

FY2019 City-to-City Collaboration Programme for Low-carbon Society

**City-to-City Collaboration Project Between
Yangon City and Kawasaki City
(Support on Low Carbon Mega Park through City-to-City
Collaboration)**

Report

March 2020

Nippon Koei Co., Ltd.
Kawasaki City

FY2019
City-to-City Collaboration Programme for Low-Carbon Society

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Between Yangon City and Kawasaki City
(Support on Low Carbon Mega Park through City-to-City Collaboration)

Report

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Abbreviations

Abbreviations	Description
CAPEX	Capital expenditure
CO ₂	Carbon Dioxide
COP	Conference of Parties
EPC	Engineering, Procurement and Construction
GHG	Greenhouse Gases
FDS	Final Disposal Site
FIT	Feed-in Tariff
FY	Fiscal Year
IRR	Internal Rate of Return
JCM	Joint Crediting Mechanism
JPY	Japanese Yen
LCAP	Low Carbon Action Plan
LPG	Liquefied Petroleum Gas
MCCSAP	Myanmar Climate Change Strategy and Action Plan
MIC	Myanmar Investment Commission
MMK	Myanmar Kyat
MOEJ	Ministry of the Environment, Japan
MOU	Memorandum of Understanding
MRV	Monitoring, Reporting and Verification
MSDP	Myanmar Sustainable Development Plan
NAPA	National Adaptation Programmes of Action
NSDS	National Sustainable Development Strategy
PCCD	Pollution Control and Cleaning Department
PTT	Public Company Limited
PV	Photovoltaics
SDGs	Sustainable Development Goals
SEZ	Special Economic Zone
UNFCCC	United Nations Framework Convention on Climate Change
YCDC	Yangon City Development Committee

CHAPTER 1 BACKGROUND AND OBJECTIVE

1.1 BACKGROUND OF THE STUDY

In December 2015, all countries participated in United Nations Framework Convention on Climate Change (UNFCCC)'s 21st Conference of the Parties (COP21) which was held in Paris, France. In COP21, Paris Agreement was adopted as a legal framework of fair and practical countermeasures to climate change after 2020. Paris Agreement aims at keeping global warming below 2 degrees Celsius above pre-industrial level, and it requires efforts to keep it below 1.5 degrees Celsius by promoting activities for decarbonization. Furthermore, at the COP24 held in Katowice, Poland in December 2018, the Paris Agreement Work Programme was adopted for the full implementation of the Paris Agreement for 2020 onwards.

In addition, it was decided that activities by non-state actors (including cities) and efforts by all non-governmental entities (cities and other local governments, etc.) are acknowledged and encouraged to be scaled up in COP21. Cities are the places to support social and economic growth since a lot of people live there. Although the total of urban areas is only 2% of all land in the world, approximately half of world population live in urban areas and the percentage is predicted to increase to 70% by 2050. Also, it is estimated that more than 70% of global CO₂ emissions are emitted from cities as of 2006; hence, cities have important roles for mitigation of climate change. Thus, implementation of countermeasures to climate change and greenhouse gas (GHG) emission reduction in cities are important for achievement of the goal of Paris Agreement.

Republic of the Union of Myanmar (hereinafter called Myanmar) ratified UNFCCC in November 25 1994 and Kyoto protocol in August 13 2003. The national policy on global warming is summarized in the following table. In 2016, Myanmar Climate Change Strategy and Action Plan (MCCSAP) 2016-2030 were formulated in order to precede action plan for global warming.

TABLE1-1 National Countermeasures for Climate Change

Action	Year	Summary
National Environment Policy in Myanmar	1994	<ul style="list-style-type: none">- Environmental protection and prevention of deterioration- Promotion of economic development- Achievement of sustainable development in priority of environmental protection- Harmony between environment and development
Myanmar•Agenda21	1997	<ul style="list-style-type: none">- Use of natural resource for sustainable development- Development of society, economy, and institution
National Sustainable Development Strategy (NSDS)	2009	<ul style="list-style-type: none">- Strategy for sustainable development in three sectors such as society, economy and environment
Environment Protection Law	2012	<ul style="list-style-type: none">- Management of natural resource- Promotion of social awareness- Cooperation to environmental program
National Adaptation Plan for Action (NAPA)	2012	<ul style="list-style-type: none">- Selection of 32 priority actions from 8 sectors- Implementation of adaptation action for global warming
Participation to Joint Crediting	2015	<ul style="list-style-type: none">- Conclusion of JCM

Action	Year	Summary
Mechanism		
Myanmar Climate Change Strategy and Action Plan (MCCSAP) 2016-2030	2016	- Target year is 2030 and plans to implement 6 priority projects for global warming policy

Source: Prepared by Nippon Koei based on 11th Workshop on GHG inventories in Asia and the published Information by the UN prepared by the JICA Study Team

The Myanmar Climate Change Strategy and Action Plan 2016-2030 is summarized below.

TABLE1-2 Summary of MCCSAP

Vision	The action plan aims to implement low carbon development in order to pursue sustainable development of Myanmar
Goal	Goal of the plan is low carbon development and adaptation of climate change with the target year of 2030
Priority Action Area	<p>Basic action plan</p> <ul style="list-style-type: none"> a) Counter measure for climate change is reflected into development plan b) Development of organization and institution for climate change strategy c) Preparation of budget for climate change strategy d) Consideration of techniques for climate change strategy e) Development of knowledge and organization for climate change f) Promotion of cooperation with several organizations for project investment <p>Priority action plan are selected from the following sectors.</p> <ul style="list-style-type: none"> 1) Agriculture and Fishery, 2) Environment, 3) Energy, Transportation and industry, 4) Urban city, 5) Welfare, 6) Education

Source: Myanmar Climate Change Strategy and Action Plan 2016

1.2 CITIES OF STUDY

Yangon City is the old capital of Myanmar and the largest city with population of 5 million. The city is rapidly urbanizing by foreign funds and public development because of recent democratization. While urban development and infrastructure development are proceeding, supply shortage is one of the issues that is arising due to dramatic increase in electricity demand. As a result, importance of saving energy and introduction of renewable energy for low-carbon development are increased

In addition, waste treatment management in Yangon City is one of the biggest issues. Recently, the construction of a complex intermediate treatment facility¹ (treatment capacity of about 1,000 ton/day) with a loan from the Polish government is planned at the landfill site (Htein Pin disposal site) located in the west. Therefore, even now the cooperation and assistance of foreign government are needed to solve the city's important issues.

¹ Consist of materials recovery facility, refuse derived fuel facility and biogas plant

Kawasaki City, in Kanagawa prefecture, is located next to Tokyo Metropolitan Government. Kawasaki City serves as one of the hub cities for the Keihin industrial zone, and the city has experience and expertise in pollution control at citizen level, company level and government level. Many companies in the city use superior environmental technologies. To utilize such experience, expertise, and technologies for developing sustainable cities, Kawasaki City promotes “Green Innovation”. Also, the city organized “Kawasaki Green Innovation Cluster” in 2015 which is a platform of industry-academia-government-citizen collaboration for contributing to environmental improvement and industrial development.

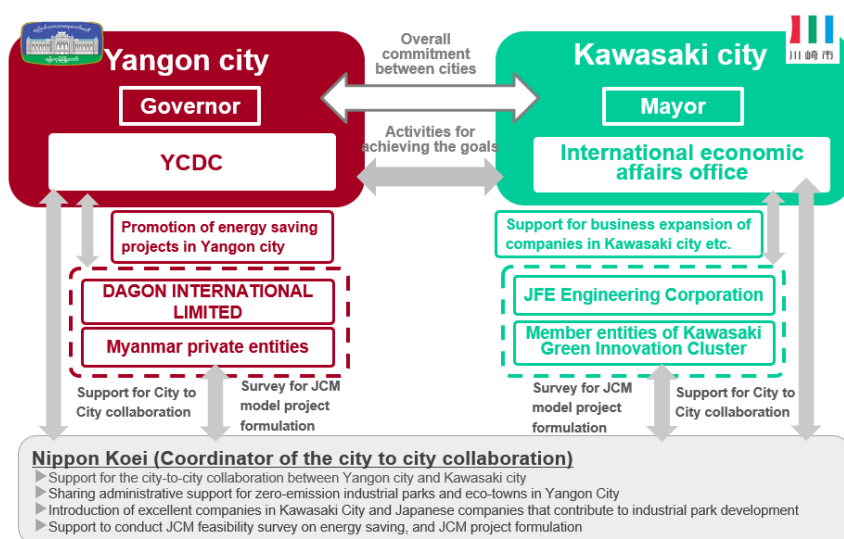
1.3 OBJECTIVE OF THE STUDY

“City-to-City Collaboration Programme for Low-Carbon Society between Kawasaki City and Yangon City” (hereinafter called “the Study”) aims to implement investigations for developing a low carbon society in foreign cities by Japanese cities that have valuable knowledge and experience. Japanese cities also collaborate with Japanese research institutes, private companies, and universities in order to conduct the surveys in an effective and efficient manner.

Under the city-to-city collaboration between Kawasaki City and Yangon City, the activities which have the following objectives are conducted: (1) Cooperation to solve the issues that Yangon City are facing by making use of experience of Kawasaki City, and (2) Project formulation aimed to apply for the JCM Model Project to materialize a low carbon city.

1.4 IMPLEMENTATION STRUCTURE

The implementation structure in the Study is presented below.



Source: Prepared by Nippon Koei

Figure1-1 Implementation Structure of the Study

The International Economic Affairs Office of Kawasaki City and Yangon City Pollution Control & Cleaning Dept. (hereinafter called “PCCD”) of Yangon City Development Committee (hereinafter called Yangon City) mainly implemented the Study.

Under the city-to-city collaboration between Kawasaki City and Yangon City, a feasibility study to formulate JCM (Joint Crediting Mechanism) Model Project has been conducted with JFE Engineering in the industrial park (Ywar Thar Gyi East Dagon Industrial Zone), where Dagon International Limited (hereinafter called “Dagon International”) has ownership as a main developer.

Nippon Koei Co., Ltd. (hereinafter called “Nippon Koei”) supported all activities of the City-to-City Collaboration and feasibility studies for JCM Model Project formulation.

1.5 STUDY SCHEDULE

After the contract in July 2019, the Study has been officially started the following August.

Schedule of the Study is presented below.

Survey Items	2019					2020	
	Aug	Sep	Oct	Nov	Dec	Jan	Feb
JCM Model Project Formulation in Energy Saving							
1) Consideration of specification of introduced technology							
2) Formulation of project plan & project evaluation							
3) Formulation of monitoring plan							
4) Coordination for International Consortium							
JCM Model Project Formulation in Introduction of Renewable Energy							
1) Consideration of specification of introduced technology							
2) Formulation of project plan & project evaluation							
3) Formulation of monitoring plan							
4) Coordination for International Consortium							
Capacity Building							
1) Capacity building under City-to-City Collaboration							
Workshop							
1) Workshop in Yangon City				★			
2) City-to-City Collaboration Seminar						☆	
Others							
1) Field Survey		★	★	★	★		★
2) Monthly report to MOEJ		☆	☆	☆	☆	☆	☆
3) Progress meeting with MOEJ	☆			☆			☆
4) Domestic meetings with Kawasaki City and related companies		☆	☆	☆		☆	☆
5) Final report							☆

★ : Implemented in Yangon City ☆ : Implemented in Japan

Source: Prepared by Nippon Koei

Figure1-2 Study Schedule in FY2019

In the Study, there are five field trips conducted not only to implement city-to-city collaboration but also to support JCM Model Project formulation.

During the field surveys, the discussion was conducted with Yangon City for City-to-City collaboration and with private companies (Japanese companies, local companies, and foreign companies) including Dagon International for the JCM Model Project formulation.

In December 2019, Yangon City and Kawasaki City held the workshop which has programmes on Kawasaki's knowledge sharing, SDGs current situation in Yangon City etc. And, in January 2020, two delegates from Yangon City were invited to Tokyo in order to participate the Seminar on City-to-City Collaboration organized by Ministry of the Environment, Japan (hereinafter called "MOEJ") and visited several facilities in Kawasaki City.

CHAPTER 2 CITY-TO-CITY COLLABORATION FOR LOW-CARBON SOCIETY

2.1 BACKGROUND OF THE CITY TO CITY COLLABORATION

“Project for formulation of JCM Model Project through City-to-City Collaboration in Yangon” has been implemented through City-to-City Collaboration between Kawasaki City and Yangon City since FY2015. The Study in FY2016 was implemented with themes of “Installation of high efficiency once-through boiler to food processing factory” and “Introduction of Solar PV into Yangon City facility”. During the Study in FY2017, “Introduction of High-efficiency Pumps into Existing Pumping Station” and “Low Carbonization of Waste Management” were conducted. Finally, the Study in FY2018 was implemented with themes of “Utilization of Energy and Energy Saving in Fruits and Vegetables Wholesale Market”.

In March 2016, both cities concluded a Memorandum of Understanding (hereinafter called “MOU”) on collaboration of the low carbon development.



Source: Prepared by Nippon Koei

FIGURE2-1 MOU between Kawasaki City and Yangon City

Although Yangon City is rapidly urbanizing, there is no policy regarding climate change. That is why, Draft Low Carbon Action Plan (LCAP) was prepared in FY2016, as one of the outputs of City-to-City collaboration, in cooperation with Kawasaki City which has knowledge and experience for low carbon plan's development and the basic policy. Basic concept of LCAP is to contribute for development of sustainable and low carbon society of Yangon City based on i) harmonization of green environment and economy and ii) creation of their good cycle, so

that the good natural environment can be maintained for the next generation and basic policies for 8 sectors described below were set.

TABLE2-1 Basic Policy for Low Carbon Action Plan

Sector	Basic Policy
Industry	<i>I. Reduction of greenhouse gas emission from industrial activities</i> 1 Establishment of a business model towards "low-carbon Yangon City" 2 Fostering eco-friendly industries 3 Creation of eco-friendly model for industrial complexes
Energy	<i>II. Utilization of renewable energy resources</i> 1 Promotion of Solar-city Project 2 Creation of a system for making an effective use of energy 3 Making a wider use of renewable energy resources, considering the regional characteristics
Urban City	<i>III. Creation of low-carbon city</i> 1 Encourage construction of highly energy efficient buildings 2 Introduction of energy efficient technology into public sector 3 Promotion of energy efficient technology to private sector
Transportation	<i>VI. Introduction of Low carbon technique in the transportation Sector</i> 1 Establishment of eco-friendly transportation network 2 Enhance convenience of public transportation 3 Promotion of measures for greenhouse gas emitted from automobiles
Waste Management	<i>V. Creation of recycling-oriented society</i> 1 Promotion of 3R activities of non-industrial wastes and industrial wastes 2 Introduction of low-carbon waste incineration facility Reduction of greenhouse gas emission from collection and transportation of wastes
Education	<i>VI. Environmental education and study on global environmental issues</i> 1 Promotion of environmental education and study 2 Promotion of human resource development
International Corporation	<i>VII. Introduction of international technology through city to city corporation</i> 1 Contribution to reduction of global greenhouse gas emission by introducing international technology through city to city corporation 2 Supporting and cooperating international environmental conservation activities
MRV	<i>VIII. Research and development of environmental technologies</i> 1 Research and development of environmental technologies, and promotion of scientific measures 2 Conducting MRV in order to promote introduction of saving energy technology

Source: Prepared by Nippon Koei

The results of other activities and contributions other than the action plan in City-to-City collaboration are shown in table below.

TABLE2-2 Achievement of the City-to-City Collaboration

#	Year	Outline
1	July, 2015	City-to-City Collaboration between Kawasaki City and Yangon City started
2	July 2015~	JCM Model Project formulation was started 1) Study for the introduction of energy-saving brewing systems to beer factory 2) Study for the introduction of High-efficiency once-through boiler in instant noodle Factory 3) Study for the introduction of high-efficiency pumps into existing pumping station 4) Study for the utilization of energy and energy saving in fruits and vegetables wholesale market
3	January, 2016	JCM workshop was held in Yangon City (at Yangon City government building)
4	March, 2016	MOU for formulation of low carbon city between Kawasaki City and Yangon City
5	September, 2016	Adoption of JCM Model Project Formulation supported by City-to-City Collaboration 1) Introduction of energy-saving brewing systems to beer factory 2) Introduction of High-efficiency once-through boiler in instant noodle Factory
6	April, 2019	City-to-City Collaboration (support on low carbon mega park through city-to-city collaboration) was started

Source: Prepared by Nippon Koei

2.2 OBJECTIVE OF THE CITY-TO-CITY COLLABORATION IN FY2019

In Yangon City, there are several industrial parks, including Thilawa Special Economic Zone (hereinafter “Thilawa SEZ”) in the suburbs of Yangon City. These industrial parks are operated by domestic and foreign private entities. On the other hand, Kawasaki City is an industrial city located in Keihin industrial area which has supported the economic growth in Japan. Kawasaki City constructed the Kawasaki Eco-town and materialized the Zero-emission industrial park in this Eco-town.

The knowledge of the environmentally friendly industrial park in Kawasaki City is highly significant in Yangon City which is the rapidly urbanizing and to be effective in the future industrial support activities. Moreover, by considering industrial parks developed by private companies as the main target of City-to-City Collaboration, it becomes more possible to introduce comprehensive energy-saving technologies which is assumed to apply the JCM Model Project.

On the other hand, the focal point of City-to-City Collaboration in Yangon City is the PCCD. Therefore, sharing the knowledge of the Kawasaki City’s experience which improved and

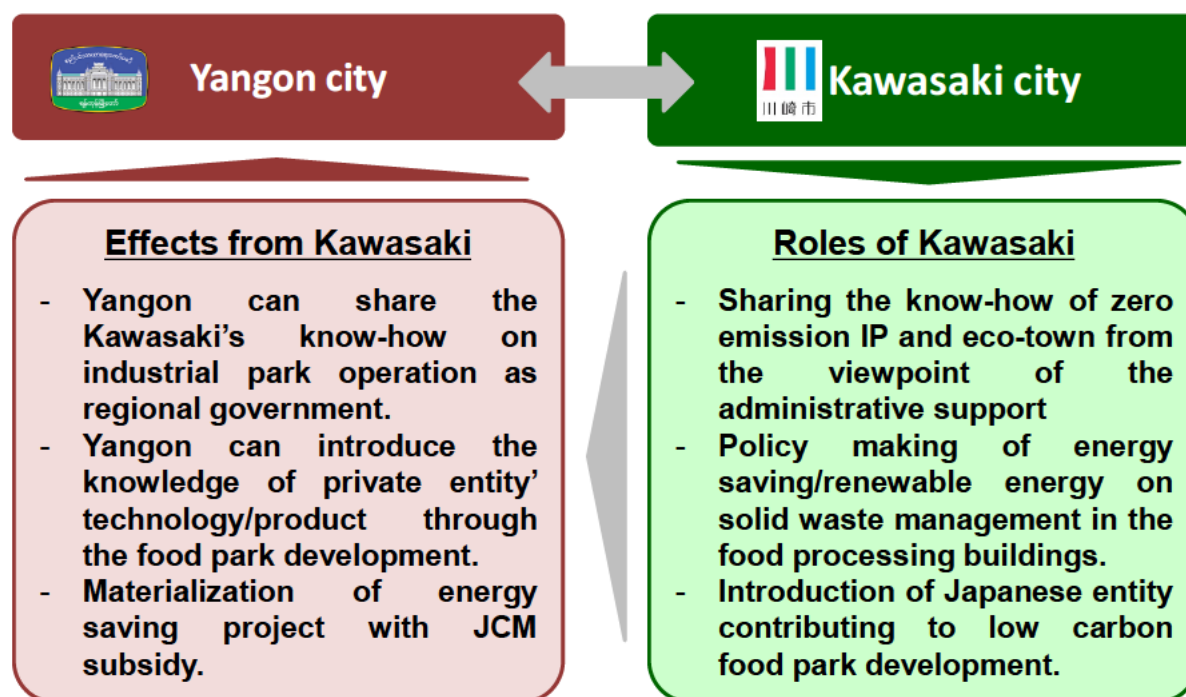
overcame the serious waste pollution issue, would help to solve the environmental problems which PCCD is facing with.

Therefore, the objectives of the Study in FY2019 are presented below.

- 1) Share the knowledge of the environmentally friendly industrial park by Kawasaki City
- 2) Consider the solution to several environmental issues that Yangon City is facing

2.3 CITY-TO-CITY COLLABORATION IMPLEMENTATION POLICY

The implementation policy for City-to-City Collaboration between Kawasaki City and Yangon City is presented in the figure below.



Source: Prepared by Nippon Koei

FIGURE2-2 Image of Implementation Policy in FY2019

Through the discussion with Yangon City, the following significant issues which Yangon City (mainly PCCD) is facing had been identified: (1) Introduction of Waste to Energy, (2) Management of leachate water treatment in the landfill site, (3) Consideration of fire prevention measures from landfill site, (4) Introduction of recycle facility and (5) Introduction of photovoltaic (hereinafter called "PV") system

The status of significant issues is described below.

TABLE2-3 Significant Issues in Yangon City (PCCD)

Significant Issues	Status
1) Introduction of Waste to Energy	In Yangon City, which is the largest city in Myanmar and increasing economic activity, the increase of the amount of waste is significant issue by the concentration of population and rapid urbanization. The amount of waste generated in Yangon City in 2018 is estimated to be around 2,500 ton/day, and is expected to increase around 14,000 ton/day in 2040. Currently in Yangon City, following four landfill sites: 1) Htawi Chaung landfill site, 2) Htein Pin landfill site, 3) Seikkyi Khaungto landfill site, 4) Dala landfill site and Waste to Energy (60ton/day) is operating. Htawi Chaung landfill site is processing 1,000 ton/day of waste, and the shortage of storage capacity is one of the immediate

Significant Issues	Status
	concerns in Yangon City. In addition, this landfill site has been a huge landfill with a cumulative total of about 4 million tons of hazardous and non-hazardous waste. Also, landfill gas (methane gas) emissions from waste landfill site is a concern of Yangon City. At the Waste to Energy constructed in April 2017, 60 ton/day of waste are treated, but the given the scale of the amount of waste generated, it is essential to further develop intermediate treatment facilities that contribute to the reduction of waste such as incineration and compost.
2) Management of leachate water treatment in the landfill site	Leachate water from Htawi Chaung landfill site has begun to affect nearby rivers (Pazundaung Creek). Environmental and social risks resulting from improper management of landfill sites are increasing.
3) Consideration of fire prevention measures from the landfill site	At Htein Pin landfill site, the largest final disposal site in Yangon City, a large-scale fire (about 50 hectares) broke out in April 2018. Many health hazards due to smoke and ash from fires have been reported, increasing the environmental and social risks resulting from improper management of landfill sites.
4) Introduction of recycle facility	Since 2005, PCCD has been operating a plastic recycle facility. This facility mainly manufactures the waste bags introduced in Yangon City since April 2012. Since 2012, a private entity (1 entity) has been operating a similar recycle facility in cooperation with Yangon City and the plastics industry. Although the recycle facility is in operation, a systematic municipal waste recycling system has not yet been developed.
5) Introduction of PV system	Myanmar is blessed with water resources, and hydropower accounts for more than 70% of total power generation. During the dry season, blackouts occur frequently due to a large drop in the amount of power generated by hydropower. In 2019, scheduled blackouts were also implemented in Yangon City due to the power shortage. Repeated blackouts have been a great loss to the industrial field, and are an urgent issue in the rapidly industrializing Yangon City. On the other hand, the introduction of PV system has not increased since electricity costs are extremely low and the Feed-in Tariff (hereinafter called "FIT") system has not been established in Myanmar.

Source: Prepared by Nippon Koei

Based on the above issues in Yangon City, the Study in FY2019 has implemented the following activities to contribute to Yangon City.

TABLE2-4 Main Activities in FY2019

#	Item	Activity
1	Share the knowledge of the environmentally friendly industrial park	Kawasaki City officer explained about Kawasaki Eco-town in the workshop (December 2019 at Yangon City). Also, when the delegates from Yangon City visited Kawasaki City on January 2020, they visited Eco-town and deepened their understanding.
2	Consider the several environmental issues Yangon City is facing	1) Introduction of Waste to Energy Kawasaki City officer explained about the experience of the introduction of Waste to Energy in the workshop. In addition, Kawasaki City officer explained the budget related to waste management in Kawasaki City because the budget is the severe issue of the waste management.

#	Item	Activity
		Furthermore, when the delegates from Yangon City visited Kawasaki City, Waste to Energy operated by Kawasaki City and private companies were explained. Kawasaki City provided the information on technology to Yangon City.
	2) Management of leachate water treatment in the landfill site	Kawasaki City officer explained the management of the landfill site in the workshop. Also, when the delegates from Yangon City visited Kawasaki City, they visited the mega solar facility which is utilized for the landfill site and shared the information about the management of landfill site which is the issue in Yangon City.
	3) Consideration of fire prevention measures from the landfill site	Continuing from last year, Kawasaki City officer explained the city's measurement of fire prevention in the workshop.
	4) Introduction of recycle facility	In large cities, such as Yangon City and Kawasaki City, comprehensive waste management should be conducted. It is combine operation of both municipal and privately companies. Therefore, when the delegates from Yangon City visited Kawasaki City, they visited recycle facility operated by a private company.
	5) Introduction of PV system	Introduction of PV system (2MW) which was requested from Yangon City was considered. In this fiscal year, a site survey of Htein Pin landfill site was conducted to confirm the current situation. In addition, when the delegates from Yangon City visited Kawasaki City, they visited the mega solar facility which is utilized for the landfill site.

Source: Prepared by Nippon Koei

Photos of the meeting with Yangon City are shown below.



Meeting with Yangon City
(September 2019)



Meeting with Yangon City
(November 2019)

2.4 STUDY RESULTS OF CITY-TO-CITY COLLABORATION

2.4.1 Overview of the City-to-City Collaboration

Results of City-to-City Collaboration activities conducted in the Study are shown in the following table.

TABLE2-5 Overview of the City-to-City Collaboration

Content	Schedule	Description
The 1 st Field Survey (Yangon)	4-10 August, 2019	This survey was conducted for the purpose of exchanging the information with related companies. In addition, in order to further formulate JCM Model Projects, collect the basic information on existing industrial parks in Yangon City and had the meeting with some companies at Thilawa SEZ to introduce JCM and confirmed the potential and interest about JCM.
Kick off meeting with MOEJ (Tokyo)	19 August, 2019	Based on contents of the project proposal, concrete purpose, activities and schedule of this project were explained to MOEJ.
The 2 nd Field Survey (Yangon)	15-21 September, 2019	This survey was conducted for the discussion with Yangon City about the Study in this fiscal year and the formulation of JCM Model Project. About the feasibility study for JCM Model Project formulation, the meeting with Dagon International and JFE Engineering was conducted. In addition, the meetings at Thilawa SEZ were also conducted for the JCM Model Project formulation.
The 3 rd Field Survey (Yangon)	26-30 November, 2019	This survey was conducted to prepare the workshop in December. In addition, to consider the introduction of PV system in Htein Pin landfill site, which was requested by Yangon City, the meeting with engineering company was conducted.
The 4 th Field Survey (Yangon)	15-21 December, 2019	This survey was conducted to hold the workshop between Kawasaki City and Yangon City. In addition, the site reconnaissance on Htein Pin landfill site which was requested by Yangon City to introduce PV system and planted site of Dagon Industrial Park was conducted. The meeting with private companies were also conducted for the survey of JCM Model Project formulation.
Workshop (Yangon)	19 December, 2019	Kawasaki City explained about the waste management conducted in Kawasaki City regarding the introduction of Waste to Energy, management of leachate water treatment in the landfill site, consideration of fire prevention measures from the landfill site and introduction of recycle facility which were the significant issued of Yangon City. In addition, Yangon City explained the current situation of waste management in Yangon City and JFE Engineering explained the recycle facility operated by private sector. Dagon International also explained about the plan of Dagon Industrial Park.
Progress Reporting to MOEJ (Tokyo)	24 December, 2019	Explanation of the progress after kick off meeting to MOEJ, the issue about JCM Model Project formulation and future schedule.
City-to-City Collaboration	15-17 January, 2020	To participate the seminar on City-to-City Collaboration hold in Shinagawa, two delegates from Yangon City have visited

Content	Schedule	Description
Seminar and Inspection in Kawasaki City by Yangon City officer (Shinagawa/Kawasaki)		to Japan. In the seminar, Kawasaki City officer gave a presentation on the Study and its outcome. Yangon City officer joined a panel discussion and had a discussion with the delegates from other cities. Yangon City officers also visited the facilities regarding waste management and renewable energy in Kawasaki City.
The 5 th Field Survey (Yangon)	10-18 February, 2020	This survey was conducted to have the meeting with Dagon International for JCM Model Project formulation and the discussion with Yangon City about the activities of the Study in FY2020.
Wrap up meeting (Yangon)	13 February, 2020	This survey was conducted to report the result of the Study in this fiscal year. In addition, to consider the implementation of the feasibility study about the introduction of PV system at Htein Pin landfill site in FY2020, the explanation about JCM Model Project and the discussion with Yangon City were conducted.
Final Reporting to MOEJ (Tokyo)	28 February, 2020	Outcome of activities in FY2019 and draft plan for FY2020 are explained to MOEJ.

Source: Prepared by Nippon Koei

2.4.2 Workshop in Yangon City

On December 19, 2019, a workshop was held in Yangon City with Kawasaki City to share the knowledge (mainly in the waste management) of Kawasaki City and exchange opinions. In addition, a session on Sustainable Development Goals (hereinafter called “SDGs”), which has attracted a lot of attention in both Japan and Myanmar in recent years, was conducted to share information on activities in both cities. Details of the utilization of SDGs in the Study are described in Section 2.5.

Kawasaki City officers explained that a systematic public-private partnership was needed for appropriate waste management. As an example, JFE Engineering explained a recycle facility operated in Kawasaki City. In addition, Dagon International, which is considering the construction of an industrial park in Yangon City, explained the outline of the industrial park and the waste management and energy savings which they were considering.

On the other hand, Yangon City officers explained their implementation structure related to waste management of PCCD and the activities currently undertaken such as the method of separate collection and cleaning activities in the city. Based on the experience of the fire at the Htein Pin landfill site in 2018, it was explained that PCCD has been conducting a management of landfill sites and a fire drill. In addition, PCCD has tried to conduct the waste collection using the application. It was confirmed that PCCD has been conducting new initiative for waste management in Yangon City.

Agenda and participants of the workshop are presented below.

TABLE2-6 Agenda of the Workshop

#	Time	Program	Speaker	Outlines
1	13:00-13:10	Opening remarks	Yangon City	-
2	13:10-13:15	Introduction of participants	-	-
3	13:15-13:45	Current situation and issues of waste treatment in Yangon City	Yangon City	Explain the waste management in Yangon City implemented by PCCD, and the recent achievements and urgent issues regarding waste management.
4	13:45-14:25	Waste treatment management in Kawasaki City (Focus on the leachate water treatment/Fire prevention measures from the landfill site/ recycle facility /Kawasaki Ecotown)	Kawasaki City	Explain the overall of the waste management in Kawasaki City. In particular, leachate water management, fire prevention in the disposal site and recycle facilities, which were proposed as important issues by PCCD. Also, it was explained about Kawasaki Eco Town.
5	14:25-14:40	JFE group's recycle facility in Kawasaki ecotown	JFE Engineering	Regarding the recycle facility, explain the private recycle facility managed by JFE Group located in Kawasaki Eco Town.
6	14:40-14:55	Overview of East Dagon Industrial Zone project and waste treatment management plan.	Dagon International	Explain overview of East Dagon Industrial Zone project and waste treatment management plan by Dagon International which is owner of the industrial Zone.
7	14:55-15:10	Coffee break	-	-
8	15:10-15:20	Overview of SDGs in the City-to-City Collaboration	Nippon Koei	Explain the approach of SDGs in City-to-City Collaboration.
9	15:20-15:30	Action of the MSDP/SDGs in Yangon City	Yangon City	Explain the activities of SDGs that Yangon City (especially PCCD) is working on.
10	15:30-15:40	Action of the SDGs in Kawasaki City	Kawasaki City	Explain the activities of SDGs that Kawasaki City is working on.
11	15:40-16:40	Q&A and discussion session	-	-
12	16:40-16:50	Closing remarks	Kawasaki City Yangon City	-

Source: Prepared by Nippon Koei

TABLE2-7 Participants of the Workshop

Affiliation	Number of Participants [person]
Yangon City (PCCD)	40
Kawasaki City (International Economic Affairs Office)	2
Dagon International	4
JFE Engineering	4
Nippon Koei	2
Myanmar Koei Co. Ltd.	2
Total	54

Affiliation	Number of Participants [person]
Yangon City (PCCD)	40
Others : Interpretation (simultaneous interpretation: Myanmar⇔ Japanese)	1

Source: Prepared by Nippon Koei

The questions/comments which were received at the workshop are presented below.

TABLE2-8 Questions/ Comments in the Workshop

#	Question/Comment	Answer
1	<p>【Speaker: Yangon City/PCCD Deputy Director General】 Does the operating cost of waste management in Kawasaki City include the revenue related to waste disposal?</p>	<p>【Speaker: Kawasaki City】 Most of the waste treatment management cost is covered by city taxes collected from citizens, because only the revenues cannot cover it. Increasing the revenue and reducing the burden on citizens is one of the city's missions.</p>
2	<p>【Speaker: Dagon International】 What is the difference of recycling energy of incineration machine and Biogas Power Generation?</p>	<p>【Speaker: Kawasaki City】 Kawasaki City collects the waste form households. The fuel of Biogas Power Generation is biodegradable waste, but it is difficult to collect the biodegradable waste for the citizen (1.5 million). Therefore, there is no Biogas Power Generation in Kawasaki City operated by the City. On the other hands, it is possible to collect the biodegradable waste in food factory. Therefore, there is the Biogas Power Generation (J Bio) operated by private company in Kawasaki City.</p> <p>【Speaker: JFE Engineering】 J Bio is the private Biogas Power Generation. It is easier to collect the biodegradable waste form food factory than households, so biogas could be extracted, and it is possible to generate electricity. Therefore, it is recommended to construct the Biogas Power Generation in Dagon Industrial Park.</p>
3	<p>【Speaker: Yangon City officer】 Are there any accommodation for industrial workers to live in the project?</p>	<p>【Speaker: Dagon International】 Affordable houses for the workers consist of 10 apartments including 6 apartments with Yangon Regional organizations (approx.:300 to 600 sq ft x60 rooms) and the remaining apartments are under the plan of the Dagon International.</p>
4	<p>【Speaker: Yangon City officer】 How to dispose of those industrial wastes?</p>	<p>【Speaker: Dagon International】 Solid waste and wastewater from Dagon Industrial Park will be managed by Dagon International supported by JFE Engineering.</p>
5	<p>【Speaker: Yangon City officer】 How is intranet and shipping of products and goods?</p>	<p>【Speaker: Dagon International】 A railway and train station are nearby the project site so that it could be used as an inland container deport which will link till to the Mandalay.</p>
6	<p>【Speaker: Yangon City/PCCD Director】 Kawasaki City has been provided the</p>	—

#	Question/Comment	Answer
	<p>knowledge for the developing countries or SDGs under City-to-City Collaboration. It was contributed to the knowledge of Yangon City About the Dagon Industrial park considered by Dagon International and JFE Engineering, it is recommended to introduce Biogas Power Generation and Waste to Energy by Yangon City. Dagon International and JFE Engineering should share the information and cooperate to PCCD about the industrial park. Also, for Yangon City, it will be possible to commit the SDGs Action Plan.</p> <p>About the introduction of PV system in Htein Pin landfill site, we hope that the plan will be implemented as soon as possible.</p> <p>Yangon City would like to continue to learn the low carbonization, materialization of the low carbon city and effective utilization of PV system.</p>	

Source: Prepared by Nippon Koei

Photos of the workshop are shown below.



Presentation by Kawasaki City officer



Group Photo after the workshop

2.4.3 Seminar on City-to-City Collaboration in Tokyo and Inspection in Kawasaki City

The following delegates from Yangon City were invited to Japan from 15 to 17 January 2020 in order to attend the Seminar on City-to-City Collaboration for Low Carbon-Society organized by MOEJ.

Overall schedule and details of the delegates are presented below.

TABLE2-9 Overall Schedule in Japan

Day	Date	Activity
1	13 January (Mon)	Move (Yangon⇒Narita)
2	14 January (Tue)	Arrive, Move to Shinagawa
3	15 January (Wed)	Inspection in Kawasaki City
4	16 January (Thur)	Attend the Seminar
5	17 January (Fri)	Attend the Seminar
6	18 January (Sat)	Move (Narita⇒Yangon)

Source: Prepared by Nippon Koei

TABLE2-10 Details of the Yangon City Delegates

#	Name	Position
1	Mr. Thura Aung	Committee Member (8), Environmental Management Authority, Yangon City
2	Mr. Kyaw Kyaw Oo	Sub Assistant Supervisor, Urban Environmental Conservation and Cleansing, Environmental Management Authority, Yangon City

Source: Prepared by Nippon Koei

On 15 January, the delegates from Yangon City visited the facilities in Kawasaki City related to following the significant issues of Yangon City (mainly PCCD): (1) Introduction of Waste to Energy, (2) Management of leachate water treatment in the landfill site, (3) Consideration of fire prevention measures from the landfill site, (4) Introduction of recycle facility, (5) Introduction of PV system.

Schedule of the inspection in Kawasaki City is presented below.

TABLE2-11 Schedule of Inspection (15 January 2020)

Time	Activity
9:30	Departure the hotel
10:00-12:00	Kawasaki Eco Gurashi Mirai-kan
	Mega solar in Ukishima
	Charge station of EV buses for garbage collection
12:30-13:30	Lunch time
14:00-15:30	J Bio food recycle
16:00	Arrival the hotel

Source: Prepared by Nippon Koei

On 16 and 17 January, the JCM seminar was held with the following program.

TABLE2-12 Program of the Seminar

Date	AM	PM
16 January	Closed seminar (1)	Site visit (Gas museum of Tokyo Gas Co., Ltd.)
17 January	Closed seminar (2)	Open seminar

Source: Prepared by Nippon Koei based on the material of Ministry of the Environment, Japan

At the closed seminar on 16 January, Kawasaki City officer gave a presentation on the Study and its outcome. The delegates of Yangon City visited the Gas museum of Tokyo Gas Co., Ltd in the afternoon of the same day.

Also, at the closed seminar on 17 January, the delegate of Yangon City (Mr. Thura Aun) joined a panel discussion and has a discussion with the delegates from other cities on the benefits of participation in the City-to-City Collaboration, the keys for promoting zero-carbon & sustainable city development, and the roles which cities should play for realizing zero-carbon society.

Yangon City officer stated that it is necessary to receive grant aid from international donors from the perspective of future waste management.

The answers from Yangon City officer in the panel discussion were as follows:

TABLE2-13 Answer in the Panel Discussion

#	Framing questions	Answer of Yangon City
1	What are the benefits to participate in the city-to-city collaboration program?	Yangon City and Kawasaki City signed a MOU in March 2016 with a view to medium- to long-term cooperation. Since then, we have shared a lot of useful information, such as energy-saving technologies, methods for reducing of greenhouse gases and environmental pollutants, and the latest technologies for recycling. We also believe that the technical exchange between both cities will allow us to share the technical know-how and experience of the model eco-town city program.
2	What are the keys for promoting low carbon & sustainable city development?	We understand that clean energy is important for achieving sustainable development and it is at the forefront of global challenges. We believe that clean energy technologies will play an important role in promoting sustainability in many areas, including sustainable industrial development.
3	What kind of role should cities play in realizing a low-carbon society?	To materialize a low-carbon society, cities consider the role of understanding and supporting government's weaknesses.
4	What is the necessary support?	We need the knowledge of how to manage hazardous and non-hazardous waste, management of air quality, and updating of waste databases. It is also considering implementing a pilot project for an eco-town located within the Yangon City boundary.

Source: Prepared by Nippon Koei

Following are the photos of the inspection in Kawasaki City and the panel discussion at the City-to-City Collaboration Seminar.



Kawasaki Eco Gurashi Mirai-kan



Panel discussion which the delegate joined

2.4.4 Site Reconnaissance on Htein Pin Landfill Site

On 20 December 2019, the site reconnaissance on Htein Pin landfill site was conducted by Kawasaki City officer and Nippon Koei accompanied by Yangon City officer. This site reconnaissance has conducted to understand the current situation and confirmed the feasibility of the introduction of solar PV system at Htein Pin landfill site, which was one of the requests from Yangon City.

As a result of the site reconnaissance, it was confirmed that the candidate site to install PV system was a section of the Htein Pin landfill site and the site was currently utilized for the landfill from the waste of Yangon City. The candidate site has a surplus space (about 10 acres) of the intermediate treatment facility which is planned to be constructed with a loan from the Polish government and the space along the landfill site (Total is more than 30 acres²). In addition, electricity from the solar PV system will consume at the Yangon City's facility which will be constructed in the site, without supplying to the existing power grid.

The following are photos of Htein Pin landfill site on December 2019.



Htein Pin landfill site



Htein Pin landfill site (remaining space)

² 30 acres = About 120,000 [m²]

The background of PCCD's request for the introduction of solar PV system at Htein Pina landfill site may be since PCCD is considering the ways to effectively utilize the unused land owned by the Yangon City. In addition, as detailed in Section 2.5.2, the introduction of renewable energy is one of the priority SDGs targets. Therefore, it is thought that PCCD is aiming for a clean business which will not be relied on the grid.

Thus, PCCD is really considering to introducing of solar PV system at the site and more detailed surveys will be conducted in the Study in FY2020, such as confirmation of ground conditions and so on.

2.4.5 Wrap-up Meeting in Yangon City

On 13 February 2020, the wrap-up meeting was held to report the activity in the Study and confirmed the future cooperation policies of the Study in FY2020.

It was reported that the workshop in Yangon City, and site visit in Kawasaki City was conducted, which the theme was the significant issues of Yangon City (especially PCCD). In addition, it was also reported that the site reconnaissance on Htein Pin landfill site was conducted to consider the introducing of solar PV system which was the request from Yangon City.

Regarding to the JCM Model Project formulation in the next fiscal year (FY2020), it was made agreement with Yangon City that the consideration of introducing solar PV system at the Htein Pin landfill site would be conducted in addition to continuing the study of Dagon Industrial Park.

Through the discussion with Yangon City, it was requested to consider the introducing of solar PV system at a new landfill site in Yangon City (East Dagon Township) under the control of PCCD. Furthermore, it was also requested from Yangon City to conduct more strengthen capacity building regarding the work of PCCD for the Study in FY2020. In order to meet such demands as much as possible, discussion with the related parties of the Study will be implemented.

Finally, regarding the SDGs which was added as a content of the Study in FY2019, it was confirmed that cooperation such as knowledge sharing of Kawasaki City would be conducted in FY2020.

Photos of the wrap-up meeting are presented below.



Wrap-up meeting (Feb 2020)



Wrap-up meeting (Feb 2020)

2.5 ADOPTION OF SDGs

Myanmar Sustainable Development Plan (hereinafter called “MSDP”), a national development plan linked to the SDG targets were formulated in August 2018 in Myanmar. Yangon City is required to develop its own SDGs plan based on the MSDP, and the Yangon City has high interest in the SDGs. On the other hand, Kawasaki City is one of the local governments with a track record of the working on SDGs in Japan.

Therefore, the Study has adopted SDGs as one of the themes of the Study for City-to-City Collaboration and a SDGs session was set up at the workshop held in December. The activities of both cities on SDGs were explained, and the status about SDGs in both cities were confirmed.

2.5.1 Activity of SDGs in Kawasaki City

Kawasaki City made public announcement of “Action Policy for Sustainable Development Goals (SDGs) in Kawasaki City” in February 2019 and has started their activities for achieving SDGs. In addition, Kawasaki City has been selected as “SDGs Future City” in July 2019, which was selected by the Regional Revitalization Promotion Office of Cabinet Office.

Kawasaki City aims to be “the happiest city with full of joy for everyone” by 2030. To achieve this goal, the city is implementing several actions at three aspects, which are “economy”, “environment”, and “social”.

TABLE2-14 SDGs Actions in Kawasaki City

Item	SDGs	Issue	Action
Economic	3,8,9,17	Adaptation to environmental changes of industrial economy	<ul style="list-style-type: none"> Strengthening of global competitiveness and creation of new industry Creating “Green Life welfare Innovation” Strengthening of research infrastructure
		Promotion of strategic industry	<ul style="list-style-type: none"> Enforcement of international

Item	SDGs	Issue	Action	
			accumulation at waterfront area and development infrastructure	competitiveness in industrial complex • Development “king sky front” as an international strategy hub
Social	5,10,11,17	Dealing with impact of the falling birthrate, the aging population, and population decrease	Making the city comfortable to live, and providing opportunities to the citizens for great success	• Diffusing a vision of “Kawasaki Para Movement” and creating legacy • Promotion of wood utilization by collaboration with suburban cities • Formulation of regional comprehensive care system for all citizens
			Formulation of urban community by the citizens	• Solving local issues by establishing “Machino hiroba (open space for citizens)” • Utilizing “Social design center” for solving local issues by citizens
Environment	7,12,13,17	Effort for solving global issues regarding to environment and energy etc.	Realization of low-carbon and circulatory city	• Promotion of actions for GHG emission reduction by citizen, companies, and local government • Installing hydrogen energy into waterfront area
			International contributions by utilizing knowledge on environmental technologies and administration	• Solving environmental issues in developing countries by utilizing JCM

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

2.5.2 Activity of SDGs in Yangon City (PCCD)

As mentioned above, MSDP, a national development plan, was formulated August 2018 in Myanmar.

MSDP guides the country's economic development by 2030, in line with the target year of the SDGs. MSDP is composed of three pillars: peace and stability, prosperity and partnership, and people and planet. Under the three pillars, MSDP has five goals, 28 strategies, and 251 action plans. The action plan is summarized which of the 169 targets of the relevant ministries and SDGs are aiming to contribute.



Source : Provided by Yangon City

FIGURE2-3 MSDP

In the future, local governments in Myanmar will be required to formulate the action plans in accordance with MSDP from the central government. Therefore, PCCD has prioritized the four action plans by MSDP's 251 action plans. PCCD

hasn't had specific plans related to these action plans yet.

TABLE2-15 Action Plans Prioritized by PCCD

Pillar3: People & Planet					
Goal5: Natural Resources & the Environment for Posterity of the Nation					
Strategy 5.1: Ensure a clean environment together with healthy and functioning ecosystem					
Action Plans		Strategic Outcomes	Relevant Agencies	12 Point Economic Policy	Relevant SDGs Targets
5.3.6	Practice effective and environmentally safe waste management and disposal in industrial, commercial, household, and public sector use contexts	Domestic solid waste and effectively disposed to promote healthy communities	MoNREC, MoLIP, MoALI, MoH, LG	EP9	6.2
5.4.2	Scale-up use of renewable energy resources such as wind, solar, hydro, geothermal and bioenergy in partnership and with agreement of local populations	Climate-resilient and low-carbon energy, transport and industrial systems promoted	MoEE, MoIND, MoPF, MoALI, MoCON	EP4	7.2
5.6.3	Design and/or assess and retrofit urban infrastructure to improve resilience to natural and man-made disasters and other shock events, with a focus on reducing carbon emission and producing greater savings from reduced energy consumption	Climate-resilient and low-carbon energy, transport and industrial systems promoted	MoHA, MoPF, MoTC, MoCON, MoNREC, MoEE	EP4, EP9	11.c
5.6.6	Provide efficient public municipal services including solid waste collection and management systems combined with public education on recycling and waste minimization practices.	Urban environment with more public spaces, improve public services, and preservation of cultural heritage	LG, MoTC, MoCON, MoPF	EP9, EP4	11.6

Source: Prepared by Nippon Koei based on MSDP

2.5.3 Utilization of SDGs in the Study

To achieve the four SDGs targets prioritized by PCCD, the Study in FY2020 will conduct the activities such as setting the unique indicators and values for Yangon City. Also, the Study will support the monitoring to measure the status of the indicators in cooperation with Kawasaki City.

The international indicators related to SDG targets prioritized by PCCD are presented below.

TABLE2-16 SDGs Target and International Indicator

SDGs target prioritized by PCCD		International Indicator
6.2	By 2030, achieve access to adequate and equitable sanitation and hygiene for all and	Proportion of population using (a) safely managed sanitation services and (b) a hand-washing facility

SDGs target prioritized by PCCD		International Indicator
	end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.	with soap and water
7.2	By 2030, increase substantially the share of renewable energy in the global energy mix.	Renewable energy share in the total final energy consumption
11.c	Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials.	Proportion of financial support to the least developed countries that is allocated to the construction and retrofitting of sustainable, resilient and resource-efficient buildings utilizing local materials
11.6	By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management.	Proportion of urban solid waste regularly collected and with adequate final discharge out of total urban solid waste generated, by cities Annual mean levels of fine particulate matter (e.g. PM2.5 and PM10) in cities (population weighted)

Source: Prepared by Nippon Koei based on SDGs

CHAPTER 3 FORMULATION OF JCM MODEL PROJECT

3.1 CURRENT SITUATION OF JCM MODEL PROJECT IN MYANMAR

In Myanmar, there are seven (7) JCM Model Projects have been adopted (Three projects have two technologies each in one project, so the number of adopted technologies is a total of 10³).

JCM Model Projects that have been adopted so far are presented below.

TABLE3-1 JCM Model Project in Myanmar

FY	Representative Entity	Partner company	Project site	Name of project	Type of Technology	Estimated GHG reduction (tCO ₂ /year)
2015	JFE Engineering	YCDC	Yangon City	Introduction of Waste to Energy Plant in Yangon City	Waste management	2,358
2016	Kirin Holdings	Myanmar Brewery	Yangon City	Introduction of Energy Saving Brewing Systems to Beer Factory	Energy saving	2,841
2016	Acecook	Acecook Myanmar	Thilawa SEZ	Introduction of High-efficiency Once-through Boiler in Instant Noodle Factory	Energy saving	674
2016	Fujita	Myanmar Agribusiness Public Corporation	Ayeyarwady Region	Rice Husk Power Generation in Rice Mill Factory in Ayeyarwady	Renewable energy	2,750
2016	Ryobi Holdings	Ryobi Myanmar Distribution Service	Thilawa SEZ	Introduction of Energy Efficient Refrigeration System in Logistics Center	Energy saving	125
2018	Global Engineering	Shwe Taung Cement	Mandalay Region	Introduction of 8.8MW Power Generation System by Waste Heat Recovery for Cement Plant	Renewable energy	19,241
2018	Kirin Holdings	Myanmar Brewery	Yangon City	Introduction of Biomass Boiler and Waste Heat Recovery System to Beer Factory	Energy saving	3,508

Source: Prepared by Nippon Koei based on Global Environment Centre Foundation's website

³ Refrigerator (for refrigeration / refrigeration), boiler, waste heat preheating utilization system: 2 each, biomass power generation, biogas combustion boiler, waste heat utilization power generation, waste to energy: 1 each

All partner companies in the JCM Model Projects which have been adopted so far in Yangon City and Thilawa SEZ are local subsidiary or same group company of Japanese representative entity excluding YCDC for Introduction of Waste to Energy Plant in Yangon City. It is thought that one of the reasons is that the local entities cannot judge the introduction of energy-saving or renewable energy equipment from the viewpoint of management because the electricity rate is low in Myanmar. For the local entities, especially if financial effects are not expected, there is no motivation to work on them, and it is thought that they will not lead to energy saving or introduction of renewable energy equipment.

Under this situation, to create JCM Model Project in Myanmar in the future, it is important to conduct the project formulation together with local entities in order to establish a presence of JCM scheme in that country. Therefore, it is desirable to conduct the JCM Model Project formulation with local entities without focusing on cooperation with local companies in Japan in the future. It will be one clue to expand the possibility of the JCM Model Project formulation in Myanmar.

3.2 OBJECTIVE OF JCM MODEL PROJECT FORMULATION IN FY2019

Yangon City is undergoing rapid urbanization due to an inflow of foreign capital and an increasing of development in private sectors along with the recent democratization. More than 25 industrial parks have been developed in the City, and new industrial parks are additionally being developed.

As mentioned in Section 3.1 above, Myanmar's low electricity tariff make it difficult to expect incentives to reduce electricity costs by saving energy and introduction of renewable energy. On the other hand, in Myanmar, the shortage of electricity supply against the increase in power demand is significant issue. In particular, the industrial field such as an industrial park, repeated blackouts during the dry season can be a great loss. Therefore, energy saving to reduce power consumption and introduction of private power generation by renewable energy play an important role in industrial parks.

In industrial parks, it has a potential for energy savings due to the prospect of mass consumption of energy. Also, it has a potential to introduce the renewable energy such as solar PV system using green belts, and small hydropower generation using water heads of irrigation canals in the industrial parks. In addition, it is expected that various type of tenant companies moves into the industrial parks, so the dissemination of JCM are implemented effectively.

Also, there are many Japanese companies in Yangon City and around the outskirts of the City, including Thilawa SEZ. Therefore, the potential is still high for the formulation of the JCM Model Project. In the Study, it was considered that conducting the preparatory survey on JCM Model Project formulation for the Thilawa Special Economic Zone and other private companies was useful.

Therefore, JCM Model Project formulation in the Study in FY2019 was conducted for the following objects.

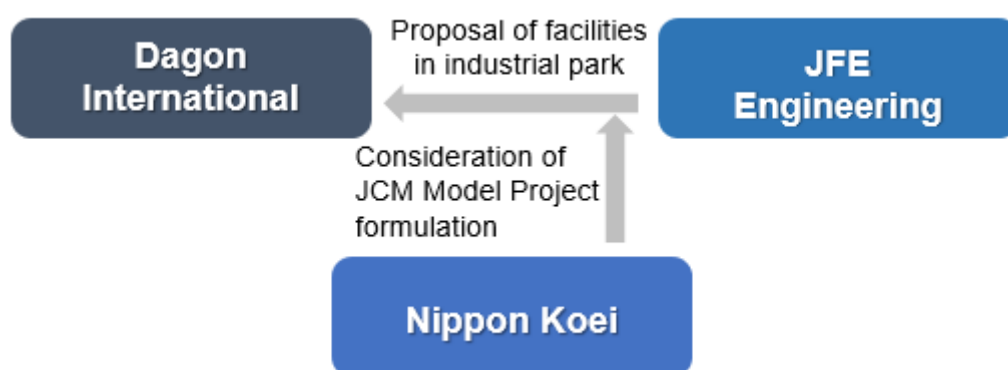
- 1) Select the project regarding energy saving and renewable energy in the industrial park.
- 2) Preparatory survey for the private companies for the JCM Model Project formulation.

3.3 FEASIBILITY STUDY OF INTRODUCTION OF ENERGY SAVING/ RENEWABLE ENERGY IN THE INDUSTRIAL PARK

Ywar Thar Gyi East Dagon Industrial Zone (hereinafter “Dagon Industrial Park”) was selected the target for the feasibility study of introduction of energy saving/renewable energy in the industrial park. In the Study, JCM Model Project formulation was conducted regarding the facilities which was proposed by JFE Engineering⁴ to Dagon International.

Dagon International, the owner of the Dagon Industrial Park, is a financial clique in Myanmar whose main business fields are real estate and construction service. Dagon International has been interested in the JCM Model Project because they have been considering introducing of solar PV system and biogas power generation in their organic market.

The demarcation of parties concerned (JFE Engineering, Dagon International and Nippon Koei) is presented below.



Source: Prepared by Nippon Koei

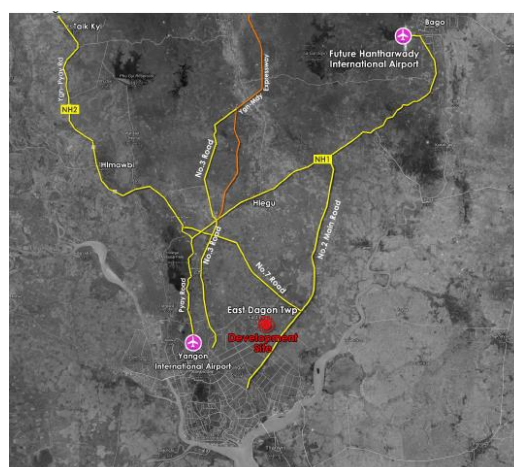
FIGURE3-1 Demarcation of the parties concerned

3.3.1 Overview of the Industrial Park

Dagon Industrial Park will be constructed at the east end of Yangon City and will be the first food industry park in Myanmar.

This industrial park will be a large-scale industrial and commercial complexed facility. Organic market, hotel and other houses will be constructed in the industrial park.

The site is a few minutes' drive from the new highway linking Yangon City to Mandalay, with good access to the Southeast area towards Thilawa



Source: Dagon International

FIGURE3-2 Planted Site

⁴ In July 2019, JFE Engineering conducted the MOU about the cooperation in this industrial park.

SEZ and future planned international airports. Therefore, this industrial park is expected to be the first food industrial park in Myanmar to overcome the issues of logistics and cold chain in Myanmar.

The planned site of the industrial park has already been acquired and it is 100% owned by Dagon International. This site is utilized for the farmland now. Therefore, the land conversion is required, and the cost will be paid by Dagon International (20%) and Myanmar government (80%). Thus, it can be said that this is a government-required project.

The basic information of industrial park and land use planning are shown as follow.

TABLE3-2 Basic Information of Industrial Park

Item	Overview
Name	Ywar Thar Gyi East Dagon Industrial Zone
Place	9.2km from Yangon Expressway (NH2), 7.2km from No.7 Road
Scale	228ha (about 42 times larger than Tokyo Domes, about 4 times larger than Tokyo Disneyland)
CAPEX	11-16 billion
Main facilities	Food processing plant, organic market, refrigeration/freezing facility, wholesale market, safety and quality testing laboratory, power supply facility, waste treatment / recycle facility, hotel, dormitory (apartment), medical facility, administration building, retail store, etc.
Main infrastructures	Water treatment facility, Wastewater treatment facility, Distribution bases, Roads in the industrial park, Lighting facility, etc.

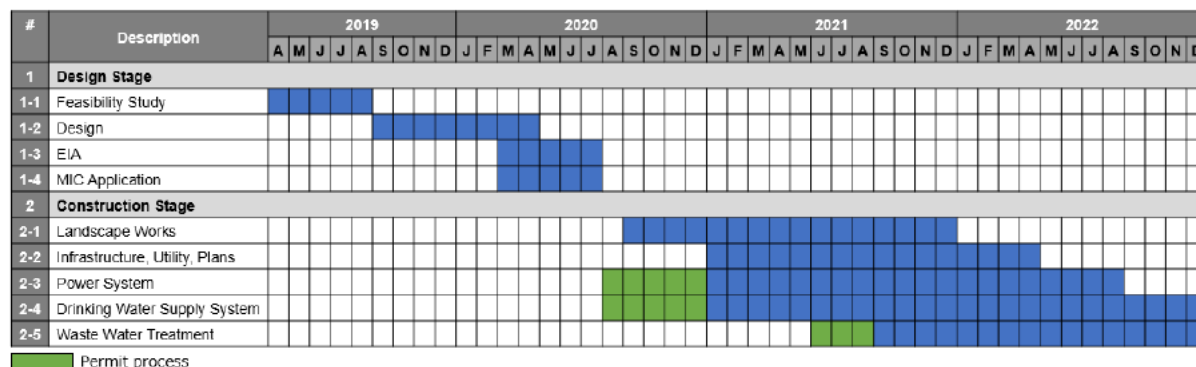
Source: Prepared by Nippon Koei based on Dagon International



Source: Dagon International

FIGURE3-3 Land Use Planning in Industrial Park

The design of the industrial park is scheduled to be completed in April 2020 and start of the construction of the industrial park is scheduled form autumn in 2020. The overall schedule of the industrial park is shown as follow.



Source: Prepared by Nippon Koei based on Dagon International

FIGURE3-4 Overall Schedule of the Industrial Park

A master plan considering the infrastructure, which is the foundation of the industrial park, was prepared in 2017 by a foreign design company. The followings are the outline of main infrastructure facilities of the industrial park confirmed by reviewing the master plan and the meeting with Dagon International.

TABLE3-3 Outline of the main infrastructure facilities

#	Item	Overview of the Infrastructure (Master plan)
1	Power Supply	Electricity is received from grid power, transformed from 66 kV to 33 kV in the industrial park, and supplied to factories, hotels and commercial facilities.
2	Water Supply	Residential area, commercial area and factory area, respectively, will be supply 2,453m3/day, 585m3 / day, and 5,250m3 / day. It is planned to take water from Lagunpyin water treatment plant
3	Wastewater Treatment	Wastewater discharged from residential areas and commercial area is treated with a semi-collective treatment system. On the other hand, Wastewater discharged from the factory area is treated by each tenant owner.
4	Waste Treatment Management	Waste disposed from each factory and commercial facility will be carried to Htawe Chaung landfill site under YCCD. The amount of waste from the industrial park has not been estimated.

Source: Prepared by Nippon Koei based on Dagon International

The development of the basic infrastructure such as power supply, water supply and wastewater treatment in the industrial park will be developed separately in three (3) phases. In the 1st phase, the construction of the factory area, the common facilities and hotel will be constructed. In the 2nd phase, in addition to the factory area, residential area will be constructed. The commercial facilities such as an organic market will be constructed in the 3rd phase.

Three development phases for the construction of the industrial park are presented below.



Source: Dagon International

FIGURE3-5 Three development phases for the construction

In the 1st phase, development will be commenced from September in 2020 with the construction of power supply and water supply. Development in all phases will be finished by December in 2025. The volume of power supply, water supply and wastewater treatment of each phase and development schedule are presented below.

TABLE3-4 Volume of power/water supply and wastewater treatment

Phase	Area (hac)	Power Supply (MVA)	Water Supply (m3/day)	Wastewater Treatment (m3/day)
Phase1	140.59	30	2,700	2,430
Phase2	39.42	28	6,420	5,770
Phase3	46.98	33		
Total	226.99	100	9,120	8,200

Source: Prepared by Nippon Koei based on Dagon International

#	Common Facility	Phase	2020				2021				2022				2023				2024				2025			
			3	6	9	12	3	6	9	12	3	6	9	12	3	6	9	12	3	6	9	12	3	6	9	12
1	Power System	1																								
		2																								
		3																								
2	Drinking Water Supply System	1																								
		2																								
		3																								
3	Waste Water Treatment	1																								
		2																								
		3																								
4	Solar Power Production	1																								
		2																								
		3																								

Phase1 : Phase1 Phase2 : Phase2 Phase3 : Phase3

Source: Prepared by Nippon Koei based on Dagon International

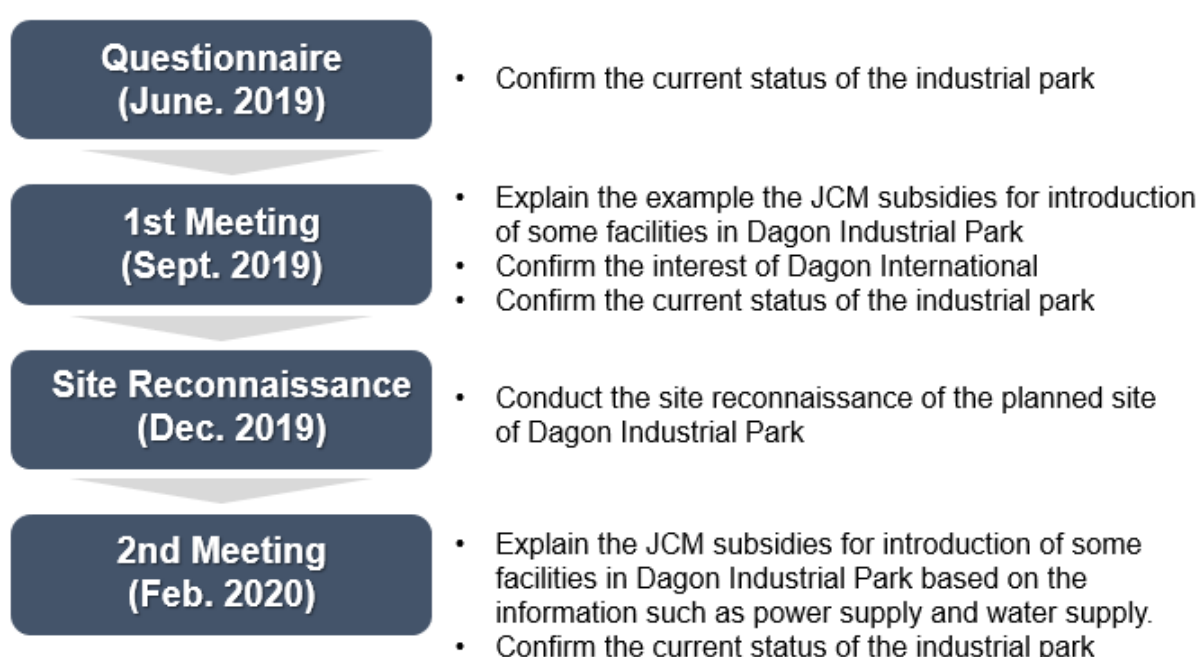
FIGURE3-6 Development Schedule on Dagon Industrial Park

3.3.2 Meeting with the Owner of the Industrial Park

For the JCM Model Project formulation, the progress of the industrial park after the master plan was confirmed in the beginning of the Study.

A questionnaire was sent to confirm the contents of the facilities and the manufacturers to be introduced in the industrial park which Dagon International has been considering after the master plan. After that, two meetings were held, and the introduction of the facilities with JCM in the industrial park was discussed. In addition, a site survey of the planned industrial park was conducted in the 4th field survey.

Workflow of the JCM Model Project formulation in the Study is shown as follow.



Source: Prepared by Nippon Koei

FIGURE3-7 Workflow of the JCM Model Project Formulation

Photos of the meeting with Dagon International are shown below.



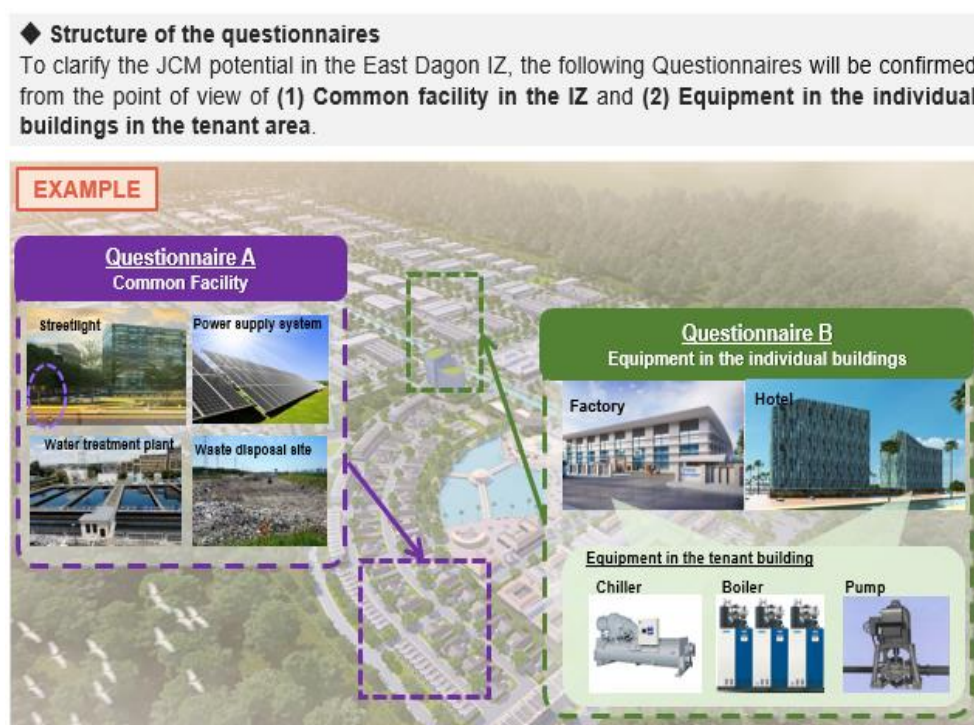
1st Meeting

2nd Meeting

(1) Questionnaire

To confirm the current status of the industrial park, a questionnaire was prepared and received the answers from Dagon International. The questionnaire consisted of two parts: a question about infrastructure facilities in the industrial park and a question about tenant companies that are planning to move in the industrial park.

From the answer of the questionnaire, it was confirmed that the introduction of infrastructure facilities in industrial park was currently under consideration (as of July 2019), and that it was possible to apply for JCM Model Project. In addition, the recruitment of tenant companies has not been done yet, so it was confirmed that the proposal of installing facilities into each tenant companies would be premature.



Source: Prepared by Nippon Koei

FIGURE3-8 Example of Questionnaire to Dagon International

(2) 1st Meeting

Based on the answer from the questionnaire, the estimated GHG emission reductions and the amount of JCM subsidies were explained in case of the introduction of four themes: solar PV system (on the rooftops), streetlights, refrigeration facility, and wastewater treatment facility which were identified to be installed in the industrial park. Amount of the GHG emission reduction and JCM subsidy were calculated for the expected capacity based on the previous similar projects.

The overview of the explanation at the 1st meeting is presented below.

TABLE3-5 Overview of the explanation in the 1st meeting

Facility	Technology	Spec
Solar Power facility	Solar panel	JCM subsidy for introducing of solar PV facility (2,700 MWh) was calculated. CAPEX: 180,000,000 [JPY] GHG emission reduction: 14,642 [tCO ₂] JCM subsidy: 30 [%]/ 54,000,000 [JPY]
Lighting facility	Streetlight	JCM subsidy for introducing of streetlights (90 units) were calculated. CAPEX: 9,000,000 [JPY] GHG emission reduction: 277.5 [tCO ₂] JCM subsidy: 10 [%]/ 900,000 [JPY]
Water treatment facility	High efficiency pump	JCM subsidy for introducing of 4 unit of high efficiency pump (2.08m ³ /m) were calculated. CAPEX: 320,802,110 [JPY] GHG emission reduction: 16,026 [tCO ₂] JCM subsidy: 19 [%]/ 60,284,218 [JPY]
Refrigeration/ Freezing facility	Heat pump desiccant dehumidifier	JCM subsidy for introducing of 3 unit of heat pump desiccant dehumidifier were calculated. CAPEX: 45,500,000 [JPY] GHG emission reduction: 2,747 [tCO ₂] JCM subsidy: 20 [%]/ 9,100,000 [JPY]

Source: Prepared by Nippon Koei

As a result of the 1st meeting with Dagon International, it was confirmed that they were high interest in the introduction of PV system and water treatment facility.

If the industrial park purchases the water from Lagunpyin water treatment plant, the water charge will be 10 times (880 MMK/m³) of the domestic water supply rate (88 MMK/m³) in Yangon City. Therefore, it was confirmed that they would like to positively consider installing their own water treatment facility in the industrial park.

From the Dagon International's view, the streetlights of Chinese products are significantly cheaper (about 1/10 the market price) than Japanese products, so it was not considered to purchase the Japanese products applying to JCM Model Project. In addition, it was confirmed that although refrigeration and freezing facilities would be needed to install in the food industry park and Dagon International had an intention to consider of JCM Model Project formulation, it was premature to recruit tenants. Therefore, more detailed discussions will be conducted after the next fiscal year.

In the 1st meeting, it was confirmed that Dagon International had high interest in applying to JCM Model Project and also the development scale and the volume of the power supply, water supply and wastewater treatment in each phase of the construction.

(3) 2nd Meeting

In this meeting, estimated effects of energy saving/renewable energy and JCM subsidies in Dagon Industrial Park were explained based on the information that had been confirmed in 1st meeting.

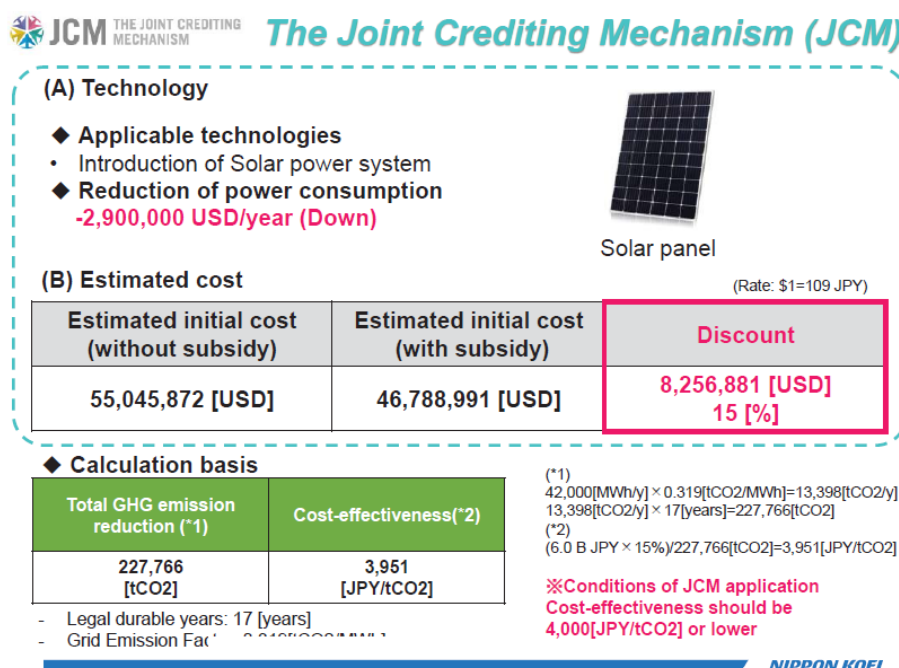
Proposed facilities and equipment were solar PV system and water treatment facility which were confirmed of the interests by Dagon International in the previous meeting, and wastewater treatment and waste management considering the current state of Myanmar's major industrial parks, Mingaladon Industrial Park and Thilawa SEZ.

The overview of the explanation at the 2nd meeting is presented below.

TABLE3-6 Overview of the explanation in the 2nd meeting

Item	Background	Technology	Description
Power supply system	Regarding power supply, the Mingaladon Industrial Park does not have its own power plant and supplies electricity using grid power. As a result, there are many power outages, especially during the dry season, which are greatly affected by rolling blackouts. The Thilawa SEZ has a 50MW gas-fired power plant, so there are few blackouts and stable power supply is possible. In this industrial park, it is assumed that many food factories will move in, so it is needed to aim stable power supply with less power outage in the industrial park.	Solar PV system	A portion of the power supplied (100 MW) to the industrial park will be supplied by solar PV system. Capacity of solar PV system is set to 30 MW in accordance with Dagon International's plan.
		Thermal recycle system	Introduction of thermal recycle system by gas turbine and once-through boiler. The turbine is rotated by the high-temperature combustion gas generated by the combustor, and the rotating power is used to rotate the generator to generate electricity, which is used as part of the electricity provided by the industrial park. Capacity of gas turbine is 7.5MW and once-through boiler is 35t/h.
Water treatment/Wastewater treatment facility	Although construction of wastewater treatment facility is not considered in the master plan of this industrial park, it has been installed in the Mingaladon Industrial Park and Thilawa SEZ in Myanmar. Also, environmental awareness is increasing in Myanmar. In order to aim for an environmentally friendly industrial park, it is necessary to consider the establishment of the wastewater treatment facility.	Water treatment facility	Introduction of the water treatment plant (Capacity: 9,320m ³) in the industrial park and reduce GHG emission by high efficiency pump.
		Wastewater treatment facility	Introduction of the wastewater treatment plant in the industrial park and reduce GHG emission by high efficiency blower.
Waste management	In the master plan of the industrial park, for waste treatment landfill disposal is considered. However, as the amount of waste in Yangon City increases, demand for intermediate treatment such as biomass power generation and waste to energy is increasing. Particularly in the food industry park, stable collection of high calorie waste can be expected.	Biogas plant	Since the estimated amount of waste is unknown, the value of the biogas power generation facility (40t/day) considered in the Study last year was used as a reference.

Source: Prepared by Nippon Koei



Source: Prepared by Nippon Koei

FIGURE3-9 Example of the proposal in 2nd meeting (PV system)

From the result of the 2nd meeting, it was confirmed that Dagon International has high interest in power supply system and water treatment/ wastewater treatment facility.

Regarding to the solar PV system, it was agreed that further considerations, such as comparison of prices by solar panel manufacturers and the resulting cost-effectiveness, would be considered. In addition, it was confirmed that Dagon International had the intention to consider installing the solar PV system (4 MW) on the rooftop at their organic market in Yangon City, which was already operated by Dagon International.

About thermal recycle system, in this proposal, the amount of GHG emission reductions were calculated by driving a gas turbine that uses natural gas as fuel, which is commonly used in Japan. However, the supply of natural gas is currently difficult in Myanmar. Therefore, it was confirmed that a thermal recycle system using LPG or diesel as a fuel instead of natural gas will be considered in the Study of next fiscal year.

In Amata Industrial Park, which is planned to be built in Yangon City, PTT (Petroleum Authority of Thailand) is planning to run an LPG gas line. In the Study, it will be confirmed whether gas line can be expanded to the Dagon Industrial Park.

Regarding the introduction of pumps in water treatment facility and the blowers in wastewater treatment facility, it was confirmed that IRR about the facilities would be calculated, and the validity of the project examined in the following fiscal years.

On the other hand, regarding biogas power generation and waste to energy, it was confirmed that the type of waste and the expected amount were unclear, so further study is needed for specific measures.

Finally, the industrial park had been scheduled to receive an investment permit from the Myanmar Investment Commission (MIC) around January 2020. However, due to the increased number of additional procedures, it was confirmed that formal approvals would likely be accepted later this year (October or November 2020).

(4) Site Reconnaissance on Planned Site of Industrial Park

In December 2019, the site reconnaissance on planned site of industrial park has conducted with Dagon International and JFE Engineering. At the time of the site reconnaissance, the planned site of the industrial park had already been acquired and the land was being cleared. Until the start of the construction, it was partially used as farmland.

The situation at the time of site reconnaissance is presented below.



Planned Site of Industrial park



La Moie river planned to take the water

3.3.3 Technology to be Installed

Through the meeting with Dagon International, the candidate technologies were selected for JCM Model Project. The candidate technologies are “Solar PV system”, “Thermal recycle system”, “High efficiency pump” and “High efficiency blower”.

The outline of each technologies is presented below.

TABLE3-7 Outline of Each Technologies

Items	Proposed condition
Solar PV system	
Capacity	30 [MW]
Annual power generation (per1 MW)	1,400 [MWh/Year]
Introduction cost per 1MW	200,000,000 [JPY/MW]
Thermal recycle	
Capacity (Gas turbine)	7.5 [MW]
Capacity (Once-through boiler)	35 [t/h]

Items	Proposed condition
Gas turbine cost	650,000,000 [JPY]
Boiler cost	50,000,000 [JPY]
Construction cost	800,000,000 [JPY]
High efficiency booster pump	
Motor output	0.045 [MW]
Flow rate	2.08 [m3/min]
Operation hours	10 [hours]
Pump cost per unit	12,000,000 [JPY]
Unit	4 [Units]
High efficiency blower	
Motor output	0.011 [MW]
Operation hours	10 [hours]
Ventilation volume	20 [m3/min]
Static pressure	6500 [mmAq]
Pump cost per unit	10,000,000 [JPY]
Unit	4 [Units]

Source: Prepared by Nippon Koei based on JFE Engineering

3.3.4 Confirmation of Project Plan and Estimated GHG Emission Reduction

Project plan and estimated GHG emission reduction about the candidate technologies for JCM Model Project are presented follows. The technologies are “Solar PV system”, “Thermal recycle system”, “High efficiency pump” and “High efficiency blower”.

TABLE3-8 Project Plan and Estimated CO2 Emission Reduction

Item	Result
Solar PV system	
Estimated total initial investment	6,000,000,000 [JPY]
Estimated energy saving	42,000 [MWh/Year]
Estimated GHG emission reduction per year	13,398 [tCO2/y]
Estimated GHG emission reduction	227,766.00 [tCO2]
Cost Effectiveness	3,951 [JPY/tCO2]
Subsidy	15 [%]
Thermal recycle system	
Estimated total initial investment	1,500,000,000 [JPY]
Reference total energy consumption	788,400 [MWh]
Reference total gas emission	60,371,430 [m3N]
Project total gas emission	71,481,600 [m3N]
Estimated GHG emission reduction per year	18,046 [tCO2/y]
Estimated GHG emission reduction	216,551 [tCO2]
Cost Effectiveness	3,463 [JPY/tCO2]
High efficiency booster pump	
Estimated total initial investment	48,000,000 [JPY]
Reference pump efficiency	75 [%]

Item	Result
Project pump efficiency	80 [%]
Estimated GHG emission reduction per year	183 [tCO ₂ /y]
Estimated GHG emission reduction	3,303 [tCO ₂]
Cost Effectiveness	3,923 [JPY/tCO ₂]
Subsidy	27 [%]
High efficiency blower	
Estimated total initial investment	4,000,000 [JPY]
Reference blower efficiency	75 [%]
Project blower efficiency	80 [%]
Estimated GHG emission reduction per year	44.8 [tCO ₂ /y]
Estimated GHG emission reduction	807 [tCO ₂]
Cost Effectiveness	2,476 [JPY/tCO ₂]
Subsidy	50 [%]

Source: Prepared by Nippon Koei

As shown in the table above, the introduction of solar PV system and thermal recycle systems are expected to reduce GHG emission and the cost-effectiveness can meet the criteria for the JCM Model Project, even if the facilities are introduced alone.

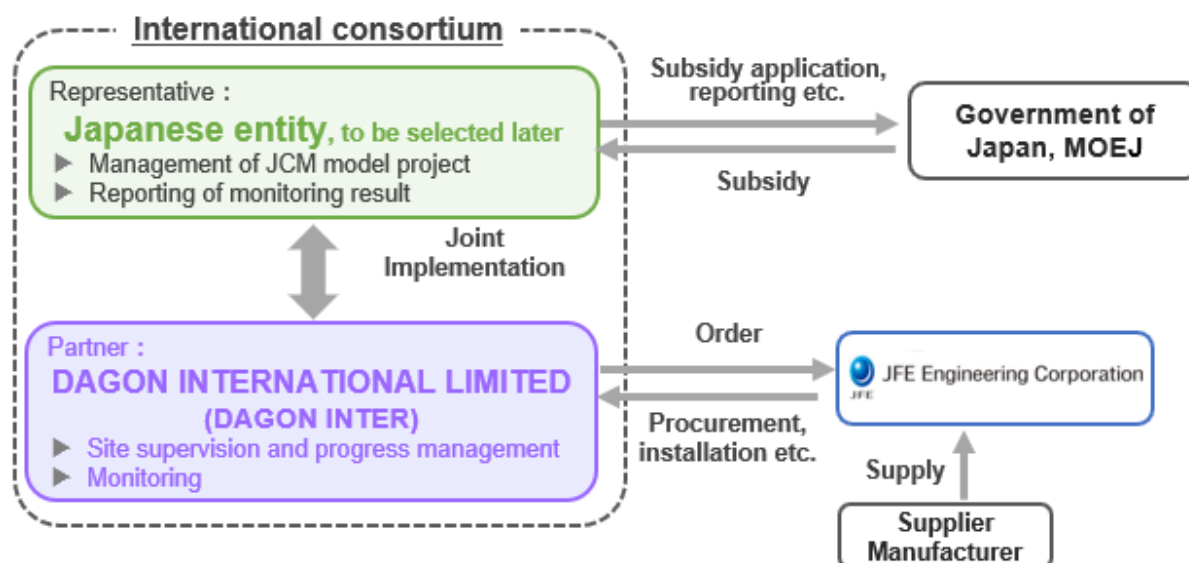
On the other hand, high efficiency pumps and high-efficiency blowers meet the standards of JCM Model Project in terms of cost effectiveness, but the annual GHG emission reduction is small. Therefore, it is desirable to consider in combination with other JCM Model Project.

Therefore, it is expected to apply JCM Model Project from the next fiscal year after various preparations related to the development of industrial park will have been implemented.

3.3.5 Coordination for International Consortium

In this project, after determining the technologies to introduce in Dagon Industrial Park, representative participant (Japanese entity) will be selected. Representative participant will manage JCM Model Project and will confirm and report the monitoring result. Also, JFE Engineering, a local EPC, will procure equipment from Japanese manufacturer and install the equipment in Dagon Industrial Park.

The International Consortium for the proposed project is presented below.

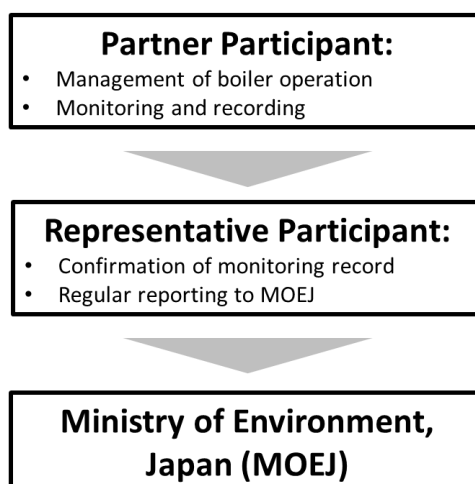


Source: Prepared by Nippon Koei

FIGURE3-10 International Consortium for the Proposed Project

3.3.6 Monitoring Plan

The monitoring system is shown in the figure below. The data recorded by the monitoring equipment will be reported to MOEJ from the partner participant through the representative participant.



Source: Prepared by Nippon Koei

FIGURE3-11 Monitoring Structure

In this project, candidate monitoring items are assumed to be general items (power consumption, power generation, fuel consumption, etc.), and regular checks should be conducted under appropriate management and operation by Dagon International. It is expected that there is no problem to acquire MRV data. In addition, the measuring instrument shall conform to international standards such as IEC standards.

3.3.7 Issues for JCM Model Project Application

The issue of JCM Model Project formation for Dagon Industrial Park is the time to obtain of MIC in this industrial park.

Approval procedures in Myanmar are generally time-consuming. Therefore, it may be delayed from the currently scheduled acquisition time (October or November 2020). In addition, MIC permit differs from the construction permit for buildings and the permit for infrastructure facilities, so it is necessary to obtain both permits in this project.

Construction and purchase of facilities and equipment will begin after MIC is obtained, so the timing of obtaining the MIC is an important matter in this project.

If MIC approval is obtained as scheduled, it has high potential to formulate of the JCM Model Project in Dagon Industrial Park after FY2020. For this reason, it has confirmed from the meetings conducted the Study that Dagon International was willing to purchase Japanese products applied JCM Model Project.

3.4 PREPARATORY SURVEY FOR PRIVATE COMPANIES

3.4.1 Formulation of JCM Model Project in Thilawa SEZ

Total eight (8) meetings with the companies in Thilawa SEZ have been conducted in the Study. It was confirmed that several companies had the plan to expand of the factory or renewal of facilities within the next few years, and at that time the possibility of JCM Model Project formulation is high.

In Thilawa SEZ, the expansion of Zone C is currently being considered. Therefore, in the future, it is expected that JCM Model Project formation can be expected by explaining of JCM Model Project to tenant companies at the timing of obtaining construction permits.

The following table shows the result of the meeting about the JCM Model Project formulation.

TABLE3-9 Meeting Results in Thilawa SEZ

#	Company	Possibility of Applying to JCM Model Project
1	Japanese recycling company	It was confirmed that there was possibility to introduce of incinerators and biogas power generation in the future.
2	Japanese steel company	It was confirmed that there was no possibility of a JCM Model Project formulation at this stage, but there are plans to increase production in a few years. There is possibility of the consideration about the applying for JCM Model Project when the factory will be invested again.
3	Japanese auto manufacturer	It was confirmed that the schedule of the construction of new factory and applying to JCM Model Project would not meet. However, there is possibility to apply to JCM Model Project when the additional equipment will be introduced.
4	Japanese beverage manufacturer	It was confirmed that there was no possibility of JCM Model Project formulation at this stage, because this factory has operated only a few years. However, there is possibility to apply to JCM Model Project when the factory will be expanded. It was confirmed that there is the interest to the introduction of industrial machineries and large refrigerated truck.
5	Japanese clothing manufacturer	It was confirmed that there was no possibility of consideration about the energy saving in this factory at this stage, because the capacity of this factory is smaller than other factories such as Thailand or Vietnam.
6	Japanese clothing manufacturer	Although it was confirmed that there was the interested of the changing to LED light of the lighting facilities in the factory, the number of installations was not enough. Therefore, it was difficult to formulate of JCM Model Project.
7	Industrial park developer	It was confirmed that it was difficult to formulate of JCM Model Project at this stage.
8	Japanese food manufacturer	It was confirmed that there was no possibility of JCM Model Project formulation at this stage, because this factory has operated only a few years.

Source: Prepared by Nippon Koei

The proposals for formulation of the JCM Model Project at their factories in Thailand or Vietnam have been received from some of the companies listed in the table above. To this information, Nippon Koei has decided to take over to another City-to-City Collaboration.

3.4.2 Survey on Japanese Food Processing Factories

By the introduction of Japanese embassy in Myanmar, the meeting with Company A, a food processing company (mainly seafood processing), was conducted.

Company A has a food processing factory in Yangon City, but the factory has a rental contract, which will expire in August 2021. Therefore, the factory is planned to be relocated, and at the same time, refrigeration/ freezing facilities and boilers will be updated. It was confirmed the interest of applying JCM Model Project. Feasibility study will be conducted in the Study in FY2020.

3.4.3 Survey on the Planned Industrial Park at Hlegu Township in Yangon Region

At Hlegu Township in Yangon Region, a development project for an industrial park (about 620ha) is underway. The industrial park is owned by Company B, a foreign capital developer.

It is being considered to install of solar PV system (about 10 ha) in the industrial park. The first phase of the construction of the industrial park, which is planned to be implemented in 2020, is being considered to introduce 3MW PV system. This plan is in line with the application schedule for JCM Model Project in FY2020, and the Study will continue to provide support in the following years.

3.4.4 Survey on Introduction of PV System to Off-Grid Area in Southern Myanmar

Company C, a telecommunications equipment construction company, is considering to introducing solar PV system in Tanintharyi division and Kayin State in southern Myanmar. Tanintharyi division and Kayin State are off-grid areas, and residents are eager to introduce the system. Especially in Tanintharyi, GHG emissions reduction can be expected, as an alternative to diesel power generation.

The outline of the project is presented below.

TABLE3-10 Outline of Introduction PV System in Southern Myanmar

Area	Outline
Tanintharyi Division	To introduce 2.4MW PV system. The large island in the state has about 1,500 households and currently uses 950 KVA of diesel power. The electricity bill is currently 800MMK / kw, but if PV system will be introduced, it is planned to be able to recover 350MMK / kw.
Kayin State	It is the plan to introduce 2MW in one village (of which 1MW will be used by the military) and 50KW in another village. In the state, Company D, a local subsidiary of Company C, has decided to conduct IPP business.

Source: Prepared by Nippon Koei

In case of implementation of this project, an international consortium will be formed between Company C (Representative Participants) and Company D, its local subsidiary (Partner participants). The local EPC will be handled by a general equipment engineering company, Company E, to install solar panels from Japanese manufacturers.

In the Study, it was confirmed that the schedule for applying for JCM Model Project, the licensing and approval of this project, and the feasibility as an IPP project.

To aim of applying for JCM Model Project in FY2020, the Study will provide support in the following year.

CHAPTER 4 FUTURE PLAN

Based on the results of the feasibility study of JCM Model Project formation and City-to-City Collaboration activities conducted in this year, the plan for the next fiscal year will be described.

4.1 APPLICATION OF JCM MODEL PROJECT

For the formulation of the JCM Model Project, “Feasibility study of introduction of energy saving/renewable energy in the industrial park” and “Preparatory survey for private companies” were conducted in the Study in FY2019.

As a result of the above the Study, the candidate projects of the application for JCM Model Project in FY2020 are presented below.

TABLE4-1 Candidate projects of the application for JCM Model Project in FY2020

#	Project	Overview	Feasibility	JCM Application
1	The project of introduction of solar PV System to Off-Grid Area in Southern Myanmar	To introduce 2.4MW solar PV system in Tanintharyi Division. It will be a replacement of diesel power. In Kayin State, it is the plan to introduce 2MW in one village and 50KW in another village.	Approval has been obtained from relevant ministries and states, therefore the possibility of applying to JCM Model Project is high. In addition, since this project is an alternative to diesel power generation, the amount of GHG emission reductions are expected to be large. This project has the possibility to be the first project to introduce solar PV system in Myanmar.	First period FY2020
2	The project of introduction on the Planned Industrial Park at Hlegu Township in Yangon Region	In the first stage of the construction, it is considered to introduce 3MW PV system. Also, total 10 ha of solar PV system will be introduced in the industrial park.	The owner of the industrial park, Company B, is a leading developer in Singapore and the preparations for industrial park development are proceeding smoothly. If the Representative Participant is selected, the possibility of applying to JCM Model Project is high.	Middle period FY2020
3	The project of introduction of energy saving /renewable energy in Dagon Industrial Park	Introduction of solar PV system and thermal recycle system.	If MIC acquisition is carried out as planned, the possibility of applying to JCM Model Project is high.	Late period FY2020
4	The project of introduction of the energy saving	Replacement of boilers and refrigeration equipment such as freezers	The current factory located in Yangon City has a rental contract, and relocation is	First period FY2021

#	Project	Overview	Feasibility	JCM Application
	equipment in food processing factory	accompanying the factory relocation scheduled in 2021	mandatory with a maturity contract. The project feasibility is high because the factory representative wants to replace the equipment at the time of relocation.	

Source: Prepared by Nippon Koei

Regarding to “Feasibility study of introduction of energy saving/renewable energy in the industrial park”, from this year's results, it was confirmed that solar PV system, thermal recycle systems, water treatment facility, and wastewater treatment facility could be applied to JCM Model Project for the common facilities in the Dagon Industrial Park.

In the next fiscal year, feasibility study for the formulation of JCM Model Project will be continued to the further consideration and application for JCM Model Project in FY2020 or FY2021. In addition, it is planned to hold JCM seminars for tenant companies.

Regarding to “Preparatory survey for private companies”, it was confirmed that there is a possibility of applying for JCM Model Project in FY2020 for the introduction of 3MW solar PV system in planned industrial park (owner: Company B) at Hlegu Township in Yangon Region. It also confirmed that there is a possibility of applying for JCM Model Project in FY2020 for the introduction of solar PV system in Tanintharyi division and Kayin State in southern Myanmar.

4.2 PROPOSED STUDY FOR FY2020 CITY-TO-CITY COLLABORATION

This report concludes by reviewing the whole goals of the Study set at the commencement of the Study and the results of the Study in this fiscal year. Also, it will be explained the plans in FY2020 and beyond.

Whole goals of the Study set at the commencement of the Study are presented below.

- 1) Support for the development of the low carbon industrial park
- 2) Formulation of the projects adopted Japanese technologies and products for energy saving and renewable energy
- 3) Support for the low carbonization in the food value chain

By holding a public-private joint workshop held in the Study, it was confirmed that Dagon International who is an owner of industrial park had increased awareness and interest in low-carbon industrial park.

Therefore, Dagon International had the high interest in the introduction of solar PV system and thermal recycle system. However, detailed studies are planned after April in 2020, when the design of the industrial park is completed, and the survey will be continued in FY2020.

Regarding the support for the low carbonization, through the Study in this year, it was confirmed that Dagon International is a company which covers the upstream and downstream of the food value chain in Myanmar and is a focal point in establishing a food value chain in Myanmar. The specific activities will be discussed and considered with Dagon International in FY2020.

Objects of JCM Model Project formulation set at the commencement of the Study and the results of the Study in this fiscal year are presented below.

- 1) Consideration of introduction of solar PV system in food industry park
- 2) Consideration of introduction of heat pump desiccant dehumidifiers in food processing factories and warehouses
- 3) Consideration of energy saving for building equipment in food industry park
- 4) Consideration of effective use of waste steam (absorption refrigerator) in facilities in food industry park

As mentioned above, the consideration of introduction of solar PV system in Dagon Industrial Park was conducted in the Study of this fiscal year and will be continued in FY2020. On the other hand, regarding the heat pump desiccant dehumidifier and other energy saving technologies in the industrial park, which were planned to be considered at the time of the commencement of this project, it was confirmed that the consideration about it was premature in the first meeting with Dagon International. In this year, the basic infrastructure is being considered in the industrial park, and the introduction of freezing and refrigeration equipment and energy saving equipment in buildings has not yet reached the study stage. However, through the second meeting, it was confirmed that some tenant companies were expected to move into the industrial park, and this activity is scheduled to start in FY2020. Specifically, JCM seminars for tenant companies are planned.

In the Study, as a “preparatory survey for private companies”, the meetings with Japanese companies, local companies, and foreign companies, including Thilawa SEZ, were conducted for the formulation of the JCM Model Project. From the Study, it was confirmed that although there were still many companies in Yangon City that didn’t know the JCM Model Project, the potential of JCM Model Project formulation was very high in Yangon City where new industrial parks were being developed. Further dissemination of the JCM Model Project is the key to project formulation. Introduced by Japanese banker in the meeting in the Study, JCM seminar will be held in this spring at a study group for companies planning to move into the Thilawa SEZ.

Based on the results of the Study in this fiscal year, three year's plan for the Study was updated.

		FY2019	FY2020	FY2021
Project of the Study set at the commencement		City-to-City Collaboration		
#	Project	1st year	2nd year	3rd year
1	Support for the development of the low carbon industrial park	Knowledge sharing of industrial park development by Kawasaki City (Workshop)	Knowledge sharing of industrial park development by Kawasaki City (Site visit in Japan)	Support for consideration about the project of industrial park development in Yangon City
2	Support for the low carbonization in the food value chain	Report on SDG activities from both Cities	Support by Kawasaki City for setting the unique SDGs indicators and values	Support by Kawasaki City the monitoring to measure the status of the indicators
Projects revised+expanded		JCM Model Project formulation		
#	Project (revised)	1st year	2nd year	3rd year
1	Introduction of renewable energy in Dagon Industrial Park	Collect information Conducting site reconnaissance	Survey + Consideration JCM Model Project formulation	Apply to JCM Model Project Strat the project
2	Introduction of energy saving equipment in Dagon Industrial Park (Refrigerator/ Freezing)	Survey + Consideration JCM Model Project formulation	Survey + Consideration JCM Model Project formulation Apply to JCM Model Project	Strat the project
3	Introduction of energy saving equipment in Dagon Industrial Park (Air conditioner/ Lighting facility)	Survey + Consideration JCM Model Project formulation	Survey + Consideration JCM Model Project formulation	Apply to JCM Model Project Strat the project
4	Introduction of energy saving equipment in Dagon Industrial Park (Waste management)	Collect information	Survey + Consideration JCM Model Project formulation	Apply to JCM Model Project Consider horizontal expansion to multiple facilities
5	Support for the low carbonization in the food value chain	Consideration of project potential for low carbonization in the food value chain	Consideration of project formulation for low carbonization in the food value chain	Apply to JCM Model Project for low carbonization in the food value chain

Source: Prepared by Nippon Koei

FIGURE4-1 Three Year's Plan of the Study (updated ver.)

In FY2020, as mentioned above, the study on the introduction of solar PV system at the Htein Pin landfill site and the new landfill site in East Dagon Township, which was requested by Yangon City, will be conducted. It will be the project that combines City-to-City collaboration and JCM Model Project formulation.

Specifically, it is assumed that, in parallel with the technical survey on the introduction of solar PV system in the landfill site, the introduction of the system as a capacity building will be conducted for PCCD by Kawasaki City. In addition, support on the development of indicators related to the SDGs will be implemented by Kawasaki City.

Furthermore, in addition to continuing the feasibility study for JCM Model Project formulation in the Dagon Industrial Park conducted in this year, the study for the food processing factory will be conducted.

About low carbon logistics and cold chains, the discussion with Dagon International will be conducted and considered the project in FY2021.