

FY2021 Project for Ministry of the Environment Japan

FY2021
City-to-City Collaboration Programme for
Zero-Carbon Society

Promotion of Zero-Emission Technology to Industrial and
Public Sectors in Ho Chi Minh City

Report

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Nippon Koei Co., Ltd.
Osaka City

**FY2021
City-to-City Collaboration Programme for
Zero-Carbon Society**

**Promotion of Zero-Emission Technology to Industrial and
Public Sectors in Ho Chi Minh City**

Report

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Abbreviations

BaU	Business-as-Usual
BEMS	Building Energy Management System
BRT	Bus Rapid Transit
CCAP	Climate Change Action Plan
CNG	Compressed Natural Gas
COP	Conference of the Parties
DICT	Department of Information and Communications Technology
DOF	Department of Finance
DOIT	Department of Industry and Trade
DONRE	Department of Natural Resources and Environment
DOT	Department of Tourism
EMS	Energy Management System
EPC	Engineering Procurement Construction
EVN	Vietnam Electricity
FIT	Feed-in Tariff
GDP	Gross Domestic Product
GEC	Global Environment Centre Foundation
GHG	Greenhouse Gas
GRP	Gross Regional Product
HCMC	Ho Chi Minh City
HEPZA	Ho Chi Minh City Export Processing and Industrial Zones Authority
INDC	Intended Nationally Determined Contribution
JCM	Joint Crediting Mechanism
LED	Light-emitting Diode
LPG	Liquefied Petroleum Gas
LULUCF	Land-Use, Land-Use Change and Forestry
MICE	Meetings, Incentives, Conference and Exhibitions
MOE	Ministry of the Environment, Government of Japan
MONRE	Ministry of Natural Resources and Environment
MOT	Ministry of Transport
MPI	Ministry of Planning and Investment
MRT	Mass Rapid Transit
MRV	Measurement, Reporting and Verification
NDC	Nationally Determined Contribution
NKV	Nippon Koei Vietnam
O&M	Operations and Maintenance
PDP	Power Development Plan
PJT	Project
PV	Photovoltaic
REF	Reference
SAWACO	Saigon Water Corporation
SOGEC	Sojitz Osaka Gas Energy Company Ltd.
SPEC	Special Presidential Envoy for Climate
SRHMC	South Regional Hydrometeorological Center
USD	United States Dollar
VND	Vietnam Don

CHAPTER 1 BACKGROUND AND OBJECTIVE

1.1 Background of the programme

Paris Agreement which entered into force in November 2016 and then to implementation stage from 2020, mentions not only central governments but non-governmental actors including local governments and cities that need to accelerate their countermeasures to climate change. Also, in “Ministerial meetings of the "Online Platform" on a Sustainable and Resilient Recovery from COVID-19” held in September 2020, confirmed the necessity of zero-carbon policies of local governments leading directly to communities and of the importance of developing of an approach by initiatives of local communities. In Japan, the Government declared that Japan is aiming to become a zero-carbon society by achieving zero emission of overall greenhouse gas (GHG) by 2050 and more than 300 local governments declared net zero emissions.

Roles of cities and local governments are becoming more important to consider for implementing climate change countermeasures and projects in each region. Toward realization of zero-carbon society in the entire globe, it is necessary to accelerate movements to sustainable and zero-carbon society especially in Asia where economic growth is remarkable. Thus, international support for city activities has been implemented to realize of zero/low-carbon society and to support activities for development of society and economy.

Also, under current situation of COVID-19 pandemic, while tackling issues related to the pandemic, cities are required to re-coordinate and consider new policies to achieve sustainable development. From these perspectives, it is important to develop new measures and cities by collaboration between cities.

In this Programme, by cooperating with Japanese cities with experiences and know-how for development of low-/zero-carbon society, Japanese research institutes, private companies and universities are working to introduce equipment to contribute to development of low-/zero-carbon society and realization of decarbonization.

In FY2021, the project for Zero-Carbon Society between Ho Chi Minh City and Osaka City (hereafter “the Project”) is positioned as the third fiscal year in the three-year plan and aims to promote zero-emission technologies to industrial and public sectors in HCMC by carrying out the study activities.

1.2 Participating cities in the project

1.2.1 Osaka City Government

Osaka City is an ordinance-designated city in Japan, and the central area of administration, economy, and culture in western Japan. Osaka City is the second biggest city in Japan following Tokyo and is the famous commercial city based on manufacturing industry heavy industry with the largest Gross Domestic Product (GDP) among ordinance-designated cities in Japan. In addition, Osaka City has a wide range of networks with foreign cities and has been

implementing and promoting various activities with sister cities, friendship cities and business partner cities including HCMC in Vietnam. Overview of Osaka City is as follows.

Table 1.1 Overview of Osaka City

#	Item	Overview
1	Area	225.33 km ² (as of October 2021)
2	Population	2,747,569 (as of January 2022)
3	Population density	12,194 people/km ² (as of January 2022)
4	Number of households	1,482,662 (as of January 2022)
5	Number of industrial enterprises	5,026 (As of June 2018: Industrial census in 2018) * Number of enterprises with more than 4 workers
6	Value of shipments of manufactured goods	JPY 3,681 billion (As of June 2018: Industrial census in 2018)
7	Main industries	Metal materials manufacturing: 1017 enterprises (20.2% of total) Printing: 653 enterprises (13% of total) Production-use machinery and Business-use machinery: 490 (9.7%) (As of June 2018: Industrial census in 2018)

Source: Prepared by Nippon Koei based on Osaka City's website

1.2.2 Ho Chi Minh City (HCMC)

HCMC located in south of the country is the biggest commercial city in Viet Nam with population of approximately 9 million. Because of recent economic growth, population concentration and urban sprawl have been occurring, which has been leading to environmental issues such as air pollution and water pollution, as well as the need for waste management and forest management. HCMC belongs to tropical climate with rain season (May to November) and dry season (December to April), 1,800-1,900 of annual rainfall and 28 degree C of average temperature. Geographic character of HCMC with 20m of above sea level and location near rivers and coasts, land-use change by industrialization and effects of recent climate change lead to flooding in rain season, which has been recognized as one of urban issues. Furthermore, because of industrialization and population growth have influenced drastic increase of energy consumption, which naturally raise Green House Gas (GHG) emissions.

In the contexts, needs of urban decarbonization is gradually increasing by installation of energy-saving and renewable energy technologies which this project promotes.

The basic statistic data of HCMC is as follows.

Table 1.2 Overview of HCMC

#	Item	Overview
1	Area	2,061 km ² (as of 2020)
2	Population	9,227,600 (as of 2020, approximately 9.5% of national total and the largest in the country.)
3	Population density	4,476 people/km ² (As of 2020)
4	Number of households	2,558,914 (as of April 2019)
5	GDP per person	USD 6,584 (As of 2018, national average is USD 2,552)

Source: Prepared by Nippon Koei from the General Statistics Office of Viet Nam



HCMC People's Committee Hall



Traffic in HCMC



View of HCMC -1



View of HCMC -2



Lockdown of HCMC -1



Lockdown of HCMC -2

Source: Taken by Nippon Koei

Figure 1.1 Current cityscape of HCMC

1.2.3 Thu Duc City

On 1 January 2021, Thu Duc City was newly established under the administration of HCMC with the merger of three districts, District 2, 9 and Thu Duc District, pursuant to Resolution No. 1111/NQ-UBTVQH14. The concept of “city within a city” is a first model in Vietnam, and Thu Duc City is expected to become a central city of major economic development in HCMC and southern Vietnam. Thu Duc City area has a high need for real estate development, since the land in Thu Thiem New Urban Area in Thu Duc City has been invested at high price.

The population of Thu Duc City is currently about 1 million people and is expected to reach about 1.5 million people by 2030, 2.2 million people by 2040, and 3 million people after 2040. The organization of Thu Duc City has 12 professional agencies and 2 non-business units under the Thu Duc City People's Committee, but details have not been announced yet.

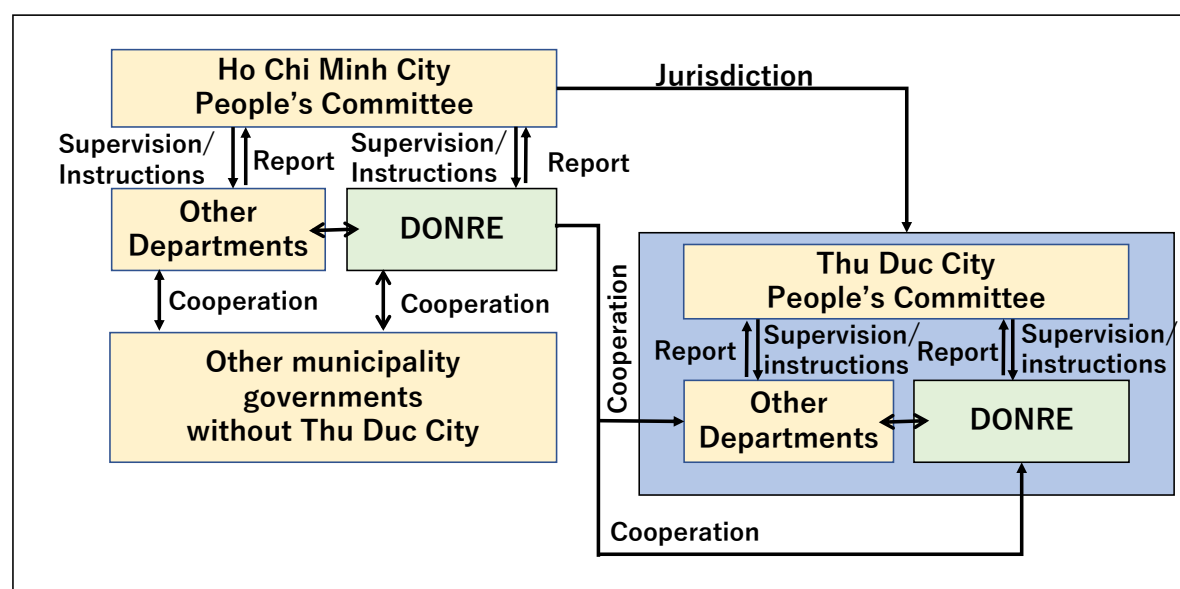
The Thu Duc City Development Plan divides 2020 to 2040 into three phases: in the first phase (2020-2022), comprehensive development plans and regulations regarding land and investment will be prepared, and in the second phase (2022-2030), innovation centers will be constructed in each district and city traffic and environment will be improved, and in the third phase (2030 to 2040), an international cooperation network will be formulated. Also, the Thu Duc City Master Plan by 2040 will be formulated based on the general planning tasks which was approved by Deputy Prime Minister Le Van Thanh on 19 September 2021.

The basic statistic data of Thu Duc City is as follows.

Table 1.3 Overview of Thu Duc City

#	Item	Overview
1	Area	211.56 km ²
2	Population	1,013,795 (as of 2020, approximately 10% of HCMC's population)
3	Population density	4,792 people/km ² (as of 2020)
4	GDP per person	7% of national GDP and 30% HCMC's GRDP

Source: Prepared by Nippon Koei from the Decision No. 1111/NQ-UBTVQH14



Source: Prepared by Nippon Koei

Figure 1.2 Relationship between HCMC and Thu Duc City (tentative image)

1.3 Objective of the project

The project aims to 1) Support for implementation of HCMC's Climate Change Action Plan (CCAP) 2021-2025 and 2) Support for formulation of Joint Crediting Mechanism (JCM) model projects in the public and industrial sector using following technologies and equipment.

- a. JCM project formulation by introducing high-efficiency equipment
- b. Large-scale JCM project formulation by fuel conversion
- c. JCM project formulation by introducing solar power generation facilities

1.4 Implementation procedure and structure

1.4.1 Institutional support

In this project between HCMC People's Committee and Osaka City, Department of Natural Resources and Environment (DONRE) of HCMC and Environmental Bureau of Osaka City are departments in charge and develop the collaboration structure for solution of urban issues and formulation of zero-carbon society.

In FY2021, to conduct the following support activities, both cities planned to share environmental/decarbonization policies and countermeasures by online meeting. From the administrative standpoints, they supports to local government/companies which are interested in introducing zero-carbon technologies and JCM scheme.

- a. Support for implementation of CCAP 2021-2025
- b. Support on JCM model project formulation in public sector
- c. Support on JCM model project formulation in public sector

1.4.2 Promotion of renewable energy and energy saving equipment

There were achievements of JCM model project formulation in HCMC and Japanese partner companies had introduced energy saving equipment and fuel conversion technology (high efficiency boiler) through the project.

In FY2021, the project support to consider the expansion of JCM model project in surrounding area and to promote new solar power generation project. In particular, it plans to collect/analyze local environmental policies and information of energy sector while collaborate with partner companies and local experts, and to hold online discussion with candidate companies/organizations regarding feasibility of JCM model project.

- a. Consideration of JCM model project installing high-efficiency technologies
- b. Consideration of large-scale JCM model project by fuel conversion
- c. Consideration of JCM model project by installing solar power generation facility

1.4.3 Implementation structure

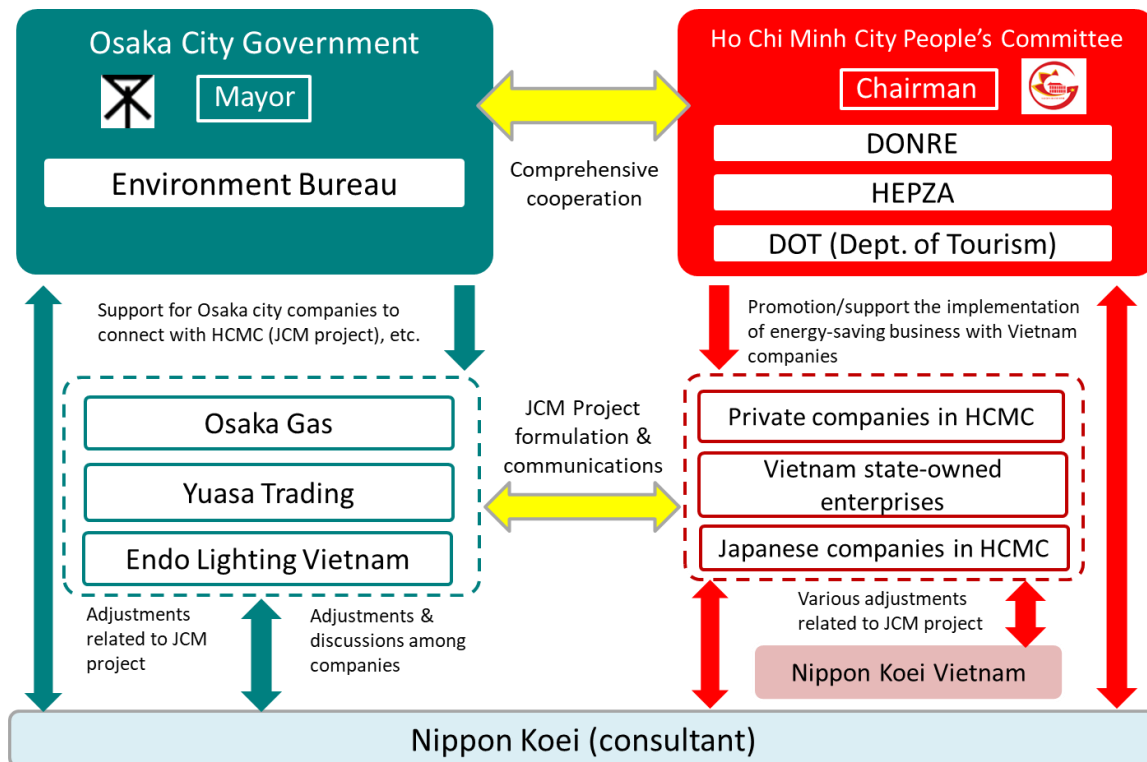
Under the collaboration between HCMC and Osaka City, in order to widen study for development of JCM model projects, information sharing and workshop with Ho Chi Minh City Export Processing and Industrial Zones Authority (HEPZA) and Department of Tourism (DOT) were carried out same as last fiscal year.

Studies for development of JCM model projects were implemented by cooperating with companies with experiences of businesses in Vietnam, Osaka Gas Co., Ltd. (gas supplier of fuel switching projects), Yuasa Trading Co., Ltd. (trading company with experience in JCM model projects in Vietnam) and ENDO Lighting Vietnam (manufacturer of highly efficient LED lighting).

Nippon Koei Co. Ltd. (hereafter “Nippon Koei”) has supported these City-to-City Collaboration activities and carried out studies for introducing zero carbon technology and advanced environmental technologies.

As business trips were limited due to COVID-19 pandemic, information collection and consideration of target local companies were implemented through online meetings with Nippon Koei Vietnam (NKV, local subsidiary of Nippon Koei) and Japanese staff of local offices of Japanese companies.

The implementation structure of this project is as follows.



Source: Prepared by Nippon Koei

Figure 1.3 Implementation structure

1.5 Project schedule

The project period is from 27 August 2021 to 10 March 2022. The schedule is shown below.

#	Activities	2020					2021			
		Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	
City-to-City Collaboration Activities										
1	Discussion on City-to-City Collaboration / Policy dialogue (Online meetings)		(Discussion and coordination by email/Online tools)							
2	Support for implementation of CCAP 2021-2025		(Discussion and coordination by email/Online tools)							
3	Discussion on MOU		(Discussion and coordination by email/Online tools)							
4	Support for development of meteorological prediction system (When HCMC requires)								▽	
5	Discussion on City-to-City Collaboration in FY2021									
JCM Model Project Formulation										
6	Discussion with/supporting companies related to potential JCM model projects		(Discussion and coordination by email/Online tools)							
7	Discussion/Studies for JCM Model Project Formulation									
8	Coordination of International Consortium									
9	Preparation for JCM Model Project formulation later than FY2020									
Others (reporting, events etc.)										
10	Monthly report to MOE		▽	▽	▽	▽	▽	▽	▽	
11	Progress meeting with MOE		▽			▽			▽	
12	Online workshop								▼	
13	Japan Visit (not implemented in FY2020)									
Field study, Preparation of report etc.										
14	Field survey (HCMC)		(Information collection by cooperation with local subsidiary)							
15	Domestic meetings (Osaka City)		▽(WEB)		▽(WEB)		▽(WEB)	▽(WEB)		
16	Final report								▽	

※ Dotted line: Online activities ▽: Domestic activities ▼: Activities by cooperation with locals

Source: Prepared by Nippon Koei

Figure 1.4 Project schedule

CHAPTER 2 ACTIONS TO CLIMATE CHANGE BY OSAKA CITY AND HO CHI MINH CITY

2.1 Actions to climate change by Osaka City

2.1.1 Osaka City Action Plan of Global Warming Countermeasures (Area Measures)

Mayor of Osaka City, Mr. Yoshimura announced to aim at realizing 2050 Zero-Carbon City in Osaka City Council of 27 November 2020 and reported it to the Ministry of the Environment (MOE) on 9 December 2020. Also, implementation of measures to achieve goal of FY2030 and an approaches and measures to realize “Zero-Carbon Osaka”, that is, zero-carbon society leading to the maturity of Osaka City are clearly stated in “Osaka City Action Plan of Global Warming Countermeasures (Area Measures)” which is prepared in March 2021.

“Osaka City Action Plan of Global Warming Countermeasures (Area Measures)” showed the target of the plan and vision for 2050 as follows.

Target of the Action Plan

To reduce 30% of GHG emission reduction by FY2030, compared with FY2013 to achieve net zero emission of GHG in 2050.

Vision for 2050

“Zero-Carbon Osaka -Realization of zero-carbon society leading to maturity of Osaka-”

“Zero Carbon Osaka” is defined as the situation that five kinds of “City” below has been formulated. Also, approach to each City is illustrated in the Action Plan.

- City with low-carbon energy
- City disseminated low-carbon actions with full of zero-carbon mind
- Sustainable City integrated low-carbon methods
- City leading decarbonization by utilizing various connections
- City well-prepared for climate change

2.1.2 Team Osaka Network

In June 2016, Osaka City established “Team Osaka Network” as a platform that private companies located in Osaka or Kansai area collaborate with Osaka City and Universities and the Network support for formulating projects that can contribute to development of zero-carbon society of cities in Asia.

As of October 2021, 154 organizations in a wide range of sectors are participating the Network. Characteristics of the member companies are sorted out in the table below.

Table 2.1 Sectors and technologies and services of members of Team Osaka Network

#	Sectors	Technologies and services
1	Plant engineering/sales	Environmental plant (Water treatment, Waste treatment Biogas etc.)
2	Energy business	Gas production/supply/sales, power generation business, renewable energy projects etc.
3	Consultant	Construction consulting (study, engineering, supervision etc.), Energy-saving consulting, Business consulting etc.
4	Manufacturing	Lighting, Boiler, Air conditioning, pump etc.
5	Financing	Bank, Leasing, Financing
6	Think-tank	Study, research of policies, research & development
7	Others	Materials, Sales, Real estate, Tourism, Trading, Telecommunication, construction, education etc.

Source: Prepared by Nippon Koei based on Osaka City's website
<https://www.city.osaka.lg.jp/kankyo/cmsfiles/contents/0000366/366046/154sankajigyoushaichiran.pdf>

2.1.3 Osaka plan for production and consumption of local energy

Osaka City developed “Osaka Plan for Production and Consumption of Local Energy” together with Osaka Prefecture in March 2014 and has been proceeding dissemination of renewable energy and efficient use of energy suitable for local characteristics. The achievement rate at the end of FY2020 was 83.2%, which was 1.248 million kW compared to the target of 1.5 million kW. Overview of the plan and progress as of FY2020 are shown in Table 2.2 and Table 2.3, respectively.

Table 2.2 Overview of Osaka plan for production and consumption of local energy

Target Period	Date of development of the plan from FY2013 to FY2020
Goals and approaches	<p><u>(1) Dissemination and extension of renewable energy</u> Approach: To promote activities for dissemination of Photovoltaic (PV) power generation by utilizing Feed-in-Tariff (FIT) and to proceed activities for dissemination and extension of other renewable energy.</p> <p><u>(2) Reduction of energy consumption (Transformation to energy-saving lifestyle)</u> Approach: To proceed transformation to energy-saving lifestyle and business style by promoting visualization of energy consumption and to promote activities for installation of energy-saving technologies and for energy saving of buildings and houses.</p> <p><u>(3) Levelling of electricity demand and stabilization of electricity supply</u> Approach: To promote activities for levelling peak demand and stabilization of electricity supply by disseminating of demand response and distributed power supply (Co-generation etc.) and by encourage business entry of various power producers</p>
Quantitative targets by FY2020)	<ul style="list-style-type: none"> • Energy supply by PV: 900,000 kW • Distributed power supply (Co-generation etc.) : 300,000 kW • Energy supply by waste to energy (WtE) etc.: 50,000 kW • Reduction of demand by gas air conditioning etc.: 200,000 kW • Reduction of demand by Building Energy Management System (BEMS) etc.: 50,000 kW
Concrete policies and projects	Individual policies and projects are annually published as Action Program after budget discussion of each fiscal year.

Source: Prepared by Nippon Koei based on Osaka Plan for Production and Consumption of Local Energy

Table 2.3 Progress of Osaka plan for production and consumption of local energy

Targets	Targets from FY2013 to FY2020 (The total target by FY2020)	Achievement (The total introduction by FY2020)	Achievement rate
PV	+900,000kW (About 1,150,000kW)	+830,000kW (About 1,080,000kW)	92.2%
Distributed energy supply	+300,000kW (About 830,000kW)	+27,000kW (About 562,000kW)	9.2%
WtE etc.	+50,000kW (About 280,000kW)	+42,000kW (About 269,000kW)	83.4%
Gas Air conditioning etc.	-200,00kW	-281,000kW	140.4%
BEMS etc.	-50,000kW	-68,000kW	136.4%

Source: Prepared by Nippon Koei based on Osaka Plan for Production and Consumption of Local Energy

2.1.4 Osaka Smart Energy Plan

Osaka Prefecture and Osaka City have newly developed the “Osaka Smart Energy Plan” in March 2021 based on the report of the Osaka Prefecture City Energy Policy Council in December 2020, as the period of the “Osaka Energy Local Production and Local Consumption Promotion Plan” expires in 2020.

This plan aims to lead the formulation of “new energy society” in the decarbonization era, realizing the growth of Osaka and the safe and secure living of the people in Osaka Prefecture. It presents the direction of energy-related initiatives to be implemented by Osaka Prefecture and Osaka City by 2030. Overview of the plan is shown below.

Table 2.4 Overview of Osaka Smart Energy Plan

Period	From FY2021 to FY2030
Vision	An environment-friendly and disaster-resistant smart energy city which realizes the growth of Osaka and the safe and secure living of the citizens in Osaka Prefecture
Target	1) Double the utilization rate of renewable energy for electricity in large consumption areas, Osaka 2) Improve energy efficiency which lead to the growth of Osaka of Osaka
Target value by 2030	Independent/ distributed energy introduction: 2.5 million kW or more Renewable energy utilization rate: 35% or more Energy utilization efficiency: 40% or more improvement (compared to FY2012)
Pillars of measures	1) Expansion of renewable energy 2) Improvement of energy efficiency 3) Strengthening resilience and abilities of power supply and demand adjustment 4) Promotion of energy-related industries and sustainable growth of companies in all fields

Source: Prepared by Nippon Koei based on Osaka Smart Energy Plan

2.2 Actions to climate change by the Central Government of Viet Nam and HCMC

2.2.1 Actions to climate change by the Central Government of Viet Nam

(1) Carbon Neutrality by 2050

Vietnam Prime Minister Pham Minh Chinh has announced the country's aim to achieve carbon neutrality by 2050 at UN Climate Change Conference (COP26) held in November 2021. Compared to the NDC target of reducing GHG emissions by 9% unconditionally and 27% with international cooperation by 2030, it is an ambitious target.

The 8th National Power Development Plan draft submitted by the Ministry of Trade and Industry (MOIT) in October 2021 states that Vietnam will reduce the proportion of coal-fired thermal power and increase the power generation capacity of renewable energy. After COP26, the National Power Development Plan has been reviewed, and it is expected that Vietnam will develop a roadmap for carbon neutrality.

(2) Green Growth Strategy 2021-2030

The Ministry of Planning and Investment (MPI) updated the "Green Growth Strategy" formulated in 2012, and it was approved on 1st October 2021. The Green Growth Strategy has set a goal to reduce GHG emissions by 15% by 2030 and 30% by 2050 compared to 2014.

The Strategy is in line with the Socio-Economic Development Strategy 2021-2030, which was developed by MPI. The Green Growth Action Plan will be developed within 1 year after the Strategy is approved.

(3) MOT Action Plan for Climate Change

The Ministry of Transport (MOT) formulated the Action Plan for active response to climate change, enhancement of natural resources management and environmental protection pursuant to Resolution No. 452/QD-BGTVT approved on 24 March 2021. The Action Plan is a 5-year plan from 2021 to 2025 and it specifies implementation of the guidelines, policies and instructions by the Government on the natural resources, as well as environment work in the transport sector for development in a sustainable and environmentally friendly manner.

The Action Plan lists the following solutions to the challenges of the transportation sector.

- i. Improvement of awareness of organizations and individuals in response to climate change
- ii. Improvement of resilience to climate change for the transport infrastructure
- iii. Improvement of management capability of GHG emission
- iv. Strengthening economical and efficient energy use
- v. Efficient management and utilization of natural resources
- vi. Reinforcement of environmental protection in development and maintenance of transportation infrastructure

vii. Controlling emission of the exhaust gas by transportation

viii. Promotion of green transportation in the private sector

Regarding the iv, the Action Plan describes in detail the strategy for decarbonization. For example, it plans đ) to improve the capacity and service quality of public passenger transport in the cities; to accelerate investment into highway transport such as Mass Rapid Transit (MRT) and Bus Rapid Transit (BRT) in Hanoi and Ho Chi Minh City; to prioritize investment and operation of energy-saving and environmental-friendly buses and taxis, such as hybrid vehicles, vehicles using Compressed Natural Gas (CNG), Liquefied Petroleum Gas (LPG); electric vehicles, etc. and e) to strengthen application of renewable energy, energy-saving technologies such as solar battery and LED light for lighting and traffic signals in the transport infrastructure investment projects and maintenance works.

(4) Nationally Determined Contribution (NDC)

Vietnamese Government firstly submitted Nationally Determined Contribution (NDC) in November 2016 and then revised it in September 2020. While NDC of 2016 targeted 8% of GHG emission reduction unconditionally and 25% with enough international cooperation by 2030 compared with Business-as-Usual (BaU) scenario, the target of revised NDC is unconditionally 9% reduction and 27% reduction with international cooperation. Reduction targets by sector are listed below.

Table 2.5 Reduction targets by sector in revised NDC

Sector	Contribution with domestic resources		Contribution with international support		Total contribution with both domestic resources and international support	
	Compared to BAU scenario (%)	Reduction amount (Mil. tonnes of CO _{2eq})	Compared to BAU scenario (%)	Reduction amount (Mil. tonnes of CO _{2eq})	Compared to BAU scenario (%)	Reduction amount (Mil. tonnes of CO _{2eq})
Energy	5.5	51.5	11.2	104.3	16.7	155.8
Agriculture	0.7	6.8	2.8	25.8	3.5	32.6
LULUCF*	1.0	9.3	1.3	11.9	2.3	21.2
Waste	1.0	9.1	2.6	24.0	3.6	33.1
IP	0.8	7.2	0.1	0.8	0.9	8.0
Total	9.0	83.9	18.0	166.8	27.0	250.8

Note (): increase in GHGs sequestration*

Source: Updated Nationally Determined Contribution (NDC), The Socialist public of Vietnam

Based on the targets of NDC, Vietnamese Government has been implementing various policies. Under the national policies, each municipality is carrying out individual policies. Main national policies are as shown below.

Table 2.6 National policies for climate change and energy use in Viet Nam

Name of regulation (Date of enforcement)	Objectives
<p>National Strategies on Climate Change (Decision 2139/QD-TTg of the Prime Minister) 05 December, 2011</p>	<p><u>Specific objectives</u></p> <ul style="list-style-type: none"> - To raise national capacity and to carry out simultaneously measures of climate change adaptation and GHG emission reduction to assure safety for people and properties for the sustainable development goals. - To strengthen human and natural system resilience to climate change, develop a low-carbon economy to protect and enhance quality of life, ensure national security and sustainable development in the context of global climate change, and actively join the international community to protect the earth's climate system.
<p>National Target Program to Respond to Climate Change period 2012-2015 (Decision 1183/QD-TTg of the Prime Minister) 30 August, 2012</p>	<p><u>Specific objectives</u></p> <ul style="list-style-type: none"> - To gradually realize the National Strategy on climate change, - To increase awareness and capacity to adapt to climate change - To orient to reduce greenhouse gas emissions - To develop low-carbon economy, - To actively cooperate with international communities to protect the global climate system
<p>Action Plan for Implementation of Paris Agreement on Climate Change (Decision 2053/QD-TTg of the Prime Minister) 28 October, 2016</p>	<p><u>Overall objectives</u> To Identify and implement appropriate activities and solutions until 2020 and 2030 to gradually carry out all the provisions in the Paris Agreement applicable to Viet Nam.</p> <p><u>Specific objectives</u></p> <ul style="list-style-type: none"> - To fulfil commitments in the Intended Nationally Determined Contribution (INDC) to mitigate GHG emissions - To fulfil commitments in the Intended Nationally Determined Contribution to adapt to climate change - To prepare human, technical and financial resources to fulfil commitments in the Intended Nationally Determined Contribution and contribute to the transition to a low-carbon, highly resilient economy - To establish and operate the transparency system (MRV system) to monitor and assess the implementation of adaptation, mitigation, and resource preparation - To revise institutions and policies to establish a favourable environment and focus national efforts to respond to climate change;
<p>National Strategies on Green Growth 2011-2020 with a vision by 2050 (Decision 1393/QD-TTg of the Prime Minister) 25 September, 2012</p>	<p><u>Overall objectives</u> Green growth, towards the low-carbon economy, natural capital enrichment has become a decisive tendency in sustainable economic development; reduction in emissions and increase in the possibility to absorb greenhouse gases is becoming mandatory and important targets in socio-economic development.</p>
<p>National Program on Economical and Efficient Use of Energy for the period 2019 – 2030 (Decision 280/QD-TTg of the Prime Minister) 13 March, 2019</p>	<p><u>Overall objectives</u> "National program on economical and efficient use of energy in the period of 2019 - 2030" is the implementation step to concretize the energy development strategy, an important element in the National Sustainable Development Strategy, with the aim to turn Viet Nam into a country using energy saving and efficiency.</p> <p><u>Specific objectives</u></p> <ul style="list-style-type: none"> - To mobilize all the national and international resources for stimulating economical and efficient use of energy through the synchronous implementation of assignments and solutions of State management, technical assistance, science and technology research and product

Name of regulation (Date of enforcement)	Objectives
	<p>development, market transition, human resource training and development, and also utilization of support from the international community in the field of economical and efficient use of energy;</p> <p>- To formulate the habit of using energy economically and effectively in all social activities; to reduce intensive use of energy in a variety of economic sectors and industries; energy efficiency becomes a regular activity in key energy users and key economic sectors that consume a lot of energy, with an aim at green growth and sustainable development.</p>

Source: Prepared by Nippon Koei based on each policy.

2.2.2 Actions to Climate Change by HCMC

(1) Climate Change Action Plan (CCAP)

In 2021, HCMC regulated Climate Change Action Plan from 2021 to 2030 with a vision to 2050 (CCAP 2021-2030). CCAP shows that HCMC strives to reduce emissions 10% by 2030 and moving towards a low carbon economy, this figure will be 30% if there is international support.

In the period of 2021-2025 focus on formulating mechanisms and policies to cope with climate change and implementing solutions, tasks and priority projects, and in the period of 2026-2030, it plans to strengthen coordination and integration of tasks and improve the capability of each sector, community and ecosystems to increase resilience to climate change.

CCAP declare that HCMC improves efficient use of energy and other resources under socio-economic development to contribute to national GHG reduction target and aims at development of low-carbon society. Important sectors for promotion of climate change countermeasures, designated in CCAP are “Agriculture”, “Industry”, “Construction Industry and Urban Planning”, “Transportation Industry”, “Culture and Tourism Industry”, “Medical Industry”, “Natural Resources and Environment Industry” and “Energy sector”. However, specific solutions in the eight priority sectors are not decided in CCAP, so companies and organizations in each sector need to formulate and implement actions.

CCAP identifies 10 priority projects from 2021 to 2030, and one of the projects in the energy sector is installation of rooftop solar power system for administrative building of Thu Duc City People’s Committee. The priority projects are shown in the table below.

Table 2.7 List of priority programs, tasks and projects to respond to climate change in HCMC in the period of 2021-2030

#	Tasks/Projects	Unit in charge	Collaboration units	Stage implementation
1	Restore and protect mangroves and other forest areas of the city	Department of Agriculture and Rural Development	Relevant Departments, agencies and units	2021-2030
2	Pilot installation of water-saving devices in public works and	Department of Natural	Relevant Departments,	2021-2030

#	Tasks/Projects	Unit in charge	Collaboration units	Stage implementation
	administrative buildings.	Resources and Environment (DONRE)	agencies and units	
3	Develop a project to collect and reuse rainwater at some public works.	DONRE	Departments, agencies, units and districts' PC	2021-2030
4	Install rooftop solar power system for administrative building of Thu Duc city People's Committee	Thu Duc city People's Committee	DONRE	2021-2023
5	Project on improving drainage, wastewater and climate change adaptation in Tham Luong - Ben Cat basin (CRUS1)	Urban Infrastructure Construction Investment management board of Ho Chi Minh City	Relevant Departments, agencies and units	2021-2025
6	Improving drainage and wastewater systems and adapting to climate change in the West Saigon Basin (CRUS2)	Urban Infrastructure Construction Investment management board of Ho Chi Minh City	Relevant Departments, agencies and units	2021-2025
7	Urban Flood Integrated Management Project in Ho Chi Minh City (loan from DANIDA - Danish)	Urban Infrastructure Construction Investment management board of Ho Chi Minh City	Relevant Departments, agencies and units	2021-2025
8	Project to improve water environment in Ben Nghe -Tau Hu-Doi-Te canal basin (phase 3)	Urban Infrastructure Construction Investment management board of Ho Chi Minh City	Relevant Departments, agencies and units	2026-2030
9	Developing a phased public bicycle system in the city, connecting the shared bicycle system with other types of public transport such as buses and subways (metro), building areas of low carbon emissions combine pedestrian streets with bicycle traffic routes in the central area.	Department of Transportation	Relevant Departments, agencies and units	2022-2030
10	Building domestic solid waste treatment plants using advanced technology in Ho Chi Minh City.	DONRE	Relevant Departments, agencies and units	2021-2030

Source: Oprepared by Nippon Koei from Climate Change Action Plan 2021-2030

Table 2.8 Overview of CCAP

Name of Plan	Climate Change Action Plan until 2015	Climate Change Action Plan 2017-2020 with vision to 2030	Climate Change Action Plan 2021-2030 with vision to 2050
Date of enforcement	15 May, 2013	17 March, 2017	8 September, 2021
Objectives	To upgrade mechanisms and policies to manage, administer and guide the implementation of CCAP To consolidate and strengthen management capacity and strengthen linkages among departments and branches in HCMC to respond to climate change To evaluate the level and impacts of climate change in Ho Chi Minh City and the degree of climate change impacts on the fields and industries To raise public awareness about climate change To identify tasks and projects that prioritize climate change adaptation and mitigation.	To develop solutions to strengthen the capacity to respond to climate change of Ho Chi Minh City when implementing socio-economic development planning and plans To contribute to the national goal of reducing greenhouse gas emissions by improving the efficiency of energy and resource use in socio-economic development activities of Ho Chi Minh City, towards low-carbon social development To improve the efficiency of the state management system in response to climate change, contributing to promoting sustainable socio-economic development.	In the period 2021-2025 focus on perfecting mechanisms and policies to cope with climate change; implement solutions, tasks and priority projects to enhance the capacity to cope with climate change and minimize the damage caused by climate change; increased resilience and adaptive capacity of the community, raising awareness to be ready to adjust to climate change. The period 2026-2030, with a vision to 2050, the city will strengthen coordination and integration activities in implementing solutions, tasks and improve the capacity of sectors, community and ecosystems to increase resilience to climate change.
Target sectors	Urban Planning, Energy, Transportation, Industry, Water management, Waste management, Construction, Safety, Agriculture, Tourism/Culture/Public awareness”		Agriculture, Industry, Construction Industry and Urban Planning, Transportation Industry, Culture and Tourism Industry, Medical Industry, Natural Resources and Environment Industry, Energy sector

Source: Prepared by Nippon Koei based on Climate Change Action Plan until 2013, Climate Change Action Plan 2017-2020 with vision to 2030 and Climate Change Action Plan 2021-2030 with vision to 2050

(2) Electricity saving program in Ho Chi Minh City

HCMC developed “Electricity Saving Program in Ho Chi Minh City” in March 2019. This program regulated reduction target of 1.5-2.0% of annual commercial electricity and measures to achieve installation of 200 MW of rooftop PV system onto public facilities in HCMC by 2025 which was decided as target in a national policy. Overview of the program is shown in Table 2-9.

Table 2.9 Overview of electricity saving program in Ho Chi Minh City

Date of enforcement	18 Mar, 2019
Program implementer	Department of Industry and Trade, Department of Finance), Department of Information and Communications, EVN HCMC, other departments, district Peoples' Committees
Objectives	<ul style="list-style-type: none"> - To implement effectively the Prime Minister's Directive No. 34/CT-TTg dated August 7, 2017 on enhancing electricity saving and other legal regulations related to the economical and efficient use of energy. - To raise awareness of all organizations and individuals in the city on economical and efficient use of electricity, striving to save 1.5% to 2% on average commercial electricity output each year. - To develop renewable energy sources, with priority given to rooftop solar power sources at headquarters of State agencies, hospitals, schools, enterprises, striving to reach the target (200 MW) set out under the Decision No. 4690/QD-BCT dated December 15, 2017 of the Ministry of Industry and Trade by 2025

Source: Prepared by Nippon Koei based on Electricity Saving Program in Ho Chi Minh City

CHAPTER 3 CITY-TO-CITY COLLABORATION FOR ZERO-CARBON SOCIETY

3.1 Background and objective

3.1.1 Background of the City-to-City Collaboration

Osaka City began a collaboration with HCMC with conclusion of MOU on technology exchange with Saigon Water Corporation (SAWACO) in 2009 and has been supporting various environmental activities of HCMC.

Especially in 2013, whereas HCMC developed the Action Plan for Formulation of Low-carbon Society in HCMC in October 2013, Osaka City and HCMC concluded “MOU on Formulation of Law-carbon City in HCMC” for comprehensive cooperation to realize steady urban development of HCMC. Based on the MOU, the two cities have been implementing City-to-City Collaboration Project since 2013.

A list of achievements of City-to-City Collaboration between Osaka City and HCMC are shown in the following table.

Table 3.1 Achievements of City-to-City Collaboration project in HCMC

#	Month/Year	Overview
1	December 2009	Conclusion of MOU on technology exchange with Saigon Water Corporation (SAWACO)
2	April 2011	Launched JCM City-to-City Collaboration Project (Ongoing)
3	October 2013	Conclusion of MOU on Formulation of Law-carbon City in HCMC
4	November 2015	Update of MOU on technology exchange with SAWACO
5	September 2016	Update of MOU on Formulation of Law-carbon City in HCMC
6	September 2016	HCMC Climate Change Action Plan 2017-2020 and Prospects until 2030
7	June 2018	Start to support on introducing a “hybrid rainfall forecasting system” for South Regional Hydro Meteorological Center (SRHMC) by Meteorological Engineering Center
8	December 2018	Update of MOU on technology exchange with SAWACO
9	September 2019- January 2020	Support for implementation of HCMC’s CCAP through JCM model project formulation
10	November 2019	“Mayor-level Policy Dialogue for Low-carbon Society between Osaka City and HCMC” in HCMC
11	November 2019	“Introduction of high-efficiency air conditioner (Variable Refrigeration Flow, VRF) and air-cooled chiller to hotels and office buildings” was adopted as JCM model project
12	July 2020	“Introduction of High Efficiency Boiler System to Food Factory” was adopted as JCM model project
13	July 2020	“Introduction of High Efficiency Air-conditioning System to Hotel in Ho Chi Minh City” was adopted as JCM model project
14	January 2020	“Project Collaboration Agreement toward Improving Accuracy of Rainfall Prediction for Ho Chi Minh City” was concluded between Osaka City and SRHMC
15	March 2021	Updated “MOU on formulation of law-/zero-carbon city in HCMC”
16	September 2021	“Introduction of High Efficiency LED Lighting with Dimming and Tunable Function to Office Building in Ho Chi Minh City” was adopted as JCM model project

#	Month/Year	Overview
17	September 2021	“Introduction of High Efficiency Chiller and High Efficiency LED Lighting with Dimming Function to Shopping Center” was adopted as JCM model project
18	September 2021	“Introduction of 9.8 MW Rooftop Solar Power System in Industrial Park” was adopted as JCM model project

Source: Prepared by Nippon Koei

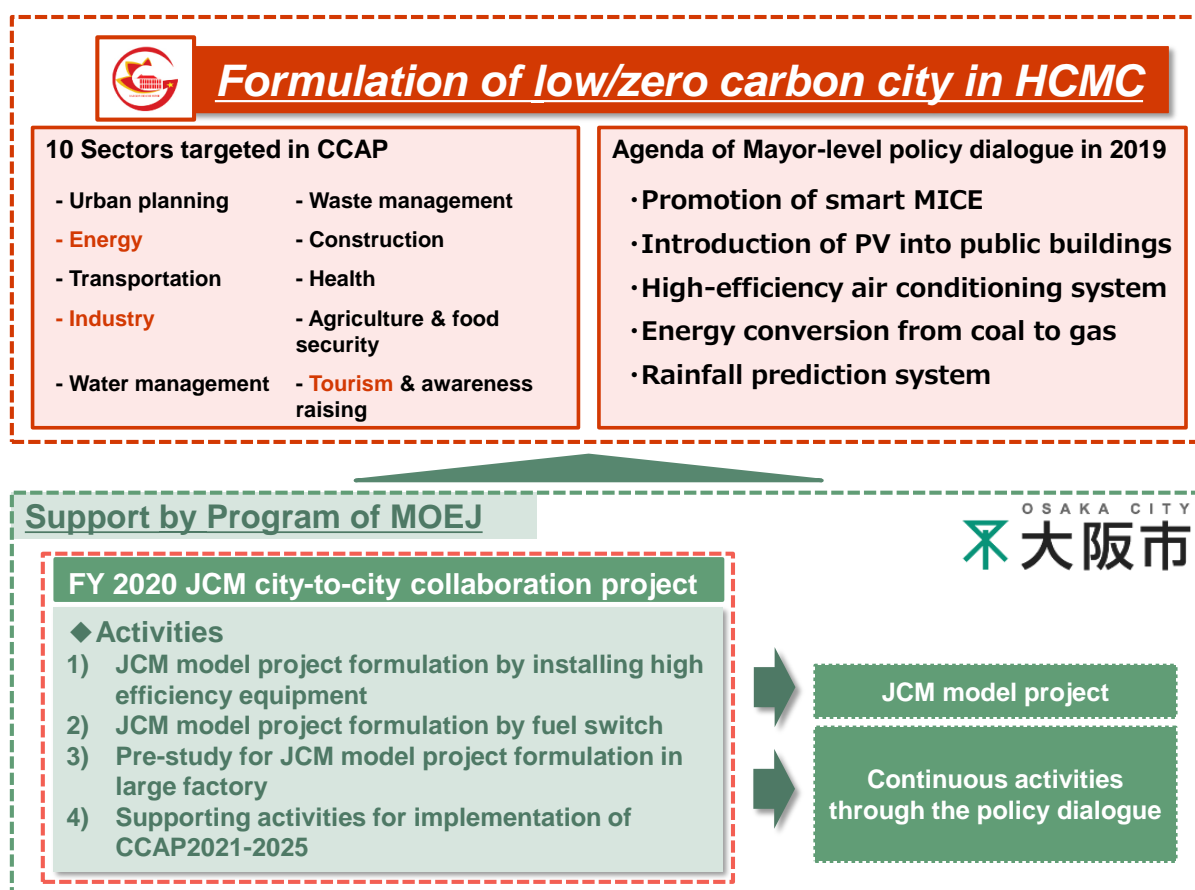
In this fiscal year, based on the good collaboration between HCMC and Osaka City, the MOU was extended and updated by reflecting previous achievements of City-to-City collaboration and the latest needs for decarbonization of HCMC.

3.1.2 Objective of the City-to-City Collaboration

As a third year of three-year plan of the City-to-City Collaboration, JCM model project formulation was implemented to introduce high-efficiency air-conditioning system and lighting (energy-saving technology), gas through flow boiler (fuel conversion) and renewable energy technology for industrial and public sectors in HCMC in FY2021. In addition, this study aims to support implementation of CCAP 2021-2030, institutional development and JCM model project formulation.

3.2 Approach of City-to-City Collaboration

The image of approach of City-to-City Collaboration is shown in Figure 3.1.



Source: Prepared by Nippon Koei

Figure 3.1 Image of approach of City-to-City Collaboration

3.3 Results of City-to-City Collaboration in FY2021

3.3.1 Overview of City-to-City Collaboration Activities in 2021

Results of the City-to-City Collaboration activities conducted during the Project are presented in the following table. Meeting materials are attached as Attachment-1.

Table 3.2 Overview of City-to-City Collaboration activities in 2021

Content	Schedule	Description
Online meeting with Osaka City	31 August 2021	Discussed with Osaka City about this year's project activities, such as policy support and formulation of JCM model projects, and agreed that the policy dialogue would be coordinated with DONRE in HCMC. Also, Osaka City decided to consider support for CCAP implementation after obtaining documents.
Online meeting for JCM model project formulation	7 September 2021 8 September 2021 14 September 2021	Explained this year's activities for Yuasa Trading, ENDO Lighting Vietnam and Osaka Gas/SOGEC (local subsidiary) and discussed appreciation of JCM model projects for next year.

Content	Schedule	Description
Kick-off online meeting to Ministry of the Environment Japan	21 September 2021	Kick-off online meeting with MOE, Osaka City and Nippon Koei was conducted and planning projects and progress of FY2021 were explained to MOE. MOE shared information on Viet Nam-Japan Environmental Week scheduled for December.
Information collection survey	11 October 2021	Discussed with local consultant/interpreter and interviewed about the situation during lockdown in HCMC and operating status of DONRE.
Online meeting with ENDO Lighting Vietnam for JCM model project formulation	13 October 2021	Discussed with ENDO Lighting Vietnam and agreed to request the following activities. <ul style="list-style-type: none"> - Promote sales activities to private companies to consider introduction of products. - Collect information on new facilities in Thu Duc City and HCMC. - Consider technology introduction at seminars.
Survey in Japan	23-25 November 2021	Visited Osaka City and had face-to-face meetings with Environment Bureau of Osaka City, ENDO Lighting and Daibiru Corporation, and inspected Maishima Incineration Plant. Main topics discussed with Osaka City were follows. <ul style="list-style-type: none"> - Progress of this project activities. - Coordination with DONRE in HCMC for policy dialogue. - As a next step for considering JCM model projects, agreed to share information with the Japanese Chamber of Commerce and Industry in Viet Nam (JCCI) and consider new companies' participation. Main topics discussed with Daibiru Cooperation were follows. <ul style="list-style-type: none"> - The possibility of utilizing JCM model scheme in new building to be constructed in Hanoi Main topics discussed with ENDO Lighting and ENDO Lighting Vietnam (online) were follows. <ul style="list-style-type: none"> - Status of JCM model projects adopted in FY2021. - Progress of information collection for applying new JCM model projects. - Agreed to hold a workshop in Viet Nam for local companies to introduce technologies in late December or early January.
Meeting with new Japanese companies for JCM model project formulation (Face-to-face/ Online)	7 December 2021 15 December 2021 10 December 2021	Exchanged information with Company A in Osaka City about the possibility of applying for JCM Eco Lease Scheme and participating in the city-to-city cooperation projects in FY2022. Exchanged information with Company B in Osaka City about the possibility of decarbonization in the transportation sector and the outline of the city-to-city projects.
Online meeting with Osaka City and HCMC	21 December 2021	Online meeting with DONRE in HCMC and Osaka City was conducted, which had been postponed due to the lockdown in Viet Nam, and agreed to hold a policy dialogue/ workshop at the practical level in late February 2022.
Survey in Japan	21 December 2021	Visited the ENDO Lighting Corporation showroom in Tokyo and collected the information on wireless dimming systems and LED Lighting with dimming and tunable functions.

Content	Schedule	Description
Online progress report meeting for Ministry of the Environment Japan	27 December 2021	Online meeting with MOE, Osaka City and Nippon Koei was conducted to report progress of activities up to December 2021 and explain three-year plan for the next fiscal year.
Online meeting with ENDO Lighting Vietnam for JCM model project formulation	11 January 2022	Discussed with ENDO Lighting Vietnam and shared the information on the coordination status of policy dialogues with DONRE and the progress of survey conducted by ENDO Lighting Vietnam.
Online meeting with Osaka City and HCMC	17 January 2022	Discussed with DONRE and Osaka City and following were decided. <ul style="list-style-type: none"> - Policy dialogue/ workshop will be held on February 21, 22, or 25. - The invitees and contents of presentation will be officially decided after gaining permission from HCMC People's Committee. - The three-year plan for the next fiscal year will be discussed in the policy dialogue.
Online meeting with new Japanese companies and Osaka City for JCM model project formulation	17 January 2022	Discussed with Osaka City and Company A in Osaka City and exchanged opinions on participation in JCM model projects and the city-to-city collaboration projects.
Online meeting with SOGEC for JCM model project formulation	18 January 2022	Discussed with SOGEC about the progress of JCM model project formulation and schedule of this project activities. SOGEC agreed to continue to consider JCM model project targeting the industrial park.
Online meeting with Yuasa Trading for JCM model project formulation	25 January 2022	Discussed with Yuasa Trading about the progress of this city-to-city collaboration project and exchanged opinions on activities for the next fiscal year. Yuasa Trading agreed to introduce their business at workshop.
Online workshop between Osaka City and HCMC	22 February 2022	Online workshop between HCMC DONRE and Osaka City was conducted as follows. <ul style="list-style-type: none"> - JCM model project and zero-carbon technologies and leasing service were introduced by Japanese side. - An officer from Tho Doc City which newly established in HCMC, introduced the city overview and future plan of city activities in climate change sector
Online final report meeting to Ministry of the Environment Japan	4 March 2022	Online meeting with MOE, Osaka City and Nippon Koei was conducted to report the activities in FY2021.
The Second Zero Carbon City International Forum (Online)	9-10 March 2022	Submitted the result report documents of the city-to-city collaboration project activities and posted it during the forum.

Source: Prepared by Nippon Koei

3.3.2 Activities related to institutional support

There are following three activities related to institutional support under the City-to-City Collaboration in this fiscal year.

(1) Support on implementation of HCMC's CCAP 2021-2030

In FY2019, information related to HCMC's CCAP 2021-2025 was organized and support for the planning was conducted as a part of City-to-City collaboration activities.

Memorandum of Understanding (MOU) on "Formulation of Law/Zero-carbon City between HCMC and Osaka City" was updated in March 2021. In this fiscal year, although opportunities of discussion were physically limited by COVID-19 pandemic, but both cities had exchanged opinions through online meeting.

In accordance with MOU, Osaka City agreed to share experience and lesson learned regarding climate change action and support implementation of HCMC's CCAP 2021-2025 through formulation of JCM model project.

According to the updated MOU, more specific low/zero-carbon activities and projects were described as follows,

- Proceeding with development of human resources, an organization and a system in order to manage the progress toward the steady implementation of the CCAP
- Sharing professional skills and knowledge in order to smoothly implement measures, research and assessment of greenhouse gas emissions toward the achievement of goals listed in the CCAP for 2020-2030
- Realizing a low/zero-carbon society by generating new projects including the installation of solar power generation system in public facilities, the promotion of smart MICE and the creation of large scale low/zero-carbon projects such as JCM
- Improving other environmental issues such as water treatment, waste management and public relations for climate change through sharing information and knowledge.

(2) Support on JCM model project formulation in public sector

As a support on JCM model project formulation in public sector, introduction of PV system to HCMC's public facilities has been considered since past years, however FIT of Viet Nam for power sales business from renewable energy has been terminated by 2021.

Therefore, it became difficult to promote new renewable power generation project using JCM scheme.

Public tender is necessary in all projects that require initial investment, which is a large constraint for financing and scheduling of JCM model project formulation in HCMC. Therefore, the possibility of leasing with JCM was considered with Japanese leasing company and it was proposed to HCMC from last fiscal year, but discussions did not proceed until the selection of specific facilities. At the local workshop in this fiscal year, leasing project with JCM was introduced to HCMC, the related organizations and Thu Duc City. It is expected to continue the discussion to promote JCM model project formulation in next fiscal year.

(3) Support on JCM model project formulation in industrial sector

There is a potential of large-scale JCM model project both energy saving and renewable energy in industrial sector such as industrial park and factories because of large consumption of energy.

There are 18 industrial parks in HCMC including many factories of Japanese company. In this fiscal year, information of the identified factories with high energy consumption was collected and analyzed potential of JCM. Additionally, at the online workshop, energy saving equipment, fuel conversion technology and the latest JCM model projects in industrial park were introduced to participants from industrial parks and factories. In next fiscal year, it is scheduled to continue discussion for identification of potential industrial park and factories and to support JCM model project formulation.

3.3.3 Viet Nam-Japan Environmental Week

MOE and MONRE jointly organized a virtual event “Viet Nam – Japan Environmental Week” on from 14 to 27 December 2021. In this event, thematic seminars related to environmental infrastructure and technology was held in order to discuss needs and seeds on the latest environmental policies, market trends, and solutions (e.g. environmental technologies) for private companies or administrative officers in both countries. In addition, virtual business matching and exhibition were also organized aiming to create an opportunity of discussing new business or deals among participants from both countries that were interested in environmental solutions.

During the period of this event, “Webinar on the Joint Crediting Mechanism (JCM) Implementation in Viet Nam 2021 – Innovation for Carbon Neutrality through the JCM –” was held by MOE, Global Environment Centre Foundation (GEC), and MONRE.

The schedule of the event is shown below.

ICT	JST	9th December (Tue)	14th December	15th December (Wed)	Plenary 16th December (Thu)	17th December (Fri)			
8:00	10:00	Closed Event	Closed Event	Thematic Seminar	9:00-9:10 Opening Remarks	Thematic Seminar			
:15	:15						:15	:15	:15
:30	:30						:30	:30	:30
:45	:45						:45	:45	:45
9:00	11:00	[Invitation Only] 8:30-16:40 FY2021 Bilateral Cooperation Project for Promotion of Co-benefits Approach on Air Pollution Control in Socialist Republic of Vietnam	[CLOSED EVENT] 8:00-11:00 Joint Working Group on Waste Management Lang: ENG (TBD)	9:00-12:00 Circular Economy and Recycling Lang: VTN-JPN (Simul)	9:10-9:30 Project Launch Ceremony Opening Session 9:30-11:15 Toward Realizing 2050 Carbon Neutrality (Keynote and Panel discussion) Lang: VTN-JPN	8:30-11:00 Joint Crediting Mechanisms (JCM) Lang: VTN-ENG			
10:00	12:00	1. Training for government officer and facility managers in Vietnam		Thematic Seminar	11:30-12:35 Exhibitors Presentation Lang: VTN-ENG	11:15-12:15 Exhibitors Presentation Lang: VTN-ENG			
:15	:15						:15	:15	:15
:30	:30						:30	:30	:30
:45	:45								
11:00	13:00	2. Expert meeting		12:30-14:50 Water Quality Management Lang: VTN-JPN	Plenary 1 13:30-15:10 (Time is subject to change) Strengthening public-private partnership on Marine plastic pollution & Circular Economy Lang: VTN-JPN	Thematic Seminar 12:30-14:00 Cooperation on Fluorocarbon Management Lang: VTN-JPN			
:15	:15						:15	:15	:15
:30	:30						:30	:30	:30
:45	:45								
13:00	15:00	3. Policy meeting		Thematic Seminar	Thematic Seminar 15:30-16:00 (Time is subject to change) Adaptation Tool demonstration Lang: VTN-JPN	Closed Event 14:00-17:00(TBC) The 1st Joint Working Group based on Joint Cooperation Plan on Climate Change toward Carbon Neutrality by 2050 Lang: VTN-JPN (Simul)			
:15	:15						:15	:15	:15
:30	:30						:30	:30	:30
:45	:45								
14:00	16:00								
:15	:15								
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:15	:15								
:30	:30								
:45	:45								
16:00	18:00								
:15	:15								
:30	:30								
:45	:45								

Figure 3.2 Schedule of Viet Nam-Japan Environmental Week

Source: Website of Viet Nam – Japan Environmental Week (https://www.jpssi.go.jp/ew2021vn/event_jp.html)

3.3.4 Online workshop

It was difficult to travel to the site and gather a large number of people due to the spread of infection of COVID-19, therefore a local workshop was conducted by online between HCMC and Osaka City on February 22, 2022. In HCMC, some attendances participated in a venue with infection control and internet environment in HCMC as hybrid style of meeting.

At the workshop, an officer from Thu Duc City which established in January 2021, introduced overviews and explain of environmental/climate change policies, issues and current activities. From Japan side, speakers introduced their adopted JCM model project in this fiscal year, renewable energy/energy saving technology and future business plan etc. The agenda of the workshop as follows, and presentation materials are shown in Attachment-2.

Table 3.3 Agenda of online workshop

#	Time (JST)	Agenda	Speakers
1	16:00-16:25	Introduction Opening remarks	Nippon Koei Ho Chi Minh City
2	16:25-16:45	Presentation 1: Outline and planning mission of Thu Duc City related to climate change	Thu Duc City
3	16:45-16:55	Presentation 2: Achievement of JCM projects in the City-to-City collaboration project	Nippon Koei
4	16:55-17:10	Presentation 3: Introduction of JCM model project and case study in 2021	Endo Lighting Vietnam
5	17:10-17:25	Presentation 4: Introduction of JCM model projects and Yuasa environmental solution	Yuasa Trading
6	17:25-16:40	Presentation 5: Introduction of JCM model project	Osaka Gas/SOGEC
7	17:40-17:55	Presentation 6: Leasing services for eco-friendly equipment for buildings/factories	Sumitomo Mitsui Trust Panasonic Finance/ BSL
8	17:55-18:00	Closing remarks	Osaka City

Source: Prepared by Nippon Koei

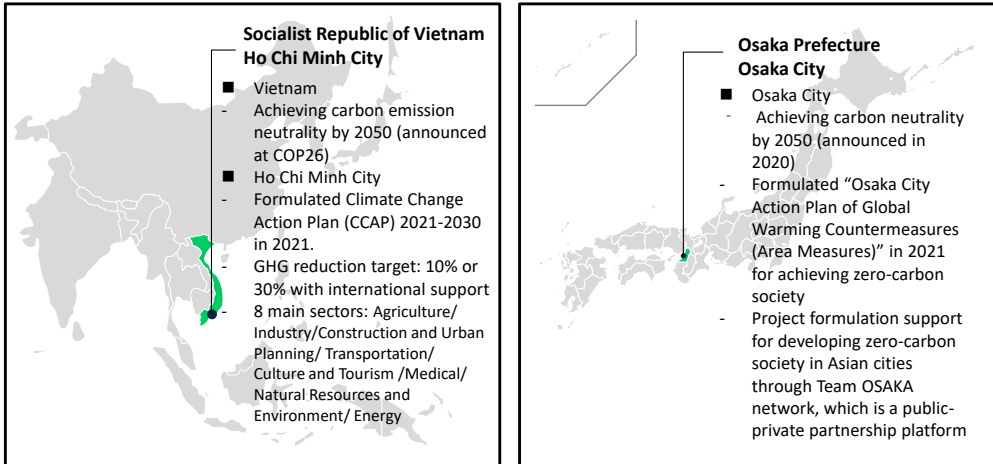
3.3.5 The Second Zero Carbon City International Forum

The online city-to-city collaboration seminar originally scheduled for this year was integrated into the Second Zero Carbon City International Forum hosted by the Ministry of the Environment, Japan on 9-10 March 2022. MOE together with the Office of the Special Presidential Envoy for Climate (SPEC), U.S. State Department organized the Forum as a part of the “Global Subnational Zero Carbon Initiative” launched by the in the Side Event at Japan Pavilion of the COP26.

In the Forum, leading subnational climate policies and actions and city-to-city collaborations to expanding “Decarbonization Domino Effect” were shared. The activities of this city-to-city collaboration project between Osaka City and HCMC were submitted as report materials (in Japanese and English) as below, and posted during the Forum (Attachment-3).

City-to-City Collaboration Project between Ho Chi Minh City, Vietnam and Osaka City, Japan

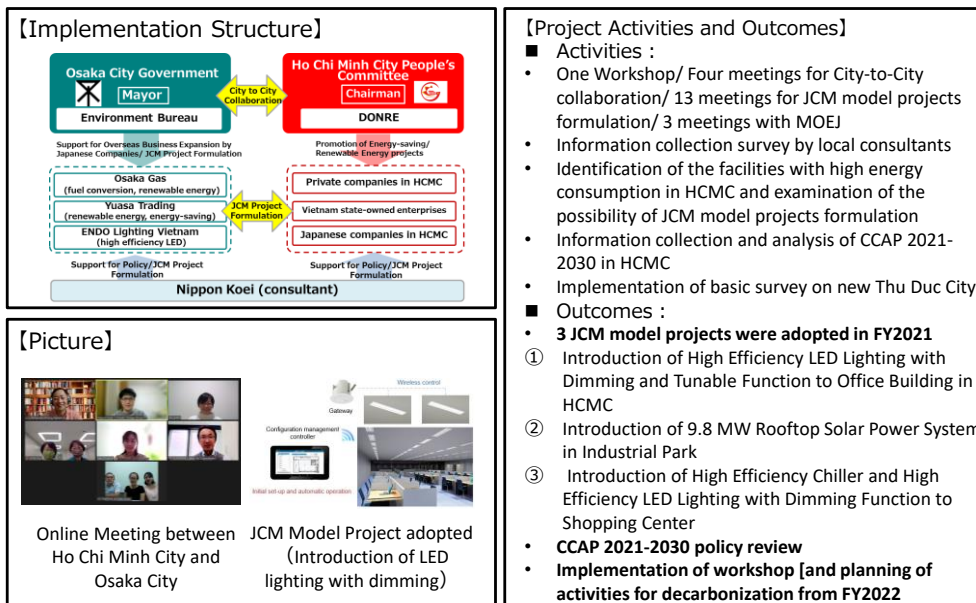
Osaka City Government and Ho Chi Minh City (HCMC) have been implementing City-to-City Collaboration Project in the environmental field since 2011. In 2013, Osaka City and HCMC concluded "MOU on Formulation of Low-carbon City in HCMC" for comprehensive cooperation to realize steady urban development of HCMC, and the MOU was extended for five years in March 2021. **Through continuous discussions between two cities and JCM model projects formation by companies, three JCM model projects were selected in FY2021, which contributes to the promotion of zero-emission technology to industrial and public sectors in HCMC.**



Source: Prepared by Osaka City and Nippon Koei

Figure 3.1 Draft materials of introducing the Project(1/2)

City-to-City Collaboration Project between Ho Chi Minh City, Vietnam and Osaka City, Japan



Source: Prepared by Osaka City and Nippon Koei

Figure 3.2 Draft materials of introducing the Project(2/2)

CHAPTER 4 JCM MODEL PROJECTS FORMULATION STUDY

4.1 Achievements of JCM model projects formulation through City-to-City Collaboration in FY2021

4.1.1 JCM model projects for introduction of high efficiency LED lighting with dimming and tunable function to office building in Ho Chi Minh City

In FY2021, ENDO Lighting Corp., which is the Japanese headquarters of ENDO Lighting Vietnam Co., Ltd., a partner company of City-to-City collaboration project, applied for JCM model project “Introduction of High Efficiency LED Lighting with Dimming and Tunable Function to Office Building in Ho Chi Minh City” and it was adopted by MOE. The latest LED catalog of Endo lighting is referred to Attachment-4.

This project replaces indoor fluorescent lights (approximately 2,300) installed in the office building (Saigon Tower) in HCMC with high-efficiency dimmable/tunable LED lighting “Tunable LEDZ” made by ENDO Lighting and combines with a wireless control system “Smart LEDZ.” This contributes to the reduction of GHG emissions in Viet Nam by reducing energy consumption from the grid, including thermal power generation using fossil fuels, and is expected to reduce 197tCO₂-eq/year.



Source: GEC web site(https://gec.jp/jcm/projects/21pro_vnm_04/)

Figure 4.1 Image of the system and technology introduced in the JCM model project (High efficiency LED lighting and wireless control system)



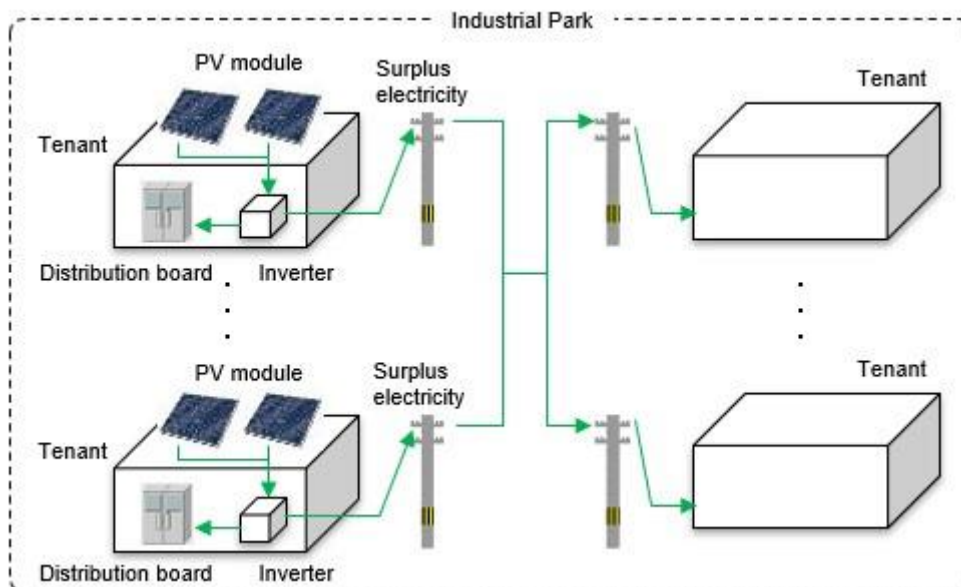
Source: Endo Lighting Vietnam

Figure 4.2 Demonstration of installation at Saigon Tower (left: white, right: warm white)

4.1.2 JCM model project for introduction of 9.8 MW rooftop solar power system in industrial park

In FY2021, Osaka Gas Co., Ltd., which is a partner company of City-to-City collaboration project applied for JCM model project “Introduction of 9.8 MW Rooftop Solar Power System in Industrial Park” and it was adopted by MOE.

This project installed 9.8 MW solar power system on the roofs of eight tenant factories in Long Duc Industrial Park in Dong Nai Province. The generated electricity is utilized without any waste by self-consuming by each tenant and supplying surplus electricity to the Industrial Park management Annual GHG emission reduction is estimated 4,312 tCO₂-eq.



Source: GEC web site(https://gec.jp/jcm/projects/21pro_vnm_06/)

Figure 4.3 Image of the system and technology introduced in the JCM model project (Rooftop solar power system)

4.1.3 JCM model project for introduction of high efficiency chiller and high efficiency LED lighting with dimming function to shopping center

In FY2021, JCM model project “Introduction of High Efficiency Chiller and High Efficiency LED Lighting with Dimming Function to Shopping Center,” in which ENDO Lighting Vietnam Co., Ltd., a partner company of City-to-City collaboration project, participated as a supplier of LED lighting, was adopted by MOE.

This project is represented by Tokyu Corporation and introduces high efficiency LED lighting (710 units) made by ENDO lighting Vietnam and high efficiency chiller (3 units) made by Daikin Industries, Ltd., a company in Osaka City to the “SORA gardens SC,” a new shopping center in the “TOKYU GARDEN CITY” in Binh Duong Province, which is located about 30km north of HCMC. These are expected to reduce 726 tCO₂-eq/year.



Source: GEC web site(https://gec.jp/jcm/projects/21pro_vnm_09/)

Figure 4.4 Image of the system and technology introduced in the JCM model project (High efficiency chiller and LED lighting)

4.2 JCM model project formulation for introduction of high efficiency equipment (once-through gas boiler)

4.2.1 Outline of the study

Since last fiscal year, in cooperation with Osaka Gas, a JCM model project formation study on the introduction of a high efficiency gas once-through boiler in HCMC have been conducted. In addition, Osaka Gas Singapore Pte. Ltd., an Osaka Gas 100% owned subsidiary company, established a joint venture company SOGEC in 2019 with Sojitz Corporation and Sojitz Vietnam. The company operates a natural gas supply business in Viet Nam.

Once-through boiler from Japanese boiler manufacturer Miura Co., Ltd. is assumed to be installed in this project.

For JCM model project formulation in FY2021, mainly continuous discussion with Vietnamese companies, Japanese companies and industrial parks who provided information previously, were carried out. As a roll-out JCM model project, JCM model project formulation was conducted using the same procedure.

Table 4.1 Study contents for Introducing once-through gas boiler

#	Study contents	Outline
1	Examination of specifications of introduced equipment	The specification of equipment was confirmed to be applicable for similar factories because of the records of introduction in Viet Nam.
2	Formulation of business plan and evaluation of business feasibility	The project cost was estimated based on the expected number of equipment. The energy saving effect, the payback period of the investment, and the amount of CO2 emission reduction were examined.
3	Review and finalize the international consortium system	The international consortium and the implementation system were examined for the application for JCM model project.
4	Preparation of MRV plan	An appropriate monitoring plan was examined for the application for JCM equipment subsidy project.

Source: Prepared by Nippon Koei

4.2.2 Specification of installed technologies

In this study, the introduction of a high-efficiency gas once-through boiler manufactured by Miura is being considered as a roll out JCM project. High-efficiency once-through boilers push boiler water to one direction of the water tubes and convert it to steam without circulation. It keeps a small amount of water, which leads to easy start-up. Also, as its size is small, it can be said that the boiler is space-saving. Besides, the once-through boiler is a technology has been developed and introduced mainly in Japan, which has features such as low noise and low NOx emission.

The following table shows the advantages of once-through boiler over other boilers.

Table 4.2 Advanced performance of once-through gas boiler

Advantage	Overview
Once-through boiler with high mobility, load following, and advanced control	Different from water tube boiler, once-through boiler produces steam in a pile. By this, starting and response to load variation is fast. High-level control for stable steam production amount and temperature control is conducted.
Space saving	Only 60% of space is necessary compared with other boilers.
High efficiency in low load operation	It controls in response to load variation. High efficiency operation is possible in broad range of load.
Recovery of exhaust combustion gas by economizer	High-efficiency is enabled by an economizer that recovers remaining heat in exhaust gas and pre-heating the water pressurized by feed-in pump.
Low NOx, low CO emissions	Emission of NOx and CO is low, which was enabled by lowering combustion temperature and arrangement of nozzle location.

Source: Prepared by Nippon Koei



Source: MIURA

Figure 4.5 Image of high-efficiency once-through gas boiler

4.2.3 Results of the study

To formulate JCM model project to introduce high efficiency equipment, interview survey to HCMC companies mainly, which had discussion from the past fiscal year, was continued. In addition, for industrial parks, which had not been approached before, preparation work of promoting JCM model project and introduction of applicable technologies were conducted for face-to-face discussion and field survey in FY2022.

4.2.4 Project plan and project evaluation

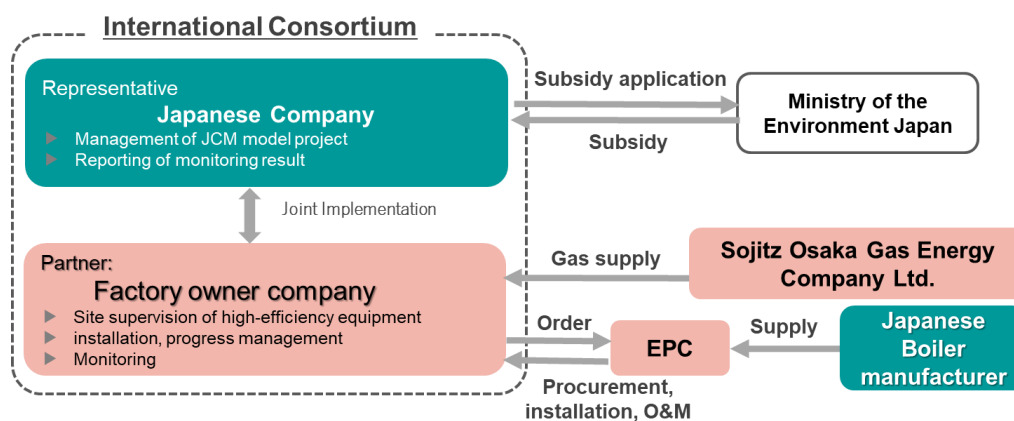
Based on the achievement of adopted JCM model project in FY2020, the project plan and evaluation were roughly assumed, and the same methodology of estimation for GHG emission reductions and cost-effectiveness would be used for JCM application.

4.2.5 Coordination for international consortium

The international consortium for JCM model project is assumed as follows. It is ideal that factory's parent company is a representative company in terms of smooth management of the JCM model project and confirmation and reporting of the monitoring results.

If a partner company is a Vietnamese company, it would be necessary to request a company, who has rich experiences of implementation of JCM model project, to be the representative company.

Then, a Japanese boiler manufacturer would supply a high efficiency gas once-through boiler to the local EPC and install boilers in the Factory. Sojitz Osaka Gas Energy Company Ltd. would supply natural gas for once-through boilers.



Source: Prepared by Nippon Koei

Figure 4.6 International consortium and implementation structure of JCM model project for introduction of once-through gas boiler

4.2.6 MRV planning

The measurement data required for estimation of GHG emission reduction is the fuel consumption of introduced high efficiency gas once-through boiler. The data required for MRV will be measured and recorded mainly by the equipment manager of the Partner company, with the support of the Japanese subsidiary of boiler manufacturer in Vietnam. The results will be reported to the Representative company. And it is expected that monitoring will be carried out under the above structure.

4.3 JCM Model project formulation for installation of energy-saving equipment (dimmable LED lighting)

4.3.1 Outline of the study

Study for JCM model project formulation for installation of dimmable and highly efficient LED lightings to buildings, commercial facilities, factories, etc. in HCMC was carried out. Studied technology is dimmable and highly efficient LED lighting sold by Endo Lighting Vietnam who is Vietnamese subsidiary of lighting equipment manufacturer, Endo Lighting Corporation based in Osaka City. Study contents are as follows.

Table 4.3 Study contents for installation of dimmable and highly efficient LED lighting

#	Study contents	Outline
1	Information collection of LED lightings in Vietnam	Information collection regarding dissemination status of LED lightings in Vietnam and products sold in HCMC.
2	Study for identification of target facilities in HCMC	Status of LED lighting installation in buildings and facilities who consume much energy in HCMC was studied.
3	Consideration of specification of installed technologies	Study of existing equipment and consideration of installed technologies were implemented.
4	Project evaluation	Project cost, energy-saving effect, payback period and CO2 emission reduction were considered.
5	Consideration of international consortium and implementation structure	International consortium and implementation structure were considered for application for JCM model project

Source: Prepared by Nippon Koei

4.3.2 Information collection of LED lighting in Viet Nam

In order to confirm dissemination status of LED lighting in Vietnam, information of lighting market in Vietnam was collected as well as information of Japanese LED lighting technologies which has been spreading in Vietnam.

In accordance with collected data, overall lighting market in Vietnam drastically increased from VND 5,275 billion in 2015 to VND 9,066 billion in 2020 and share of LED lighting sharply rose from 37.7% in 2015 to 60.4% in 2020. Market scale of “Commercial and service facility” including candidate building of the study is VND 3,626 billion in 2020 and 65% of total is occupied by LED lighting. The detail of lighting market in Vietnam is shown below.

Table 4.4 Trend of lighting market scale in Viet Nam

List of lighting equipment	2015	2020	List of LED lighting equipment	2015		2020	
	Billion VND	Billion VND		Billion VND	%	Billion VND	%
Household lighting equipment	1952	3354	LED household lighting products	772	39.5	2012	60.0
Commercial and service lighting equipment	2110	3626	LED commercial & service lighting products	844	40.0	2357	65.0
Industrial lighting equipment	316	544	LED industrial lighting products	79	25.0	217	39.9
Exterior lighting equipment	897	1542	LED exterior lighting products	296	33.0	1164	75.5
Total	5275	9066	Total	1991	37.7	5750	63.4

Source: Prepared by NKV based on “Local Development and Promotion of LED Technologies for Advanced General Lighting in Viet Nam”

4.3.3 Study for identification of target facilities in HCMC

Status of LED lighting installation in ten buildings and ten factories, who consume much energy in HCMC was studied.

Although there was only one building where has not installed LED lightings, LED lightings in some facilities were already operated for nearly ten years or were low-efficient products, which means that there is a potential to install dimmable and highly efficient LED lighting.

4.3.4 Specification of installed technologies

Tunable LEDZ, dimmable and highly efficient LED lighting of Endo Lighting has one of the most efficient LED lightings in Japan. Table 4.5 shows the comparison among LED lightings sold in Vietnam by three manufacturers. Efficiency of Tunable LEDZ is 160 lm/W which is much better than around 110 lm/W of products of a local manufacturer, Company C and of European manufacturer, Company D.

In addition, by combining with wireless control system, Smart LEDZ, dimming (function to tune brightness of lightings) and toning (function to change color of lightings to meet preference of users and purpose) can be controlled automatically, which realizes further energy saving.



Source: Company A

Figure 4.7 Dimmable LED lighting “Tunable LEDZ” of Company A

Table 4.5 Comparison of LED lighting

Supplier (Base country)	A (Japanese)	C (Vietnamese)	D(Dutch)
Length (mm)	1,200	1,210	1,195
Color temperature (K)	5,000	3,000	4,000
Luminous (lm)	6,025	7,600	3,370
Power consumption (W)	37.8	72	30
Efficiency (lm/W)	159.4	105.5	112.3

Source: Prepared by Nippon Koei based on information of the three manufacturers

Tunable LEDZ is dimmable by scheduling operation and manual operation, which lead to large amount of energy saving. As a reference, by operating like Figure 4-8, approximately 40% of energy saving can be realized.

Qty (B)	(C)															(C)	(D) = B x C	
	1-6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21-24	Lighting time 1unit	Lighting time All unit
2800	0	50	100	100	100	100	100	100	100	100	100	100	100	100	50	0	13	36,400
2800																	TTL	36,400

Qty (B)	(C)															(C)	(D) = B x C	
	1-6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21-24	Lighting time 1unit	Lighting time All unit
2800	0	40	55	100	85	70	10	55	55	55	55	55	50	50	40	0	7.75	21,700
2800																	TTL	21,700

Top: Existing lighting **Bottom:** After replacement with LED of Company A **Dimming effect** **-40.4%**

Source: Endo Lighting Vietnam

Figure 4.8 Reduction of lighting rate by scheduling operation

LED lighting of Company A can be controlled one by one with different dimming rate even if they are installed in the same space, enables keeping the same brightness in the space without difference of dark and bright positions. This leads to improvement of value of the office

because this point is important for office workers from the perspective of indoor working environment.

4.3.5 Project evaluation

To apply for JCM model project in FY2021, GHG emission reduction, subsidy amount, cost-effectiveness and payback period were calculated. The result of the trial calculation is shown in Table 4.6 and Table 4.7. Since JCM methodology of interior LED lighting has not been developed in Vietnam, calculation was carried out based on approved methodology in Indonesia “AM_ID005: Installation of LED Lighting for Grocery Store”. However, this methodology cannot take dimming effects into account, thus formula below was utilized to calculate annual electricity consumption and GHG reduction.

$$(\text{PRJ annual GHG reduction}) = (\text{PRJ annual electricity consumption}) \times (\text{Emission factor})$$

$$(\text{REF annual GHG reduction})$$

$$= (\text{REF annual electricity consumption}) \times (\text{Emission factor}) \times (\text{PRJ efficiency}) \times (\text{REF efficiency})$$

$$(\text{PRJ annual electricity consumption}) = (\text{Operation hour}) \times (\text{No. of LED}) \times (\text{Lighting input}) \times (\text{Dimming rate})$$

$$(\text{REF annual electricity consumption}) = (\text{Operation hour}) \times (\text{No. of LED}) \times (\text{Lighting input})$$

PRJ: Project REF: Reference

Table 4.6 Trial calculation of GHG reduction and cost-effectiveness

#	Item	Figure	Unit	Remarks
a)	Operation hour	3,120	h/year	=13h/day x 240day (Condition)
b)	Number of lighting	2,800	-	Condition
c)	Input	37.8	W	Figure from catalogue
d)	Lighting rate	60	%	Study by Company B
e)	PJT annual electricity consumption	198	MWh	=a) x b) x c) x d)
f)	REF annual electricity consumption	330	MWh	=a) x b) x c)
g)	Luminous flux	6,025	lm	Figure from catalogue
h)	PJT efficiency	159.4	lm/w	= g) / c)
i)	REF efficiency	110.0	lm/w	AM_ID005
j)	Emission Factor	0.913	tCO2/MWh	GEC guideline for FY2020 JCM model project
k)	PJT GHG emission	180.9	tCO2/year	= d) x h) (AM_ID005)
l)	REF GHG emission	436.9	tCO2/year	= f) x h) / i) x j) (AM_ID005)
m)	Annual GHG reduction	256	tCO2/year	= j) - i)
n)	Project period	12	year	legal lifetime
o)	Total GHG reduction	3,072	tCO2	= k) x l)
p)	Subsidy amount		JPY	Subsidy rate %
q)	Cost-effectiveness	3,999	JPY/tCO2	= n) / m)

Source: Prepared by Nippon Koei

Table 4.7 Project evaluation

Item	Figure	Unit
Project cost		JPY million
Subsidized expense		JPY million
Assumed subsidy amount		JPY million
Reduction of electricity cost		JPY million/year
Payback period (without subsidy)	6.9	year
Payback period (with subsidy)	5.2	year

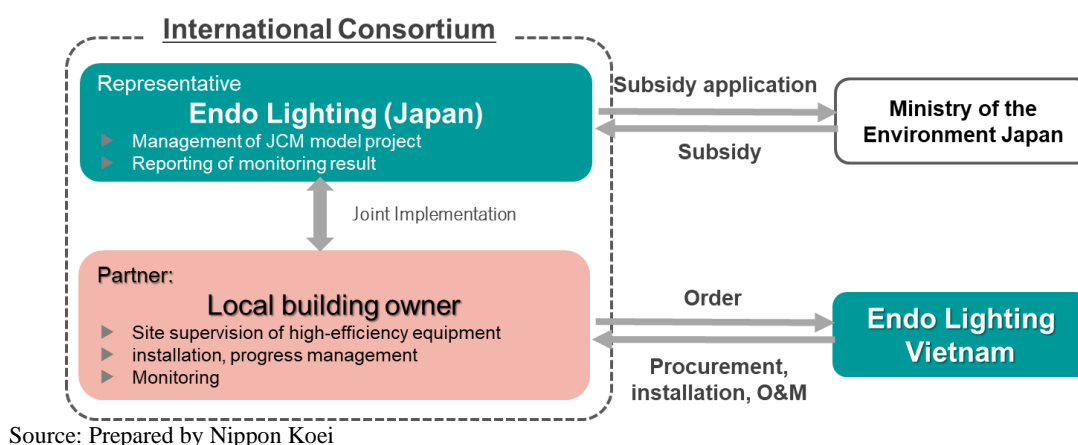
Source: Prepared by Nippon Koei

As a result of the trial calculation above, it was found that project for installation of dimmable and highly efficient LED lighting of Endo Lighting has a high potential to be applied for JCM model project.

4.3.6 Consideration of international consortium and implementation structure

Two of international consortium and implementation structure below can be assumed for application for JCM model project.

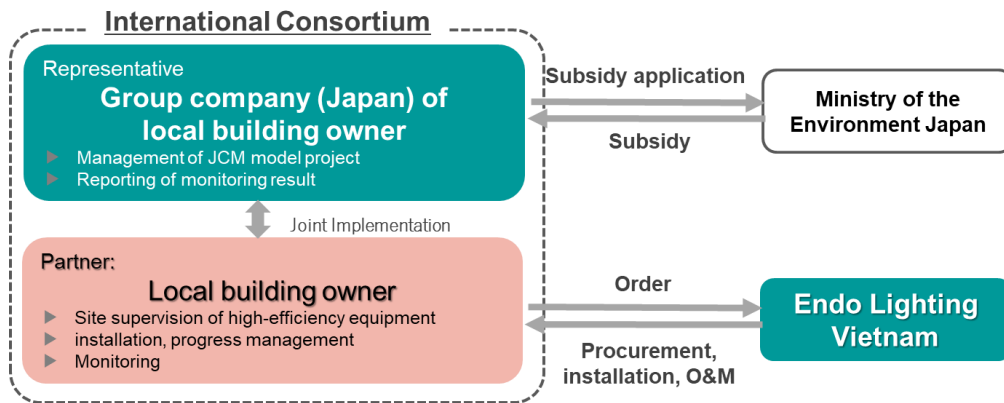
One is a similar structure to “4.1.1 JCM model projects for introduction of high efficiency LED lighting with dimming and tunable function to office building in Ho Chi Minh City”. Endo Lighting Corporation (Japan) as a representative company, manages this project comprehensively and implement checking and reporting of monitoring results while local building owner, as a partner company, order the LED lighting to Endo Lighting Vietnam and owns them. Endo Lighting Vietnam is in charge of procurement, installation and operation and maintenance (Figure 4.9).



Source: Prepared by Nippon Koei

Figure 4.9 International consortium and implementation structure of JCM model project for introduction of dimmable and highly efficient LED lighting (1)

Another is a similar structure to “4.1.3 JCM model project for introduction of high efficiency chiller and high efficiency LED lighting with dimming function to shopping center”. Local building owner and their group company based in Japan to form an international consortium and buy LED lightings from Endo Lighting Vietnam. Endo Lighting Vietnam is in cahрге of procurement, installation and operation and maintenance (Figure 4.10).



Source: Prepared by Nippon Koei

Figure 4.10 International consortium and implementation structure of JCM model project for introduction of dimmable and highly efficient LED lighting (2)

4.4 JCM Model project formulation in public sector (renewable energy)

4.4.1 Outline of the study

To formulate JCM model project in public sector, information regarding candidate facilities and necessary technologies were collected through the interview to HCMC-DONRE.

As a result of previous study in FY2020, it was identified that HCMC have a high interest in renewable energy which contributes to decarbonization. Especially, installation of the rooftop PV system to public facilities were recognized as a high potential in HCMC. However, the project in public facilities owned by HCMC with initial investment, requires a public tender. If public tender is required, it is difficult to apply for JCM model project due to schedule, finance, implementation structure etc. Therefore, the possibility of leasing was continually considered as a method of introducing equipment without a tender.

In FY2020, the following items were studied.

Table 4.8 Study contents for JCM model project in public sector

#	Study contents	Outline
1	Consideration and analysis of condition of public tender	Based on the condition of public tender, financial scheme with low initial investment was considered.
2	Promotion of understanding of JCM subsidy scheme	To promote the understanding of HCMC, outline of JCM scheme and example of JCM for public facility in other country were introduced.
3	Information collection of candidate facilities for JCM	The outline of public buildings and large scale facilities in HCMC were collected.
4	Project evaluation	In case of 1MW PV solar generation, project cost, amount of power generation, the payback period of the investment, and the amount of GHG emission reduction were examined.

Source: Prepared by Nippon Koei

4.4.2 Specification of installed technologies

Although technologies to be installed in public facilities is decided depending on the purpose and scale, the following equipment (PV panel, inverter, battery, and monitoring system) is assumed to be introduced.

Table 4.9 Specification of target equipment

#	Equipment	Outline
1	PV panel	The PV panel is made by Japanese manufacturer and the specification needs to be suitable for public facility such as shape and weight and to have better power generation efficiency and durability.
2	Inverter	The specifications of inverter will be decided according to the compatibility with the solar panel.
3	Battery	Battery is introduced depending on the necessity. Manufacturers and standards depend on the scale and application of power generation. Specifications are selected based on efficiency, size, price, ease of procurement, etc.

#	Equipment	Outline
4	Monitoring system	The system needs to measure the amount of generated power for the calculation of GHG emission reduction and to control remotely for getting monitoring data. Optimal specifications for PV panels and other equipment are required.

Source: Prepared by Nippon Koei

4.4.3 Results of the study

In the case of introducing PV system (1MW), draft project plan with leasing was continually proposed to HCMC-DONRE from the last fiscal year. By participation of leasing company, it has advantages that there is no maintenance work/cost of HCMC during leasing period and that it is cheaper than the normal leasing fee because of JCM subsidy. Annual expense is only the leasing fee without initial cost. Therefore, it was decided that DONRE confirms whether public tender was necessary, with People's Committee.

According to DONRE, there was no specific candidate facilities owned by HCMC, but new public facilities and city hall of Thu Duc City which would be newly established inside HCMC was listed as candidate. The new facility has the advantage that it is easier to introduce PV system because engineering in consideration of the load capacity of the roof is available. Collection of information and consideration of project formulation will continue in the next fiscal year.

4.4.4 Project evaluation

With the aim of JCM application later than this fiscal year, project feasibility was evaluated. JCM methodology "VN_AM007_ver 01.0 (Installation of Solar PV System)" was applied for the evaluation. Annual power generation, GHG emission reduction and cost-efficiently were estimated by assuming 1MW of PV system.

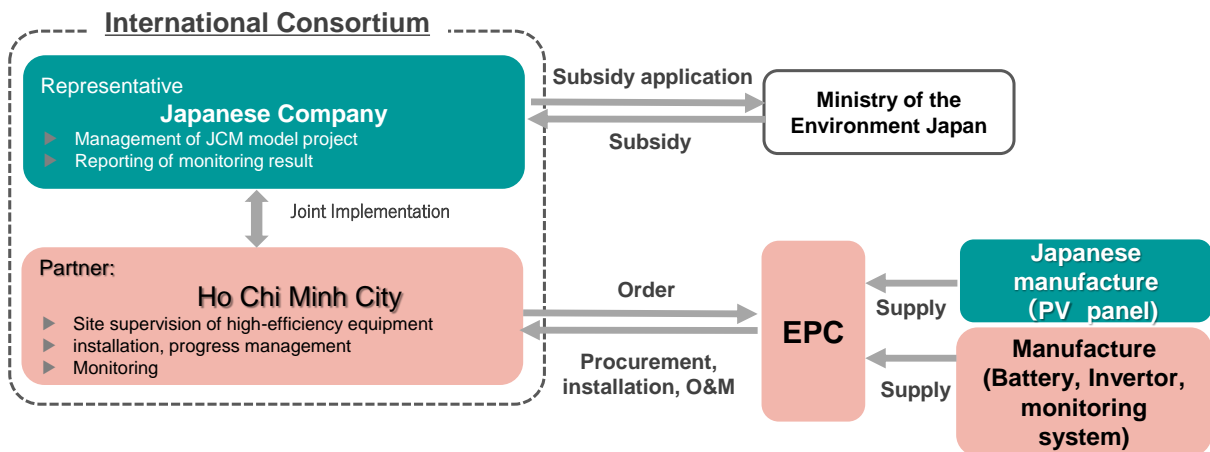
In addition, there are already four JCM model projects to install PV system in Viet Nam, so subsidy rate is assumed to be maximally 30%.

Table 4.10 Trial calculation of project for installation of PV solar system

Items	Figure	Unit	Remarks
Project cost (rough calculation)	■	JPY million	Including PV panels, inverters, batteries, Monitoring system etc.
Annual power generation by renewable energy	1,444	MWh/year	Estimated by a calculation model
Annual GHG emission reduction	991	tCO ₂ /year	EF (Renewable energy): 0.533 (tCO ₂ /MWh)
Cost efficiency	Around 3,000	JPY/tCO ₂	Assumed condition

Source: Prepared by Nippon Koei

4.4.5 Consideration of international consortium and implementation structure



Source: Prepared by Nippon Koei

Figure 4.11 International consortium and implementation structure of JCM model project in public sector

CHAPTER 5 IMPACT OF COVID-19 AND INGENUITY FOR IMPLEMENTING STUDY

Due to the expansion of COVID-19 infection since January 2019, the usual main activities such as field surveys, discussion between the cities, workshops, and a City-to-City Collaboration seminar were totally held online, and it means that all activities of this fiscal year were implemented under various restrictions. However, even under this pandemic situation, several activities could be carried out with ingenuity, some activities were transferred to alternative ones, and others plan to be implemented in/ after the next fiscal year as follows.

5.1 Impact of the spread of COVID-19 in Viet Nam

In Viet Nam, the spread of infection had been suppressed for a long time by promoting thorough immigration restrictions and infection control, but because infection has spread since July 2021, lockdown was carried out in the big cities such as Hanoi City and Ho Chi Minh City where the population is concentrated. Although the impact was relatively small in Vietnam's main industry such as agriculture, forestry and fisheries, the economic damage is expected to be serious in the mining/ construction industry and service industry (restaurant etc.). Due to the economic slowdown in Viet Nam, local companies may be refraining from capital investment. Therefore, to promote installing energy saving technologies and renewable energy, it is necessary to explain more carefully about the economic merits of utilizing subsidy of JCM model project.

5.2 Ingenuity for implementing study smoothly

Improvement of internet environment in HCMC:

Communication with HCMC was carried out via e-mail and local staffs. Although there were some restrictions on network environment of online meetings, the content of the meetings was almost the same as face-to-face meetings. In addition, when the online workshop was held, DONRE rented and installed an equipment for smooth online conference in their office so that the workshop could be held without any problems about internet connection.

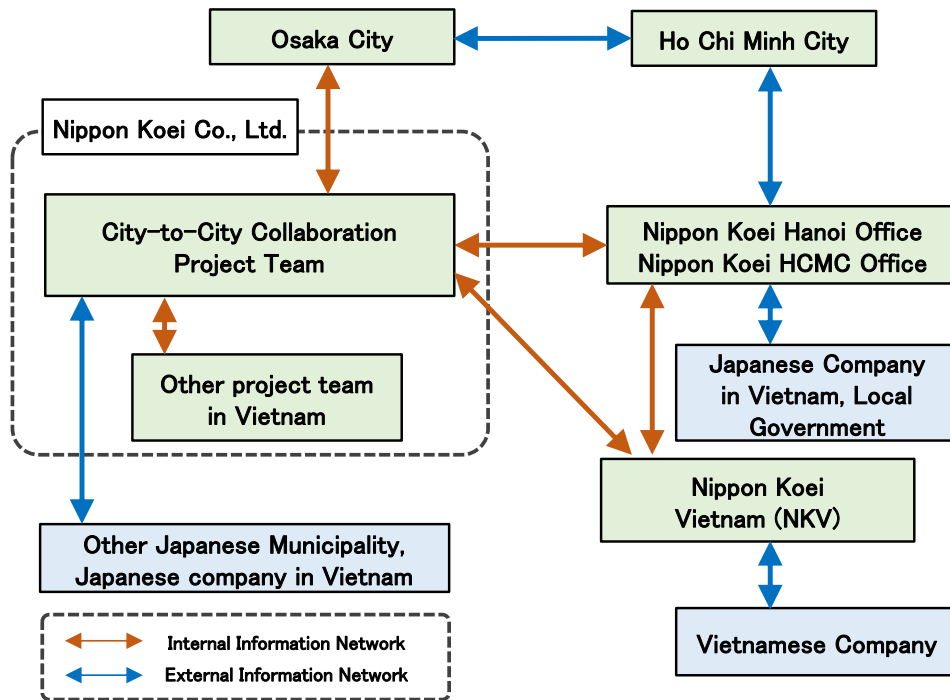
Smooth communication through interpreters and translated materials:

In response to the requests from the participants of conferences and workshops, providing as much support and preparation as possible such as arranging interpreters for Japanese/English/Vietnamese, and translating presentation materials were implemented. These supports helped communication smoothly between the cities within the limited time via online.

Implementation of efficient surveys utilizing local offices:

By cooperating with Nippon Koei's Hanoi office and local subsidiary (NKV), collecting information and analysis regarding City-to-City Collaboration activities and JCM model project formulation could be conducted efficiently (see as following figure). In addition, a

company profile of Nippon Koei was utilized to deepen the understanding of the local concerned (see Attachment-5)



Source : Prepared by Nippon Koei

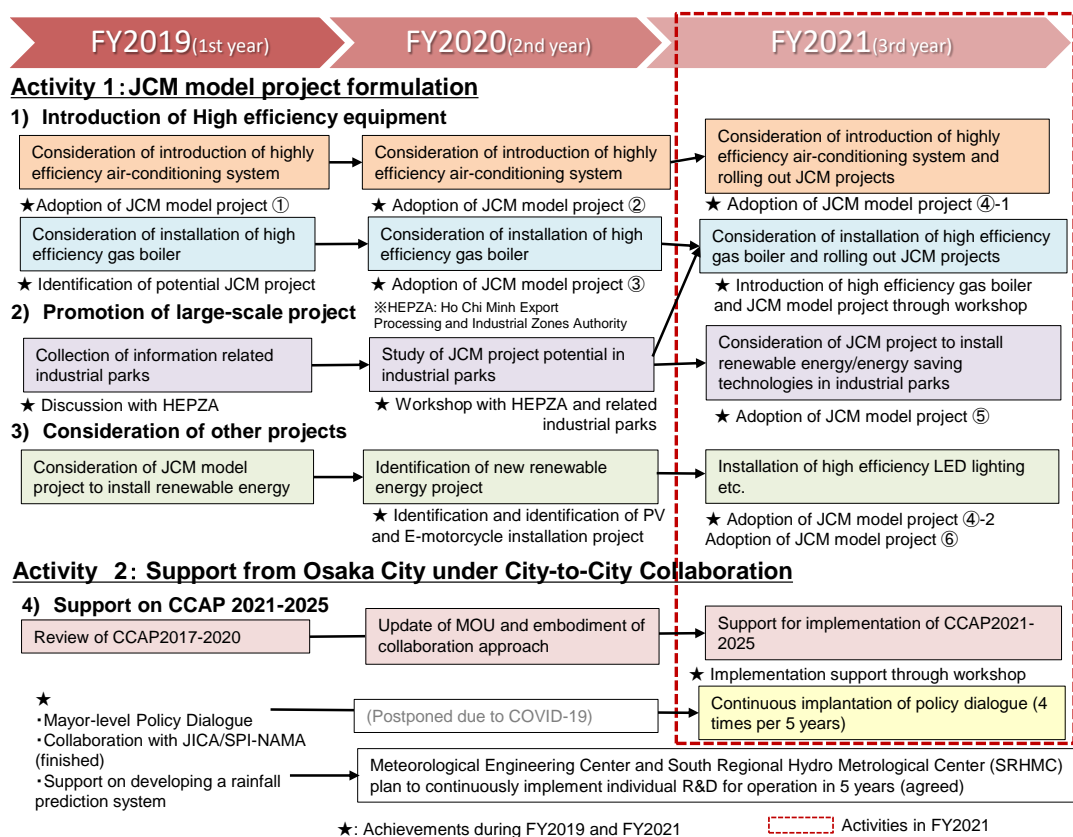
Figure 5.1 Internal/External information collection network and division of roles in the COVID-19 Pandemic

CHAPTER 6 ACHIEVEMENTS OF THREE YEARS

6.1 Original plan

The City-to-City Collaboration between Osaka City and Ho Chi Minh City has implemented various activities based on the following three-year plan since 2019, with revising them responded to the situations in Ho Chi Minh City every year. In particular, due to COVID-19 infection since January 2020, each activities tended to be delay whereas collecting information, discussions with relevant persons, and project formulations have been continuously conducted under the situation that traveling to Viet Nam and field survey could not be implemented. Some of the concrete reasons of this delay were that renewal/newly installing of equipment in Vietnamese companies were postponed in a part of industrial sectors, and investments of Japanese companies became slowdown. In addition, since the lockdown in major cities in Viet Nam and the declaration of state emergency in Japan were announced in each to enhance COVID-19 countermeasures, an online workshop and discussions could not be implemented in proper timing and frequency, and it caused the delay of the plan as well.

On the other hand, total six projects (inclusive of a horizontal expansion project near Ho Chi Minh City) were adopted as JCM model projects, and also the collaboration agreement has been extended for the next five years based on MOU concluded in March 2021. Taking these outcomes into consideration, almost all the goals of the three-year plan could be achieved under the restrictions.



Source: Prepared by Nippon Koei

Figure 6.1 Three-years plan of City-to-City Collaboration (FY2019-FY2021)

6.2 Self-evaluation for three years achievements

6.2.1 Institutional support

(1) Support for implementation of CCAP 2021-2025

Collecting Information for finding possibilities of collaboration between the cities to implement Ho Chi Minh City's CCAP assuming the utilization of JCM was conducted since its draft stage. The CCAP finally has been approved in this fiscal year, so it seems that concrete activities will be started to implement from the next fiscal year.

In the MOU of the City-to-City Collaboration between the two cities concluded in the last fiscal year, it is mentioned clearly to conduct mitigation measures at the target sectors of CCAP (promotion of project for GHG emission reduction by installing renewable energy, fuel conversion, and installing energy saving technologies). So, it will be an achievement of the Project to further activities on the basis of policy evidence as the local governments.

(2) Support on JCM model project formulation in public sector

In JCM model project formulation in public sector, solar power generation project installing panels on a roof of facility which owned by Ho Chi Minh City was considered before. However, it was difficult to formulate JCM model project because a bidding for initial investment was necessary as a public project and cost estimation considering utilization of JCM could not be committed.

Furthermore, although the utilization of JCM with a leasing which can reduce initial investment was proposed by Japanese side, it has not still achieved to formulate JCM model project in public sector in the Project since a project implementation at the target facility was postponed.

On the other hand, it was a big outcome that Thu Duc City has newly joined in the City-to-City Collaboration. Regarding Thu Duc City's smart city plan and their construction projects, there are high potentials to install energy saving equipment and renewable energy technologies of Japanese companies.

(3) Support on JCM model project formulation in industrial sector

In the industrial sector, JCM model project formulation has been considered at the industrial parks managed by HEPZA cooperating with DONRE. To the owner companies of industrial parks and private companies, installing energy saving and renewable energy technologies were proposed in the common infrastructures (generation facility, water supply facility, etc.) in the industrial parks by utilizing JCM subsidy. In addition, to each tenant factories in the industrial parks, renewal of facilities that consume electricity or fuel a lot by utilizing JCM was proposed, and the concrete technologies were introduced to them.

Under the COVID-19 pandemic, since an investment to projects got slow and smooth communication with local companies was difficult, formulating JCM model project with Ho Chi Minh City is still under consideration. In the future, based on the declaration of carbon neutral by Vietnamese government, it is expected that environmental consideration and GHG

emission reduction become more obligatory at the industrial parks under the jurisdiction of the government. At that time, it is also expected to utilize the achievements of the City-to-City Collaboration and know-how of project formulation.

6.2.2 Energy saving/ Renewable energy sector

The Project has achievements of total six projects adopted as JCM model project for the past three years, by implementation of the study for JCM model project formulation in the industrial sector with the following technologies. As a feature, after formulating the first JCM model project in Ho Chi Minh City, it was expanded horizontally to the surrounding areas. It is expected to be one of the model cases of the City-to-City Collaboration and “the decarbonization domino” accelerated by MOE.

- a. Consideration of JCM model project installing high-efficiency technologies: 4 cases
- b. Consideration of large-scale JCM model project by fuel conversion: 1 case
- c. Consideration of JCM model project by installing solar power generation facility: 1 case

Table 6.1 List of the adopted JCM model projects from the Project

#	Representative (Adopted year)	Project Name	Estimated GHG emissions reduction(tCO ₂ /y)
1	Osaka Gas Co., Ltd. (FY2021)	Introduction of 9.8 MW Rooftop Solar Power System in Industrial Park	4,312
2	Tokyu Corporation (FY2021)	Introduction of High Efficiency Chiller and High Efficiency LED Lighting with Dimming Function to Shopping Center	726
3	ENDO Lighting Corporation (FY2021)	Introduction of High Efficiency LED Lighting with Dimming and Tunable Function to Office Building in Ho Chi Minh City	197
4	Hitachi-Johnson Air Conditioning, Inc (FY2020)	Introduction of High Efficiency Air-conditioning System to Hotel in Ho Chi Minh City	184
5	Acecook Co., Ltd. (FY2020)	Introduction of High Efficiency Boiler System to Food Factory	7,631
6	Hitachi-Johnson Air Conditioning, Inc (FY2019)	Introduction of High Efficiency Air-conditioning System and Air Cooled Chillers to Office Buildings	1,823

Source: Prepared by Nippon Koei based on GEC website (<https://gec.jp/jcm/jp/projects/>)

CHAPTER 7 FUTURE PLAN

Based on the results of JCM model project formulation and intercity collaboration activities in the City-to-City Collaboration so far, a next three-year plan from the next fiscal year is proposed as follows.

According to MOU on “Formulation of Law/Zero-carbon City between HCMC and Osaka City” concluded by the mayors of both cities in March 2021, the cities plan to implement further cooperation on the basis of the past City-to-City Collaboration activities.

The next three-year plan (from FY2022 to FY2024) is considered as follows, based on the achievements of current three-year plan (from FY2019 to FY2021) and the results of discussions between the cities so far.

Mainly in four sectors, new activities and approaches are proposed. Taking advantage of the past achievements of intercity collaboration and know-how of JCM model project formulation, decarbonization domino and further JCM model project formulation will be promoted in not only DONRE in Ho Chi Minh City but also other local governments such as Thu Duc City, private companies, and surrounding cities as well.

Table 7.1 Achievements of the Project and proposal of the next three-year plan

Category	Activities Implemented from FY2019 to FY2021 Current 3-year Activities	Activities Plan from FY2022 to FY2024 New 3-year Plan (draft)	New Activities
① City-to-City collaboration activities	«Discussion through Policy Dialogue» <ul style="list-style-type: none"> • Renewed MOU between HCMC and Osaka City for creating zero-carbon/ low-carbon city (extended 5 years) • Support for implementation of Climate Change Action Plan in Ho Chi Minh City : CCAP2021-2030 	«Potential Support Activities» <ul style="list-style-type: none"> • Support for planning and implementation activities towards carbon neutrality by 2050 • Support for creating decarbonization projects in the public sector • Support for green recovery in the private sector 	Expansion of the City-to-City activities for the decarbonization domino
② JCM model projects applied technologies and sectors	«Support for expanding single technologies» <ul style="list-style-type: none"> • Energy-saving equipment (high efficiency air conditioning/ high efficiency LED) • Renewable energy (solar power generation) • Fuel conversion (high efficiency gas boiler) *Adopted 6 JCM model projects	«Potential New Sectors» <ul style="list-style-type: none"> • Smart public transportation/ Smart private logistics • Support for smart city development (Urban infrastructure) 	Expansion of JCM model projects to other areas and introduction of new technologies
③ JCM model projects target areas	«Facilities in HCMC» Public facilities, Private and commercial buildings, Industrial park and factories, Hotel and Tourist facilities	«Potential Additional Areas» <ul style="list-style-type: none"> • New city, Thu Duc City (under the jurisdiction of HCMC) • Industrial park in the suburbs of HCMC 	Expansion of the target areas and promotion of the other areas/ sectors
④ Counterparts and partner organizations	«Current counterparts» <ul style="list-style-type: none"> • DONRE • HEPZA • DOT 	«Potential Additional Organizations» <ul style="list-style-type: none"> • Other departments in HCMC (Foreign Affairs Bureau, DOT) • Thu Duc City DONRE • HCMC Japanese Chamber of Commerce and Industry etc. 	Strengthening the collaboration between counterparts and adding new partners

Source: Prepared by Nippon Koei