MOEJ

Final Report

City-to-City Collaboration for Zero-Carbon Society in FY2023

Zero-Carbon Society Development in Bandung City through Energy Saving in Building and Transportation Sectors

March 2024

Oriental Consultants Co., Ltd.
Kawasaki City

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List of Abbreviations

Abbreviation	Meaning
BEMS	Building and Energy Management System
ESCO	Energy Service Company
FS	Feasibility Study
GEIPP	Global Eco-Industrial Parks Programme
GHG	Greenhouse Gas
HPS Lamp	High Pressure Sodium Lamp
JCM	Joint Crediting Mechanism
LED	Light Emitting Diode
MRT	Mass Rapid Transit
PLN	Perusahaan Listrik Negara
RPJMN	Rencana Pembangunan. Jangka Menengah Nasional
SNI	Standard National Indonesia
TDBUPBPJ	Tanda Daftar Badan Usaha Penyedia Bahan Perlengkapan Jalan
TKDN	Tingkat Komponen Dalam Negeri
TOD	Transit Oriented Development
UNIDO	United Nations Industrial Development Organization
VWV	Variable Water Volume

Chapter 1 Project Overview

1.1 Project Objective

According to the report of Working Group III of the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) released in 2022, approximately 70% of global GHG emissions originate from cities, and it is essential to accelerate climate action in cities to achieve the 1.5-degree target set in the Paris Agreement. In Japan, the national and municipal governments are working together to create more than 100 decarbonization leading areas under the regional decarbonization roadmap formulated in June 2021, with the aim of achieving zero-carbon cities, and efforts are underway to expand these initiatives throughout Japan.

In order to realize world-wide decarbonization, it is necessary to accelerate the efforts toward building a sustainable zero-carbon society, especially in areas of rapid economic growth, such as parts of Asia. To this end, international efforts are being strengthened to support urban initiatives to decarbonize cities, which are the places that support socio-economic development.

As an example of such efforts, the Ministry of the Environment of Japan launched the Clean City Partnership Program (C2P2) with JICA in February 2023 centered around city-to-city collaboration in order to address the current challenges faced by cities around the world in a multifaceted manner. This program will provide comprehensive and synergistic support to partner cities to address urban challenges related to climate change, environmental pollution, the circular economy, and nature regeneration (“nature positive”) through further mobilization of technology and funds in collaboration with Japanese municipal governments, private companies, and financial institutions. It will also promote collaboration with other key stakeholders, including G7 and other like-minded countries and international development finance institutions.

In this project, Japanese research institutes, private companies, universities, etc., together with Japanese cities that have experience and expertise in decarbonization, will conduct study projects to support partner cities’ efforts to create a zero-carbon society and to introduce facilities and equipment that contribute to the creation of a zero-carbon society.

1.2 Project Overview

Project title:	City-to-City Collaboration for Zero-Carbon Society in FY2023 Zero-Carbon Society Development in Bandung City through Energy Saving in Building and Transportation Sectors
Implementation period:	August 4, 2023 to March 8, 2024
Ordering party:	International Cooperation/Environmental Infrastructure Strategy Section, Global Environment Bureau, the Ministry of the Environment of Japan
Consignee:	Oriental Consultants Co., Ltd.

1.3 Implementation Structure

The project was led by Kawasaki City and Bandung City's International Cooperation Office, Department of Environment, and Department of Transportation. At the workshop held in Bandung City, Department of Urban Housing and the Innovation Office of Bandung City also participated in order to widely share information and exchange opinions. In considering the formation of JCM Model Projects in building and transportation sectors, research was conducted with the cooperation of Azbil Corporation, which has already entered the Indonesian market and has a proven track record, and MinebeaMitsumi Inc., which has sales experience in many countries and is aiming to expand into Indonesia.

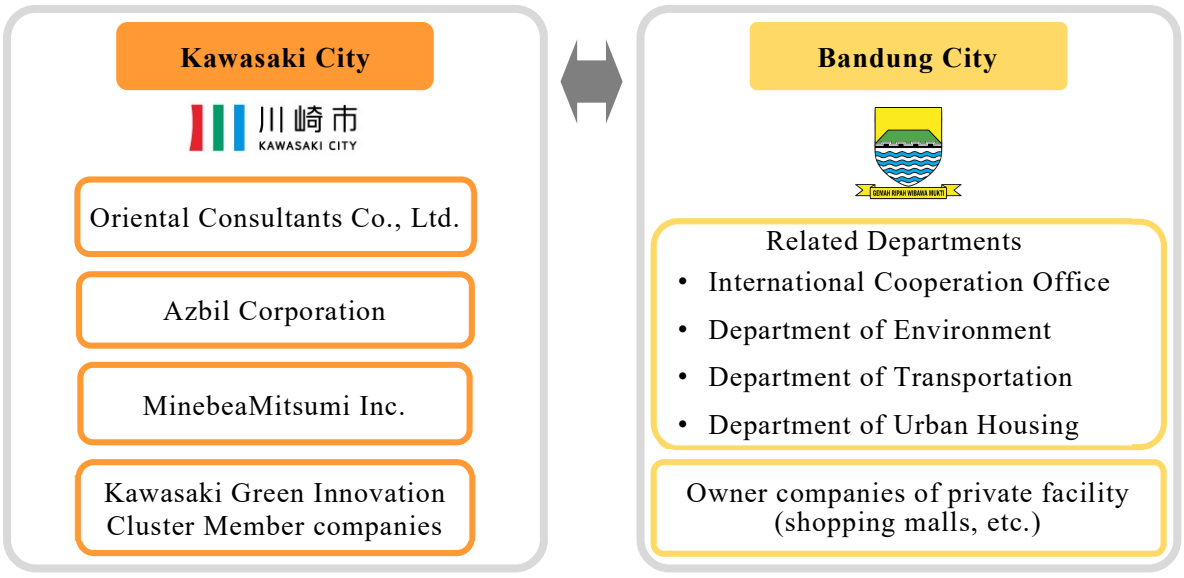


Figure 1-1 Implementation structure

1.4 Implementation Plan

In this year, the final year of the three-year plan, we deepened the past results and discussions with Bandung City and realized the project formation utilizing the JCM Model Projects in building and transportation sectors. In the building sector, we selected facilities with high feasibility from among those surveyed in the previous years and made proposals for high-efficiency air-conditioning system and energy management. In making the proposal, a detailed survey was conducted with the installation of measurement equipment, and the amount of electricity and GHG reductions were estimated. In the transportation sector, we identified priority roads in Bandung City for LED streetlights and studied the feasibility of realization through the JCM Model Projects. For the proposal of LED streetlights, we conducted simulations of multiple cases regarding the installation interval and illuminance of streetlights, selected the optimal proposal after consulting with the Department of Transportation, and estimated the amount of electricity and GHG emission reductions.

Table 1-1　Schedule in FY2023

Item	2023						2024		
	7	8	9	10	11	12	1	2	3
Meetings	KoM ▲			Progress report ▲			Final report ▲		
Examination for JCM Model Projects									
(1) Building sector: High-Efficiency Air Conditioning System and Energy Management		◀———	———	———	———	———	———	———▶	
(2) Transportation sector: Smart LED Streetlight		◀———	———	———	———	———	———	———▶	
(3) Survey for New JCM Model Projects			◀———	———	———	———	———	———▶	
Field survey, information sharing		◀——▶			◀——▶			◀——▶	
Workshop					▲				
Coordination of related organizations/meetings					◀·····▶		◀·····▶		
Monthly report		▲	▲	▲	▲	▲	▲	▲	▲
Final report					◀———	———	———	———▶	Submission ▲

Chapter 2 Overview of Bandung City and Initiatives for Zero-Carbon Society Development

2.1 Overview of Bandung City

Bandung City is the capital of West Java Province in western Java Island, located 200 km southeast of the national capital of Jakarta. The city has an area of 167.31 km2 that consists of 30 districts. Situated at a high altitude of 700-800 m above the sea level, it remains cooler throughout the year than other areas of the country. Bandung City has the third largest population in Indonesia at around 2.44 million, following Jakarta and Surabaya. Population density of Bandung City is 14,600 persons/km2, and of Jakarta is 16,700 persons/km2.

With a real GDP growth rate of about 7% (5% higher than the national average) before 2019, Bandung City has an important role in the economic development of Indonesia. The city's main industries include textile (which accounts for about 35% of the total), clothing (15%), and food (12%) industries (Department of Industry and Trade of Bandung, 2020), which have brought many manufacturing factories into the city. The city has a long prosperous history as the political, economic, and cultural center of West Java Province and is also well known as an academic city with more than 20 universities.

Figure 2-1 Map of Bandung City

Source: OpenStreetMap

2.2 City-to-City Collaboration between Kawasaki City and Bandung City

Kawasaki City and Bandung City have continued to exchange knowledge on advanced environmental technologies and environmental policies through participation in the 3rd Asia-Pacific Eco-Business Forum hosted by Kawasaki City (2007) and subsequent annual forums. In FY2014 and FY2015, Kawasaki City conducted "Feasibility Study on Formation of JCM Model Projects for Realization of Low-Carbon Society in Asia" (the Ministry of the Environment of Japan)

and have conducted studies on the installation of energy-saving facilities in buildings, LED streetlights, waste management, and energy management system in commercial facilities. In February 2016, the two cities signed a “Memorandum of Understanding (MOU) on City-to-City Collaboration for the Formation of Low Carbon and Sustainable Cities” and have been implementing projects mainly to improve waste management capacity and river water quality, utilizing JICA grassroots technical assistance projects and programs of the Ministry of the Environment of Japan. Kawasaki City is also promoting local economic revitalization and international contributions through the “Kawasaki Green Innovation Cluster” utilizing the city’s environmental technologies and environmental industries, and in this project, technical knowledge on energy-saving facilities were shared with the cooperation of member companies.

In February 2020, the two cities extended the MOU until February 2025 in order to promote further collaboration for the formation of a sustainable city. In November 2022, the Mayor of Bandung City visited Kawasaki City and made a courtesy visit to the Mayor of Kawasaki City, inspection tour and exchanged views on air pollution control, waste management, and environmentally friendly public transportation in Kawasaki City, with the Director General of the Environment Department, the Director General of the Transportation Department, and the Director General of the Urban Planning Department of Bandung City. Kawasaki City and Bandung City continue to implement individual projects and engage in high-level dialogue and building on the past cooperation between the two cities, multidisciplinary activities are expected to continue.

Table 2-1 City-to-city collaboration between Kawasaki City and Bandung City

Date	Overview
Jan. 2007	The 3rd Asia-Pacific Eco-Business Forum hosted by Kawasaki City
FY2014	FY 2014 Feasibility Study on Formation of Large-Scale JCM Model Projects for Realization of Low-Carbon Society in Asia "Support for Formation of Low-Carbon City through City-to-City Collaboration between Bandung City and Kawasaki City"
FY2015	FY 2015 Feasibility Study on Formation of JCM Model Projects for Realization of Low-Carbon Society in Asia "Support Project for Formation of Low-Carbon City through City-to-City Collaboration between Bandung City and Kawasaki City: Introduction of Energy Management System (EMS) in Commercial Facilities Using Bilateral Credit Project"
Feb. 2016	Signed Memorandum of Understanding on City-to-City Collaboration for the Formation of Low-Carbon and Sustainable Cities
FY 2017	JICA Grassroots Technical Cooperation Project (Special Framework for Regional Revitalization) "Waste Management Project for Establishment of Sustainable Resource Recycling Society in Bandung City, Indonesia"
Aug. 2018	The 2nd Japan-Indonesia Environmental Policy Dialogue Joint Statement by the Ministry of the Environment of Japan and the Ministry of Environment and Forestry of Indonesia on cooperation to improve the water quality of the Chitalum River
FY2019-	"City-to-City Collaboration Programme for Zero-Carbon Society, Improvement of River Water Quality in Indonesia", the Ministry of the Environment of Japan
Feb. 2020	MOU on City-to-City Collaboration for the Formation of Low-Carbon and Sustainable Cities extended until February 2025.
FY2021-	"City-to-City Collaboration Programme for Zero-Carbon Society", the Ministry of the Environment of Japan (this project)
Nov. 2022	Courtesy visit and inspection of Kawasaki City by Mayor of Bandung City, Director General of Environment Department, Director General of Transportation Department, and Director General of Urban Planning Department
Nov. 2022	The 15th Kawasaki International Eco-Tech Fair (poster exhibition on the project)
Nov. 2023	Participation and presentation at the "Waste Management Seminar" organized by Bandung City

Source: Study team

2.3 Initiatives for Zero-Carbon Society Development in Bandung City

2.3.1 GHG Emission in Bandung City

Bandung City measures the Greenhouse Gas (GHG) of carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O) in accordance with Presidential Regulation No. 71 of 2011 on the Implementation of the National Greenhouse Gas Inventory. Total emissions in 2021 was 785,555 t-CO2/year. The energy sector produced the most emissions, accounting for 72.32%. The main

sources of emissions were land transportation, households, and wastewater treatment.

Table 2-2 GHG emission in Bandung City (2021)

Category	Emission			
	CO2	CH4	N2O	CO2eq
(1) Energy procurement and use	553,606	0.399	0.015	568,112
Transportation				
Aircraft	2,277	0.000	0.000	2,302
Land transportation	276,733	0.128	0.012	283,606
Railway	4,810	0.000	0.002	5,368
Other				
Households	269,786	0.272	0.001	276,836
(2) Agriculture, forestry, and changes in land use	0.410	0.470	0.170	62,680
Livestock				
Gastrointestinal fermentation in livestock	0.000	0.170	0.000	4,238
Livestock excrement management	0.000	0.049	0.000	1,283
Non-CO2 emissions on land				
Use of urea	0.410	0.000	0.000	410
Direct N2O emissions from soil management	0.000	0.000	0.170	50,500
Indirect N2O emissions from soil management	0.000	0.000	0.000	0
Indirect N2O emissions from livestock excrement management	0.000	0.000	0.000	0
Rice-related emissions	0.000	0.250	0.000	6,240
(3) Waste treatment	0.000	6.140	0.020	158,000
Solid waste treatment	0.000	0.200	0.020	9,510
Wastewater treatment				
Household wastewater treatment	0.000	5.810	0.000	145,260
Total	554,015	6.879	0.200	785,555

Source: Materials provided by Bandung City

2.3.2 Environmental Strategic Plan 2018-2023, 2024-2026

The Strategic Plan of the Department of Environment of Bandung City, which is planned by the cities selected in the National Medium-Term Development Plan (RPJMN), is positioned as a guideline for the implementation of the contents presented in the National Medium-Term Development Plan at the city level. The 2018-2023 version of the Environmental Strategic Plan states that GHG emissions reductions have exceeded targets from 2014 to 2018, with a target of a 9% reduction in 2023 compared to the previous year. In the transportation sector, where emissions are the highest, measures such as encouraging the use of motorcycles and shared-ride minibuses and establishing vehicle access control zones have been implemented. From an urban planning perspective, it also indicates that priority should be given to the protection of road functions, road traffic management, and the development of mass public transportation systems. On the other hand, it was also confirmed that the understanding of GHG emissions is limited. For example, emissions from the industrial sector were not calculated due to difficulties in obtaining data. For the energy sector, only some of the public transportation systems for which data was available were calculated.

In the subsequent plan for 2024 and beyond, GHG emission reduction targets are only shown for the forest and waste sectors combined, with a reduction target of 17.54% in 2024 compared to the previous year.

Table 2-3 Issues and approaches for GHG emission reduction in Bandung City

Category	Contents
Transportation	Issues: Increased use of private vehicles and lack of use of alternative energy sources Approaches: Reduce vehicle derived GHG emissions by easing traffic congestion, improving bicycle paths and sidewalks, and promoting the use of public transportation
Energy	Issues: Increase in electricity consumption Approaches: Reduce electricity consumption, use of biogas
Industry	Issues: Use of coal and diesel Approaches: Conversion of industrial waste to energy
Waste	Issues: Increase in waste volume, inadequate treatment systems Approaches: Utilization of waste-derived energy, regulation of waste disposal
Agriculture, livestock	Issues: heavy use of fertilizers, unmanaged livestock waste Approaches: breed improvement, waste treatment facilities and compost use
Land utilization, green space	Issues: Urban expansion and decrease in green space Approaches: Secure public green space

Source: Materials provided by Bandung City

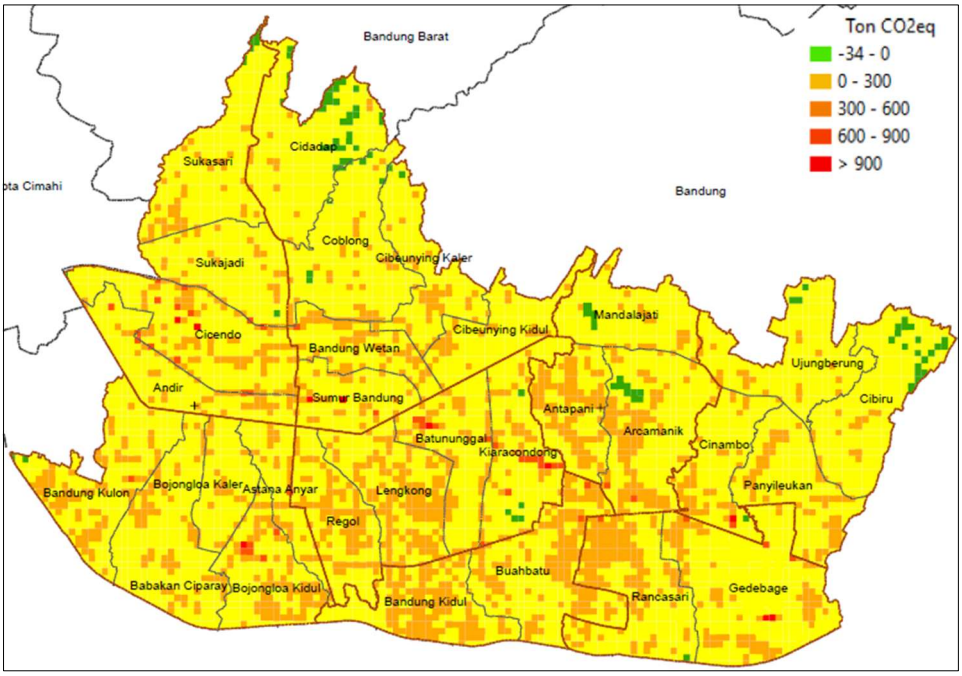


Figure 2-2 Distribution of GHG emissions in Bandung City

Source: Bandung City

Chapter 3 Formation of JCM Model Projects in Building Sector

This project aims to introduce BEMS (Building Energy Management System), which uses IoT technology to control equipment and optimize the indoor environment and energy performance, to the facilities in Bandung, as a technology that contributes to GHG reduction in the building sector. It is generally said that it is possible to reduce energy consumption by about 5 to 7% by introducing BEMS. At the same time, updating high-efficiency equipment is contributed to reduce the overall energy consumption of the building by measuring, visualizing, and optimizing energy usage through the introduction of BEMS. In this study, we examined the possibility of introducing BEMS for air conditioning equipment, which consumes a large proportion of energy, among building equipment.

In the second year of this project (FY2022), we conducted screening surveys of centrally air-conditioned facilities to estimate energy savings and GHG reductions by focusing on improving the efficiency of the heat source control system, which accounts for the majority of energy consumption by air conditioning, and to study its contribution to building energy management. Specifically, among commercial facilities with central air conditioning systems in Bandung, we selected five facilities from 15 candidates that are large in scale, have long operating hours, and are expected to have relatively high air conditioning loads, and conducted screening surveys.

This year, based on the results of screening survey, we selected two facilities for detailed surveys, Bandung Indah Plaza (shopping mall) and Trans Studio Bandung (amusement park), after consulting with the companies that own the facilities, to obtain energy consumption data by installing measurement equipment. The feasibilities of implementation through the JCM Model Projects were examined. The flow of the survey in the building sector is shown in the figure below.

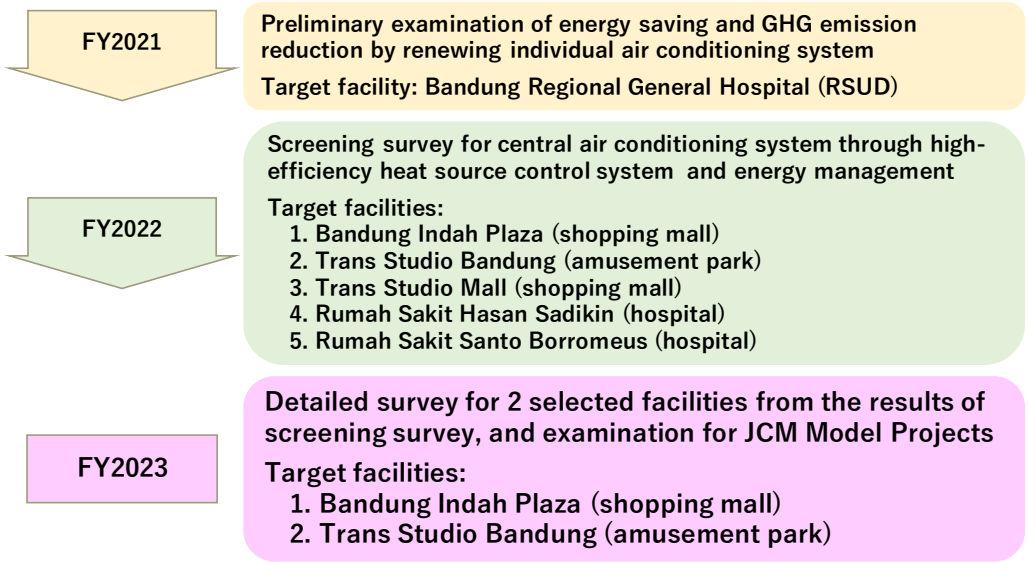


Figure 3-1 Survey flow (building sector)

Source: Study team

3.1 High-Efficiency Air Conditioning System and Energy Management

3.1.1 Overview

Targeting Bandung Indah Plaza (shopping mall) and Trans Studio Bandung (amusement park) in Bandung City, energy consumption data was acquired and analyzed to identify energy conservation measures and facilities proposed for installation, and the feasibilities of implementation through the JCM Model Projects were examined.

3.1.2 Target Facilities

The table below shows an overview of target facilities.

Table 3-1 Target facilities

Bandung Indah Plaza		
Type: Completed: Owner: Floor Level: Total floor area: Air conditioning system:	Shopping mall 1990 Lippo Group 4 floors 75,868 m2 Water-cooled Renovations are underway as needed.	
Trans Studio Bandung		
Type: Completed: Owner: Total floor area: Air conditioning system:	Amusement Park 2001 PT. Para Bandung Propertindo (under CT Corporation) 170,000 m2 Air-cooled	

Source: Study team

The results of the screening survey (FY2022) are shown in the table below. Energy conservation and GHG emission reductions are expected through equipment installation and energy management. And the facility-owning companies are highly interested in energy conservation.

Table 3-2 Results of screening survey

Bandung Indah Plaza（shopping mall）	
Proposed facilities	VWV control: “savic-net G5 (Azbil Corporation)” controls the followings, ・ Primary pumps ・ Condensate pumps ・ Cooling tower
Electricity reduction	158.4 MWh/year
GHG reduction	133.05 t-CO2/year

Trans Studio Bandung（amusement park）	
Proposed facilities	VWV control: “savic-net FX (Azbil Corporation)” controls the following, ・ Primary pumps
Electricity reduction	243.9 MWh/year
GHG reduction	204.87 t-CO2/year

Source: Study team

3.1.3 Results of Detailed Survey

（1） Current Status and Issues

In the detailed survey, after preliminary check of the facilities at the site in November 2023, measurement equipment was installed in December of the same year to acquire and analyze actual measurement data. Below are the current facilities and issues obtained from the detailed survey.

Table 3-3 Current status and issues

Bandung Indah Plaza	
Current facilities	
 Chiller (Introduced in 2011)	 Primary pump
 Condensate pump	 Pump control panel
Operational status	・ All equipment is manually operated on site by operators. ・ Operating hours are from 10:00 to 21:00 (same on weekdays and weekends) ・ 320 operating days per year (estimated)
Issues	・ Chiller and pump (outdoors): The water temperature is set at 5.5 to 6.5 degrees and the pump is operating at a high load. The pumps are operating at their initial settings at the time of installation, and there is a possibility that excess water is being pumped. ・ Air conditioner (indoor): The two-way valve that adjusts the flow of chilled water is missing or not working properly, causing the chiller to consume more chilled water than necessary, leading to deterioration of the chiller's operating efficiency.

Trans Studio Bandung	
Current facilities  Chiller unit  Primary pump  Pump control panel	
Operational status	・ All equipment is manually operated on site by operators. ・ Operating hours are from 9:30 to 17:00 (same on weekdays and weekends) ・ 300 operating days per year (estimated)
Issues	・ Chiller and pump (outside): The pumps are operating at their default settings at the time of installation, and there is a possibility that excess water is being pumped. ・ Air conditioner (indoor): The end differential pressure is not being measured or monitored.

Source: Study team

（2） Proposed Measures and Facilities for Bandung Indah Plaza

1） Excessive load on chiller

The water supply temperature is currently set at a low temperature of 5.5 to 6.5 degrees, and the chiller is operating under high load. As a countermeasure, it is thought to be effective to change and adjust the set value of the water supply temperature to bring it closer to the optimal operation for the chiller. The chiller water supply temperature setting will be gradually set from 5.5 degrees or 6.5 degrees to closer to 7.5 to 8.0 degrees while monitoring the load return temperature, and the measures to do are as follows.

[Proposed measures]

1. Install a temperature sensor on each of the return piping routes (total of 3 systems) from the load side (air conditioner) and measure the return temperature.
2. Check the daily trend, and if the return temperature is not extremely high, gradually ease the chiller water supply temperature setting manually.

The facilities required for the above is as follows.

[Proposed facilities]

- Temperature sensor (3 piping systems)
- Wiring and piping work
- Touch panel for monitoring
- Controller, control panel

Through the above measures, it is possible to expect a reduction in electricity consumption of approximately 28.5 MWh/year.

2） Excess water flow from pump

The system is being operated with the initial settings at the time of installation and may be supplying excess water. Since the air conditioner does not have a two-way valve installed, it is difficult to optimize the water supply amount, and it will be excluded from this study.

3） Air conditioner flow rate adjustment

There is no two-way valve to adjust the flow rate of chilled water, or it is not working properly, more chilled water is consumed than necessary, leading to a deterioration in the operating efficiency of the chiller. A possible countermeasure would be to install two-way valves in all individual air conditioners (30 units in total), but this will be excluded from this study as the existing air conditioning circuit is complex and estimation is difficult at this time.

（3） Proposed Measures and Facilities for Trans Studio Bandung

1） Excess water flow from pump

The system is being operated with the initial settings at the time of installation and may be supplying excess water. As a countermeasure, it is considered effective to install an additional pump inverter unit, determine the load trend, and reduce the pump output within a range that does not cause a chilled water shortage. The proposed measures are as follows.

[Proposed measures]

1. Added return temperature from load and temperature measurement at each chiller inlet.
2. Add or update inverter unit (VSD) to each pump
3. Perform VSD proportional control using temperature load. When the load is low, a signal to reduce the number of pumps is output.

The facilities required for the above is as follows.

[Proposed facilities]

- Temperature sensor
- Wiring and piping work
- Pump inverter unit
- Controller, control panel

Through the above measures, it is possible to expect a reduction in electricity consumption of approximately 121.3 MWh/year.

2） Measurement of terminal differential pressure

There is a possibility of further energy saving control by installing a terminal differential pressure sensor, but it is excluded from this study because it is not possible to conduct detailed verification of the existing piping circuit and it is difficult to identify points near the terminal.

3.1.4 Examination for JCM Model Projects

（1） GHG Emission Reductions

The table below shows the estimated reductions in electricity consumption and GHG reductions obtained from the detailed surveys of the two facilities.

Table 3-4 Electricity consumption reduction and GHG reduction

	Electricity consumption reduction (MW/year)	Electricity rate reduction*1 (yen/year)	GHG reduction*2 (t-CO2/year)
Bandung Indah Plaza	28.5	365,376	24.8
Trans Studio Bandung	121.3	1,552,614	105.5

*1 : Unit price of electricity: 1kWh=Rp.1,445=approx. 12.8 yen (data from PLN, as of March 2022)

*2 : CO2 emission coefficient of electricity = 0.87 t-CO2/MWh (Table 2-1 Indonesia (Energy Conservation) of the JCM Model Projects in FY2023 (as of March 27, 2023 (public notice)), No. 22 Jamali Electric Power Co. System, Jawa Barat Area, Case 1)

Source: Study team

（2） Possibility of Introducing the Proposed Facilities

From the above results, it was confirmed that a certain amount of GHG reduction can be expected by installing temperature sensors and monitoring equipment at both facilities. The introduction of relatively small-scale equipment will definitely lead to a reduction in electricity bills, and the benefits for facility owners are clear, so the hurdles to introducing equipment are low, and future additions can be made using the installation of this equipment as a first step. We can also expect the introduction of new equipment and expansion to other facilities.

3.1.5 Examination for JCM Model Projects

（1） Cost Effectiveness

The table below shows the results of cost-effectiveness and payback period estimates for the JCM Model Projects, assuming a subsidy rate of 30% and a statutory useful life of 15 years.

Table 3-5 Cost effectiveness and payback period

	Cost effectiveness*1,2 (yen/t-CO2)	Payback period (years)
Bandung Indah Plaza	2,255	2.3
Trans Studio Bandung	2,300	2.3

*1 : Subsidy rate for JCM Model Projects = 30% (Subsidy rate based on the actual results of adoption in each partner country, which is shown in Attachment 3, Classification of Similar Technologies in the Global Environment Centre's "Guidelines for Publicly Inviting Applications for the Subsidy for Carbon Dioxide Emission Control Measures Projects (Subsidy for Equipment in the Bilateral Credit System Financial Support Project) for Fiscal Years 2005 to 2025" (April 6, 2023). (The subsidy rate = upper limit of 30% (4 projects or more)

*2 : Assuming legal useful life = 15 years (Source: "Useful Life Table of Major Depreciable Assets," National Tax Administration Agency)

Source: Study team

Based on the above results, the two facilities meet the application requirements for the JCM Model Projects in terms of cost effectiveness (approximately 4,000 yen/t-CO2 or less). On the other hand, the payback period is set at three years or more as an application requirement, and this project is evaluated to not meet the application requirements. However, it is thought that there is possibility to further improve energy savings and GHG emission reduction effects from a long-term perspective by considering future equipment introduction and renewal.

For example, Trans Studio Bandung is using an old chiller that was installed in 2011, and by updating it to a high-efficiency chiller, further energy savings can be expected. Since this is a large investment, there is a possibility that it could be implemented in the future through a JCM Model Project by introducing high-efficiency equipment in time for equipment renewal. For Bandung Indah Plaza, it would be effective to install motor valves on the chilled water coils of individual air conditioners and add valve opening control based on temperature, but there are 30 air conditioners and the existing air conditioning circuit is complicated. Therefore, it was difficult to make an estimate at this point. In the future, if it becomes possible to carry out a detailed survey after discussions with facility owners, it is expected that even more effective projects will be implemented.

（2） Implementation Structure

The following figure shows a proposed implementation structure in the case where the proposed project is implemented using the JCM Model Projects. When forming an international consortium as the project implementer, the representative participant will be Azbil Corporation, the parent company of PT. Azbil Berca Indonesia. The representative participant will manage the JCM Model Project and report the results of monitoring. The partner participant will be a local company that owns the facility and will purchase the equipment from PT. Azbil Berca Indonesia. In addition to installing the equipment, PT. Azbil Berca Indonesia will carry out periodic inspections.

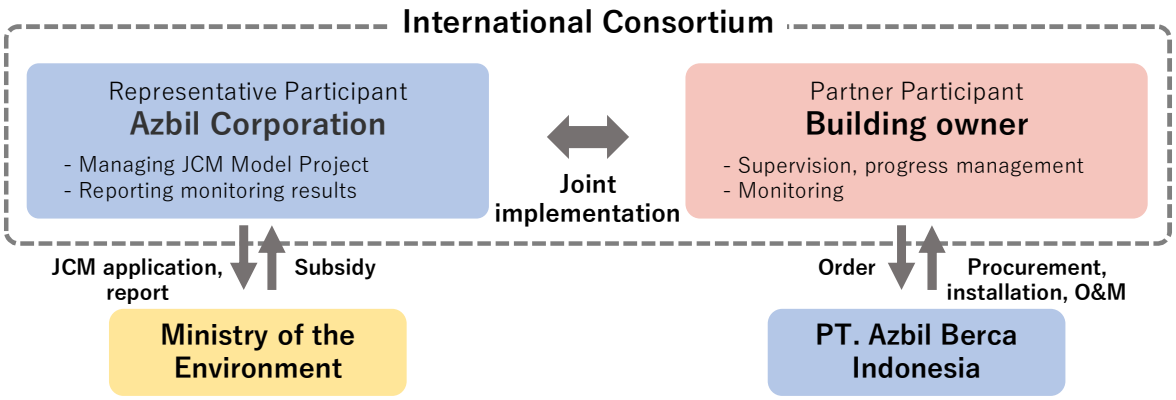


Figure 3-2 Implementation structure

Source: Study team

（3） Implementation Schedule

The following figure shows the proposed schedule for the implementation of the JCM Model Project from application to completion after the completion of this city-to-city collaboration project. 6 months are expected to be required after the completion of this project in March 2024 for the conclusion of the international consortium agreement and preparation of application documents, and the application for the JCM Model Project is expected to be submitted in September 2024.

	2024												2025					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
City-to-City Collaboration Programme FY2023	→	→	→															
Application period of JCM Model Projects				←	-	-	-	-	-	-	→							
Preparation/submission of JCM applications				→	→	→	→	→	▲									
Selection of JCM Model Projects												▲						
Notification of subsidy, contract													▲					
Procurement, construction														→	→	→		
Test run, adjustment																→	→	
Beginning of commercial operation																		▲

Figure 3-3 Implementation schedule

Source: Study team

（4） Issues and Future Approaches

The results of the above survey revealed that the installation of the proposed facilities and energy management in Bandung Indah Plaza and Trans Studio Bandung would reduce electricity consumption and GHG emissions. In order to implement the projects as JCM Model Projects, detailed study is required to ensure the feasibility of the project. In order to realize the projects, the cooperation of the facility-owning company that will be the joint as partner participant of the international consortium is necessary, and in particular, it is considered necessary to reach an agreement not only among the facility-owning company but also among the group companies regarding the financing of capital investment.

Based on interviews with the owners of Trans Studio Bandung, we have learned that they wish

to conduct detailed energy conservation surveys at other facilities owned by group companies, including hotels and shopping malls, and we expect that the implementation of the project at this facility will serve as a foothold for horizontal expansion to other facilities.

3.2 Summary of Building Sector

The following figure shows the details of the three-year activities in the building sector of this project, which started in 2021.

As support through city-to-city collaboration, knowledge sharing was conducted on the systems and policies of Indonesia and Bandung City, and Japan and Kawasaki City related to green buildings. Bandung City is one of the leading cities in Indonesia in developing green building standards, and in line with the National Green Building Guidelines published in 2015, Bandung City issued the Comprehensive Mayor Regulation No. 1023/2016 on Green Buildings (Bandung Mayor Regulation No. 1023/2016 on Green Building) and a new administrative decree (Ministry Regulation No. 21/2021) in 2021. Based on this new administrative decree, evaluation standards and certification systems for green buildings are being prepared. High-efficiency facilities and energy management, which were discussed in this project, are also required to be considered from the construction planning stage, and further promotion of their introduction is expected in the future.

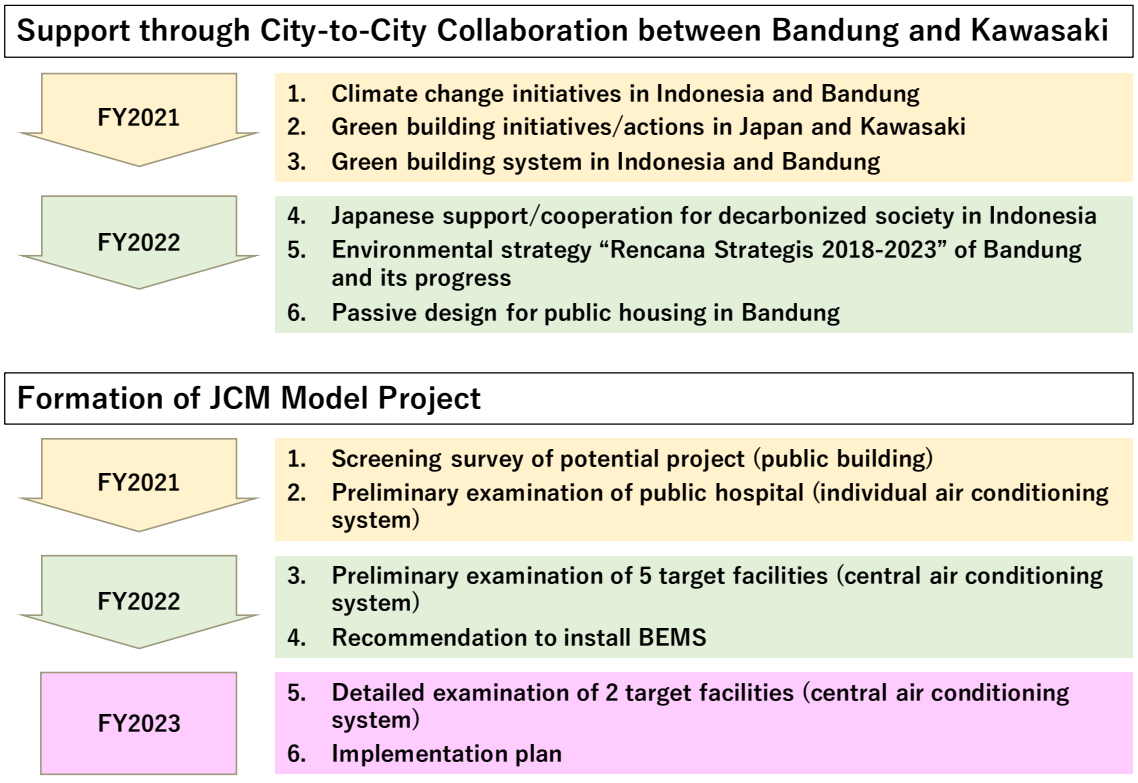


Figure 3-4 Summary of building sector

Source: Study team

As for the formation of JCM Model Projects, in the first year, we confirmed that high-efficiency equipment contributes to GHG emission reductions through estimates based on the assumption that the air conditioning equipment (individual air conditioning system) at the Bandung City Regional General Hospital would be upgraded. In the second year of the study, we focused on the improvement of the efficiency of the heat source control system, which accounts for most of the energy consumption by air conditioning system, and energy management in a facility with a central air conditioning system and estimated the amount of electricity and GHG emission reductions. In the feasibility study, an ESCO business scheme was also examined to reduce the burden on facility-owning companies, including the initial investment, with regard to financing, which is an issue in project implementation. In the final year, two facilities with high business potential and high interest in energy conservation among facility-owning companies were selected for detailed survey, and the feasibility of implementation through the JCM Model Project was examined.

At the facilities targeted by this project, appropriate operational adjustments have not been made to the equipment, and the equipment is either operated with the initial values at the time of installation or is only turned on and off at preset values, and energy management is not being implemented. It was confirmed that the effectiveness of energy saving would be increased by introducing this system. The fact that we were able to confirm the energy saving and GHG emission reduction effects of high-efficiency equipment and energy management in Bandung City, where the air conditioning load is relatively low due to its cool climate, suggests that it is likely to be introduced in other regions as well. It is expected that horizontally deploying the results of this study and business model to other similar facilities and other regions will lead to a decarbonization domino.

Chapter 4　Formation of JCM Model Projects in Transportation Sector

Bandung City is an eco-city along with Solo City and Denpasar City, where the Indonesian government is implementing a pilot project and is progressing with the conversion of streetlights to LED lights. This project aims to introduce smart LED streetlights that can control and manage illuminance and have higher energy-saving effects, in line with the renewal of streetlights being promoted by Bandung City. Smart LED streetlights reduce power consumption by adjusting the on/off time and illuminance and can centralize maintenance and management tasks through IoT networking, making it a product that is expected to reduce maintenance costs by increasing efficiency and avoiding breakdowns.

In the first and second year of this project, we researched the current status and plans of LED streetlights installation being promoted in Bandung City, and estimated the electricity consumption reduction and GHG reduction effects if LED streetlights is promoted in accordance with the plans. According to the interview with Bandung City, the latest target for the entire city is 68,984 streetlights, and 51,358 streetlights have been installed by the end of 2022, with a target of 58,762 to be installed by the end of 2023. In contrast, 606 streetlights were actually budgeted for in 2023 and 1,107 in 2024. In addition, all new streetlights installed after 2022 are LED. On the other hand, the current LED streetlights do not have dimming functions and smart functions to control and centrally manage the illumination of streetlights via wireless communication. In this fiscal year's survey, the possibility of implementation through the JCM Model Projects was examined by simulating the installation intervals and illumination intensity of LED streetlights on roads in the Cibeuying area, which was identified as a priority area for LED streetlights installation by Bandung City. The flow of the study in the transportation sector is shown in the figure below.

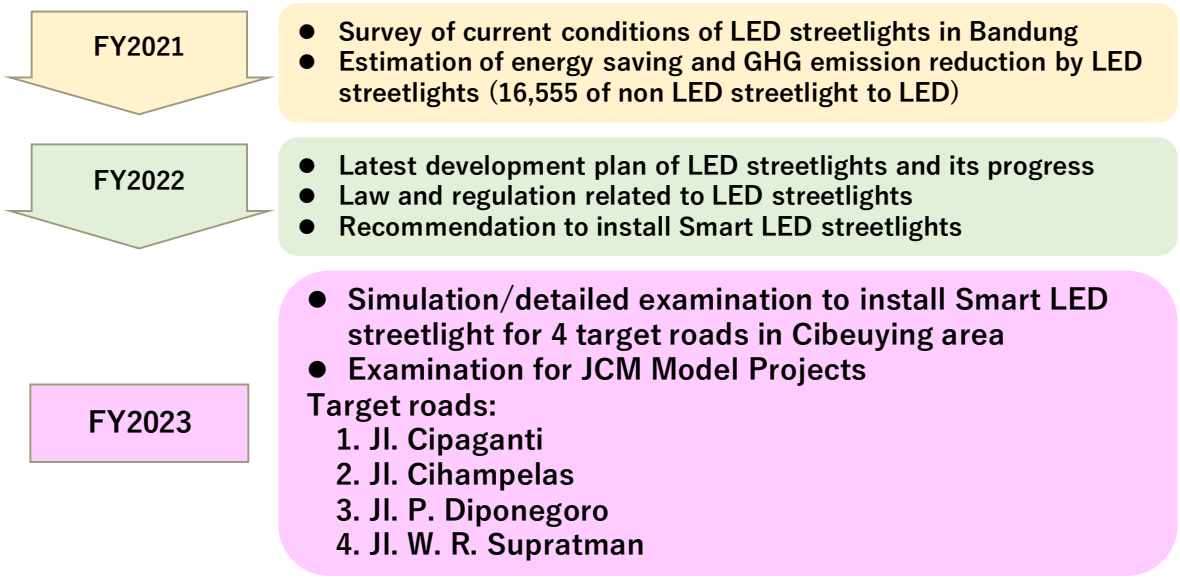


Figure 4-1　Survey flow (transportation sector)

Source: Study team

4.1 Introduction of Smart LED Streetlight

To estimate the reduction in electricity consumption and GHG emissions, simulations were conducted on the installation intervals and illumination of the proposed LED streetlights for four roads in Cibeuying district in Bandung, and to study the feasibility of the project through the JCM Model Projects.

4.1.1 Target Roads

The location of the target roads is shown in the figure below and a summary of each road is shown in the table below.

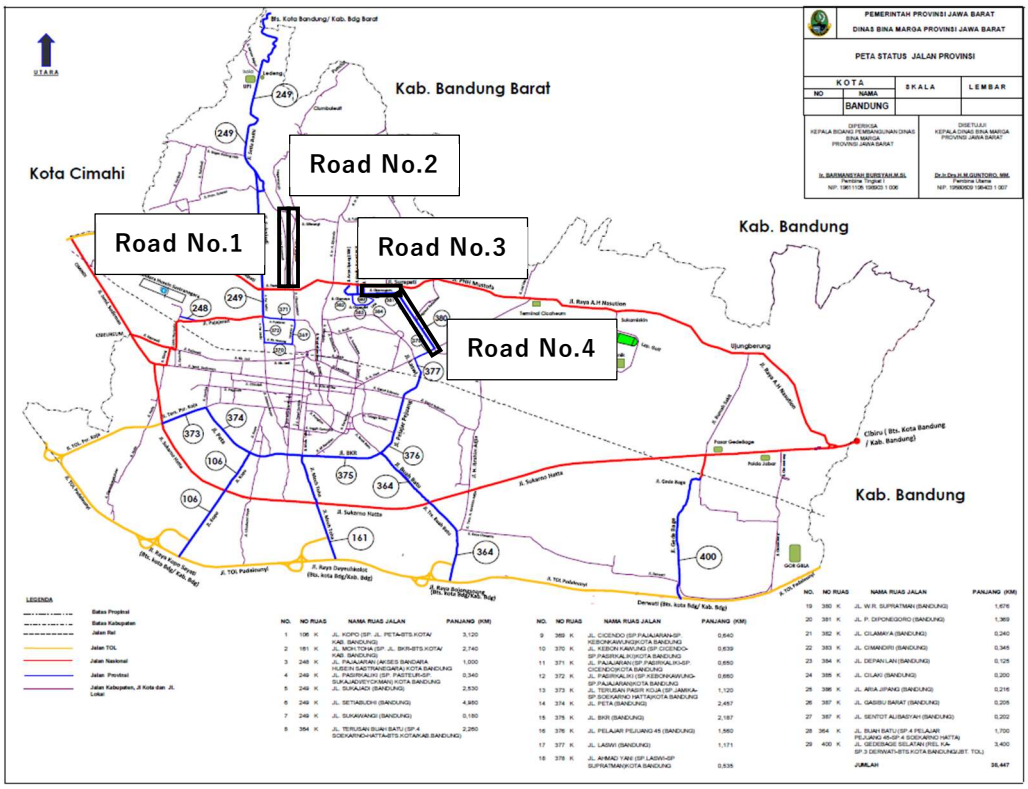


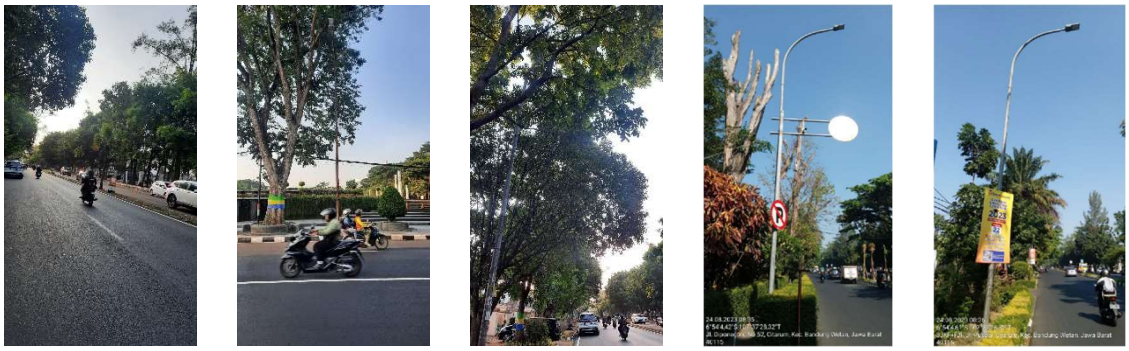
Figure 4-2 Location of roads

Source: Materials provided by Bandung City

Table 4-1 Overview of target roads

Road No.1	Jl. Cipaganti
Type:	Prefectural and city road
Road length:	1.9 km
Road width:	7 m
Number of lanes:	2 lanes (1 lane on each side)
Median strip:	None
Current status:	・ There are streetlights with a mixture of regular lamps and LEDs. ・ Tall trees on both sides of the road partially obstruct streetlights. ・ Public bus route
Photo (study team and Bandung City)	   

Road No.2	Jl. Cihampelas
Type:	Prefectural and city road
Road length:	2.5 km
Road width:	7 m
Number of lanes:	2 lanes (1 lane on each side)
Median strip:	None
Current status:	・ There are streetlights with a mixture of regular lamps and LEDs. ・ There are narrow sidewalks on both sides of the road and dense buildings along the road.
Photo (study team and Bandung City)	   

Road No.3	Jl. P. Diponegoro
Type:	State road
Road length:	1.3 km
Road width:	14 m
Number of lanes:	2 lanes (2 lanes on each side)
Median strip:	Yes (approx. 1 m)
Current status:	・ There are streetlights with a mixture of regular lamps and LEDs. ・ There are tall trees on both sides of the road, partially obstructing the streetlights. ・ Located in the center of Bandung City working 24 hours a day, and there are many students.
Photo (study team and Bandung City)	
Road No.4	Jl. W. R. Supratman
Type:	State road
Road length:	1.6 km
Road width:	14 m
Number of lanes:	2 lanes (2 lanes on each side)
Median strip:	Yes (approx. 1 m)
Current status:	・ There are streetlights with regular lamps. ・ There are tall trees on both sides of the road and in the median, which obstruct some of the streetlights. ・ Located in the center of Bandung City working 24 hours a day, and there are many students.
Photo (study team and Bandung City)	

Source: Study team

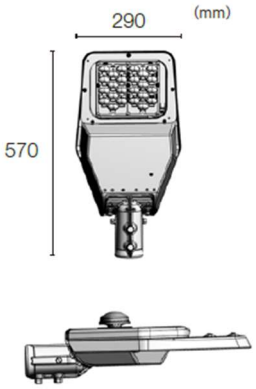
4.1.2 Proposed Facilities and Technologies

（1） LED Streetlights

The specifications of the LED streetlights proposed for installation are shown in the table below. The proposed LED streetlights are manufactured by MinebeaMitsumi Inc. It uses a lens based on a proprietary optical design, and by adjusting the mounting angle, it is possible to reduce light leakage, limit the direction of illumination, and optimize luminance and luminous intensity. It is also characterized by its large uniformity, enabling uniform brightness on road surfaces.

Table 4-2 Specifications of proposed LED streetlights

Power Consumption	58W
Rated Luminous Flux	8,400 lm
Correlated Color Temperature CCT	5,000 K
Color Rendering Index CRI	Ra 70
LED Module Life Span	60,000 hours (30 degrees, 80% luminous flux maintenance)
Light Distribution Type	Cutoff type (IES Type I)
Input Voltage	AC100V-242V, 50Hz/60Hz
Weight	5.9 kg
Protection Class	IP65 (Japan), IP66 (outside Japan)
Operating temperature range	Minus 20 to 50 degrees
Lightning surge resistance	15 kV (common mode)



Source: MinebeaMitsumi Inc.

（2） Dimming Function, Wireless Network

In addition to the high illumination rate, the proposed product achieves further energy savings through dimming. For Bandung City, an average dimming rate of 70% is proposed as shown in the figure below, and the combination of LED lamps and dimming can achieve a power reduction of approximately 30% compared to LED lamps only.

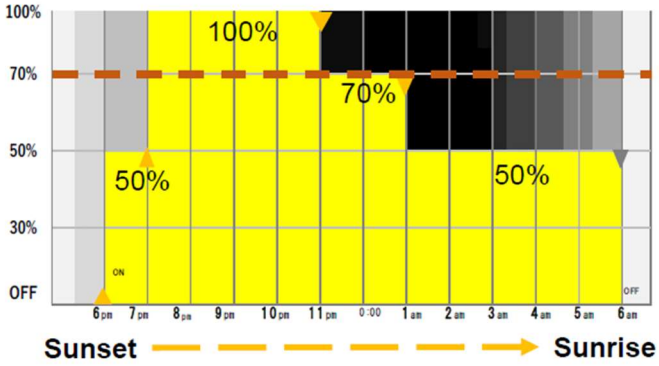


Figure 4-3 Example of dimming pattern (average dimming rate 70%)

Source: MinebeaMitsumi Inc.

By building a wireless network (6LoWPAN) with the installation of nodes and gateways, it is possible to control the turning on/off of streetlights, dimming control, and scheduling control. This will enable an accurate understanding of electricity consumption and further energy savings.

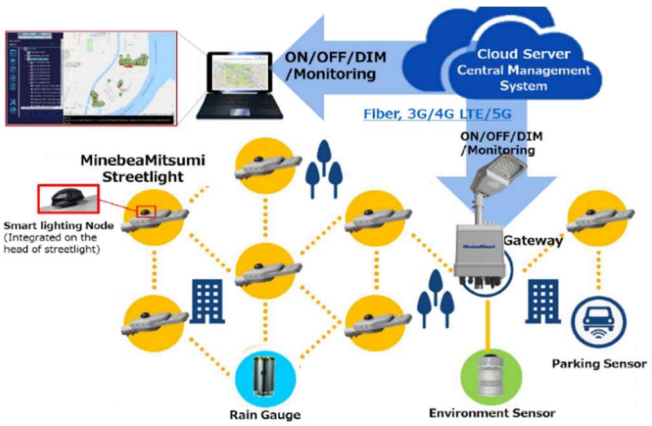


Figure 4-4 Image of wireless network

Source: MinebeaMitsumi Inc.

In Cambodia, MinebeaMitsumi Inc. already has experiences to install LED streetlights through the JCM Model Projects, and more than 20,000 LED streetlights in Phnom Penh, Siem Reap, and other cities. The company plans to expand its business in Indonesia as well and is currently preparing to obtain the necessary certification and to list its products in the E-catalog.

4.1.3 Results of Simulation

For the simulation, the current road conditions and prerequisites were set by collecting and confirming information through materials provided by the Department of Transportation, workshops with Bandung City, individual discussions with the Department of Transportation, and field surveys. The current status of road lights is shown in the table below.

Table 4-3 Current status of roads and streetlights

Current condition of road:	Road length (m)	Road width (m)	Number of lanes	Median strip	
1. Jl. Cipaganti	1,900	7	2	None	
2, Jl. Cihampelas	2,500	7	2	None	
3. Jl. P. Diponegoro	1,300	14	4	1m	
4. Jl W. R. Supratman	1,600	14	4	2m	
Current status of streetlights:	Number of lights	Installation interval (m)	Height (m)	Type	Installation location
1. Jl. Cipaganti	35	54	11	1 light	one side
2, Jl. Cihampelas	42	59	11	1 light	one side
3. Jl. P. Diponegoro	24	54	11	1 light	offset
4. Jl W. R. Supratman	18	36	11	1 light	offset

Source: Study team

In order to consider the equipment and arrangement to be adopted based on the current situation, we verified the illuminance when setting the power consumption to 58W and the installation spacing to 30m and to the power consumption to 74W to the installation spacing to 35m on Cipaganti Road. The height of the road light poles was set at 11m, the same as the current situation. The results are shown below.

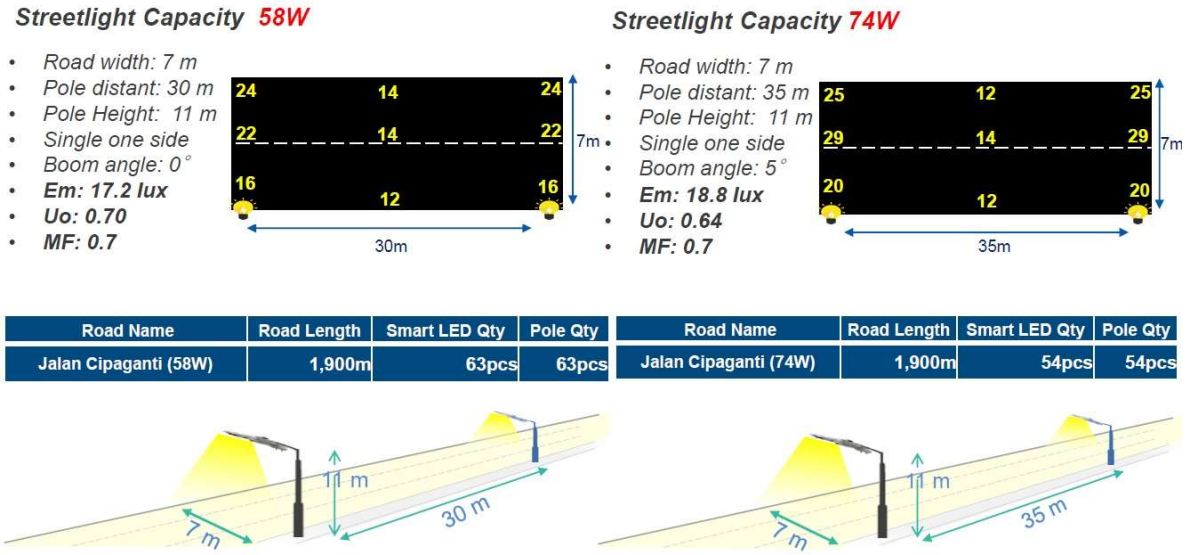


Figure 4-5 Example of simulation results

Source: MinebeaMitsumi Inc.

Based on the above simulation, the conditions for installing 58W and 74W products on each road were set as follows. Trial calculations of electricity consumption were conducted for 58W and 74W products for a total of 4 cases with average dimming rates of 100% (no dimming) and 70%.

Table 4-4 Assumptions for simulation and estimation

	Number of lights	Installation interval (m)	Height (m)	Type	Installation location
1. Jl. Cipaganti	63	30	11	1 light	one side
2, Jl. Cihampelas	83	30	11	1 light	one side
3. Jl. P. Diponegoro	87	30	11	1 light	offset
4. Jl W. R. Supratman	107	30	11	1 light	offset
	Power Consumption	Arm length (m)	Swing angle (degree)	Illuminance avg. (lx)	Uniformity (Uo)
1. Jl. Cipaganti	58W	1.0	0	16.9	0.70
2, Jl. Cihampelas	58W	1.0	0	16.9	0.70
3. Jl. P. Diponegoro	58W	1.5	0	19.8	0.67
4. Jl W. R. Supratman	58W	1.5	0	19.5	0.67

Source: Study team

The table below shows the current electricity consumption and the estimated electricity consumption based on the assumptions used in the simulation. The current electricity consumption provided by Bandung City (*1 in the table below) is an overestimated value and is assumed to include not only the use by streetlights, but also stolen electricity and use for other purposes. Therefore, this study estimated the electricity consumption of the current road lamps assuming that regular lamps (HPS 250W, halogen lamps) are used (*2 in the table below) and added for comparison. It was confirmed that power consumption could be reduced in all cases, and the Department of Transportation responded that the 58W, 70% case was the most suitable.

Table 4-5 Electricity consumption of streetlights

Unit: MWh/year

	Current status*1	HPS 250W*2	58W (100%)	58W (70%)	74W (100%)	74W (70%)
1. Jl. Cipaganti	10,842	38.5	16.0	11.2	17.5	12.3
2, Jl. Cihampelas	1,369	46.0	21.1	14.8	23.3	16.3
3. Jl. P. Diponegoro	1,275	26.3	22.1	15.5	24.0	16.8
4. Jl W. R. Supratman	2,960	48.2	27.2	19.0	29.8	20.9
Total	16,446	158.8	86.4	60.5	94.6	66.3

Source: Study team

4.1.4 Examination for JCM Model Projects

Previous simulations have confirmed that replacing current streetlights with dimmable LED streetlights can reduce GHG emissions.

From the viewpoint of the JCM Model Projects, there is a track record of installing LED

streetlights in the Karawang International Industrial City in Indonesia and Cambodia, and its effectiveness has been confirmed. However, in these cases, high-pressure sodium lamps, which were commonly used in the past, were set as the reference technology for cost-effectiveness calculations. On the other hand, in Bandung City, LED streetlights will be the standard for products introduced in the future as a measure. In that case, the reference for calculating the cost-effectiveness of LED streetlights with a dimming function will be LED streetlights that already have a certain level of energy savings, and the cost-effectiveness will be limited compared to the previous two cases. It is assumed that it will be difficult to meet the application requirements for the JCM Model Projects.

However, since the GHG reduction effect of updating the currently installed streetlights to the proposed product is significant, the amount of reduction is calculated below.

（1） GHG Emission Reductions and Cost-Effectiveness

As a result of the simulations and discussions with Bandung City, it was concluded that the 58W (70%) case is the suitable proposal for Bandung City out of the four cases that were simulated. The table below shows the estimated results of the electricity consumption reduction and GHG reduction of the 58W (70%) case.

Table 4-6 Electricity consumption reduction and GHG reduction

	Electricity consumption reduction (MWh/year)	Electricity rate reduction*1 (yen/year)	GHG reduction*2 (t-CO2/year)
1. Jl. Cipaganti	27.1	347,162	23.6
2, Jl. Cihampelas	31.2	399,744	27.2
3. Jl. P. Diponegoro	10.8	138,355	9.4
4. Jl W. R. Supratman	29.2	373,151	25.4
Total	98.3	1,258,412	85.5

*1 : Unit price of electricity: 1kWh=Rp.1,445=approx. 12.8 yen (data from PLN, as of March 2022)

*2 : CO2 emission coefficient of electricity = 0.87 t-CO2/MWh (Table 2-1 Indonesia (Energy Conservation) of the JCM Model Projects in FY2023 (as of March 27, 2023 (public notice)), No. 22 Jamali Electric Power Co. System, Jawa Barat Area, Case 1)

Source: Study team

（2） Possibility of Introducing the Proposed Facilities

Regarding the introduction of LED streetlights with dimming function, in Bandung City, where LED streetlights are the reference for calculating cost effectiveness as a JCM Model Project, it is difficult to meet the application requirements for the JCM Model Project. It was confirmed that there is a large GHG reduction effect compared to the current situation. In addition, the electricity consumption that Bandung City currently knows is excessive considering the current condition of streetlights, and it is assumed that there is a possibility of electricity theft. Updating the system can also be expected to have the effect of accurately understanding power consumption and improving administrative management capabilities. Furthermore, the proposed facility enables centralized

control through wireless networking, and by installing various environmental sensors as ancillary equipment, it is possible to collect data efficiently over a wide range, which not only has a GHG reduction effect, but also has the ability to monitor air quality, etc. It is also expected to improve urban management by understanding environmental and traffic data.

Against this background, it can be said that the introduction of smart LED streetlights will be beneficial for Bandung City from the standpoint of both reducing GHG emissions and improving urban management. Possible methods of introduction include smart LED streetlights alone, aiming to be adopted by participating in bidding when road lights are installed, and smart city systems in the environment and transportation fields that consist of various monitoring surveys through networking. Therefore, it may be possible to consider introducing this system in cooperation with support projects from other organizations such as JICA, the Ministry of Land, Infrastructure, Transport and Tourism, and the Ministry of Economy, Trade and Industry.

（3） Issues and Future Approaches

Since the installation of streetlights will be implemented as a public project regardless of whether it is implemented through the JCM Model Projects, the requirements for Japanese companies in public procurement have already been examined in the survey of second year. On the other hand, challenges remain in securing the budget for the Bandung City. Specifically, it is necessary to keep in mind that the most recent annual budget of the Department of Transportation is small and the cycle of securing budgets each year. According to interviews with the Department of Transportation, the Department of Planning is in charge of budget requests, and it is not easy to reflect the requests of the Department of Transportation, and budget increases have not been realized. We also asked the Department of Transportation about the possibility of securing a joint budget with other departments to implement the project, but the possibility was unknown. In order to secure a budget, it is necessary to determine the target roads and outline specifications of the LED streetlights to be installed and submit an application to the Department of Planning two years prior to the implementation of the project. By then, the proposed system must have obtained the necessary certifications and be listed in the E-catalog to participate in the bidding process.

In order to introduce the proposed system in Bandung, the products and companies must be certified and registered in accordance with Indonesian laws and regulations. The relevant legislation was compiled in the survey of second year. The table below shows the necessary procedures from the perspective of introducing the proposed system, based on interviews with the Department of Transportation.

Table 4-7 Certifications and registrations required for LED streetlights

(1) Percentage of products produced in Indonesia (TKDN: Tingkat Komponen Dalam Negeri)
Jurisdiction: Ministry of Industry of Indonesia Time required for procedures: Application - about 2 months (in longer cases, it may take up to 1 year) ・ The required TKDN for LED streetlights is 40% or more. ・ In addition to the raw materials of the product, labor and overhead costs are also considered in the calculation of TKDN.
(2) Certificate of registration as a provider of road materials and equipment (TDBUPBPJ: Tanda Daftar Badan Usaha Penyedia Bahan Perlengkapan Jalan)
Jurisdiction: Ministry of Transportation of Indonesia Time required for processing: Application - about 2 months ・ The certificate of company registration is required for companies that manufacture products related to transportation infrastructure. ・ All Indonesian companies involved in the manufacture of products are required to register.
(3) Indonesia National Standard (SNI: Standard National Indonesia)
Jurisdiction: Ministry of Industry of Indonesia Time required for procedure: Application - about 2 months ・ The SNI certification certifies that the product meets Indonesian standards (SNI certification) and is applicable throughout Indonesia.
(4) Electronic Catalog System (E-catalog)
・ This is a website used by government agencies and others to procure products and services, and includes product names, specifications, prices, TKDNs, etc. (https://e-katalog.lkpp.go.id/) ・ All products purchased by Bandung City (public procurement) must be listed in the E-catalog.
Remarks
・ The order of the procedures is as follows: (1) TKDN is required first, and (2) TDBUPBPJ and (3) SNI procedures can proceed at the same time. ・ The procedures (1), (2), and (3) are required for public projects and are not necessary for private projects.

Source: Study team

4.2 Summary of Transportation Sector

The figure below shows the three-year efforts in transportation sector of the project, which began in 2021. The support through city-to-city collaboration focused on air pollution, one of the themes of the MOU between Kawasaki City and Bandung City, and its causing factor, traffic congestion. In this project, the current situation in Bandung City was assessed, and knowledge was shared about the measures and efforts being taken in Japan and Kawasaki City to improve traffic congestion and the implementation of air quality monitoring. Regarding air quality monitoring, with the cooperation of a company in Kawasaki City, the project team introduced the system actually introduced in Kawasaki City, and also identified issues and suggestions for improvement of the monitoring system in Bandung City. Although Bandung City has been implementing air quality monitoring in accordance with national regulations and standards, there are concerns about the validity of the measured values due to the small frequency and number of measurement points, and it is difficult to say that the system covers the entire city area. Although the air quality monitoring system is not directly linked to GHG emission reductions, it is intended to realize more extensive and efficient data collection using the streetlight network in the future by attaching various environmental sensors as ancillary equipment to the smart LED streetlights studied in Chapter 4.

In the first year of the project, the current status of streetlights in Bandung City and its development plan were identified, and electricity consumption and GHG reductions were estimated if streetlights that are not currently LED were converted to LED. In the second year, research was focused on the public procurement system, assuming the participation of Japanese companies to the public procurement in the future. Specifically, we identified the requirements of TKDN and E-catalog. In order to increase the certainty of project implementation, it is necessary to closely examine the project cost and GHG reductions, and also to consider re-selection of roads using the results obtained in this study as a model case.

Through discussions with the Department of Transportation, we have deepened awareness of Bandung City's issues and mutual understanding of the proposed technologies and the project. We hope that the implementation of LED streetlights will progress with continuous support of the city-to-city collaboration between Kawasaki City and Bandung City.

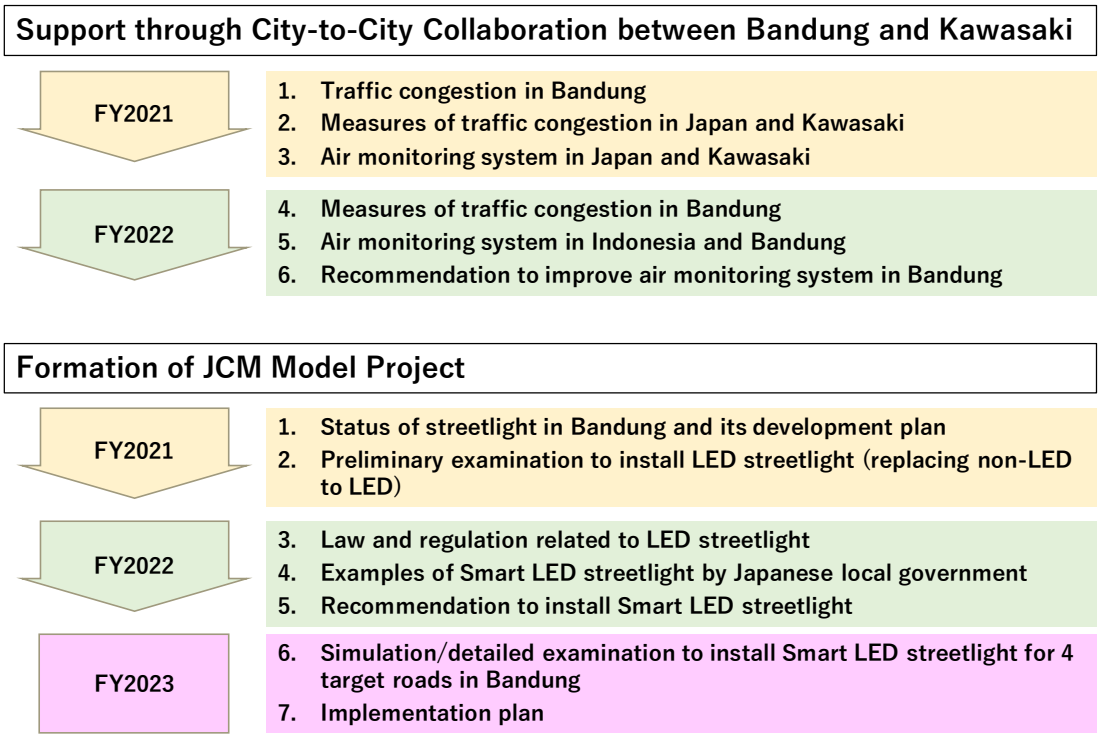


Figure 4-6 Summary of transportation sector

Source: Study team

Regarding the smart and multi functionalization of streetlights, this study primarily proposed dimming functions, but took into account the possibility of adding ancillary functions in the future. The Department of Transportation was particularly interested in 24-hour monitoring and management of lighting. Smart technology is one of the strengths of Japanese companies, and IoT networking will enable the adjustment of LED streetlights' on/off times and illumination intensity, contributing to further energy conservation and GHG reduction. By incorporating cameras, microphones, various sensors, 5G base stations, video display systems, speakers, and other devices, it will be possible to monitor traffic volume and road conditions, and by providing functions such as traffic guidance and disaster guidance, it will contribute to urban resilience. The following examples and points to note can be used as model cases for future considerations in Bandung City.

(1) Demonstration Experiment for Understanding the Environment around Roads

MinebeaMitsumi Inc., a partner of this project, installed streetlights equipped with various environmental sensors on six roads managed by the Osaka Prefectural Government and conducted a demonstration experiment to centrally manage the illuminance of the streetlights and collect environmental data in the vicinity of the roads via wireless communication. The data collected included wind speed and direction, temperature, humidity, air pressure, rainfall, illumination, UV, and acceleration. By using the data, weather conditions that can be used for road management, especially in summer and winter seasons are examined.

Figure 4-7　LED streetlight and environmental sensor

Source: MinebeaMitsumi Inc.

（2） Introduction to Monitor Rivers and Identify Road Flooding

Suginami Ward has introduced an IoT streetlight system along the Kanda River and in front of JR Asagaya station for the purpose of real-time river monitoring and understanding road flooding. With the recent increase in torrential rains and rapid river flooding caused by large typhoons, flood countermeasures in urban areas have become an issue. The system is expected to help city for safe and secure by preventing flooding such as river overflows and flooding of roads.

Figure 4-8　IoT streetlight system installed in Suginami Ward

Source: https://jpn.nec.com/streetlight/case.html

Chapter 5 Survey for New JCM Model Projects

5.1 Possibility of Collaboration with Other Support Programs

5.1.1 Overview

The installation of high-efficiency facilities and energy management in the buildings, and smart LED streetlights that have been addressed in the project are expected to further reduce GHG emissions and be cost-effective for facilities with a large site area and scale, such as industrial parks. There are several industrial parks in Indonesia, including some developed by Japanese companies, where occupying companies are working to decarbonize their own factories, and industrial park owners are also decarbonizing their facilities. For the industrial parks, decarbonization efforts are appealing to their tenants, and for the tenants, it is part of their CSR activities. In this project, we focused on industrial parks near Jakarta to investigate the status of decarbonization efforts and the potential for future collaboration. The table below provides overview of the Jababeka Industrial Estate and Karawang International Industrial City and the content of interviews.

Table 5-1 Overview of industrial park and its decarbonization efforts

Jababeka Industrial Estate
[Overview] Location: Cikarang, West Java (about 35km from Jakarta) Development and operation: PT. Jababeka Tbk. Opening: 1989 Number of tenant companies: 2,000 companies (30 countries) Facilities/Infrastructure: Power plants, industrial water, wastewater treatment facilities, communications, residential areas, hotels, commercial facilities [Decarbonization efforts] ・ In 2022, the Net Zero Industrial Cluster Plan was announced at the Indonesia Net Zero Summit 2022, a side event of the G20 Business Summit (B20 Summit) held in Indonesia, with the goal of achieving net zero by 2050. ・ In 2023, participated in the Net Zero Transition Initiative for Industrial Clusters led by the World Economic Forum. ・ Major initiatives include solar power generation, biomass co-firing, waste treatment, recycling-oriented manufacturing processes, electric mobility, and the use of hydrogen. ・ In the long term, the company is interested in TOD (Transit Oriented Development), considering organic connections with railroads and Cikarang Dry Port. ・ The tenant company has already installed solar panels on the roof of its factory, but there are issues with the aging of the building and its durability. ・ The company is also working on issuing green power certificates to tenants, as well as developing educational facilities and parks.

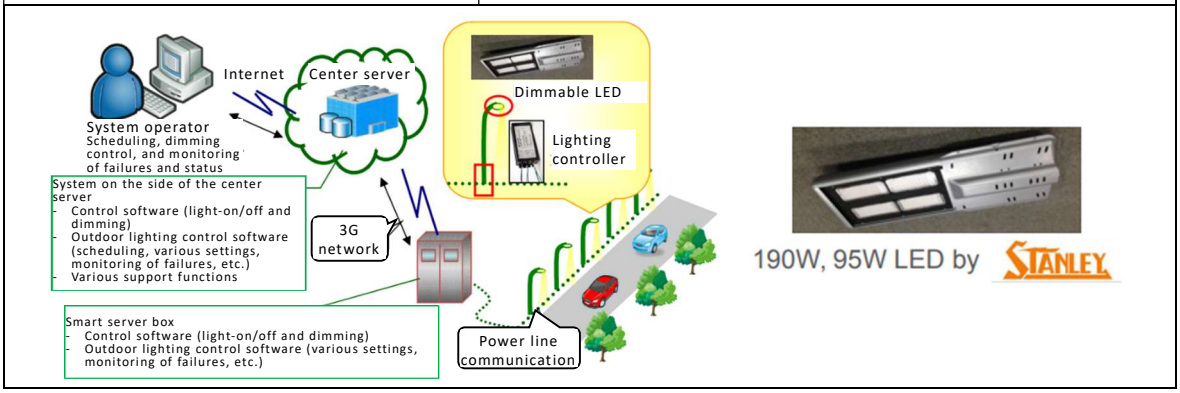
Karawang International Industrial City
[Overview] Location: Karawang, West Java (approx. 50km from Jakarta) Development and operation: ITOCHU Corporation, Sinarmas Group (major Indonesian conglomerate) Opening: 1993 Site area: 1,484 ha Number of tenant companies: 160 companies (approximately 80% are Japanese companies) Facilities/Infrastructure: Electricity, industrial water, natural gas, wastewater treatment facilities, waterways, communications, rental offices/warehouses, hotels, commercial facilities [Decarbonization efforts] ・ JCM Model Projects (1) Installation of smart LED street lighting system: NTT Facilities (see below) (2) Installation of absorption chillers at a chemical plant: Tokyo Century Corporation (3) Installation of a 5 MW solar power generation system at a vehicle and engine plant: Toyota Motor Corporation ・ The new plant of Sharp Corporation, which started operation in April 2023, has installed a solar power generation system (installed capacity: approx. 2,000 kW), which is used for various facilities such as lighting and production lines. ・ In 2020, selected for the Global Eco-Industrial Parks Programme (GEIPP), an initiative of the Ministry of Industry of Indonesia, the United Nations Industrial Development Organization (UNIDO), and the Swiss government. (There are 92 industrial parks worldwide, and three industrial parks have been selected in Indonesia, including MM2100 Industrial Park (developed and operated by Marubeni Corporation) and Batamindo Industrial Park.) ・ Six feasibility studies are underway within the framework of GEIPP. (The Project has reviewed draft FS reports for three of these projects: “Rainwater Utilization (see below)”, “Food Waste Separation and Composting Training” and “Promotion of GHG Emissions Calculation”.) ・ Major initiatives include solar power generation, asphalt reuse, composting, smart streetlights, IoT flow meters, and environmental education facilities and parks.

Source: Study team

Karawang International Industrial City has installed smart LED streetlights through the JCM Model Project (see (1) in the table above). This project is similar to the smart LED streetlights project discussed in the transportation sector of this project (Chapter 4), in which existing streetlights (high-pressure sodium lamps) were converted to LED, and a system to remotely control and monitor LED lighting was installed to save energy and reduce GHG emissions.

In addition, interviews with companies conducted last year revealed that several of the industrial parks in Indonesia have a mixture of conventional and LED lamps, and that a switch to LED is expected in the future. Since the industrial parks are expected to further develop energy-saving streetlights in the future, there is potential for implementation and horizontal development through the JCM Model Projects.

Table 5-2 Overview of JCM Model Project at Karawang International Industrial City

Project	Introduction of the Smart LED Street lighting System to Industrial Park
Implementing organization	NTT Facilities
Year of adoption	2015
Estimated GHG emission reduction	543 t-CO2/year
Equipment used	・ Dimmable LED lamp: 1,260 units ・ 95w x 660 units (equivalent to HPS 250W) ・ 190w x 600 units (equivalent to HPS 400W) ・ Lighting controller: 1,260 units ・ Smart server box: 14 units
	

Source: https://gec.jp/jcm/jp/projects/15pro_ina_02/

5.1.2 Estimation of GHG Emission Reduction for Rainwater Utilization Project

In the FS report provided by Karawang International Industrial City, regarding the “Pond Utilization for Water and Rain Harvesting” the total amount of rainwater stored and other figures were provided, and GHG emission reductions were estimated based on this data. The table below shows the key points of the FS report and the estimated GHG emission reductions.

Table 5-3 Key points of FS report and estimated GHG emission reduction

[Key points of FS report]

- Seven reservoirs (25,382 ha in total) are located on the site and can be used to store rainwater.
- Rainwater harvesting reduces electricity consumption for water purification and contributes to CO2 emission reduction.
- Installation of a rainwater collection system could lead to a direct cost reduction of approximately 80% of water charges in the long term. (However, no rationale is provided.)
- The amount of water collected from the roof is estimated to be 196.5x1,000,000 m3/month.
- The water bill to be borne by the tenant company could save Rp. 1,844,486,550 per month.
- The maintenance cost for the use of the reservoir is low, and the investment burden is also low.
- Rainwater can be used for cleaning and purification facilities that do not have very high-quality requirements, but each tenant has different water quality requirements, so a detailed survey is required.

Total amount of rainwater	[redacted]
CO2 emissions per 1m3 of water distribution	235 g/m3 Source: Bureau of Waterworks, Tokyo Metropolitan Government, actual figures in 2021
GHG emission reduction amount	46,177.5 t-CO2/month

Source: Study team

There is no detailed description of the rainwater purification method that will replace the use of the current water purification facilities, and it is unlikely that all rainwater will be replaced with purified water suitable for each application. Estimation of GHG emission reductions will need further examination.

The study being conducted in Karawang International Industrial City will be submitted as a final FS report, after which the owner of the industrial park will decide whether or not to implement the project. For those projects that are decided to be implemented but cannot raise funds, UNIDO will submit a proposal to the World Bank for consideration of implementation. Using the results of these studies, projects that meet the application requirements for the JCM Model Projects may be implemented in collaboration within the framework of GEIPP.

5.2 Introduction of Energy Management System for Underground Station

Since the energy management in the building sector addressed in this project is also effective for the underground stations of the urban transportation system in Jakarta, we conducted a survey mainly through interviews with Japanese companies supporting the Jakarta MRT project. The table below shows an overview of the Jakarta MRT and the key points of the proposal.

In underground stations, the majority of energy use is due to air conditioning and ventilation. In Indonesia, air conditioning tends to be set at high levels, and there is a high possibility that the underground stations are also excessively cooled. If the equipment is being operated at the default values at the time of installation, adjustments and controls based on actual operating conditions can be made to achieve both safety and energy efficiency. For the underground station of the Jakarta MRT, optimal energy control of the existing facilities is effective as first step. By understanding how much energy and electricity savings can be realized through this process, it will lead to incentives for investment in energy-saving equipment in the future.

PT. MRT Jakarta, the operator of the Jakarta MRT, is promoting TOD (Transit Oriented Development) projects along the rail line, and energy management at underground stations will lead to effective utilization of underground space in the future.

Table 5-4 Overview of Jakarta MRT and proposal points

Overview of Jakarta MRT
Operating Entities: PT. MRT Jakarta [North-South Line] ・ Total length: 23.5 km, 21 stations ・ Phase 1: Starts operation in March 2019 ・ Section: Lubak Bulus - Bundelang HI, 15.7 km ・ Underground: 5.9 km, 6 stations / Elevated: 9.8 km, 7 stations ・ Phase 2: Scheduled to open in 2029 ・ Section: Bundelang HI - Kampung Bandung, 7.8 km ・ Underground: 7.5 km, 7 stations / Overground: 0.3 km, 1 station [East-West Line] ・ Total length: 89.5 km (from Balaraja to Cikarang) ・ Scheduled start of operation: 2029 ・ In November 2022, a memorandum of cooperation was signed between the Indonesian Ministry of Transport and the Japanese Ministry of Land, Infrastructure, Transport and Tourism. Basic design is underway with yen loans.
Key points of the proposal
・ The initial values of air conditioning equipment (cooling towers, chillers, cooling pumps, etc.) installed in underground stations are set conservatively by looking on the safe side at the time of installation. By adjusting them to more appropriate values during operation, energy savings can be achieved (without resorting to the installation of new equipment). ・ The MRT stations are very well air-conditioned. In Indonesia, the air conditioning of buildings tends to be set low, and this is regarded as a service to users, so it is necessary to save energy without lowering the service level. ・ The accumulation and visualization of energy consumption data enables the determination of the age-related deterioration of equipment and the need for maintenance. ・ Energy conservation and energy management efforts can also promote environmentally friendly public transportation.

Source: Study team

[Senayan station]

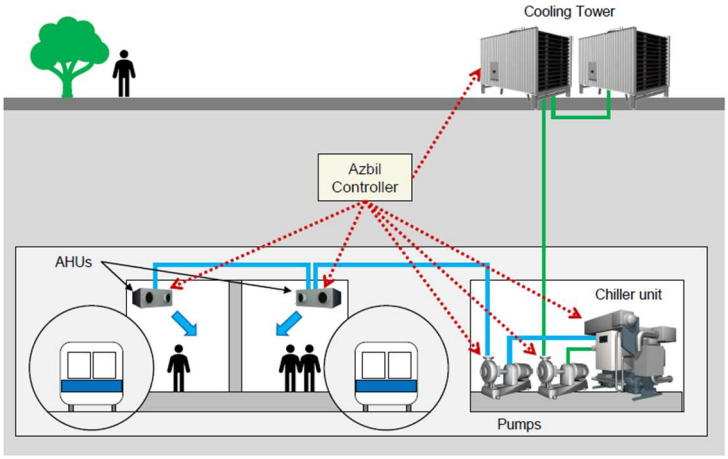


Figure 5-1 Image of energy management system for underground station

Source: Study team

5.3 Energy Saving and Energy Management for Commercial Facilities

The owners of the facilities studied in the buildings sector (Chapter 3) are Bandung Indah Plaza, owned by the Lippo Group, an Indonesian conglomerate, and Trans Studio Bandung, owned by PT. Para Bandung Propertindo, which is part of the Indonesian conglomerate CT Corp. Both companies own shopping malls, hotels, and complexes not only in Bandung City but also in Indonesia widely. The energy conservation and GHG emission reduction effects of the facilities confirmed in this project can be used as a model case when proposing the introduction of similar facilities and BEMS to other similar buildings and can be expected to be horizontally deployed in similar facilities owned by these companies. The table below shows facilities with potential for horizontal deployment in the future. In particular, Jakarta has a large number of large-scale facilities and is expected to have a higher air conditioning load than Bandung, so there is potential for energy conservation and GHG emission reductions, which will likely lead to commercialization.

Table 5-5 Potential facilities for energy saving and energy management

Facility name: Istana Plaza Type: Shopping mall	Location: Bandung Owned by: Lippo Group Facility overview: Opened in 2001, 47,534 m2 (2 floors underground, 4 floors above ground)
Facility name: Mal Lippo Cikarang Type: Shopping mall	Location: Cikarang (in Lippo Cikarang Industrial Estate) Owner company: Lippo Group Facility overview: Opened in 1995, 39,605 m2 (2 floors above ground)
Facility name: The Plaza Semanggi Type: Shopping mall, office	Location: Jakarta Owned by: Lippo Group Facility overview: Opened in 1995, 155,122 m2 (2 floors underground, 7 floors above ground + 13 floors (office))
Facility name: Trans Studio Mall Type: Complex facility	Location: Bandung Owned by: CT Corp Facility overview: Opened in 2001, with shopping mall, hotel, and amusement park (target of this project)

Source: Study team

For these facilities, a proposal that combines the introduction of high-efficiency air conditioning system, LED lighting inside and outside the facility, on-site solar power generation and storage batteries, and energy management using BEMS is appropriate. As mentioned above, since electricity costs are kept low in Indonesia, the incentive for business operators to invest in facilities only by introducing energy-saving and renewable energy equipment is considered to be low. Therefore, it is desirable to further improve the efficiency of energy management through the introduction of BEMS. BEMS is a system that grasps the operation status of facilities in real time and records, monitors, controls, and operates the energy consumption status, which not only directly leads to a reduction in electricity bills, but also contributes to optimizing the life cycle cost of facilities by appropriately determining the aging of facilities and whether maintenance is required.

Chapter 6 Activities of FY 2023

6.1 Overview of Activities

The table below provides an overview of the field surveys, workshops, and discussions with related organizations conducted this fiscal year for the project.

Table 6-1 Activities of this fiscal year

Date	Item	Discussions/Activities
2023		
Aug. 11	Discussion with International Cooperation Office and Department of Transportation (online)	Discussed about the studies for JCM Model Projects in building and transportation sectors for the current fiscal year, and schedule for the first field survey.
Aug. 13-17	1st field survey	Discussions with the relevant departments of Bandung City and local companies in Indonesia, and confirmation of facilities and roads to be surveyed.
Aug. 14	Discussion with JETRO Jakarta Office (on-site)	Information sharing about local and Japanese companies in Indonesia. It was recommended that they utilize the list (business catalog) of Japanese companies operating in Indonesia and the decarbonization technology introduction prepared by JETRO.
Aug. 15	Discussion with Department of Transportation (on-site)	Discussed process for introduction of smart LED streetlights; confirmed TKDN and listing in E-catalog.
Aug. 15	Discussion with International Cooperation Office (on-site)	Progress report on the project and schedule, confirmation of invitation to “Seminar on City-to-City Collaboration for Zero-Carbon Society” by the Ministry of the Environment of Japan (to be held in February 2024).
Aug. 15	Discussions with owner of Trans Studio Bandung (on-site)	Overview of the city-to-city collaboration project and the contents of detail survey were explained, and agreement was reached on the implementation of detail survey.
Aug. 15	Field survey of roads	Field survey of four target roads
Sep. 1	Discussion with Kawasaki City (hybrid)	Discussed the plan for the second field survey. Also continued to discuss the possibility of Kawasaki companies entering the Indonesian market in relation to the JCM Model Projects.
Sep. 7	Discussions with MinebeaMitsumi Inc. (online)	Organize the data necessary to conduct the simulation and check with the Department of Transportation regarding the proposal to install smart LED streetlights.

Date	Item	Discussions/Activities
Sep. 7	Discussion with Sakai Heavy Industries Co., Ltd. (online)	Hearing on JCM Model Project candidates and initiatives related to decarbonization. The company as a whole is working to reduce CO2 emissions, but there are no plans at this time to introduce new energy-saving equipment.
Sep. 29	Discussions with Department of Transportation and MinebeaMitsumi Inc. (online)	Reconfirmation of TKDN and E-catalog. Also confirmed that the data server must be located in Indonesia.
Oct. 17	Discussions with Karawang International Industrial City (online)	Explained the outline of the city-to-city collaboration project and the JCM Model Project and interviewed the participants about their efforts for decarbonization in the industrial park. Requested the FS report as they are currently implementing with the Ministry of Industry and UNIDO.
Oct. 20	Discussions with Azbil Corporation (face-to-face)	Requested to participate 2nd field survey and workshop. Confirmation of the schedule for conducting detailed survey for building sector.
Oct. 23	Discussions with MinebeaMitsumi Inc. (online)	Confirmed to show simulation results for the proposed smart LED streetlights, assuming multiple patterns of illumination.
Oct. 24	Discussions with Kawasaki City (face-to-face)	Discussed about a workshop and plan of 2nd field survey. Requested for preparation at the workshop and other arrangement.
Oct. 25	Discussions with Jababeka Industrial Estate (online)	Hearing on potential JCM Model Projects and initiatives related to decarbonization. The company confirmed its intention to give priority to the use of waste for energy conversion.
Oct. 30	Discussion with International Cooperation Office and Kawasaki City (online)	Discussed workshop and waste management seminar to be held in Bandung City. Requested for preparation at the workshop and other arrangement.
Nov. 2	Interim report to the Ministry of the Environment of Japan (online)	Progress report to the Ministry of Environment. Confirmed concrete results in the building and transportation sectors, and continuation of the project in the coming year. Shared information about “Seminar on City-to-City Collaboration for Zero-Carbon Society” by the Ministry of the Environment of Japan (February 2024).
Nov. 5-12	2nd field survey	Workshops in Bandung City, participated in Waste Management Seminar. Identified target facilities and roads for survey, held individual discussions with relevant departments, and reported on the project to the JICA office and embassy, etc.

Date	Item	Discussions/Activities
Nov. 6	Workshop (hybrid)	Sharing the achievements of the projects and activities of this fiscal year. Presentation by Kawasaki City: Progress of specific initiatives (establishment of regional energy companies, solar panel installation ordinances and mandates, support for small and medium enterprises) during the first year after the formulation of "Kawasaki Carbon Challenge 2050". Presentation by Bandung City: Latest plan of "Rencana Strategis 2024-2026" of the Department of Environment and the Department of Transportation. Details are provided in the next section and in the appendix.
Nov. 7	Participation for the Waste Management Seminar organized by Bandung City (on-site)	Held at SMPN 14 Bandung, a national junior high school in Bandung, the lecture was given by Kawasaki City to about 300 students about waste management system. Water Supply and Sewerage Bureau of Kawasaki City also gave a lecture on the activities of JICA projects.
Nov. 7	Site inspection of Bandung Indah Plaza and discussion with PT. Azbil Berca Indonesia (on-site)	Verify existing HVAC equipment and usage at facilities surveyed in the building sector. Confirm installation of measurement equipment and data collection and analysis schedule.
Nov. 8	Discussion with Department of Transportation and MinebeaMitsumi Inc. (Hybrid)	Discussed technical details of the proposal to introduce smart LED streetlights. Presented simulation results and confirmed details of the proposal, including illuminance, pole spacing and height, etc.
Nov. 8	Discussion with International Cooperation Office (on-site)	Review of the workshop, overview of the final field survey (February 2024), draft letter for "Seminar on City-to-City Collaboration for Zero-Carbon Society". Sharing information on the timing of discussions on the extension of the environmental MOU with Kawasaki City, and cooperation in other areas (Chitalum River water quality improvement, waste management, human resource exchange).
Nov. 8	Discussions with PT. Sakai Indonesia (on-site)	Hearing on potential JCM Model Projects and decarbonization initiatives. Confirmed that the company as a whole is working to switch to LED lighting in its facilities (almost 100%), save energy, operate machine tools more efficiently, and reduce the amount of fuel used. The factory's electricity consumption is low and electricity costs are low.

Date	Item	Discussions/Activities
Nov. 9	Discussions with PT. Tokyo Century Indonesia (on-site)	Hearing on potential JCM Model Projects. JCM Model Projects are led by the head office, and the office assists in liaison between the head office and the Indonesian parties concerned.
Nov. 9	Discussions with JICA Indonesia Office (on-site)	Discussion about the project and the possibility of collaboration with JICA projects. Both Indonesian and Japanese companies are highly interested in waste-related projects. It is necessary to approach the project from all aspects, including environmental education, as well as technology introduction. Companies are expected to make effective use of the schemes of each ministry and to develop their business in Indonesia.
Nov. 9	Discussion with Karawang International Industrial City (on-site)	Hearing on potential JCM Model Projects and initiatives/activities related to decarbonization. Requested to provide draft FS reports of six projects led by the Ministry of Industry and UNIDO, including waste management and water treatment facilities. There is no interest at this time in installing solar panels due to low electricity costs, but there is potential for upfront investment in anticipation of carbon credit transactions.
Nov. 9	Discussion with the Embassy of Japan in Indonesia (on-site)	Overview of the project and progress report. Bandung City is active in waste management. Expectations for high-level exchanges among municipalities and effective use of know-how to provide one-stop services. Hopes for continued support from Kawasaki City across multiple sectors.
Nov. 10	Discussions with Green Energy Limited and PT. Daya Baru Lestari (on-site)	Hearing on potential JCM Model Projects. Requested detail information on the possibility of introducing high-efficiency air-conditioning equipment, BEMS, and LED streetlights to facilities in Jakarta (shopping malls, hotels, convention centers) as candidates.
Nov. 10	Discussions with PT. Oriental Consultants Indonesia/OCG (on-site)	Overview of this project and progress report, and information sharing on the Jakarta MRT project. Energy management system proposed for the shopping mall in Bandung City could be applied to the Jakarta MRT station building or incorporated in the TOD proposal.
Nov. 10	Discussion with JETRO Jakarta Office (on-site)	Overview and progress of the project. JETRO is actively supporting Japanese companies to enter Indonesian market, introducing decarbonization technologies, and match with the Indonesian companies with business catalog.

Date	Item	Discussions/Activities
Dec. 15	Contact to PT. Daya Baru Lestari	Request for detailed information on facilities owned in Jakarta (hotel and convention center complex).
Dec. 15	Received FS Report from Karawang International Industrial City	Part of the FS report (draft version) by UNIDO has been received.
Dec. 18	Discussions with Kawasaki City (face-to-face)	Confirmation of field survey plan in February 2024. The field survey will include discussions on the extension of the MoU between Kawasaki City and Bandung City.
Dec. 19	Discussion with International Cooperation Office (online)	Confirmation of field survey in February, and reminder to register participant for "Seminar on City-to-City Collaboration for Zero-Carbon Society" in February 2024.
Dec. 25	Discussions with OCG and Azbil Corporation (online)	Discussed the possibility of proposing energy management system by Azbil to optimize air conditioning and ventilation at underground stations for TOD investment and development project that OCG is supporting in cooperation with Jakarta MRT.
Dec. 27	Discussion with International Cooperation Office and Kawasaki City (online)	Discussions about field survey in February, results of three-year city-to-city collaboration project, and the MoU between Kawasaki City and Bandung City.
2024		
Jan. 15	Contact to PT. Daya Baru Lestari	Request for detailed information on facilities owned in Jakarta (hotel and convention center complex).
Jan. 15, 25	Confirmation with Azbil Corporation	Progress checks on the analysis of measured data from the two facilities.
Jan. 18, 25	Confirmation with MinebeaMitsumi Inc (transport sector)	Progress checks on the simulation of the introduction of smart LED streetlights and the finalization of the proposal to Bandung City and the estimation of the project costs.
Jan. 19	Discussions with the Ministry of the Environment of Japan (face-to-face)	Discussed the progress of this year's survey, a summary of three-years project and key points for compiling the report.
Jan. 23	Discussions with OCG and Azbil Corporation (online)	Discussions about a possible proposal for Jakarta MRT for energy management system by Azbil to optimize the air conditioning and ventilation of underground stations, as well as the link with TOD investment and development project that OCG is supporting in cooperation.

Date	Item	Discussions/Activities
Jan. 30	Discussions with Kawasaki City (online)	Discussion about the schedule of third field survey, and the content of the final discussions with Bandung City. Check the status of registration from Department of Transportation for “Seminar on City-to-City Collaboration for Zero-Carbon Society” in February.
Feb. 2	Discussions with International Cooperation Office and Kawasaki City (online)	Confirmation of the schedule of third field survey and the content of the final discussions.
Feb. 4-9	3rd field survey	Discussions with Department of Transportation and International Cooperation Office. Project reports to JICA and Japan Embassy.
Feb. 5	Discussions with OCG (on site)	Discussion on MRT and LRT in Jakarta, an overview of the TOD development plan and possible proposals for energy management system and optimization of underground stations as a horizontal development in the building sector.
Feb. 6	Discussions with Department of Transportation, International Cooperation Office and MinebeaMitsumi Inc. (hybrid)	Explanation of energy savings, GHG savings and estimated project costs of LED streetlights. Finalization for the results of simulations, technical confirmation, product specifications, product and company registration procedures and the budget of Bandung City.
Feb. 7	Discussions with JETRO Jakarta Office (on site)	Report on discussions with Bandung City and the progress and compilation of the study. Continuous support especially in transportation sector will be needed.
Feb. 7	Discussions with the Embassy of Japan in Indonesia (on site)	Report on discussions with Bandung City and the progress and compilation of the study. Hopes that survey results will lead to concrete projects in the future.
Feb. 7	Discussions with JICA Indonesia Office (on site)	Report on discussions with Bandung City and the progress and compilation of the study. As pointed out by Bandung City, TKDN and other permits and approvals will be required.
Feb. 19	Final report to the Ministry of the Environment of Japan (online)	Report on the results of this year’s survey and the summary of three-years projects.
Feb. 26-27	Participation for “Seminar on City-to-City Collaboration for Zero-Carbon Society”	A member from Department of Transportation of Bandung City attended the seminar in Tokyo.

6.2 Workshop

Workshop was held in Bandung City, attended by relevant organizations from Kawasaki City and Bandung City, to share information on the policies of the two cities and to confirm and discuss the implementation details of the project. Summary of the workshop is shown below. The contents of the Q&A session (minutes of the meeting) and presentations are shown in Appendix.

（1） Purpose

- Review and agree on the three-year project implementation policy and plan and the activities for this fiscal year.
- Confirm and discuss details of this fiscal year's activities.
- To understand the latest situation of GHG emissions and various measures and activities in Bandung City.
- Provide information on the measures and activities of Kawasaki City towards the formation of decarbonization society.

（2） Outcome

- The implementation policy of the project, progress and activities for this fiscal year were explained, and it was confirmed that study will be conducted for (1) building sector: promotion of high-efficiency air conditioning system and energy management, and (2) transportation sector: promotion of smart LED streetlights, with the assumption that these will be implemented through JCM Model Projects.
- Obtained an update on Bandung City's GHG emission reduction achievements and GHG emission reduction targets and specific initiatives and activities as outlined in the Department of Environment's Strategic Plan 2024-2026.
- Regarding "Kawasaki Carbon Challenge 2050", Kawasaki City's decarbonization strategy, which has been formulated one year ago, knowledge was shared on the progress of specific initiatives (establishment of local energy companies, solar panel installation ordinances and mandates, and support for small and medium-sized enterprises).

（3） Agenda

Date: November 6, 2023

Format: Hybrid format

(Venue: Bandung City Conference Room, online: zoom meeting)

Time	Contents/Presenter
Opening	
10:00-10:05	Opening remarks: Bandung City
Presentation/Q&A	
10:05-10:30	1. Kawasaki City: Initiatives and progress in the year since the formulation of “Kawasaki Carbon Challenge 2050”
10:30-11:00	2. Bandung City: Strategic plan "Rencana Strategis 2024-2026 ・Department of Environment ・Department of Transportation
11:00-11:15	3. Oriental Consultants: Activities of city-to-city collaboration project in FY2023
11:15-11:30	4. Azbil Corporation: Survey contents in buildings sector
11:30-11:45	5. MinebeaMitsumi Inc.: Survey contents in transportation sector
11:45-11:55	6. Q&A
Closing	
11:55-12:00	Closing remarks: Kawasaki City

（4） Photo




（5） Minutes of the Meeting, Presentation Materials (Appendix A-1~)