase required power from the grid and use it on site<br>– Project: (1) use the steam generated from the existing steam boiler in a cogeneration system, using an equivalent amount of low-energy steam on site (2) generate the required power with the cogeneration system and use it on site<br>– Key factors in greenhouse gas reduction calculations: (1) amount of electricity not purchased from the power station hooked up to the grid (equivalent to the amount of power generated at the plant)<br>– Technological requirements included in eligibility criteria: cogeneration system technologies |

【Formulas used to estimate CO2 reduction】

- ◆ Number of generators required was calculated in proportion to the boiler energy generated for Company A (seafood processing)

- ◆ Grid power replaced with self-generated power
  - Units of power generation × number of generators x operational time x grid emissions coefficient* x actual operational rate* = amount of $CO_2$ emissions
  - 160 kW × 10 units x (24 h x 300 days)/year × 0.5638 $tCO_2$/MWh x 0.8 = **5,102 tCO2/y**

    **Assuming generator to run at an 80% operational rate in this process*

### 3.4 Company G (seafood processing)

The table below shows the results of the initial JCM project framework investigation regarding Company G's plan to introduce refrigeration equipment.

| | |
|---|---|
| Project scope | Install fifteen refrigeration units |
| Estimated project size | JPY 163 million |
| Years to ROI | 8.2 (4.1 years with a 50% equipment subsidy) |
| Estimated reduction in $CO_2$ emissions | 1,400 $tCO_2$/year |
| Cost efficiency of $CO_2$ reductions* | JPY 8,980 per $tCO_2$ (without subsidy)<br>JPY 4,490 per $tCO_2$ (with 50% subsidy) |

| | |
|---|---|
| Methodologies and concepts | – Project boundaries: Refrigeration units<br>– Reference: Cooling capacity of the refrigeration units widely used in Vietnam (refrigeration/cold storage capacity per unit of power)<br>– Project: High-efficiency Japan-made refrigeration units that use environmentally friendly coolant and deliver a coefficient of performance (COP) of 7.0 or higher<br>– Key factors in greenhouse gas reduction calculations: Amount of energy not consumed as a result of efficiency improvements in refrigeration units (basic unit difference)<br>– Technological requirements included in eligibility criteria: (1) use of environmentally friendly coolant and (2) high efficiency with a coefficient of performance (COP) of 7.0 or higher |

【Formulas used to estimate CO2 reduction】

For this company, we referred to the example of the Energy Efficient Refrigerants to Cold Chain Industry JCM project investigation by Mayekawa Manufacturing in Indonesia. The calculations are based on 24-hour operation, 365 days a year.

- ◆ Compressor motor capacity x shaft power = motor input (equivalent to refrigerator output)
  - 110 kW x 0.85 = 93.5 kW
- ◆ Reduction in $CO_2$ = refrigerator input x energy savings x operational time x grid emissions coefficient
  - 93.5 kW × 0.2 × 15 units × 8760h/year × 0.5638 $tCO_2$/MWh = 1385 $tCO_2$/y ≈ 1400 $tCO_2$/y

### 3.5 Company H (steel)

Because we did not get to meet with Company H until our final mission, we have not had time to perform a sufficient investigation. Although this company is very interested in energy-saving capital investments, they lack the knowledge needed to formulate a clear strategy. We will need to conduct further inquiries going forward, but based on discussions so far, we can propose the following JCM project framework as a result of our initial considerations.

| | |
|---|---|
| Project scope | Partially replace coal used as fuel with biomass |
| Estimated project size | JPY 200 million |

| | |
|---|---|
| Years to ROI | 1.5 (0.8 years with a 50% equipment subsidy) |
| Estimated reduction in $CO_2$ emissions | 7,000 $tCO_2$/year |
| Cost efficiency of $CO_2$ reductions* | JPY 4,080 per $tCO_2$ (without subsidy)<br>JPY 2,040 per $tCO_2$ (with 50% subsidy) |
| Methodologies and concepts | – Project boundaries: Heating furnace equipment, including solid fuel gasification equipment<br>– Reference: Continued use of 10,000 tons of coal annually as gasified fuel for furnaces designed to heat refined pillar-shaped steel rods and process them into steel products<br>– Project: Switch 30% of the 10,000 tons (based on heat value, equivalent to 3000 tons) of the coal gasified annually to biomass<br>– Key factors in greenhouse gas reduction calculations: Amount of coal not consumed as fuel as a result of switching to biomass<br>– Technological requirements included in eligibility criteria: (1) stable supply system for biomass gasification (2) technologies to link the biomass system to the existing system |

【Formulas used to estimate CO2 reduction】

There is a possibility that coal gasification and the switch to biomass will have different calorific values, so in these calculations we estimate conservatively that the biomass will be equivalent to 30% of the caloric value of the coal currently consumed.

◆ Coal replaced with biomass

- Coal consumption × replacement rate x net calorific value x carbon discharge coefficient x molecular weight of $CO_2$ / atomic weight of carbon = amount of $CO_2$ emissions
- 10000 t/year × 0.3 × 25.1 GJ/t × 25.8 kgC/GJ × 44 / 12 = 7123 $tCO_2$/y ≈ 7000 $tCO_2$/y

## 3.4 Future action plan

As we have already discussed, our main task with this survey was to identify and formulate potential JCM projects. The companies we selected are working in some of Da Nang's key industries, and we therefore expect that the formulation and implementation of these JCM projects will serve as model case studies for each sector. This will not only communicate the benefits of JCM projects to other Da Nang companies, but greatly contribute to a broad-based rollout of the Joint Crediting Mechanism in the area as well. As a result of our findings, we plan to address these proposals in our city partnership feasibility studies next fiscal year based on the action plan outlined below.

(Figure 3-18. Future action plan for potential JCM projects)

| Company | Action plan |
|---|---|
| Company A (seafood processing) | Technical aspects<br>● In addition to options 1 and 2, compare a third option of introducing a biomass power generation system in order to set up the final JCM project framework<br>● For each piece of equipment balance the steam temperature and pressure needed for processing<br>Financial aspects<br>● The company has already gotten internal approval to invest in the boiler, but we will need to hold a meeting to discuss technical tasks and a detailed investment plan in anticipation of putting together a more concrete investment plan in the future<br>Operational aspects<br>● Form an international consortium*<br>● Set up a monitoring system |
| Company B (textiles) | Start by reanalyzing the cost efficiency of cutting $CO_2$ in this project and decide whether the company should be targeted for further investigation. Carry out the following activities if a decision is made to move forward.<br>Technical aspects<br>● Compare the introduction of D-shaped LEDs with LED tubes before making a revised proposal<br>● Confirm safety and other important factors<br>● Get a sense of the overall lighting distribution within the plant and offices<br>Financial aspects<br>● The company has made a final decision to invest in LED lighting and has enough credit for the budget amount. Going forward, we will need |

| | |
|---|---|
| | to discuss a detailed investment plan as we confirm the technical aspects of the project.<br>Operational aspects<br>● Form an international consortium*<br>● Set up a monitoring system |
| Company C (papermaking) | Technical aspects<br>● Carry out an feasibility study and engineering work related to the introduction of a cogeneration system<br>● Carry out a feasibility study on the introduction of a biomass gasification power generation system that uses sludge and wood shavings<br>Financial aspects<br>● Although this company is very interested in introducing a cogeneration system, we will need to consider the investment plan in conjunction with the technical aspects of the project. Therefore, we will need to consult with them regarding the detailed investment plan in the future.<br>Operational aspects<br>● Form an international consortium*<br>● Set up a monitoring system |
| Company G (seafood processing) | Start by reanalyzing the cost efficiency of cutting $CO_2$ in this project and decide whether the company should be targeted for further investigation. Carry out the following activities if a decision is made to move forward.<br>Technical aspects<br>● Reconfirm introduction technologies and other critical factors<br>Financial aspects<br>● The company has already gotten internal approval for an investment plan, but financial matters must be reconfirmed.<br>Operational aspects<br>● Form an international consortium*<br>● Set up a monitoring system |
| Company H (steel) | Technical aspects<br>● Propose a list of optimized energy-saving measures that the company could introduce (because we met with this company during the final mission of our investigation, we were unable to do walkthrough surveys and the like).<br>Financial aspects<br>● Although this company is interested in energy-saving measures, they have not yet discussed the details of their upcoming capital investment plan—so we will need to consult with them about the technical aspects of the project along with financial matters going forward.<br>Operational aspects<br>● Form an international consortium*<br>● Set up a monitoring system |

*The credit rating of the companies that will be introducing equipment will be critical in forming an international consortium. Although we collected general sales figures and other basic management information from JCM project candidates as part of the foregoing investigation, it will be important to work with organizations that have more detailed insights into the credit situation at these local firms going forward.

# 4 Water Supply Study

## 4.1 Overview of water supply study

### 4.1.1 Past history

- **FY 2013 Project Formulation Study on ODA Overseas Economic Cooperation (Ministry of Foreign Affairs)**

Osumi has been engaged in studies in Da Nang though the "FY 2013 Project Formulation Study on ODA Overseas Economic Cooperation (Ministry of Foreign Affairs)" together with Nippon Koei. When that study was carried out, Osumi was able to confirm the potential to update pumps in the water supply area of the JCM intercity cooperation F/S. During multiple consultations with executives at DAWACO, Osumi confirmed DAWACO's needs to update facilities, such as pumps, and carried out simple site visits at the Cau Do water treatment plant and An Trach pumping station.

DAWACO's needs, which were confirmed in the FY 2013 Ministry of Foreign Affairs study, were to develop a total of 12 pumps (six water supply pumps at the Cau Do water treatment plant, six water conveying pumps for salinity control at the An Trach water plant) as JCM model projects. In response to the clear intention of DAWACO to develop this into a JCM model project, a study was started though the FY 2015 JCM intercity cooperation F/S.

In the FY 2013 Ministry of Foreign Affairs study, Osumi provided an explanation to DAWACO on the JCM project formulation study and technical assistance. At the start of the JCM intercity cooperation F/S, DAWACO already had a certain level of knowledge about the general overview of the JCM. In addition, the Ministry of Foreign Affairs study confirmed that DAWACO intends to prepare their own funding during interviews about the availability of self-funding at the time of a proposal for JCM technical assistance.

- **FY 2013 JICA Project on Support for Overseas Business Expansion of SMEs (Dissemination & demonstration projects)**

In October 2014, a preliminary study was conducted on the replacement of one pump as the premise for a proposal for the "FY 2013 JICA Project on Support for Overseas Business Expansion of SMEs (dissemination & demonstration projects)". A limited investigation was carried out with the objective of gaining a basic idea of energy-saving effects through a simple energy-saving assessment. It was determined that the power saving and $CO_2$ reduction effects of Japanese products and technologies could be understood through a preliminary demonstration at one pump using the JICA Project on Support for Overseas Business Expansion of SMEs (dissemination and demonstration projects). Prior to the preliminary study in Da Nang, discussions were carried out with Yokohama Water based on an introduction from the Development Cooperation Division, International Affairs Bureau of Yokohama, and several points were confirmed in the preliminary study. In consultations with DAWACO, the challenges being faced were repeatedly stated, and included imbalances in hydraulic head pressure, water supply, and pump shaft power, as well as extremely poor pump efficiency from the very beginning when the pumps were introduced. Pump technical experts presented the characteristic curve for pump performance to the study team and described the specific issues they were facing. The CEO also described various issues, including increases in maintenance costs due to the frequency of pump repairs and loud noises from the pumps, and confirmed the need to replace these pumps with high-performance pumps using Japanese technology as soon as possible. In considering a proposal on the equipment cost for replacement and demonstration of one group of pumps relative to the JICA Project on Support for Overseas Business Expansion of SMEs, the study team considered the JCM the most optimal choice for the formulation of the project and decided to promote this proposal in this fiscal year's JCM intercity cooperation F/S following discussions with DAWACO.

### 4.1.2 Study targets

The targets of this study are shown below.

- **Output 1: Identification of water treatment plant with potential for development**

**as JCM model project and determination of technical specifications for pumps**

- Activity 1-1： Through site visits to several water treatment plants in Da Nang (old Cau Do water treatment plant, new Cau Do water treatment plant, San Bay water treatment plant, and An Trach pumping station) and meetings with stakeholders, such as DAWACO (1st local visit (September 2015), 2nd local visit (November 2015)), the study team confirmed that updating pumps at the old and new Cau Do water treatment plants had the most potential for development as a JCM model project. The Sun Bay water treatment plant and An Trach pumping station have limited operating times/year and it is believed that the potential for $CO_2$ emission reductions is limited. Therefore, both DAWACO and the study team agreed to pass on these sites as JCM model projects at this time.

- Activity 1-2: Examination of technical requirements and determination of technical specifications for the renewal of three existing pumps in the old Cau Do WTP and six existing pumps in the new Cau Do WTP.

(Figure 4-1. Pumps identified in this study with potential as JCM model projects) (reproduced)

| Target facility | Old Cau Do Water Treatment Plant (Level 1) | New Cau Do Water Treatment Plant (Level 2) |
|---|---|---|
| Number of pump facilities | 3 | 6 |
| Pump efficiency | (Current) 50.5% (when 2 pumps are in operation) →(New) 83% (when 2 pumps are in operation) | (Current) 63.3% (when 5 pumps are in operation) →(New) 86% (when 5 pumps are in operation) |
| Capacity (m3/hr) | (Current) 2,154→(New) 2,375 | (Current) 9,590→(New) 11,600 |
| Estimated project cost | Slightly less than JPY 200 million total | |
| GHG emission reduction effect (calculated) | 118 t/year | 481 t/year |

- Activity 1-3: Analysis on reductions of $CO_2$ emissions and power consumption with updates to pumps

As described in Activity 1-2, the pump efficiency of the three pumps in the old Cau Do WTP (Level 1) and the six pumps in the new Cau Do WTP (Level 2), which are both targets for the JCM, is 50% and 63.3%, respectively. However, a pump efficiency of 75% which is generally introduced in new pump facilities, was conservatively set as the pump efficiency in the reference scenario. On the other hand, pump efficiency in the project is 83% or 86%, as described in Activity 1-2 from the technical documentation from Ebara Vietnam. The reduction in power consumption through updates to pumps is the amount in cases where this pump efficiency is the benchmark, and is the amount of $CO_2$ emissions reduced that has been calculated from the grid power emission factor of 0.5408 tCO2/MWh. It should be noted that, in cases that are based on the actual measurements of existing pump efficiency, the calculation results of $CO_2$ emission reductions greatly exceed the greenhouse gas emission reduction effects (estimate) described in Activity 1-2. Therefore, a rough calculation of the reduction effects can be said to be an extremely conservative value from the perspective of the JCM.

- **Output 2: Resolution of issues from a cost perspective related to the introduction of pumps in the development of JCM model projects**

- Activity 2-1: Investment capacity was confirmed with executives and accounting personnel at DAWACO through this activity study. The result of this study indicated that DAWACO is prepared to self-finance the project to a maximum of USD 1 million (about JPY 120 million) and confirmed that additional loans from financial institutions or additional cash infusion from Da Nang City will not be necessary.

- Activity 2-2: In considering the self-investment capacity of DAWACO and pump prices (reference value; includes laying costs), it is clear that pumps can be updated without the need for additional financial support measures in cases where the subsidy rate of JCM technical assistance is about 40% or higher.

- Activity 2-3: In cases where updates to pumps are carried out using JCM technical assistance and with self-financing, it will be necessary to have reports on pump technical specifications and reports on creating funds, including prices, Memorandums of Understanding between DAWACO and pump companies, and Memorandums of Understanding between DAWACO and JCM project representative companies.

- **Output 3: Solutions for problems from a procedural perspective, including tender**

- Activity 3-1: The study confirmed that as long as costs are within the amounts clarified in Activity 2-1, the approval process by DPC and Da Nang authorities is relatively simple. The reason for this is that it is possible for DAWACO to have a certain level of decision making that is independent of the DPC, such as independent accounting practices, in the transition from a state-owned company to a limited company.

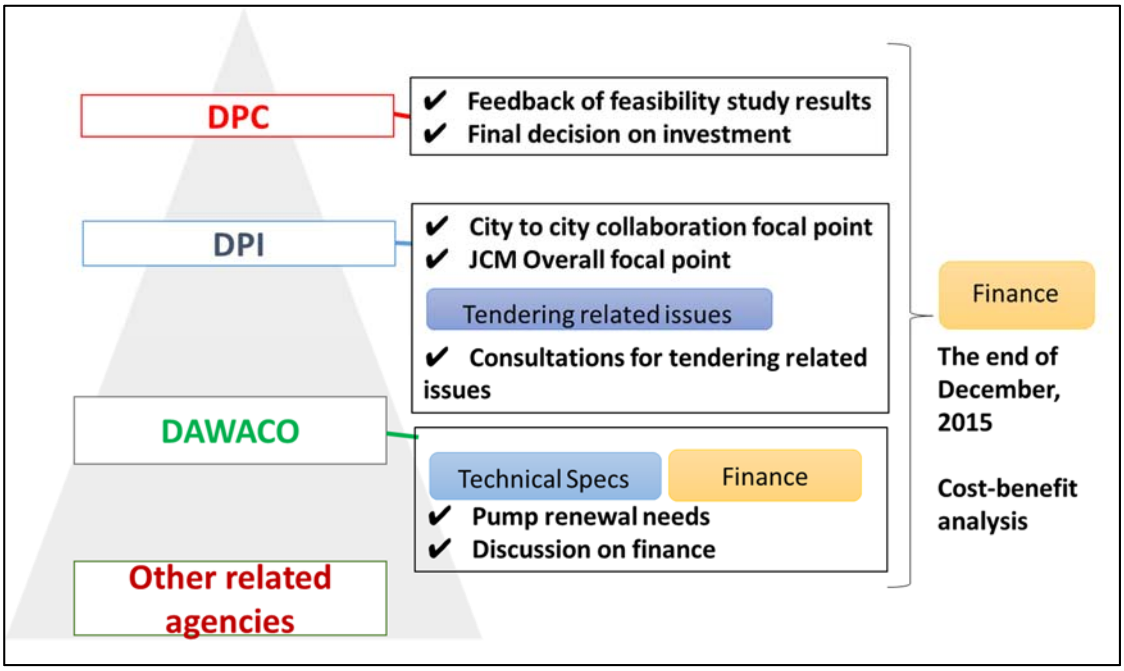
- Activity 3-2: The study confirmed the possibility of simplifying the tendering process. Specifically, the study team gained approval for the possibility of selecting pumps through “Nominated Tendering”, when normally an international tender (tender by several companies) would be needed.

- Activity 3-3: The study confirmed the documents that would be required in cases of Nominated Tendering, as agreed upon in Activity 3-2 with DPC, DPI, and DAWACO. Specifically, it will be necessary to have reports on pump technical specifications and reports on creating funds, including prices, Memorandums of Understanding between DAWACO and pump companies, and Memorandums of Understanding between DAWACO and JCM project representative companies.

### 4.1.3 System for updates to water supply equipment in Da Nang

The system in Da Nang City is shown by activity under the JCM intercity cooperation

F/S in the preparation for the development of JCM model projects for updates to water supply equipment (low-carbon pumps).




(Figure 4-2. Decision makers in Da Nang City by activity in this study)

1. **Technical considerations: (Main decision maker): DAWACO**

This study identified water treatment plants that require updated equipment and that are also appropriate for development as JCM model projects, as well as technical specifications for the type of equipment that will be introduced, based on the needs to update equipment in water treatment plants in Da Nang City that were indicated by DAWACO at the time of the FY 2013 Ministry of Foreign Affairs study. DAWACO, which is a water treatment plant administrator, took command in technical investigations and discussions with pump suppliers (calculations using several pump introduction scenarios, consideration of performance curves and pump data sheets, and collaborative studies on pump designs). The details of technical considerations by DAWACO will be submitted to DPC and DPI before the proposal for JCM technical assistance is developed.

2. **Cost considerations: (Decision maker on pump costs) DAWACO, (Approved by) DPC**

DAWACO executives and the accounting department took on a central role with pump suppliers in promoting considerations when examining costs (pump prices, installation costs). DPC provides basic approval in cases where DAWACO self-finances updates for equipment. DPI compiles information on progress as the coordinator of the project.

3. **Procedural and tender considerations: (Primarily responsible department) DPI (Coordinator), DPC (Approval)**

DPI carries out the coordination of studies for JCM technical assistance, including simplification of tender processes. Final decisions are handed down by DPC. DAWACO and the study team will address the application for tendering and other issues to DPC.

## 4.2 Technical considerations

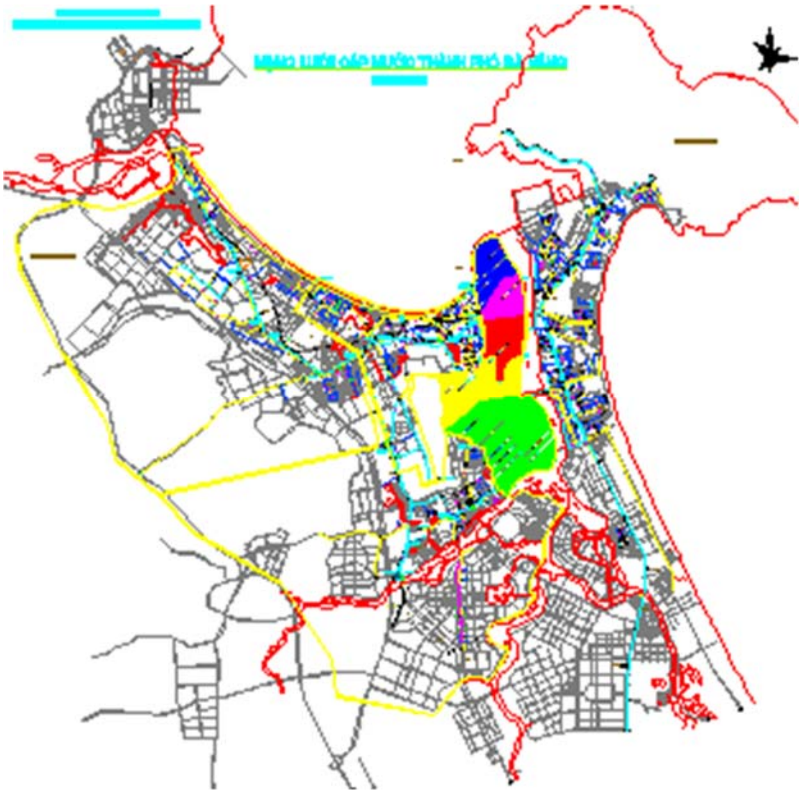
### 4.2.1 Overview of water treatment plants in Da Nang

The Danang Water Supply One Member Limited Company (DAWACO) carries out the management and operation of water supply in the entire city. The current state of water supply in Da Nang is shown below, as provided by DAWACO.

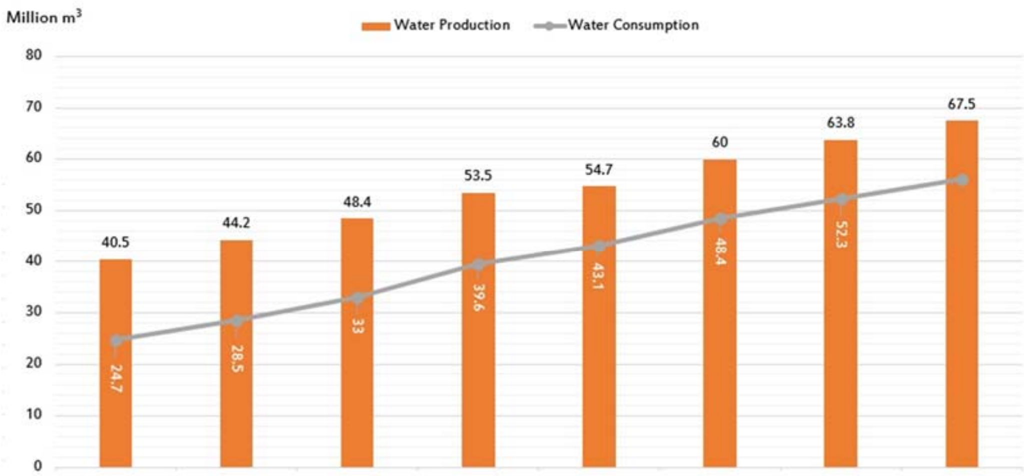
(Figure 4-3. Current state of water supply in Da Nang as of 2014)

| | | |
|---|---|---|
| Revenue of DAWACO | | 15.4 million USD |
| Water supply capacity | | 210,000 $m^3$/day |
| Length of water supply and drainage pipes | Water conveyance pipes (Internal diameter >200 mm) | 278 km |
| | Water distribution pipes (Internal diameter: 100-200 mm) | 279 km |
| | Water supply pipes (Internal diameter <100 mm) | 3,632 km |
| Pressure | | 0.5 -2.7 bar (5 -27 m, equivalent to water pillar) |
| Percentage of households with water supply | | Urban area: 94.1%<br>Rural area: 39.1% |
| Average amount of water consumed | | 162 L/person/day |
| Rate of non-revenue water | | 16.82% |

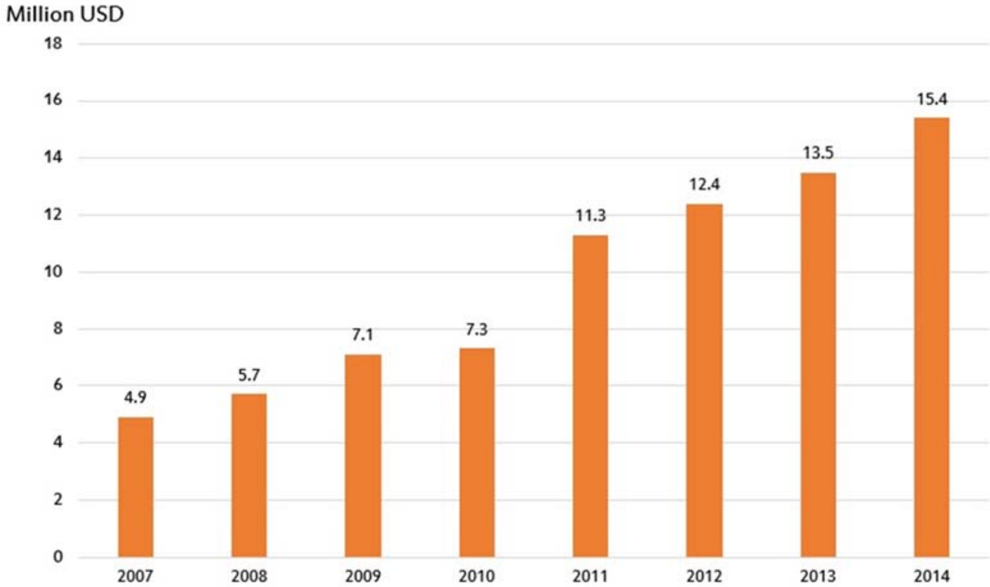
(Source: Materials from DAWACO)



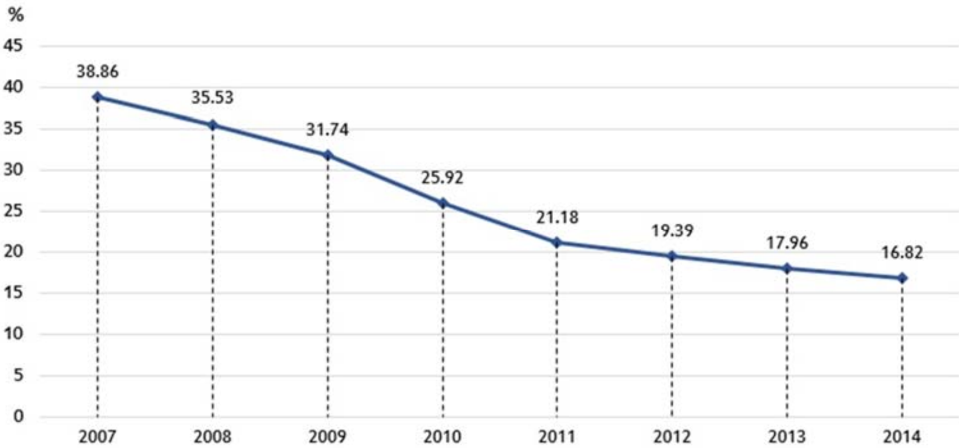
(Figure 4-4. Water supply network in Da Nang (Source: Materials from DAWACO))



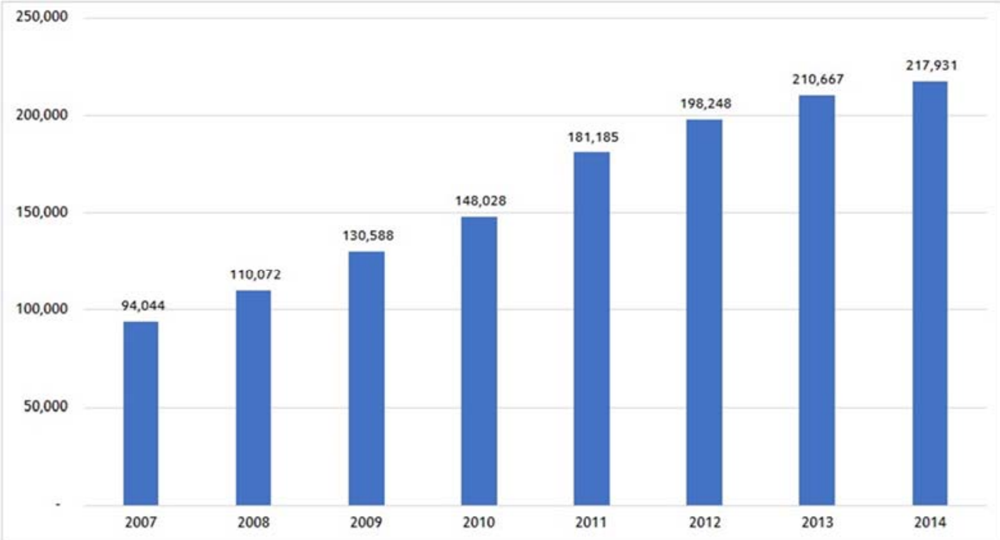

(Figure 4-5. Water production and consumption in Da Nang (Source: Materials from DAWACO))




(Figure 4-6. Changes in revenue in DAWACO (Source: Materials from DAWACO))




(Figure 4-7. Changes in non-revenue water (Source: Materials from DAWACO))




(Figure 4-8. Changes in number of users (Source: Materials from DAWACO))

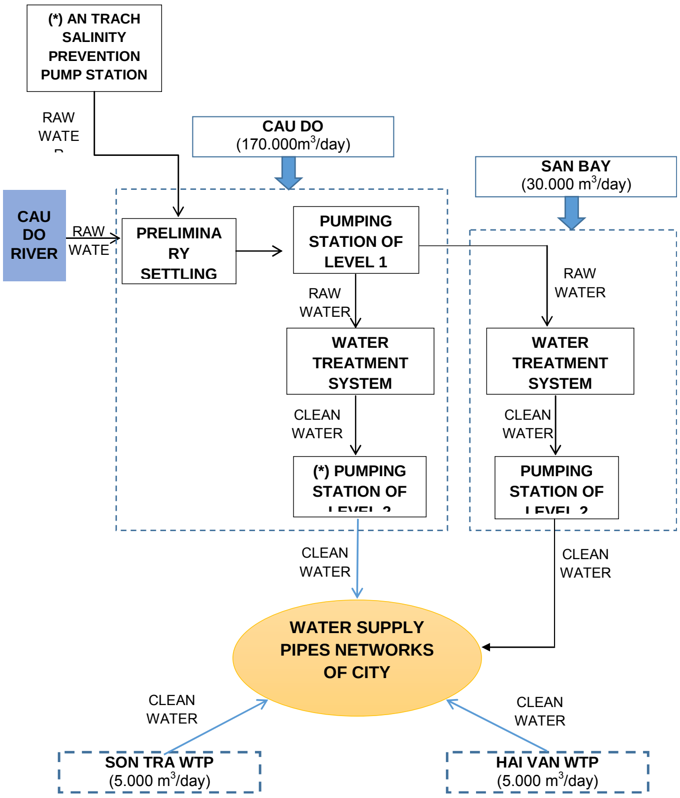
(Figure 4-9. Water supply capacity of DAWACO water treatment plants)

| Water treatment plants | Water supply capacity ($m^3$/day) |
|---|---|
| CAU DO | 170.000 |
| SAN BAY | 30.000 |
| SON TRA | 5.000 |
| HAI VAN | 5.000 |
| TOTAL | 210.000 |

(Source: Materials from DAWACO)


(Figure 4-10. Overview of waterworks in Da Nang[8])

8 Source: Modification of figures in the Report on Study of Human Resources Development to Promote Sound




(Figure 4-11. Water production systems in DAWACO[10])

As shown in Figure 4-9, the current water supply capacity in the entire city of Da Nang is 210,000 m$^3$/day (Record water supply of 220,000 m$^3$/day). The main water source is the Cau Do River, which flows through Quang Nam Province. There are four water treatment plants that supply water to the water supply net in Da Nang: San Bay water treatment plant, Son Tra water treatment plant, and Hai Van water treatment plant, in addition to the Cau Do water treatment plant, which is the main water supply source. The current state of these plants is that operation and maintenance is not efficient, water intake sources for existing water treatment plants are close to estuaries, and raw water contains salt. When salinity in water intake at the Cau Do water treatment plant are high, the An Trach pumping station, which takes in water from the upper basin, is used, and raw water with lower salinity is sent to the Cau Do water treatment plant.

Figure 4-7 shows the changes in rates of non-revenue water. Previously, there was a high percentage of non-revenue water in Da Nang, reaching as high as 40% to 50%.

---

Management of Water Projects from the Perspective of Water Safety in Waterworks in Da Nang City, Socialist Republic of Viet Nam (March 2012, Janan International Corporation of Welfare Service)

[10]Source: Report on Electrical Energy Use in Danang Water Supply One Member Limited

However, with the introduction of Swedish GIS management technique technologies, the rate of non-revenue water today has decreased to about 17% and the city is now among the best areas in Viet Nam for non-revenue water rates.

Da Nang is an important city in central Viet Nam, and in the future, significant population growth and industrial expansion is expected, which will result in a significant increase in water demand as well. However, the reduced flow rate of the Cau Do River, where the city is carrying out hydropower development in the upper basin, has become a major issue.

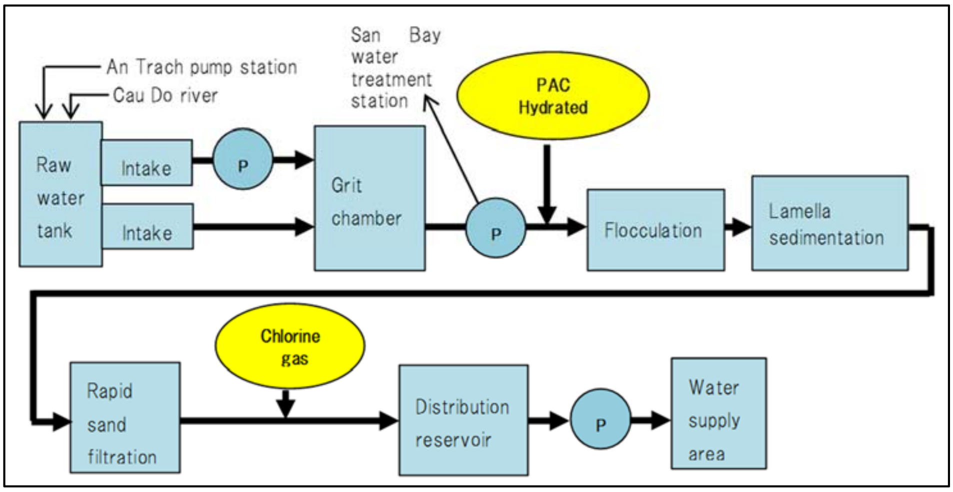
However, studies on new treated water supply projects have been carried out through water supply projects by the Asian Development Bank (ADB) and JICA Preparatory Surveys (PPP Infrastructure) with the participation of Kashima, Hitachi, and Yokohama Water, following loan projects, since large-scale facility improvement is difficult with financing only from DAWACO.

According to the Da Nang Department of Construction (DOC), by 2020, the water supply capacity of the Cau Do water treatment plant will be extended to 60,000 $m^3$/day. With the planned construction of a new water treatment plant with a capacity of 120,000 $m^3$/day in the Hoa Lien district (water distribution network development: ADB loans and support from Russia, construction of water treatment plant: investment from private companies using schemes such as PPP), the water supply capacity is expected to reach 390,000 $m^3$/day. In addition, currently, three pumps at the An Trach pumping station (water conveyance capacity of 210,000 $m^3$/day) will be updated, and there is a strong intention to increase the water supply capacity to 230,000 $m^3$/day. Next, government approval is currently being sought for long-term future plans for 2030-2050. Da Nang is also currently considering the development of a new supply net, as well as increasing water supply capacity throughout Da Nang. According to the Danang DOC, industrial parks lack pressure and the city is considering the introduction of facilities to increase pressure. The city is showing their intention to introduce a new water supply net in newer settlements.

The current state of each water treatment plant and the An Trach pumping station are shown below.

## 1. Current state of Cau Do water treatment plant

The Cau Do water treatment plant has the largest water supply capacity in Da Nang (170,000 $m^3$/day). The water treatment process is shown in Figure 4-12 below.




(Figure 4-12. Water treatment process in the Cau Do water treatment plant[12])

(Photo 4-1. Lamella Sedimentation at Cau Do WTP)

(Photo 4-2. Raw water basin for the Cau Do WTP)


(Photo 4-3. Water quality monitor at water intake)


(Photo 4-4. Monitor in control room)

[12] Source: Modification of figures in the Report on Study of Human Resources Development to Promote Sound Management of Water Projects from the Perspective of Water Safety in Waterworks in Da Nang City, Socialist Republic of Viet Nam (March 2012, Janan International Corporation of Welfare Service)

The Cau Do water treatment plant takes in water from around the Cau Do bridge (Cau Do River), about 13 km upstream from the mouth of the river. However, when salinity in the intake water from the Cau Do River are high, raw water with low concentrations of salt are sent from the An Trach pumping station (intake water from the Yen River at the upstream of the Cau Do River basin). The Cau Do water treatment plant automatically measures the water quality of water intake from the Cau Do River (water temperature, salinity, PH, turbidity) and confirms this using water quality monitors.

The raw water pump lines after the sedimentation basin at the Cau Do water treatment plant is complex. There are two systems: one for conveying water to the San Bay water treatment plant and one for the treatment process at Cau Do water treatment plant.

The system for the treatment process at Cau Do water treatment plant includes two pumping stations (New Cau Do Level 1 Pumping Station to convey water in a pipe diameter of 600 mm and the old Cau Do Level 1 Pump, which conveys water in a pipe with a diameter of 400 mm).

In addition, water conveyance systems to the San Bay water treatment plant include two pumping stations in the Cau Do water treatment plant (new San Bay Level 1 Pumping Station and the old San Bay Level 1 Pumping Station).

The water supply system at the Cau Do water treatment plant has only one system (Level 2 Pumping Station), which supplies clean water through six large-capacity water supply pumps.

(Figure 4-13. Raw water pump and water supply pump system in the Cau Do WTP)

| Water conveyance system | Pumping station | Water conveyance capacity |
|---|---|---|
| System for raw water treated at Cau Do WTP | Old Cau Do Level 1 Pumping Station | 5,000 $m^3$/day |
| | New Cau Do Level 1 Pumping Station | 12,000 $m^3$/day |
| System for raw water conveyed to San Bay WTP | Old San Bay Level 1 Pumping Station | |
| | New San Bay Level 1 Pumping Station | |
| System to supply water to the water supply net | Cau Do Level 2 Pumping Station | 170,000 $m^3$/day |

Pumps in the old Cau Do Level 1 Pumping Station

The old Cau Do Level 1 Pumping Station requires three pumps as shown in Figure 4-14 (All three pumps do not have inverters attached.)

(Figure 4-14. Pump specifications at the old Cau Do Level 1 Pumping Station)

| Manufacturer/Make & model | | Country of manufacture | Year installed | Specifications | |
|---|---|---|---|---|---|
| Pump | | Russia | 1977 | Flow | 1,000m³/h |
| | | | | Head pressure | 19m |
| Electric motor | Vihem | Taiwan | 2008 | Motor capacity | 110 Kw |
| | | | | Nominal current | 163-164 A |
| | | | | Working voltage | 380 V |

(Photo 4-5. Raw water pump in old Cau Do Level 1 Pumping Station)

Of the three pumps, two are in operation (one is for backup). The pumps are old; however, there have been no incidences of cavitation or other problems.

Efficiency according to operating mode is shown in Figure 4-15. (Catalog value, power consumption per unit: 0.086kW/m$^3$; pump efficiency when two pipes are in operation: 50.5%)

（Figure 4-15. Operating mode and efficiency of the old Cau Do Level 1 Pumping Station)

| Operation Pattern | Mode | Power consumption per unit [kwh/m$^3$] | Pump Efficiency [%] |
|---|---|---|---|
| 1 | 2 pumps in operation (1 for backup) | 0.086 | 53.37 |

Pumps in the new Cau Do Level 1 Pumping Station

The new Cau Do Level 1 Pumping Station requires four pumps as shown in Figure 4-16.

(Figure 4-16. Pump specifications at the new Cau Do Level 1 Pumping Station)

<table>
<tr><th colspan="2">Manufacturer</th><th>Serial number</th><th>Country of manufacture</th><th>Year installed</th><th colspan="2">Specifications</th></tr>
<tr><td rowspan="3">Pump</td><td rowspan="3">GRUNDFOS</td><td rowspan="3">0741/<br>1704307006</td><td rowspan="3">Taiwan</td><td rowspan="6">No.1-3<br>:2008<br>No.4:<br>2015</td><td>Flow</td><td>2,650m$^3$/h</td></tr>
<tr><td>Head pressure</td><td>19m</td></tr>
<tr><td>Motor capacity</td><td>200 Kw</td></tr>
<tr><td rowspan="3">Electric motor</td><td rowspan="3">TECO</td><td rowspan="3">C074633-3</td><td rowspan="3">Taiwan</td><td>Nominal current</td><td>364 A</td></tr>
<tr><td>Working voltage</td><td>380 V</td></tr>
<tr><td>Rotational speed</td><td>980 rpm</td></tr>
</table>

(Photo 4-6. Raw water pumps in the new Cau Do Level 1 Pumping Station)

Pump operating conditions are smooth, stable, and have no vibration. Of the four pumps, three have inverters attached (38-42Hz). The pump that does not have an inverter attached is a quadrant drainage pipe that is frequently closed.

At this time, erosion phenomenon has not yet occurred, and the pump operating efficiency is also comparatively high. Efficiency according to operating mode is shown in Figure 4-17 (power consumption per unit of 0.0755 kWh/$m^3$ according to catalog value).

(Figure 4-17. Operating mode and efficiency of new Cau Do Level 1 Pumping Station)

| Operation pattern | Mode | Power consumption per unit [kwh/$m^3$] | Pump efficiency [%] |
|---|---|---|---|
| 1 | 3 pumps operating (1 backup)<br>(With inverter: 1 pump)<br>(Without inverter: 2 pumps) | 0.073-0.074 | 74.80 |
| 2 | 1 pump operating (2 backup)<br>(With inverter: 0 pumps)<br>(Without inverter: 1 pump)<br>Valves: quadrant closed | 0.066 | 55.09 |
| 3 | 1 pump operating (2 backup)<br>(With inverter: 0 pumps)<br>(Without inverter: 1 pump)<br>Valves: Open | 0.060 | 61.35 |

<u>Pumps at old San Bay Level 1 Pumping Station</u>

The old San Bay Level 1 Pumping Station requires two pumps as shown in Figure 4-18.

(Figure 4-18. Status of pumps at old San Bay Level 1 Pumping Station)

| | No. 1 Pump | No. 2 Pump |
|---|---|---|
| Flow | 800$m^3$/h | 300-500$m^3$/h |
| Head pressure | 35m | 35m |
| Motor capacity | 110kw | 90kw |
| Inverter | None | None |

(Photo 4-7. Raw water pump in old San Bay Level 1 Pumping Station)

Raw water pumps at new San Bay Level 1 Pumping Station

The new San Bay Level 1 Pumping Station requires two pumps as shown in Figure 4-19.

(Figure 4-19. Pump specifications for new San Bay Level 1 Pumping Station)

| Manufacture/Make & model | | Serial number | Country of manufacture | Year installed | Specifications | |
|---|---|---|---|---|---|---|
| Pump | HELMKE | 34512/2 | France | 2008 | Flow | 1,500m³/h |
| | | | | | Head pressure | 35m |
| | | | | | Motor capacity | 200 Kw |
| Electrical Motor | HELMKE | 2221000700 | France | | Nominal current | 364 A |
| | | | | | Working voltage | 380 V |
| | | | | | Rotational speed | 1,480 rpm |

(Photo 4-8. Raw water pump in new San Bay Level 1 Pumping Station)

Pump operating conditions are smooth, stable, and have no vibration. At this time, erosion phenomenon has not yet occurred, and the pump operating efficiency is also comparatively high. Efficiency according to operating mode is shown below (catalog value, power consumption per unit: 0.182 kW/$m^3$; pump efficiency when five pipes are in operation: 63.3%).

(Figure 4-20. Operating mode and efficiency at new San Bay Level 1 Pumping Station)

| Operation pattern | Mode | Power consumption per unit [kwh/$m^3$] | Pump efficiency [%] |
|---|---|---|---|
| 1 | 2 pumps operating (1 backup) | 0.1173 | 85.5 |

<u>Pumps at Cau Do Level 2 Pumping Station</u>

The Cau Do Level 2 Pumping Station requires six vertical-type water supply pumps, as shown in Figure 4-21. Of the six pipes, inverters are attached to four (maximum frequency: 48 HZ). Two pipes are manufactured by VACON (Finland) and two are manufactured by Siemens (Germany).

(Figure 4-21. Pump specifications at Cau Do Level 2 Pumping Station)

<table>
<tr><th colspan="2">Manufacturer</th><th>Serial number</th><th>Country of manufacture</th><th>Year installed</th><th colspan="2">Specifications</th></tr>
<tr><td rowspan="3">Pump</td><td rowspan="3">GRUNDFOS</td><td rowspan="3">0722/1733405004</td><td rowspan="3">Taiwan</td><td rowspan="6">2008</td><td>Flow</td><td>2,400m³/h</td></tr>
<tr><td>Head pressure</td><td>42m</td></tr>
<tr><td>Motor capacity</td><td>450 Kw</td></tr>
<tr><td rowspan="3">Electric motor</td><td rowspan="3">TECO</td><td rowspan="3">C074634-4</td><td rowspan="3">Taiwan</td><td>Nominal current</td><td>794 A</td></tr>
<tr><td>Working voltage</td><td>380 V</td></tr>
<tr><td>Rotational speed</td><td>1,470 rpm</td></tr>
</table>

(Photo 4-9. Raw water pumps at Cau Do Level 2 Pumping Station)



(Photo 4-10. Inverters attached to Cau Do water supply pump) (Manufactured by VACON Finland)

(Photo 4-11. Inverters attached to (Cau Do water supply pump) (Manufactured by Siemens Germany)

Of the six pumps, three to five are in operation (one to three pumps for backup). Depending on water demand, the pumping station makes an effort to implement power-saving measures by controlling the number of pumps in combination with different numbers of inverters. However, during the day, the operating rate of inverters is lowered in consideration of inverter loss (about 3%) because the demand load is relatively stable.

The pumps are loud when they are in operation and vibrations occur due to cavitation. Severe erosion phenomena also occur. Operating pump efficiency varies depending on the operation mode, including inverters. Efficiency according to operation mode is shown in Figure 4-22 (power consumption per unit of 0.1875 kWh/$m^3$ according to catalog value).

(Figure 4-22. Operation mode and efficiency at Cau Do Level 2 Pumping Station)

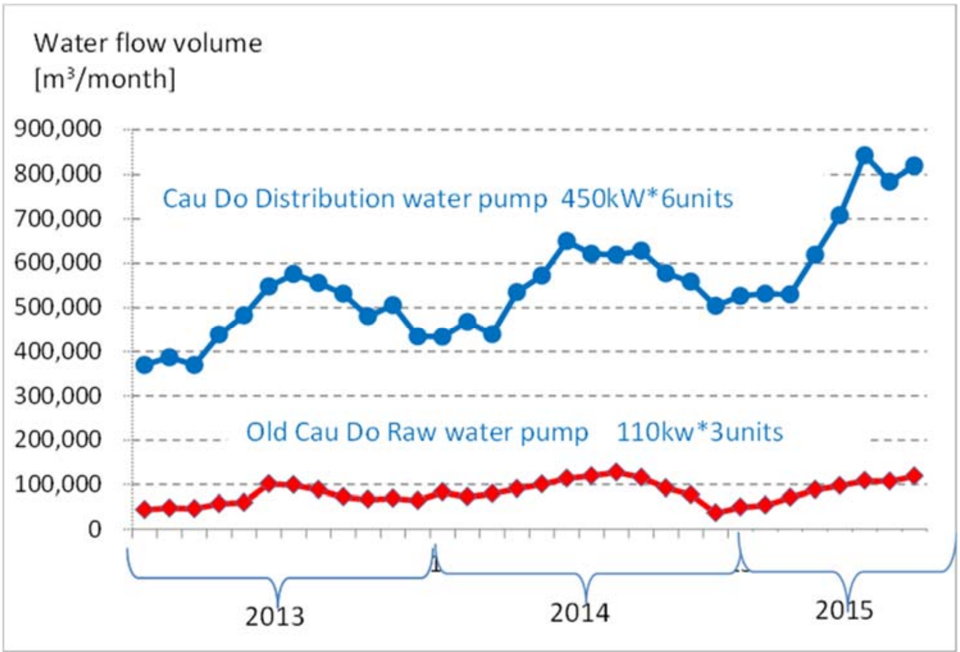
| Operation pattern | Mode | Power consumption per unit [kwh/$m^3$] | Pump efficiency [%] |
|---|---|---|---|
| 1 | 5 pumps operating<br>(With inverter: 3 pumps)<br>(Without inverter: 2 pumps) | 0.178-0.186 | 61.39 |
| 2 | 5 pumps operating<br>(With inverter: 4 pumps)<br>(Without inverter: 1 pump) | 0.176 | 64.25 |
| 3 | 4 pumps operating<br>(With inverter: 2 pumps)<br>(Without inverter: 2 pumps) | 0.151 | 70.13 |
| 4 | 4 pumps operating<br>(With inverter: 4 pumps)<br>(Without inverter: 0 pumps) | 0.152 | 66.01 |
| 5 | 3 pumps operating<br>(With inverter: 3 pumps)<br>(Without inverter: 0 pumps) | 0.119 | 62.51 |
| 6 | 3 pumps operating<br>(With inverter: 2 pumps)<br>(Without inverter: 1 pump) | 0.158 | 64.63 |

<u>Past measurement data for water conveyance amount and power consumption at Cau Do water treatment plant</u>

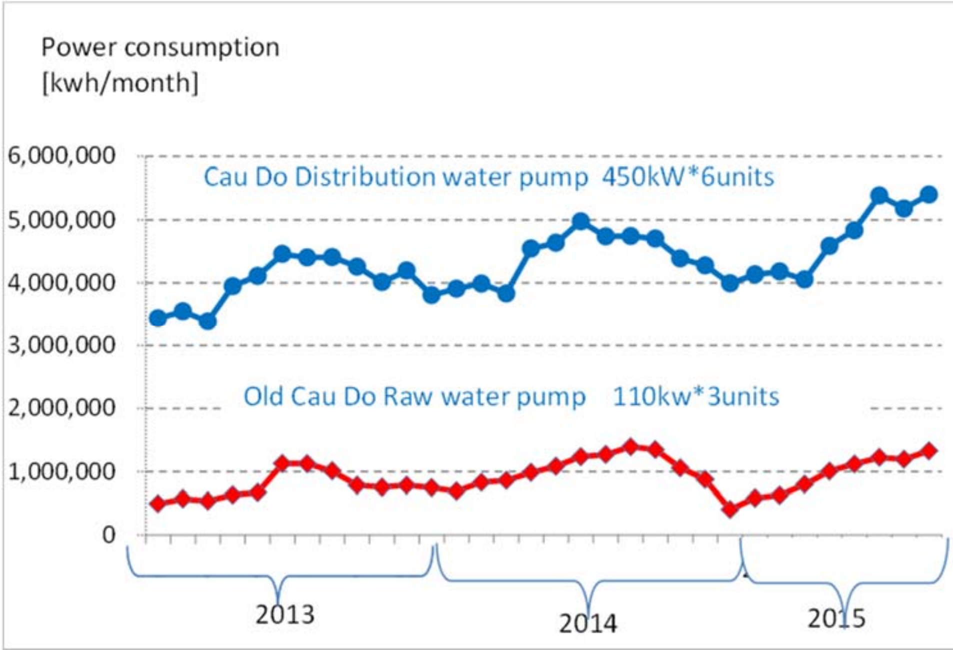
Past measurement data has been compiled for the old Cau Do Level 1 Pumping Station (raw water system) and the Level 2 Pumping Station (water supply system) in the Cau Do water treatment plant.

Power consumption has been measured for each pump in the old Cau Do Level 1 Pumping Station (three 110-kw raw water pumps). However, only the total amount of water conveyed is measured in the three pumps (usually, two pumps in operation and one as backup). In addition, power consumption is measured for each of the pumps in the Level 2 Pumping Station (six 450-kw water supply pumps). However, only the total amount of water conveyed is measured in the six pumps (usually, four to five pumps in operation and one to two as backup).

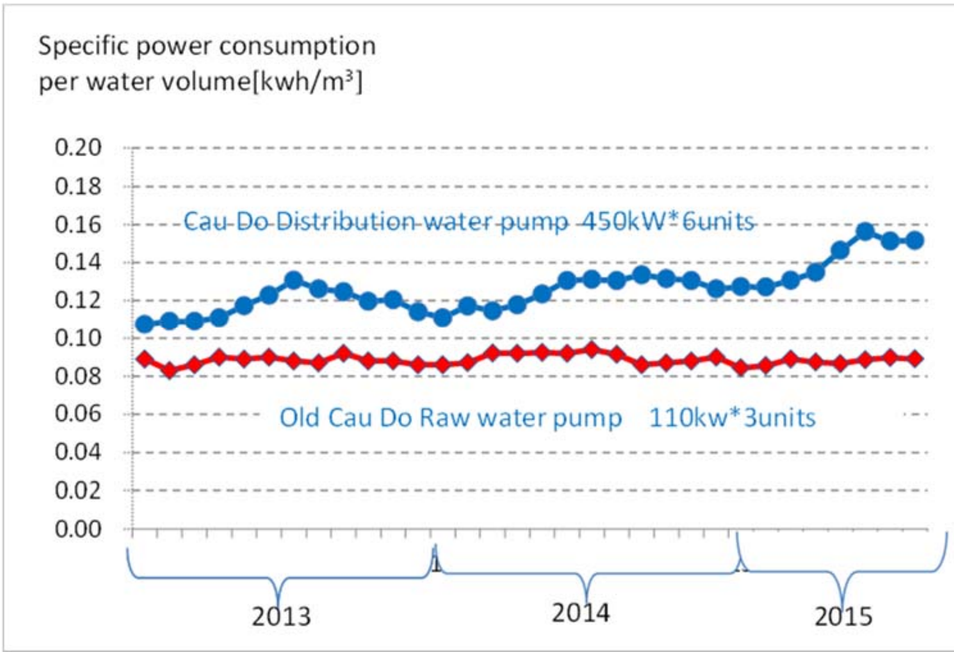
Data on water conveyance amount, power consumption, and power consumption per unit per month is shown in Figures 4-23 to 4-25, as provided by DAWACO. The maximum and minimum values for lifting height of the Cau Do Level 2 Pumping Station are shown in Figure 4-26.



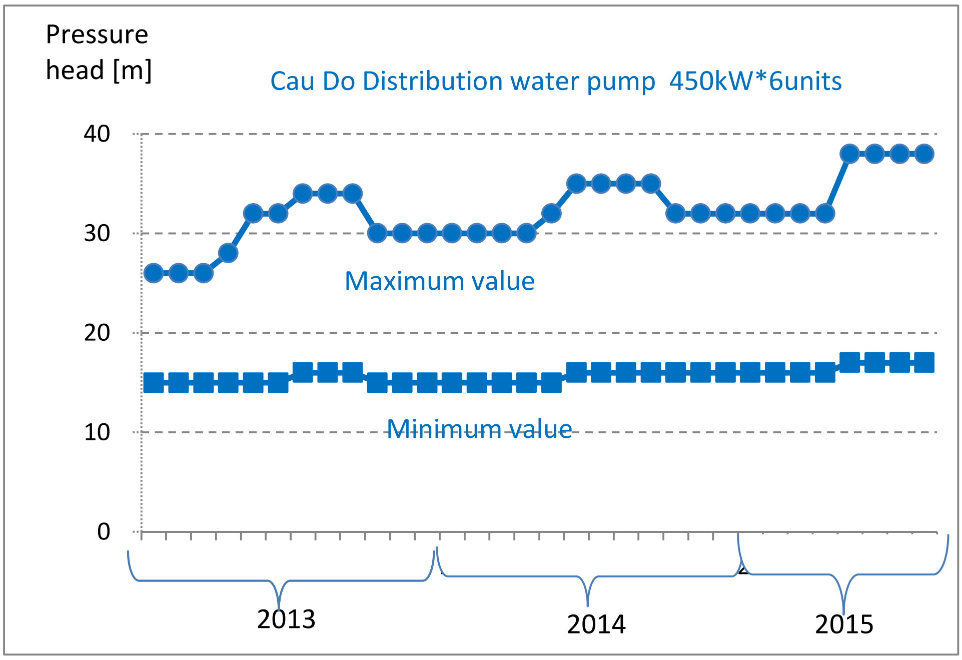

(Figure 4-23. Changes in water conveyance amount from Cau Do WTP (Source: Data from DAWACO))




（Figure 4-24. Changes in power consumption in Cau Do WTP (Source: Data from DAWACO)）




(Figure 4-25. Changes in power consumption per unit in Cau Do WTP (Source: Data from DAWACO))




(Figure 4-26. Changes in maximum and minimum values in Cau Do Level 2 Pumping Station (Source: Data from DAWACO))

With respect to the system for raw water, both the lifting height of the pump (less than 20 m) and the power consumption per unit for raw water systems are low. Changes in the power consumption per unit are stable (fluctuation range: 0.083 to 0.094 kWh/m$^3$, with an average of 0.089 kWh/m$^3$). On the other hand, both the lifting height of the water supply system (maximum value of around 35 m) and power consumption per unit are also high. Depending on demand, the power consumption per unit will change (fluctuation range: 0.108 to 0.156 kWh/m$^3$, with an average of 0.126 kWh/m$^3$) because operations need to respond to fluctuations in flow rates.

<u>Availability of inverter control</u>

There is usually a little leeway in pump capacity for cold and warm water systems using only one pump. For this reason, if resistance (pressure) is increased by squeezing the valve on the pump discharge side and water volume can be adjusted by design, the valve resistance (pressure) can be opened to achieve energy savings by adjusting water volume with the introduction of rotational speed using an inverter. This makes it possible to achieve energy savings of 20% or more.

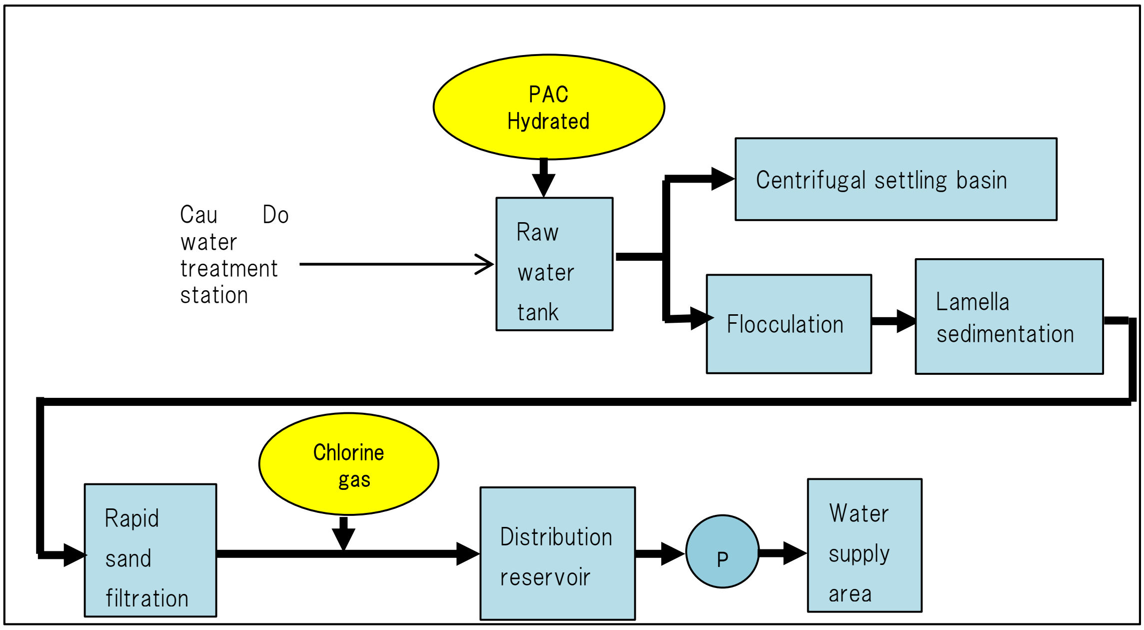
However, in water treatment plants, flow rate adjustments are carried out using several pumps and by controlling the number of pumps. In particular, for raw water systems, there is a storage function in the raw water basin and it is possible to place stable arched ladders on the pumps. If the inverter is running, there will be a power loss of about 3%. If the inverter is in stable operation under all possible conditions, there may be times in which it is better to not operate the inverter and gain power-saving effects instead.

The water supply system at the new Cau Do WTP can operate in a stable manner during the daytime. This means that the inverter can be run at night when the inverter is stopped and the flow rate fluctuations are high.

For this reason, the existing six pumps in the water supply system at the new Cau Do WTP will be updated to the same extent (450 kW) and four existing inverters will continue to be used as is.

## 2. Current state of San Bay water treatment plant

The San Bay water treatment plant has a water supply capacity second only to the Cau Do water treatment plant (30,000 $m^3$/day). The water treatment process is shown in Figure 4-27.




(Figure 4-27. Water treatment process at San Bay WTP[14])

[14] Source: Modification of figures in the Report on Study of Human Resources Development to Promote Sound Management of Water Projects from the Perspective of Water Safety in Waterworks in Da Nang City, Socialist Republic

The San Bay water treatment plant received raw water from two pumping stations in the Cau Do water treatment plant (new San Bay Level 1 Pumping Station and old Say Bay Level 1 Pumping Station). After the raw water sent to the Cau Do water treatment plant has been treated, this treated water is then sent to the water supply net from the two pumping stations (new San Bay Level 2 Pumping Station and old San Bay Level 2 Pumping Station), resulting in a water supply capacity of 15,000 $m^3$/day.

(Figure 4-28. System of raw water pumps and water supply pumps in San Bay WTP)

| Water conveyance system | Pumping station | Water conveyance capacity |
|---|---|---|
| System for raw water received from Cau Do WTP | Old San Bay Level 1 Pumping Station | |
| | New San Bay Level 1 Pumping Station | |
| Water supply system to the water supply net | Old San Bay Level 2 Pumping Station | 15,000$m^3$/day |
| | New San Bay Level 2 Pumping Station | 15,000$m^3$/day |

Raw water pump at the old San Bay Level 2 Pumping Station

The water supply capacity of the old San Bay Level 2 Pumping Station is 15,000 $m^3$/day. The WTP uses two pumps (both without inverters attached), as shown in the following Figure 4-29.

(Figure 4-29. Pump conditions at the old San Bay Level 2 Pumping Station)

| | No.1 pump |
|---|---|
| Flow | 800$m^3$/h |
| Head pressure | 35m |
| Motor capacity | 160kw |
| Inverter | None |

of Viet Nam (March 2012, Janan International Corporation of Welfare Service)

(Picture 4-12. Pumps at old San Bay Level 2)

(Photo 4-13. Display of water supply amount in old system)

<u>Raw water pumps in the new San Bay Level 2 Pumping Station</u>

Water supply capacity at the new San Bay Level 2 Pumping Station is 15,000 $m^3$/day and requires two pumps, as shown in Figure 4-30 (both pumps manufactured by Vacon Finland and with inverters attached) and one pump, as shown in Figure 4-31 (without inverter attached).

Pump operating conditions are smooth, stable, and with no vibration. At this time, erosion phenomenon has not yet occurred, and the pump operating efficiency is also high.

(Figure 4-30. Specifications for the No. 1 and 2 pumps at the new San Bay Level 2 Pumping Station)

| Manufacturer/Make & model | | Country of manufacture | Year installed | Specifications | |
|---|---|---|---|---|---|
| Pump | 10LR 18A | France | 2005 | Flow | 1,400$m^3$/h |
| | | | | Head pressure | 35m |
| | | | | Motor capacity | 200 Kw |
| Electric motor | | France | | Nominal current | 338 A |
| | | | | Working voltage | 380 V |
| | | | | Rotational speed | 1,489 rpm |

*Inverters are attached to both pumps.

(Figure 4-31. Specifications for pump No. 3 at the new San Bay Level 2 Pumping Station)

| Manufacturer | | Country of manufacture | Year installed | Specifications | |
|---|---|---|---|---|---|
| Pump | Valencia | Spain | 2014 | Flow | 1,400m³/h |
| | | | | Head pressure | 35m |
| | | | | Motor capacity | 200 Kw |
| Electric motor | Valencia | Spain | | Nominal current | 325 A |
| | | | | Working voltage | 380 V |
| | | | | Rotational speed | 1,480 rpm |

*No inverter attached.


(Photo 4-14. Pumps at new San Bay Level 2)

(Photos 4-15. With inverter (VACON Finland)

(Photo 4-16. Water supply flow rate display for new system (manufactured by ABB))

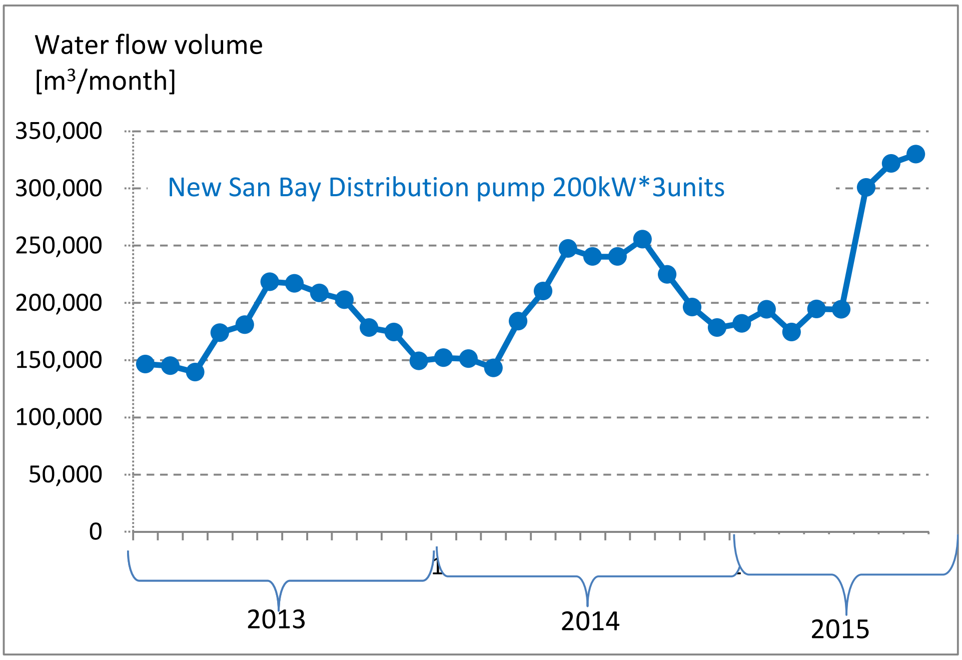
The operation pattern of the water supply pump is for both the new and old systems, as shown in the table.

(Figure 4-32. Operation patterns for water supply pumps at the San Bay water treatment plant)

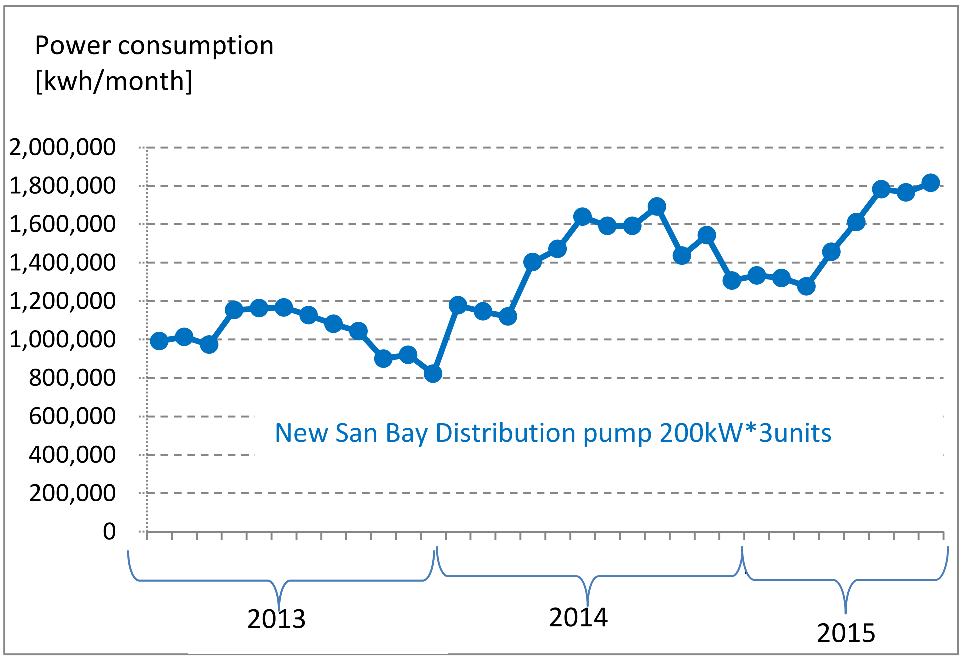
| | Old system | New system | | Lifting height |
|---|---|---|---|---|
| | 160kW*2 pumps (Without inverter) | 180kW*2 pumps (With inverter) | 180kW*1 pump (Without inverter) | |
| Day | 1 pump: rated operation<br>1 pump: stopped | 2 pumps: adjusted operation | Stopped | 40m |
| Night | One pump operating. Remaining two pumps stopped. | | Rated operation | 30m |

<u>Past measurement data for water supply volume and power consumption at the water supply pump in the San Bay water treatment plant</u>

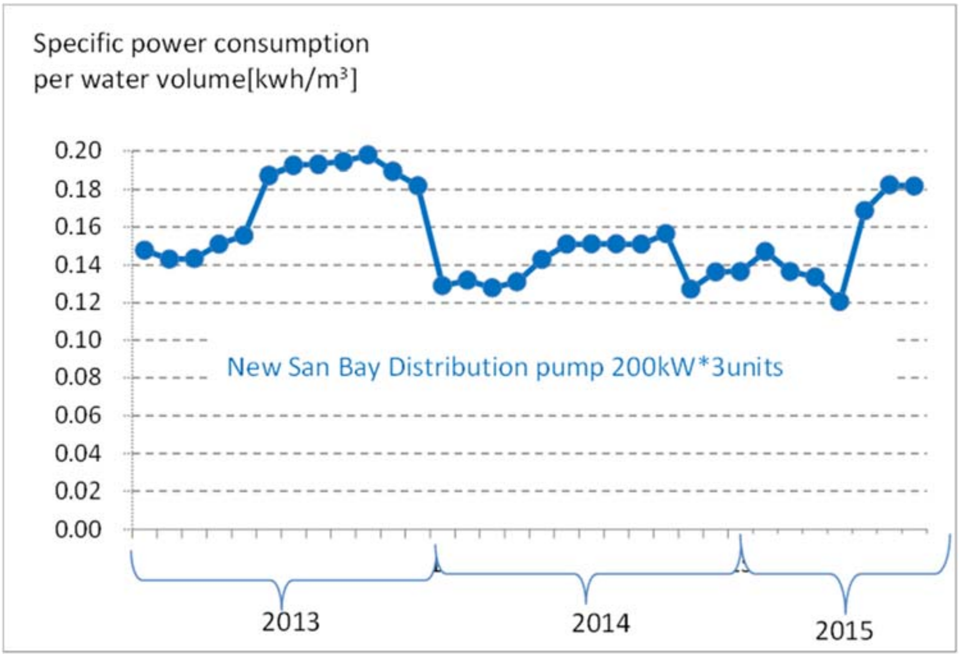
Data on water supply volume, power consumption, and power consumption per unit per month in the new San Bay Level 2 Pumping Station is shown in Figure 4-33 to 4-35.




(Figure 4-33. Change in water supply amount at the new San Bay Level 2 Pumping Station (Source: Data from DAWACO))




(Figure 4-34. Changes in power consumption at the new San Bay Level 2 Pumping Station (Source: Data from DAWACO))




(Figure 4-35. Changes in power consumption per unit at the new San Bay Level 2 Pumping Station (Source: Data from DAWACO))

The water system at the San Bay water treatment plant (Level 2 Pumping Station) is operated in synchronization with the old San Bay Level 2 Pumping Station and the new San Bay Level 2 Pumping Station. For this reason, although dependent on the conditions at the old San Bay Level 2 Pumping Station, the new San Bay Level 2 Pumping Station pumps are comparatively newer and better performing, with a high lifting height (day: about 40 m, night: about 34 m) and high power consumption per unit.

In addition, depending on demand, the power consumption per unit will also change (fluctuation range: 0.121 to 0.198 kWh/$m^3$ with an average of 0.155 kWh/$m^3$) because operations need to respond to fluctuations in flow rates.

### 3. Current state of An Trach pumping station

When salinity in water intake at Cau Do water treatment plants is high, water intake is carried out at the upstream of the Yen River and raw water is pumped to Cau Do water treatment plant.

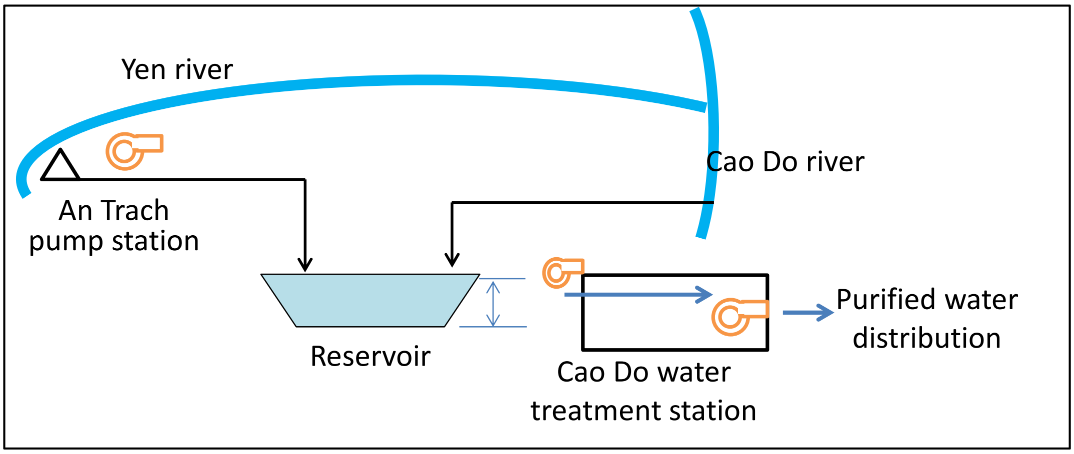
Depending on the salinity in the water intake from Cau Do River:

(1) The An Trach pumping station will stop if the concentrations are 250 mg/L or lower (250 mg/L is the national standard. In reality, the pump will run when concentrations are 200 mg/L and above).

(2) Water will be conveyed if concentrations are between 250 mg/L and 1,000 mg/L, and water will be mixed with water intake from the Cau Do River.

(3) Water intake from the Cau Do River will be stopped if concentrations are 1,000 mg/L or above, and all water conveyed from An Trach pumping station will be used.

Main operating periods are between May and July. However, the Cau Do River is experiencing reduced river flow, which has resulted in high concentrations of salt in the Cau Do River, since water is being released in a different watershed due to hydropower development in the upstream area of the Cau Do River. For this reason, the number of operating days annually has raised the operation rate up to about 180 days.




(Figure 4-36. Relationship between Cau Do WTP and An Trach WTP)

(Photo 4-17. Water intake weir from the Yen River)

The water conveyance capacity of An Trach pumping station is 210,000 $m^3$/day and requires six pumps, as shown in Figure 4-37 (all six pumps do not have inverters attached.)

(Figure 4-37. Pump specifications at An Trach pumping station)

| Manufacturer/Make & model | | Serial number | Country of manufacture | Year installed | Specifications | |
|---|---|---|---|---|---|---|
| Pump | GRUNDFOS<br><br>TORENT PUMPS EMMANUEL N. KAZIS PUMPS | 29382/1 | Taiwan | :2007 | Flow | 2,200$m^3$/h |
| | | | | | Head pressure | 50m |
| | | | | | Motor capacity | 400 Kw |

| | | | | | | |
|---|---|---|---|---|---|---|
| Electric motor | TECO 3-PHASE INDUCTION MOTOR | 6074642-1 | Taiwan | | Nominal current | 710/663 A |
| | | | | | Working voltage | 880/415 V |
| | | | | | Rotational speed | 1460 rpm |

*Inverter not attached.

The motor capacity of the pump originally operated at 400 kW. However, the water conveyance amount is low, pump capacity is too large, pressure is too high, and the pump fails frequently. For these reasons, one stage of the two-stage impeller in the six pumps was removed and the capacity was lowered to 230 kW. However, with increasing salinity in the Cau Do River, the pump operating rate increased, and in mid-July 2015, the capacity of one pump was increased from 230 kW to 400 kW. Currently, one pump is not in operation and is being modified in order to increase capacity from 230 kW to 400 kW. The remaining four pumps will also be modified to increase capacity to 400 kW. Currently, when all pumps are running, one pump will operate at 400 kW together with the three other pumps that will operate at 230 kW.

In addition, the total amount of power consumption in the pumps is measured at this pumping station. Water conveyance volume is not measured; however, the approximate amount of water conveyance is estimated according to the water levels in the raw water basin.

(Photo 4-18. Pumps at An Trach pumping station)

(Photo 4-19. Impeller removed for modifications)

## 4. Son Tra water treatment plant

The Son Tra water treatment plant uses the spring waters of Suoi Da and Suoi Tinh.

Water supply capacity is 5,000 m$^3$/day and exploiting capacity is 4,409 m$^3$/day.


(Photo 4-20. Son Tra water treatment plant)

**5. Hai Van water treatment plant**

The Hai Van water treatment plant uses the spring waters of Suoi Luong and supplies water to the Hoa Hiep Bac district and Lien Chieu industrial zone. Water supply capacity is 5,000 m$^3$/day and exploiting capacity is 1,485 m$^3$/day.

(Photo 4-21. Hai Van water treatment plant)

### 4.2.2 Menu options for updating pumps

On 15 September (Tue), 2015 during the first field visit, in the first consultations between DAWACO and the Japan study team of IGES and Osumi, focus was put on An

Trach pumping station, Cau Do water treatment plant and San Bay water treatment plant, as sites with large water conveyance volumes and large power consumption. Of these sites, first, DAWACO contacted the Japan study team to select a pump system that could be developed as a candidate JCM model project site. In late October before the second field visit (1 November to 7 November 2015), the initial proposal from DAWACO had been developed and included the five sites as candidate JCM model project sites, as shown in Figure 4-38.

(Figure 4-38. Initial proposal for candidate JCM model projects as submitted by DAWACO)

| Proposal No. | Target WTP | Target system | Details of initial proposal |
|---|---|---|---|
| Initial proposal 1 | Cau Do WTP | Old Cau Do Level 1 Pumping Station (raw water system) | Updates to three existing pumps as below<br>-Flow: 1000 ⇒1200-1500$m^3$/h<br>-Lifting height：19⇒14-15m |
| Initial proposal 2 | Cau Do WTP | Cau Do Level 2 Pumping Station (water supply system) | Updates to two existing pumps<br>-Flow: 800/300-500<br>⇒1200-1500/1200-1500$m^3$/h<br>-Lifting height: 35/35⇒14-15/14-15m |
| Initial proposal 3 | Cau Do WTP | Old San Bay Level 1 pumping station (water conveyance system for raw water to San Bay WTP) | Updates to six existing pumps as below<br>-Flow: 2400⇒3000-3400$m^3$/h<br>-Lifting height: 42⇒40-45m<br>-Motor capacity: 450⇒ <550kw<br>Introduction of two additional inverters (Continued use of four existing inverters) |
| Initial proposal 4 | An Trach pump station | Water conveyance system from An Trach pump station to Cau Do WTP | Updates to six existing pumps as below<br>-Flow: 2200⇒3000-5000$m^3$/h<br>-Lifting height: 50⇒25-30m<br>-Motor capacity: 400⇒300-350kw<br>-Pump efficiency: 80-87% |
| Initial proposal 5 | San Bay WTP | New San Bay Level 2 pumping station (water supply system) | Of the three existing pumps, there is one pump that does not have an inverter attached. An inverter will be introduced for this pump. |

For DAWACO, which is a water supply operator, although there are common areas between the points for selecting pumps that will be candidates for pump updates and the points that are important for the JCM technical assistance project, they can often be very different. Each of the matters that should be emphasized can be found below.

Selection points for DAWACO

- Frequent failures, pumps and system are relatively old.
- Efficiency is poor and electricity costs are needed. Development of pumps and systems that can be expected to have cost-saving benefits for electricity costs with updates to pumps (short investment return period for initial investment).
- Control initial investment as much as possible.
- Safety from the perspective of supply capacity due to increase in water demand.
- No significant changes in pipe arrangements, pressure and electrical systems with pump updates.
- Potential to introduce existing inverters (If pump capacity will be much larger than the capacity of existing pumps, existing inverters cannot be used in new pumps.)
- Secure installation space for newly introduced pumps.
- Durability of installation location with respect to the weight of newly introduced pumps.
- Easy work environment for construction when replacing pumps.
- Enhance after-service after the introduction of pumps.

Selection points from the JCM technical assistance project

- Large $CO_2$ emission reduction effects (large capacity and pumps with better operation rates are relatively a better choice)
- Cost effective (low subsidy per $tCO_2$ emission reduction)
- System to easily quantify $CO_2$ emission reductions through projects.
- Secure monitoring system on site after the implementation of the program when the credit issue risk is low (It is beneficial to focus on the same site if targeting multiple systems.)
- Problems with recording systems for monitoring data on pump failures and power

consumption become a credit risk. In terms of credit risk, after-sales services are being expanded.

- In terms of credit risk, after-sales services are being expanded.

Candidates for JCM technical assistance will be determined from a comprehensive examination of the points of both parties.

Five sites were cited in the initial proposal from DAWACO shown in Figure 4-38. Proposal 4 on the An Trach pumping station was put forth by DAWACO as a high-priority site because of its large capacity and frequent failures. However, this site was quickly removed from the list of JCM candidate sites from the perspective of JCM technical assistance, since the number of days of operation (180) is low and there are risks to the monitoring system following the implementation of the project, as well as credit risks.

Therefore, the study team decided to specifically select candidate sites from the four other proposals (with particular focus on proposals 1 and 3) at the second field survey by sitting down with pump technical experts from Ebara Vietnam and carrying out technical consultations

(Subsequent information on the process is outlined in 3.2.3 Results of Interviews with DAWACO)

### 4.2.3 Proposed technical requirements for updating pumps

Initially, DAWACO delivered initial proposals for five sites. With the removal of the An Trach pumping station (proposal 4) from the list of candidate sites, the study team decided to select projects from among the four remaining proposals that will be used to apply for technical assistance from the Ministry of the Environment from next fiscal year.

The following technical issues must be satisfied when setting specifications for pumps that will be introduced in systems which will be target projects.

- Sites with pump efficiency of approximately 80% or over from the perspective of power-saving effects
- Sites that can continue using the current power supply system from the perspective

of initial investment

←For power consumption, it is more effective for the power supply system to be a high-voltage system. Currently, the water treatment plants of DAWACO operate on low voltage. With updates to pumps, it may be possible to change the systems to high-voltage systems; however, this system change requires a great deal of initial investment. The price of inverters for high-voltage systems is also high. (Of the new water treatment plants that are planned for construction, it is beneficial to continue using low-voltage power supply systems since this JCM project targets existing water treatment plants.)

- Pump head pressure taking safety factors into account

  ←With changes in future water demand, higher head pressure may also be required. For this reason, it may be beneficial to consider margins rather than necessary performance at this time. Safety factors must be considered for specified values for the purpose of pump design and cost calculations.

- Ensure that pump capacity is not excessive

  ←In cases where a pump will be updated to a larger-capacity pump, it is necessary to consider not only the base price of the pump, but to also replace the diameter of pipe fittings with larger diameter piping. In order to reduce initial investment, it is necessary to ensure that pipework does not need to be replaced.

- Pumps that take into account noise and vibration measures

  ←Since problems such as noise, vibrations, and erosion are occurring, it is beneficial to ensure water conveyance functions with as few rotations as possible.

- Pumps that take into account cavitation measures

  ←Cavitation is occurring at the Cau Do Level 2 Pumping Station and other facilities. Therefore, it would be beneficial to develop a design that lowers the required head.

- Importance of introducing new inverters

  ←Since inverter loss is about 3%, there are cases in which it may be more energy efficient not to use an inverter. There are a number of cases in which the pump volume for raw water systems is low and the reservoir acts as a buffer. In this case, the need for a supplemental inverter is low. However, for water supply systems, the pump volume is high, which means that the need for supplemental inverters is high because of the large changes in load fluctuations to meet demand.

- Enhancing after-sales services (support systems have been established in Viet Nam by manufacturers)

### 4.2.4 Outcomes of meetings with DAWACO

On 15 September (Tuesday), 2015, during the first field visit, the first discussions between DAWACO and the Japan study team of IGES and Osumi focused on JCM candidate model project sites to be selected from the list of sites which included the An Trach pumping station, Cau Do water treatment plant and San Bay water treatment plant, all of which have large water supply volumes. Consultations were carried out with DAWACO following these discussions.

On 5 November (Thursday), 2015 during the second field visit, DAWACO proposed four sites (shown in Figure 4-39) as JCM project candidate sites during technical consultations between DAWACO and the Japan study team, and also accompanied by Yokohama. The contents of initial proposals changed slightly (proposed changes) because initial investment is small. (Although the An Trach pumping station has six large-capacity pumps (400 kW), it could not be included as a JCM candidate site because of its limited operation when the salinity of the Cau Do River is too high (number of days in operation per year: 180).

In addition, the Yokohama Waterworks Bureau explained about water supply in Yokohama and offered technical advice to DAWACO on cavitation measures.

(Figure 4-39. Proposals for JCM candidate sites, as presented by DAWACO)

| Proposal No. | Target facility | Target system | Project activities |
|---|---|---|---|
| Revised proposal 1 | Cau Do WTP | Old Cau Do Level 1 Pumping Station (raw water system) | Updates to 3 existing pumps |
| Revised | Cau Do | Old San Bay Level 1 Pumping | Updates to 3 existing |

| | | | |
|---|---|---|---|
| proposal 2 | WTP | Station (raw water conveyance system to San Bay WTP) | pumps |
| Revised proposal 3 | Cau Do WTP | Cau Do Level 2 Pumping Station (water supply system) | Updates to 6 existing pumps |
| Initial proposal 4 was removed from list of candidate sites | An Trach Pumping Station | Water conveyance system from An Trach Pumping Station to Cau Do WTP | Updates to 6 existing pumps |
| Proposal 5 (Same contents as first proposal) | San Bay WTP | New San Bay Level 2 Pumping Station (water supply system) | Of the three existing pumps, there is one pump that does not have an inverter attached. A new inverter will be introduced for this pump. |

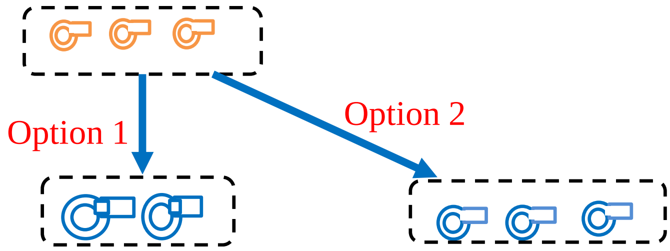
Details of revised proposal 1

As shown in Figure 4-40, option 1 in the revised proposal increases the capacity of the pump and reduces the number of pumps by one (for a total of 2 pumps). Option 2 sets the pump capacity close to the current situation and the number of pumps remains the same at three pumps.

The advantages and disadvantages of each option are shown in Figure 4-41.

Existing pumps

| Three existing pumps (no inverter) | |
|---|---|
| Motor capacity | 110 kw |
| Flow | 1,000 $m^3/h$ |
| Head pressure | 19 m |
| Pump efficiency specifications | 50.5% |




Proposal on the introduction of pumps

(Figure 4-40. Overview of proposal on updates to pumps in the old Cau Do Level 1 Pumping Station)

| Option 1 | | Option 2 | |
|---|---|---|---|
| Two new pumps (without inverter) | | Three new pumps (without inverter) | |
| Motor capacity | 185 kw | Motor capacity | 75 kw |
| Flow | 2,600 $m^3/h$ | Flow | 1,200 $m^3/h$ |
| Head pressure | 16 m | Head pressure | 16 m |
| Pump efficiency specifications | ≧83% | Pump efficiency specifications | ≧83% |

(Figure 4-41. Advantages and disadvantages of each option in revised proposal 1)

| | | |
|---|---|---|
| Option 1 | Advantages | Electricity cost per pump is low. |
| | Disadvantages | Necessary to replace piping about 50 m from raw water basin, which means that construction costs will be high. |
| Option 2 | Advantages | - Smooth operation is possible due to the number of pumps.<br>- Little maintenance is required for the piping system, which results in lower construction costs compared with Option 1. |
| | Disadvantages | Running costs are higher than Option 1. |

Details of revised proposal 2

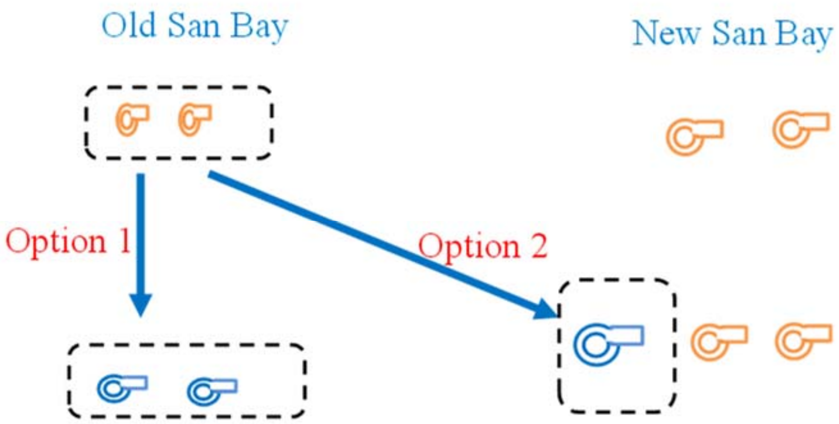
As shown in Figure 4-42, in option 1, pumping capacity has been updated to a slightly higher capacity than the current pumps, although the number of pumps remains the same. The pumps will replace existing pumps and be installed in the current location of these existing pumps in the old San Bay Pumping Station. In option 2, the pumping capacity employs only one pump to replace the two current pumps. The pumps will be installed in open areas in the new San Bay Level 1 Pumping Stations, rather than the old San Bay Level 1 Pumping Station.

The advantages and disadvantages of each option are shown in Figure 4-43.

Current pumps

| Old San Bay<br>2 existing pumps (without inverter) | | |
|---|---|---|
| Motor capacity | 110 kw | 90kw |
| Flow | 1,000 m³/h | 300-500m³/h |
| Head pressure | 35 m | |
| Pump efficiency specifications | 53.4% | |

| New San Bay<br>2 existing pumps (without inverter) | |
|---|---|
| Motor capacity | 200kw |
| Flow | 1,500 m³/h |
| Head pressure | 35 m |
| Pump efficiency specifications | |




Proposal on the introduction of pumps

(Figure 4-42. Overview of proposal on updates to pumps in the old San Bay Level 1 Pumping Station)

| Option 1<br>2 new pumps (without inverter)<br>Updated at Old San Bay | |
|---|---|
| Motor capacity | 132 kw |
| Flow | 1,100 m³/h |
| Head pressure | 35 m |
| Pump efficiency specifications | ≧86% |

| Option 2<br>1 new pump (without inverter)<br>Open space in new San Bay | |
|---|---|
| Motor capacity | 185kw |
| Flow | 1,500 m³/h |
| Head pressure | 35m |
| Pump efficiency specifications | |

(Figure 4-43. Advantages and disadvantages of each option in revised proposal 2)

| | | |
|---|---|---|
| Option 1 | Advantages | Easy construction and installation |
| | Disadvantages | − Overall maintenance of raw water is difficult because the raw water system is still separated.<br>− This option is less efficient than option 2. |
| Option 2 | Advantages | Overall maintenance of raw water is easy because the raw water system is all in one place. |
| | Disadvantages | − Installation space is small, which makes construction difficult.<br>− Need to improve piping system. |

Details of revised proposal 3

As shown in Figure 4-45, in option 1, pump capacity is considerably higher than the capacity of current pumps, although the number of pumps remains the same at six. Since water supply capacity is generally high, it is possible to increase the number of back-up pumps from one to two in this option for times when water demand is highest. In option 2, pump capacity is slightly higher than the current pump capacity, although the number of pumps remains the same at six. Since the flow rate of the pumps is not very high, one option would be to use the four existing inverters.

The advantages and disadvantages of each option are shown in Figure 4-44.

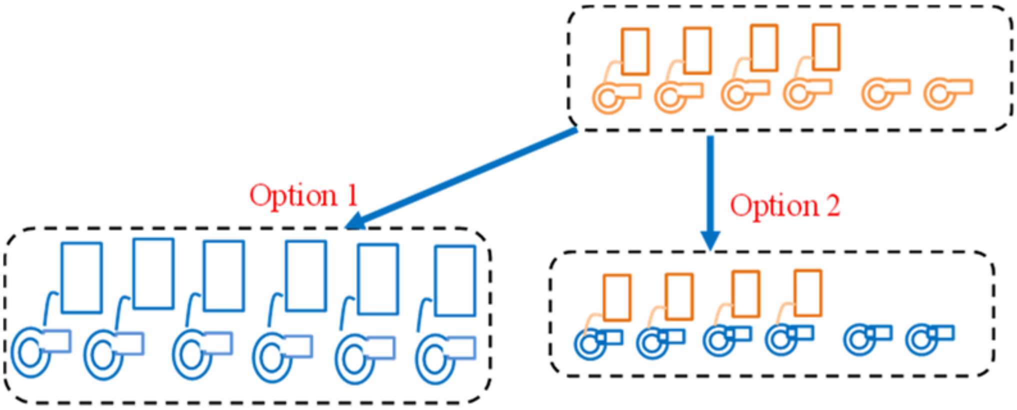
(Figure 4-44. Advantages and disadvantages of each option in revised proposal 3)

| | | |
|---|---|---|
| Option 1 | Advantages | − Supply capacity is high and safety is ensured.<br>− Can meet increased demand in the future. |
| | Disadvantages | − Large capacity, which makes the unit price of each pump high.<br>− Construction costs are high because the electrical system must be changed, including inverters and electric cables.<br>− The pumps are loud because the motor capacity is large.<br>− Must be replaced often and initial investment is quite high. Maintenance costs are even higher than option 2. |
| Option 2 | Advantages | − If the flow rate does not exceed 2,900m$^3$/h, existing inverters can be used.<br>− Initial investment and maintenance costs are |

| | | |
|---|---|---|
| | | more economical than option 1. |
| | Disadvantages | − Less safe than option 1 from the perspective of supply capacity since five pumps must be operating normally at all times (only one back-up pump). |

Current pumps

| 6 existing pumps (4 out of 6 pumps with inverters) | |
|---|---|
| Motor capacity | 450 kw |
| Flow | 2,650 m³/h |
| Head pressure | 42 m |
| Pump efficiency specifications | 63.3% |




Proposal on the introduction of pumps

(Figure 4-45. Overview of proposal on updates to pumps in the Cau Do Level 2 Pumping Station)

| Option 1 | | Option 2 | |
|---|---|---|---|
| 6 new pumps (without inverter), 2 back-up pumps<br>Introduction of new inverters for all 6 pumps | | 6 new pumps (without inverter), 1 back-up pump<br>Use of existing inverters in 4 pumps | |
| Motor capacity | 500 kw | Motor capacity | 439 kw |
| Flow | 3,000 m³/h | Flow | 2,800 m³/h |
| Head pressure | 45 m | Head pressure | 45 m |
| Pump efficiency specifications | ≧86% | Pump efficiency specifications | ≧86% |

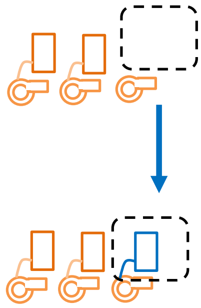
<u>Details of revised proposal 5</u>

As shown in Figure 4-46, there are three pumps at the new San Bay Level 2 Pumping

Station; however, inverters have already been introduced in two of these pumps. This proposal is not intended for updating pumps, but to newly introduce an inverter to the one pump that does not have an inverter.

Current pumps

| 3 existing pumps (2 pumps with inverters) | | |
|---|---|---|
| | 2 pumps (with inverter) | 1 pump (without inverter) |
| Motor capacity | 200 kw | 200 kw |
| Flow | 1,400 $m^3$/h | 1,400 $m^3$/h |
| Head pressure | 35 m | |
| Pump efficiency specifications | | |



Proposal details

(Figure 4-46. Overview of proposal on the introduction of inverters in the new San Bay Level 2 Pumping Station)

| Continued use of 3 existing pumps | | |
|---|---|---|
| | 2 existing pumps (continued use with existing inverters) | 1 existing pump (new introduction of inverter) |
| Motor capacity | 200 kw | 200 kw |
| Flow | 1,400 $m^3$/h | 1,400 $m^3$/h |
| Head pressure | 35 m | |
| Pump efficiency specifications | | |

<u>Technical recommendations from Ebara Vietnam</u>

On 6 November (Friday), engineers from Ebara Vietnam took part in the survey and carried out technical consultations again with DAWACO and the Japan study team.

The study confirmed that the above-mentioned revised proposals 1 and 3, which are relatively cost-effective from the perspective of initial investment and $CO_2$ emission reductions, will be developed as proposals for JCM technical assistance from the Ministry of the Environment next fiscal year.

Ebara Vietnam took options 1 and 2 of revised proposal 1 and options 1 and 2 of revised proposal 3 and conducted a technical examination of these options.

Technical proposals for each of these options were submitted to DAWACO in December, as shown in Figure 4-47 for proposal 1 and Figure 4-48 for proposal 3 (Some changes were made to pump specifications, etc.)

In response to this, technical consultations were carried out between DAWACO and the Japan study team on 6 January (Wednesday), 2016 during the final field visit, which also included the participation of Yokohama and Ebara Vietnam. Consultations were carried out on the application for technical assistance from the Ministry of the Environment in the next fiscal year, based on Ebara Vietnam's Technical Proposal for Option 2 in the old Cau Do Level 1 Pumping Station and Ebara Vietnam's Technical Proposal for Option 2 in the Cau Do Level 2 Pumping Station.

(Figure 4-47. Specifications for the new introduction of pumps in the old Cau Do Level 1 Pumping Station by Ebara Vietnam)

| | Existing Pump | Ebara Vietnam Technical Proposal for Option 1 | Ebara Vietnam Technical Proposal for Option 2 |
|---|---|---|---|
| Pump Model | HS450×350×440 | 600×500 CHMN<br> | 450×400 CFMN<br> |
| Number | 3 | 2 | 3 |
| Manufacturer | Russia maker(1977), Vihem Motor (2008) | Ebara | Ebara |
| Maintenance | No alternatives or must be imported | − Alternatives are available as Ebara Vietnam has a local factory.<br>− Rapid after-sales technical support<br>− Easy to check and repair rotation section by opening the top of the casing. | |

| Specification values | | | |
|---|---|---|---|
| Flow | 1,000 $m^3$/h | 2,650 $m^3$/h | 1,200 $m^3$/h |
| Head pressure | 19 m | 16 m | 12 m |
| Motor capacity | 110 kw | 110 kw | 55 kw |
| Pump efficiency | 50.5% (2 pumps operating) | 86% | 83% (2 pumps operating) |
| Number of rotations | | 740 rpm | 990 rpm |
| Total power consumption per unit of time | 185 kw | 131 kw | 93 kw |
| Total capacity | 2,154 $m^3$/h | 2,600 $m^3$/h | 2,375 $m^3$/h |
| Power consumption per unit | 0.086 kw/$m^3$ | 0.051 kw/$m^3$ | 0.039 kw/$m^3$ |
| Water conveyance capacity (for 24-hour operations) | 51,696 $m^3$/day | 63,600 $m^3$/day | 57,000 $m^3$/day |
| Current situation | Cavitation, noise, vibration | Parallel operation at best point | |
| Operating conditions | Normal operation: 2 pumps + 1 backup pump | Normal operation: 2 pumps + 1 backup pump | Normal operation: 2 pumps + 1 backup pump |
| Update sites | | Pumps, electric motors, inlet pipes, priming systems, panel systems, inverters | Pumps, electric motors, pipe connectors |
| Maintenance periods | Replacement of a number of parts each year due to cavitation and corrosion | − Each year: Lubrication with lubricating oil, ground packing<br>− Every five years: Replace casing liner, shaft sleeve, packing sleeve | |
| Notes | | Initial investment is large due to the changes necessary for the new panel. | Recommended by Ebara |

(Figure 4-48. Specifications for the new introduction of pumps in the old Cau Do Level 2 Pumping Station by Ebara Vietnam)

| | Existing pump | Ebara Vietnam technical proposal for option 1 | Ebara Vietnam technical proposal for option 2 |
|---|---|---|---|
| Pump model | HS450×350×440 | 600×500 CHMN  | 450×400 CFMN  |
| Number of pumps | 6 | 6 | 6 |
| Manufacturer | Grundfos | Ebara | Ebara |
| Maintenance | No alternatives or must be imported | − Alternatives are available as Ebara Vietnam has a local factory.<br>− Rapid after-sales technical support<br>− Easy to check and repair rotation section by opening the top of the casing. | |
| Specification values | | | |
| Flow rate | 2,400 $m^3$/h | 2,800 $m^3$/h | 2,400 $m^3$/h |
| Head pressure | 42 m | 50 m | 52 m |
| Motor capacity | 450 kw | 500 kw | 450 kw |
| Pump efficiency | 63.3% (5 pumps operating) | 88% (4 pumps operating) | 86% (5 pumps operating) |
| Number of rotations | 1,450 rpm | 740 rpm | 990 rpm |
| Total power consumption per unit of time | 1,744 kw | 1,687 kw | 1,783 kw |
| Total capacity | 9,590 $m^3$/h | 11,200 $m^3$/h | 11,600 $m^3$/h |
| Power consumption per unit | 0.182 kw/$m^3$ | 0.151 kw/$m^3$ | 0.154 kw/$m^3$ |
| Water conveyance capacity (for 24-hour operations) | -170,000 $m^3$/day | -230,000 $m^3$/day (Operating 4 pumps for 15 hours) | -230,000 $m^3$/day |
| Current situation | Cavitation, noise, vibration | Parallel operation at best point | |
| Operating conditions | 2 stationary pumps + 3 VFD umps (with head pressure of 40 m) | 4 pumps running full speed (total head: 50 m) | 5 pumps running full speed (total head: 52 m) |
| Update sites | | Pumps, electric motors, pipe connectors, panel systems, inverters | Pumps, electric motors, pipe connectors |

| | | | |
|---|---|---|---|
| Maintenance period | Replacement of a number of parts each year due to cavitation and corrosion | – Each year: Lubrication with lubricating oil, ground packing<br>– Every five years: Replace casing liner, shaft sleeve, packing sleeve | |
| Notes | | Initial investment is large due to the changes necessary for the new panel and new inverters. | Recommended by Ebara |

<u>Setting specification values for proposed pumps in option 1 of the Ebara Technical Proposal for the old Cau Do Level 1 Pumping Station</u>

Pump performance characteristic curves (for one pump) are shown in Figure 4-49 for each of the pumps proposed by Ebara Vietnam in the Ebara Technical Proposal 1 for Option 1. An overview of settings for pump specification values are also shown below.

○Main Parameters

(Main pump)

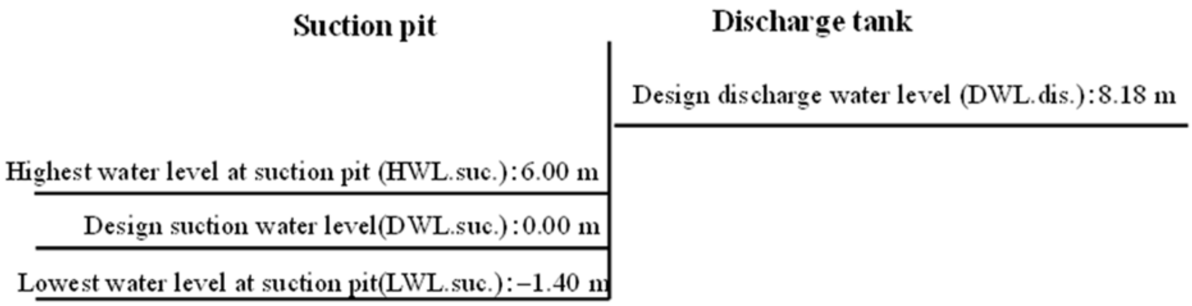
- Service: Suctioning raw water
- Total number of pumps: 2 (1 in constant operation)
- Pump capacity (Q): 44.17 $m^3$/min
- Pump efficiency (Etap)：86.0%
- Pump rotation: 740 rpm

(Pipes)

- Materials: Steel
- Suction diameter: 600 mm
- Discharge diameter: 500 mm

(Water levels)

- Pump floor position: 2.00 m
- Pump center line position: 2.19 m (=actual suction head (hs))




○Calculated data

(Head loss)

- Suction head loss (Hfsuc.):0.690 m
- Discharge head loss (Hfdis.):2.114 m

  ⇒Head loss (Hf)= Hfsuc.+ Hfdis.=2.804 m

(Actual lifting height)

- Actual design lifting height (Ha)=DWL.dis-DWL.sun=8.18 m
- Actual minimum lifting height (Hamin):2.18 m
- Actual maximum lifting height (Hamin):9.58 m

(Total lifting height)

Total lifting height (HT)=Hf+Ha=10.98m⇒(considering safety factors)16.0 m

(Shaft power)

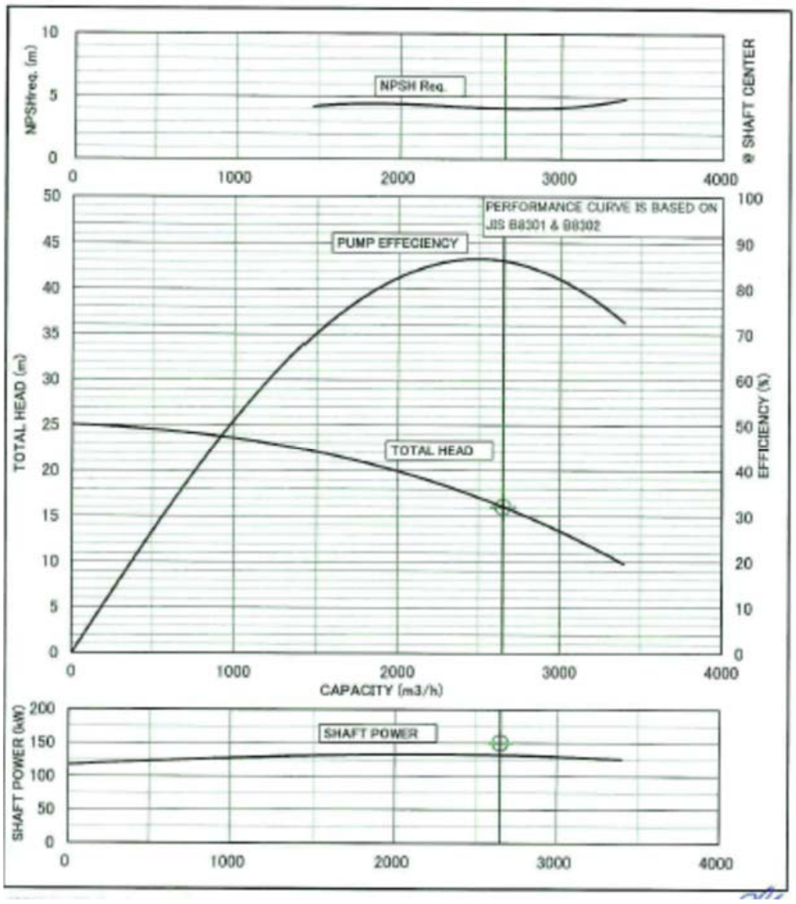
- Pump efficiency

  Shaft power (P)=0.163*(Q/60)*HT/Etap ⇒ ( considering safety factor of 10% ) 147.33kw⇒150kw

(Assessment of cavitation)

| | Design point | Actual minimum lifting height time |
|---|---|---|
| Atmospheric pressure (Hat) | 10.3 m | 10.3 m |
| Saturated vapor pressure (Hv) | 0.30 m | 0.30 m |
| Actual suction head (hs) | 2.19 m | –5.01 m |

| | | |
|---|---|---|
| Actual suction head loss (hfsuc.) | 0.69 m | 1.32 m |
| Safety factors (B) | 0.50 m | 0.50 m |
| Effective head (hsv)<br>= Hat–Hv–hs– hfsuc.–B | 6.62 m | 13.19 m |
| Required head (Hsv) | 4 m<br>(According to pump characteristic curve) | 4.5 m<br>(According to pump characteristic curve) |
| Assessment of cavitation | No issue with cavitation because hsv≧Hsv | No issue with cavitation because hsv≧Hsv |




(Figure 4-49. Pump performance characteristic curve in one proposed pump in the old Cau Do Level 1 Pumping Station (Ebara Vietnam Technical Proposal for Option 1))

<u>Setting specification values for proposed pumps in option 2 of the Ebara Technical Proposal for the old Cau Do Level 1 Pumping Station</u>

Pump performance characteristic curves (for one pump) are shown in Figure 4-50 and in Figure 4-51 for multiple pumps proposed by Ebara Vietnam in the Ebara Technical Proposal for Option 2. An overview of settings for pump specification values are also shown below.

○Main Parameters

(Main pump)

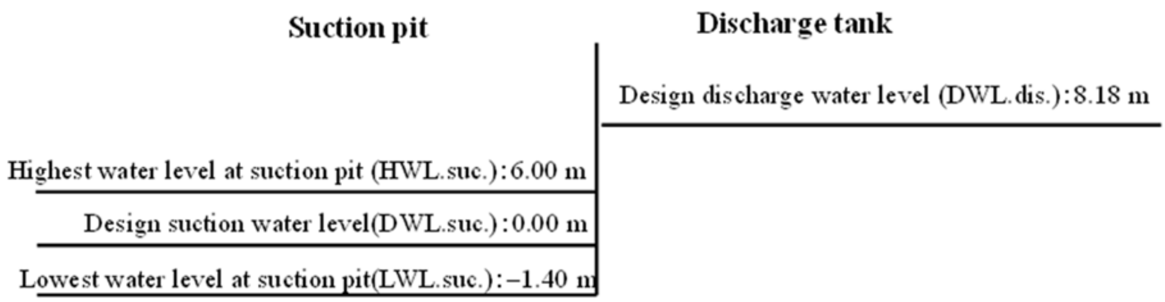
- Service: Suctioning raw water
- Total number of pumps: 3 (2 in constant operation)
- Pump capacity (Q): 40.00 $m^3$/min
- Pump efficiency (Etap)：83.0%
- Pump rotation: 990 rpm

(Pipes)

- Materials: Steel
- Suction diameter: 450 mm
- Discharge diameter: 400 mm

(Water levels)

- Pump floor position: 2.00m
- Pump center line position: 2.19 m (=actual suction head (hs))




○Calculated data

(Head loss)

- Suction head loss (Hfsuc.)：0.341 m
- Discharge head loss (Hfdis.)：0.723 m

  ⇒Head loss (Hf)= Hfsuc.+ Hfdis.=1.065 m

(Actual lifting height)

- Actual design lifting height (Ha)=DWL.dis-DWL.sun=8.18 m
- Actual minimum lifting height (Hamin)：2.18 m
- Actual maximum lifting height (Hamin)：9.58 m

(Total lifting height)

Total lifting height (HT)=Hf+Ha=9.24m⇒（considering safety factors）12.0 m

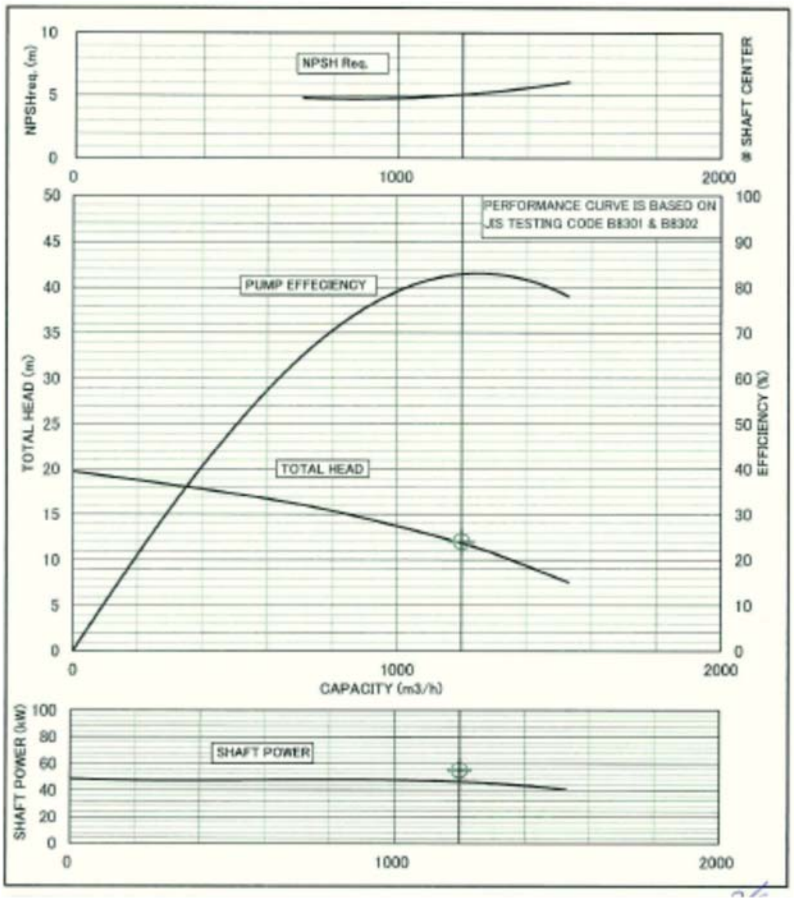
(Shaft power)

- Pump efficiency

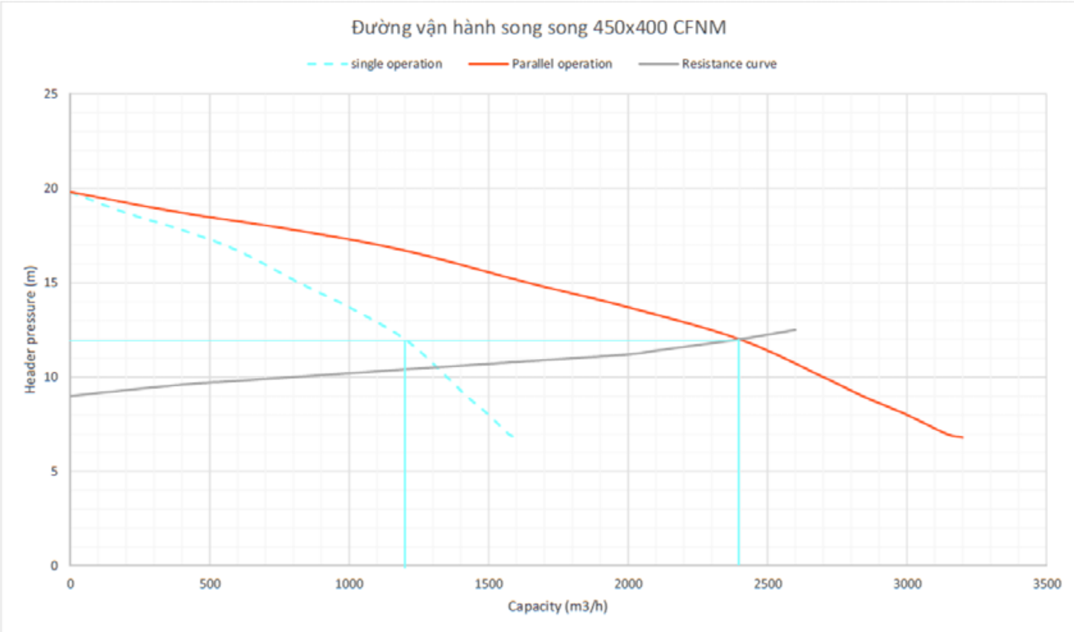
  Shaft power (P)=0.163*(Q/60)*HT/Etap⇒（considering safety factor of 10%）51.85kw ⇒55kw

(Assessment of cavitation)

| | Design point | Actual minimum lifting height time |
|---|---|---|
| Atmospheric pressure (Hat) | 10.3 m | 10.3 m |
| Saturated vapor pressure (Hv) | 0.30 m | 0.30 m |
| Actual suction head (hs) | 2.00 m | –4.00 m |
| Actual suction head loss (hfsuc.) | 0.34 m | 0.46 m |
| Safety factors (B) | 0.50 m | 0.50 m |
| Effective head (hsv)<br>= Hat–Hv–hs– hfsuc.–B | 7.16 m | 13.04 m |
| Required head (Hsv) | 5 m<br>(According to pump characteristic curve) | 5 m<br>(According to pump characteristic curve) |
| Assessment of cavitation | No issue with cavitation because hsv≧Hsv | No issue with cavitation because hsv≧Hsv |




(Figure 4-50: Pump performance characteristic curve in one proposed pump in the old Cau Do Level 1 Pumping Station (Ebara Vietnam Technical Proposal for Option 2))




（Figure 4-51. Pump performance characteristic curve in cases where multiple proposed pumps are running in the old Cau Do Level 1 Pumping Station (Ebara Vietnam Technical Proposal for Option 2)）

Setting specification values for pumps in option 1 of the Ebara Technical Proposal for the Cau Do Level 2 Pumping Station

Pump performance characteristic curves (for one pump) are shown in Figure 4-52 and in Figure 4-52 for multiple pumps proposed by Ebara Vietnam in the Ebara Technical Proposal for Option 1. An overview of settings for pump specification values are also shown below.

○Main Parameter

(Main pump)

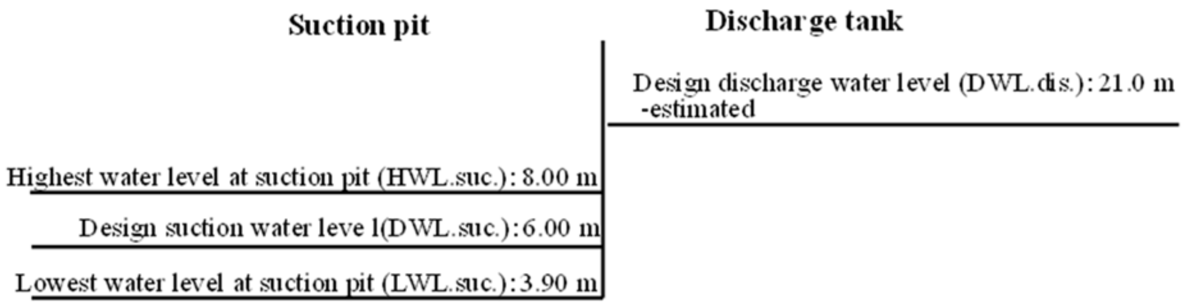
- Service: Supply of treated water
- Total number of pumps: 6 (4 in constant operation)
- Pump capacity (Q)：186.67 $m^3$/min
- Pump efficiency (Etap)：88.0%
- Pump rotation：740 rpm

(Pipes)

- Materials: Steel
- Suction diameter: 600 mm
- Discharge diameter: 450 mm

(Water levels)

- Pump floor position: 2.70m
- Pump center line position: 3.45 m (=actual suction head (hs))




○Calculated data

(Actual lifting height)

- Actual design lifting height (Ha)=DWL.dis-DWL.sun=15.00 m
- Actual minimum lifting height (Hamin)：13.00 m
- Actual maximum lifting height (Hamin)：17.10 m

(Total lifting height)

Total lifting height (HT)=Hf+Ha=43.7m⇒（considering safety factors）50.0 m

(Shaft power)

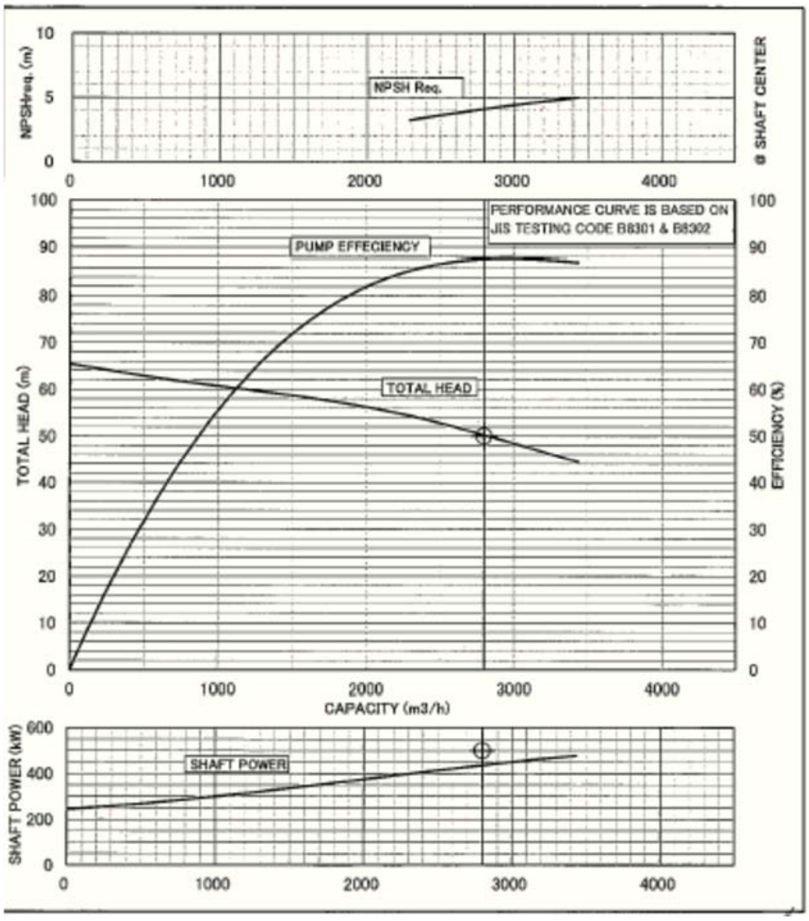
- Pump efficiency

  Shaft power (P)=0.163*(Q/60)*HT/Etap ⇒（considering safety factor of 10%）475.42kw⇒500kw

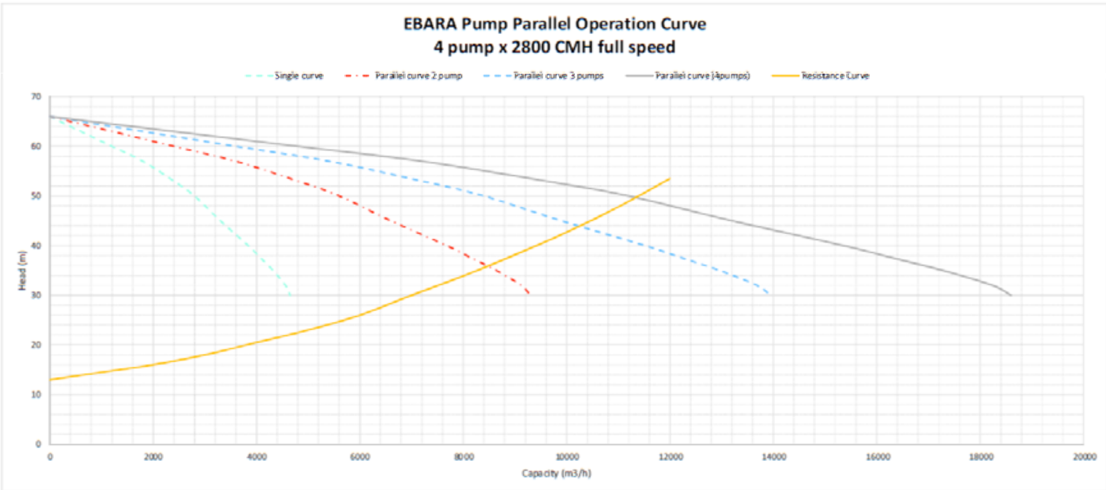
(Assessment of cavitation)

| | Design point | Actual minimum lifting height time |
|---|---|---|
| Atmospheric pressure (Hat) | 10.3 m | 10.3 m |

| | | |
|---|---|---|
| Saturated vapor pressure (Hv) | 0.30 m | 0.30 m |
| Actual suction head (hs) | −2.55 m | −4.55 m |
| Actual suction head loss (hfsuc.) | 1.37 m | 1.86 m |
| Safety factor (B) | 0.50 m | 0.50 m |
| Effective head (hsv) = Hat−Hv−hs− hfsuc.−B | 10.68 m | 12.19 m |
| Required head (Hsv) | 4 m (According to pump characteristic curve) | 5 m (According to pump characteristic curve) |
| Assessment of cavitation | No issue with cavitation because hsv≧Hsv | No issue with cavitation because hsv≧Hsv |




(Figure 4-52. Pump performance characteristic curve in one proposed pump in the Cau Do Level 2 Pumping Station (Ebara Vietnam Technical Proposal for Option 1))




（Figure 4-53. Pump performance characteristic curve in cases where multiple proposed pumps are running in the Cau Do Level 2 Pumping Station (Ebara Vietnam Technical Proposal for Option 1)）

Setting specification values for pumps in option 2 of the Ebara Technical Proposal for the Cau Do Level 2 Pumping Station

Pump performance characteristic curves (for one pump) are shown in Figure 4-54 and in Figure 4-55 for multiple pumps proposed by Ebara Vietnam in the Ebara Technical Proposal for Option 2. An overview of settings for pump specification values are also shown below.

○Main Parameters

(Main pump)

- Service: Supply of treated water
- Total number of pumps: 6 (5 in constant operation)
- Pump capacity (Q)：200.00 $m^3$/min
- Pump efficiency (Etap)：86.0%
- Pump rotation：990 rpm

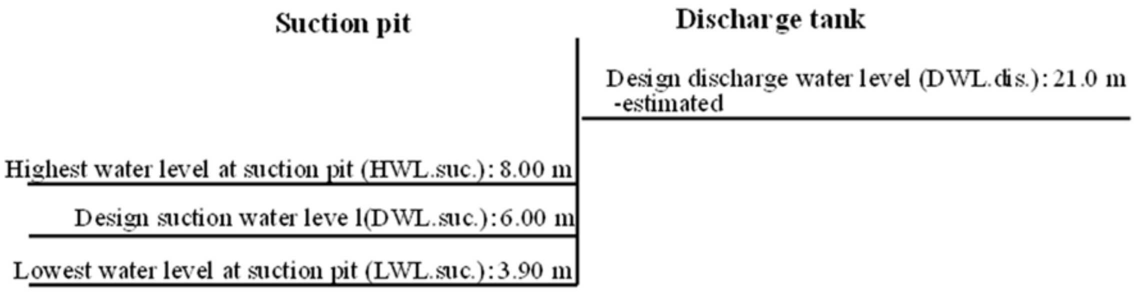
(Pipes)

- Materials: Steel
- Suction diameter: 500 mm

- Discharge diameter: 350 mm

(Water levels)

- Pump floor position: 2.70m
- Pump center line position: 3.45 m (=actual suction head (hs))




○Calculated data

(Actual lifting height)

- Actual design lifting height (Ha)=DWL.dis-DWL.sun=15.00 m
- Actual minimum lifting height (Hamin)：13.00 m
- Actual maximum lifting height (Hamin)：17.10 m

(Total lifting height)

Total lifting height) (HT)=Hf+Ha=51.00m⇒（considering safety factors）52.0 m

(Shaft power)

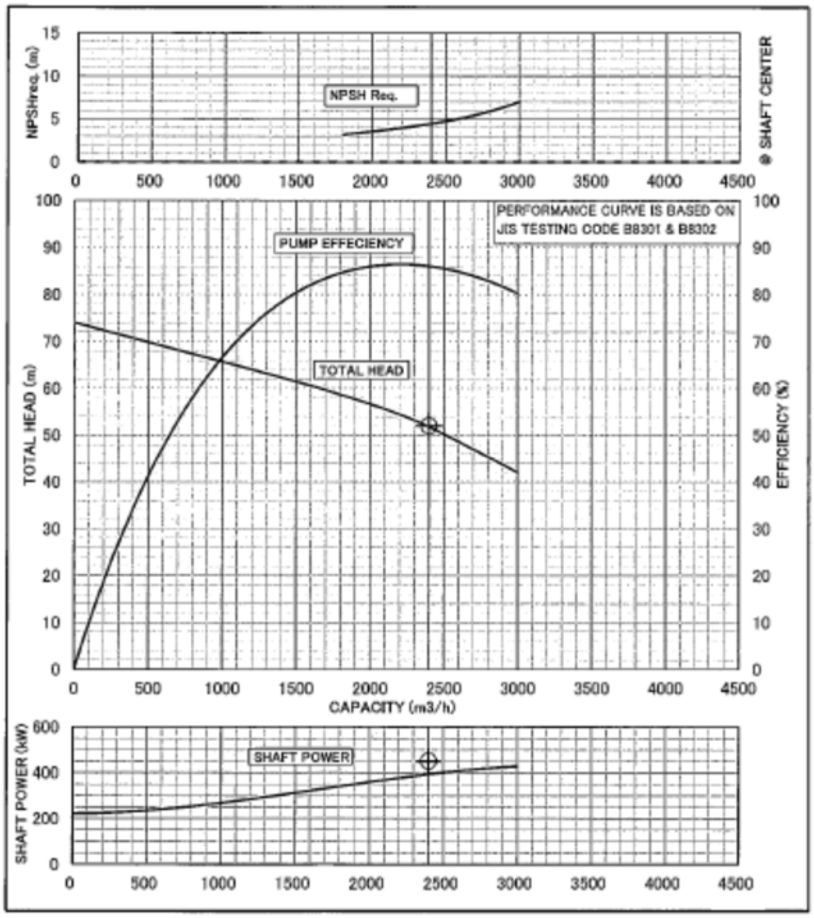
- Pump efficiency

  Shaft power (P)=0.163*(Q/60)*HT/Etap ⇒（considering safety factor of 10%）433.66kw⇒450kw

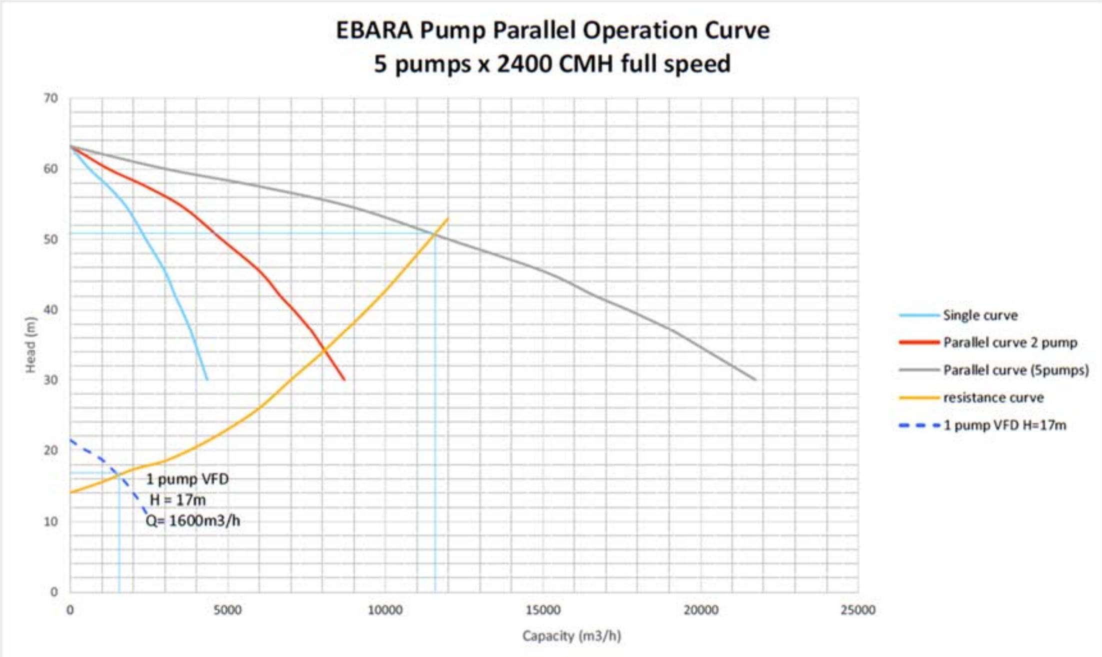
(Assessment of cavitation)

| | Design point | Actual minimum lifting height time |
|---|---|---|
| Atmospheric pressure (Hat) | 10.3 m | 10.3 m |
| Saturated vapor pressure | 0.30 m | 0.30 m |

| | | |
|---|---|---|
| (Hv) | | |
| Actual suction head (hs) | –2.55 m | –5.55 m |
| Actual suction head loss (hfsuc.) | 1.37 m | 1.86 m |
| Safety factor (B) | 0.50 m | 0.50 m |
| Effective head (hsv) = Hat–Hv–hs– hfsuc.–B | 10.68 m | 13.14 m |
| Required head (Hsv) | 5 m (According to pump characteristic curve) | 7 m (According to pump characteristic curve) |
| Assessment of cavitation | No issue with cavitation because hsv≧Hsv | No issue with cavitation because hsv≧Hsv |




(Figure 4-54. Pump performance characteristic curve in one proposed pump in the Cau Do Level 2 Pumping Station (Ebara Vietnam Technical Proposal for Option 2))




(Figure 4-55. Pump performance characteristic curve when newly introduced pumps from Ebara Vietnam are operating in parallel in the Cau Do Level 2 Pumping Station (Ebara Vietnam Technical Proposal for Option 2))

### 4.2.5 GHG emission reduction potential

**1. GHG emission reduction potential based on the current situation**

GHG emission reduction potential was calculated based on the current situation in which existing pumps in the Cau Do Level 1 Pumping Station and the Cau Do Level 2 Pumping Station are updated to pumps recommended by Ebara Vietnam. Calculations used the manufacturers' specification values for two energy benchmarks (pump efficiency and power consumption per unit).

<u>Calculations in the old Cau Do Level 1 Pumping Station</u>

Relevant data on the old Cau Do Level 1 Pumping Station is shown in Figure 4-56 and the results of calculations for emission reductions based on the current situation are shown in Figure 4-57.

(Figure 4-56. Relevant data on the old Cau Do Level 1 Pumping Station)

| | | Data | Unit | Notes |
|---|---|---|---|---|
| Current amount of power consumed | $PC_{current}$ | 981 | MWh/y | Data from DAWACO (average from 2013-2015 (to August) |
| Specification values for existing pump efficiency | $\eta_{exist\text{-}spec}$ | 50.5 | % | Materials from Ebara Vietnam |
| Specification values for power consumption per unit of existing pump efficiency | $SPC_{exist\text{-}spec}$ | 0.086 | $kwh/m^3$ | Materials from Ebara Vietnam |
| Specification values for pump efficiency of new pumps (pumps recommended by Ebara) | $\eta_{new\text{-}spec}$ | 83.0 | % | Materials from Ebara Vietnam |
| Current specification values for power consumption per unit of new pumps (pumps recommended by Ebara) | $SPC_{new\text{-}spec}$ | 0.036 | $kwh/m^3$ | Materials from Ebara Vietnam |
| Grid power emission factors in Viet Nam | $EF_{CO2,grid}$ | 0.5408 | $tCO_2/MWh$ | Viet Nam MONRE |

(Figure 4-57. Relevant data on old Cau Do Level 1 Pumping Station)

| | When using pump efficiency as benchmark | When using power consumption per unit as benchmark |
|---|---|---|
| Current emissions [$tCO_2$/year] | $PC_{current}$ * $EF_{CO2,grid}$<br>=981 * 0.5408<br>= 531 | $PC_{current}$ * $EF_{CO2,grid}$<br>=981 * 0.5408<br>= 531 |
| Power saved as result of pump updates [MWh/year] | $PC_{current}$ *(1-$\eta_{exist\text{-}spec}$ /$\eta_{new\text{-}spec}$)<br>=981 *(1- 50.5/83.0)<br>=341 | $PC_{current}$*(1-$SPC_{new\text{-}spec}$/ $SPC_{exist\text{-}spec}$)<br>=981 *(1- 0.036/0.086)<br>=570 |
| Emission reductions as result of pump updates [$tCO_2$/year] | $PC_{current}$*(1-$\eta_{exist\text{-}spec}$/$\eta_{new\text{-}spec}$)* $EF_{CO2,grid}$<br>=981 *(1- 50.5/83.0)*0.5408<br>=207 | $PC_{current}$*(1-$SPC_{new\text{-}spec}$/$SPC_{exist\text{-}spec}$)* $EF_{CO2,grid}$<br>=981 *(1- 0.036/0.086) *0.5408<br>=308 |

Cau Do Level 2 Pump Station

Relevant data on the Cao Do Level 2 Pumping Station is shown in Figure 4-58 and the results of calculations for emission reductions based on the current situation are shown in Figure 4-59.

(Figure 4-58. Relevant data on Cau Do Level 2 Pumping Station)

| | | Data | Unit | Notes |
|---|---|---|---|---|
| Current amount of power consumed | $PC_{current}$ | 6,610 | MWh/y | Data from DAWACO (Average from 2013-2015 (up to August)) |
| Specification values for existing pump efficiency | $\eta_{exist\text{-}spec}$ | 63.3 | % | Materials from Ebara Vietnam |
| Specification values for power consumption per unit for existing pump efficiency | $SPC_{exist\text{-}spec}$ | 0.182 | $kwh/m^3$ | Materials from Ebara Vietnam |
| Specification values for pump efficiency of new pumps (pumps recommended by Ebara) | $\eta_{new\text{-}spec}$ | 86.0 | % | Materials from Ebara Vietnam |
| Specification values for power consumption per unit of new pumps (pumps recommended by Ebara) | $SPC_{new\text{-}spec}$ | 0.154 | $kwh/m^3$ | Materials from Ebara Vietnam |
| Grid power emission factors in Viet Nam | $EF_{CO2,grid}$ | 0.5408 | $tCO_2/MWh$ | Viet Nam MONRE |

(Figure 4-59. Relevant data on the old Cau Do Level 2 Pumping Station)

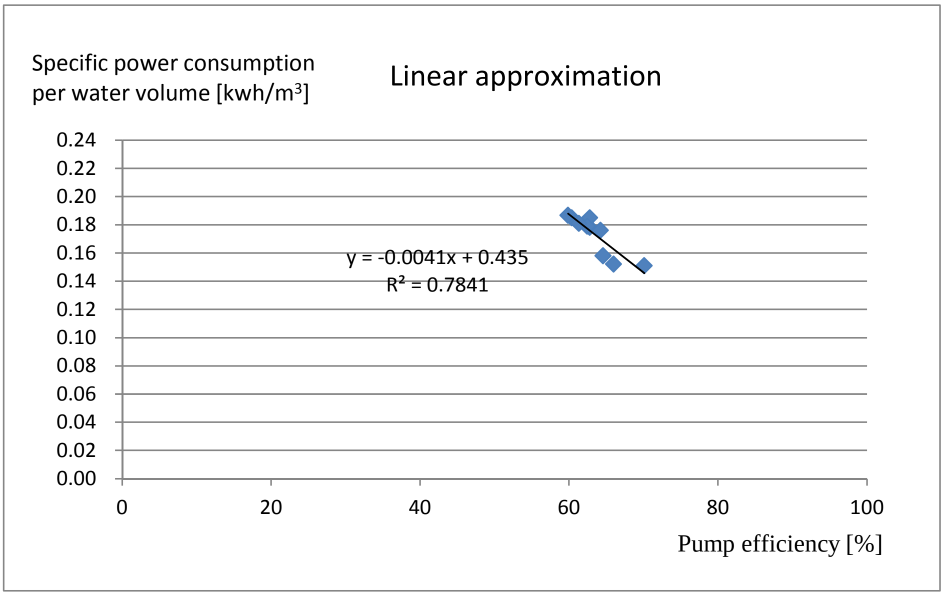
| | When using pump efficiency as benchmark | When using power consumption per unit as benchmark |
|---|---|---|
| Current emissions [$tCO_2$/year] | $PC_{current}$ * $EF_{CO2,grid}$<br>=6,610 * 0.5408<br>= 3,575 | $PC_{current}$ * $EF_{CO2,grid}$<br>=6,610 * 0.5408<br>= 3,575 |
| Power saved as result of pump updates [MWh/year] | $PC_{current}$ *(1-$\eta_{exist\text{-}spec}$ /$\eta_{new\text{-}spec}$)<br>=6,610 *(1- 63.3/86.0)<br>=1,744 | $PC_{current}$*(1-$SPC_{exist\text{-}spec}$/ $SPC_{exist\text{-}spec}$)<br>=6,610*(1- 0.154/0.182)<br>=1,017 |
| Emission reductions as | $PC_{current}$*(1-$\eta_{exist\text{-}spec}$/$\eta_{new\text{-}spec}$)*<br>$EF_{CO2,grid}$ | $PC_{current}$*(1-$SPC_{exist\text{-}spec}$/$SPC_{exist\text{-}spec}$)*<br>$EF_{CO2,grid}$ |

| | | |
|---|---|---|
| a result of pump updates [$tCO_2$/year] | =6,610 *(1- 63.3/86.0)*0.5408 =1,016 | =6,610*(1- 0.154/0.182)*0.5408 =550 |

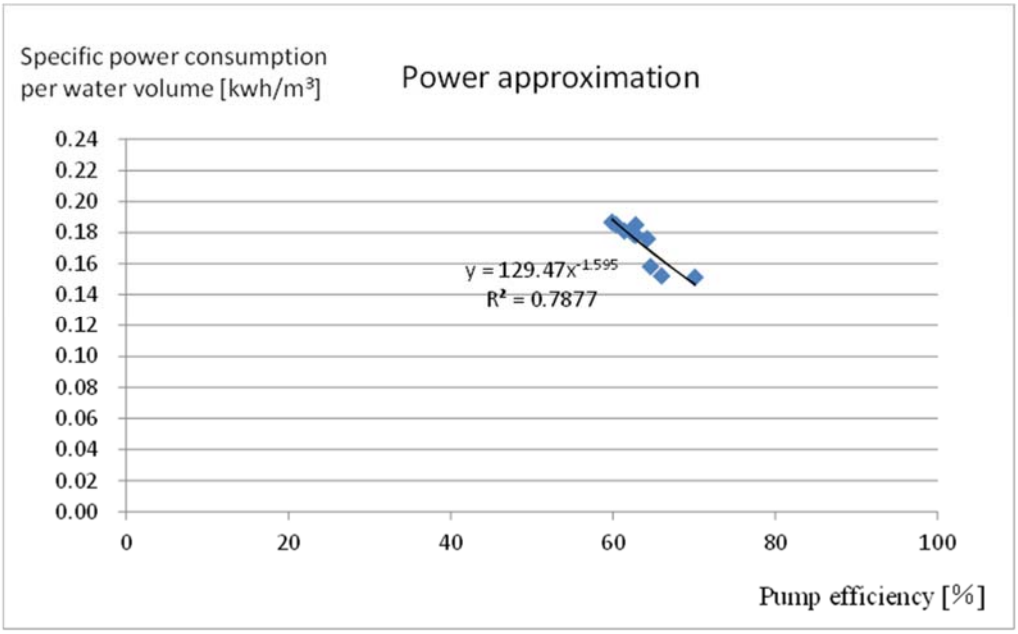
Comparison of two energy benchmarks

The correlation between power consumption per unit and pump efficiency can be shown based on historical data of the Cau Do Level 2 Pumping Station.

This correlation can be seen in two examples: linear regression and power regression. The results of correlation through linear regression of pump efficiency and power consumption per unit is shown in Figure 4-60, and the results of correlation through power approximation of pump efficiency and power consumption per unit is shown in Figure 4-61. In both cases, the contribution rate (=sure of the correlation coefficient) is also high at 78% and higher.




(Figure 4-60. Correlation with linear approximation of pump efficiency and power consumption per unit)




(Figure 4-61. Correlation with power approximation of pump efficiency and power consumption per unit)

**2. Calculation method for GHG emission reductions from reference values**

Many of the JCM methodologies that have been approved to date include projects in which the key reference energy consumption rate (benchmark) is easy to set (COP values in air conditioning and refrigeration, light emitting efficiency (lm/W) in LED lighting, etc.). However, the key energy consumption rate for pumps is believed to be the amount of power consumed per unit of water (kWh/m3). In this case, it is extremely difficult to quantify this to reflect actual situations since power consumption is also greatly affected by conditions in the water treatment plants in which multiple pumps will be replaced (position and lifting height for water conveyance, pipe diameter and resistance, controls for the number of pump and operation of inverters for fluctuations in water demand).

Here, a basic formula is shown in cases that are based on the use of power consumption per unit [kwh/m$^3$] and pump efficiency [%] as energy benchmarks.

Basic formula for emission reductions in cases where power consumption per unit is the benchmark (Calculation option 1)

$ER_p = RE_p - PE_p$

$RE_{RE} = PC_p * (SPC_{RE} / SPC_p) * EF_{CO2,grid} / 1000$

$PE_p = PC_p * EF_{CO2,grid}/1000$

$SPC_p = PC_p * 1000 / Q_p$

Here:

| | | |
|---|---|---|
| $Q_p$ | Quantity of water supply in period p | $m^3/p$ |
| $SPC_{RE}$ | Reference power consumption per unit | $kwh/m^3$ |
| $SPC_p$ | Power consumption per unit in period p | $kwh/m^3$ |
| $EF_{CO2,grid}$ | Grid power emission factor | $tCO_2/MWh$ |
| $PC_p$ | Power consumption in period p | kWh/p |

The following two options are assumed to be the specified methods for power consumption per unit as the energy benchmark.

- Calculation option 1-1: Method that directly applies the reference power consumption per unit (SPCRE) and the project power consumption per unit (SPCp） as the manufacturer’s specification value.
- Calculation option 1-2: Method that conservatively adjusts the reference power consumption per unit (SPCRE) and project power consumption per unit (SPCp) without directly applying the manufacturer’s specification value.

<u>Basic formula for emission reductions in cases where pump efficiency is the benchmark (Calculation option 2)</u>

The following formula is used when pump efficiency (%) can be relatively easily obtained from the pump manufacturer and used as the energy benchmark.

$ER_p = RE_p – PE_p$

$RE_p = PC_p * (\eta_p/\eta_{RE}) * EF_{CO2,grid}/1000$

$PE_p = PC_p * EF_{CO2,grid}/1000$

Here:

| | | |
|---|---|---|
| $Q_p$ | Quantity of water supplied in period p | $m^3/p$ |
| $\eta_{RE}$ | Reference pump efficiency | % |
| $\eta_p$ | Project pump efficiency | % |
| $EF_{CO2,grid}$ | Grid power emission factor | $tCO_2/MWh$ |
| $PC_p$ | Power consumption in period p | kWh/p |

The following two options are assumed to be the specified methods for pump efficiency as the energy benchmark.

- Calculation option 2-1: Method that directly applies the reference pump efficiency ($\eta_{RE}$) and project pump efficiency ($\eta_p$) as the manufacturer's specification value.
- Calculation option 2-2: Method that conservatively adjusts the reference pump efficiency ($\eta_{RE}$) and project pump efficiency ($\eta_p$) without directly applying the manufacturer's specification value.

Setting the benchmark value using on the manufacturer's specification value (Calculation options 1-1 and 2-1)

The reference and project benchmarks can be fixed as set values before the start of the project by directly adjusting the manufacturer's specification value. Therefore, the monitoring item is only the amount of power consumed（$PC_p$）after the implementation of the project. The advantages and disadvantages of this calculation method are as follows.

Advantages: The calculation method is simple and reduces the work that must be done by the project members.

Disadvantages: In the area of water supply, there are various factors that can affect power consumption and efficiency, including factors that are on a case-by-case basis, such as actual lifting height and pipe resistance, as well as control of flow rates by adjusting the number of pump and inverters used in accordance with water demand. With updates to pumps, the amount of actual power-saving effects and improvement levels of efficiency cannot be expressed by comparing the manufacturer's specification values. In particular, this method has a decidedly low level of accuracy in the following cases (although it depends on the settings for reference benchmark values), and there is a significant possibility that effects will be overestimated.

- If the difference between the manufacturer's specification values and the measured values are large
- System in which an inverter has been introduced (overall energy efficiency of the system is highly dependent on factors other than pump performance.)
- Systems in which water demand fluctuations are large, in particular.

Measurement methods for benchmarks in calculation option 1-2

As mentioned above, there is a possibility that effects will be overestimated in calculation options 1-1 and 1-2. This formula is a conservative calculation method.

When power consumption in the project（$PC_p$）and water supply amount（$Q_p$）are used as the monitoring items after project implementation, the power consumption per unit（$SPC_p$）in the project is calculated as follows.

$SPC_p = PC_p / Q_p$

To find the current power consumption per unit ($SPC_{hist}$), the power consumption ($PC_{hist}$) and water supply quantity ($Q_{hist}$) are calculated as follows on the basis of actual measured values.

$SPC_{hist} = PC_{hist} / Q_{hist}$

The following calculation is used to find the reference power consumption per unit ($SPC_{RE}$) based on the manufacturer's specification value for power consumption per unit of pumps introduced in the project, by considering the level of divergence between the manufacturer's specification value for existing pumps ($SPC_{cur\text{-}spec}$) and actual past measurements ($SPC_{hist}$), and the level of divergence between the manufacturer's specification value of pumps introduced in the project ($SPC_{PJ\text{-}spec}$) and actual measured values ($SPC_p$).

$SPC_{RE} = SPC_{RE\text{-}spec} * \text{Min}\ \{1, (SPC_p / PC_{PJ\text{-}spec}) / (SPC_{hist} / SPC_{cur\text{-}spec})\}$

Here:

| | | |
|---|---|---|
| $Q_p$ | Quantity of water supplied in period p | $m^3/p$ |
| $PC_p$ | Amount of power consumed in period p | MWh/p |
| $SPC_p$ | Power consumption per unit in period p | $kwh/m^3$ |
| $SPC_{PJ\text{-}spec}$ | Manufacturer's specification value for power consumption per unit of pumps introduced in the project | $kwh/m^3$ |
| $Q_{hist}$ | Past amount of water supplied yearly | $m^3/y$ |
| $PC_{hist}$ | Past amount of power consumed yearly | MWh/y |
| $SPC_{hist}$ | Past power consumption per unit | $kwh/m^3$ |
| $SPC_{cur\text{-}spec}$ | Manufacturer's specification value for power consumption per unit for existing pumps | $kwh/m^3$ |
| $SPC_{RE}$ | Power consumption per unit for reference pumps | $kwh/m^3$ |

| | | |
|---|---|---|
| $SPC_{RE\text{-}spec}$ | Specification values of power consumption per unit for reference pumps | kwh/$m^3$ |

<u>Measurement methods for benchmarks in calculation option 2-2</u>

This calculation method is similar to calculation option 1-2. However, when power consumption ($PC_p$), quantity of water supply ($Q_p$), and total lifting height ($H_p$) are used as the monitoring items after project implementation, the power consumption per unit ($\eta_p$) in the project is calculated as follows.

$\eta_p=\rho*g*Q_p*H_p/1000/3600/PC_p$

To find current pump efficiency ($\eta_{hist}$), power consumption ($PC_{hist}$) and quantity of water ($Q_{hist}$) are calculated as follows based on actual measured values.

$\eta_{hist}=\rho*g*Q_{hist}*H_{hist}/3600/PC_{hist}$

The following calculation is used to find the reference pump efficiency ($\eta_{RE}$) based on the manufacturer's specification value for pump efficiency of pumps introduced in the project, by considering the level of divergence between the manufacturer's specification value for existing pumps ($\eta_{cur\text{-}spec}$) and actual past measurements ($\eta_{hist}$), and the level of divergence between the manufacturer's specification value of pumps introduced in the projects ($\eta_{PJ\text{-}spec}$) and actual measured values ($\eta_p$).

$\eta_{RE} = \eta_{RE\text{-}spec}*Max\{1, (\eta_p/\eta_{PJ\text{-}spec} )/( \eta_{hist}/\eta_{cur\text{-}spec})\}$

Here:

| | | |
|---|---|---|
| $Q_p$ | Quantity of water supplied in period p | $m^3$/p |
| $PC_p$ | Amount of power consumed in period p | MWh/p |
| $H_p$ | Total lifting height in period p (average value) | m |
| $\eta_p$ | Pump efficiency in period p | Non-dimension |
| $\eta_{PJ\text{-}spec}$ | Manufacturer's specification value for pump efficiency of pumps introduced in the project | Non-dimension |
| $Q_{hist}$ | Past amount of water supplied yearly | $m^3$/y |
| $PC_{hist}$ | Past amount of power consumed yearly | MWh/y |
| $H_p$ | Past yearly average of all lifting heights | m |
| $\eta_{hist}$ | Past power consumption per unit | Non-dimension |
| $\eta_{cur\text{-}spec}$ | Manufacturer's specification value for pump efficiency of existing pumps | Non-dimension |
| $\eta_{RE}$ | Pump efficiency of reference pumps | Non-dimension |

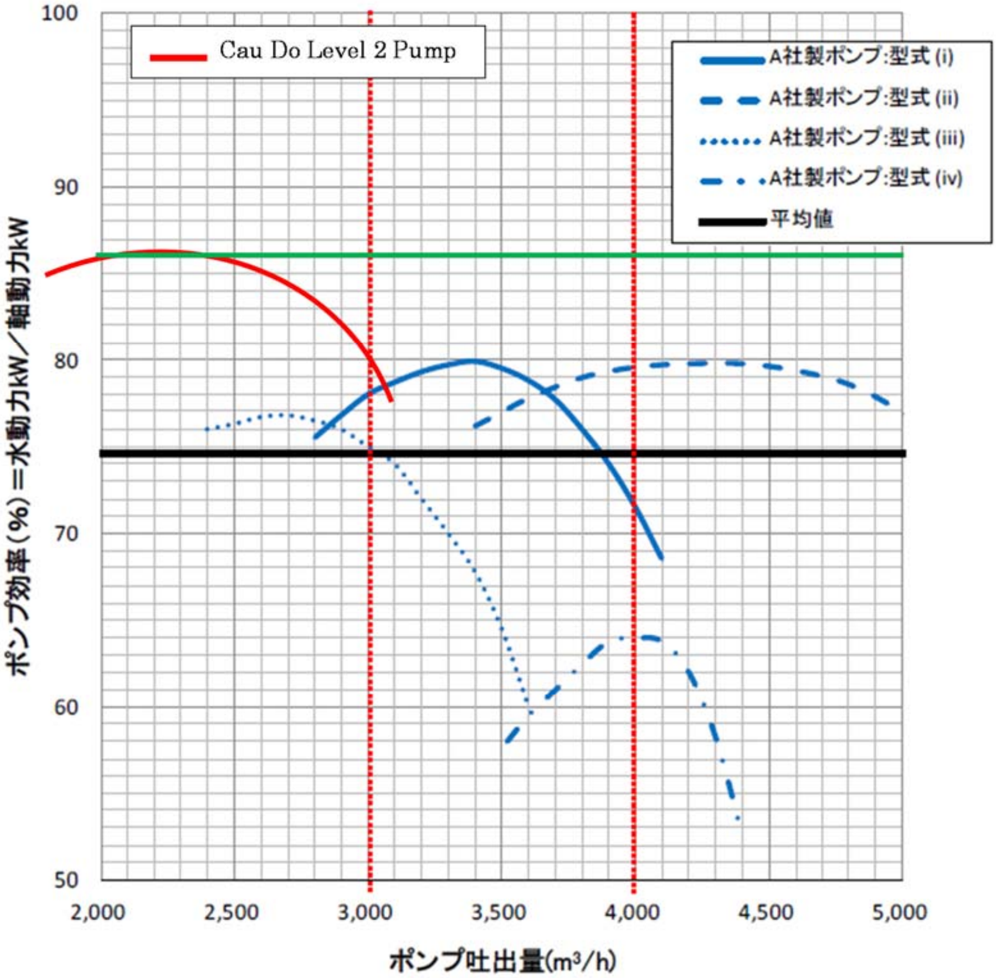
| | | |
|---|---|---|
| $\eta_{RE\text{-}spec}$ | Specification values for pump efficiency of reference pumps | Non-dimension |

Estimated values of GHG emissions from reference values (for calculation option 2-1)

As shown in Figures 4-47 and 4-48, pump efficiency in the old Cau Do Level 1 Pumping Station and the Cau Do Level 2 Pumping Station are 83% and 86%, respectively, according to specification values of new pumps recommended by Ebara Vietnam. Here, the reference pump efficiency for both the old Cau Do Level 1 Pumping Station and the Cau Do Level 2 Pumping Station has been set at 75% in a FY 2014 JCM Feasibility Study on "Energy savings through the introduction of high-efficiency pumps for irrigation."

In four pump models of manufacturers that have a high market share in Viet Nam (any pump model that has been generally introduced in existing facilities), the average maximum efficiency of each pump has been set at a flow rate of 3,000 to 4,000 $m^3$/h. (Figure 4-62 references a pump efficiency index figure (performance curve) for reference pumps in the report described, and adds the pump efficiency performance curve for pumps in option 2 of the Cau Do Level 2 Pumping Station in the figure.)

If using option 2-1 in the calculation methods (pump efficiency set as benchmark and only manufacturer specification values identified), $CO_2$ emission reductions are estimated as 1180 $tCO_2$/year at the old Cau Do Level 1 Pumping Station and 481 $tCO_2$/year at the Cau Do Level 2 Pumping Station.




出典：平成 26 年度 JCM 実現可能性調査「灌漑用高効率ポンプ導入による省エネルギー」報告書詳細版…引用

(Figure 4-62. Comparison of pump efficiency performance curves of reference pumps and pumps in option 2 at the Cau Do Level 2 Pumping Station)

## 4.3 Budgetary provisions

In the development of JCM model projects, even if local partners take a strong stance towards technical assistance projects, it is important to confirm risks at an early stage, including poor financial infrastructure and the inability to make budgetary provisions. In this study, discussions have been carried out with DAWACO about investment capacity several times since the first mission, and the project team has been able to confirm that a strong financial base is in place.

Activity 2-1:

First, the study team confirmed investment capability with executives and accounting personnel at DAWACO through studies and activities. In carrying out a number of question and answer sessions on DAWACO's financial base, the study team found that DAWACO is prepared to self-finance the project.

Activity 2-2:

Next, the study team clarified the potential to update pumps without the need for additional financing support measures, in consideration of cooperation from pump suppliers, the self-financing capacity of DAWACO, and the price of pumps, and if the subsidy rate of the JCM technical assistance is about 40% or higher. Calculations included laying costs and value-added taxes based on the reference values from the pump suppliers.

Activity 2-3:

In cases where updates to pumps are carried out using JCM technical assistance and with self-financing, it will be necessary to have reports on pump technical specifications and reports on creating funds, including prices, Memorandums of Understanding between DAWACO and pump companies, and Memorandums of Understanding between DAWACO and JCM project representative companies. (For more information, see "Characteristic Issues & Solutions through Waterworks Corporation Projects" below.)

In addition, the subsidy rate of the JCM technical assistance project is a maximum of 50%, and the study team has obtained the understanding of DAWACO to share information if the situation changes depending on the overall budget, number of JCM technical assistance projects, and potential for country bias in the development of proposed projects under the JCM technical assistance project.

## 4.4 Characteristic Issues and Solutions through Waterworks Projects

In order to effectively tie JCM feasibility studies to actual project development through intercity cooperation, it is essential to confirm topic management and solutions with the common understanding of Da Nang City, Yokohama City, and businesses in procedures when applying to JCM technical assistance projects for water supply and public facilities.

The water supply area, which is the target of this study, is an area that normally requires the involvement of municipal governments. In Da Nang, water supply is managed by the Danang Water Supply One Member Limited Company (DAWACO). For this reason, it is important to seek alternative plans for proposals for technical assistance projects, such as an understanding of local public procurement systems, as well as simplified tendering processes and direct nominations in cases that require tenders.

In fact, when looking at the technical assistance projects that were adopted in FY 2015, there are there are many project proposals involving the private sector. One of the reasons why there are so few public projects is that it is difficult to confirm and reach a consensus on procedural processes. In project feasibility studies in areas that require the involvement of the local government, not only water, but also waste, there are often clear challenges when the projects reach the technical assistance stage. This study carried out a preliminary examination of measures with the aim to clarify the public survey process in Viet Nam and ensure a smooth basis for the preparation of a technical assistance project to solve, rather than set aside, issues that are a unique part of public projects, such as tendering.

■ Public procurement in Viet Nam

In Viet Nam, the “New Law on Tendering” (No. 43/2013/QH13 on Tendering) came into effect in January 2014. Through the enactment of this law, other laws on tendering, as well as laws related to public tendering for construction, were also revised (No. 16/2003/QH11). Major changes in the New Law on Tendering are below (GIDE Loyrette Nouel 2014):

- The law targets consulting services, services other than consulting services, procurement projects, and public projects with 30% or more funding from the national government within the total amount of the project.
- Cases in which total investment with funds from national or state-owned enterprises (defined as domestic capital of 50% or more) is 30% or less, but the total investment is more than VND 500 billion (equivalent to USD 2.4 billion).

However, there are exceptions in the law related to tendering mentioned above:

- National emergencies resulting in force majeure
- Cases where there is a need for procurement through a direct nomination because it is necessary due to state secrets, technology compatibility, or copyright
- Cases where procurement of public products and services is below an amount specified by the government
- Civil engineering designs by architects that have received awards for designs
- Transfer of infrastructure facilities in which the purpose of land acquisition has already been determined.

Incidentally, contents that were exceptions to the tendering process where contractors were appointed directly by foreign donors have been deleted, and direct nomination is now possible only in the following cases.

- Cases in which a single investor is the only one involved in the implementation of the project
- Cases in which project proposals are made by a single investor because of intellectual property rights, business confidentiality, or in the context of financial arrangements.
- Cases in which an investor has proposed a feasible project, which can be carried out with high efficiency in accordance with government regulations.

■ Public procurement in Da Nang

Next, the study referenced public tendering in Da Nang. Public procurement in Da Nang is carried out using a basic tendering process, with the same exceptions mentioned above. The procedure for public procurement in Da Nang is outlined below. To take part in the process, it is necessary to have a Letter of Intent (with technical requirements attached) about the items for procurement, as well as an estimate for these items.

- Steps in the procedure for public procurement
  - Step 1: The organization that wishes to carry out procurement submits information related to the procurement item and the price estimate for the procurement item in letter form to Da Nang (Department of Finance).
  - Step 2: A request for approval is submitted by the department head(s) of coordinating departments (special departments that coordinate standards and regulations, existing facilities and guideline documents, etc.).
  - Step 3: A request for consideration of approval is submitted to DPC with respect to approval for procurement items.

This process takes approximately one and a half months (about 30 business days) to receive a judgement from the DPC. There are no fees for this process because there are no particular forms required. Applicants can prepare documents, including the above points, in any format.

- Base for public procurement procedures

  The following procedures conform to the decisions of the national government.
  - Decision No 170/2006 / QD-TTg dated 18/07/2006 of the Prime Minister issued regulations standards, norms and vehicle equipment work of agencies and officials and public servants government;
  - Decision No 59/2007 / QD-TTg dated 07/5/2007 of the Prime Minister issued regulations standards, norms and management mode, used vehicles in state agencies, units public service, state companies;
  - Decision No 57/2008 / QD-Committee dated 15/12/2008 of People's Committee of Da Nang city enacted regulations decentralization of state management of state property in the administrative offices, the business units up, assets are established on state ownership in the city of Da Nang.
  - Decree 03 /2015/QĐ-UBND on public procurement

- Confirmation and agreement for JCM technical assistance projects related to updates to DAWACO pumps

Over the course of examining laws and procedures related to public procurement and tendering in Da Nang, Viet Nam, the study team confirmed the possibility of direct nomination in certain cases. In this case, the investment by DAWACO for updates to pumps for the proposal for JCM technical assistance will not exceed “cases in which total investment with funds from national or state-owned enterprises (defined as domestic capital of 50% or more) is 30% or less, but the total investment is more than VND 500 billion (equivalent to USD 2.4 billion),” as stipulated in the “New Law on Tendering.” Therefore, it is conceivable that there is a possibility that the project can be implemented using a direct nomination. Therefore, in this study, we have repeatedly examined the possibility of simplifying procedures to update pumps through DAWACO with DPC, DPI, and DAWACO.

**Activity 3-1:**

First, the study confirmed that the approval process by the Da Nang authorities, centering on the DPC, has been simplified. Specifically, if pump replacement will be covered by self-funding from DAWACO and a subsidy from the JCM project, as clarified in Activity 2, out of the three-step procedure that Da Nang usually requires for this type of project, it was agreed that the procedures in step 1 (submission of a letter to the Department of Finance) would not be necessary, and that the project could move immediately to step 2 (submission of a letter to DPC to request approval), and that step 2 (request for approval to coordinating department, in this case, DPI) could be carried out concurrently with Step 3 with the submission of the Letter of Intent.

It is conceivable that this decision is possible, not only because of limited pump prices and DAWACO’s sufficient capacity for self-financing, but also because of the level of independence that DAWACO has, as it is a not a state-owned company and is not under the infrastructure of Da Nang city hall.

In June 2010, DAWACO transitioned from being a fully-owned state enterprise to a limited company. By becoming a limited company, DAWACO could aim at improving institutional capacity and making management more efficient. In addition, with DAWACO becoming a limited company, it has enabled the collection of water charges from residents with the provision of water supply services.

**Activity 3-2:**

This study confirmed the simplification of the tendering process. Initially, the study team had created a proposal on the possibilities for both “Limited Tendering” and “Nominated Tendering” and had obtained approval from DPI. Early on in the study, a pump supplier took active part in technical studies and DAWACO confirmed their intention to actively introduce pumps from specific manufacturers to benefit from technical capacity, energy saving capacity, and JCM assistance.

Therefore, the study has gained approval for the possibility of selecting pumps using “Nominated Tendering” by attaching the required documents above. It should be noted that since DAWACO has transitioned to a limited company and the form of capital is different than that from regular state-owned enterprises, they have a level of independence in decision-making, and it is conceivable that this will have important implications for this proposal.

**Activity 3-3:**

Lastly, the study confirmed with DPC, DPI, and DAWACO what documents would be required in the case of Nominated Tendering, as agreed upon in Activity 3-2. Specifically, it will be necessary to have reports on pump technical specifications and reports on creating funds, including prices; Memorandums of Understanding between DAWACO and pump companies; and Memorandums of Understanding between DAWACO and JCM project representative companies

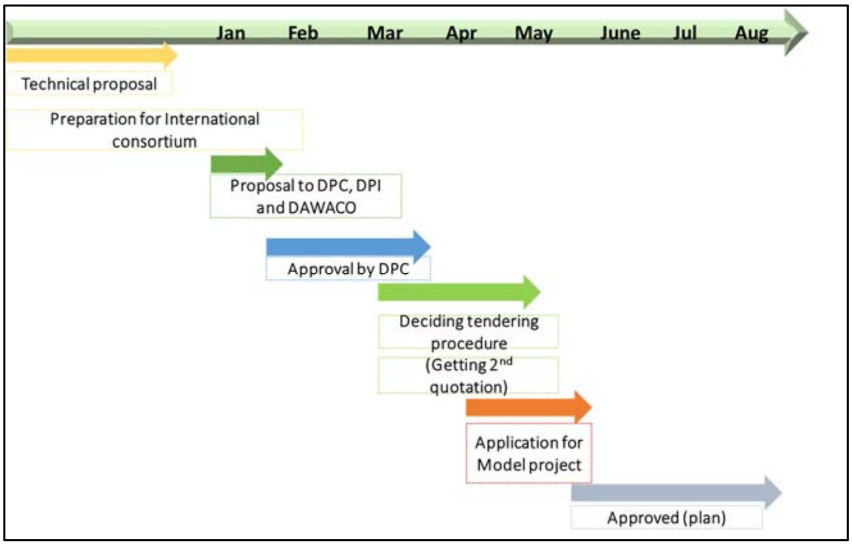
- Step 3 (Submission of request for approval to DPC and Step 2, approval by DPI Director): Submission of request for approval for procurement items (As required in Step 2, information sharing must be carried out and promoted in coordination departments as well.). At this time, the following documents should be attached to the request.
    - Attach Memorandum of Understanding between the international consortium

(Japan) and DAWACO for the JCM technical assistance project proposal.

- Attach Memorandums of Understanding between pump suppliers and DAWACO
- Submit application letter for procurement items (attach technical requirements) and estimates for procurement items, which are typically required in conventional procedures.

## 4.5 Action Plan

At the final field visit, the study confirmed and agreed upon the schedule and steps towards the application as a JCM technical assistance project in 2016 with DPC, DPI, and DAWACO.




(Figure 4-63. Action plan and schedule until application as JCM technical assistance project)

- Step 1 (to February)

The study team will submit a final report for DPC and DPI, as well as proposals based on the study in letter form (Letter of Intent). DAWACO will submit a request for approval to DPC and DPI for updating pumps. At that time, design details based on determined technical specifications, as well as price estimates, will be attached.

- Step 2 (to beginning of May)

After step 1, it will take about three months for DPC to reach a decision. The representatives of the international consortium will move forward with preparations for the submission of the proposal for the JCM technical assistance project in FY 2016. Around mid-May, DPC will give their consent for a simplified tender process, as well as approval for pump updates.

- Step 3 (to end of May)

After consent is received, the study team will submit the proposal to the JCM technical assistance project (deadline for submission from FY 2015 outcomes was around the second half of May).

## 4.6 Results of consultations and missions (water supply)

### 4.6.1 1st mission

(Table 4-64. Schedule for 1st mission (water supply)

| | |
|---|---|
| 14 September (Mon) | Kick-off meeting with DCP, DPI |
| 15 September (Tue) | Meeting with DAWACO, site visit to WTP |
| 16 September (Wed) | Site visit to WTP |
| 17 September (Thu) | Wrap-up meeting on 1st mission with DPI, Meeting with Department of Construction |

- 14 September (Monday): Kick-off meeting with DPC

■ Attendees: DPI, DAWACO, Department of Industry and Trade (DOIT), Department of Construction (DOC), Da Nang Energy Conservation Center (DECC), Department of Transport (DOT), Industrial Zone Management Board, DONRE, Climate Change Coordination Office (CCCO), IGES, Mizuho Information and Research Institute, Osumi Co., Ltd.

■ Overview of meeting:

- Comments from Da Nang

DAWACO expressed their expectations for concrete progress towards the development of JCM model projects. DOIT also asked about expectations other than the introduction of energy-saving facilities in DAWACO, while also commenting on interest in energy savings at hotels and factories. Attendees also indicated the need to train local companies using monitoring methods after expanding the development of JCM projects. The Industrial Zone Management Board also expressed their expectations of the JCM. In addition, CCCO also asked questions about the difference between overseas development assistance (ODA) and the JCM, and added a request that there be a focus not only on Japanese companies, but also local companies in Danang because it would be difficult to visit all of the factories.

- Comments from study team

The study team gave an overview of the monitoring period and implementation methods. The team responded that they wanted everyone to be at ease, and that they planned to organize a second JCM workshop on high-efficiency energy to deepen understanding about the JCM. In addition, the study team explained that ODA was for relatively large-scale projects and involved financial assistance and technical cooperation for a fee or free of charge, and that the JCM was for relatively small, individual and specific projects. The study team responded that they wanted to take part in a factory visit in November and December, focusing on local companies in Da Nang.


(Photo 4-22. Kick-off meeting with DPC (14 September (Monday)))

- <u>14 September (Monday): Kick-off meeting with DPI</u>

- Attendees: DPI, IGES, Mizuho Information & Research Institute, Osumi
- Objective: Share objective and schedule for 1st mission
- Overview of meeting:

The study team expressed their appreciation to DPC and DPI for their cooperation and support and shared the purpose of the first mission. The team spoke about the target for the water supply part of the study, which is the identification of water treatment plants and facilities that would be suitable as JCM model projects. DPI spoke specifically about DAWACO's needs and the current situation and advised all stakeholders to proceed after discussing issues in detail.


(Photo 4-23. Kick-off meeting with DPI, 14 September (Monday))

- <u>15 September (Tuesday): Meeting with DAWACO</u>

- Attendees: DAWACO, IGES, Osumi
- Objective: Explanation of project and ideas on how to proceed
- Overview of meeting:

The study team explained about the progress of the project. DAWACO explained about the treatment capacity and operating status of the old and new Cau Do water treatment plant, San Bay water treatment plant, Son Tra water treatment plant, Hai Van water treatment plant and An Trach Water Plant. The vice-president of DAWACO talked about how this JCM feasibility study and the JCM project development were major projects for DAWACO and that there was interest in energy savings, as well as benefits from energy savings from a management perspective. Accounting department staff from

DAWACO explained that, although there was potential for DAWACO to self-finance the project if costs were below a certain level, it is necessary to carry out careful discussions with DPI on the tender process. In addition, a project manager asked a question about the price per pump. It should be noted that during the first mission, there was mention of DAWACO's priority to update pumps, starting with pumps and pipes at An Trach water plant, and followed by pumps at the Cau Do water treatment plant. Discussions were also held on the need for monitoring during the legally-set service life of pumps and elimination of profits within the international consortium.

(Photo 4-25. Meeting with DAWACO, 15 September (Tuesday))

- 15 September (Tuesday): Site visit to water treatment plant

■ Attendees: DAWACO, IGES, Osumi

■ Objective: Accurate grasp of situation at An Trach water plant

■ Overview of site visit:

During the site visit, the study team confirmed the number of existing pumps, introduction period, capacity, salinity and operating status, and power consumption of pumps.


(Photo 4-26. Pumps at An Trach water plant)

- 16 September (Wednesday): Site visit to water treatment plant

■ Attendees: DAWACO, IGES, Osumi

■ Objective: Accurate grasp of situation at San Bay water treatment plant

■ Overview of site visit:

During the site visit, the study team confirmed the number of existing pumps, introduction period, capacity, salinity and operating status, power consumption of pumps, installation of inverters and operating status.

(Photo 4-25. Pumps at San Bay water treatment plant)

- <u>17 September (Thursday): 1st wrap-up meeting with DPI</u>

- Attendees: DPI, IGES, Mizuho Information and Research Institute
- Objective: 1st mission report
- Overview of meeting:

The study team reported about the meetings with DAWACO on water supply, as well as site visits to the old and new Cau Do water treatment plants, An Trach water plant, and San Bay water treatment plant. The team explained that they were able to obtain a variety of data during the site visits to the water treatment plants and explained that they were able to obtain information on existing water treatment plants and plans for water treatment plants that are being newly planned. The team reported that through this study, they were able to understand the official position towards the development of a JCM model project to replace pumps in water treatment plants, as well as the general needs in wastewater and sewage treatment. The study team would like to check if wastewater and sewage treatment would be a target for JCM model project development in the future. (See above for information on needs assessment study.)

- <u>17 September (Thursday): Meeting with Department of Construction (DOC)</u>

- Attendees: DOC, IGES, Osumi
- Objective: Explanation of JCM projects and interviews on management of water treatment plants in Da Nang
- Overview of meeting:

DOC is the advisor to DPC in relation to construction projects and issues permission for the planning of water and sewerage projects. The treatment capacity at the Cau Do water treatment plant is expected to increase to 60,000 $m^3$/day by 2020. There are plans to construct a new water treatment plant in the future in Da Nang (Hoa Lien water treatment plant, 120,000 $m^3$/day). The construction of the water treatment plant is planned to be carried out through PPP (public-private partnerships), and the drainage network is planned to be carried out with assistance from the Asian Development Bank (ADB) and Russia. Da Nang is planning to increase the capacity of the Cau Do and Hoa Lien water treatment plants to 390,000 $m^3$/day by 2020. The city also has plans to update three pumps in the An Trach water plant. There were also explanations on plans to improve the water pressure in industrial parks and deploy drainage networks in newly reclaimed land. There were also explanations about the current state of water quality for tap water, and according to DAWACO, there is no issue with this. However, the water distribution network is aging and improving the water quality for tourist areas only is a sensitive issue. The DOC spoke about the emerging problem of wastewater and sewage treatment in Da Nang and asked about prioritizing the development of JCM projects for water supply. In response to this, the study team explained that past studies have revealed the energy saving needs in DAWACO water treatment plants.

(Photo 4-27. Meeting with DOC)

### 4.6.2 2nd mission

(Table 4-65. Schedule of the 2nd mission (water supply)

| | |
|---|---|
| 2 November (Mon) | Kick-off meeting with DPI |
| 3 November (Tue) | Meeting with the Da Nang Wastewater & Sewage Corporation |
| 4 November (Wed) | Site visits to water treatment plants |
| 5 November (Thu) | DAWACO workshop, 1st wrap-up meeting with DPI |
| 6 November (Fri) | DAWACO technical meeting, 2nd wrap-up meeting with DPI |

- 2 November (Monday): Kick-off meeting with DPC, DPI

■ Attendees: DPI, Yokohama International Affairs Bureau, IGES, Osumi, Mizuho Information & Research Institute

■ Objectives: Report on past activities from last mission to this mission, schedule for this mission, plans for mission in January about tendering

■ Overview of meeting:

- Activities from last mission to this mission

With regard to research projects in the water supply area, the research team reported that the president of DAWACO visited in Japan in October to attend a JCM Intercity Cooperation Workshop (organized by the Ministry of the Environment and IGES). At that time, a meeting was held on pump proposals (draft) and financing. In addition, the study team explained that the emphasis of the Ministry of the Environment is on cost-effectiveness in the JCM, and therefore, the An Trach water plant was removed from the list of candidate sites for the development of a JCM model project since there were few days that the plant was in operation.

- Schedule for this mission

The study team explained that a pump supplier company accompanied this mission and that they planned to provide an estimate. In addition, since the subsidy of the JCM is paid after equipment is introduced, the study team shared their intention to reconfirm the financial resources of DAWACO.

- Tendering

The study team explained that they had heard a story from an electric company that it was possible to carry out pilot projects with a simply tendering process though memorandums of agreement, and that if this were possible, they would like to use the simple tendering process. DPI said that DAWACO must use a basic tendering process, but that they would check on the potential for simple tendering.

- Plans for mission in January

The study team explained about the plans for the mission from 4 (Wed) to 8 (Fri) January.

(See the chapter on needs assessment above for more information about the needs assessment study.)

(Photo 4-28. Kick-off meeting with DPI, 2 November (Mon))

- <u>3 November (Tuesday): Meeting with Da Nang Wastewater & Sewage Corporation</u>

■ Attendees: Da Nang Wastewater & Sewage Corporation, Yokohama International Affairs Bureau, IGES, Mizuho Information & Research Institute, Osumi

■ Objective: Explanation of the JCM and interviews on the state of all sewage treatment

■ Overview of meeting:

The study team explained about the study with DAWACO. Refer to the section below on the needs of the wastewater and sewage sector for an explanation of Da Nang Wastewater & Sewage Corporation.)

(Photo 4-29. Meeting with the Da Nang Wastewater & Sewage Corporation)

- 5 November (Thursday): DAWACO Workshop

- Attendees: DAWACO, Yokohama International Affairs Bureau, Osumi, IGES
- Objectives: Understanding of DAWACO's current needs to replace pumps, presentations on energy-saving actions by the Waterworks Bureau, sharing of the timeline for the application for technical assistance.
- Overview of meeting:
  - Replacing pumps

DAWACO explained about their desire to replace pumps in the Cau Do and San Bay water treatment plants. DAWACO asked a number of questions: if it would be more energy efficient to install inverters on all pumps because it can regulate the amount of water supplied; if it was necessary to install an inverter on raw water pumps since there is a storage basin at the old Cau Do water treatment plant; that they wanted an expert opinion on the benefits of replacing the six pumps in the new Cau Do water treatment plant and installing inverters on the six pumps, or using the inverters on the existing four pumps; and that they would like to listen to the opinions of the experts at the end of the field survey. The study team responded that maintenance and management should also be included in the study and that they would also like to carefully consider this because of the expense involved in maintenance and management.

- Explanation of the timeline for applying for technical assistance

The study team explained about the decision on consortium members by April 2016 and the preparation of necessary documents, submission of the necessary documents to the Ministry of the Environment if the project would be adopted, plans to start the project around September, and the possibilities for simple tendering. The team also offered a brief explanation of the initial cost recovery period, but that they would like to wait for the detailed estimate from the pump company.

DAWACO wanted to know how the percentages for the subsidy were determined. With the replacement of pumps, it is also possible to introduce better treatment capacity in anticipation of the future. In this case, the amount of power consumed may be higher. DAWACO asked if this could also be covered in the JCM proposal, and about calculations for $CO_2$ emission reductions using calculation methods of the JCM. The study team responded that the percentage of the subsidy is determined based on this, and that it is possible that the increase in treatment capacity can be included in the JCM proposal as well.

(Photo 4-30. DAWACO Workshop, 5 November (Thu))

- <u>6 November (Friday): DAWACO technical meeting</u>

■ Attendees: DAWACO, Yokohama International Affairs Bureau, Osumi, IGES, Ebara Vietnam

■ Objective: Direction for pump replacement

■ Overview of meeting:

The meeting was conducted using the explanatory materials from 5 November (Thursday), with DAWACO and Ebara Vietnam commenting on each issue. During the site visit, it was discovered that the operation time of the San Bay water treatment plant was short (about 500 hours per year). Therefore, both Ebara Vietnam and DAWACO reached an agreement on policies that only focus on replacing pumps at the Cau Do water treatment plant for the development of a JCM model project.

【Old Cau Do water treatment plant (raw water pump)】

- Option 1:

  In this option, there is a potential to replace water distribution and supply pumps with more efficient pumps without much change to the capacity of the three pumps, in order to increase the potential for $CO_2$ emission reductions since annual operating time is long.

- Option 2: Updating two pumps with high-processing capacity and adding an inverter to one pump
  Since the capacity of pumps will be increased in this option, it is also necessary to replace the pipes, which has an impact on cost. In addition, the water distribution and supply pumps may also need to be replaced.

The study team explained that all costs should be considered, including running costs, and asked about the idea of standby pumps. DAWACO explained that there was always one standby pump. The team also explained that it might be more efficient to have one large pump, rather than two small ones.

【New Cau Do water treatment plant (water supply pump)】

- Option 1: This option would replace all six pumps with high-processing capacity pumps and would install six new inverters. Two pumps would be on standby. In this case, it would be necessary to replace all existing electrical systems, as well as the water supply and distribution pipes. However, this would also improve safety management.
- Option 2: In this option, all six pumps would be replaced with high-efficiency pumps with the same treatment capacity. Four existing inverters would be used and two new inverters would be added. One pump would be on standby. In this case, safety management is lower than option 1, but initial investment is small.

The study team introduced examples from Yokohama and explained that there is little possibility for failure if there is only one standby pump, all pumps are high quality, and there is a proper electrical system.

- Conclusions from discussions

Ebara proposed calculations for the cost-effectiveness of (1) replacing three pumps with two high-capacity pumps (proposal to increase treatment capacity in anticipation of the future→large initial investment), and (2) replacing three existing pumps with three pumps that have the same treatment capacity (large energy reduction) at the old Cau Do water plant, in order to determine which option would be the better choice.

At the new Cau Do water treatment plant, all six pumps will be replaced with high-efficiency pumps that have about the same treatment capacity. Agreement was reached on using the existing four inverters. It was decided that during the day, five pumps would be operated without using inverters and at night, inverters would be operated to reduce flow rate, and that one pump would always be on standby.

- Future timeline

In the future, DAWACO will provide the necessary data to Ebara and the details of the JCM project will be confirmed at the next mission in January.

(Photo 4-31. DAWACO technical meeting, 6 November (Friday))

- <u>6 November (Friday): Wrap-up meeting with DPI on 2nd mission</u>

■ Attendees: DPI, Yokohama International Affairs Bureau, Mizuho Information & Research Institute, Osumi, IGES

■ Objective: Reporting on the 2nd mission

■ Overview of meeting:

The study team explained about the DAWACO workshop and DAWACO technical meeting. Specifically, with the participation of experts from Ebara Vietnam, information could be collected through the site visits to the Cau Do and San Bay water treatment plants, as well as the technical meeting with DAWACO, in order to determined detailed specifications, and that agreement was reached with DAWACO on specific proposals. In the future, it was decided that the final detailed proposal would be determined with the study team by the end of January with exchange between Ebara and DAWACO. The study team will also prepare the documents needed for procedures between January and April, and the Japan side shared that they would like to decide on the representative companies in the international consortium. One challenge is the long time required for tendering. In Indonesia, special treatment was given to the JCM, and by omitting or abridging the tendering process, technology can be easily provided. In addition, there are three points needed for the success of the JCM project: (1) quality of proposal: adoption of cost-effective proposal with $CO_2$ emissions and costs, (2) simplification of tendering process, and (3) sharing the capabilities of Japanese companies.

DPI explained about the necessity of submitting a Letter of Intent for the tendering process and the necessity of offering good prices and including a technical assessment, regardless of the need for the tendering process. DPI also explained that special treatment can be considered in Viet Nam in cases where there is assistance from a foreign country, and that it is necessary to have an appeal from the donor side (request procedure from MOEJ). For example, a hospital in Da Nang was built with assistance from South Korea, and South Korea requested that Korean products be used. There is a need to confirm if this can be applied to the scale of the JCM. Depending on the project proposal, DPC will be able to decide on the type of tendering and can easily determine if it is better to apply for special treatment once the detailed proposal has been decided (including cost).

(Photo 4-32. Wrap-up meeting the DPI on 2nd field visit, 6 November (Friday))

### 4.6.3 Final mission

(Table 4-66. Schedule of final field visit (water supply))

| | |
|---|---|
| 6 January (Wed) | Kick-off meeting with DPI, final meeting with DAWACO |
| 7 January (Thu) | Meeting and site visit with Da Nang Wastewater & Sewage Corporation, courtesy visit to DPC |
| 8 January (Friday) | Final meeting with DPC/DPI/DAWACO on JCM intercity cooperation |

- <u>6 January (Wednesday) Kick-off meeting with DPI</u>

■ Attendees: DPI, Yokohama International Affairs Bureau, Mizuho Information & Research Institute, Osumi, IGES

■ Objectives: Sharing schedule and purpose of final mission

■ Overview of meeting:

The study team shared the schedule and outcome targets of the final mission with DPI. In the meeting with DAWACO, the study team gave a presentation on the study, which included a report on a technical survey of technologies, $CO_2$ reduction potential, and pump cost estimates, as well as the proposal on tendering processes. The study team also explained about checking the schedule and steps towards submitting the proposal for technical assistance. In response to this, DPI offered advice to include the Letter of Intent when the tendering process is limited to one company (Nominated Tendering). The meeting also reported that Memorandums of Understanding will be concluded between DAWACO and the pump supplier, as well as between DAWACO and the representative companies of the international consortium. In addition to the Letter of Intent, DAWACO explained about the necessary to attach technical requirements and price estimates when submitting the Letter of Intent for Nominated Tendering. (For information on the needs assessment survey, refer to Chapter 2.)

(Photo 4-33. Kick-off meeting with DPI (1))

(Photo 4-34. Kick-off meeting with DPI (2))

(Photo 4-35. Kick-off meeting with DPI (3))

- 6 January (Wednesday)  Final meeting with DAWACO

- Attendees, DAWACO, Yokohama International Affairs Bureau, Osumi, IGES, Ebara Vietnam
- Objectives: Proposals and consultations on procedural processes towards the development of the technical proposal and the proposal for technical assistance
- Overview of meeting:

The study team once again provided an explanation of the technical specifications that were determined based on the needs of DAWACO. Specifically, agreement was reached with DAWACO on the second technical proposal (update pumps with same capacity) for both Cau Do I (three pumps) and Cau Do II (six pumps).

The study team also offered an explanation about the estimates for CO2 emission reductions. Although the current pump efficiency is about 50%, in order to make a comparison with the efficiency of general pumps on the market in the methodology of the JCM, for example, the efficiency of energy-efficient pumps (project pumps) increases to 86% with respect to the efficiency of 75% of general pumps (reference pumps). The study team shared their ideas on methodology, such as creating a methodology for the difference between reference pumps and project pumps, and explained about the importance of deciding whether to adopt CO2 emission reductions in the contents (subsidy rate) of the technical assistance project.

In addition, Nominated Tendering was proposed for the form of tender when submitting the proposal for the technical assistance project, in addition to sharing the results of the survey on the possibility of self-financing by DAWACO, in cases where the subsidy rate is 40% or higher. Lastly, the study team explained that before the submission of the proposal for technical assistance, the required Letter of Intent and contents of the Memorandums of Understanding would be shared with DAWACO. There are often cases where the provision of financial statements is not easy. However, the study team confirmed with DAWACO that there would be no issue with submitting the financial statements from the past three years.

(Photo 4-36. Final meeting with DAWACO)

- <u>7 January (Thursday): Meeting and site visit at Da Nang Wastewater & Sewage Treatment Corporation</u>

■ Attendees: Da Nang Wastewater & Sewage Treatment Corporation, Yokohama International Affairs Bureau, IGES

■ Objectives: Explanation of the JCM and second round of interviews on the overall state of sewage treatment.

■ Overview of meeting:

The study team gave an overview of the study with DAWACO (For more information on Wastewater & Sewage Treatment Corporation, see “Needs of the Wastewater and Sewage Sector” below.”

(Photo 4-37. Meetings with the Da Nang Wastewater & Sewage Treatment Corporation)

- 7 November (Thursday): Courtesy visit with DPC

- Attendees: DPC, DPI, DOFA, Yokohama International Affairs Bureau, IGES
- Objective: Courtesy visit, confirmation of renewal of intercity cooperation, progress report on the JCM study
- Overview of courtesy visit:

The Yokohama International Affairs Bureau spoke about the plan to quickly push forward with the technical assistance project in the water supply sector through the JCM study. In response to this, the DPC responded that they want to quickly move forward with updates to water supply pumps and that they welcome the help of the Japanese government.

In addition, Yokohama wanted to confirm the direction of the Da Nang Urban Development Forum in March 2016 with Mr. Huynh Duc Tho, Chairman of DPC, and carry out cooperation though the renewal of a Memorandum of Understanding between the two cities, including an expanded cooperative relationship, exchange between the economic bureaus, and investment. In response to this, DPC agreed to send a report on the Da Nang Urban Development Forum to Mr Huynh Duc Tho in March, as well as to the renewal of the Memorandum of Understanding between the two cities.

With regard to cooperation in other sectors, Yokohama explained about pilot projects on waste treatment (separation of waste in specified areas and small-scale demonstration projects) and Da Nang also agreed on the development to a JCM pilot project.

(Photo 4-38. Yokohama's courtesy visit with DPC)

- <u>8 November (Friday): Final wrap-up meeting on JCM intercity cooperation F/S</u>

- Attendees: DPC, DPI, DAWACO, Da Nang Wastewater & Sewage Treatment Corporation, Yokohama International Affairs Bureau, Mizuho Information & Research Institute, Osumi, IGES
- Objective: Final wrap-up meeting on JCM intercity cooperation F/S and sharing schedule for the submission of proposal to technical assistance project
- Overview of meeting:

The study team conducted a final wrap-up meeting on the study with DPC, DPI, and DAWACO. In the study on water supply, all stakeholders decided to introduce three pumps in the old Cau Do water treatment plant and six pumps in the new Cau Do water treatment plant. In addition to the proposal on technical specifications, proposals were also made on a financial plan and Nominated Tendering based on estimates of pump prices (See previous chapters on needs assessment.)

DAWACO said that they understood that at the start of the JCM study, energy reductions were the only objectives. However, with the use of the JCM, there are also effects for the reduction of CO2 emissions at the same time. DAWACO aims to create an even better environment, and the improvement of the environment will have a good impact throughout the city. Most of the issues were resolved during this mission and the study team wants to quickly address the financial cost issues. Through this plan, DAWACO is also happy to be able to contribute to improving the environment. Attendees expressed the opinion that they want to promote plans and implement the JCM project to send a message to the general public. DPC indicated that they were well aware of the contents of the study, and with the need to address CO2 emissions in the city, they hope that DAWACO to be successful in the implementation of the project. DPC also said that even after the JCM technical assistance project, they wish to continue to use the successful outcomes throughout the city, and requested that the needs of the technical assistance project using the JCM in Da Nang be reported to the Ministry of the Environment.

Yokohama City spoke about the importance of the JCM study to achieving the action plan and would like to advance the implementation of activities, including cooperation between companies in Yokohama and Da Nang in the future.


(Photo 4-39. Final wrap-up meeting)

## 4.7 Wastewater & sewage needs

This study carried out two meetings with the Wastewater & Sewage Treatment Corporation in Da Nang, and conducted a needs assessment in the wastewater and sewage sector. Information obtained through meetings and site visits are outlined below.

【Sewage treatment companies】

The basic management of domestic wastewater is mainly carried out by state-owned companies under DONRE. However, since 2012, water distribution at Tho Quang Industrial Park (number of seafood processing companies) is also being managed.

【Current state of wastewater and sewage treatment facilities】

There are four treatment plants for domestic wastewater: (1) Phu Loc WWTP (treatment capacity: 46,000 $m^3$/day), (2) Hoa Cuong WWTP (treatment capacity: 46,000 $m^3$/day), (3) Ngu Hanh Son WWTP (treatment capacity: 16,000 $m^3$/day), and (4) Son Tra WWTP (treatment capacity: 18,000 $m^3$/day). Electric costs from these treatment plants accounted for about 15% of the total management costs. Most of these costs are the electricity costs for pumps. All four treatment plants are old and the plants hope to replace poorly performing pumps.

In addition, a detailed investigation is needed on wastewater treatment. However, the highest priority should be given to the four pumping stations that are located along the coastal areas in new tourism areas in the city. Overflows occur due to the amount of wastewater that exceeds the capacity of the 13.5 kWh to 22 kWh pumps. Da Nang, which has a thriving tourism industry, often indicates that this point is a problem.

It should be noted that new pumps have already been introduced in 20 locations in 2014. In addition, the scale of pumping stations for rainwater in two locations is large. However, even though pumps were replaced in 2013, the operation rate is low because it is only for rainwater. In addition, sewage from the Tho Quang Industrial Park will be sent to the Son Tra treatment plant in 2016 for wastewater treatment. There are also plans to start the construction of a new wastewater treatment plant in Lien Chieu between 2018 and 2020.

【Current state of domestic wastewater】

Raw sewage treatment tanks are installed in each household. Although human waste is treated, kitchen wastewater flows directly into the sewers. Sediment is collected by URENCO and disposed in landfills. The quality of domestic wastewater is on par with that of developed countries. This is due to in part to the treatment tanks; however, another reason is also due to the fact that rainwater and domestic wastewater both flow through the same water pipes together, which means that it is diluted. In addition, domestic wastewater is treated mostly with aeration and sedimentation. Treatment uses old technology and no machines.

【Future plans in sewage treatment】

There are about 100 pumps installed in 42 locations. Most pumps have a capacity of 1600 kWh or higher. In addition, the total electricity costs per year are about USD 400,000. In 2007, with support from the World Bank, a series of updates to pumps and pipes were carried out (pipe laying by JICA). However, efficiency has significantly decreased in the seven or eight years since. A master plan from 2020 to 2040 is available, which aims at an 80% target for treatment of domestic wastewater (which is currently 40% to 50%) by 2020. It should be noted that, at present, untreated wastewater overflows and drains into the sea as is.

【Projects other than JCM projects】

In addition to the JCM, studies are also being carried out by the Japan International Cooperation Agency (JICA) and the World Bank on the Tho Quang Industrial Park. JICA is also conducting a demonstration project in the Phu Loc treatment plant together with the University of Da Nang and Japanese companies. Both JICA and the World Bank are targeting new facilities, and it is better for JCM project development to focus on the recovery of old pumps based on the fact that JICA demonstration projects also target only sewage treatment plants.

【Future action & potential】

The study team confirmed the strong interest of the Da Nang Wastewater & Sewage Treatment Corporation for the development of JCM project. There are a number of problems though, the first being of financial concern. The second problem is that, unlike DAWACO, this is within the jurisdiction of Da Nang City, and therefore, consent from both DPC and DPI is needed before studies are performed, which is expected to make the decision-making process long and complex. Specifically, unlike the independently-managed DAWACO (water supply), the Da Nang Wastewater & Sewage Corporation belongs to Da Nang City, and the owner of the pumps is the DPC. Therefore, even if they want to take part in the JCM study, it is necessary to obtain the approval of both the People's Committee (DPC) and the Department of Planning and Investment (DPI). In order to obtain consent, it is necessary to (1) determine if it is possible for Yokohama to send a Letter of Intent to Da Nang, and for (2) IGES to send a detailed explanation of (1) to Da Nang (including facility and financial overview). The third problem is the need to check the flow rate, power consumption, and number of years that the current pumps have been in use in order to consider updating the pumps. However, this is difficult to measure because they are not equipped with meters or other measuring devices. The fourth problem is that the wastewater in the pumping stations in the new city area that were part of this site visit have already been confirmed to exceed capacity, and therefore, pump capacity must be improved. In this case, it is possible that, in addition to simple pump replacement, additional equipment will also need to be replaced since construction of the entire piping system is important.


(Photo 4-40. Consultations on map of pumping stations in Da Nang)

(Photo 4-41. Overflowing wastewater in new city area)

(Photo 4-42. Pump installation location in new city area)

(Photo 4-43. Site visit to pump distribution switchboard)


(Photo 4-44. Overflowing wastewater in new city area (2))

# 5 Reference Materials


Osumi Co., Ltd. Nippon Koei (2013). “Final Report on Study for Project Formulation on Proposals for Energy-Saving Assessments and Measures Using Simple Measurement Methods & Promotion of Environmental Education in the Socialist Republic of Viet Nam”.

Overseas Environmental Cooperation Center (2014). “Feasibility Study FY 2013 Large-Scale JCM Project for Realizing Low-Carbon Development in Asia: Support for JCM Project Formulation in City of Da Nang, Viet Nam”

GIDE Loyrette Nouel, (2014) “The New Tendering Rules in Vietnam”

# 6 Attachments (Presentations, other)

# First Mission

Presentation Materials

Institute for Global Environmental Strategies

# FY 2015 MOEJ Commissioned JCM Feasibility Study Project

# JCM Feasibility Study in Da Nang through "Technical Cooperation for sustainable Urban Development" with Yokohama City

September, 2015

Institute for Global Environmental Strategies (IGES)
Mizuho Information & Research Institute Inc.
Osumi Co. Ltd.,

# 0. City of Da Nang and Yokohama signed MOU on Technical Cooperation

**Memorandum of Understanding on Technical Cooperation for Sustainable Urban Development Signed with the City of Da Nang, on 9th April, 2013.**


**Contents of Agreement**

- The City of Yokohama will offer technical advice in promoting eco-city development of the City of Da Nang.
- The Parties will encourage participation of the private sector and academic organizations.
- The Parties will call for support of Central Governments of both sides and international organizations
- The Parties- shall exchange information in order to strengthen the cooperative relationship effectively

# 0. Da Nang City, City of Yokohama and JICA work together for Action Planning for Sustainable Development

**The 3rd Danang Urban Development Forum in Yokohama:**
**August 27th – 31st, 2015**

**Aiming Medium and Long Term Achievement by viable, tangible and practical "Action Plans"**



# 0. Da Nang City, City of Yokohama and JICA work together for Action Planning for Sustainable Development

❑ Summary of Identified Main Development Strategies in the 2nd Danang Urban Development Forum

**◖Cross-cutting Actions◗**

1. Elaborate integrated and sustainable urban development strategy
2. Draw up new industrial development strategies
3. Update "Environmental City of Danang" and formulate an integrated strategic plan for a new "Environment City" manifesto
4. Strengthen land-use and development control system
5. Establish sustainable funding and an infrastructure development mechanism
6. Establish a comprehensive human resource development system

**◖Major Programs◗**

1. **Promote and accelerate environment improvement program**: water supply, waste water, air supply, solid waste, etc.
2. **Develop integrated Danang port system (Lien Chieu and Tien Sa Ports)**: internationally competitive regional gateway port
3. **Develop a competitive public transport network and TOD**: LRT, BRT, bus and integrated urban development
4. **Develop new CBDs and renovate the existing CBD**: polycentric compact urban structure
5. **Develop mixed-use multifunctional New Town(s)**: compact smart city with affordable, disaster proof and energy saving housing and facilities
6. **Strengthen natural disaster management system**: Comprehensive measures including land-use control, infrastructure provision, early warming and evacuation system.

# 1. Overview of the Study

**JCM Feasibility Study in Da Nang through "Technical Cooperation for Sustainable Urban Development" with Yokohama City**

**Japan-side**

**City of Yokohama**

**Project Management**

**IGES**

**Y-PORT Center**

**MOU to establish bilateral cooperation between Da Nang and Yokohama, Apr 2013**

**Vietnam-side**

**City of Da Nang**

**People's Committee**

**DPI**

## Water Management

| | | |
|---|---|---|
| **IGES**<br>Osumi Co., Ltd. | ESCO for installing Energy Efficient pumps ⟷ Solving procedure related issues in order to gain JCM subsidies ⟷ | DAWACO, DPI, DOC, CCCO |

## Needs Assessment

| | | |
|---|---|---|
| **Mizuho Information & Research Institute, Inc.**<br>Osumi Co., Ltd. | Low Carbon Tech in Hotel , Factories and Commercial buildings ⟷ Low carbon Distributions (port) ⟷ | DPI, Department of Construction DONRE, DOI, Industrial Park Management, The Univ of Da Nang (University of Technology), Hotels, Tiensa Port, CCCO |

5

# 1. Project Team from Japan side

OPEN YOKOHAMA

**City of Yokohama**
Official and first communication to Da Nang City

IGES

**IGES**
- Overall coordination
- Water management project manager

MIZUHO

**MHIR**
- Needs assessment project manager

安全・安心な環境を創り続けます osumi 株式会社オオスミ

**Osumi**
- (Water & Needs Assessment) Energy Conservation Diagnosis and Technology issues



6

# Water Management

7

## 2. Outcomes and Activities

<u>Renewal of 12 pumps in Cau Do and Ancha Water Plant</u>

Outcome 1

Detailed ESCO

Activity 1

**1-1**: Continual Monitoring
1-1-1: Installation of power meter
1-1-2: Collection of data and evaluation (annual usage of electricity, inspection of meter, water supply amount )

**1-2:** Analysis of motors for possible countermeasures
1-2-1: Potential of Inverter Control

Outcome 2

Consideration of financing

Activity 2

**2-1: Consideration of financing scheme**
2-1-1:Calculation of cost
2-1-2:Meeting with banks based in Vietnam

**2-2 Facility Implementation Project FY2016 Preparation**
2-2-1: Agreement on cooperation for JCM facility implementation project in FY2016
2-2-2: Funding step

Outcome 3

Solving issues toward facility implementation

Activity 3

**3-1: Solving issues related to tenders**
3-1-1: Verification of tendering step in Vietnam

3-1-2: Discussion for alternative limited tender contract

3-1-3: Preparation of specification for JCM facility implementation project FY2016

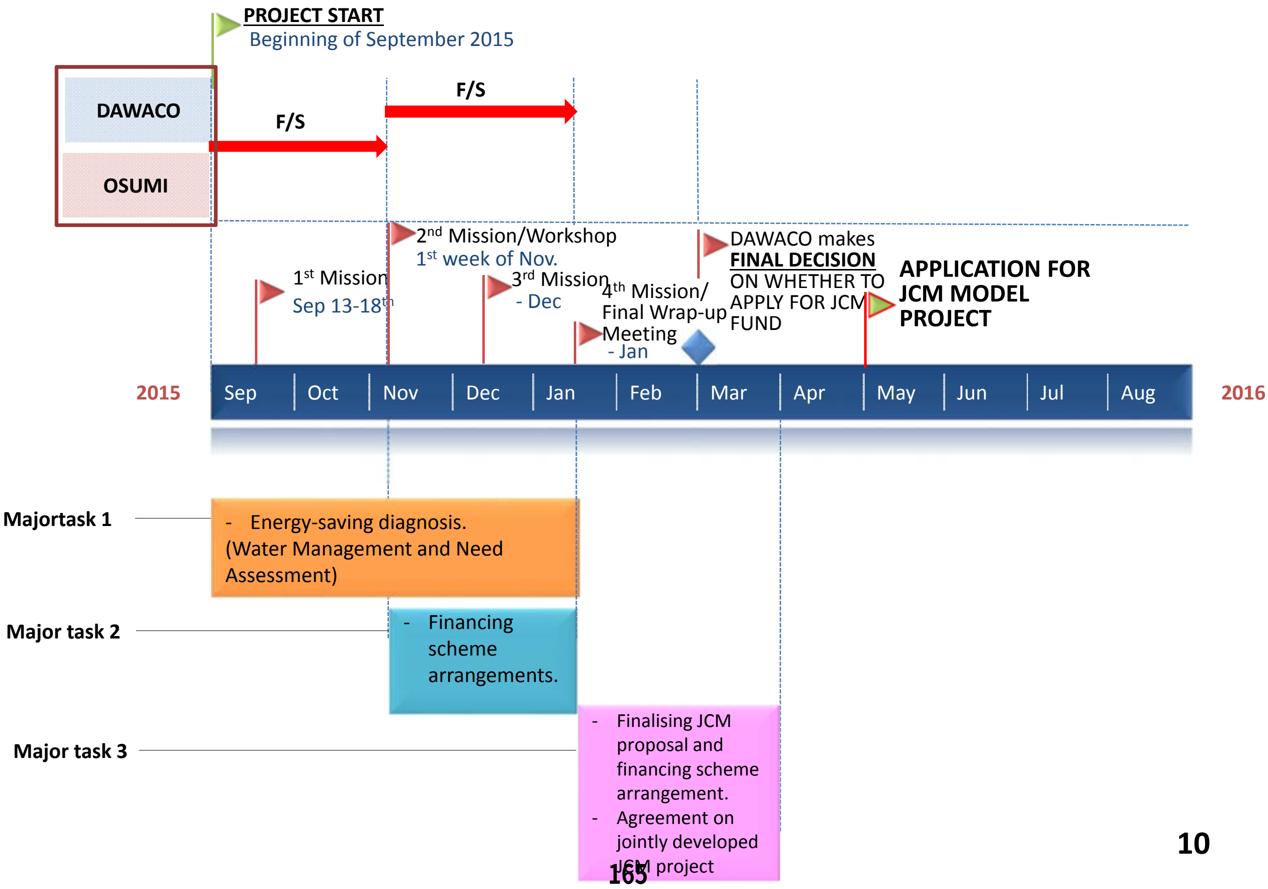
8

# 3. Implementation Flow of the Study

| | Activity 1: ESCO implementation | Activity 2: Consideration of Financing | Activity 3: Preparing for Facility implementation |
|---|---|---|---|
| 2015/09 – 1st Study Mission | **1-1 : Prep for Continual Monitoring** 1-1-1: Installation of power meter, 1-1-2: Collection of data and evaluation | **2.0 and 3.0: Kick –off meeting (Presentation of our FS to DPI, DOC and DAWACO)** | **3-1: Solving issues related to tenders** 3-1-1: Verification of tendering step in Vietnam |
| 2015/10 | 1-1-2: Collection of data and evaluation (calculation of electricity usage for 12 pumps) | **2-1: Consideration of financing scheme** 2-1-1:Calculation of DAWACO cost | |
| 2015/11 – 2nd Study Mission | **1-2:** Analysis of motors for possible countermeasures 1-2-1: Potential of Inverter Control | **2-1: Consideration of financing scheme** 2-1-2:Meeting with banks based in Vietnam as Vietnam Dev Bank, Vietnam Inv. Dev. Bank | **3-1: Solving issues related to tenders** 3-1-2: Discussion for alternative limited tender contract |
| 2015/12 | | **2-2: Prep for Facility Implementation Project FY2016** 2-2-2: Funding prep | |
| 2016/01 – 3rd Study Mission | | **2-2: Prep for Facility Implementation FY2016**2-2-1: Agreement on cooperation for JCM facility implementation in FY2016 | **3-1: Solving issues related to tenders** 3-1-3: Prep of specification for JCM facility implementation project FY2016 |

9

# 4. Schedule




10

# Needs Assessment



# 2. Background and Objectives of the Study

**Background:**

●Conclusion of MoU on Technical Cooperation for Sustainable Urban Development between Da Nang City and City of Yokohama（April, 2013）

●Establishment of "Da Nang City Development Forum" (December, 2014) by Da Nang City, JICA, and City of Yokohama

→ This forum is the platform to discuss implementation of DaCRISS

→ The six action plans and the six project were selected and prioritized through in the last couple of "Da Nang City Development Forum" meetings

→ The City of Yokohama continues to share the technical information for implementation of DaCRISS

**Objectives:**

The objectives of the Study are the following based on the said situation:

- Formulate JCM projects (energy-saving & low-carbon projects) which contribute to elaborate & embody one of the six action plan, "Refine "Environment City of Danang" and Formulate a Integrated Strategic Plan for a New "Environment City" Manifesto"
- Provide feedback of the study to "Da Nang City Development Forum" in order to facilitate discussion on low-carbon development in Da Nang City at a policy level as well as JCM project formation

# 3. Framework of the Study (Outcomes & Activities)

**Facilitation of Low-Carbon Development in the Whole City of Da Nang**

**Outcome 1**

JCM Project Formation with a focus on hotels, commercial facilities, factories and port-related facilities

**Outcome 2**

Facilitation of discussion on low-carbon development in Da Nang City at a policy level

**Activity 1**

**1-1**: Prepare lists of candidates (including hotels & factories) for energy conservation diagnosis
**1-2**: Conduct energy-saving facilitation workshop aimed at the companies listed by 1-1
**1-3**: Select 5 facilities (companies) at a maximum for energy conservation diagnosis
**1-4**: Conduct energy conservation diagnosis for the facilities selected in 1-3 and have a interview with the owners
**1-5**: Prepare the list of energy-saving technologies to be potentially installed in facilities of Da Nang
**1-6**: Discuss with the companies holding the energy- saving technologies suitable to the facilities diagnosed in 1-4
**1-7**: Invites the companies holding the energy-saving technologies with an interest in JCM and Site survey the facilities
**1-8**: Compile the study results for the way forward in and after 2016

**Activity 2**

**2-1**: Confirm approach of Da Nang City for energy saving at a policy level
**2-2**: Consider the collaboration for energy saving in Da Nang at a policy level based on the partnership between Da Nang City and Yokohama
**2-3**: Compile the study results (inc. water management) and provide feedback to Da Nang City Development Forum

13

# 4. Implementation Flow of the Study

**1st Study Mission**

Kick-off Meeting

Activity 1-1 Preparation of the list of target facilities

Activity 2-1 Confirmation of the approach of Da Nang City for Energy Saving at policy level

**2nd Study Mission**

Activity 1-2 Implementation of Energy-Saving Facilitation Workshop

Activity 1-3 Selection of target facilities

Activity 2-2 Consideration of the collaboration for energy saving in Da Nang at a policy level

**3rd Study Mission**

Activity 1-4 Implementation of Energy Conservation Diagnosis

Activity 1-5 Preparation of the list of energy-saving technology

Activity 1-6 Meeting with the companies holding energy-saving technology

**4th Study Mission**

Activity 1-7 Site Survey and Discussion for JCM Project Planning / Wrap-up Meeting

Activity 1-8 Preparation to apply for JCM project support scheme in JFY2016

Activity 2-3 Feedback of the study results (inc. water management)

14

# 5-1 Flow up to the JCM Project Implementation After Completion of the Study

5 facilities at a maximum diagnosed for energy saving and conducted preliminary survey for JCM project formation

**Degree of Preparation** for JCM Project Implementation including technology solution, financial plan, Project Implementation Structure, MRV Implementation Structure, JCM methodology

【High Degree of Preparation】
Apply to JCM Model Project in JFY2016

【Further survey needed】
Apply to JCM Project Planning Study in JFY2016
→ Apply to JCM Model Project in 2017

【Further survey needed】
Apply to JCM Feasibility Study in JFY2016
→ Apply to JCM Model Project in or after JFY2017

15

# 5-2. JCM Project Support Scheme by Ministry of Environment, Japan

**Project Formulation Stage**

| | |
|---|---|
| JCM Feasibility Study based on partnership between Cities | To find & formulate JCM projects based on the cities' partnership between a partner countries and Japan |
| JCM Feasibility Study | To conduct preliminary survey on project implementation plan, financial plan, and MRV methodology for JCM project elaboration |
| JCM Project Planning Study | To formulate a financial plan, detailed design, construction plan, O&M plan, implementing structure, MRV methodology, etc.. for JCM registration |

**Project Implementation Stage**

| | |
|---|---|
| JCM Model Project | To subsidize up to the half of the initial investment which contributes to CO2 emission reduction (Then, GoJ receives more than the half of the emission credit from the project) |
| JCM Cooperation Fund with JICA | To subsidize the initial investment of the project supported by the Japanese governmental financial institutions such as JICA which contributes to CO2 emission reduction |
| JCM ADB Trust Fund | To subsidize the initial investment of the project supported by ADB which contributes to CO2 emission reduction |

16

# 5-3 JCM Model Project Programme 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

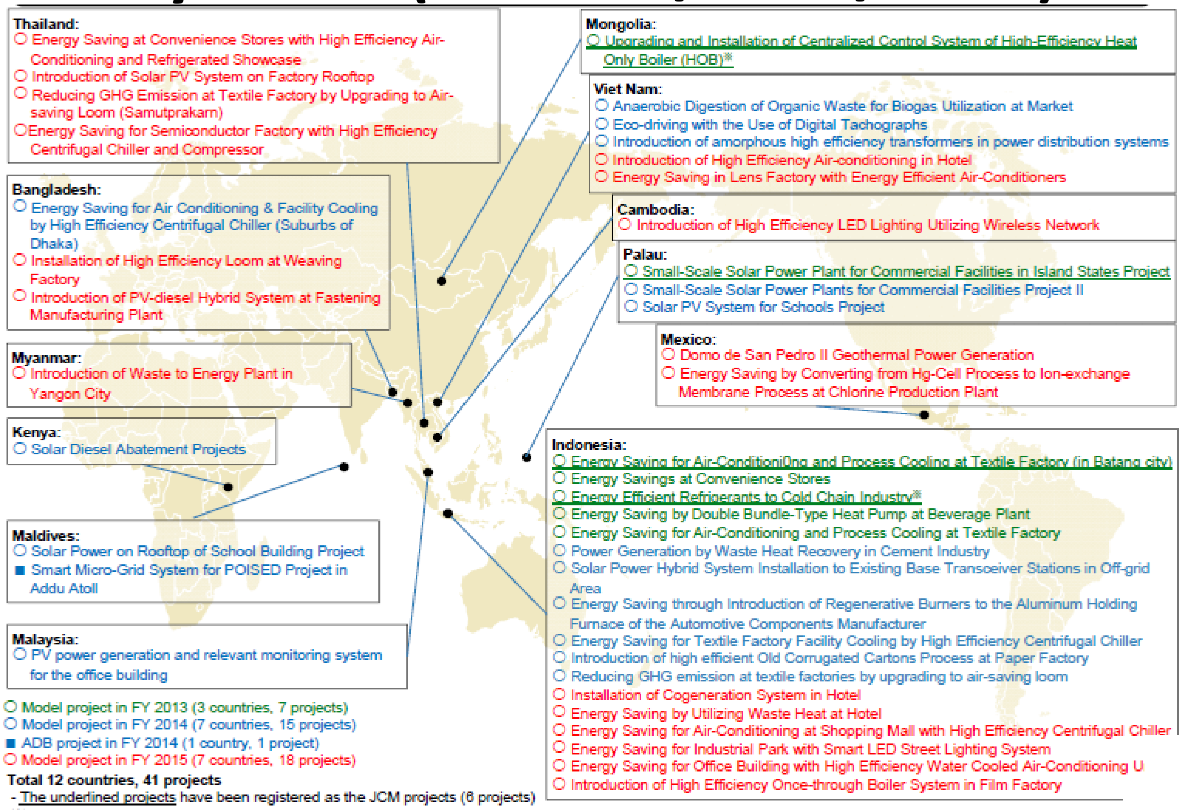
**International consortiums (which include Japanese entities)**

Project Period:
1〜3years

- 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.

17

# 5-4. Cased of JCM Model Project Program by MOEJ (JFY2013/2014/2015)




**Total 12 countries, 41 projects**
- The underlined projects have been registered as the JCM projects (6 projects)
※these projects account for 2 registered JCM projects respectively, as they're operating in different sites

18

# 5-5. Some Cases of JCM Model Project Program by MOEJ (Hotels & Factories)

**These projects contribute not only to Energy Saving but also CO2 Emission Reduction.**

## Hotel

| Country | Project |
|---|---|
| Vietnam | Introduction of Air-Conditioning System with Highly Efficient Inverter to Hotels |
| Indonesia | Introduction of Co-generation System to Hotel |
| Indonesia | Introduction of Waste Heat Utilization System to Hotel |
| Indonesia | Introduction of Ai-Conditioning System to Office building |
| Indonesia | Introduction of Highly-efficient Turbo chiller to Shopping Mall for energy saving of Air-conditioning system |

## Factory

| | |
|---|---|
| Vietnam | Introduction of Highly-Efficient NH3 Heat Pump to Seafood Processing Factory |
| Indonesia | Introduction of Energy-Saving Turbo Chiller for cooling facilities in the Factory |
| Indonesia | Introduction of Waste Heat Utilization System to Cement Factory |
| Indonesia | Introduction of Regenerative Burners to the Aluminum Holding Furnace of the Automotive Components Manufacturer |
| Indonesia | Introduction of Smart LED Street Lighting System to Industrial Zone |

19

# 6. Implementation Schedule of the Study

| Activity | | | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Kick-off Meeting | | | the 1st study mission | | | | | |
| 1 | 1-1 | Preparation of the list of target facilities | | | | | | | | |
| | 1-2 | Implementation of Energy-Saving Facilitation Workshop | | | | the 2nd study mission | | | | |
| | 1-3 | Selection of target facilities | | | | | the 3rd study mission | | | |
| | 1-4 | Implementation of Energy Conservation Diagnosis | | | | | | | | |
| | 1-5 | Preparation of the list of energy-saving technology | | | | | | | | |
| | 1-6 | Meeting with the companies holding energy-saving technology | | | | | | | | |
| | 1-7 | Site Survey and Discussion for JCM Project Planning<br>Wrap-up Meeting | | | | | | the 4th study mission | | |
| | 1-8 | Preparation to apply for JCM project support scheme in JFY2016 | | | | | | | | |
| 2 | 2-1 | Confirmation of the approach of Da Nang City for Energy Saving at policy level | | the 1st study mission | | | | | | |
| | 2-2 | Consideration of the collaboration for energy saving in Da Nang at a policy level | | | | the 2nd study mission | | | | |
| | 2-3 | Feedback of the study results (inc. water management) | | | | | | | | |
| | | Wrap-up Meeting | | | | | | the 4th study mission | | |
| | | Preparation of Reports | | | | | | | | |

Submission of interim report

Submission of draft final report

Submission of final report

Activities in Vietnam

Activities in Japan

20

## Kick-Off Meeting

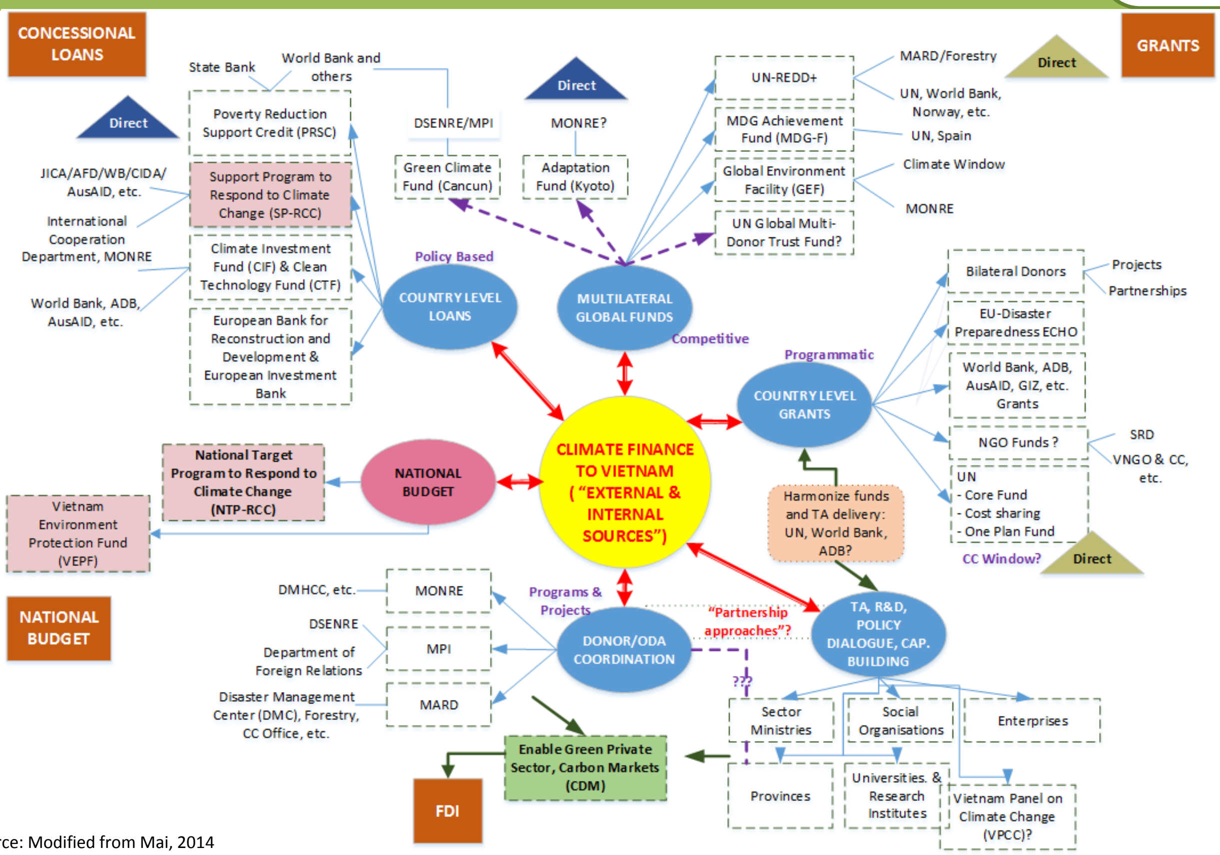
# JCM Procedures

***Presented by:***

Pham Ngoc Bao, Ph.D
Policy Researcher
Institute for Global Environmental Strategies (IGES)
Email: ngoc-bao@iges.or.jp

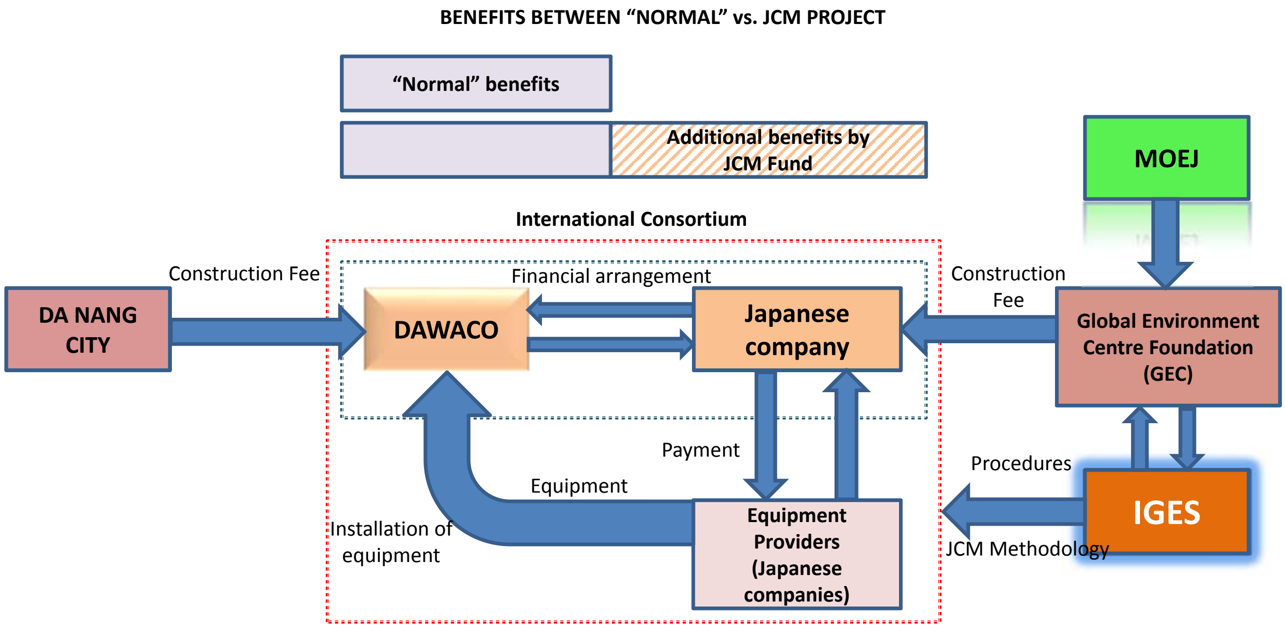
---

## CLIMATE FINANCE IN VIETNAM

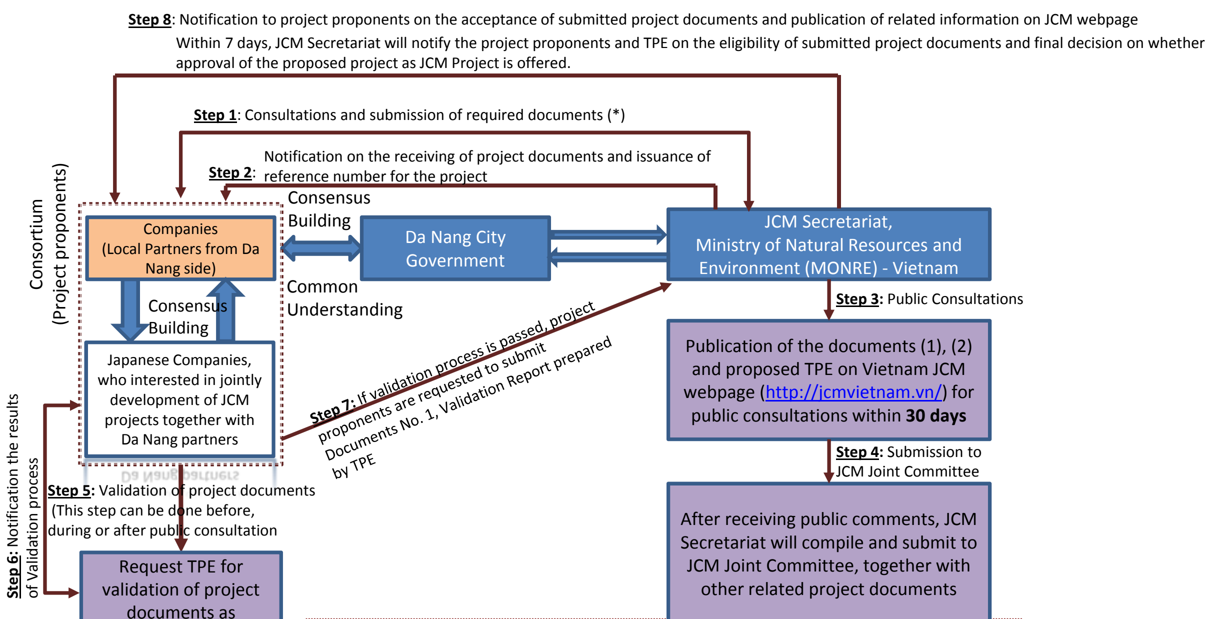



Source: Modified from Mai, 2014

# PROPOSED ORGANIZATIONAL STRUTURE FOR JCM PROJECT



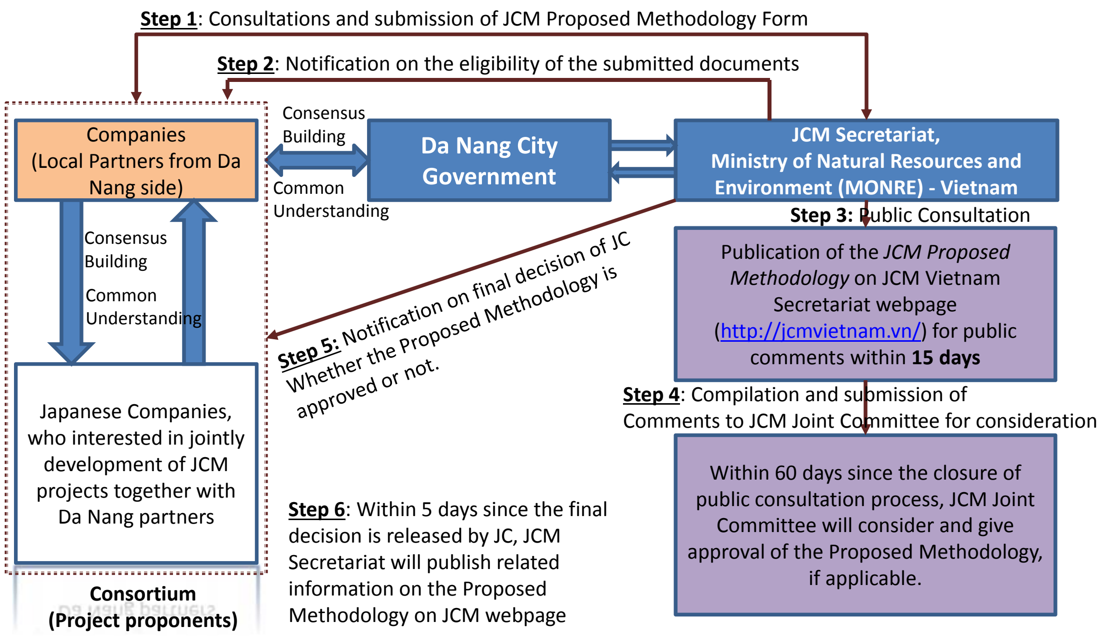

# PROCEDURES FOR JCM PROJECT REGISTRATION IN VIETNAM




*(*) Required documents for submission:*
- *Project Design Documents (PDD) Form (1)*
- *JCM Project Registration Request Form (2)*
- *JCM Modalities of Communication Statement Form (3)*

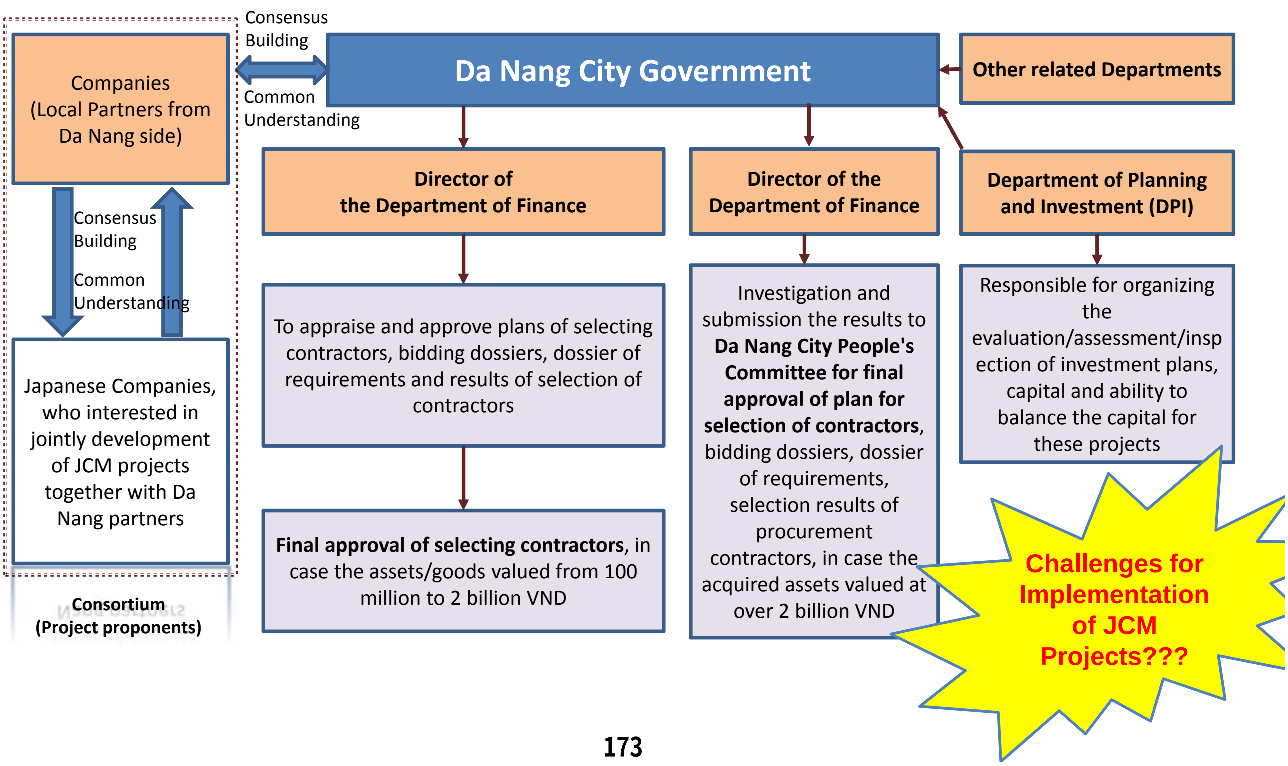
**Note**: Documents must be submitted both in English and in Vietnamese.

## PROCEDURES FOR APPROVAL OF PROPOSED JCM METHODOLOGY



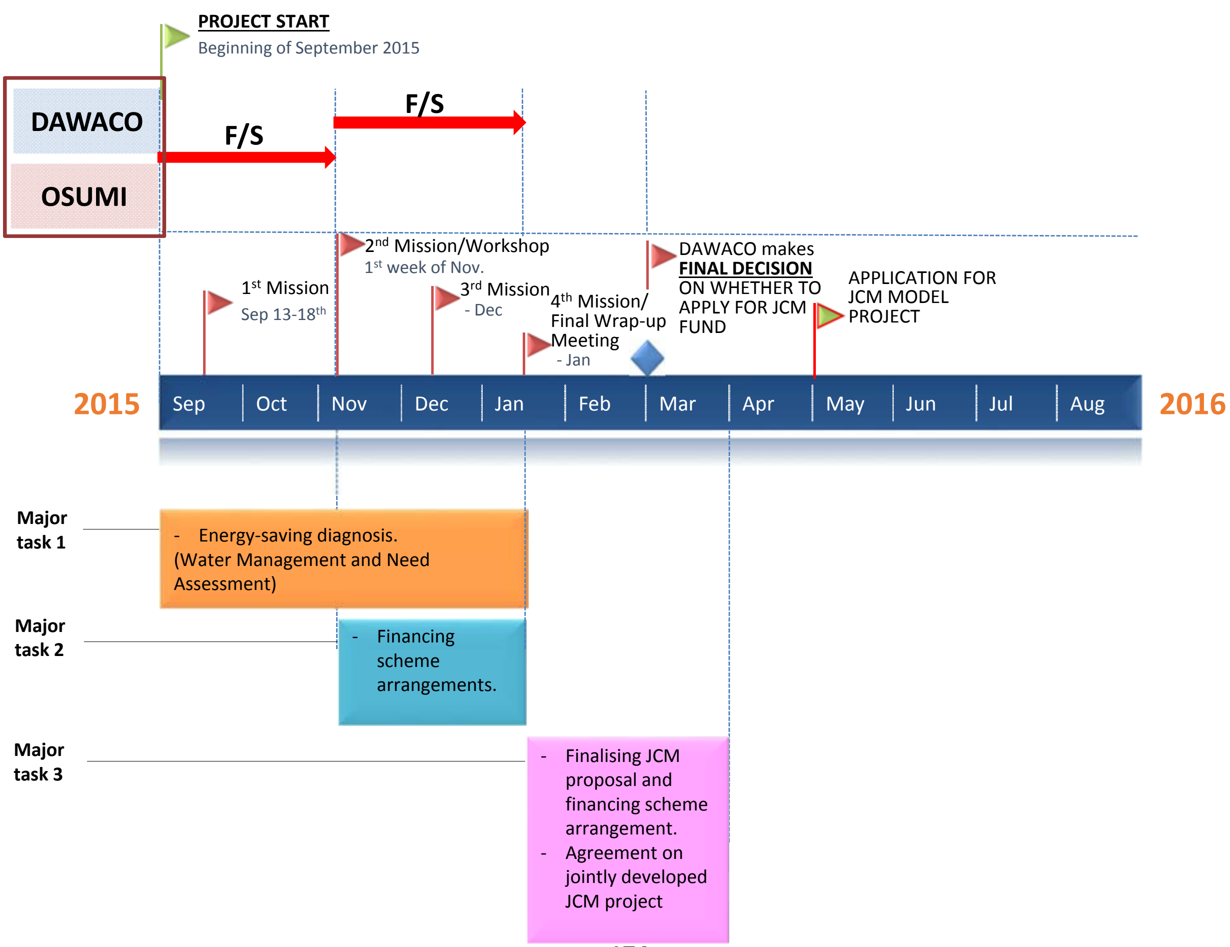

*Note: Figure is prepared based on the Circular No. 17/2015/TT-BTNMT – Regulations on Development and Implementation of Joint Crediting Mechanism (JCM) Projects under the Framework of Vietnam-Japan Collaboration*

## TENDERING PROCESS AND APPROVAL OF SELECTED CONTRACTORS



## KEY REGULATIONS AND POLICIES RELATED TO TENDERING PROCESS IN DA NANG

1. Law on Bidding – Law No. 43/2013/QH13
2. Decree No. 30/2015/ND-CP: Detailed provisions for the implementation of some articles in the Law on Bidding for selection of investors
3. Decision No. 03/2015/QD-UBND: Promulgated regulation on procurement, building and investment management in Da Nang City.
4. Decision No. 50/2012/QD-TTg on Application of appointed contractors for bidding packages under special circumstances by the Prime Minister for consideration and final decision
5. Circular 05/2015/TT-BKHĐT: Detailed provisions on preparing bidding documents for procurement of goods



# Joint Crediting Mechanism (JCM)

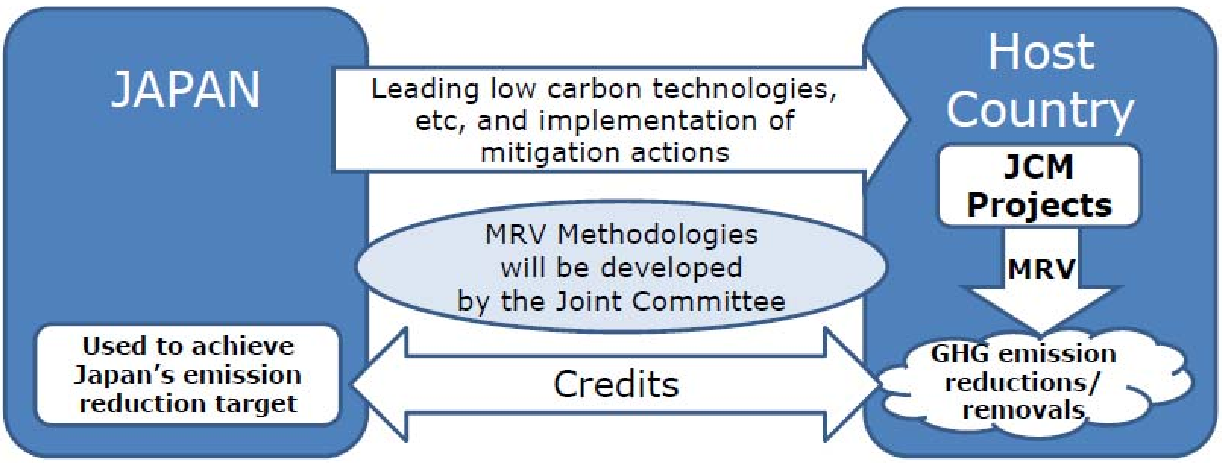
# A Brief Introduction

Pham Ngoc BAO, Ph.D

Institute for Global Environmental Strategies (IGES)

September 14th, 2015

## Basic Concept of the JCM



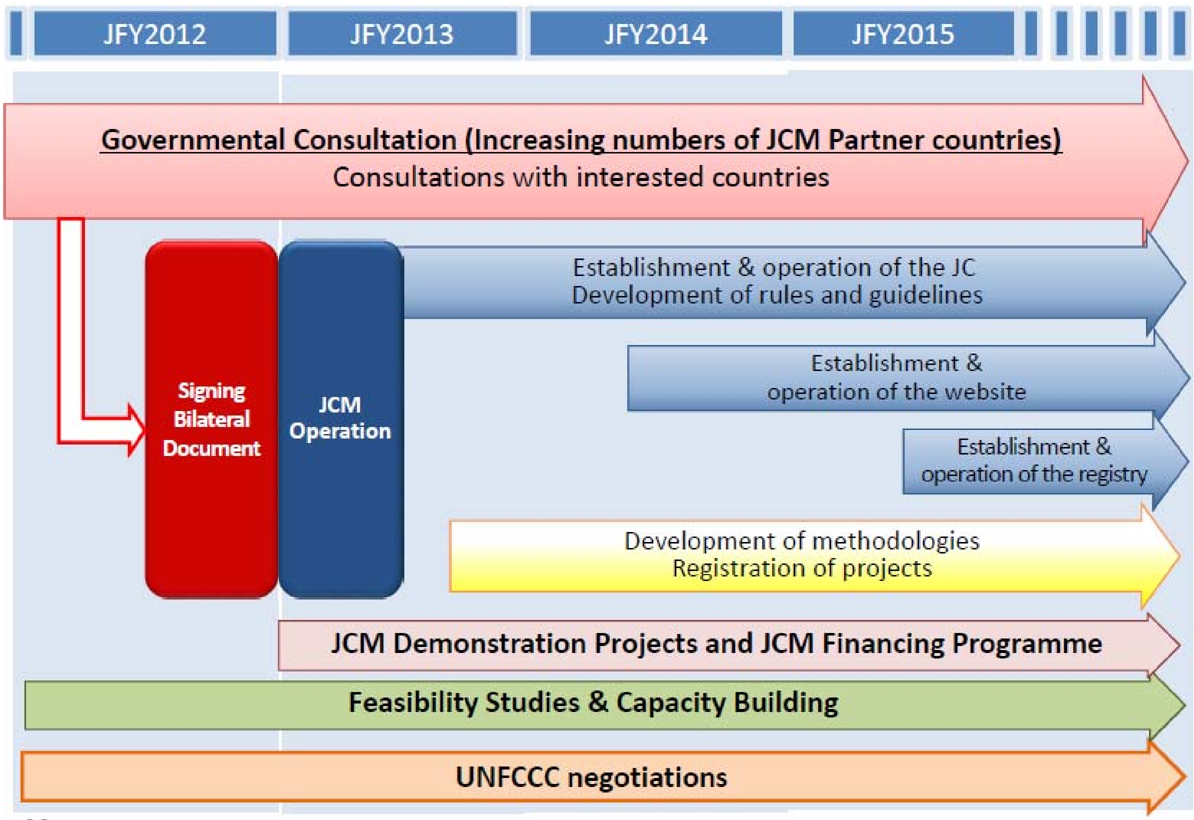

Note: 'MRV' stands for Measurement, Reporting, Verification.

Source: Adopted from Government of Japan (2015)

# Purpose of the JCM

- To facilitate diffusion of leading low carbon technologies, products, systems, services, and infrastructure etc
- To appropriately evaluate contributions to GHG emission reductions or removals from developed countries through mitigation actions implemented in developing countries
- To contribute to the ultimate objective of UNFCCC by facilitating global actions for ERs or removals

31




32

Source: Government of Japan (2015)

➢ Japan has held consultations for the JCM with developing countries since 2011 and has established the JCM with Mongolia, Bangladesh, Ethiopia, Kenya, Maldives, Viet Nam, Lao PDR, Indonesia, Costa Rica, Palau, Cambodia, Mexico, Saudi Arabia and Chile.

Mongolia
Jan. 8, 2013
(Ulaanbaatar)

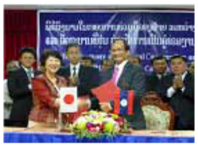
Bangladesh
Mar. 19, 2013
(Dhaka)

Ethiopia
May 27, 2013
(Addis Ababa)

Kenya
Jun. 12,2013
(Nairobi)

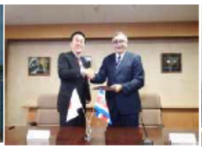
Maldives
Jun. 29, 2013
(Okinawa)

Viet Nam
Jul. 2, 2013
(Hanoi)



Lao PDR
Aug. 7, 2013
(Vientiane)

Indonesia
Aug. 26, 2013
(Jakarta)

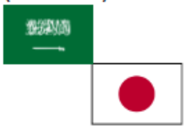


Costa Rica
Dec. 9, 2013
(Tokyo)

Palau
Jan. 13, 2014
(Ngerulmud)

Cambodia
Apr. 11, 2014
(Phnom Penh)

Mexico
Jul. 25, 2014
(Mexico City)

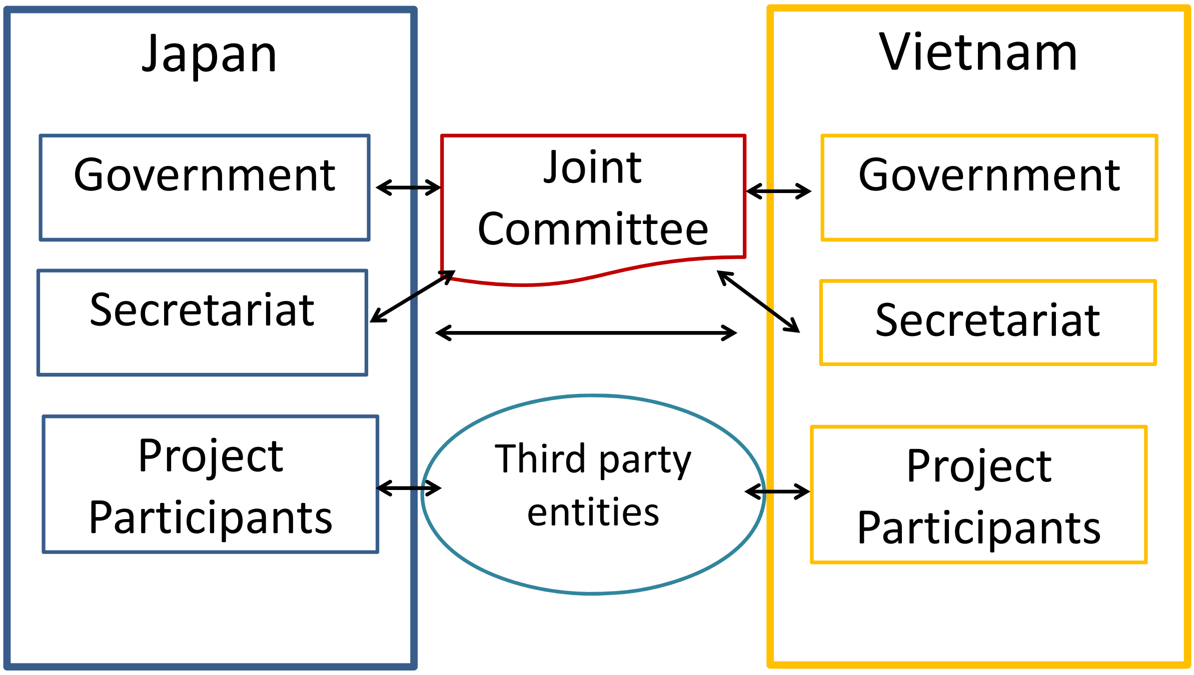


Saudi Arabia
May 13, 2015

Chile
May 26, 2015
(Santiago)

Source: Government of Japan (2015)

# Overview of Institutions



# Key Features of the JCM

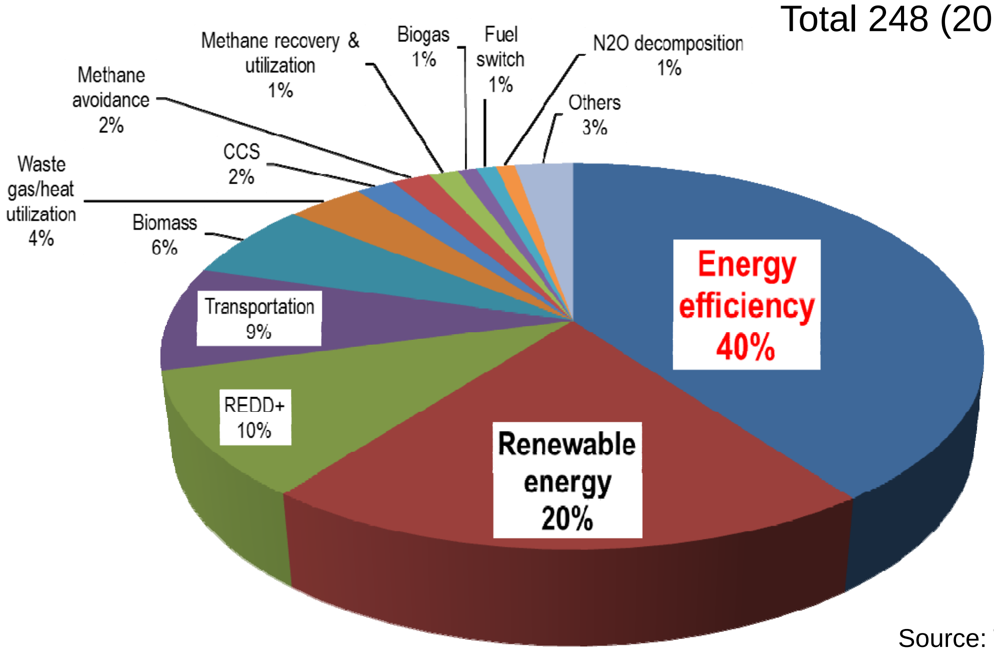
- *"The JCM starts its operation as the non-tradable credit type mechanism".*
- *"The Japanese side and the Vietnamese side (hereinafter referred to as "both sides") continue consultation for the transition to the tradable credit type mechanism and reach a conclusion at the earliest possible timing, taking account of implementation of the JCM."*
- *"A project which started operation on or after 1 January 2013 is eligible for consideration as the JCM project.*

Source: Guidance for the implementation of the Joint Crediting Mechanism (JCM)

35

# Type of Feasibility Studies

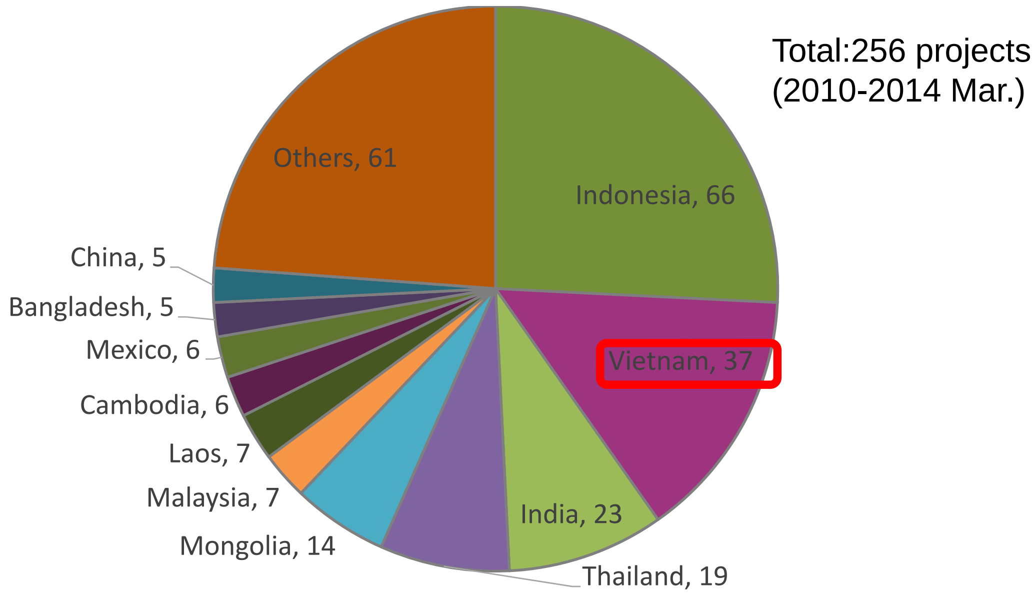
Total 248 (2010-2013 Jul.)




Source: Taken from Asakawa, 2013

36

# Targeted Country of Feasibility Studies




*Projects implemented in more than one countries is counted in others

Source: New mechanism information platform

37

# Future Challenges under JCM

- Potential projects should be explored and identified to implement the JCM as soon as possible.
- Methodologies for calculating emission reductions should be developed and approved for project implementations.
- TPE training is needed to build capacity of local entities.

38

# Request to DPI for Implementation of the Feasibility Study (F/S) in General

1. Counterpart of the Study & the collaboration structure of Da Nang City
- To confirm a focal person (Name & Contact) of this study (Water Management & Needs Survey) of DPI (the lead agency)
- To confirm other concerned authorities/institutions and these focal persons (Name & Contact) of each
- To confirm the below tables (1) water management & (2) Needs Survey

**(1)Draft Counterpart List of the Study (Water Management)**

| Responsible | Expected Collaboration in this Study |
|---|---|
| **DPI (Lead Agency)** | Overall Coordination & Consultation, tendering process |
| **DAWACO** | Technical consultation toward pump renewal, financing, tendering process |
| **DOC** | Technical consultation for macro facility installation |
| **Da Nang Industrial Univ.** | Potential assistance for conducting energy efficiency diagnosis |



# Request to DPI for the F/S (Cont.)

**(2)Draft Counterpart List of the Study (Needs Survey)**

| Responsible | Expected Collaboration in this Study |
|---|---|
| **DPI (Lead Agency)** | Overall Coordination & Consultation<br>◆ Support to get necessary help from designated departments<br>Support to energy-saving workshop (including invitation of companies & support to questionnaire survey)<br>Discussion on the energy-saving & low-carbon development policy & plan |
| ***DOIT***<br><br>***IPDCC***<br>***Da Nang Energy Conservation Center*** | Support (including Discussion & Information Sharing) to the whole process of the study, main process is as follows:<br>◆Preparation of a long list of hotels, commercial facilities, factories, industrial zones, port-related facilities<br>◆Preparation of a shortlist of the said companies in terms of JCM project formulation such as relatively large potential not only to save energy but also to reduce CO2 emission reduction<br>◆Implementation of energy-saving workshop for the shortlisted companies<br>◆Selection of JCM Candidate Projects (5 at a maximum)<br>◆Preparation of a preliminary business plan for JCM Candidate Projects<br>Discussion on the energy-saving & low-carbon development policy & plan |
| **DOCST** | Support to the study process of energy saving of hotels |
| **Ind. Zone Management Board** | Support to the study process of energy saving of the factories in the industrial zone as well as the industrial zone itself (i.e. infrastructure in the industrial zone) |
| **DOT, Da Nang Port Corp.** | Support to the study process of energy saving of the port-related facilities |

# Second Mission

Presentation Materials

**Chương trình Hợp tác giữa thành phố Yokohama và thành phố Đà Nẵng về phát triển bền vững**



Y-PORT
YOKOHAMA PARTNERSHIP OF RESOURCES AND TECHNOLOGIES

## Thành phố Yokohama

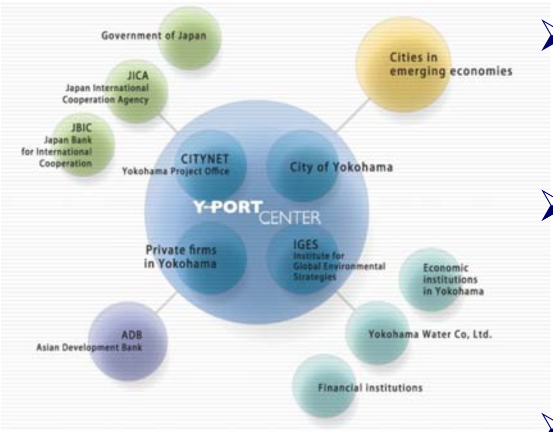
1

Y-PORT
Yokohama Partnership of Resources and Technologies

## Chương trình Hợp tác về Phát triển Đô thị Bền vững


2

# MỤC TIÊU CỦA Y-PORT




- Cung cấp các giải pháp thực tiễn về phát triển đô thị thông minh cho các thành phố ở châu Á và trên thế giới.
- Phối hợp với các chuyên gia, các doanh nghiệp và các thành phố có kỹ thuật tiên tiến trong việc sáng tạo ra các giải pháp về đô thị thông minh.
- Chia sẻ thông tin với các cơ quan/tổ chức quốc tế và Chính phủ Nhật Bản, từ đó xúc tiến, triển khai các hoạt động cụ thể, với sự hỗ trợ từ các cơ quan hữu quan.

*Visit our web site:*
*http://www.city.yokohama.lg.jp/kokusai/yport/en/*

Y-PORT
Yokohama Partnership of Resources and Technologies

Y-PORT CENTER
Yokohama Urban Smart Solution

# Hợp tác giữa thành phố Yokohama và Đà Nẵng

Biên bản ghi nhớ về Hợp tác Kỹ thuật Phát triển Đô thị Bền vững giữa Thành phố Đà Nẵng và Thành phố Yokohama（9/5/2013）


Lĩnh vực hợp tác

1. Thành phố Yokohama sẽ hỗ trợ kỹ thuật cho phía Đà Nẵng trong công tác xây dựng Thành phố Môi trường.

**2. Hai bên sẽ kêu gọi sự tham gia của các viện nghiên cứu và các đơn vị, doanh nghiệp có kiến thức, kinh nghiệm trong phát triển đô thị mà, trọng tâm là về vấn đề môi trường, để đạt được mục tiêu như đã nêu ở trên**

.3. Hai bên sẽ kêu gọi sự hỗ trợ từ phía các Cơ quan quốc tế và Chính phủ để có thể nhận được sự hỗ trợ thích hợp nhất trong quá trình thực hiện công tác hợp tác kỹ thuật

4. Hai bên sẽ chỉ định đơn vị liên lạc chịu trách nhiệm trong việc trao đổi thông tin nhằm đẩy mạnh hiệu quả hợp tác. Đơn vị liên lạc của phía Đà Nẵng là Văn phòng đại diện của thành phố tại Nhật Bản, còn phía Yokohama là Phòng Hợp tác Quốc tế, Cục Chính Sách

4

Yokohama Partnership of Resources and Technologies

# Sơ đồ tổ chức hợp tác giữa hai thành phố

Chính phủ Việt Nam

**Hợp tác giữa hai quốc gia**

Chính phủ Nhật Bản

Thành phố Đà Nẵng

Hợp tác giữa hai thành phố

Thành phố Yokohama

Y-PORT CENTER
Yokohama Urban Smart Solution

Collaboration

JICA

ADB
ASIAN DEVELOPMENT BANK

Doanh nghiệp tư nhân
Đơn vị học thuật

Xúc tiến giao lưu trong lĩnh vực kinh doanh và học thuật

Doanh nghiệp tư nhân
Đơn vị học thuật

Xúc tiến phát triển đô thị bền vững thông qua công tác liên kết với người dân

5

Y-PORT
Yokohama Partnership of Resources and Technologies

Thành phố Đà Nẵng, JICA, Thành phố Yokohama đồng tổ chức Diễn đàn Phát triển Thành phố Đà Nẵng
Hỗ trợ xây dựng Kế hoạch Hành động của thành phố Đà Nẵng

**Diễn đàn Phát triển Thành phố Đà Nẵng lần thứ 3**
**（Tại thành phố Yokohama）： Tổ chức: chiều 31/8/2015**


**Đạt được kết quả trong giai đoạn trung và ngắn hạn thông qua việc xây dựng Chiến lược Hành động có tính khả thi, thực tiễn và cụ thể**

6

Y-PORT
Yokohama Partnership of Resources and Technologies

## Hợp tác với doanh nghiệp Yokohama trong việc cắt giảm khí nhà kính


Mạng lưới Kết nối Đa thành phố

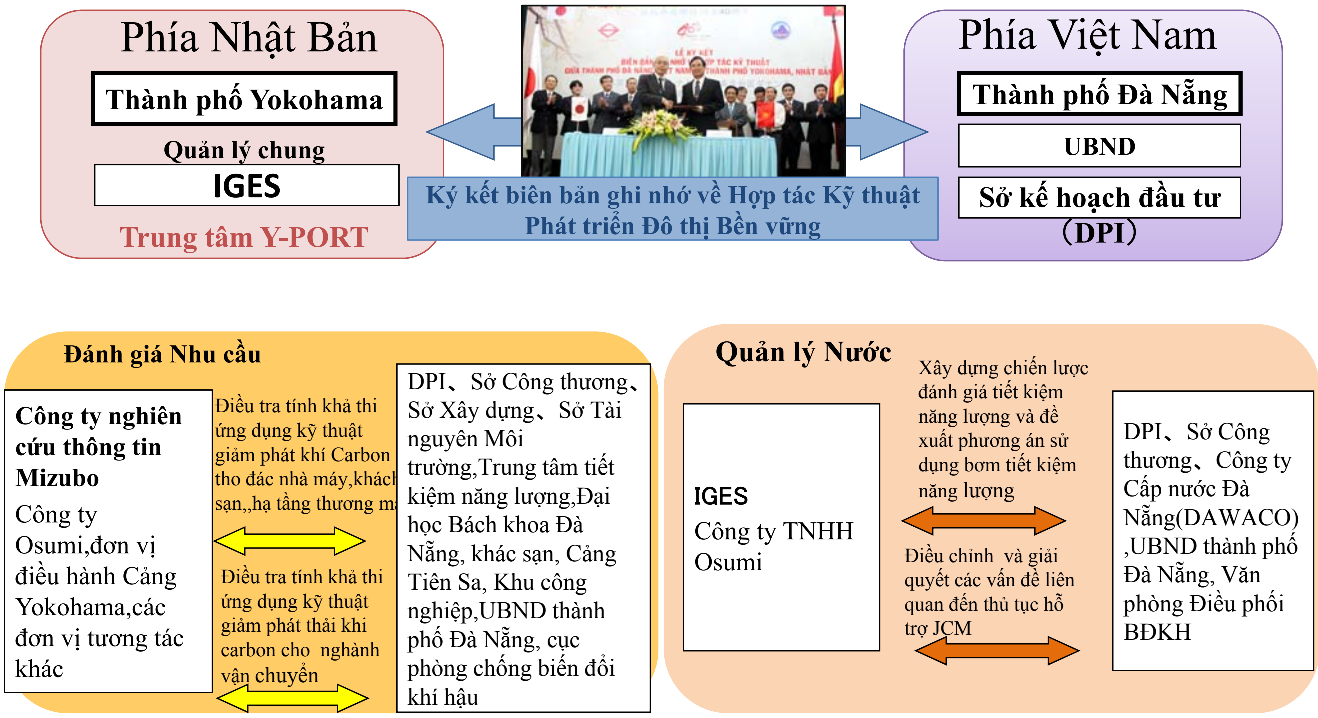
Thành phố Yokohama chủ trì Hội nghị Thượng đỉnh Cấp cao Châu Á
（Hội nghị các Thành phố Thông minh Châu Á)

***Hội nghị lần thứ 4*** **20/10/2015 tại Pacifico**

- 21 thành phố Châu Á
- Các ban nghành Quốc tế và các tỉnh thành Nhât Bản（30 ban nghành）

**Xúc tiến hợp tác giữa các thành phố thông qua mạng lưới đa thành phố Châu Á**

Nghiên cứu khả thi JCM năm 2015(Tp. Đà Nẵng), góp phần xúc tiến các dự án cắt giảm khí nhà kính, đóng góp vào mục tiêu phát triển bền vững của thành phố Đà Nẵng.



MIZUHO

One MIZUHO

Sự hình thành dự án JCM và
các thông tin nhằm xúc tiến thực hiện

# Khái quát về cơ chế tín chỉ chung giữa 2 quốc gia（JCM）và dự án hỗ trợ thiết bị xúc tiến JCM của Bộ Môi Trường Nhật Bản

Ngày 4 tháng 11 năm 2015

Nhóm khảo sát JCM Nhật bản

みずほ情報総研株式会社
Mizuho Information & Research Institute, Inc.



JCM : cơ chế tín chỉ chung

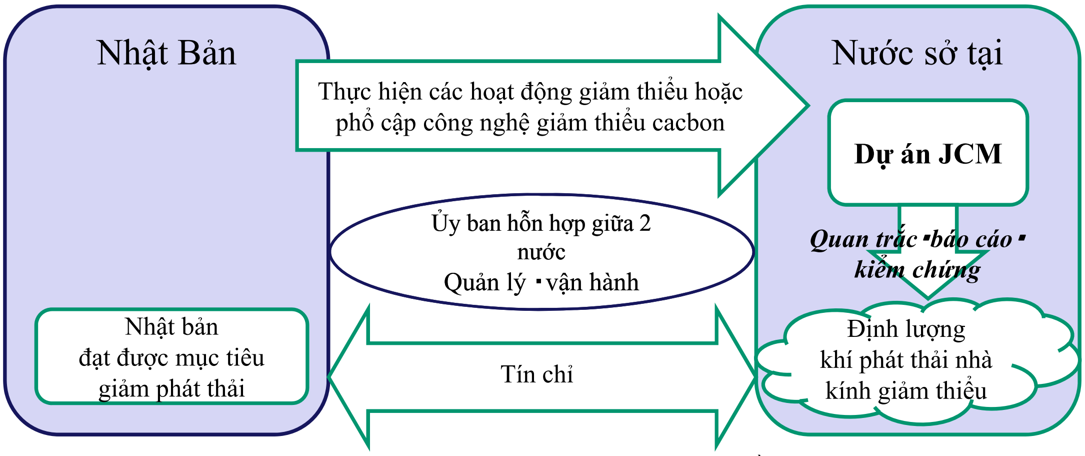




MIZUHO

# Khái niệm cơ bản về cơ thế tín chỉ chung giữa 2 quốc gia（JCM）

- Thúc đẩy phổ biến công nghệ, sản phẩm, hệ thống, dịch vụ và cơ sở hạ tầng tiên tiến, phát thải các-bon thấp cũng như tiến hành các hoạt động giảm nhẹ và đóng góp vào sự phát triển bền vững của các nước đang phát.
- Đánh giá sự nổ lực của Nhật Bản thông qua việc định lượng khí phát thải nhà kính giảm thiểu, đồng thời giúp Nhật Bản đạt được mục tiêu đã đề ra về giảm phát thải khí nhà.
- Đóng góp vào mục tiêu chung của Công ước Khung của Liên hợp quốc về biến đổi khí hậu (UNFCCC) thông qua thúc đẩy các hành động giảm nhẹ và hấp thụ phát thải toàn cầu.

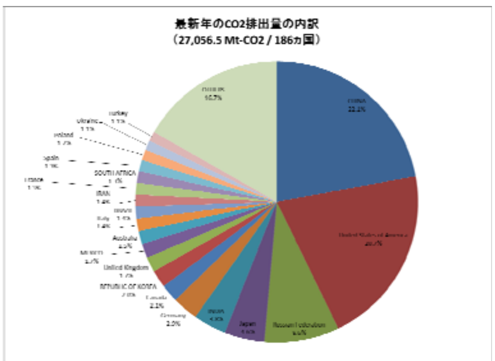



Nguồn： Bộ Môi Trường Nhật Bản




# Tại sao Nhật Bản lại nổ lực thực hiện cơ chế JCM

- Nhật Bản là một trong nhiều quốc đã phát thải nhiều khí CO2, vì vậy trách nhiệm liên quan đến vấn đề biến đổi khí hậu lớn.
- Tháng 7 năm 2015, chính phủ Nhật Bản đã nộp bản cam kết về mục tiêu giảm thiểu khí nhà kính lên tổ chức UNFCCC, cụ thể đến năm 2030 giảm 26% so với cùng kì năm 2013（giảm 25,4% so với cùng kì năm 2005）,（ước tính khoảng 1 tỷ 42 triệu tấn CO2).
- Lượng khí nhà kính giảm thiểu được thông qua các dự án JCM sẽ được công nhận và tính vào con số chung về giảm thiểu CO2 mà Nhật Bản đã đặt ra.
- Thông qua dự án JCM, Nhật Bản đề ra mục tiêu giảm thiểu được từ 50 – 100 triệu tấn CO2, tính theo lũy kế đến năm .



# Các nước đối tác trong cơ chế JCM

➢ Đến thời điểm hiện tại đã ký kết với 15 quốc gia về cơ chế tín chỉ chung（tháng 9 năm 2015）


Nguồn： Bộ Môi Trường Nhật Bản




1. Cơ chế tín chỉ chung giữa 2 quốc gia (JCM) là gì?

2. Dự án hỗ trợ thiết bị xúc tiến JCM của Bộ Môi Trường Nhật Bản

3. Lợi ích của việc tham gia JCM？

4. Giới thiệu về những thiết bị, công nghệ mới đã thực hiện trong khuôn khổ dự án hỗ trợ thiết bị

JCM：cơ chế tín chỉ chung

# Khái quát về dự án hỗ trợ thiết bị của Bộ Môi Trường Nhật Bản

## Gian đoạn hình thành

Khảo sát sơ bộ về khả năng tham gia cơ chế JCM

Nghiên cứu khả thi nội dung tham gia cơ chế JCM（FS）

Hoàn thành hồ sơ đăng ký cơ chế JCM（PS）

Hỗ trợ khảo sát các dự án thí điểm cơ chế JCM (Chính phủ Nhật Bản hỗ trợ tài chính)

## Giai đoạn thực hiện

**Chúng tôi đang tìm kiếm các đối tượng có thể tham gia dự án hỗ trợ thiết bị JCM**

Dự án hỗ trợ thiết bị JCM

Bộ Môi Trường Nhật Bản sẽ hỗ trợ tối đa 50% tài chính, đối với việc đầu tư thay thế thiết bị kỹ thuật giảm thiểu CO2. Đây là dự án hỗ trợ cho việc xúc tiến cơ chế JCM




# Dự án hỗ trợ thiết bị của Bộ Môi Trường Nhật Bản

Bộ Môi Trường Nhật Bản

Hỗ trợ tối đa 50% chi phí đầu tư mới

●Đo đạc lượng khí nhà kính giảm thiểu được thông qua việc thực hiện MRV
●Ghi nhận hơn 50% tín dụng giảm phát thải

Hiệp hội quốc tế

Đại diện dự án（doanh nghiệp Nhật Bản）

Các doanh nghiệp khác cũng có khả năng tham gia

Doanh nghiệp đầu tư thiết bị tại nước sở tại

Mua thiết bị máy móc tiết kiệm năng lượng

| | |
|---|---|
| Đối tượng hỗ trợ | Hiệp hội quốc tế（bao gồm các tập đoàn tư nhân của Nhật Bản） |
| Thời gian thực hiện dự án | Tối đa 3 năm |
| Đối tượng hỗ trợ | Các dự án đầu tư máy móc thiết bị nhằm giảm thiểu phát thải CO2 |
| Ngân sách năm 2015 | 2,4 tỷ yên Nhật |

Nguồn： Bộ Môi Trường Nhật Bản

# Các dự án hỗ trợ thiết bị đã và đang triển khai（nhà máy）

| Quốc gia | Tên dự án |
|---|---|
| Indonesia | Tiết kiệm năng lượng hệ thống làm lạnh và hệ thống chiếu sáng trong nhà máy dệt（thiết bị đông lạnh tiết kiêm năng lượng kiểu mới） |
| Indonesia | Thay thế thiết bị làm lạnh hiệu suất cao sử dụng CO2 và NH3 để làm lạnh tự nhiên cho dây chuyền làm lạnh |
| Indonesia | Thay thế bơm nhiệt nóng lạnh đồng thời |
| Indonesia | Hệ thống phát điện sử dụng hơi thừa tại nhà máy xi măng |
| Indonesia | Lắp đặt hệ thống phát điện mặt trời Hybrid cho các trạm di động tại các khu vực không có điện |
| Indonesia | Lắp đăt lò đốt tái tạo cho các lò luyện nhôm tại nhà máy sản xuất linh kiện oto |
| Indonesia | Lắp đặt hệ thống xử lý giấy carton cũ tại nhà máy giấy入 |
| Indonesia | Lắp đặt hệ thống đèn LED chiếu sáng tại khu công nghiệp |
| Indonesia | Lắp đặt hệ thống lò hơi hiệu quả cao tại nhà máy sản xuất phim |
| Việt Nam | Lắp đặt hệ thống điều hòa tiết kiệm năng lượng tại nhà máy sản xuất ống kính |
| Việt Nam | Lắp đặt máy biến áp vô định hình hiệu suất cao cho mạng truyền tải và phân phối điện |
| Thái Lan | Thay thế máy dệt tiết kiệm năng lượng cho nhà máy dệt may |
| Thái Lan | Thay thế máy nén, máy làm lạnh tiết kiệm năng lượng cho nhà máy sản xuất chất bán dânz |

Nguồn： Bộ Tài nguyên Môi Trường




# Các dự án hỗ trợ thiết bị đã và đang triển khai (khách sạn）

| Quốc gia | Tên dự án |
|---|---|
| Indonesia | Lắp đặt hệ thống đồng phát |
| Indonesia | Lắp đăt thiết bị sử dụng nhiệt thừa |
| Indonesia | Lắp đặt các máy làm lạnh ly tâm hiệu suất cao cho hệ thống điều hòa của trung tâm mua sắm |
| Indonesia | Lắp đặt điều hòa làm mát bằng nước hiệu suất cao cho hệ thống điều hòa của văn phòng |
| Việt Nam | Thay thế máy điều hòa không khí, máy biến tần cho khách sạn |
| Malaysia | Phát điện bằng năng lượng mặt trời tại các tòa nhà |

Nguồn： Bộ Môi Trường Nhật Bản

# Các dự án hỗ trợ thiết bị đã và đang triển khai （giao thông）

| Quốc gia | Tên dự án |
|---|---|
| Việt Nam | Lái xe sinh thái tiết kiệm nhiên liệu thông qua việc sử dụng đầu đĩa kỹ thuật số |

Nguồn：Bộ Môi Trường Nhật Bản



MIZUHO

1. Cơ chế tín chỉ chung giữa 2 quốc gia (JCM) là gì?

2. Dự án hỗ trợ thiết bị xúc tiến JCM của Bộ Môi Trường Nhật Bản

3. Lợi ích của việc tham gia JCM？

4. Giới thiệu về những thiết bị, công nghệ mới đã thực hiện trong khuôn khổ dự án hỗ trợ thiết bị

JCM：cơ chế tín chỉ chung




MIZUHO

# Lợi ích của việc tham gia JCM？

## Giảm chi phí đầu tư ban đầu

Đối với các doanh nghiệp có ý định thay thế hoặc đầu tư thiết bị giảm thiểu CO2 thì sẽ được chính phủ Nhật Bản hỗ trợ tối đa 50% tổng chi phí đầu tư.

## Giảm chi phí quản lý vận hành

Việc thay thế các thiết bị tiên tiến sẽ cắt giảm chi phí quản lý vận hành (chi phí năng lượng).

## Trách nhiêm đối với xã hội (CSR) từ những dự án môi trường

Việc cắt giảm khí nhà kính phát thải là một đóng góp lớn cho xã hội, nâng cao hiệu quả CSR
Điều này đồng nghĩa với việc hình ảnh của doanh nghiệp sẽ được nâng lên tầm quốc tế.




MIZUHO

1. Cơ chế tín chỉ chung giữa 2 quốc gia (JCM) là gì?

2. Dự án hỗ trợ thiết bị xúc tiến JCM của Bộ Môi Trường Nhật Bản

3. Lợi ích của việc tham gia JCM？

4. Giới thiệu về những thiết bị, công nghệ mới đã thực hiện trong khuôn khổ dự án hỗ trợ thiết bị

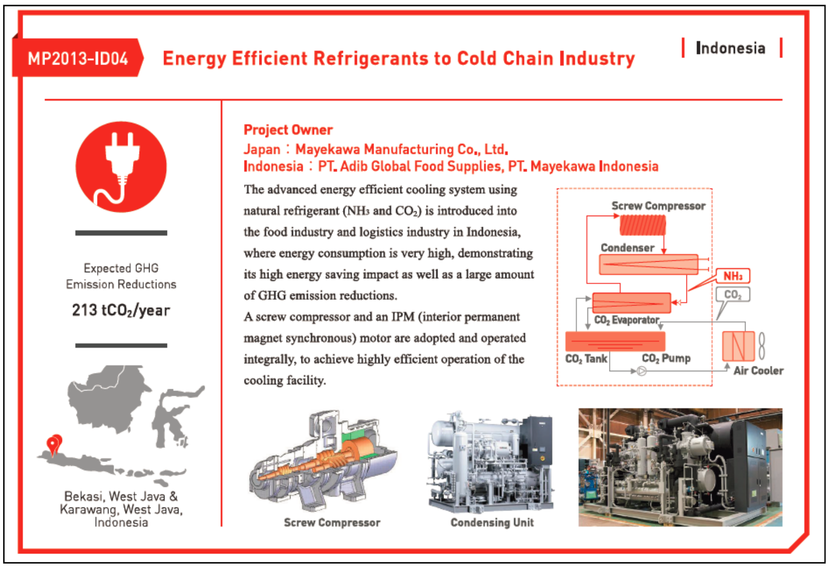
JCM : cơ chế tín chỉ chung




MIZUHO

# (ví dụ1) Hệ thống làm lạnh hiệu suất cao

- Máy làm lạnh hiệu suất cao sử dụng dung môi tự nhiên, phục vụ cho tủ cấp đông và kho lanh bảo quản.
- Tiết kiệm hơn 20% năng lương so với thiết bị hiện tại, (điện năng tiêu thụ 1 năm giảm khoảng 165MWh). Vừa giảm được khí nhà kính, vừa tiết kiệm chi phí tiêu thụ điện năng.

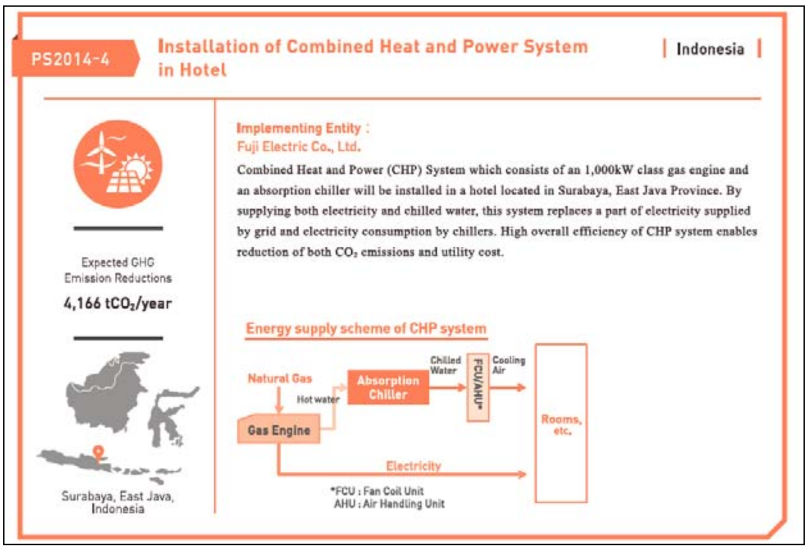



Nguồn: trung tâm môi trường toàn cầu (GEC)




# (ví dụ 2) Hệ thống đồng phát trong khách sạn

- Sử dụng hệ thống đồng phát (động cơ chạy bằng gas) để phát điện cung cấp cho khách sạn, đồng thời nhiệt thừa được thu hồi và đưa qua máy làm lạnh hấp thụ để sử dụng cho hệ thống điều hòa.
- Trường hợp được hỗ trợ 50%: giảm điện năng tiêu thụ và CO2 phát thải. Tỉ lệ thu hồi vốn nội bộ (IRR) trong vòng 15 năm khoảng 24**%**. Thời gian thu hồi vốn khoảng 4 năm.




Nguồn: trung tâm môi trường toàn cầu (GEC)

# (ví dụ 3) Hệ thống đèn LED cho Khu công nghiệp

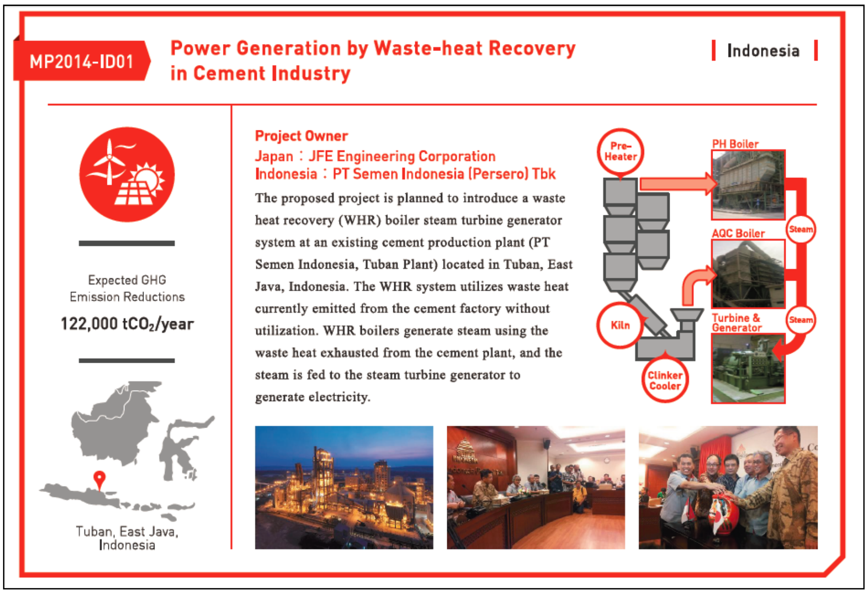
- Lắp đặt đèn LED và hệ thống điều chỉnh ánh sáng từ xa cho khu công nghiệp
- Việc điều chỉnh ánh sáng trở nên thuận lợi, so với hệ thống chiếu sáng cũ tiết kiệm được nhiều năng lượng và giảm CO2 phát thải.


Nguồn: trung tâm môi trường toàn cầu (GEC)




# (ví dụ4) Hệ thống phát điện sử dụng nhiệt thừa tại nhà máy xi măng

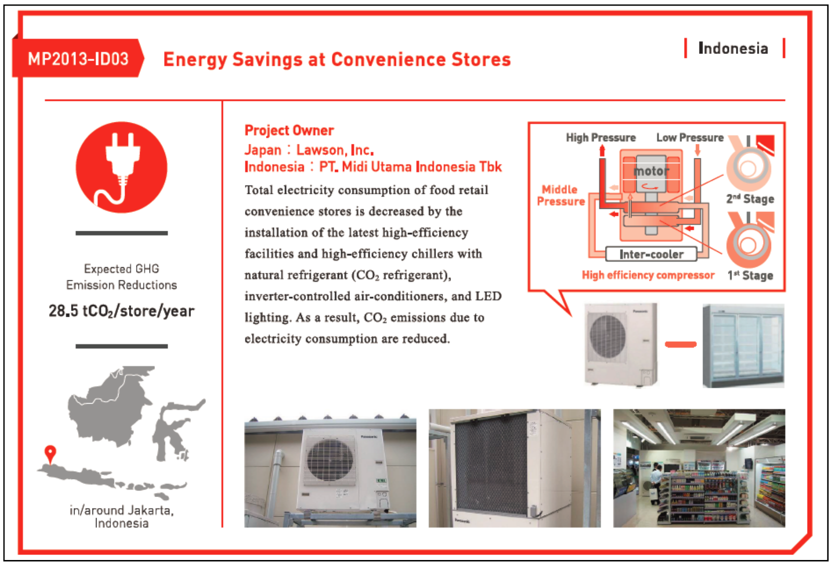
- Lắp đặt thiết bị để thu hồi nhiệt thừa từ quy trính sản xuất xi măng, chuyển hóa nhiệt năng thành điện năng.
- Điện sản xuất được có thể phục vụ cho một phần trong nhà máy, tiết kiệm năng lượng và giảm CO2 phát thải.




Nguồn: trung tâm môi trường toàn cầu (GEC)

# (ví dụ5) Tiết kiệm năng lượng tại các cửa hàng tiện lợi

- Thay thế máy điều hòa không khí sử dụng dung môi tự nhiên (CO2), máy làm lạnh có biến tần, đèn LED.
- Điện năng tiêu thụ 1 năm của mỗi cửa hàng giảm khoảng 39,001kWh.Hiệu quả tiết kiệm năng lượng 21**%** → giảm phát thải CO2 (＊) thực hiện cho một chuỗi nhiều cửa hàng.

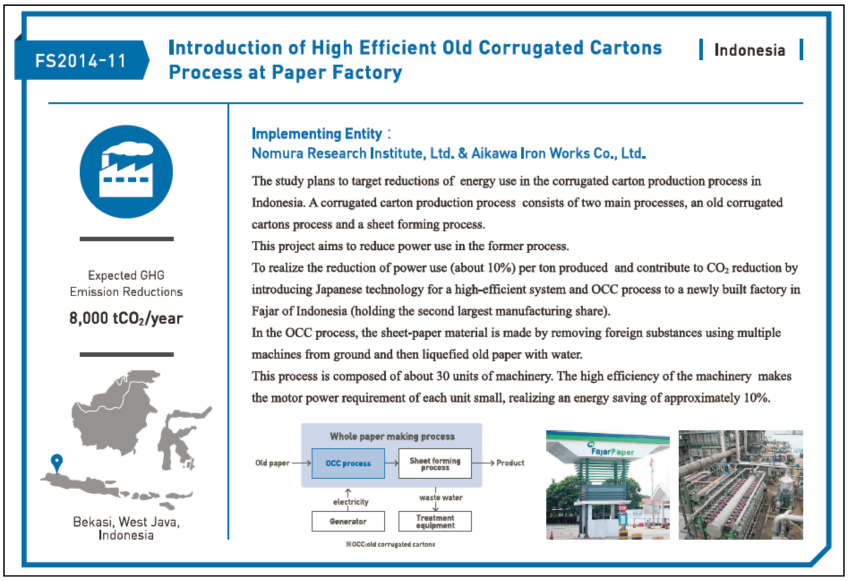



Nguồn: trung tâm môi trường toàn cầu (GEC)




# (ví dụ6) Hệ thống xử lý giấy bì carton cũ

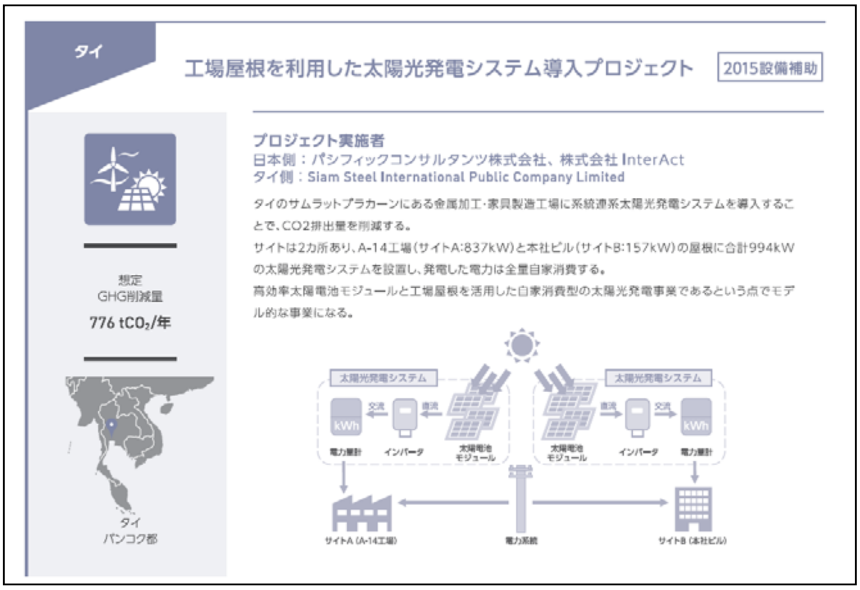
- Lắp đặt hệ thống xử lý giấy bìa carton cũ (hiệu suất cao,công nghệ Nhật Bản) để làm nguyên liệu cho quy trình sản xuất giấy.
- Điện năng tiêu thụ giảm khoảng 10% trên 1 tấn thành phẩm → giảm phát thải khí nhà kính.




Nguồn: trung tâm môi trường toàn cầu (GEC)

# (ví dụ 7) Hệ thống phát điện năng lượng mặt trời

- ➢ Lắp đặt hệ thống phát điện bằng năng lượng mặt trời cho nhà máy gia công kim loại, sản xuất đồ dùng gia đình. Đây là mô hình phát điện tại chỗ, lấy điện từ pin mặt trời lắp trên mái nhà.
- ➢ Lượng điện năng giảm khoảng 1,397MWh → giảm phát thải CO2



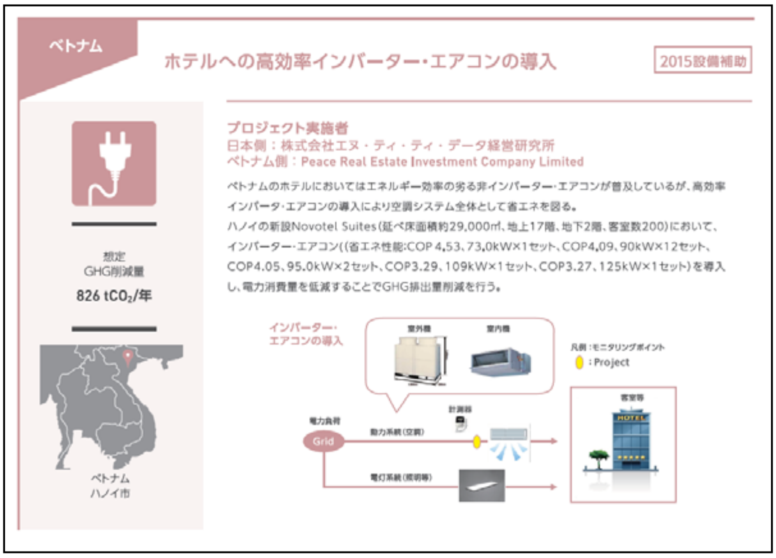

Nguồn: trung tâm môi trường toàn cầu (GEC)




MIZUHO

# (ví dụ 8) Thay thế điều hòa, máy biến tần hiệu suất cao cho khách sạn

- ➢ Tính năng tiết kiệm năng lượng của các thiết bị như sau・
- ➢ COP 4.53、73.0kW × 1set、COP4.09、90kW × 12set、COP4.05、95.0kW × 2set、COP3.29、109kW × 1set、COP3.27、125kW × 1set）。
- ➢ Điện năng tiêu thụ giảm đáng kể → giảm phát thải CO2.



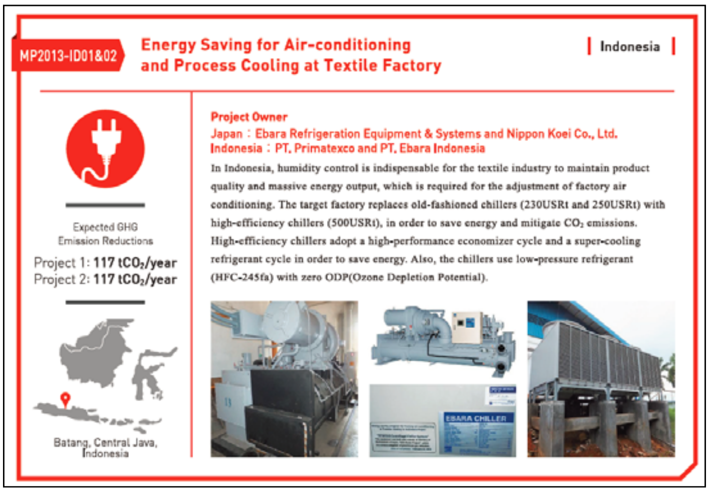

Nguồn: trung tâm môi trường toàn cầu (GEC)




MIZUHO

# (ví dụ9) Đổi mới hệ thống điều hòa trong nhà máy

- Để bảo quản sản phẩm, việc quản lý độ ẩm rất quan trong, do đó đã thay thế hệ thống điều hòa cũ tiêu hao năng lượng. (máy lạnh cũ, 2 máy (230USRt、250USRt (※) máy lạnh mới tiết kiệm năng lượng, 1 máy (500USRt))。
- Giảm điện năng tiêu thụ → giảm phát thải CO2
- Sử dụng dung môi làm lạnh HFC245fa, không gây ảnh hưởng đến tầng Ozon, hơn nữa, hạn chế sự bay hơi của dung môi nhờ sự hấp thụ của than hoạt tính → giảm phát thải khí nhà kính



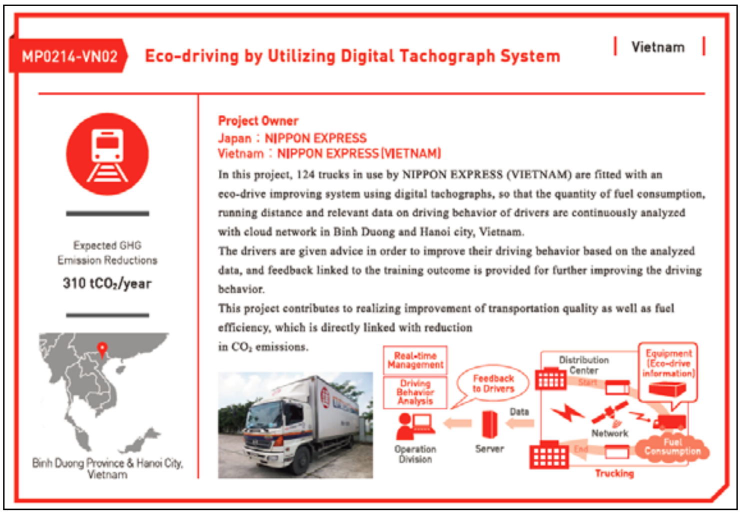

Nguồn: trung tâm môi trường toàn cầu (GEC)



MIZUHO

# (ví dụ10) Đồng hồ tốc độ điện tử trên xe tải

- Lắp đặt đồng hồ tốc độ điện tử trên 130 xe tải của công ty vận chuyển Việt Nam Nippon Express. Hơn nữa, nhờ thiết bị này có thể lưu trữ và phân tích các dữ liệu như lượng tiêu hao nhiên liệu, khoảng cách di chuyển và hành vi lái xe của tài xế.
- Dựa vào kết quả phân tích để hướng dẫn và cải thiện kịp thời hành vi lái xe.
- Không chỉ nâng cao chất lượng dịch vụ vận chuyển, mà còn có hiệu quả tiết kiệm nhiên liệu → giảm phát thải CO2.




Nguồn: trung tâm môi trường toàn cầu (GEC)



MIZUHO

# Lợi ích của việc tham gia dự án hỗ trợ thiết bị

Được hỗ trợ một nửa giá trị đầu tư ban đầu, thời gian thu hồi vốn được rút ngắn, chi phí vận hành thiết bị giảm
→ chi phí trung dài hạn giảm đáng kể

- Hỗ trợ một nửa chi phí đầu tư thiết bị tiết kiêm năng lượng, giảm phát thải khí nhà kính
- Chi phí vận hành thiết bị giảm nhờ đầu tư thiết bị tiên tiến tiết kiệm năng lượng（chi phí điện, các chi phí năng lượng khác）giảm.




Cảm ơn các bạn đã quan tâm theo dõi!!

Thank you so much for your attention!!

ARIGATOU GOZAIMASHITA!!

# JCM Feasibility Study in Da Nang through "Technical Cooperation for Sustainable Urban Development" with Yokohama City

DANANG, NOVEMBER 2015

## BACKGROUND AND OBJECTIVES OF THE JCM FEASIBILITY STUDY

**Background:**

●Conclusion of MoU on Technical Cooperation for Sustainable Urban Development between Da Nang City and City of Yokohama (April, 2013)

●Establishment of "Da Nang City Development Forum" (December, 2014) by Da Nang City, JICA, and City of Yokohama

→ This forum is the platform to discuss implementation of DaCRISS

→ The six action plans and the six project were selected and prioritized through in the last couple of "Da Nang City Development Forum" meetings

→ The City of Yokohama continues to share the technical information for implementation of DaCRISS

**Objectives:**

The objectives of the Study are the following based on the said situation:

- Formulate JCM projects (energy-saving & low-carbon projects) which contribute to elaborate & embody one of the six action plan, "Refine "Environment City of Danang" and Formulate a Integrated Strategic Plan for a New "Environment City" Manifesto"
- Provide feedback of the study to "Da Nang City Development Forum" in order to facilitate discussion on low-carbon development in Da Nang City at a policy level as well as JCM project formation

## JCM FEASIBILITY STUDY IN DA NANG THROUGH "TECHNICAL COOPERATION FOR SUSTAINABLE URBAN DEVELOPMENT" WITH YOKOHAMA

**Japan-side**
City of Yokohama
Project Management
IGES
Y-PORT Center

MOU to establish bilateral cooperation between Da Nang and Yokohama, Apr 2013

**Vietnam-side**
City of Da Nang
People's Committee
DPI

**Water Management**

| | | |
|---|---|---|
| **IGES**<br>Osumi Co., Ltd. | ESCO for installing Energy Efficient pumps<br>Solving procedure related issues in order to gain JCM subsidies | DAWACO, DPI, DOC, CCCO |

**Needs Assessment**

| | | |
|---|---|---|
| **Mizuho Information & Research Institute, Inc.**<br>Osumi Co., Ltd. | Low Carbon Tech in Hotel , Factories and Commercial buildings<br>Low carbon Distributions (port) | DPI, Department of Construction DONRE, DOI, Industrial Park Management, The Univ of Da Nang (University of Technology), Hotels, Tiensa Port, CCCO |

# CASE STUDY OF ON-GOING JCM FS IN WATER MANAGEMENT IN DANANG VIETNAM

## OVERVIEW OF STUDY IN WATER MANAGEMENT

Japan - side

**City of Yokohama**

**Project Management**

**IGES**

**Y-PORT Center**

**MOU to establish bilateral cooperation between Da Nang and Yokohama, Apr 2103**

Vietnam - side

**City of Da Nang**

**People's Committee**

**DPI**

**Water Management**

**IGES**
Osumi Co., Ltd.

ESCO (Energy Service Companies) for installing Energy Efficient pumps

Solving procedure related issues in order to gain JCM subsidies

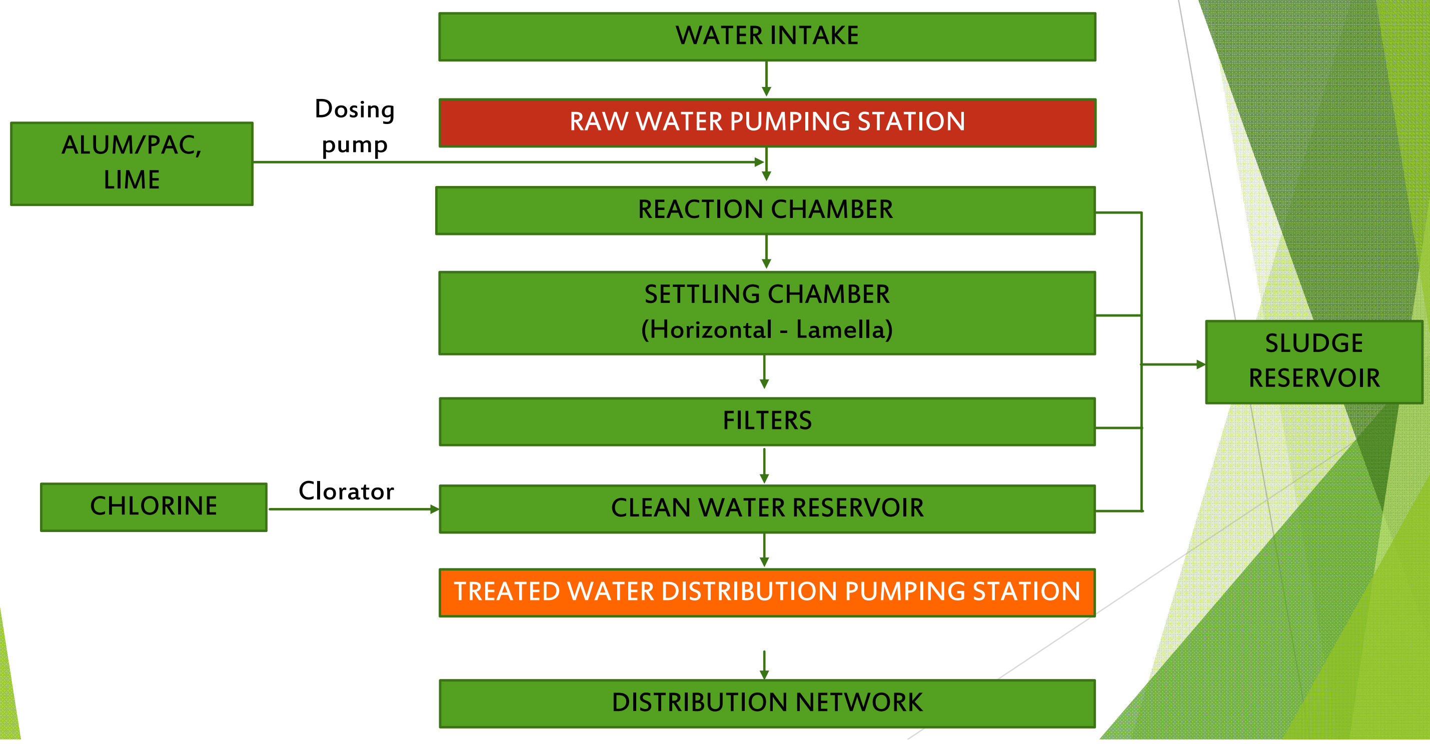
DAWACO
DPI
DOC
CCCO (climate change coordination office)

Da Nang city had a decision to implement the JCM cooperation program feasibility study funded by the Ministry of Environment of Japan in document No. 7066/UBND-TH dated September 8th, 2015.

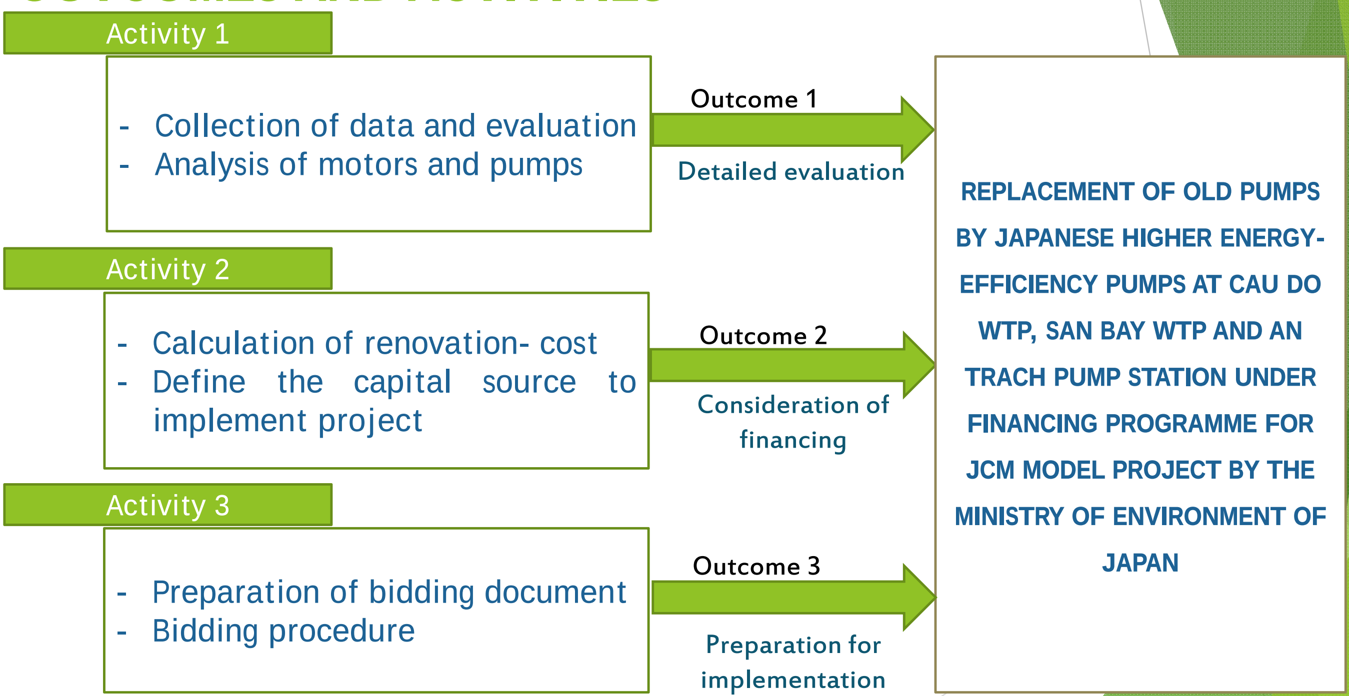
## ABOUT DAWACO

- Total number of staff: 617
- Number of Water treatment plants: 04 WTPs
- Total designed capacity: 210,000 m³/ day
- Rate of households to be served: 88,5%
- Average water consumption: 130 liters/person/day
- Rate of non-revenue water: 17,4%

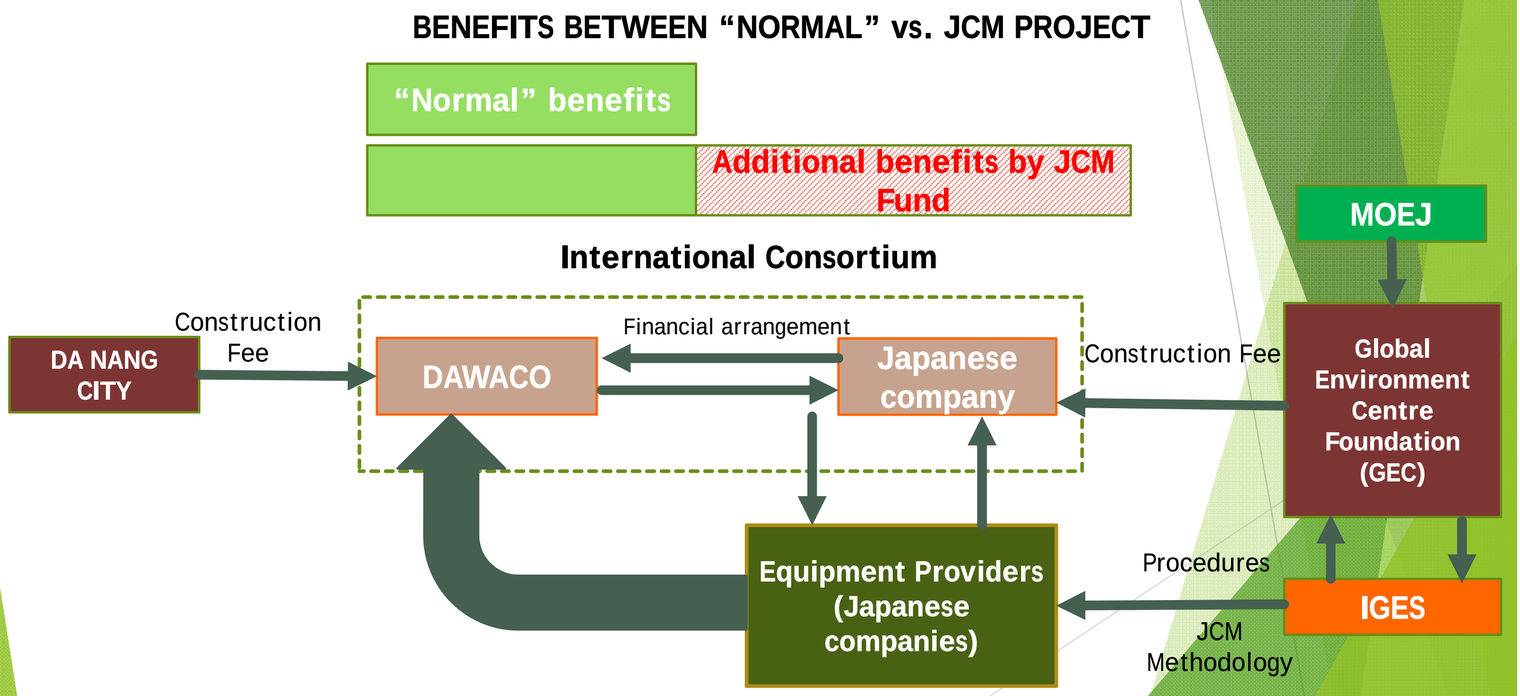
# TYPICAL WATER TREATMENT PROCESS




# OUTCOMES AND ACTIVITIES



## ORGANIZATION STRUCTURE (Benefits)



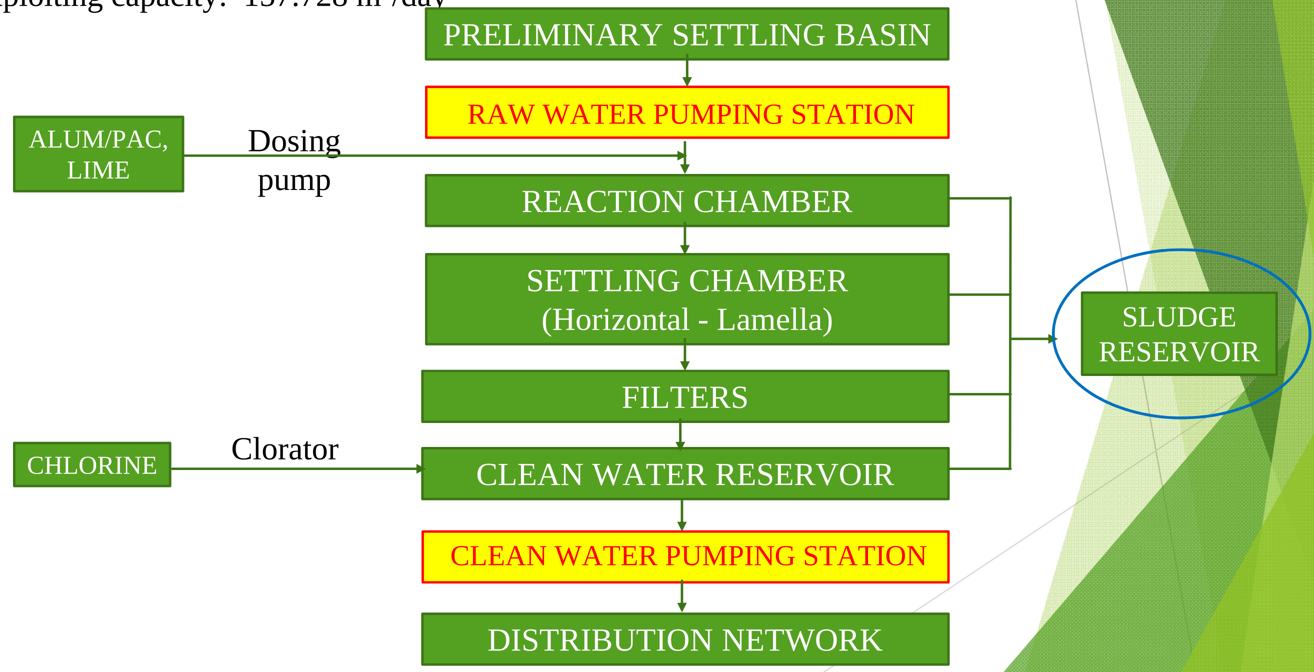

PROPOSED SCENARIOS FOR REPLACEMENT OF RAW AND CLEAN WATER PUMPS*

CAU DO, SAN BAY WATER TREATMENT PLANTS

## Under the JCM Financing Scheme by the Ministry of the Environment, Japan

# CAU DO WATER TREATMENT PLANT

- ❖ Designed capacity: 170,000 $m^3$/day
- ❖ Exploiting capacity: 157.728 $m^3$/day




# PRELIMINARY SETTLING BASIN BEFORE GOING TO THE RAW WATER PUMPING STATION

## RAW WATER PUMP STATION AT CAU DO WTP

**Current Scenario at NEW CAU DO (4 pumps)**

Total capacity:
Q =120,000 $m^3$/day

1
2
3
4

Designed capacity for one pump
Q= 2,650 ($m^3$/h)
H = 19 (m)
N = 200 (kW)
Actual efficiency: 74 (%)

(**Only 1 INVERTER PUMP**)

Q= 2,650 ($m^3$/h)
H = 19 (m)
N = 185 (kW)
Actual efficiency: 74 (%)

4 raw water pumps for NEW CAU DO

2 raw water pumps for NEW SAN BAY

**Current Scenario at OLD CAU DO (3 pumps)**

Total capacity:
Q =50,000 $m^3$/day

1
2
3

Designed capacity for one pump
Q= 1,000 ($m^3$/h)
H = 19 (m)
N = 110 (kW)
Actual efficiency of 2 pumps when parallel operation: 53.4 (%)

3 raw water pumps for OLD CAU DO

## RAW WATER PUMP STATION AT CAU DO WTP

**Current Scenario at NEW CAU DO (4 pumps - NO CHANGE)**

Total capacity:
Q =120,000 $m^3$/day

1
2
3
4

Designed capacity for one pump
Q= 2,650 ($m^3$/h)
H = 19 (m)
N = 200 (kW)
Actual efficiency: 74 (%)

(**Only 1 INVERTER PUMP**)

Q= 2,650 ($m^3$/h)
H = 19 (m)
N = 185 (kW)
Actual efficiency: 74 (%)

4 raw water pumps for NEW CAU DO

2 raw water pumps for NEW SAN BAY

**Expected Scenario Under JCM Project at OLD CAU DO**

**(Replacing with 3 new energy-efficiency pumps - with 1-3 inverters)**

N1
N2
N3

Expected capacity for one pump
Q= 1,200 – 1,500 ($m^3$/h)
H = 14-16 (m)

Replacing with 3 NEW raw water pumps for OLD CAU DO

# CLEAN WATER PUMP STATION AT CAU DO WTP

**Current Scenario at CAU DO WTP**
**(6 horizontal centrifugal pumps)**

Total capacity:
Q =170,000 m$^3$/day

1
2
3
4
5
6

Designed capacity for one pump
Q= 2,400 (m$^3$/h)
H = 42 (m)
N = 450 (kW)
Actual efficiency of 3-5 pumps when parallel operation: 62.3 (%)

(**4 INVERTER PUMPS**)

6 clean water pumps at CAU DO WTP

**Expected Scenario Under JCM Project at OLD CAU DO**

**(Replacing with 6 new energy-efficiency pumps - with 2 additional inverters)**

N1
N2
N3
N4
N5
N6

Designed capacity for one pump
Q= 3,000-3,500 (m$^3$/h)
H = 45 - 50 (m)
(6 INVERTER PUMPS)

- To meet increasing water demand in the future, vision 2025.

- Currently, the actual operating capacity of the pumps are exceeding the designed capacity.

# SAN BAY WATER TREATMENT PLANT

❖ Designed capacity: 30.000 m$^3$/day
❖ Exploiting capacity: 35.062 m$^3$/day

RAW WATER FROM CAU DO PLANT

DISTRIBUTION TOWER

SAN BAY NEW
REACTION CHAMBER
LAMELLA SETTLING CHAMBER
FILTERS
CLEAN WATER RESERVOIR
CLEAN WATER PUMPING STATION

SAN BAY OLD
REACTION CHAMBER
CENTRIFUGAL SETTLING CHAMBER
FILTERS
CLEAN WATER RESERVOIR
CLEAN WATER PUMPING STATION

DISTRIBUTION NETWORK

# SAN BAY RAW WATER TREATMENT PLANT

**Current Scenario at OLD SAN BAY Raw Water Pumping Station (Within Cau Do raw Pumping Station)**

**(2 horizontal centrifugal pumps)**

1

2

Designed capacity:
Q= 800 ($m^3$/h)
H = 35 (m)
N = 110 (kW)
Efficiency: 53.4 (%)

Designed capacity:
Q= 800 ($m^3$/h)
H = 35 (m)
N = 90 (kW)
Efficiency: 53.4 (%)

4 raw water pumps for NEW CAU DO

**Expected Scenario Under JCM Project at SAN BAY Raw Water Pumping Station**

**(Replacing with 2 new energy-efficiency pumps - with 1- 2 inverters)**

N1

N2

Expected capacity for each pump:
Q= 1,000-1,200 ($m^3$/h)
H = 35-40 (m)

Replacing 2 raw water pumps at OLD SAN BAY with 2 New energy-efficiency pumps

# NEW SAN BAY CLEAN WATER PUMPING STATION

**Current Scenario at New SAN BAY Clean Water Pumping Station**

**(3 horizontal centrifugal pumps, equipped with 2 INVERTERS)**

1

2

3

Designed capacity for non-inverter pump:
Q= 1,400 (m3/h)
H = 35 (m)
N = 185 (kW)
Efficiency: 68-70%

**2 INVERTER PUMPS**

Designed capacity for each inverter pump:
Q= 1,400 (m3/h)
H = 35 (m)
N = 185 (kW)
Efficiency: 80-82%

3 clean water pumps at NEW San Bay

**Expected Scenario Under JCM Project at New SAN BAY Clean Water Pumping Station**

**(Addition of INVERTER to the pump without inverter)**

1

2

3

**Equipped this pump with INVERTER (with capacity of 200 kW)**

Expected efficiency: 80-82%

**3 INVERTER PUMPS**

## EXPECTED RESULTS

- Having the new Japanese pumps with good quality and higher energy-efficiency (increasing the energy-efficiency of pumps) with low investment cost.
- Reducing the power consumption and GHG emissions, contributing to the targets of the City toward "An Environmental City" by the year 2020.
- Stable and effective performance in producing activity and better service.

## THANK YOU FOR YOUR ATTENTION

# VIETNAM-JAPAN JOINT CREDITING MECHANISM

*Nguyen Thanh Hai*

*Department of Meteorology, Hydrology and Climate Change*

*Ministry of Natural Resources and Environment*

*Da Nang, 4 November 2015*

## Contents

- ❑Overview of Vietnam's JCM
- ❑Milestones and achievements
- ❑Frequently asked questions
- ❑The way forward

# Overview

The Beginning
The MOU
Institutional arrangement
Project Procedure Cycle

# Vietnam-Japan JCM: The Beginning

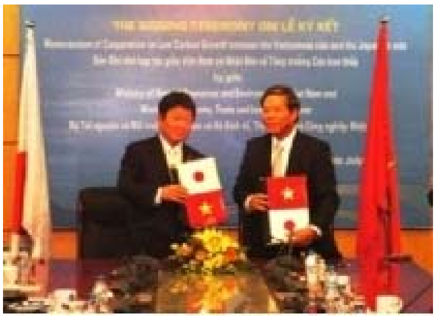
2 July 2013 - Signing the bilateral document on Joint Crediting Mechanism

Minister of Natural resources and Environment Vietnam

Minister of Economy, Trade and Industry Japan

"Memorandum of Cooperation on Low Carbon Growth between the Vietnamese side and Japanese side"

# Vietnam-Japan JCM: the MOU



JCM is a mechanism that encourages the business sector of both sides to invest in low-carbon technologies

"In pursuit of the ultimate objective of the UNFCCC; of achieving sustainable development; and in order to continue to address climate change in cooperation beyond 2012"

"To promote investment, deployment of low-carbon technologies, products, systems, services, infrastructures to achieve low-carbon growth in Vietnam"

"Verified reductions or removals from projects under the JCM can be used as part of Japan's internationally pledged GHG mitigation efforts and Vietnam's NAMA"

"Facilitating financial, technological and capacity building support for the implementation of the JCM"

"JCM starts as non-tradable credit type mechanism and continue towards transition to tradable credit type"

# Vietnam-Japan JCM: Institutional arrangement

**Government of Vietnam**

- ❑ Vice Minister of MONRE (co-chair)
- ❑ MONRE
- ❑ MOIT
- ❑ MOF
- ❑ MPI
- ❑ MARD
- ❑ MOC
- ❑ MOST
- ❑ MOT

**Government of Japan**

- ❑ Minister of Japan Embassy in Hanoi (co-chair)
- ❑ MOEJ
- ❑ METI
- ❑ Other agencies

**Joint Committee**
(02 Co-chairs)

JCM Secretariat

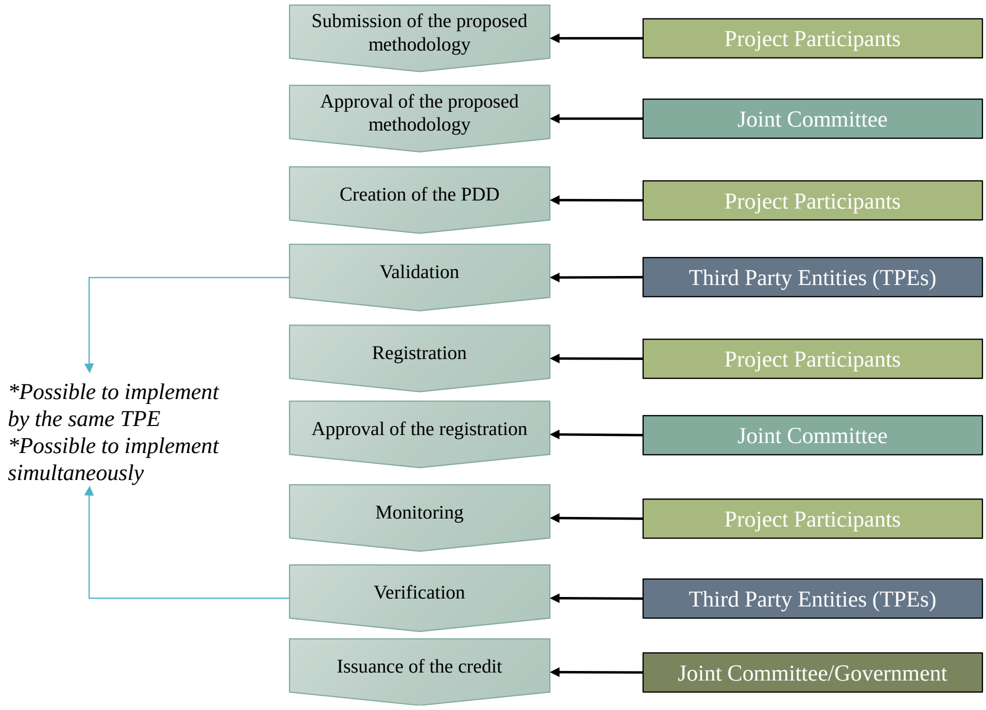
Vietnam's DMHCC

Japan's Mitsubishi UFJ Research and Consulting Co., Ltd

Circular 17/2015/TT-BTNMT by MONRE dated 06 April 2015 on guidelines for the implementation of JCM projects

- ❖ Rules of procedure
- ❖ Guidelines for the implementation of JCM projects
- ❖ Others…

# Vietnam-Japan JCM: Project Procedure Cycle




# Milestones and achievements

Major milestones

Other achievements

Approved Methodologies

Projects

TPEs

# Vietnam-Japan JCM: Major milestones

18/9/2013

## First Joint Committee Meeting

Signing Ceremony for adoption of the "Guidance for the Implementation of the Joint Crediting Mechanism" and the "Joint Crediting Mechanism Rules of Procedures for the Joint Committee"

Discussion on other rules and guidelines for adoption

17/2/2014

## Second Joint Committee Meeting

Adopted rules and guidelines to be followed for the pilot phase of the JCM implementation between Vietnamese side and Japanese side

Discussion on the potential projects

14/1/2015

## Third Joint Committee Meeting

Adopted 3 proposed methodologies

Discussion on proposed revised "Joint Crediting Mechanism Rules of Procedures for the Joint Committee", "Joint Crediting Mechanism Guidelines Project Cycle Procedures" and "Joint Crediting Mechanism Guidelines for Designation as a Third-Party Entity"

4/8/2015

## Fourth Joint Committee Meeting

1st JCM registered project

Discussion on proposed amendments to the "Guidance for the Implementation of JCM", "JCM Credits Issuance Request Form" and "JCM Project Cycle Procedures"

# Vietnam-Japan JCM: Other achievements

- *Designating TPEs
- Calling for public input on methodologies/project documents
- *Approving methodologies/JCM projects
- Institutionalization of JCM (Circular 17/2015/TT-BTNMT by MONRE)
- Promotion, capacity building and awareness raising
- Encouraging private sector involvement

**Joint Committee decisions made via electronic means*

# Vietnam-Japan JCM: Approved Methodologies

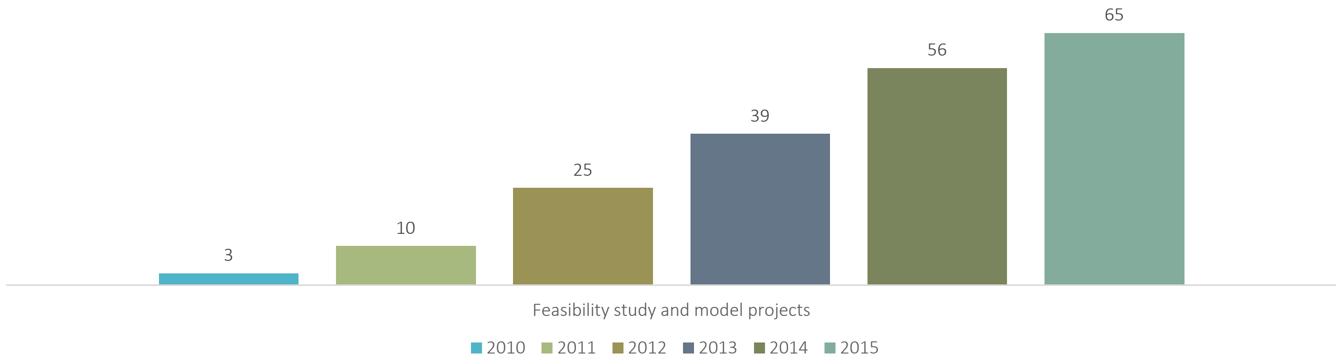
**Methodology**
→ calculating emission reductions achieved by project and monitoring project.

**Approved methodologies**

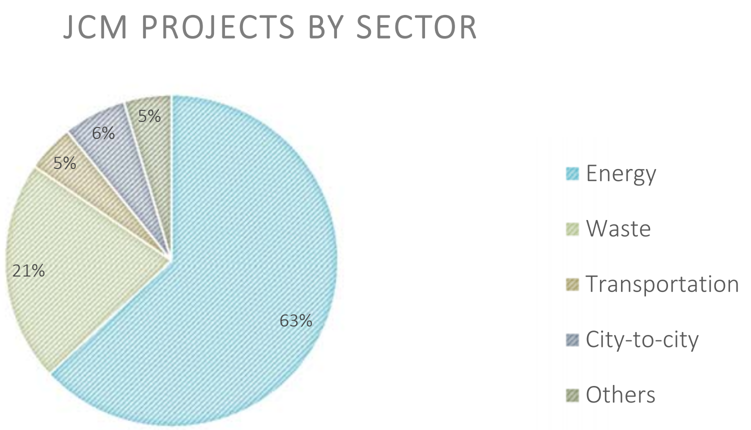
- **VN_AM001** – Transportation energy efficiency activities by installing digital tachograph systems
- **VN_AM002** – Introduction of Room Air Conditioners Equipped with Inverters
- **VN_AM003** – Improving the energy efficiency of commercial buildings by utilization of high efficiency equipment
- **VN_AM004** – Anaerobic digestion of organic waste for biogas utilization within wholesale markets
- **VN_AM005** – Installation of energy efficient transformers in a power distribution grid

# Vietnam-Japan JCM: Projects

NUMBER OF JCM FEASIBILITY STUDIES, PLANNING STUDIES, MODEL AND DEMONSTRATION PROJECTS



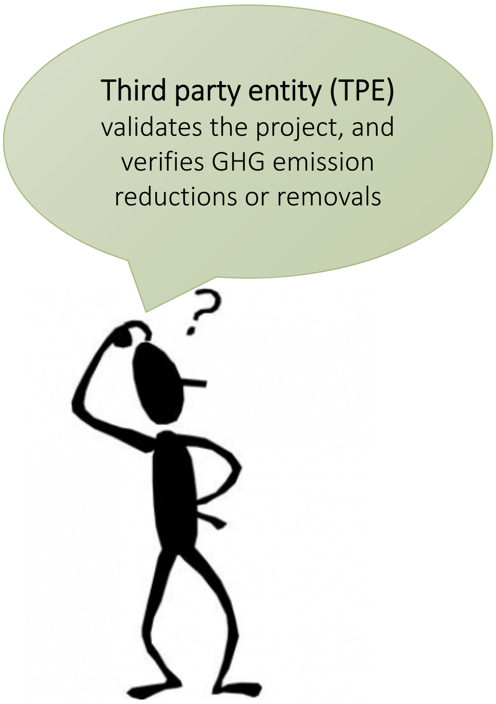
# Vietnam-Japan JCM: Projects




# Vietnam-Japan JCM: Projects


VN001 "Eco-Driving by Utilizing Digital Tachograph System"

# Vietnam-Japan JCM: Third Party Entities




| | Entity | Sectoral scope for validation | Sectoral scope for verification | Designated date |
|---|---|---|---|---|
| TPE-VN-001 | Lloyd's Register Quality Assurance Limited | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13 | 23 Apr 14 |
| TPE-VN-002 | Japan Quality Assurance Organization | 1, 3, 4, 5, 9, 10, 13, 14 | 1, 3, 4, 5, 9, 10, 13, 14 | 23 Apr 14 |
| TPE-VN-003 | Japan Management Association | 1, 2, 3, 4, 6, 8, 9, 14 | 1, 2, 3, 4, 6, 8, 9, 14 | 27 May 14 |
| TPE-VN-004 | TÜV SÜD South Asia Private Limited | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | 27 May 14 |
| TPE-VN-005 | Deloitte Tohmatsu Evaluation and Certification Organization Co., Ltd | 1, 2, 3, 4, 5, 8, 10, 12, 13, 15 | 1, 2, 3, 4, 5, 8, 10, 12, 13, 15 | 27 May 14 |
| TPE-VN-006 | TUV Rheinland (China) Ltd | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 | 29 Mar 15 |
| TPE-VN-007 | EPIC Sustainability Services Private Limited (EPIC) | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15 | 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15 | 29 Mar 15 |
| TPE-VN-008 | KBS Certification Services Pvt. Ltd | 1, 3, 4, 5, 7, 9, 10, 12, 13, 15 | 1, 3, 4, 5, 7, 9, 10, 12, 13, 15 | 31 May 15 |

# Frequently asked questions

# Vietnam-Japan JCM: Q&A

Q: What does Vietnam benefit from JCM?

A: Vietnam will benefit from financial, technology and capacity building support by Japan

+ For private sector: receiving up to 50% of the investment cost from the Japanese side, motivating companies and businesses switching to low-carbon, high-efficiency advanced technologies from Japan, leading to higher productivity, lower emissions and stronger competitiveness

+ For the Government of Vietnam: enhancing Vietnam's contribution to the ultimate goal of the UNFCCC, facilitating implementation of NAMAs and iNDC, contributing to sustainable development, climate change response and green growth

# Vietnam-Japan JCM: Q&A

Q: What are advantages and disadvantages of JCM?

Advantages

+ Bilateral agreement so procedures are simpler and faster

+ Strong financial and technical support from Japan

+ Support from Gov' of Vietnam

Disadvantages

+ Recent mechanism without international recognition

+ Technical guidelines are still undergoing revision

+ Unclear mechanism for distributing credits

+ Credits are not tradable

# Vietnam-Japan JCM: Q&A

Q: What are both countries are looking for in a JCM project?

**Japanese side**

- Projects that have high potential in development of JCM Methodologies to quantify GHG emission and demonstration of the effectiveness of leading Japanese technologies and/or products installed and operated in the projects
- GHG emission reduction or removal amount to be MRVed by a Third Party Entity (TPE)
- Project Participants to consist of entities from Japan and host country (only Japanese entities can apply for the JCM model, demo projects)
- Technology installation to be completed within 3 years since the adoption of financing
- To contribute to Japan's accomplishment of GHG emission reduction goals

**Vietnamese side**

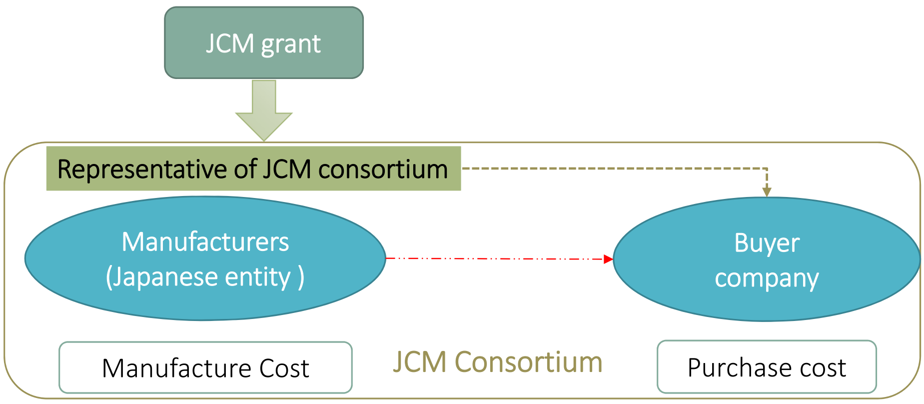
- Projects to comply with applicable strategies/master plans/development plans of Vietnam; regulations/standards on science and technology; socio-economic development plans of localities
- Implementation of projects do not have adverse impact environmentally and socially
- Contributing to the implementation of Nationally Appropriate Mitigation Actions (NAMA) and Intended Nationally Determined Contributions to the UNFCCC (INDC) of Vietnam
- Based on actual need of Vietnamese business sector

# Vietnam-Japan JCM: Q&A

Q: Can a Vietnamese company apply for JCM funding from the Gov' of Japan?

A: No. Only Japanese entity are eligible for applying for funding from the Gov' of Japan for JCM projects. However, a Vietnamese company can (and should) actively search for a Japanese counterpart when they want to register their projects under the JCM.

Example:



# Vietnam-Japan JCM: Q&A

Q: What is a JCM consortium?

◆A:
A JCM consortium is a project framework for conducting a JCM project, consisting of both Japanese and local companies of Vietnam. All parties will sign an agreement.

❖Japanese company
- Receive JCM grants from the Japanese government and deliver the grant to partners of the consortium
- Entity to play as a representative of JCM consortium

❖Vietnamese company
- Responsible to purchase and install JCM technologies
- It can be a Japanese company, if it has a business license in Vietnam

# Vietnam-Japan JCM: Q&A

Q: What are JCM financial schemes?

A: There are currently 4 financial channels for JCM projects

➢GoJ Funding for demonstration and model projects

✧MEOJ: 50% of investment costs for technology;

✧METI and NEDO: 100% of investment costs for technology; purchase of technology after three years at a normal discount rate;

➢New "leapfrog" development enabling program by MOEJ

✧*Japan Fund for the JCM (JFJCM – ADB trust fund):* To provide financial incentives for the adoption of the advanced low-carbon technologies that are too expensive for the ADB-financed projects

✧*Fund for expansion of low-carbon technologies:* To finance JCM projects which have better efficiency of reducing GHG emission in collaboration with other projects supported by JICA or other Japanese entities.

# Vietnam-Japan JCM: Q&A

Q: Is there a JCM financial mechanism in Vietnam?

A: At the moment, there is no specialized financial mechanism for the JCM. Therefore, all JCM project activities are subject to current Vietnamese laws (e.g.: import taxes, procurement law, etc.).

# Vietnam-Japan JCM: Q&A

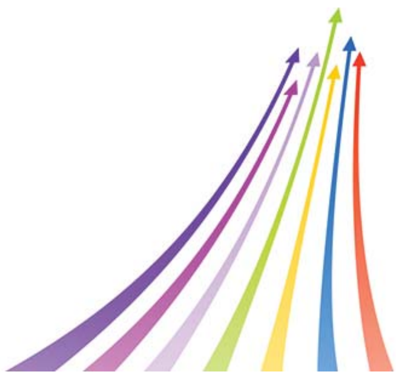
Q: Apart from any normal costs for a normal project, are there any other costs in a JCM projects?

A: Apart from normal costs, project participants (Vietnamese and Japanese entities in the JCM consortium) *may* have to pay the fees for the TPE to carry out validation and verification.

# The way forward

## Vietnam-Japan JCM: The way forward

- Cooperating with Vietnamese stakeholders and Japanese counterparts to review and strengthen the project cycle procedures, credit distribution, credit trading and financial mechanism
- Forming technical advisory board for JCM
- Organizing JCM workshops to government agencies and business sector
- Organizing business forum on JCM and other technology support mechanisms



# Contacts

- *Department of Meteorology, Hydrology and Climate Change*

No. 10, Ton That Thuyet, Hanoi

Tel: *(+84-4) 37-955-116*

Fax: *(+84-4)37-759-770*

JCM Secretariat email: info@jcmvietnam.vn

International JCM website: http://www.mmechanisms.org/e/index.html

Vietnam JCM website: http://jcmvietnam.vn/

Thank you!!!

Sự hình thành dự án JCM
Tài liệu hội thảo xúc tiến

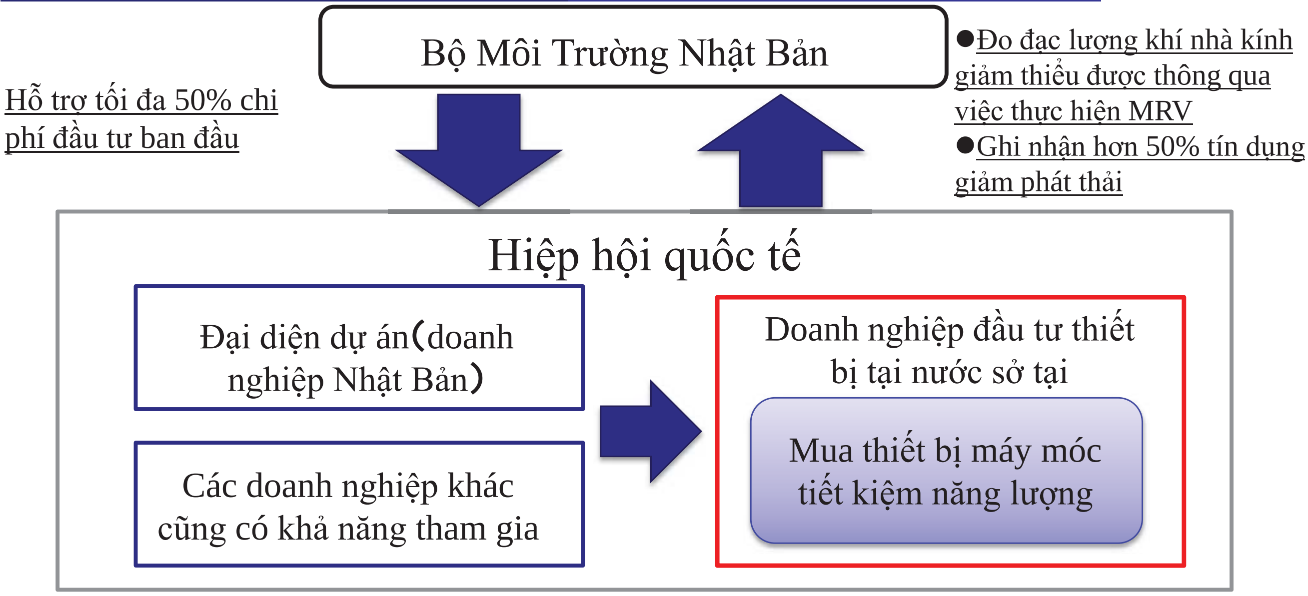
# Thủ tục đăng ký dự án hỗ trợ thiết bị JCM

Ngày 4 tháng 11 năm 2015

Nhóm khảo sát JCM Nhật Bản

みずほ情報総研株式会社
Mizuho Information & Research Institute, Inc.

# Dự án hỗ trợ thiết bị của Bộ Môi Trường Nhật Bản




**Đối tượng hỗ trợ**

Hiệp hội quốc tế（bao gồm các tập đoàn tư nhân của Nhật Bản）

**Đối tượng hỗ trợ**

Các dự án đầu tư máy móc thiết bị nhằm giảm thiểu phát thải CO2

**Thời gian thực hiện dự án**: Tối đa 3 năm

**Ngân sách năm 2015**: 2,4 tỷ yên Nhật

Nguồn： Bộ Môi Trường Nhật Bản



# Khuôn khổ dự án hỗ trợ thiết bị JCM

① Ngân sách năm 2015： 2,4 tỷ yên Nhật, kéo dài 3 năm（tổng cộng 7,2tỷ yên Nhật）⇒ khoảng 443 tỷ VND/ 3năm, tổng cộng 1,330 tỷ VND

② Nội dung hỗ trợ： hỗ trợ tối đa một nửa tổng giá trị đầu tư thiết bị (theo kinh nghiệm từ trước đến nay, 1 dự án khoảng 50 triệu yên Nhật（khoảng 9.2 tỷ VND）～khoảng 100 triệu yên Nhật(khoảng 184 tỷ VND)

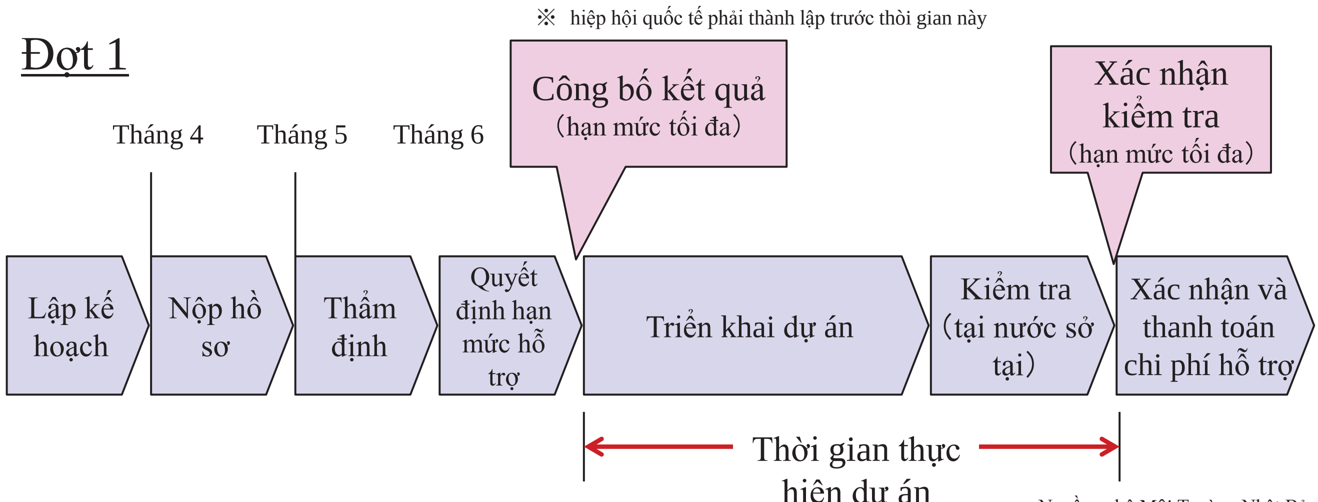
③ Đối tượng tiếp nhận： hiệp hội quốc tế

④ Đối tượng dự án： các dự án thay thế máy móc thiết bị nhằm mục đích giảm thiểu phát thải CO2（bao gồm chi phí xây dựng, chi phí thiết bị, chi phí văn phòng）

⑤ Trách nhiệm của phía tiếp nhận hỗ trợ：
- Sau khi hoàn thành dự án lắp đặt, trong thời gian khấu hao phải tiến hành quan trắc và tính toán lượng CO2 giảm thiểu.
- Báo cáo và nộp lên chính phủ Nhật hơn một nửa tín chỉ JCM từ việc cắt giảm CO2.

⑥ Lưu ý： doanh nghiệp vẫn phải chi trả tối thiểu là một nửa tổng giá trị đầu tư.

# Thủ tục đăng ký dự án hỗ trợ thiết bị JCM (phần 1)




Nguồn: bộ Môi Trường Nhật Bản

## Giai đoạn「lập kế hoạch」

- Trường hợp có sẵn dự án đầu tư thiết bị và cơ chế tài chính ⇒ xem xét khả năng đăng lý dự án hỗ trợ thiết bị JCM
- Đánh giá dựa trên cơ sở cơ chế JCM ※có thể tham khảo ý kiến Bộ Môi Trường
- Nghiên cứu kế hoạch, tài chính, thể chế thực hiện MRV, lịch trình, từ đó xây dựng nội dung thực, kế hoạch dự án chi tiết.




# Thủ tục đăng ký dự án hỗ trợ thiết bị JCM (phần 2)

## Gian đoạn「nộp hồ sơ」

- Viết đề xuất dựa trên kế hoạch thực hiện dự án
- Bắt đầu nộp hồ sơ từ tháng 4, công bố kết quả vào tháng 6
- Nếu ngân sách đợt 1 còn dư thì sẽ chuyển sang đợt 2 (dự kiến tháng 9 năm 2015)

## Giai đoạn「thẩm định」

- Bộ Môi Trường và các chuyên gia thực hiện
- Tiêu chí lựa chọn: ①thiết bị đầu tư có mang lại hiệu quả giảm phát thải CO2 không ②có hiệu quả tiết kiệm năng lượng so với thiết bị tại nước sở tại hay không, không cần phải thiết bị tân tiến
- Cần phải điều chỉnh trước vì tính cạnh tranh cao

## Giai đoạn「quyết định hạn mức hỗ trợ」

- Xem xét nội dung các hồ sơ đăng ký, điều chỉnh hạn mức hỗ trợ.
- Theo đó, sự thành lập của hiệp hội quốc tế là cần thiết.

# Thủ tục đăng ký dự án hỗ trợ thiết bị JCM（phần 3）

Giai đoạn「triển khai dự án」

- Bắt đầu triên khai sau khi công bố kết quả và hạn mức hỗ trợ
- Trong thời gian này phải hoàn thành các thủ tục đặt hàng, thanh toán chi phí thiết bị đã được phê duyệt theo đề xuất.（ngày nộp báo giá thiết bị có thể gia hạn đến trước ngày công bố kết quả）
- Trong thời gian triển khai dự án nếu không hoàn thành các thủ tục nói trên thì dự án hỗ trợ thiết bị sẽ bị hủy
- Trong thời gian này, tiến hành đăng ký thủ tục cũng như phương pháp luận của cơ chế JCM. Chi phí để thực hiện MRV năm đầu sẽ được Bộ Môi Trường Nhật Bản hỗ trợ.

Giai đoạn「kiểm tra tại nước sở tại」

- Đại diện của Bộ Môi Trường Nhật Bản sẽ đến doanh nghiệp tại nước sở tại để xác nhận việc hoàn thành lắp đặt và vận hành thiết bị mới.




# Thủ tục đăng ký dự án hỗ trợ thiết bị JCM（phần 4）

Giai đoạn「xác nhận và thanh toán chi phí hỗ trợ」

- Thanh toán chi phí hỗ trợ dựa trên hóa đơn và đơn đề nghị thanh toán trước ngày 30 tháng 4 của năm tiếp theo ( sau 1 năm nộp hồ sơ yêu cầu thanh toán.)
- Đối với dự án triển khai trong nhiều năm, có thể thanh toán từng năm một, tuy nhiên đợt thanh toán của năm cuối cùng phải điều chỉnh hợp lý.

Giai đoạn「sau khi kết thúc dự án hỗ trợ thiết bị」（đến cuối năm 2020）

- Sau khi kết thúc gian đoạn triển khai, trong thời gian khấu hao thiết bị phải thực hiện quan trắc khoảng 3 lần, nội dung quan trắc : đo đạc, quản lý năng lượng
- Dựa trên kết quả quan trắc này để tính toán quy đổi tín chỉ giảm phát thải ứng với MRV, và nộp cho chính phủ Nhật Bản.

# Hiệp hội quốc tế là gì?

Bộ Môi Trường Nhật Bản

Hỗ trợ tối đa 50% chi phí đầu tư ban đầu

●Đo đạc lượng khí nhà kính giảm thiểu được thông qua việc thực hiện MRV
●Ghi nhận hơn 50% tín dụng giảm phát thải

Hiệp hội quốc tế

Đại diện dự án（doanh nghiệp Nhật Bản）

Các doanh nghiệp khác cũng có khả năng tham gia

Doanh nghiệp đầu tư thiết bị tại nước sở tại

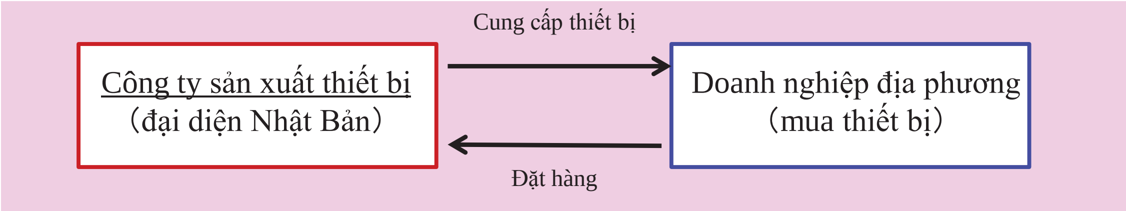
Mua thiết bị máy móc tiết kiệm năng lượng

● Phụ trách việc nộp hồ sơ và làm việc với Bộ Môi Trường, do đó doanh nghiệp tại nước sở tại chỉ cần tham gia, mọi thủ tục do doanh nghiệp Nhật Bản thực hiện.

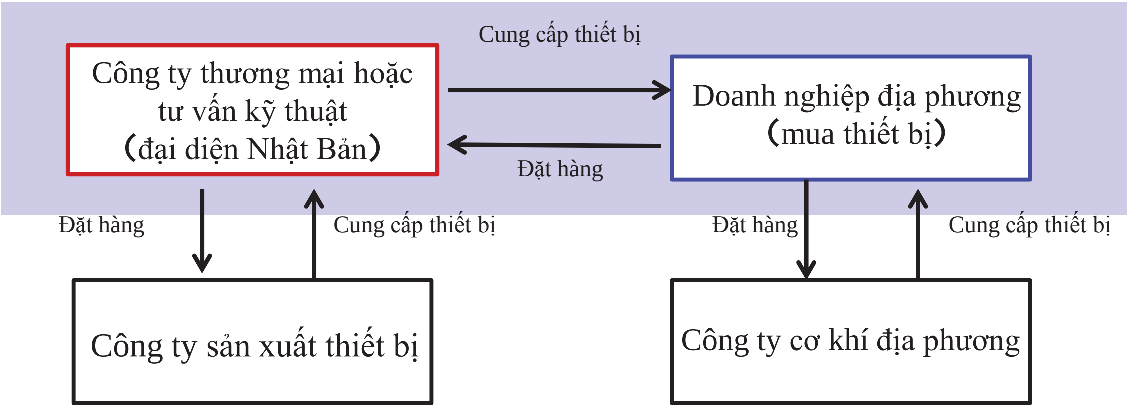
Nguồn: Bộ Môi Trường Nhật Bản

# Ví dụ về cấu thành hiệp hội quốc tế

Case ① liên doanh với công ty sản xuất thiết bị Nhật Bản




Case ② liên doanh với các công ty thương mai hoặc tư vấn kỹ thuật Nhật Bản




Nguồn: Bộ Môi Trường Nhật Bản




1. Khuôn khổ dự án hỗ trợ thiết bị JCM

2. Hiệp hội quốc tế là gì？

3. Thiết bị thuộc đối tượng hỗ trợ

4. Tiêu chí thẩm định

5. Trách nhiệm của phía tiếp nhận hỗ trợ？

6. Các điểm mấu chốt khi đăng ký

7. Hồ sơ đăng ký

8. Kế hoạch trong thời gian tới

# Thiết bị nào thuộc đối tượng hỗ trợ？

「cắt giảm phát thải CO2」、「tính toán định lượng được lượng khí nhà kính cắt giảm」

| Tên dự án | Lượng CO2 cắt giảm （tCO2/năm） |
|---|---|
| Tiết kiệm năng lượng cho hệ thống điều hòa tại trung tâm mua sắm bằng việc thay thế máy làm lạnh ly tâm | 996 |
| thay thế đèn đường LED cho khu công nghiệp | 908 |
| Hệ thống phát điện sử dụng nhiệt thừa Tại nhà máy xi măng | 122,200 |
| Hệ thống xử lý giấy bìa carton cũ tiết kiệm năng lượng cho nhà máy giấy | 14,885 |
| Cắt giảm năng lượng cho hệ thống điều hòa và quy trình làm lạnh （máy làm lạnh tiết kiệm năng lượng tân tiến） | 247～715 |
| Thay thế thiết bị làm lạnh hiệu suất cao cho dây chuyền làm lạnh | 213 |
| Thay thế máy lạnh, biến tần hiệu suất cao導cho khách sạn (200 phòng) | 826 |
| Lắp đặt hệ thống phát điện năng lượng mặt trời quy mô nhỏ cho trung tâm thương mai | 310 |
| Lắp đặt máy dệt hiệu suất cao cho nhà máy dệt— | 1,518 |
| Thay thế bơm nhiệt nóng lạnh đồng thời cho nhà máy sản xuất nước uống giải khát | 585 |
| Lắp đặt hệ thống phát điện năng lượng mặt trời tại nhà máy | 776 |

Nguồn： Bộ Môi Trường Nhật Bản




# Điểm quan trọng đăng ký danh mục dự án JCM

- Như đã đề cập, các dự án liên quan đến giảm thiểu carbon, tiết kiệm năng lượng và tái sử dụng năng lượng thì phù hợp với cơ chế JCM.
- Có thể mục tiêu của tổng thể dự án không phải cắt giảm CO2, tuy nhiên nếu có khả năng cắt giảm CO2 trong một số các hợp phần của dự án, thì vẫn có thể đăng ký dự án hỗ trỡ thiết bị.
- Hơn nữa, không nhất thiết phải đầu tư những thiết bị tối tân, kỹ thuật hiện đại, chỉ cần chứng minh được thiết bị mới có hiệu quả tiết kiệm năng lượng hơn thiết bị đang sử dụng, thì vẫn thuộc đối tượng của dự án hỗ trợ thiết .

*※chẩn đoán tiết kiệm năng lượng*

Đối tượng thuộc dự án JCM

*※tham khảo ý kiến bộ Môi Trường Nhật Bản*

Xem xét kế hoạch đầu tư và tài chính

*※ tham khảo ý kiến bộ Môi Trường Nhật Bản*

Đánh giá tính khả thi

1. Khuôn khổ dự án hỗ trợ thiết bị JCM

2. Hiệp hội quốc tế là gì？

3. Thiết bị thuộc đối tượng hỗ trợ？

**4. Tiêu chí thẩm định**

5. Trách nhiệm của phía tiếp nhận hỗ trợ？

6. Các điểm mấu chốt khi đăng ký

7. Hồ sơ đăng ký

8. Kế hoạch trong thời gian tới




# Tiêu chí thẩm định

| | |
|---|---|
| Thẩm định cơ bản | Có đáp ứng các điều kiện đưa ra hay không |
| | Có hiệu quả giảm phát thải khí nhà kính hay không |
| | Thiết bị công nghệ có mang tính thực tiễn hay không |
| | Tính ưu việt của công nghệ (bao gồm kỹ thuật quản lý) có mang tính khách quan hay không? |
| | Có gây ảnh hưởng xấu đến kinh tế xã hội và môi trường của nước sở tại hay không |
| | Việc tính toán chi phí đầu tư có hợp lý hay không |
| Thẩm định đánh giá | Sự chắc chắn của thể chế thực hiện dự án |
| | Hiệu quả kinh tế của việc cắt giảm phát thải khí nhà kính |
| | Khả năng đáp ứng các phương pháp luận |
| | Tính chiến lược và khả năng thúc đẩy phổ biến |

Đáp ứng tất cả các hạng mục

Đưa ra quyết định dựa vào điểm số

Thông báo chính thức

Nguồn： Bộ Môi Trường Nhật Bản

# Trách nhiệm của phía tiếp nhận hỗ trợ

【Đăng ký vào danh mục dự án JCM】

- Bộ Môi Trường Nhật Bản sẽ hỗ trợ.

【Quan trắc lượng khí nhà kính cắt giảm】

- Trong thời gian khấu hao thiết bị sẽ tiến hành quan trắc vài lần để tính toán lượng khí nhà kính cắt giảm và báo cáo cho Bộ Môi Trường Nhật Bản. Phương pháp luận sẽ được hoạch định dưới sự hỗ trợ của Bộ Môi Trường Nhật Bản.

【Thanh toán tín chỉ JCM】

- Phát hành và nộp cho chính phủ Nhật Bản hơn một nửa số tín chỉ

MIZUHO

# Các điểm mấu chốt khi đăng ký

① Phải thành lập Hiệp hội quốc tế ( kết hợp với doanh nghiệp Nhật Bản). Bởi vì doanh nghiệp Nhật Bản sẽ là đơn vị đại diện để đăng ký mọi thủ tục và làm việc với chính phủ Nhật Bản.

② Đầu tư thiết bị có tiềm năng cắt giảm CO2 lớn

③ Có kế hoạch tài chính rõ ràng（vì tối thiểu phải chịu một nửa tổng giá trị đầu tư）

④ Phải xác định thể chế MRV (đo đạc – báo cáo – kiểm chứng CO2) ← chính phủ Nhật Bản hỗ trợ







MIZUHO

# Hồ sơ đăng ký

Hồ sơ đăng ký sẽ do đại diện dự án (doanh nghiệp Nhật Bản) thwucj hiện. Doanh nghiệp tại nước sở tại chỉ cần cung cấp các thông tin và giấy tờ cần thiết có liên quan.

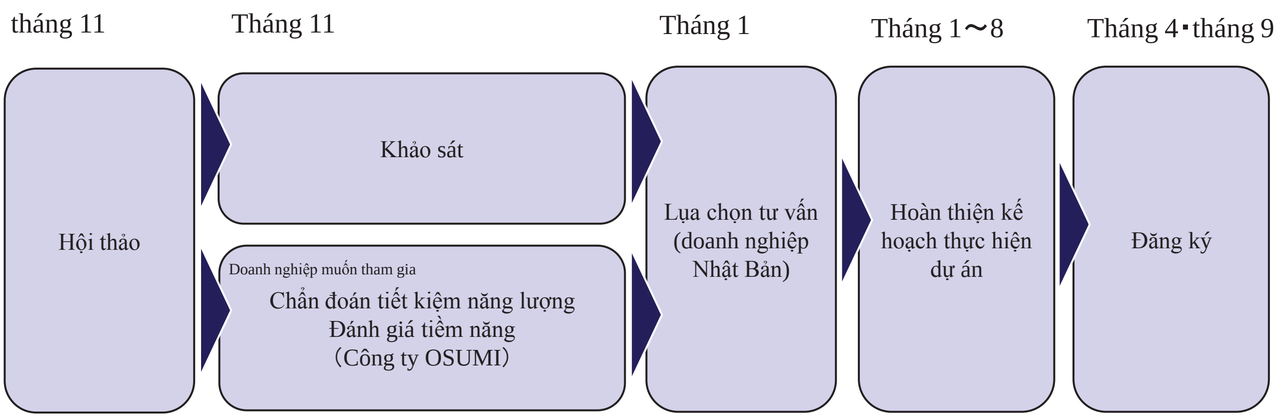
1. Đơn đăng ký
2. Kế hoạch thực hiện
3. Hồ sơ mô tả danh mục dự án JCM
4. Project Idea Note for the Model Project
5. Nội dung chi phí
6. Tài liệu giới thiệu liên quan đến công nghệ thiết bị
7. Tài liệu giới thiệu về công ty (đơn vị đăng ký), giấy phép kinh doanh và các giấy tờ liên quan đến tư cách pháp nhân
8. Báo cáo tài chính
9. Đơn đăng ký của đại diện dự án
10. Thỏa thuận của Hiệp hội quốc tế
11. Các báo cáo kinh doanh khác…

Nguồn： Bộ Môi Trường Nhật Bản

# Kế hoạch trong thời gian tới

➢ Chuẩn bị hồ sơ đăng ký dự án hỗ trợ thiết bị năm 2016（đợt 1 : tháng 4, đợt 2 : tháng 9）

① Khảo sát nhu cầu của doanh nghiệp, chẩn đoán tiết kiệm năng lượng, thu thập các thông tin chi tiết
② Sau đó, lựa chọn doanh nghiệp Nhật Bản (tư vấn) để hợp tác thực hiện
③ Trong trường hợp cần thiết sẽ tổ chức làm việc trực tiếp giữa doanh nghiệp Việt Nam và tư vấn Nhật Bản
④ Xây dựng thể chế MRV, kế hoạch thực hiện, kế hoạch tài chính để đưa ra một kế hoạch thực hiện dự án hoàn chỉnh.



Cảm ơn các bạn đã quan tâm theo dõi!!
Thank you so much for your attention!!
ARIGATOU GOZAIMASHITA!!

# DỰ ÁN TIẾT KIỆM NĂNG LƯỢNG TẠI CÁC NHÀ MÁY SẢN XUẤT CỦA DAWACO

DANANG, 11/2015

## NỘI DUNG CHÍNH

1. HIỆN TRẠNG CÁC TRẠM BƠM
2. LÝ DO CẢI TẠO, THAY THẾ
3. TIÊU CHÍ CẢI TẠO, THAY THẾ
4. PHƯƠNG ÁN CẢI TẠO, THAY THẾ
5. KẾT QUẢ MONG MUỐN
6. THẢO LUẬN

# 1. HIỆN TRẠNG TRẠM BƠM

TRẠM CẤP I CẦU ĐỎ CŨ

TRẠM CẤP II CẦU ĐỎ

TRẠM CẤP I SÂN BAY CŨ

TRẠM CẤP II SÂN BAY

# 1. HIỆN TRẠNG TRẠM BƠM

TRẠM BƠM CẤP I CẦU ĐỎ CŨ

Trạm có 3 bơm hoạt động. Công suất như sau:
+ Q= 1,000 ($m^3$/h)
+ H = 19 (m)
+ N = 110 (kW)
+ Hiệu suất 2 bơm hoạt động song song: 53.4 (%)
+ Tiêu hao điện năng trung bình năm 2013 là 0,088 kWh/$m^3$, năm 2014 là 0,09 kWh/$m^3$, đến 8/2015 là 0,088 kWh/$m^3$
+ I=180 A
+ COS$\varphi$ = 0,86

# 1. HIỆN TRẠNG TRẠM BƠM

TRẠM CẤP I SÂN BAY CŨ

Trạm có 2 bơm hoạt động. Công suất như sau:
Bơm 1:
+ Q= 800 ($m^3/h$)
+ H = 35 (m)
+ N = 110 (kW)
Bơm 2:
+ Q= 300-500 ($m^3/h$)
+ H = 35 (m)
+ N = 90 (kW)
+ Hiệu suất 2 bơm hoạt động: 53.4 (%)
+ Tiêu hao điện năng trung bình năm, năm 2014: 0,129 $kWh/m^3$, đến 8/2015 : 0,146 $kWh/m^3$
+ COS$\varphi$ = 0,86

# 1. HIỆN TRẠNG TRẠM BƠM

TRẠM BƠM CẤP II CẦU ĐỎ

Trạm có 6 bơm (4 bơm biến tần). Công suất như sau:
+ Q= 2.400 ($m^3/h$)
+ H = 42 (m)
+ N = 450 (kW)
+ [NPSH] = 12,6
+ Tiêu hao điện năng trung bình năm 2013: 0,118$kWh/m^3$, năm 2014 : 0,125 $kWh/m^3$, đến 8/2015 : 0,141 $kWh/m^3$
+ Dòng điện 400-600 A
+ COS$\varphi$ = 0,91

# 1. HIỆN TRẠNG TRẠM BƠM

TRẠM BƠM CẤP II SÂN BAY

Trạm có 3 bơm (2 bơm biến tần). Công suất như sau:
+ Q= 1400 ($m^3$/h)
+ H = 35 (m)
+ N = 185 (kW)
+ Hiệu suất 68-70 (%)
+ Tiêu hao điện năng trung bình năm 2012 : 0,142kWh/$m^3$ , năm 2013 : 0,17kWh/$m^3$, năm 2014 : 0,142 kWh/$m^3$, đến 8/2015 : 0,146 kWh/$m^3$
+ COS$\varphi$ = 0,9

# 2. LÝ DO CẢI TẠO THAY THẾ

TRẠM BƠM CẤP I CẦU ĐỎ CŨ

1. Các máy bơm lắp đặt trước năm 2000
2. Hiệu suất làm việc thấp ≤ 60 %
3. Đã cải tạo và sửa chữa nhiều lần
4. Động cơ cũng đã được quấn lại, thay thế.
5. Độ ồn vượt mức cho phép.

## 2. LÝ DO CẢI TẠO THAY THẾ

TRẠM CẤP I SÂN BAY CŨ

1. Các máy bơm lắp đặt trước năm 2000
2. Hiệu suất làm việc thấp ≤ 60 %
3. Khi vận hành phải mồi bơm
4. Đã cải tạo và sửa chữa nhiều lần
5. Động cơ cũng đã được thay thế
6. Độ ồn vượt mức cho phép.

## 2. LÝ DO CẢI TẠO THAY THẾ

TRẠM BƠM CẤP II CẦU ĐỎ

1. Cải tạo, thay thế kết hợp nâng công suất phù hợp với công suất cấp nước giai đoạn 2016-2020.
2. Độ ồn lớn, vượt tiêu chuẩn cho phép.
3. Hiệu suất làm việc thấp
4. Bánh xe công tác bị rỗ, mòn phải thay thế nhiều lần.
5. Tiêu hao điện năng vẫn còn ở mức cao.

## 2. LÝ DO CẢI TẠO THAY THẾ

TRẠM BƠM CẤP II SÂN BAY

1. Hiện tại máy bơm số 03 chưa lắp đặt biến tần.

## 3. TIÊU CHÍ CẢI TẠO, THAY THẾ

1. Đảm bảo ổn định sản xuất.
2. Tăng hiệu suất hoạt động của máy bơm ≥86%. Giảm tiêu hao điện năng trên $1m^3$ nước sản xuất.
3. Cải tạo, thay thế kết hợp việc nâng công suất cấp nước đáp ứng nhu cầu dùng nước giai đoạn 2016-2020.
4. Giảm độ ồn của máy bơm và động cơ trong quá trình hoạt động.

## 4. PHƯƠNG ÁN CẢI TẠO, THAY THẾ

TRẠM BƠM CẤP I CẦU ĐỎ CŨ

Thay mới 03 máy bơm có công suất cụ thể như sau:

1
2
3

| Cũ | Mới |
|---|---|
| Q= 1,000 ($m^3$/h) | Q = 1200 m3/h |
| H = 19 (m) | H= 16m |
| N = 110 (kW) | N=64KW |
| η =53.4% | η ≥86% |
| | Lắp 1 biến tần |

- Cải tạo lại đường ống hút ống đẩy: mỗi máy bơm một đường ống hút riêng biệt. Thay thế hệ thống van cổng cũ bằng van bướm để thuận tiện trong quá trình thao tác, vận hành.

## 4. PHƯƠNG ÁN CẢI TẠO, THAY THẾ

TRẠM CẤP I SÂN BAY CŨ

Thay mới 02 máy bơm có công suất cụ thể như sau:

PHƯƠNG ÁN 1

Cũ

1
Q= 1000 ($m^3$/h)
H = 35 (m)
N = 110 (kW)
η = 53.4%

2
Q= 300-500 ($m^3$/h)
H = 35 (m)
N = 90 (kW)
η = 53.4%

Mới

2 bơm
Q=1100 m3/h
H=35m
N= 134KW
Lắp mới 1 biến tần
η ≥86%

+ Hệ số làm việc đồng thời tạm tính k=0,9
- Cải tạo lại đường ống hút ống đẩy.

# 4. PHƯƠNG ÁN CẢI TẠO, THAY THẾ

Thay mới 01 máy bơm có công suất cụ thể như sau:

PHƯƠNG ÁN 2

Cũ

1
- Q= 1000 ($m^3$/h)
- H = 35 (m)
- N = 110 (kW)
- η = 53.4%

2
- Q= 500-800 ($m^3$/h)
- H = 35 (m)
- N = 90 (kW)
- η = 53.4%

Mới

1 bơm
- Q=1500 m3/h
- H=35m
- N= 185KW
- Lắp mới 1 biến tần
- η ≥86%

+ Lắp mới 1 bơm tại vị trí trạm bơm cấp I sân bay mới
+ Lắp đặt mới lại đường ống hút ống đẩy.

# 4. PHƯƠNG ÁN CẢI TẠO, THAY THẾ

Thay mới 06 máy bơm có công suất cụ thể như sau:

TRẠM BƠM CẤP II CẦU ĐỎ

1 2 3 4 5 6

PHƯƠNG ÁN 1

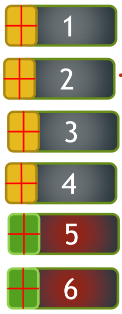
Cũ
- Q= 2400 ($m^3$/h)
- H = 42 (m)
- N = 450 (kW)
- TB η = 62.3%

Mới
- Q = 3200 m3/h
- H= 45m
- N=501KW
- η ≥86%
- Lắp mới 6 biến tần
- 4 bơm hoạt động

+ Hệ số làm việc đồng thời tạm tính k=0,9
- Cải tạo lại đường ống hút ống đẩy.
- Độ an toàn trong vận hành cao.

# 4. PHƯƠNG ÁN CẢI TẠO, THAY THẾ

PHƯƠNG ÁN 2




TRẠM BƠM CẤP II CẦU ĐỎ

**Cũ**

Q= 2400 ($m^3$/h)
H = 42 (m)
N = 450 (kW)
η = 62.3%

**Mới**

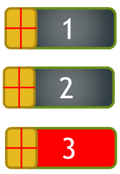
Q = 2800 m3/h
H= 45m
N=439KW
η ≥86%
Lắp thêm 2 biến tần
5 bơm hoạt động

+ Hệ số làm việc đồng thời tạm tính k=0,85
- Cải tạo lại đường ống hút ống đẩy.
- Độ an toàn trong vận hành thấp.

**Chọn phương án 2:**

- Vừa đáp ứng công suất, đảm bảo công suất động cơ không vượt quá công suất biến tần hiện có.
- Tiết kiệm được chi phí hơn phương án 1

# 4. PHƯƠNG ÁN CẢI TẠO, THAY THẾ




TRẠM BƠM CẤP II SÂN BAY

1. Lắp mới 1 biến tần 200 KW cho máy bơm số 03

## 5. KẾT QUẢ MONG MUỐN

- Chọn được các máy bơm hoạt động phù hợp với điều kiện hiện trạng, có hiệu suất cao
- Tiết kiệm được điện năng tiêu thụ
- Đảm bảo công suất hoạt động của nhà máy giai đoạn 2016-2020 là 230.000 m3/ ngày đêm.

## CẢM ƠN CÁC BẠN ĐÃ LẮNG NGHE

# THẢO LUẬN

# On Energy Saving Efforts at the Yokohama Waterworks Bureau


November 5, 2015

Facilities Department, Waterworks Bureau, Yokohama City

Motoharu Yamagishi

1

## Contents

1. An outline of the Waterworks in Yokohama City
2. Water Purification Plants of Yokohama Waterworks Bureau
3. Efforts for Renewable Energy
4. Efforts for Reduction in Power Consumption
5. Conclusion

2

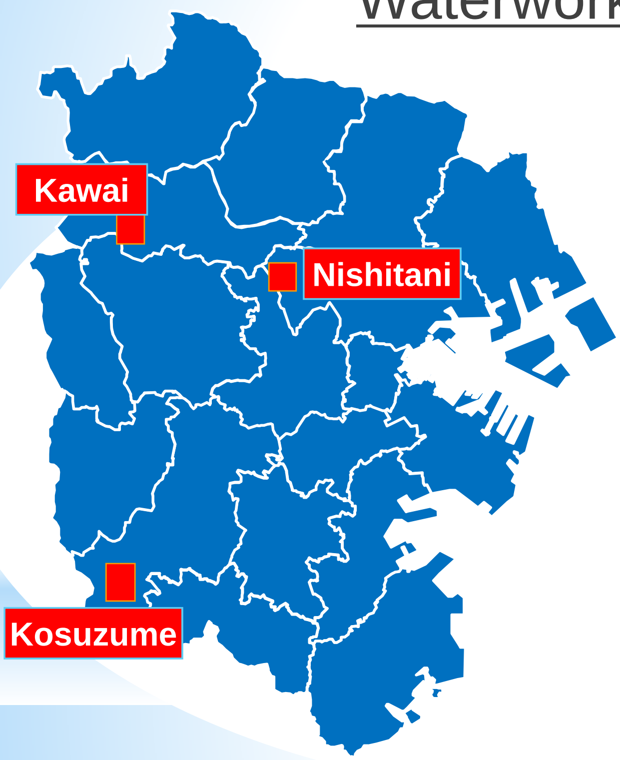
# 1. An outline of the Waterworks in Yokohama City

| | |
|---|---|
| Total population | 3,702,093 |
| Population served | 3,702,038 |
| Number of households served | 1,792,557 |
| Coverage rate | 100.0% |
| Annual water supply | 420,506,000 $m^3$ |
| Average daily water supply | 1,152,071 $m^3$ (311 liters per capita) |
| Maximum daily water supply | 1,254,000 $m^3$ |
| Total pipe length | 9,275 km |

as of the end of March 2014

3

# 2. Water Purification Plants of the Yokohama Waterworks Bureau



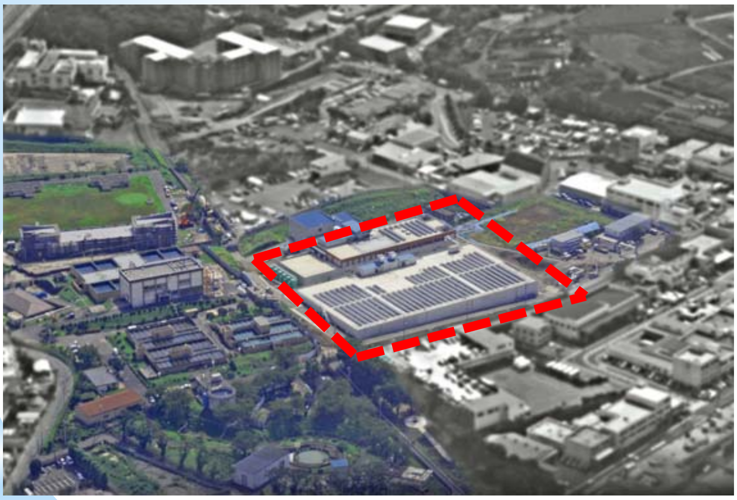

Kawai Purification Plant (Cerarokka)
Purification capacity: 172,800 $m^3$/day

Nishitani Purification Plant
Purification capacity: 356,000 $m^3$/day

Kosuzume Purification Plant
Purification capacity: 1,009,200 $m^3$/day

4

## Kawai Purification Plant



Receiving voltage: 6 kV

Standby power generation for emergencies: 662 kW (gas turbine)

- Renewed in 2014 as a membrane filtration type purification plant
- Photovoltaic power generation equipment with a capacity of 336 kW installed on the roof

5

## 3. Efforts for Renewable Energy

**Mid-term Management Plan (2012–2015)**
**Practical use of renewable energy**

The Bureau has decided that practical use of renewable energy sources, such as small hydraulic power generation and photovoltaic power generation, should be promoted to ensure the establishment of a more environment-friendly water supply system.

# Photovoltaic power generation equipment

①

Photovoltaic power generator for the filter basin at the Kosuzume Purification Plant

②

Photovoltaic power generator for the settling basin at the Kosuzume Purification Plant

③

Photovoltaic power generator for effluent treatment facilities at the Nishitani Purification Plant

# Photovoltaic power generators

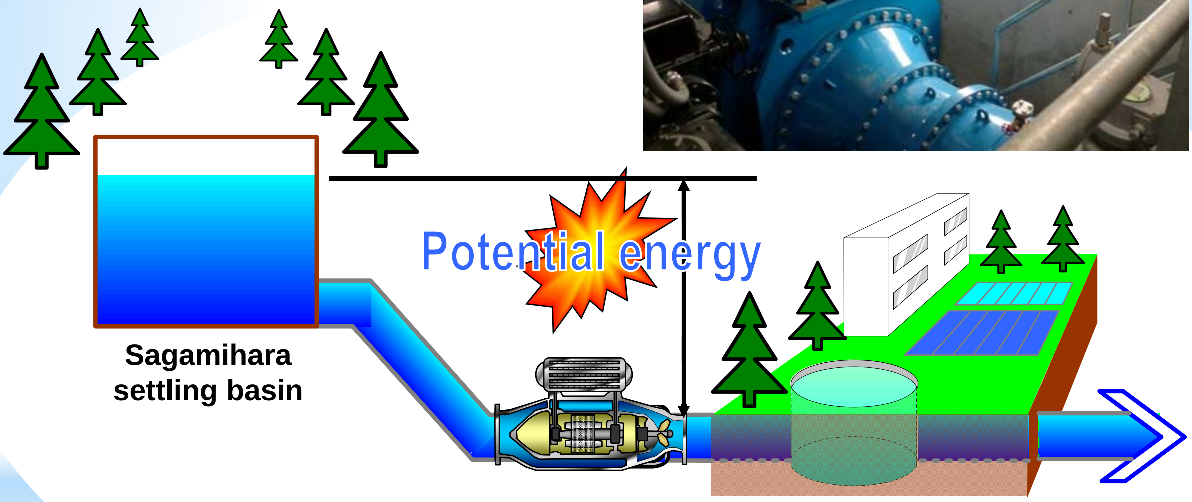
## Generated power output (2014)

| Purification plant | Type of facilities | Generation capacity (kW) | Annual power output (kWh) | Reduction in $CO_2$ (t-$CO_2$) |
|---|---|---|---|---|
| Kosuzume Purification Plant | Settling basin | 200 | 101,105 | 53.6 |
| | Filter basin | 522 | 479,019 | 254.3 |
| | Site of former effluent treatment facilities | 270 | 350,006 | 185.8 |
| Nishitani Purification Plant | Effluent treatment facilities | 180 | 154,453 | 82.0 |
| Kawai Purification Plant Cerarokka | | 336 | 436,077* | 231.5 |
| Total | | 1,508 | **1,520,660** | **807.2** |

*Records from August 2014 to July 2015

# Small hydraulic power generator

・Kawai Purification Plant




These are aqueduct facilities and are expected to serve for stable power generation.

9

# Small hydraulic power generator

Records of generated power output from small hydraulic power generators (2014)

| Type of facilities | Generation capacity (kW) | Power output (kWh) | Reduction in $CO_2$ (t-$CO_2$) |
|---|---|---|---|
| Kohoku Distributing Reservoir | 300 | 1,900,970 | 1009.4 |
| Aoyama Source Office | 49 | 325,780 | 172.9 |
| Kawai Purification Plant | 270 | 1,757,910 | 933.4 |
| Total | 619 | **3,984,660** | **2115.7** |

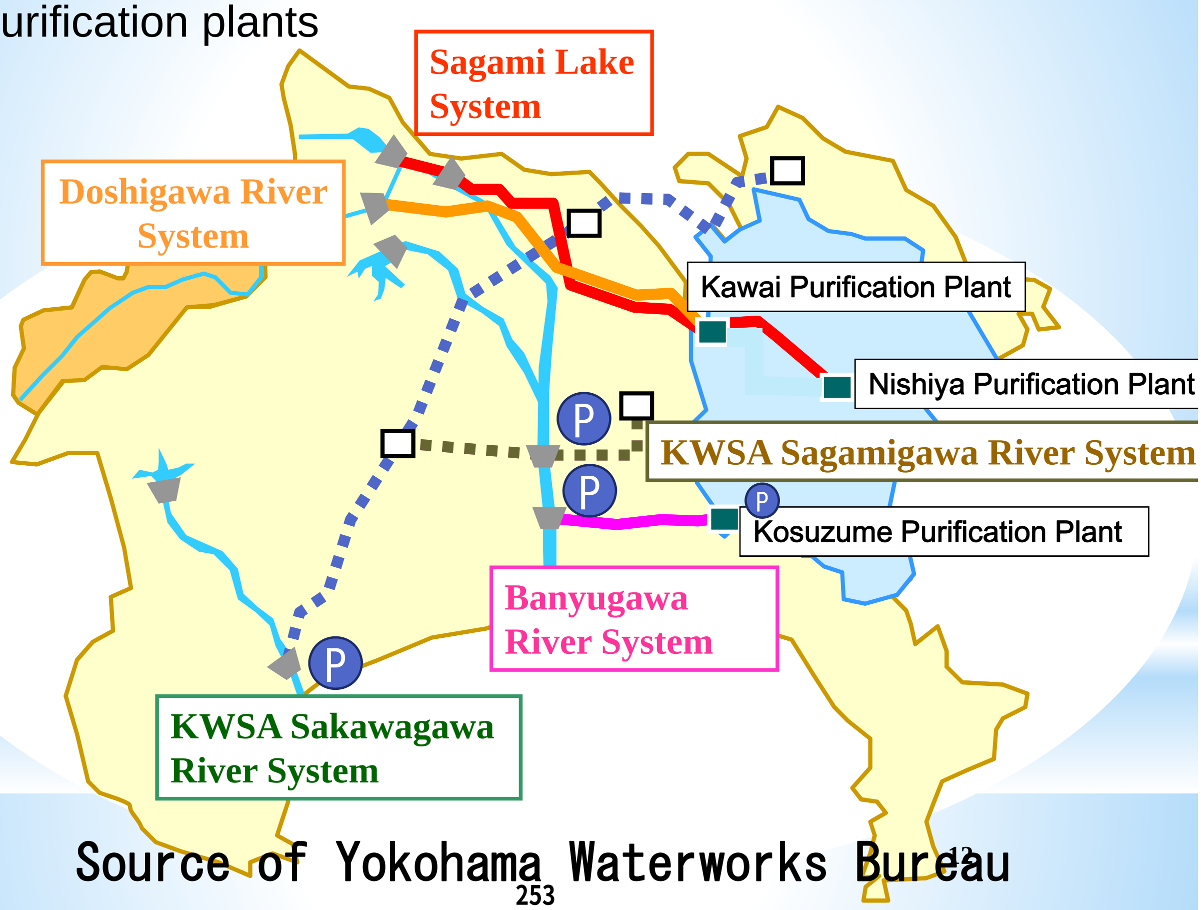
The power output from photovoltaic and small hydraulic power generators recorded in 2014 accounted for about 2.5% of the power consumed in the distributing reservoirs and pumping stations at the three purification plants.

## 4. Efforts for Reduction in Power Consumption

**Mid-term Management Plan (2012–2015)**
**Environment-friendly water supply system**

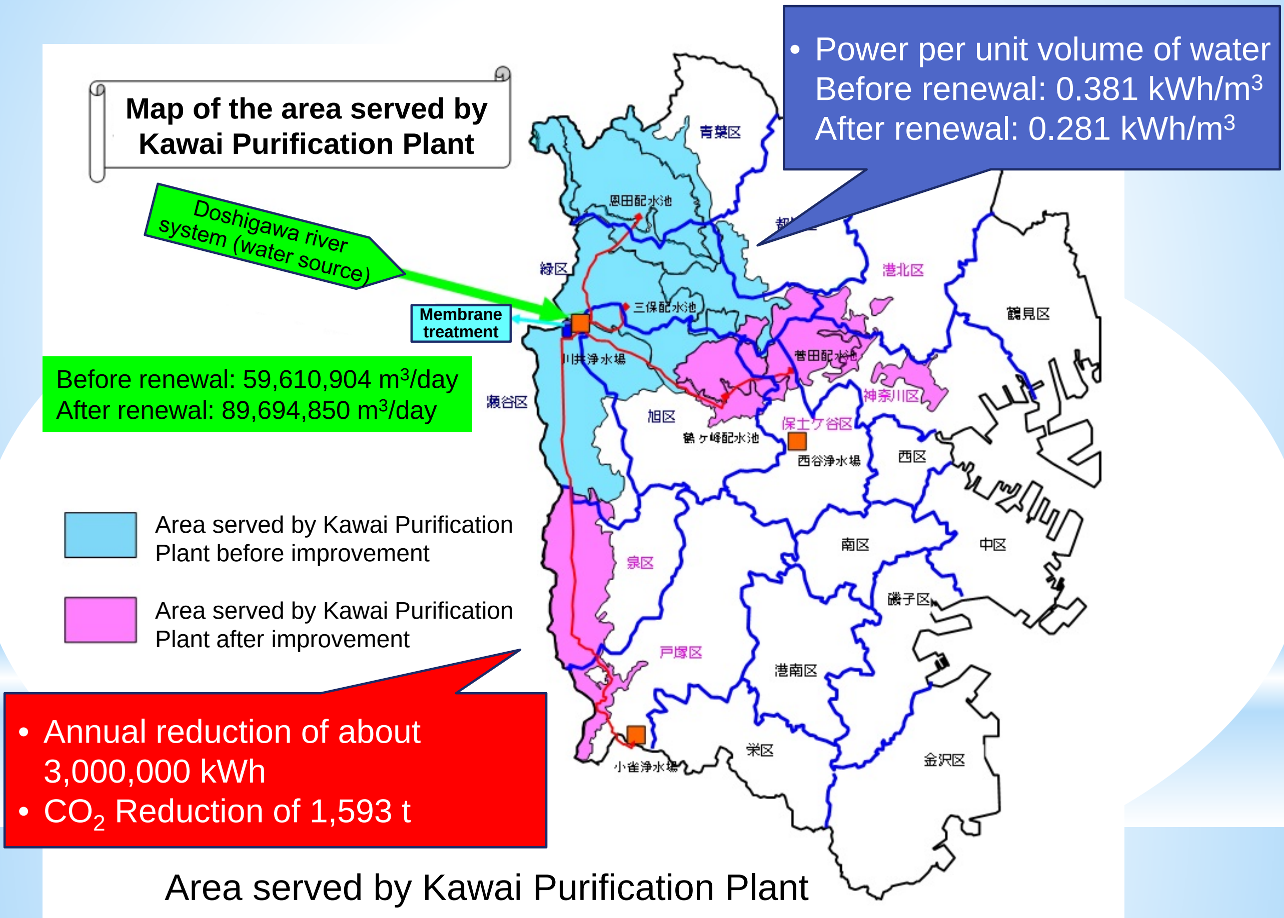
A goal was set aiming at contributing to a reduction in power consumption and prevention of global warming through preferential use of gravity flow-type facilities and efficient use of pump type facilities.

(1) Effective use of gravity flow-type purification plants




Source of Yokohama Waterworks Bureau

12



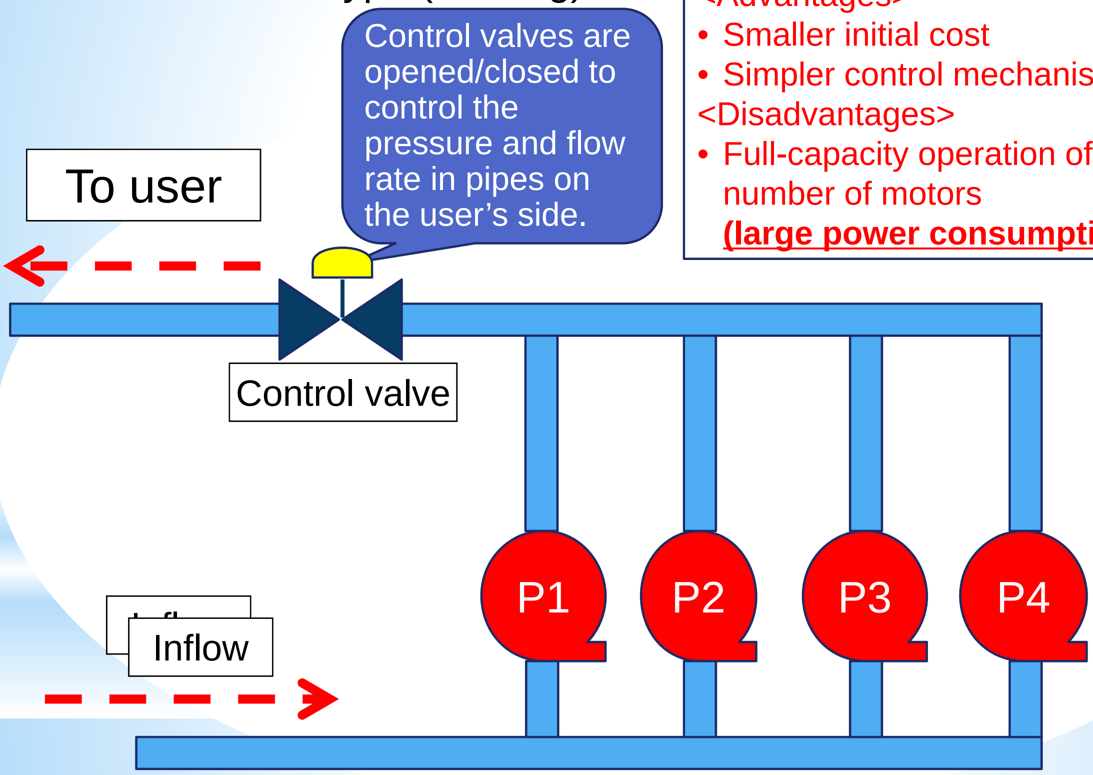

Area served by Kawai Purification Plant

(2) Reduction in power consumption by replacement with inverter control type facilities

- Control valve type (existing)

<Advantages>
- Smaller initial cost
- Simpler control mechanism

<Disadvantages>
- Full-capacity operation of a required number of motors **(large power consumption)**



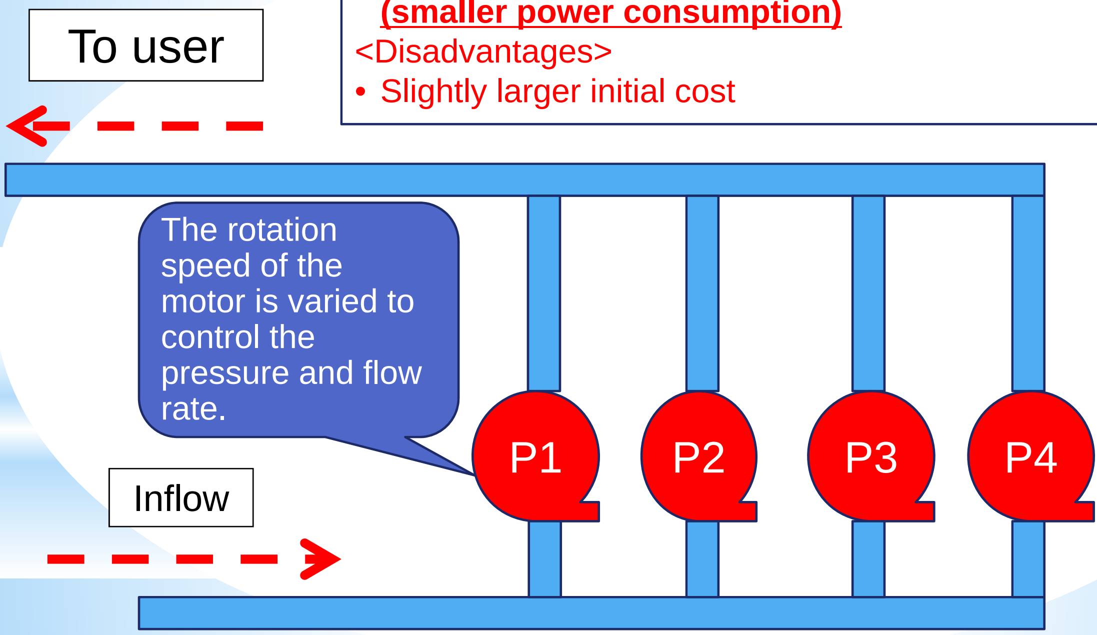
- Inverter control type (VVVF control type)

<Advantages>

- The rotation speed of each motor can be varied to ensure smooth control of the pressure and flow rate in the pipes on the user's side.
  **(smaller power consumption)**

<Disadvantages>

- Slightly larger initial cost




## Effect of replacement with VVVF control facilities for reduction in power consumption

| Name of pumping stations | | Pump A | Pump B |
|---|---|---|---|
| Year of replacement | | 2009 | Fiscal 2001 |
| Type of control before replacement | | Control valve | Rotor resistance control* |
| Power consumption (annual) | Before replacement (kWh) | 1,753,000 | 1,853,000 |
| | After replacement (kWh) | 1,213,000 | 1,542,000 |
| Reduction (kWh) | | 540,000 | 311,000 |
| Percent reduction | | 30% | 17% |
| Reduction in $CO_2$ (t-$CO_2$) | | **286.7** | **165.1** |

* External resistance is connected to a secondary circuit of the motor and the resistance is varied to control the rotation speed.

- Management of power consumed

**Local monitoring and control**

- Water purification facilities are monitored and controlled.


Monitoring and control system


Purification plant


External facilities (pumping station, distributing reservoir)

**Remote monitoring and control**

- External facilities such as distributing reservoirs and pumping stations are monitored and controlled.

# 5. Conclusion

The Waterworks Bureau and the Environment

## Efforts for the Environment

### Renewable Energy

Carbon dioxide released from energy consumption accounts for more than 90% of the greenhouse gas emissions in Yokohama City. Thus, for controlling greenhouse gas emissions, it is important to enhancing the use of nonfossil renewable energy while reducing the total consumption of energy.

To construct an environment-friendly water supply system, the Waterworks Bureau is now actively introducing photovoltaic power generators and small hydraulic power generators.

### What are renewable energy sources?

Of the various nonfossil energy sources, those considered to be able to serve permanently are called renewable energy sources.

Unlike fossil fuels, these energy sources are characterized by being renewed and supplied constantly, ensuring smaller loads on the global environment. Specifically, they include sunlight, solar heat, wind force, geothermal heat, atmospheric heat, and biomass.

### Photovoltaic power generation facilities

Following the installation in fiscal 2000 of a movable photovoltaic power generator over the filter basin in the Kosuzume Purification Plant, efforts to introduce renewable energy sources were promoted through the construction of photovoltaic power generation facilities totaling 1,570 kWh in fiscal 2014.


Movable photovoltaic power generator installed over the filter basin in the Kosuzume Purification Plant

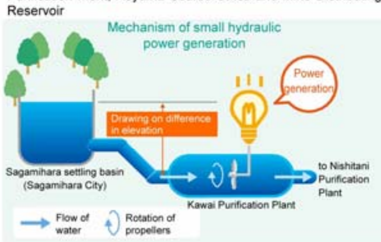
### Additional special projects include environment protection measures taken for reservoirs

Aerators have been installed in a reservoir to accelerate the circulation of water in the reservoic; eight have been installed in Lake Sagami, and five in Lake Tsukui.

◂An aerator operating in Lake Sagami

### Small hydraulic power generator

Small hydraulic power generators that use the force of water flowing through water pipe lines have recently been installed to promote the introduction of renewable energy sources. As of the end of fiscal 2014, such generators have been installed at the following four sites: Kohoku Distributing Reservoir, Kawai Purification Plant, Aoyama Source Office and Mine Distributing Reservoir

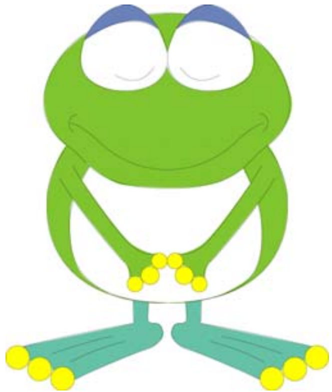



**Records of introduction of renewable energy (end of fiscal 2014)**

| Type of facility | Generation capacity (kW) | Expected output (kWh) | Reduction in $CO_2$ (t-$CO_2$) | Number of ordinar servable households |
|---|---|---|---|---|
| Small hydraulic power generator | 656 | 3,373,300 | 1,787 | 1,041 |
| Photovoltaic power generator | 1,570 | 1,650,384 | 874 | 509 |

*Data for small hydraulic power generators include the effect on the reserve of the owner, Tokyo Electric Power Company, of the Kohoku Distributing Reservoir.

Thank you for your kind attention.



19

JCM Feasibility Study in Da Nang through "Technical Cooperation for Sustainable Urban Development" with Yokohama City

PPROPOSAL FOR JCM PROJECT RELATED TO ENERGY-SAVING AT DAWACO - DA NANG

Prepared by: Institute for Global Environmental Strategies (IGES)

Da Nang, 5th Nov. 2015

# Background

## Joint Crediting Mechanism (JCM):

- One of various approaches based on Decision 1/CP.18, jointly developed and implemented by Japan and partner countries, and Japan intends to contribute to elaborating the framework for such approaches under the UNFCCC.

## JCM Promotion Scheme by MOEJ

- The Ministry of the Environment Japan (MOEJ) launched:
  - **Financing Programme for JCM Model Projects;**
  - **Feasibility Studies for elaborating investment plan on JCM projects;**
  - Capacity Building Programmes for the JCM.

## Global Environment Centre Foundation (GEC):

- The Secretariat of Financing Programme and Feasibility Study Programme for the JCM, commissioned by the MOEJ

2

## Financing Programme for JCM Model Projects by MOEJ

**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 planned period.

3

## Example of International Consortium

International Consortium

Representative Participant
(Shall be Japanese entity)
Main Role : Overall project management

↕ Joint Implementation

Partner Participant(s)
(At least one local entity shall be a partner)
Main Role : Installation and management of facilities

Order ↓ ↑ Construction — Contractor

Order ↓ ↑ Supply — Manufacturer

*Contractor and Manufacturer may be or may not be a member of International Consortium depending on the project.

4

# Projects eligible for the financing

The projects eligible for the financing programme shall satisfy the requirements (a) to (d) listed below:

(a) Projects that reduce energy-related $CO_2$ emissions in developing countries with which Japan has signed or has been consulting to sign bilateral document on the JCM, and that are expected to contribute to achieving Japan's emission reduction target through the JCM;

(b) Implementation of projects will not adversely affect the environment and society of countries where projects are implemented

(c) Reduction of GHG emissions achieved by the projects can be quantitatively calculated and verified; and

(d) Facilities installed by the projects do not receive any other subsidy by the Government of Japan.

The JCM shall prioritize the following countries that have already signed or decided to sign the bilateral documents:

Mongolia, Bangladesh, Ethiopia, Kenya, Maldives, Vietnam, Laos, Indonesia, Costa Rica, Palau, Cambodia, Mexico, Saudi Arabia, Chile, Myanmar and Thailand (*If other countries sign bilateral documents subsequently, they shall also be included.)



# Typical Sectors for JCM Projects

- Renewable Energy
- Energy Saving
- Waste Handling & Disposal
- Transport

# Applicant eligible for the financing

Applicant shall be Japanese entity corresponding to any of the requirements below and the representative participant of international consortiums.*

1. Private company,
2. An independent administrative institution,
3. An incorporated association/foundation,
4. A corporation established under the Japanese law,
5. Any organization admitted as appropriate for the applicant by GEC with approval from the Minister of the Environment, Japan as appropriate for the applicant.

*International consortium shall be composed of a Japanese representative participant and a JCM partner-country participant(s) which shall efficiently promote the implementation of projects.

7

# Responsibilities of the representative participant

- Application to the financing programme
- Management of the progress in the project, development of the project implementation plan, and acting as the contact entity for accounting and other administrative work related to the project.
- Introduction of the leading low carbon technology.
- Purchase, installation and commissioning of the facilities.
- Return of the finance resulting from violations of the Financing Regulations by any of the partner participants.

Practically purchase, installation and commissioning of the facilities can be made by partner participant(s). However representative participant shall make sure that partner participant(s) properly implement these measures, for example, by supervision of commissioning.

8

## Vital points to be confirmed for project implementation (1)

| Point \ Type | O&M by local participant(s) | O&M jointly by representative and local participant (s) |
|---|---|---|
| **Structure for project implementation (not only facilities installation but also O&M and MRV)** | ➢ Early decision made by representative participant<br>➢ Decision made by local participant(s)<br>➢ Managerial and financial soundness of local participant(s)<br>➢ Contents of international consortium agreement (or MoU, LoI on the agreement) to be signed by all participants | |
| **Finance** | ➢ Approval by local participant on purchase and installation of facilities<br>➢ Credit administration by financial entity if necessary | ➢ Approval by relevant participants on investment and its ratio in the project<br>➢ Credit administration by financial entity if necessary |
| **Profitability** | ➢ Profitability analysis before applying for JCM financial support | |

9

## Vital points to be confirmed for project implementation (2)

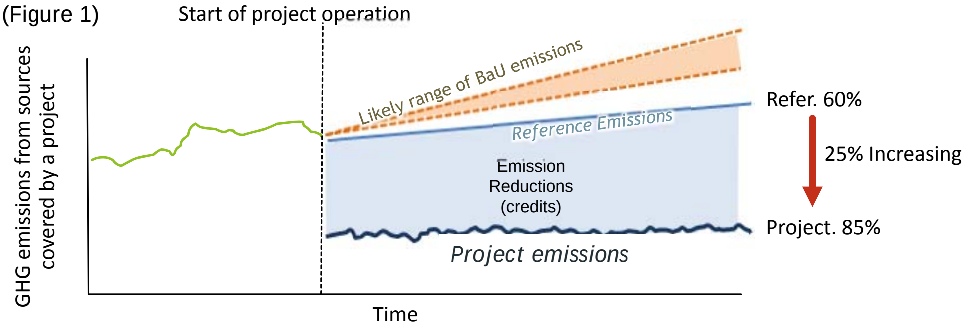
| Point \ Type | O&M by local participant(s) | O&M jointly by representative and local participant (s) |
|---|---|---|
| **Schedule** | Time adjustment for purchase, installation and financial support (needs special care if bidding required) | Agreement by relevant participants on organizing SPC and its schedule |
| **Relevant laws, permits and licenses** | ➢ Identification of Relevant laws (ex. FIT, bidding) and understanding of its practical operation<br>➢ Necessary period for getting relevant permits and licenses | |

<u>All of the above points needs to be confirmed with relevant documents and evidence</u>

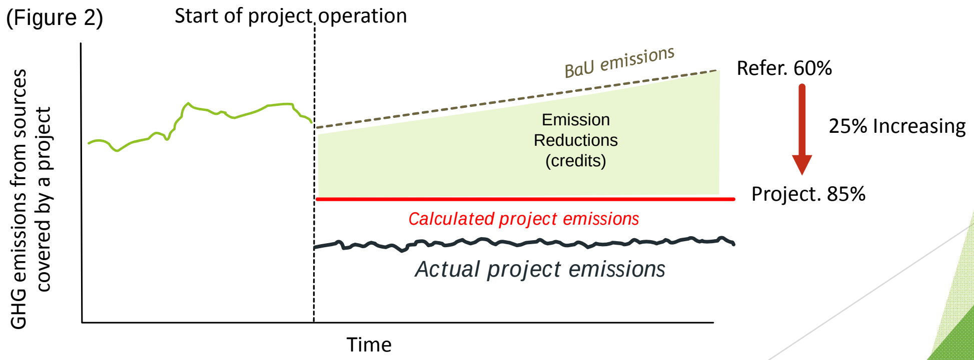
10

# Reference Emission vs. Project Emission

(Figure 1)

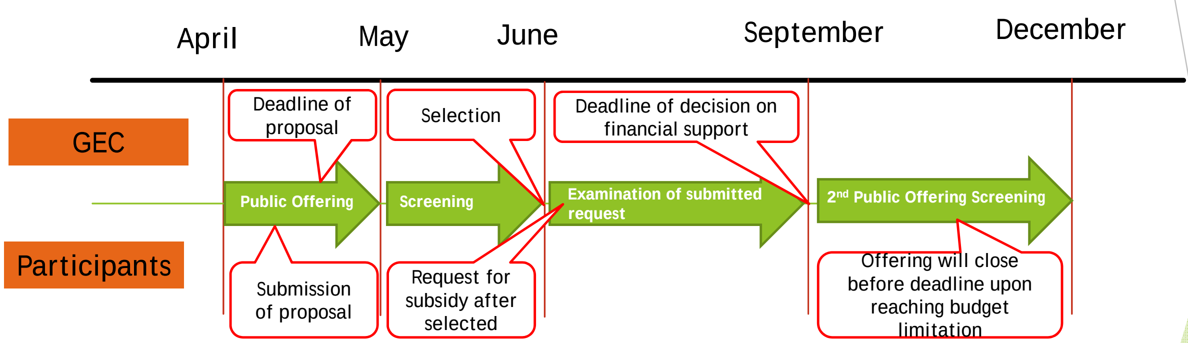



(Figure 2)



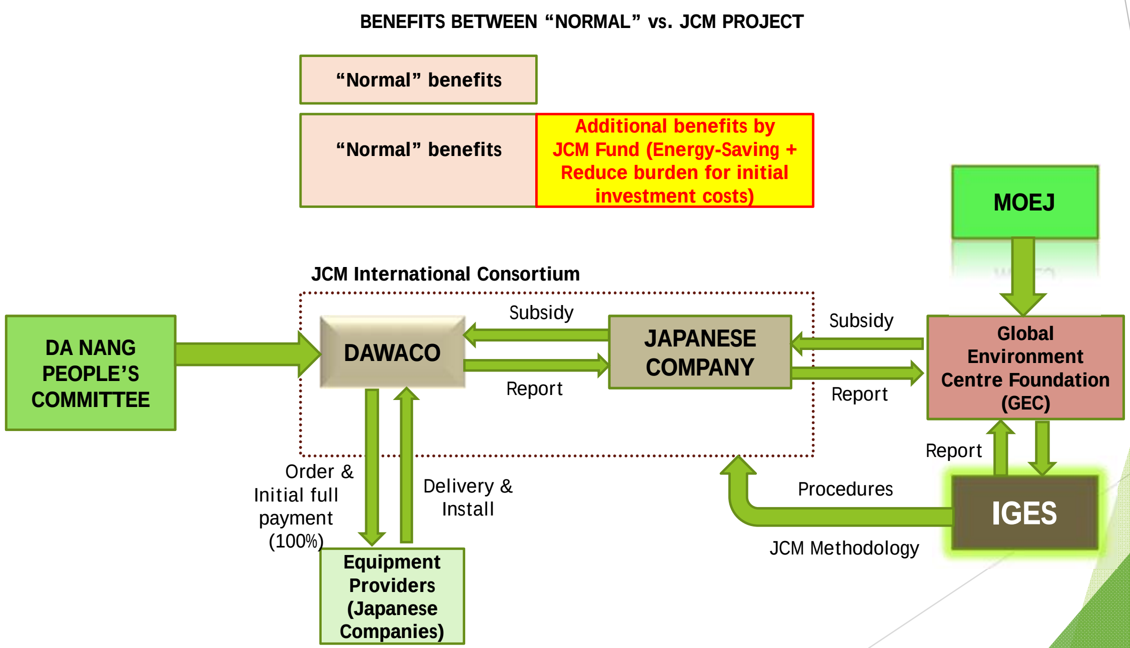

All ideas are subject to further consideration and discussion with host countries

# SCHEDULE OF PUBLIC OFFERING IN FY2015



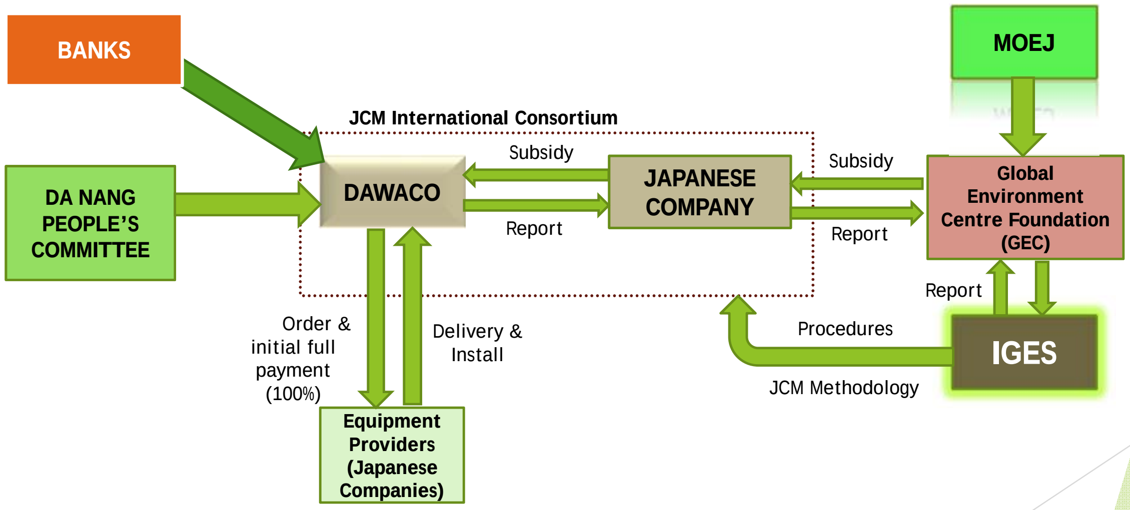
# Proposed Financing Schemes

## FINANCING SCHEME 1 - DAWACO



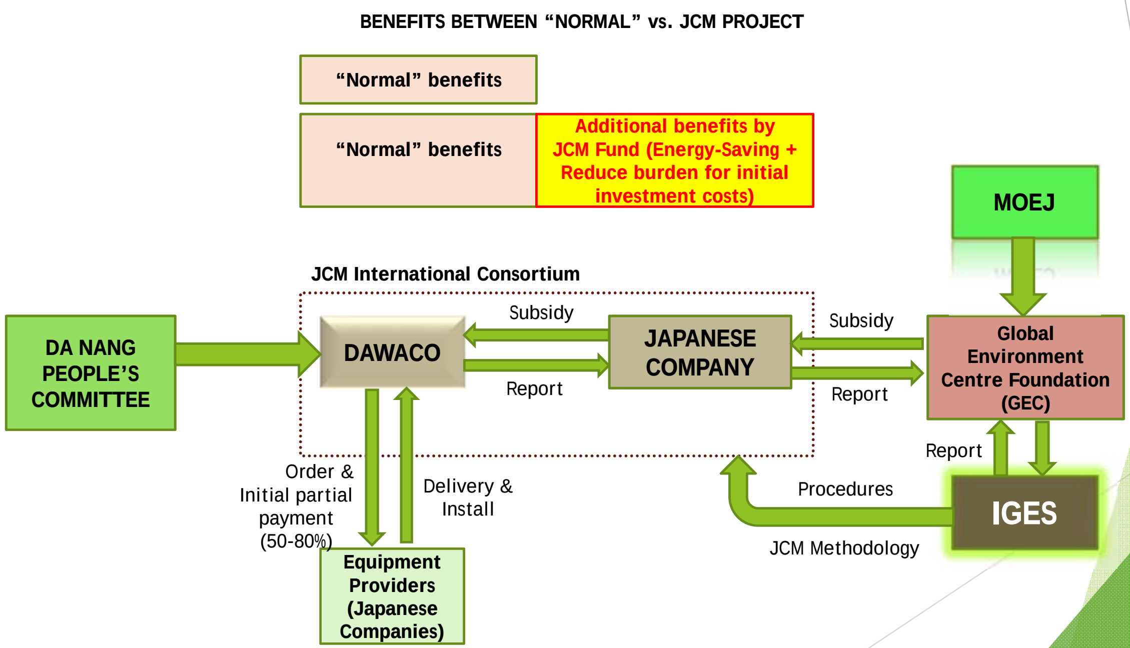

# Proposed Financing Schemes

## FINANCING SCHEME 2 – DAWACO & BANKS



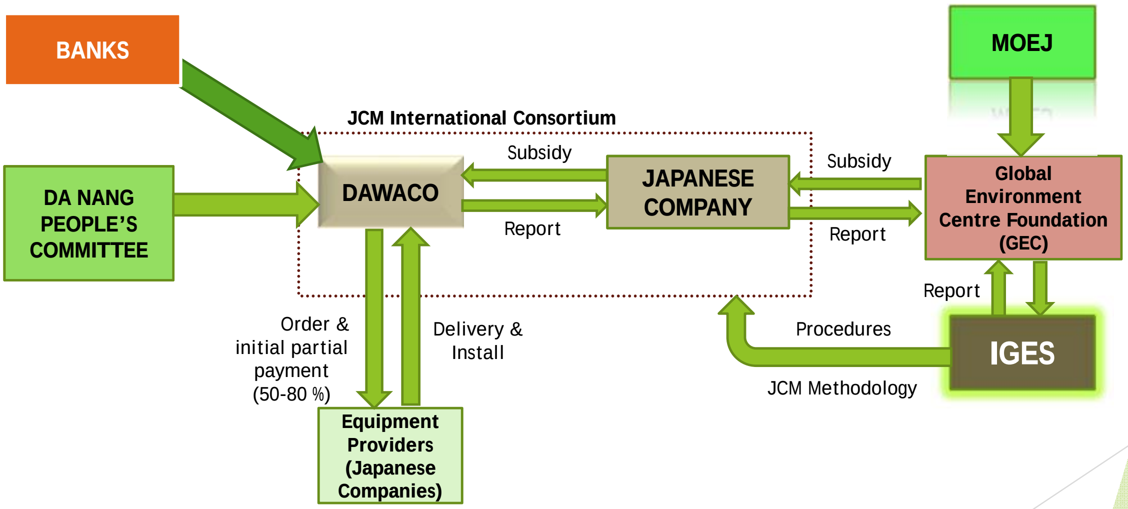
# Proposed Financing Schemes

## FINANCING SCHEME 3 - DAWACO




# Proposed Financing Schemes

## FINANCING SCHEME 4 – DAWACO & BANKS



# Final Mission

Presentation Materials

Institute for Global Environmental Strategies

# JCM Da Nang F/S
# Pump Renewal Proposal

## JCM Feasibility Study in Da Nang through "Technical Cooperation for sustainable Urban Development" with Yokohama City

January, 2016

Institute for Global Environmental Strategies (IGES)
Mizuho Information & Research Institute Inc.
Osumi Co. Ltd.,

# Overview of the study

# 1st Mission – September 2015

<Water> To collect information of the current status of water plant
<Needs Assessment> To start creating long list of JCM candidates

| Summary of Mission Schedule | | | |
|---|---|---|---|
| 9/14 (Mon) | IGES | Osumi | MHIR |
| | | Kick-off meeting @ DPI | |
| | | Kick-off meeting @ DPC | |
| | Meeting with Japanese Business Association | | |
| 9/15 (Tue) | IGES | Osumi | MHIR |
| | Meeting with DAWACO<br>Site visit @ Cau Do Water Plant | | Meeting w/DOT |
| | Meeting with Da Nang Port Corporation | | |
| | Unv. of Science and Technology | | Site Visit @ Seafood Service Zone |
| 9/16 (Wed) | IGES | Osumi | MHIR |
| | Meeting with DOIT | | |
| | (Internal meeting @ Brilliant Hotel) | | |
| | Site visits<br>@Antra Water Plant<br>and San Bay Water Plant | | Meeting with Industrial Zone Management Board<br>and DAIZICO |
| | | | Presentation @ Board Meeting of JBA |
| 9/17 (Thu) | IGES | Osumi | MHIR |
| | Meeting with DOC | | |
| | Meeting with Saigon Da Nang Joint Stock Investment Company | | |
| | Meeting with Department of Tourism | | |
| | Wrap-up meeting @DPI | | |



# 2nd Mission – November 2015

<Water> To understand DAWACO's needs & share points important for JCM to DAWACO
<Needs Assessment> Creation of short list through hearings

| Summary of Mission Schedule | | | |
|---|---|---|---|
| 11/2 (Mon) | IGES | Osumi | MHIR |
| | Meeting with DPI | | |
| | | Meeting with a candidate company | |
| | Preparation for the workshop | | |
| | 15:00-16:00 Meeting with DOFA | 16:00-17:00 Meeting with a candidate company | |
| 11/3 (Tue) | IGES | Osumi | MHIR |
| | Meeting with the wastewater company | | |
| | Meeting with public lighting company | Meeting with a candidate company | |
| | Meeting with JBAD | | Meeting with JBAD |
| 11/4 (Wed) | IGES | Osumi | MHIR |
| | Workshop for facilitation of JCM Project Formulation & Implementation | | |
| | Site visit @ candidate site for new station | Meeting with 2 candidate companies | |
| | 16:30-17:30 Reporting to DPI | | |
| 11/5 (Thu) | IGES | Osumi | MHIR |
| | WS with DAWACO | | Leave for Japan |
| | Survey @ water plants(Caudo and Sun Bay) | | |
| 11/6 (Fir) | IGES | Osumi | MHIR |
| | Technical meeting with DAWACO | | |
| | Wrap up meeting with DPI | | |
| 11/7 (Sat) | IGES | Osumi | MHIR |
| | Leave for Japan | | |

# 3rd Mission - January 2016

<Water> To provide our proposal for the pump renewal
<Needs Assessment> To provide our result of JCM model project candidates and wrap-up with more meetings with candidates

| 1/6 (Wed) | IGES | Osumi | MHIR |
|---|---|---|---|
| AM | Preparatory meeting with DPI | | |
| | Tech meeting w/Dawaco | Meeting with a candidate company | |
| PM | Final meeting w/Dawaco | Meeting with a candidate company | |
| **1/7 (Thu)** | **IGES** | **Osumi** | **MHIR** |
| AM | Meeting with the waste water company | Meeting with a candidate company | |
| PM | Meeting with the waste water company | Meeting with a candidate company | |
| **1/8(Fri)** | **IGES** | **Osumi** | **MHIR** |
| AM | Preparation for wrap-up meeting | Meeting with a candidate company | |
| PM | Final wrap-up meeting | | |
| | Final meeting with DPC and DPI (TBD) | | |
| **1/9 (Sat)** | **IGES** | **Osumi** | **MHIR** |
| AM | Leave for Japan | | |
| | | | |

5

# Activities and Outputs

Pump renewal in the old Cau Do (Raw Water) and the new Cau Do (Purified Water)

**Output 1**

**Technical analysis**

**Activity 1**

**1-0: Identifying the pumps and specifications**

**1-1: Collection of data and its analysis** (electricity usage and water flow amount)

**1-2: Consideration of different pump renewable alternatives**

1-2-1: Usage of invertors

1.2-2: Preparation of methodology (draft)

**Output 2**

**Financial proposal**

**Activity 2**

**2-1: Financing**

2-1-1: Cost benefit analysis

2-1-2: Analysis of DAWACO's investment capacity and investment will

2-1-3: Procedures for financing

**2-2: Preparation for Model Project in FY2016**

**Output 3**

**Tendering and procedures**

**Activity 3**

**3-1: How to solve issues of tendering**

3-1-1: Tender in normal situation

3-1-2: Consideration of analysis

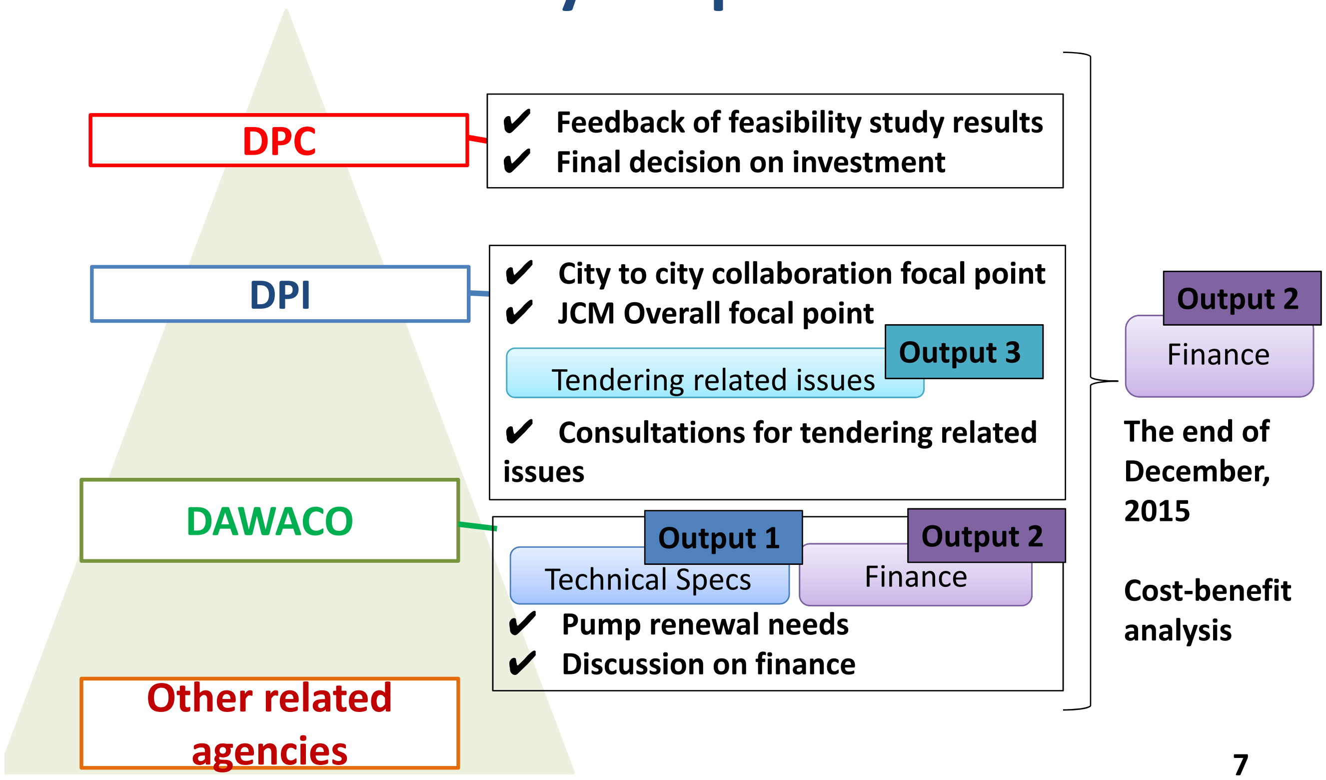
3-1-3: Agreement on the tendering method and its condition

**3-2: Consideration of international consortium**

**3-3: Proposal of DPC and DPI**

6

# Overview of JCM partners by outputs




7

# Our Findings and proposals

8

# Output 1 Technical Recommendation

**Finding 1** The Study team recommends to replace ① 3 pumps in CauDo I and ② 6 pumps in CauDo II with same capacity.

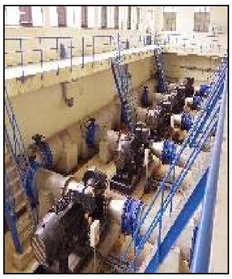
## Old Cau Do I (Raw Water) Pumps

Replaced with 3 new pumps

$CO_2$Reduction 118 t/year (Project pump 83% from Reference pump 75%)

Cost Benefit Analysis 62.2USD/t

(Condition : Subsidy ratio 40%; 3 high efficiency pumps including installation cost and tax: About USD275,000; Usage period 15 years)



## New Cau Do II (Filtered Water) Pumps

Replaced with 6 new pumps

$CO_2$Reduction 481 t/year (Project pump 83% from Reference pump 75%)

Cost Benefit Analysis 93.4USD/t

(Condition : Subsidy ratio 40%; 3 high efficiency pumps including installation cost and tax: About USD1,683,000; Usage period 15 years)



# Compared with the reference scenario (In case of subsidy rate 40%)

- Payback period 6.7 years (Cau Do I) and 9.2 years (Cau Do II).
- For MOEJ the cost-benefit (USD/ton) may be slightly low for Cau Do II.

**The case for 40% Subsidy**

| Scenario 2 Cost | Unit # | Lifetime Energy reduction | Cost/Benefit (USD/ton) |
|---|---|---|---|
| Cau Do I | 3.0 | 1,769 | **62.20** |
| Cau Do II | 6.0 | 7,208 | **93.40** |

| Scenario 2 Cost | Energy cost reduction | Energy cost per year | Energy Saving | Payback Period |
|---|---|---|---|---|
| Cau Do I | 293,586 | 24,716 | 370,744 | 6.7 |
| Cau Do II | 1,302,457 | 109,651 | 1,644,761 | 9.2 |

**0.0842 USD/kWh**

**Price/1kWh=1897Don=0.084USD (10%VAT included)**

**Calculation basis** 1. Project efficiency based on Ebara Technical proposal (Cau Do I **83% ,** Cau Do II **86%, 2.** Reference efficiency **75%**

# Compared with current scenario

Cost benefit based on the actual current scenario is more optimistic compared to the calculation with reference considered

**Compared with current scenario (in case of subsidy rate 40%)**

| Scenario 2 Cost | Energy cost reduction | Energy cost per year | Total energy saving (15 years) |
|---|---|---|---|
| Cau Do I | 512,730 | 43,166 | 647,483 |
| Cau Do II | 2,943,650 | 247,819 | 3,717,284 |

0.0842 USD/kWh

Price/1kWh=1897Don=0.084USD (10%VAT included)

**Calculation basis**

- ✓ Project efficiency based on Ebara Technical proposal (Cau Do I **83%** , Cau Do II **86%)**
- ✓ Reference efficiency **75%**



# Our calculation method

## Calculation of Reference Emission

$$\mathbf{RE}_{\mathrm{i,p}} = \sum_{\mathrm{i}} \left\{ \mathbf{EC}_{\mathbf{PJ,i,p}} \times \left( \boldsymbol{\eta}_{\mathbf{PJ,i}} \div \boldsymbol{\eta}_{\mathbf{RE,i}} \right) \times \mathbf{EF}_{\mathbf{elec}} \right\}$$

$\mathrm{RE}_{\mathrm{i,p}}$ : Reference emissions during the period p [tCO2/p]
$\mathrm{EC}_{\mathrm{PJ,i,p}}$ : Power consumption of project pump i during the period p [MWh/p]
$\eta_{\mathrm{PJ,i}}$ : Pump efficiency of project pump i [-]
$\eta_{\mathrm{RE,i}}$ : Pump efficiency of reference pump i [-]
$\mathrm{EF}_{\mathrm{elec}}$ : CO2 emission factor for consumed electricity [tCO2/MWh]

## Calculation of Projects Emission

$$\mathbf{PE}_{\mathrm{i,p}} = \sum_{\mathrm{i}} \left( \mathbf{EC}_{\mathbf{PJ,i,p}} \times \mathbf{EF}_{\mathbf{elec}} \right)$$

$\mathrm{PE}_{\mathrm{i,p}}$ : Project emissions during the period p [tCO2/p]
$\mathrm{EC}_{\mathrm{PJ,i,p}}$ : Power consumption of project pump i during the period p [MWh/p]
$\mathrm{EF}_{\mathrm{elec}}$ : CO2 emission factor for consumed electricity [tCO2/MWh]

## Calculation of Emission Reduction

$$\mathbf{ER}_{\mathbf{p}} = \mathbf{RE}_{\mathrm{i,p}} - \mathbf{PE}_{\mathrm{i,p}}$$

$\mathrm{ER}_{\mathrm{p}}$ : Emission reductions during the period p [tCO2/p]
$\mathrm{RE}_{\mathrm{i,p}}$ : Reference emissions during the period p [tCO2/p]
$\mathrm{PE}_{\mathrm{i,p}}$ : Project emissions during the period p [tCO2/p]

Nippon Koei Co., Ltd. and EBARA Corp. (2014) "Energy Saving for Irrigation Facility by Introducing High-efficiency Pumps" Pg 9-10

# Compared with the reference scenario (In case of subsidy rate 50%)

- Most attractive for DAWACO with payback period 5.6 years (Cau Do I) and 7.7 years (Cau Do II). For MOEJ the cost-benefit (USD/ton) may be slightly low.

| Scenario 2 Cost | Unit # | Lifetime Energy reduction | Cost/Benefit (USD/ton) |
|---|---|---|---|
| Cau Do I | 3.0 | 1,769 | **77.75** |
| Cau Do II | 6.0 | 7,208 | **116.75** |

| Scenario 2 Cost | Energy cost reduction | Energy cost per year | Energy Saving | Payback Period |
|---|---|---|---|---|
| Cau Do I | 293,586 | 24,716 | 370,744 | 5.6 |
| Cau Do II | 1,302,457 | 109,651 | 1,644,761 | 7.7 |

**0.0842 USD/kWh**

**Price/1kWh=1897Don=0.084USD (10%VAT included)**

**Calculation basis** 1. Project efficiency based on Ebara Technical proposal (Cau Do I **83% ,** Cau Do II **86%, 2.** Reference efficiency **75%**

13

# Compared with the reference scenario (In case of subsidy rate 30%)

- There are higher chance to be chosen as model project for both Cau Do I and Cau DO II but longer payback period

| Scenario 2 Cost | Unit # | Lifetime Energy reduction | Cost/Benefit (USD/ton) |
|---|---|---|---|
| Cau Do I | 3.0 | 1,769 | **46.65** |
| Cau Do II | 6.0 | 7,208 | **70.05** |

| Scenario 2 Cost | Energy cost reduction | Energy cost per year | Energy Saving | Payback Period |
|---|---|---|---|---|
| Cau Do I | 293,586 | 24,716 | 370,744 | 7.8 |
| Cau Do II | 1,302,457 | 109,651 | 1,644,761 | 10.7 |

**0.0842 USD/kWh**

**Price/1kWh=1897Don=0.084USD (10%VAT included)**

**Calculation basis** 1. Project efficiency based on Ebara Technical proposal (Cau Do I **83% ,** Cau Do II **86%, 2.** Reference efficiency **75%**

14

# Output 2 Financing Proposal

**Finding 1** To replace pumps in the <u>budget **within USD 1MM**</u>, the amount DAWACO could prepare themselves according to our discussion

**Follow-up 1** **The 3rd mission:** To clarify unit numbers of pump renewals based on different subsidy ratio (30%, 40% and 50%)

**Follow-up 2** **January to March:** To get approval from City of Da Nang (DPC, DPI) for the pump renewal

**Background**

- ✓ **First mission:** Shared understanding about importance of financing to get JCM Model Project.
- ✓ **Second mission:** The study team confirmed the self investment capacity and investment will of DAWACO.

15

# Output 3-a Tendering Proposal

**Finding 1** To aim for limited tendering or nominated tendering

**Follow-up 1** **The 3rd mission:** Official letter from the study team to Da Nang City to recommend limited/nominated tendering

**Follow-up 2** **January to March:** To get approval from City of Da Nang (DPC, DPI) for the pump renewal

**Follow-up 3** **April to June:** To start limited/nominated tendering while applying for JCM Model Project (application: late May)

**Background**

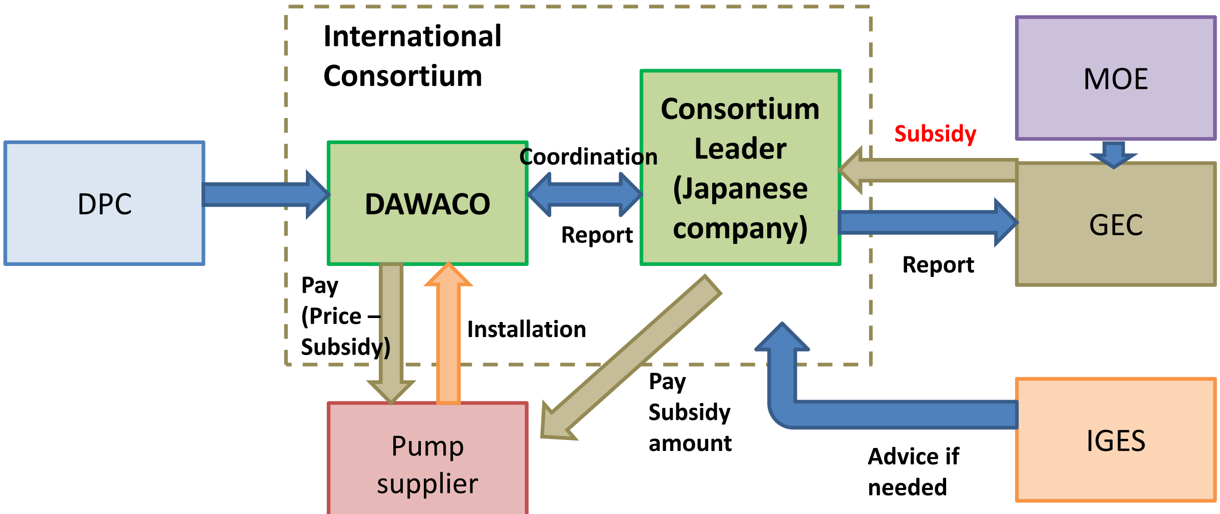
- ✓ **First mission:** Shared understanding about importance of tendering for JCM Model project
- ✓ **Second mission:** The study team confirmed the conditions for limited/nominated tendering

16

# Output 3-b International consortium

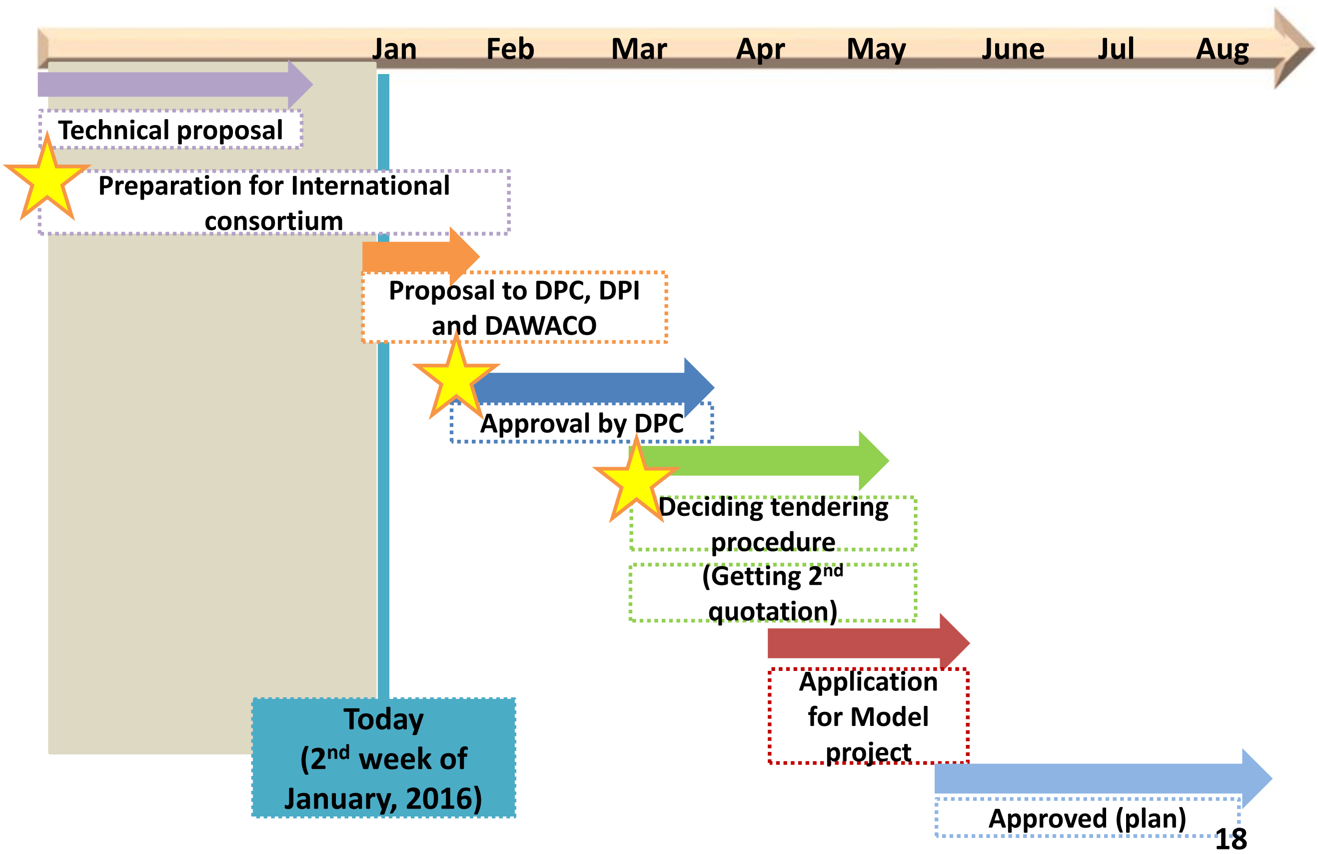
**Follow-up 1** MOU between DAWACO and Japanese company to organize international consortium

**Follow-up 2** On Japanese side we are preparing with companies including one Yokohama based company to lead and join the international consortium




17

# Schedule




18

Institute for Global Environmental Strategies

# WRAP-UP MEETING

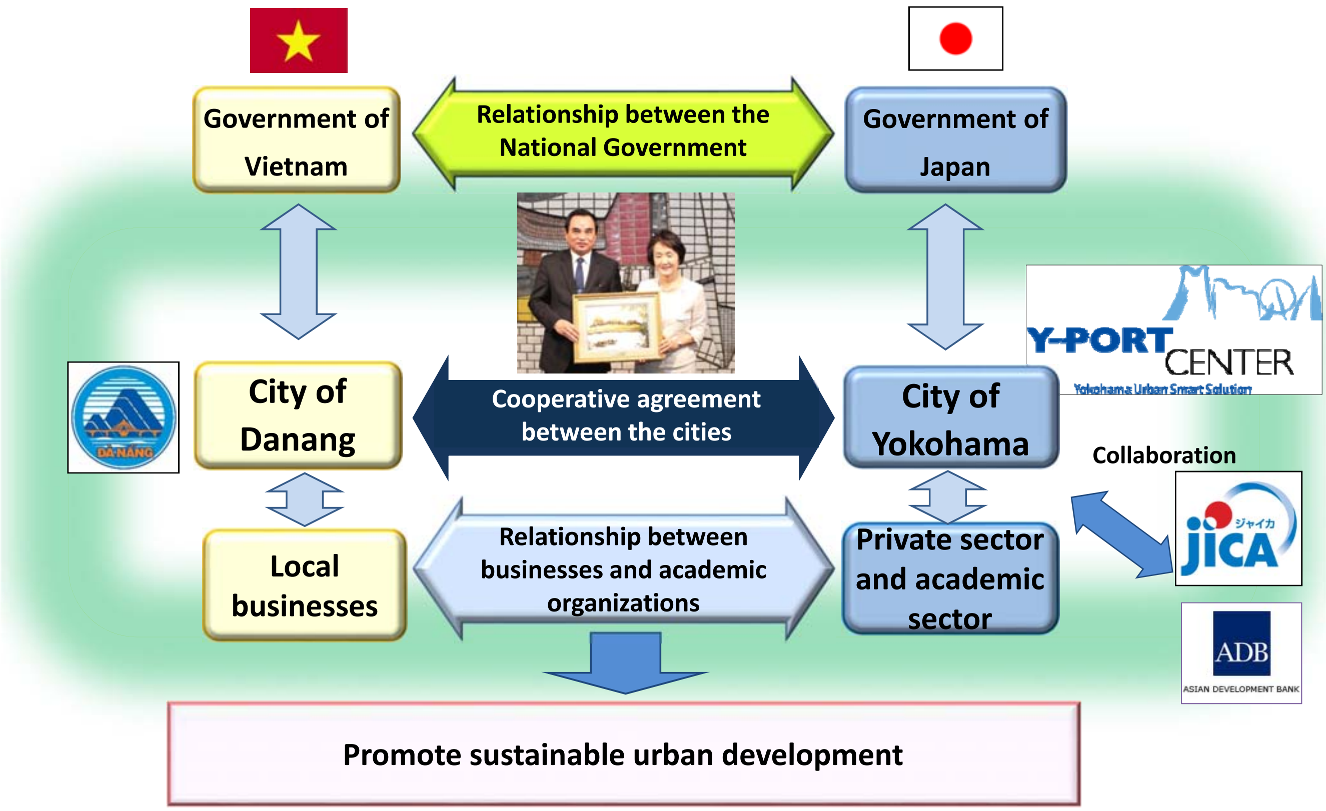
## JCM Feasibility Study in Da Nang through "Technical Cooperation for sustainable Urban Development" with Yokohama City

January, 2016

City of Yokohama
Institute for Global Environmental Strategies (IGES)
Mizuho Information & Research Institute Inc.
Osumi Co. Ltd.

# Framework of Cooperation with Cities

Cooperation with the City of Danang



# Feasibility Study at Glance



## Who we are: Project Team from Japan side

OPEN YOKOHAMA

**City of Yokohama**
Official and first communication to Da Nang City

IGES

**IGES**
- Overall coordination
- Water management project manager

MIZUHO

**MHIR**
- Needs assessment project manager

安全・安心な環境を創り続けます
osumi
株式会社オオスミ

**Osumi**
- (Water & Needs Assessment) Energy Conservation Diagnosis & Technology issues

# The study team works under city to city collaboration

JCM Feasibility Study in Da Nang through "Technical Cooperation for Sustainable Urban Development" with Yokohama City

**Japan-side** Y-PORT Center

City of Yokohama (Participation of water bureau)

Project Management

IGES

MOU to establish bilateral cooperation between Da Nang and Yokohama, Apr 2013

**Vietnam-side**

City of Da Nang

People's Committee

DPI

## Water Management

IGES
Osumi Co., Ltd.

Identifying the technical specifications of pumps

Discussion on financing and tendering to gain JCM subsidies

DAWACO, DPI, DOC, CCCO

## Needs Assessment

Mizuho Information & Research Institute, Inc.
Osumi Co., Ltd.

Low Carbon Tech in Hotel , Factories and Commercial buildings

Low carbon Distributions (port)

DPI, DOC,DONRE, DOI, Industrial Park, The Univ of DaNang , Hotels, Tiensa Port, CCCO



# 1st Mission – September 2015

<Water> To collect information of the current status of water plant
<Needs Assessment> To start creating long list of JCM candidates

| Summary of Mission Schedule | | | |
|---|---|---|---|
| 9/14 (Mon) | IGES | Osumi | MHIR |
| | Kick-off meeting @ DPI | | |
| | Kick-off meeting @ DPC | | |
| | Meeting with Japanese Business Association | | |
| 9/15 (Tue) | IGES | Osumi | MHIR |
| | Meeting with DAWACO<br>Site visit @ Cau Do Water Plant | | Meeting w/DOT |
| | Meeting with Da Nang Port Corporation | | |
| | Unv. of Science and Technology | Site Visit @ Seafood Service Zone | |
| 9/16 (Wed) | IGES | Osumi | MHIR |
| | Meeting with DOIT | | |
| | (Internal meeting @ Brilliant Hotel) | | |
| | Site visits<br>@Antra Water Plant<br>and San Bay Water Plant | Meeting with Industrial Zone Management Board<br>and DAIZICO | |
| | | Presentation @ Board Meeting of JBA | |
| 9/17 (Thu) | IGES | Osumi | MHIR |
| | Meeting with DOC | | |
| | Meeting with Saigon Da Nang Joint Stock Investment Company | | |
| | Meeting with Department of Tourism | | |
| | Wrap-up meeting @DPI | | |

# 2nd Mission – November 2015

<Water> To understand DAWACO's needs & share points important for JCM to DAWACO
<Needs Assessment> Creation of short list through hearings

**Summary of Mission Schedule**

| Date | IGES | Osumi | MHIR |
|---|---|---|---|
| 11/2 (Mon) | IGES | Osumi | MHIR |
| | Meeting with DPI | | |
| | | Meeting with a candidate company | |
| | Preparation for the workshop | | |
| | 15:00-16:00 Meeting with DOFA | 16:00-17:00 Meeting with a candidate company | |
| 11/3 (Tue) | IGES | Osumi | MHIR |
| | Meeting with the wastewater company | | |
| | Meeting with public lighting company | Meeting with a candidate company | |
| | Meeting with JBAD | | Meeting with JBAD |
| 11/4 (Wed) | IGES | Osumi | MHIR |
| | Workshop for facilitation of JCM Project Formulation & Implementation | | |
| | Site visit @ candidate site for new station | Meeting with 2 candidate companies | |
| | 16:30-17:30 Reporting to DPI | | |
| 11/5 (Thu) | IGES | Osumi | MHIR |
| | WS with DAWACO | | Leave for Japan |
| | Survey @ water plants(Caudo and Sun Bay) | | |
| 11/6 (Fir) | IGES | Osumi | MHIR |
| | Technical meeting with DAWACO | | |
| | Wrap up meeting with DPI | | |
| 11/7 (Sat) | IGES | Osumi | MHIR |
| | Leave for Japan | | |
| | | | |

7

# 3rd Mission - January 2016

<Water> To provide our proposal for the pump renewal
<Needs Assessment> To provide our result of JCM model project candidates and wrap-up with more meetings with candidates

| 1/6 (Wed) | IGES | Osumi | MHIR |
|---|---|---|---|
| AM | Preparatory meeting with DPI | | |
| | Tech meeting w/Dawaco | Meeting with a candidate company | |
| PM | Final meeting w/Dawaco | Meeting with a candidate company | |
| **1/7 (Thu)** | **IGES** | **Osumi** | **MHIR** |
| AM | Meeting with the waste water company | Meeting with a candidate company | |
| PM | Meeting with the waste water company | Meeting with a candidate company | |
| **1/8(Fri)** | **IGES** | **Osumi** | **MHIR** |
| AM | Preparation for wrap-up meeting | Meeting with a candidate company | |
| PM | Final wrap-up meeting | | |
| | Final meeting with DPC and DPI (TBD) | | |
| **1/9 (Sat)** | **IGES** | **Osumi** | **MHIR** |
| AM | Leave for Japan | | |

8

# Activities and Outputs

Pump renewal in the old Cau Do (Raw Water) and the new Cau Do (Purified Water)

**Output 1** – **Technical analysis**

**Activity 1**

**1-0: Identifying the pumps and specifications**

**1-1: Collection of data and its analysis** (electricity usage and water flow amount)

**1-2: Consideration of different pump renewable alternatives**

- 1-2-1: Usage of invertors
- 1.2-2: Preparation of methodology (draft)

**Output 2** – **Financial proposal**

**Activity 2**

**2-1: Financing**

2-1-1: Cost benefit analysis

2-1-2: Analysis of DAWACO's investment capacity and investment will

2-1-3: Procedures for financing

**2-2: Preparation for Model Project in FY2016**

**Output 3** – **Tendering and procedures**

**Activity 3**

**3-1: How to solve issues of tendering**

3-1-1: Tender in normal situation
3-1-2: Consideration of analysis
3-1-3: Agreement on the tendering method and its condition

**3-2: Consideration of international consortium**

**3-3: Proposal of DPC and DPI**

9

# Overview of JCM partners by outputs

**DPC**

- ✔ Feedback of feasibility study results
- ✔ Final decision on investment

**DPI**

- ✔ City to city collaboration focal point
- ✔ JCM Overall focal point

**Output 3** Tendering related issues

- ✔ Consultations for tendering related issues

**DAWACO**

**Output 1** Technical Specs

**Output 2** Finance

- ✔ Pump renewal needs
- ✔ Discussion on finance

**Other related agencies**

**Output 2** Finance

**The end of December, 2015**

**Cost-benefit analysis**

10

# Output 1 Technical Recommendation

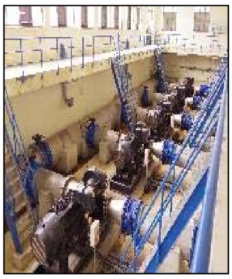
**Finding 1** The Study team recommends to replace ① 3 pumps in CauDo I and ② 6 pumps in CauDo II with same capacity.

### Old Cau Do I (Raw Water) Pumps
Replaced with 3 new pumps

$CO_2$Reduction 118 t/year (Project pump 83% from Reference pump 75%)

Cost Benefit Analysis 62.2USD/t

(Condition : Subsidy ratio 40%; 3 high efficiency pumps including installation cost and tax: About USD275,000; Usage period 15 years)



### New Cau Do II (Filtered Water) Pumps
Replaced with 6 new pumps

$CO_2$Reduction 481 t/year (Project pump 86% from Reference pump 75%)

Cost Benefit Analysis 93.4USD/t

(Condition : Subsidy ratio 40%; 3 high efficiency pumps including installation cost and tax: About USD1,683,000; Usage period 15 years)



# Output 2 Financing Proposal

**Finding 1** To replace pumps in the budget **within USD 1MM**, the amount DAWACO could prepare themselves according to our discussion

**Follow-up 1** **The 3rd mission:** To clarify unit numbers of pump renewals based on different subsidy ratio (30%, 40% and 50%)

**Follow-up 2** **January to March:** To get approval from City of Da Nang (DPC, DPI) for the pump renewal

**Background**

- ✓ **First mission:** Shared understanding about importance of financing to get JCM Model Project.
- ✓ **Second mission:** The study team confirmed the self investment capacity and investment will of DAWACO.

# Output 3 Tendering Proposal

**Finding 1** To aim for limited tendering or nominated tendering

**Follow-up 1** **The 3rd mission:** Official letter from the study team to Da Nang City to recommend limited/nominated tendering

**Follow-up 2** **January to March:** To get approval from City of Da Nang (DPC, DPI) for the pump renewal

**Follow-up 3** **April to June:** To start limited/nominated tendering while applying for JCM Model Project (deadline: late May)

**Background**

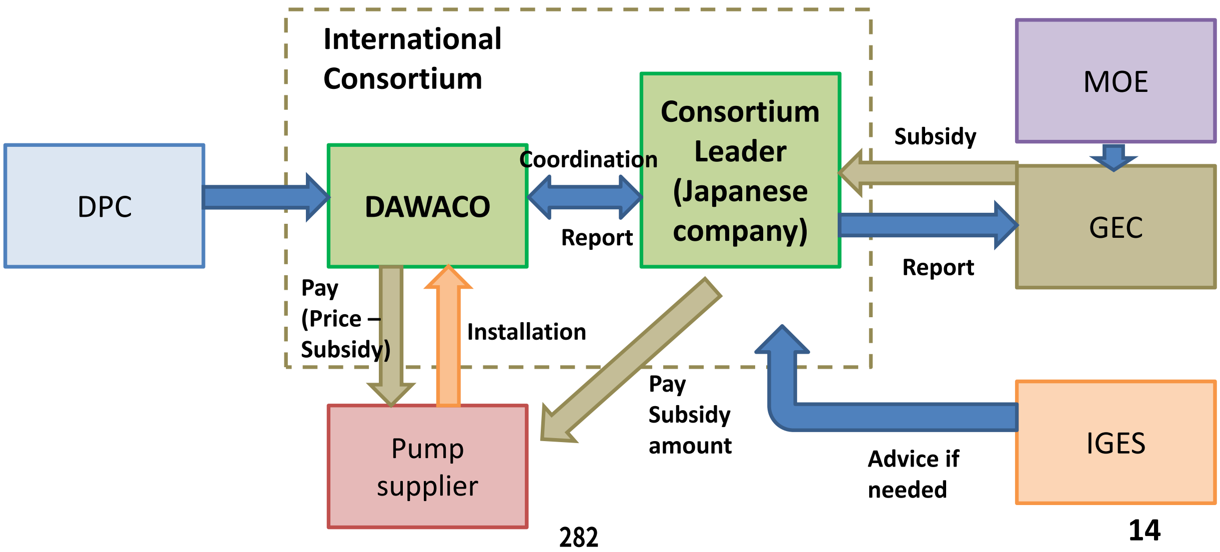
- ✓ **First mission:** Shared understanding about importance of tendering for JCM Model project
- ✓ **Second mission:** The study team confirmed the conditions for limited/nominated tendering



# Output 3-b International consortium

**Follow-up 1** MOU between DAWACO and Japanese company to organize international consortium

**Follow-up 2** On Japanese side we are preparing with companies including one Yokohama based company to lead and join the international consortium



Bộ Môi Trường
Khảo sát khả năng hình thành dự án JCM nhằm xây dựng xã hội Cacbon thấp tại Châu Á năm 2015
Dự án khảo sát hỗ trợ thiết bị theo cơ chế JCM, trong khuôn khổ hợp tác kỹ thuật nhằm phát triển đô thị bền vững giữa thành phố Đà Nẵng và thành phố Yokohama

# Báo cáo cuối kỳ
# Khảo sát nắm bắt nhu cầu
# Wrap-Up Meeting

Tháng 1 năm 2016

Y-Port Center- thành phố Yokohama
Mizuho Information & Research Institute Inc.
Có quan nghiên cứu chiến lược môi trương toàn cầu（IGES）
Osumi Co. Ltd.,

# Báo cáo cuối cùng
# Khảo sát nhu cầu JCM

## Mục lục

# 1. Khái quát khảo sát

- Mục đích: tìm kiếm khả năng áp dụng cơ chế JCM tại 5 cơ sở thuộc các lĩnh vực khách sạn, nhà máy, cảng biển, cơ sở thương mại trên địa bàn thành phố Đà Nẵng.
- Thời gian: tháng 9 năm 2015 ～ tháng 3 năm 2016
- Cơ quan tham gia phía Đà Nẵng: Sở KHDT (đầu mối), Sở Công thương, Sở Văn hóa thể thao du lịch, Sở Giao thông, Ban quản lý KCN, công ty cảng Đà Nẵng
- Nhóm khảo sát (phía Nhật Bản): thành phố Yokohama, IGES, viện thông tin Mizuho, công ty Osumi

| Tên tổ chức | Vai trò |
|---|---|
| IGES | Tổng quản |
| Viện thông tin Mizuho | Đánh giá tiềm năng giảm thiểu CO2, lên kế hoạch dự án JCM, quản lý quy trình khảo sát |
| Công ty Osumi | Kiểm tra về mặt kỹ thuật, đánh giá tiềm năng giảm thiểu CO2 |

3

# 2. Nội dung khảo sát (hoạt động và kết quả)

Xúc tiến giảm thiểu Cacbon trên toàn thành phố Đà Nẵng

**Kết quả 1**

Khảo sát tìm kiếm tiềm năng JCM tại các cơ sở thương mại, khách sạn, nhà máy và cảng biển

**Hoạt động 1**

**Kết quả 1-1 Nắm bắt nhu cầu đầu tư thiết bị**
Hoạt động 1-1: xây dựng danh sách các doanh nghiệp có tiềm năng tiết kiệm năng lượng
Hoạt động 1-2: phát phiếu khảo sát dựa trên danh sách đó
**Kết quả 1-2 lựa chọn đối tượng cho dự án JCM**
Hoạt động 1-3: tổ chức hội thảo về xúc tiến JCM
Hoạt động 1-4: khảo sát thực tế các đối tượng có tiềm năng thực hiện cơ chế JCM
**Kết quả 1-3 xúc tiến hình thành dự án JCM**
Hoạt động 1-5: khảo sát chi tiết về kỹ thuật
Hoạt động 1-6: đánh giá tiềm năng giảm thiểu CO2, thiết kế sơ bộ về kỹ thuật, khái toán chi phí đầu tư.
Hoạt động 1-7: trao đổi với doanh nghiệp thuộc đối tượng JCM về mặt kỹ thuật và tài chính.
Hoạt động 1-8: chuẩn bị hồ sơ đề xuất dự án năm 2016

**Kết quả 2**

Xúc tiến nghị luận giảm thiểu cacbon kết nối với các kế hoạch xây dựng đô thị trên toàn địa bàn thành phố Đà Nẵng

**Hoạt động 2**

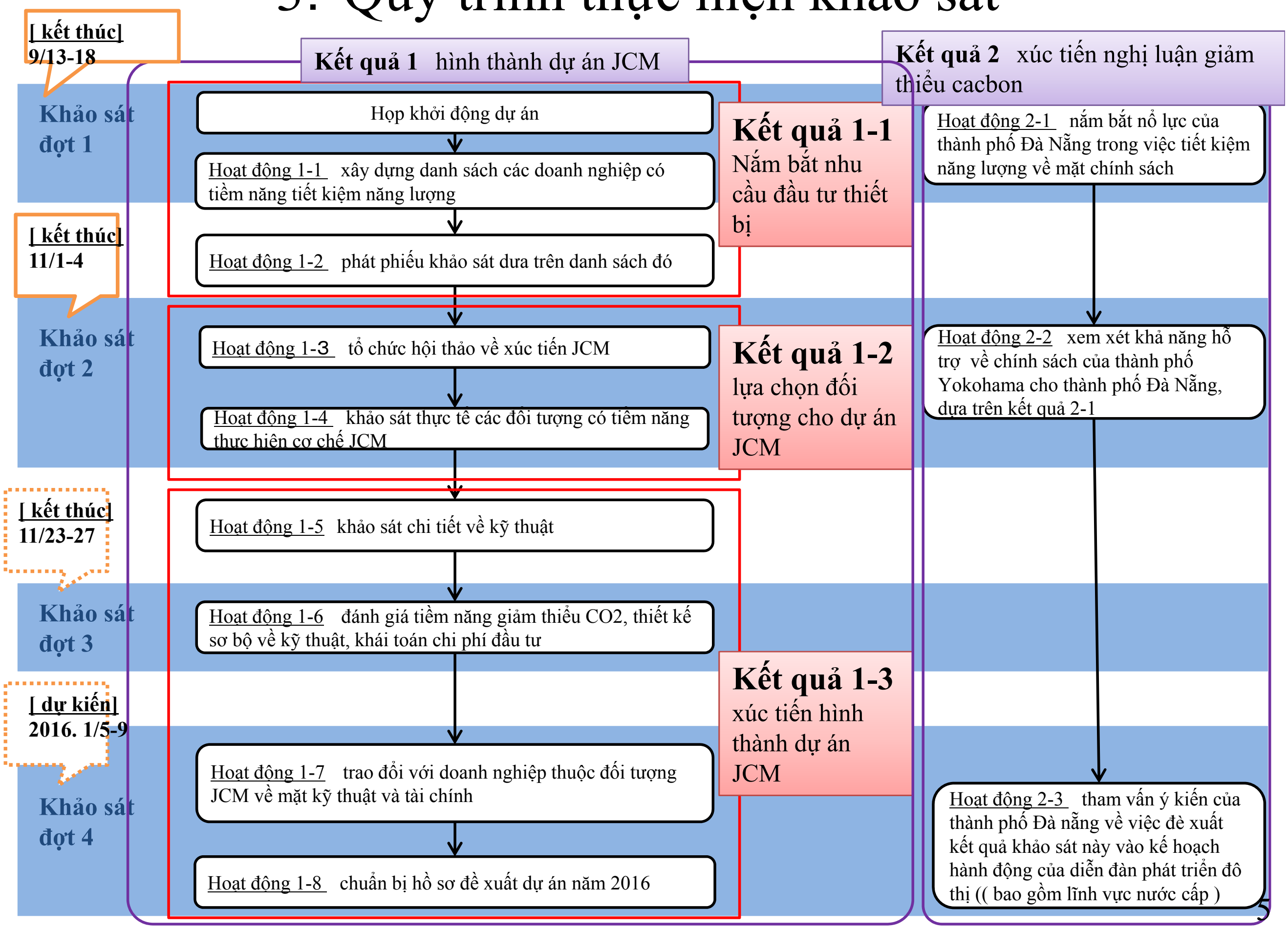
Hoạt động 2-1: nắm bắt nỗ lực của thành phố Đà Nẵng trong việc tiết kiệm năng lượng về mặt chính sách

Hoạt động 2-2: xem xét khả năng hỗ trợ về chính sách của thành phố Yokohama cho thành phố Đà Nẵng, dựa trên kết quả 2-1

Hoạt động 2-3: tham vấn ý kiến của thành phố Đà nẵng về việc đề xuất kết quả khảo sát này vào kế hoạch hành động của diễn đàn phát triển đô thị (( bao gồm lĩnh vực nước cấp )

4

# 3. Quy trình thực hiện khảo sát




5

# 4. Kết quả khảo sát（1）

## Kết quả 1-1 nắm bắt nhu cầu đầu tư thiết bị

**Hoạt động 1-1** xây dựng danh sách các doanh nghiệp có tiềm năng tiết kiệm năng lượng

● trong đợt khảo sát lần 1, thông qua Sở KHDT, nhóm khảo sát đã thu thập được danh sách các doanh nghiệp sử dụng năng lượng trọng điểm, các khách sạn từ 3 sao trở lên, các công ty vận chuyển quy mô lớn, và danh sách các doanh nghiệp trong khu công nghiệp trên địa bàn thành phố Đà Nẵng

● từ danh sách đó, lựa chọn 50 doanh nghiệp ( 15 khách sạn, 28 nhà máy, 7 công ty vận chuyển) để phát phiếu khảo sát, dựa trên tiêu chí sau:

- ◆ doanh nghiệp： chế tạo sản xuất, không phải lắp ráp
- ◆ khách sạn： từ 3 sao trở lên,（trên 50 phòng）, khách sạn cũ
- ◆ vận chuyển： các công ty taxi lớn tại Đà nẵng, do sở Giao thông tiến cử

**Hoạt động 1-2** phát phiếu khảo sát dựa trên danh sách đã lựa chọn

● dưới sự hỗ trợ của Sở KHDT, thực hiện phát phiếu khảo sát cho các doanh nghiệp đã lựa chọn tại hoạt động 1-1, với nội dung khảo sát như: có kế hoạch đầu tư thiết bị mới hay không, lượng năng lượng tiêu thụ, thông số kỹ thuật các thiết bị đang sử dụng…

**Tóm tắt kết quả**

●Đã phát phiếu khảo sát cho 50 doanh nghiệp, thu thập được 20 phiếu phản hồi, trong đó có 12 doanh nghiệp có dự định thay thế đầu tư thiết bị.

● loại hình kinh doanh của 12 doanh nghiệp bao gồm thủy sản, sản xuất giấy, dệt, may mặc, chế tạo thiết bị điện tử, thực phẩm, khách sạn, vận chuyển.

●Các thiết bị dự kiến thay thế bao gồm điều hòa, máy lạnh, lò hơi, chiếu sáng, máy phát điện, máy nóng lạnh…

6

# 4. Kết quả khảo sát（2）

## Kết quả 1-2　lựa chọn đối tượng cho dự án JCM

**Hoạt động 1-3**　tổ chức hội thảo về xúc tiến JCM

● nội dung hội thảo：　giới thiệu về thủ tục, lợi ích, và nội dung của dự án hỗ trợ thiết bị trong khuôn khổ cơ chế JCM, thời gian ngày 4 tháng 11 ( đợt khảo sát lần 2)

● khách mời：　ngoài 12 doanh nghiệp có ý định đầu tư như trình bày tại hoạt động 1-2, còn có 7 doanh nghiệp có tiềm năng đến từ các lĩnh vực như ( sản xuất sắt thép, xi măng, cao su, nhựa), tổng cộng 20 doanh nghiệp.

● doanh nghiệp tham gia：　trong số các doanh nghiệp tham gia, có 13doanh nghiệp thuộc loại hình（dệt may mặc, khách sạn, xi măng, nhựa, cơ khí, thủy sản, sắt thép, bao bì, giấy, sữa）.
Doanh nghiệp nhà nước bao gồm công ty cấp nước DAWACO, công ty cảng Đà Nẵng. Ngoài ra còn có sự Tham gia của các sở ban ngành như: sở KHDT, sở Công thương, sở văn hóa du lịch, sở Giao thông, trung tâm biến đổi khí hậu…

(*)ngoài ra, có một số doanh nghiệp tham gia hội thảo Có ý muốn tìm hiểu kỹ hơn về JCM (tham khảo slide 9)



# 4. Kết quả（2）

## Kết quả 1-2　Lựa chọn đối tượng cho dự án JCM

**Hoạt động 1-4**　khảo sát thực tế các đối tượng có tiềm năng thực hiện cơ chế JCM

● Trong đợt khảo sát lần 2 (trung tuần tháng 11), đã khảo sát thực tế về kỹ thuật và tình hình kinh doanh của 5 doanh nghiệp thuộc đối tượng JCM, nội dung như sau:
Tiêu chuẩn lựa chọn : ① có ý định đầu tư thiết bị, ② các thiết bị dự định thay thế có tiềm năng giảm thiểu CO2 hơn các thiết bị đang sử dụng. Các doanh nghiệp này cũng tham dự hội thảo.

| Tên doanh nghiệp | Nhu cầu đầu tư thiết bị |
|---|---|
| ①công ty A (thủy sản ) | Tăng công suất lò hơi |
| ②công ty B (dệt may ) | Thay thế đèn LED |
| ③công ty C (giấy ) | Tiết kiệm năng lượng cho quy trình sản xuất giấy cũ（quy trình OCC） |
| ④khách sạn D | Thay thế hệ thống điều hòa |
| ⑤công ty sữa E | Thay thế lò hơi |

**Tóm tắt kết quả**

● như trình bày ở slide trước, đối với 3 doanh nghiệp **①thủy sản, ②dệt may và ③ sản xuất giấy,** tiềm năng giảm thiểu CO2 và nhu cầu đầu tư thiết bị phù hợp với cơ chế JCM nên có khả năng đăng ký dự án hỗ trợ thiết bị, do đó đã tiếp tục khảo sát chi tiết hơn với từng doanh nghiệp trong đợt khảo sát lần 3.

# 4. Kết quả khảo sát(3)

## Kết quả 1-3　xúc tiến hình thành dự án JCM

**Hoạt động 1-5**　khảo sát chi tiết về kỹ thuật　**【thực hiện tại Nhật Bản(tháng 11 ～tháng 12)】**

Tham khảo tư vấn về kỹ thuật từ các doanh nghiệp Nhật Bản chuyên về lò hơi, đèn LED, máy phát điện…

**Hoạt động 1-6**　đánh giá tiềm năng giảm thiểu CO2, thiết kế sơ bộ về kỹ thuật, khái toán chi phí đầu tư **【khảo sát lần 3(ngày 23 tháng 11-27tháng 11)】**

1. Doanh nghiệp thuôc đối tượng JCM(sàn lọc thông qua các hoạt động 1-1～4)

| Tên doanh nghiệp | Thiết bị đầu tư |
|---|---|
| (1)công ty A(thủy sản ) | Tăng công suất lò hơi |
| (2)công ty B　(dệt may ) | Thay thế đèn LED |
| (3)công ty C　(giấy) | Tiết kiệm năng lượng cho quy trình sản xuất giấy cũ (quy trình OCC) |



# 4. Kết quả khảo sát(3)

## Kết quả 1-3　xúc tiến hình thành dự án JCM

2. Hiện trạng từ sau báo cáo giữa kỳ (công việc tại Nhật ＋kết quả khảo sát đợt 3)

### (1)công ty A(thủy sản)

<Nhu cầu>
Tăng công suất lò hơi từ 1 tấn lên 1.5 tấn

＜Khung đề xuất cho dự án JCM (phác thảo)＞
- Dự định của doanh nghiệp: sử dụng nhiên liệu than đá

| | |
|---|---|
| Công nghệ | Lò hơi sinh khối kết hợp phát điện quy mô nhỏ (công ty street design) |
| Tiềm năng giảm CO2 | 1,977tCO2/năm |
| Chi phí – hiệu quả | 557 yên/tCO2(thời gian khấu hao theo luật 15năm) |
| Thời gian hoàn vốn | 1.31 năm |
| Tổng chi phí đầu tư | Khoảng 33 triệu yên Nhật (khái toán) |

(＊)　việc sử dụng Tuabin hơi nước sẽ tạo ra 1 lượng điện đủ để sử dụng trong nhà máy, chi phí điện tạo ra khoảng 0.67 yên/kWh, thấp hơn chi phí điện lấy từ mạng lưới quốc gia là 10yen/kWh. Hơn nữa, giá thành hơi sinh ra từ lò hơi sinh khối khoảng 0.77yen/kg, rẻ hơn nhiều so với giá thành hơi sử dụng nhiên liệu than đá là 4.3yen/kg.

＜kế hoạch trong tương lai＞
- giới thiệu chi tiết cho doanh nghiệp công ty A, xem xét khả năng hình thành dự án JCM.
- nếu khả năng đáp ứng cơ chế JCM cao, chuẩn bị hồ sơ đăng ký dự án hỗ trợ thiết bị JCM.

### (2)công ty B (dệt may)

＜Nhu cầu＞
Thay thế 6000 bóng đèn LED

＜Khung đề xuất cho dự án JCM (phác thảo)＞
- Dự định của doanh nghiệp: sử dụng đèn LED (Rạng Đông)

| | |
|---|---|
| Công nghệ | D Series Hf32 loại tiết kiệm năng lượng 6900lm (Panasonic) |
| Tiềm năng giảm CO2 | 378～498tCO2/năm |
| Chi phí - hiệu quả | 4,515～7,424yên/tCO2 (thời gian khấu hao 8 năm) |
| Thời gian hoàn vốn | 1.78～2.92 năm |
| Tổng chi phí đầu tư | Khoảng 35,95 triệu yen～44,93 triệu yen(khái toán) |

※　thay đổi phụ thuộc vào việc thiết lập độ sáng thích hợp và hiệu quả　cải thiện vận hành.
(＊)sản phẩm LED của Panasonic được tích hợp cả bóng đèn LED và thiết bị chiếu sáng, hơn nữa chỉ phần dưới của bòng LED được thiết kế chiếu sáng nên cùng một diện tích vó thể giảm số lượng bóng.
(＊)độ an toàn (cháy nổ, chập…) cao và có chức năng phóng chống việc giảm ánh sáng.

＜kế hoạch trong tương lai＞
- xem xét khả năng hình thành dự án JCM trong đợt khảo sát cuối cùng.

# 4. Kết quả khảo sát（3）

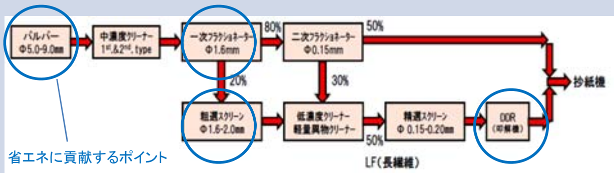
## Kết quả 1-3　xúc tiến hình thành dự án JCM

**（3）công ty C（sản xuất giấy）**

＜nhu cầu＞
Đổi mới quy trình sản xuất（quy trình OCC）

※quy trình OCC：　là quy trình sản xuất giấy chất lượng cao từ nguyên liệu giấy cũ（OCC）hoặc giấy cũ tổng hợp（MW）

※tại Indonesia đã có dự án JCM thực hiện cho quy trình OCC.




＜kế hoạch trong tương lai＞
- giới thiệu công nghệ OCC Nhật Bản trong đợt khảo sát cuối cùng.
- nếu công ty C có kế hoạch cụ thể cho việc đầu tư thiết bị của quy trình OCC, thì nhóm khảo sát sẽ xem xét khả năng hình thành dự án JCM.



# 4. Kết quả（3）

## Kết quả 1-3　xúc tiến hình thành dự án JCM

**Hoạt động 1-7**　trao đổi với doanh nghiệp thuộc đối tượng JCM về mặt kỹ thuật và tài chính
**【khảo sát đợt cuối（tháng 1 năm 2016）】**

**Hoạt động 1-8**　chuẩn bị hồ sơ đề xuất dự án năm 2016
**【công việc tại Nhật（tháng 1 năm 2016）】**

- dựa vào kết quả của hoạt động 1-6 và đợt khảo sát cuối cùng, sẽ chuẩn bị hồ sơ đăng ký dự án hỗ trợ thiết bị JCM hoặc khả năng hình thành dự án JCM trong tường hợp cần thiết.

# 4. Hiện trạng khảo sát（4）

## Kết quả 2　xúc tiến nghị luận giảm thiểu cacbon trên toàn địa bàn thành phố Đà Nẵng

**Hoạt động 2-1**　nắm bắt nổ lực của thành phố Đà Nẵng trong việc tiết kiệm năng lượng về mặt chính sách

- trong đợt khảo sát lần 1, sau khi làm việc với các sở ban ngành đã xác đinh được các nội dung như sau:
  - ◆ sở Văn hóa thể thao du lịch：　thúc đẩy cơ chế đánh giá khách sạn sinh thái（tuy nhiên CO2 không nằm trong hạng mục đánh giá.）. Đã có 3 khách sạn được công nhận.
  - ◆ sở Công thương：　đang thực hiện quan trắc đánh giá hiện trạng sử dụng năng lượng đối với các doanh nghiệp sử dụng năng lượng trọng điểm, dựa theo luật tiết kiệm năng lượng.（các doanh nghiệp phải nộp kết quả quan trắc, báo cáo và kế hoạch sử dụng năng lượng hiệu quả cho sở Công thương）.
- ngoài ra, còn có một số các dự án liên quan đến tiết kiệm năng lượng, giảm thiểu Cacbon như sau:
  - ◆ sở Giao thông：　trong khuôn khổ giai đoạn 2「dự án phát triển đô thị bền vững」do ngân hàng thế giới tài trợ về triển khai hệ thống BRT nhằm bảo về môi trường và tiết kiệm nhiên liệu, đưa vào sử dụng xe bus hybrid bằng ngân sách của thành phố Đà Nẵng.
  - ◆ công ty cảng Đà Nẵng：　nhằm bảo về môi trường và tiết kiệm nhiên liệu, dự kiến thay thế thiết bị cần cẩu hybrid.

13

# 4. Kết quả khảo sát（4）

## Kết quả 2　xúc tiến nghị luận giảm thiểu cacbon trên toàn địa bàn thành phố Đà Nẵng

**Hoạt động 2-2**　xem xét khả năng hỗ trợ　về chính sách của thành phố Yokohama cho thành phố Đà Nẵng, dựa trên kết quả 2-1

**Hoạt động 2-3**　tham vấn ý kiến của thành phố Đà nẵng về việc đè xuất kết quả khảo sát này vào kế hoạch hành động của diễn đàn phát triển đô thị (( bao gồm lĩnh vực nước cấp )
【công việc tại Nhật（tháng 1 năm 2016）】

- về vấn đề giảm thiểu Cacbon, tiết kiệm năng lượng, thành phố Đà Nẵng chưa có kế hoạch mang tính thống nhất, cũng như chưa có tầm nhìn mang tính chiến lược, các dự án đang triển khai một cách rời rạc.
- do đó, để thúc đẩy giảm thiểu Cacbon và tiết kiệm năng lượng mang tính nhất quán và hiệu quả, nhóm khảo sát đề xuất ghi thêm nội dung này vào kế hoạch hành động đã được đề ra tại diễn đàn phát triển đô thị thành phố Đà Nẵng, được thực hiện bởi 3 bên là thành phố Yokohama, JICA và thành phố Đà Nẵng.
- về việc thúc đẩy tiết kiệm năng lượng, giảm thiểu Cacbon, trước tiên cần đặt ra tầm nhìn chiến lược để từ đó xây dựng kế hoạch thực hiện, góp phần vào công cuộc xây dựng thành phố Đà Nẵng trở thành thành phố môi trường vào năm 2020.

# 5. Tiêm năng thực hiện dự án JCM tại thành phô Đà Nẵng

Tiềm năng thực hiện dự án JCM tại thành phố Đà Nẵng

- nhu cầu đầu tư thiết bị tại các doanh nghiệp chưa thực hiện khảo sát
- nhu cầu thay thế thiết bị định kỳ tại các nhà máy sản xuất
- nhu cầu thay thế thiết bị tại các khách sạn
- khả năng áp dụng công nghệ đồng phát

**Các điểm quan trọng của dự án JCM**

- doanh nghiệp có nhu cầu đầu tư thiết bị

  Để đăng ký dự án JCM thì doanh nghiệp cần có kế hoạch đầu tư thiết bị, và thiết bị dự định đầu tư phải tiết kiệm năng lương, giảm thiểu cacbon hơn thiết bị cũ. Có nghĩa là cần có kế hoạch tài chính cho việc đầu tư thiết bị thì việc đăng ký dự án JCM sẽ nhanh hơn.
- doanh nghiệp sử dụng nhiều năng lương, phát thải nhiều CO2
  - các ngành công nghiệp phát thải nhiều CO2 như sắt thép, hóa học, gạch, xi măng, cơ khí kim loại, giấy…
  - các thiết bị phát thải nhiều CO2 như lò hơi, động cơ (bơm, máy nén), máy lạnh, điều hòa, thiết bị chiếu sáng…

  （＊）công nghệ đồng phát cũng có khả năng
- tình hình tài chính ổn định

  Trong trường hợp đăng ký dự án hỗ trợ thiết bị, phải khảo sát về tình hình tài chính



Cảm ơn các bạn đã quan tâm theo dõi!!

Thank you so much for your attention!!

ARIGATOU GOZAIMASHITA!!

Institute for Global Environmental Strategies

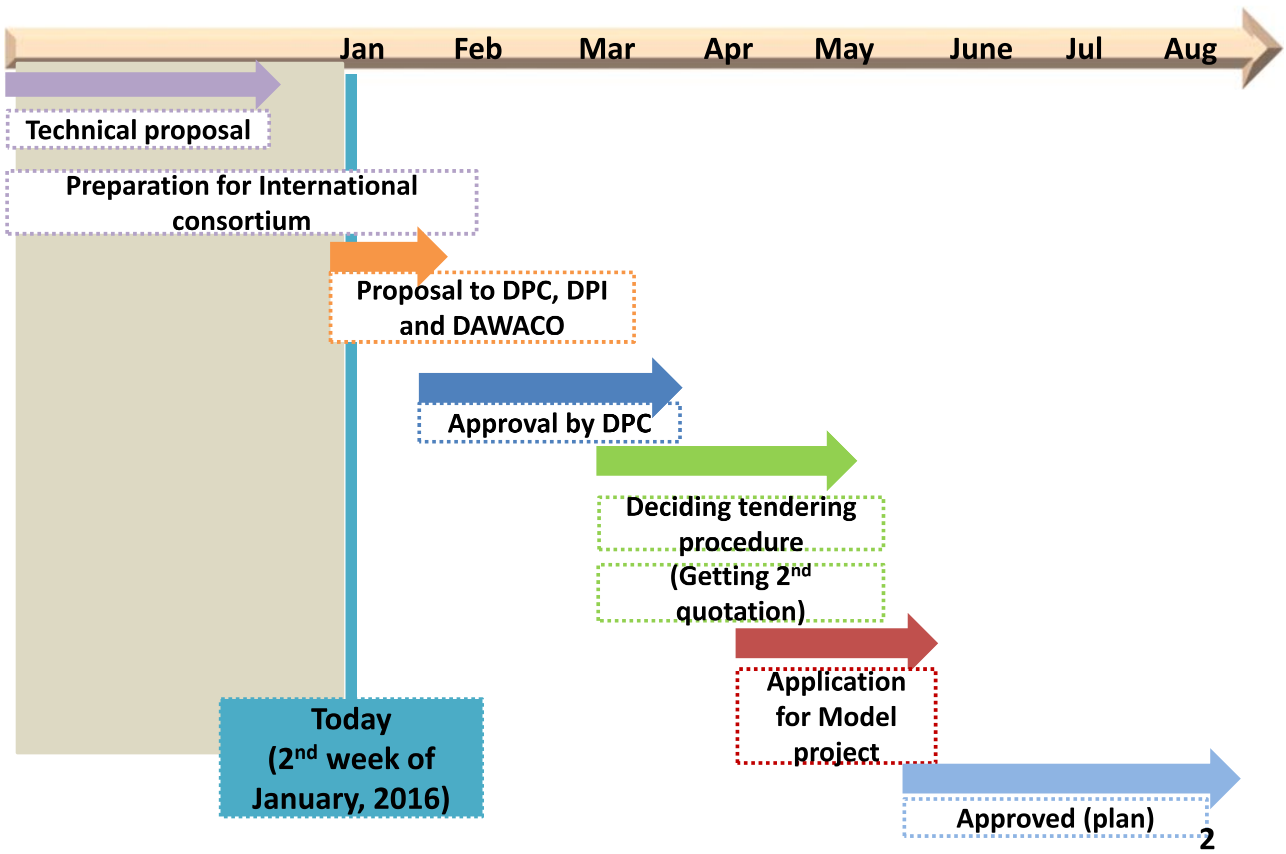
# Toward JCM Model Project

## JCM Feasibility Study in Da Nang through "Technical Cooperation for sustainable Urban Development" with Yokohama City

January, 2016

Institute for Global Environmental Strategies (IGES)
Mizuho Information & Research Institute Inc.
Osumi Co. Ltd.,

# Schedule at glance



# Schedule and Checklist

| | Schedule | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tasks | Jan | | | | Feb | | | | Mar | | | | | Apr | | | | | May | | | | June | | | | |
| | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 5 |
| Finalize the detailed technical proposal | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Finalize the quotation based on the agreed proposal | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Japanese parties discuss the formation of international consortium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sign the MOU (DAWACO & Ebara) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IGES prepares and send the Letter of Intent to DPC (cc. DPI) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sign the MOU (DAWACO & Japanese leader of the international consortium) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DAWACO sends request letter to DPC regarding nominated tendering | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DAWACO prepares financial report | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Japanese companies & DAWACO sign agreement for consortium | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Hand the report to City of Da Nang | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Decision made by DPC | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Preparation of proposal for JCM Model Project 2016 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Submission of final proposal for the JCM Model Project 2016 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Expected to get the result | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| Technical | Consortium | Report | Result |
| Finance | Tendering | Decision | |

3

Commission Report on
Feasibility Study on FY2015
Large-Scale JCM Project for Realizing Low-Carbon Development in Asia （JCM Feasibility Study in Da Nang through "Technical Cooperation for Sustainable Urban Development" with Yokohama City）
March, 2016

Institute for Global Environmental Strategies（IGES）

2108-11 Kamiyamaguchi, Hayama, Kanagawa
240-0115 Japan
Tel: 046-855-3700 Fax: 046-855-3809
URL: http://www.iges.or.jp
E-mail: iges@iges.or.jp