FY2020 Project for Ministry of the Environment Japan

FY2020
City to City Collaboration for Zero-carbon Society

Promotion of Carbon-Free Society in Iskandar Regional Area (Phase 2) (City of Kitakyushu-Iskandar Regional Development Authority Collaboration Project)

Report

March 2021

NTT Data Institute of Management Consulting, Inc.

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Chapter 1: Overview and Background

1.1 Overview

(1) Objective

The 21st Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 21) was held in Paris, France in December 2015. Attended by all nations that make up the United Nations Framework on Climate Change, the session saw the adoption of the Paris Agreement, a legal framework for taking fair and effective measures to combat climate change in 2020 and beyond. The Paris Agreement promotes efforts aimed at decarbonization, calling for nations to keep global temperature rise well below 2 degrees centigrade compared to pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees centigrade. At COP21, it was decided that stakeholders would be asked to be aware of the actions of non-state actors such as municipalities, welcome the efforts of all non-governmental actors (municipalities and other local public bodies), and scale up their efforts.

COP22 was then held in Marrakesh, Morocco in November 2016. This session saw the delivery of the Marrakesh Action Proclamation for our Climate and Sustainable Development, which reemphasized the urgent need to address global warming of an unprecedented scale. It also served as a substantial opportunity to reconfirm the importance of global actions by states as well as local governments and to achieve further prosperity and sustainable development through economic change.

These sessions were followed by COP23 held in Bonn, Germany (host country: Fiji) in 2017; COP24 held in Katowice, Poland in 2018; and COP25 held in Madrid, Spain in December 2019). Japan expressed its proactive stance towards decarbonization to all nations present at the sessions.

In 2020, the Paris Agreement finally entered the implementation phase. The Paris Agreement also calls for the acceleration of climate change by non-governmental actors, including municipalities and cities, in addition to the central government, and cities and municipalities are key players in the consideration and implementation of specific regional climate change measures and projects. In order to realize a decarbonized society in the world as a whole, it is necessary to accelerate the movement toward building a sustainable decarbonized society and a low-carbon society as a transitional point, especially in Asia where economic growth is remarkable. In order to decarbonize and reduce the carbon footprint of cities, which are places of activities that support socioeconomic development, international efforts to support the efforts of cities are being strengthened.

In light of the above, this project aims to develop an eco-town that is symbiotic with industry and contributes to the realization of a decarbonized society as well as the reduction of energy-derived CO2 emissions, in collaboration with the City of Kitakyushu and the Iskandar Regional Development Authority (IRDA), which has experience and know-how in the

formation of low-carbon societies. In collaboration with the Iskandar Regional Development Authority (IRDA) and Kitakyushu City, which has experience and know-how in the formation of a decarbonized society, research activities will be conducted with the aim of creating projects that will lead to the acquisition of JCM credits.

(2) Activities

This study will be conducted with support from Malaysia's Iskandar Regional Development Authority and Kitakyushu and will involve the following activities aimed at promoting decarbonization in Malaysia and achieving a JCM project that will contribute to this goal.

- Activity 1: Realization of an eco-town in industrial symbiosis
- Activity 2: Realization of waste-to-energy
- Activity 3: Excavation JCM-applicable projects

(3) Project methodology

(3)-1. Activity 1: Realization of an eco-town in industrial symbiosis

	The activity item	What's in the activity?
①	Collection of inventory data on waste discharged from factories	Collect inventory data on waste discharged from factories in industrial parks in the Iskandar region. Review industrial parks (or factories) that are cooperative with IRDA's activities during the collection process of this inventory data and select suitable candidate housing complexes for the pilot project.
②	Factory-to-plant matching based on inventory data	Based on the collected inventory data, matching between factories (matching whether waste from one plant can be used as raw fuel at another plant) is performed.
③	Examination of policy support (preferential treatment, penalties, etc.) in parallel with the above two activities	In parallel with the above two activities, we will consider the ideal way of policy support (preferential treatment, penalties, etc.) to realize industrial symbiosis and eco-town in one.
④	Planning of a pilot project that summarizes the above examination results	The above results of the study will be compiled, a pilot project will be planned, and goals (KPIs) to be achieved in the pilot project will be examined.

(3)-2. Activity 2: Realization of waste-to-energy

	The activity item	What's in the activity?
①	Technical study for realization of waste power generation	We will study the technology to generate electricity with heat that can stably heat treat waste, etc.
②	Institutional study for the realization of waste power generation	We will consider a system concerning the appropriate division of roles between the public and private sectors, as well as rules such as chipping fees as waste disposal costs and electricity sales revenue generated.
③	Economic study for the realization of waste power generation	Initial investment and operating costs of waste power generation facilities and income from chipping fees and electricity sales will be examined.

(3)-3. Activity 3: Excavation of JCM application projects

	The activity item	What's in the activity?
①	Direct consultation with potential private companies	We will conduct project discovery and direct consultation with a view to introducing high-efficiency equipment such as boilers and chillers when updating facilities at aging factories that are thought to have needs in Malaysia, mainly in the Iskandar development area, and waste heat recovery power generation at cement plants, etc., which have not yet been widely used, and conduct direct consultations to conduct concrete examinations of the projects.
②	Examination of implementation system of JCM equipment assistance project	Confirm the intention of representative businesses and local companies to participate in the JCM equipment assistance project and consider materialization of the project.

(3) Performance period

September 3, 2020 - March 10, 2021

(4) Action framework for study

As shown in Table 1, this survey is conducted in collaboration with City of Kitakyushu, NTT Data Institute of Management Consulting, Nippon Steel Engineering, The Kitakyushu Urban Center, and the Iskandar Regional Development Agency.

Table 1 Implementation System Diagram

Business operators	Role
Kitakyushu	・ Coordination of consultations with IRDA, etc. ・ Activities aimed at realizing an industrially symbiotic eco-town
NTT Data Management Laboratories	Consultations for the formulation of an action plan ・ Activities aimed at realizing an industrially symbiotic eco-town ・ Economic considerations for the realization of waste power generation ・Excavation of JCM application projects Summary of this project
JAPAN STEEL ENGINEERING	・ Technical considerations for the realization of waste power generation
Kitakyushu Urban Center, Institute for Global Environmental Strategies (IGES・KUC)	・ Institutional study for the realization of waste power generation
Iskandar Regional Development Authority(IRDA)	・ Collection of inventory data on waste discharged from factories Collection of local information on waste power generation

(5) Study schedule

The three-year business plan envisioned for this project is shown in Figure 1. In this fiscal year, in the second year of the three years, activity 1 aims to plan a pilot project during this investigation and to implement the pilot project and turn it into a business after the next fiscal year. Activity 2 also aims to materialize medium- to long-term projects (within 3-5 years). In Activity 3, based on the assumption that Malaysia will sign the JCM, we will conduct a survey this fiscal year with the aim of applying and commercializing the JCM equipment subsidy project within a short period of 1-3 years.

However, with the spread of covid-19 in Malaysia, the activities of governments and companies have been restricted, and possible activities have been carried out within the limits.

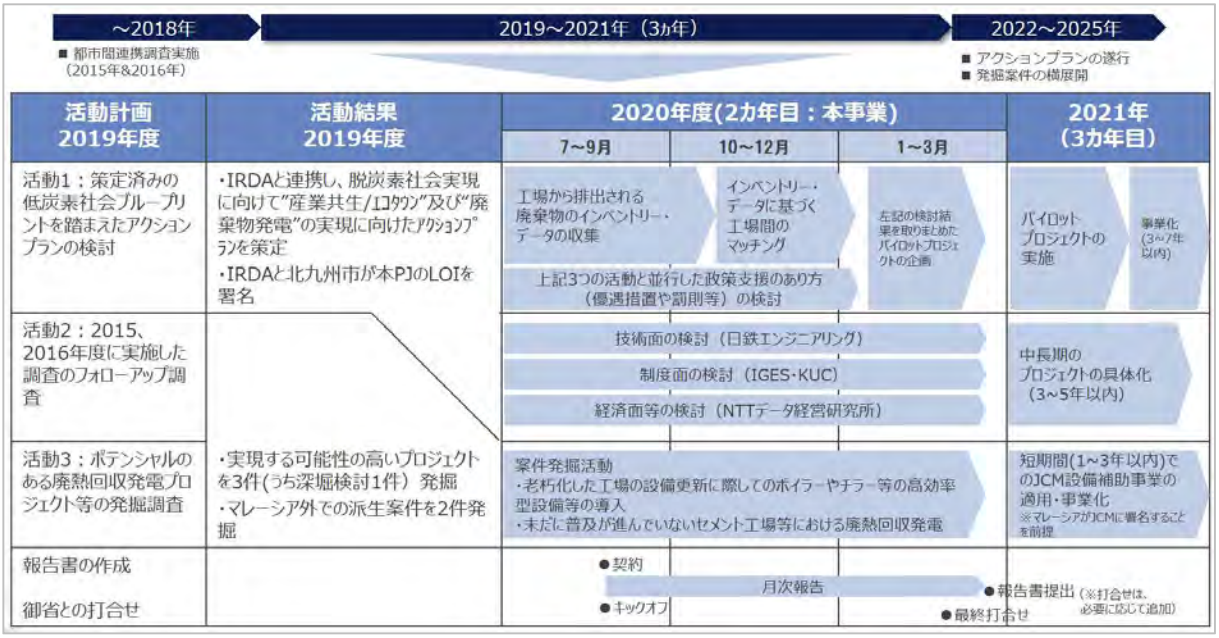

Fig. 1 Tentative study schedule

1.2 Background

1.2.1 Overview of the IRDA

(1) About the IRDA

The Iskandar Regional Development Authority (IRDA) is a governmental agency established in 2007 to direct efforts at promoting Iskandar Malaysia. By regulating public and private interests, it aims to promote the development of a sustainable international city. The IRDA has three core functions and areas of legal authority for achieving the above objectives.

(a) Planning

Integrating and recommending planning policy from the federal government, the state of Johor, and local governments to help improve well-being in Iskandar Malaysia. Identifying and developing strategies to enhance infrastructure, skills, and scientific research for Iskandar Malaysia development.

(b) Promotion

Undertaking broad-based promotion of Iskandar Malaysia to the general public and potential investors. Driving, coordinating, and monitoring the development of economic sectors and social infrastructure for both local and overseas.

(c) Facilitation

Providing consultation and information on investing in Iskandar Malaysia. Acting as the principal coordinating agent on behalf of relevant government agencies in relation to receiving, processing, and expediting requisite approvals for investors in Iskandar Malaysia. Assisting existing investors in resolving issues affecting their business

environment.

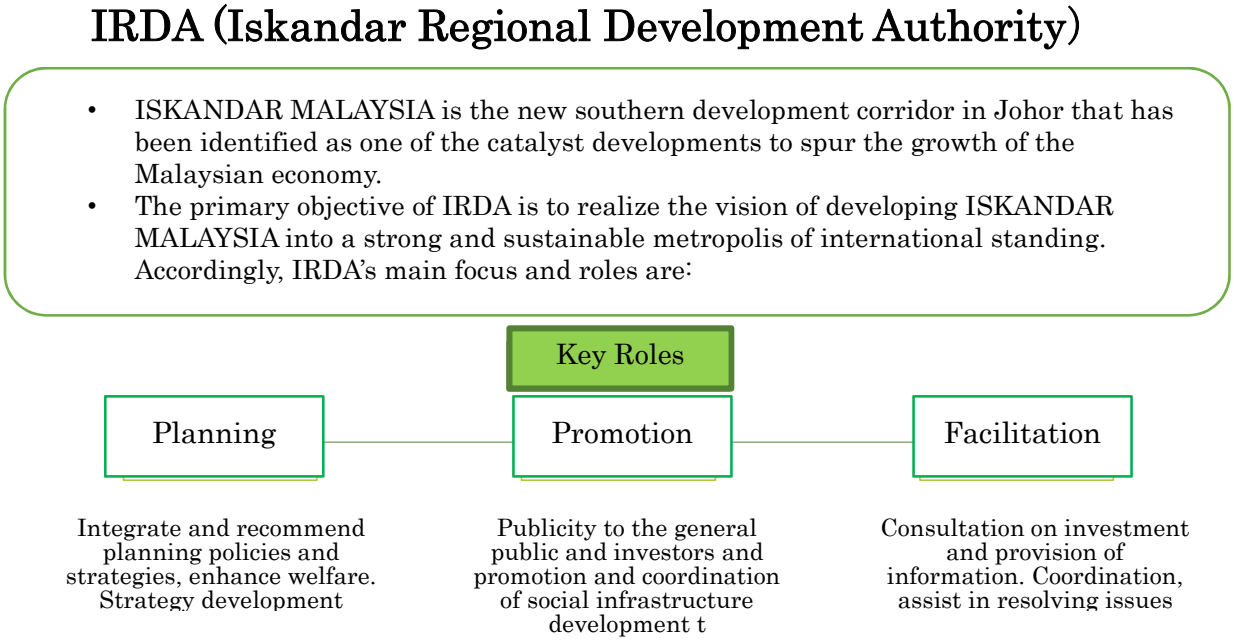

Fig. 2 Functions of the Iskandar Regional Development Authority[1]

(2) Iskandar Development Region

The Iskandar Development Region lies at the southern edge of the Malay Peninsula in southern Johor, a Malaysian state on the coast across from Singapore. With a population of around 1.9 million, it is the country's second most important center for economic activity after Kuala Lumpur. Malaysia's federal government established five economic corridors (key development regions) during the period of the Ninth Malaysia Plan (2006-2010), with comprehensive regional development projects being conducted in Iskandar Malaysia. The Eleventh Malaysia Plan (2016-2020), submitted to the Parliament of Malaysia by former prime minister Najib Razak in 2015, also establishes the Iskandar Development Region as a key development region. The five-year plan focuses on five main initiatives: environmental education and creative clusters, tourism and logistics centers, environment and energy, food, and the development of manufacturing industries focused on oleo chemistry. Iskandar Malaysia occupies 2,217 square kilometres and comprises five flagship zones, namely [A] Johor Bahru City Centre, [B] Iskandar Puteri (formerly Nusajaya), [C] Western Gate Development, [D] Eastern Gate Development, and [E] Senai-Skudai. This is roughly the same area as the Tokyo Metropolitan area and three times the size of Singapore. On February 22, 2019, Prime Minister Mahathir Mohamad announced that Iskandar Malaysia would be expanded to 4,749 square kilometres, suggesting even

[1] Prepared by NTT Data Institute of Management Consulting, Inc. based on data from the Iskandar Regional Development Authority's website

more active development is in store for the Iskandar Development Region.

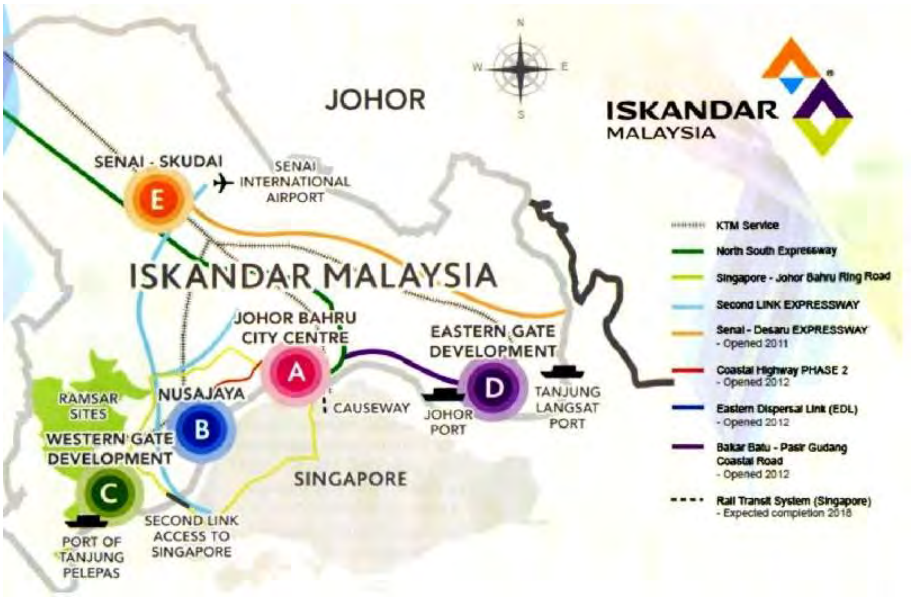

Fig. 3 Map of the Iskandar Development Region[2]

The aforementioned five flagship zones making up the Iskandar Development Region have the following functions and characteristics.

Zone A: Johor Bahru City Centre

This zone focuses on, among other things, business centre development, culture and tourism, strengthening immigration functions, and waterfront property development. It has trading infrastructure, a financial centre, and a service centre (linked to Singapore via the Johor-Singapore Causeway).

Zone B: Iskandar Puteri (formerly Nusajaya)

Zone activities include Johor state government building construction, attracting education, medicine, and entertainment industry players, and Puteri Harbour development. Specifically, the zone comprises an academic city with universities offering foreign curricula, entertainment functions that include a movie filming studio as well as LEGOLAND and other theme parks, medical tourism and other service industries, and state government functions.

Zone C: Western Gate Development

This zone is centered on marine logistics centre and power plant development and contains physical distribution, free trade, and oil storage port facilities. It links to

[2] New Straits Times article published February 22, 2019 entitled "Iskandar Malaysia to be extended, covering more areas in Johor"

Singapore via the Malaysia–Singapore Second Link.

Zone development leverages the Port of Tanjung Pelepas's geographical advantage of being near Singapore and other Southeast Asian nations and water deep enough to accommodate even larger vessels. Connected by sea routes to ports around the world, the Port of Tanjung Pelapas is the second largest in Malaysia in terms of container transaction volume and the 18th in the world[3]. [3]The port has a total area of roughly 7.8 square kilometers and comprises a container port and an adjoining free-trade zone.

Zone D: Eastern Gate Development

This zone's functions consist of electrical, chemical, and oleo chemical product manufacturing and has a petrochemical storage port. Comprising Pasir Gudang Port, Tanjung Langsat Port, and Tanjung Langsat Technology Park, the zone occupies a total of approx. 15 square kilometers. It also contains Pasir Gudang Industrial Park, which has attracted foreign manufacturing firms from around the world.

Zone E: Senai-Skudai

This zone's functions consist of Senai International Airport, a logistics centre, a high-tech industry, a space-related industry, a shopping centre, and a cyber-city. Home to University of Technology, Malaysia (UTM), one of Malaysia's most prestigious national universities, the zone also has Johor Bahru Premium Outlets, the first of its kind in Southeast Asia, making it an attractive area for tourism as well as industry.

[3] Ministry of Land, Infrastructure, Transport and Tourism, Ranking of Global Container Handling Volume by Port (2018 preliminary figures)https://www.mlit.go.jp/common/000228237.pdf

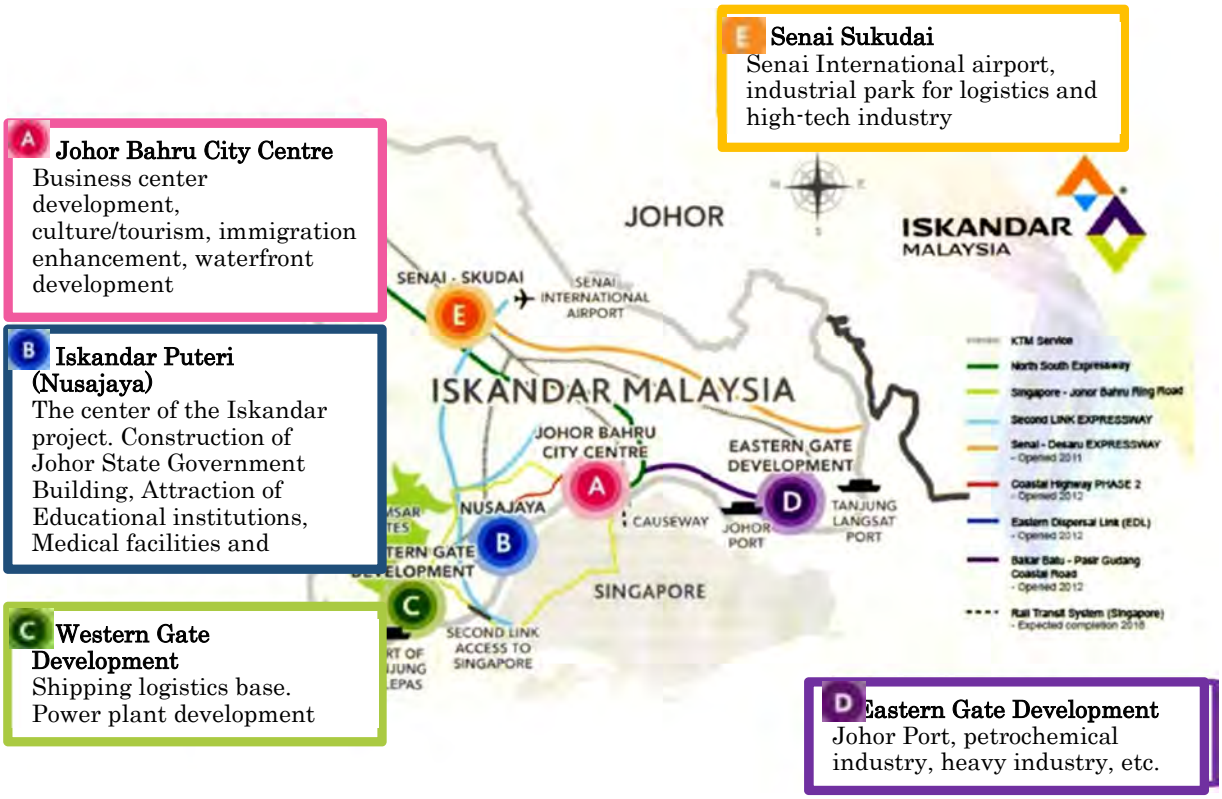

Fig. 4 Characteristics of the Iskandar Development Region's flagship zones

(3) Industrial areas subject to the study

(a) Pasir Gudang Industrial Park

This industrial park was established 30 years ago. The area has long been a location of business expansion into Malaysia by Japanese and other firms. Among enterprises who arrived in the early years, many are now dealing with aging facilities and equipment at their plants and are facing efficiency problems.

Industrial park name	Pasir Gudang Industrial Park
Distance from major city	36 km from Johor Bahru
Japanese firms with a presence[4]	· Adeka Foods (Asia) Sdn. Bhd. · Aida Manufacturing (M) Sdn. Bhd. · Hitachi Chemical (Johor) Sdn. Bhd. · Demits Chemical (M) Sdn. Bhd. · Palau Edible Oil Sdn. Bhd. and others

(b) Kaasen Preindustrial Senai Industrial Park

[4] Toyo Keizai Inc.: Excerpt from the Overseas Japanese Companies Database, By Country, 2019 edition

Industrial park name	Kaasen Preindustrial Senai
Distance from major city	32 km from Johor Bahru
Japanese firms with a presence	· Panasonic System Networks Malaysia Sdn. Bhd. · Mitsubishi Electric (Malaysia) Sdn. Bhd. · Hickok (Malaysia) Sdn. Bhd. · Hitachi Cable (Johor) Sdn. Bhd. · Matsushita Precision Industrial Co. Sdn. Bud and others

(c) Kaasen Preindustrial Terbium Industrial Park

Industrial park name	Kaasen Preindustrial Terbium
Distance from major city	15 km from Johor Bahru
Japanese firms with a presence	· Dan Café (Malaysia) Sdn. Bhd. · J.K. Sumi Wire Harness Sdn. Bhd. · Southern Lion Sdn Bud · Mizuho Precision Engineering (M) Sdn. Bhd. · Chiyoda Integer Co. (Johor) Sdn. Bhd. and others

(d) Other areas

In addition to the above, studies are also focusing on finding private companies not located in the area (those in the Johor Bahru and Kuala Lumpur areas) for high-potential JCM equipment subsidy projects.

1.2.2 The Malaysian Government's Efforts to Reduce Greenhouse Gas Emissions

(1) Influence of the Political Struggle and Corona Disaster in Malaysia

(Political struggle)

In the 14th general election (federal house and state parliamentary elections) held on May 9, 2018, the United Malays National Organization (UMNO) and the National Front (BN), which had been in power since Malaysia's independence in 1957, were defeated significantly, and former Prime Minister Mahathir's Malaysian Unified Presume Party was dissimived and hostile to Mahathir. An opposition coalition formed by the People's Justice Party (PKR) and other parties won with majority, resulting in the first change of government after independence.

However, on February 24, 2020, Mahathir abruptly submitted his resignation to the king. Originally, in the last general election, Mr. Mahathir had pledged to give Anwar the post of

prime minister in the future, but after becoming prime minister he remained vague about the time of zen transfer. There had also been a struggle over post-Mahathir, with Azmin, who served as economy minister in the administration, d'eel to be seen as Mahathir's successor. In light of this situation, Mahathir's resignation was aimed at minimizing the political impact and rebuilding the political system at an early time.

Later, after a reorganization of the ruling and opposition parties, Muhyiddin, a subordinate of Mahathir's heart, became prime minister in March2020. The largest number of seats in the Diet of the new ruling coalition is UMNO, which lost the last general election, and there have been calls from within the administration that early dissolution and general elections should be held to resolve the political struggle that has continued to smolder.

(Related to the Coronal Disaster and the Struggle for Government)

On the other hand, at the same time as the above political struggle, the spread of the new coronavirus had occurred in Malaysia.

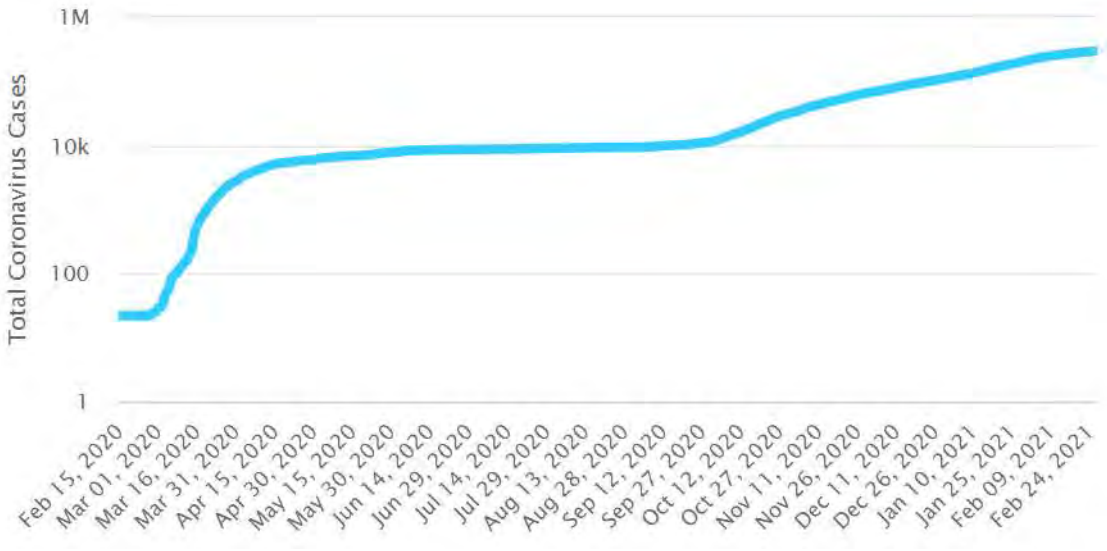

Figure 1 Total Number of Cases in Malaysia (2010-2010)[5]

Figure 1 Total Number of Cases in Malaysia (2010-2010)2020 after Mahathir's resignation. Since the political struggle continued even after the discovery of the infection in Japan, and the lack of concrete responses, distrust of the people of the government was growing, so the Muhyiddin administration issued a border blockade and an activity restriction order (MCO) immediately after its inauguration, and deployed troops throughout the city to take thorough measures to prevent infection. As a result, the spread of the infection was suppressed once, and almost all economic activities resumed in June of the same year. However, since October of the same year, the spread of infection has continued again (it is said to be the "second wave"

[5] Worldmeter（https://www.worldometers.info/coronavirus/country/malaysia/) more quotes.

in Malaysia).
On January 12, 2021, King Abdullah declared a state of emergency for all of Malaysia. The period is until August 1, and general elections, local elections, and by-elections will not be held during the election period, and the Diet will not be held. It is said that the voice which thinks this to be a life-prolonging plan of a de facto Muhyiddin government has also been raised from the ruling party UMNO etc.

(Impact on efforts to reduce greenhouse gas emissions)
Before the 2018 general election, ministries dealing with environmental and climate change issues were divided into Ministry of Natural Resources and Environment, Ministry of Energy, Green Technology and Water, and Ministry of Science and Technology. The Mahathir administration has integrated these into the Ministry of Energy, Green Technology, Science and Climate Change (Science and Climate Change, MEGTSCC) and established a new ministry responsible for environmental and climate change, waste disposal (designated garbage) and social experimentation.

Muhyiddin's government has reorganized its ministries and agencies, and the Ministry of Science, Technology and Innovation (MINISTRY of Science, Technology and Innovation) and others are independently acting on policy management from the MEGTSCC.

(2) Greenhouse gas emission reduction efforts
(Green Technology)

In 2009, the Malaysian government formulated the Green Technology Policy, in which green technology drives economic growth and sustainable development. The system designates four areas (energy, buildings, wastewater and waste, and transportation) as core areas of green technology.

The Malaysian government aims to account for 1.5%of GDP (RM60 billion) in green business by2030 by promoting the adoption of these green technologies in the National Green Technology Master Plan.

(State policies concerning energy)

The principal initiatives of Malaysia's renewable energy policy are as follows. Malaysia's basic energy policy aims to develop the country's economy by promoting a safe and highly cost-effective energy supply and efficient energy usage while reducing unproductive energy consumption and minimizing environmental impact as outlined in the Eleventh Malaysia Plan (2016-2020). 4,342,000,000 ringgit (4.9%) of the total budget for the seven strategies in the plan is being budgeted to "pursuing green growth for sustainability and resilience."

Table 3 shows Malaysia's main renewable energy-related policies. In a bid to spur further

renewable energy usage and thereby help Malaysia maintain energy self-sufficiency, a feed-in-tariff ("FIT") system was announced as part of the Renewable Energy Act in 2011.

Table 3 Malaysia's line of policy on renewable energy[6]

Government Policy on Renewable Energy	
1999	Five Fuel Diversification Policy
2001	The Third Outline Perspective Plan (2001-2010))
2005	The National Biofuel Policy (NBP 2006)
2009	The Renewable Energy Act National Renewable Energy Policy
2010	Green Technology Financing Scheme (GTFS) https://www.asiax.biz/news/21065/ Energy Commission Act
2011	The Renewable Energy Act (Rev.) Sustainable Development Business Law Sustainable Energy Development Authority Act 2011
2013/2014	The Renewable Energy Act and Sustainable Energy Development Authority Act
2015	The Eleventh Malaysia Plan (11MP) (2016-2020)
2017	Green Technology Master Plan 2017-2030) (GTMP)
2019	Preapration of the Twelfth Malaysia Plan, 2021-2025

(Status and goals for renewable energy deployment)

With the exception of solar power, whose price was initially set at a high level, the feed-in-tariff system implemented under the Renewable Energy Act announced in 2011 has seen little renewable energy proliferation due to a degression rate marked by perennial option price decline. Within the FIT system, a premium rate is set on products produced in Malaysia. Solar power, for example, carries a premium price with no degression rate, creating advantageous conditions for companies producing in Malaysia.

[6] Prepared by NTT Data Institute of Management Consulting, Inc. based on NEDO's Survey Report on Smart Community-related Technology and Service Standardization and International Trends

Table 4 Renewable energy deployment (installed capacity, unit: MW)[7]

Year	Biogas	Biogas (埋立て、農業廃棄物)	Biomass	Biomass (固形廃棄物)	Small Hydro	Solar PV	Geo-thermal	Total
2012	2.00	3.16	36.90	8.90	11.70	31.54	0.00	94.20
2013	3.38	3.20	0.00	0.00	0.00	107.00	0.00	113.58
2014	1.10	0.00	12.50	0.00	0.00	65.15	0.00	78.75
2015	0.00	5.40	12.50	7.00	6.60	60.34	0.00	91.34
2016	0.00	15.46	19.50	0.00	12.00	77.81	0.00	124.77
2017	0.00	22.54	0.00	0.00	0.00	38.09	0.00	60.63
2018	0.00	3.60	0.00	5.85	0.00	1.54	0.00	10.99
累積	6.48	53.36	80.90	21.75	30.30	381.47	0.00	574.26

Annual renewable energy generation from 2011 to 2050, shown in Table 5, suggests deployment is still insufficient to achieve target levels.

Table 5 Renewable energy environmental targets for 2011 to 2050[8]

年	年間バイオマス GWh	年間バイオマス GWh	年間小水力発電 GWh	年間太陽光発電 GWh	年間 固形廃棄物 GWh	年間再生可能エネルギー電力 (GWh)	年間CO2回避 (t/年)	累積CO2回避 (t)	再生可能エネルギー累積 (MW)
2011	675	123	300	7.7	123	1,228	846,975	846,975	217
2015	2,024	613	1,450	61	1,223	5,374	3,707,825	10,816,136	975
2020	4,906	1,472	2,450	194	2,208	11,229	7,747,900	41,803,181	2,065
2025	7,297	2,146	2,450	456	2,330	14,680	10,128,817	88,071,821	2,809
2030	8,217	2,514	2,450	1,019	2,392	16,592	11,448,339	143,444,366	3,484
2035	8,217	2,514	2,450	2,128	2,453	17,762	12,255,721	202,908,742	4,317
2040	8,217	2,514	2,450	4,170	2,514	19,865	13,707,192	268,207,951	5,729
2045	8,217	2,514	2,450	7,765	2,575	23,522	16,229,914	343,765,293	8,034
2050	8,217	2,514	2,450	13,540	2,637	29,358	20,256,975	436,426,797	11,544

(Green Technology Financing Scheme)

The Green Technology Financing Scheme is a financing system established for green business development with an eye to achieving sustainable economic growth for Malaysia. The scheme provides low-interest loans to all green technology producers, green technology users, and ESCOs that pay corporate taxes, whether they be foreign or local enterprises. Loans were originally intended to be provided only for facilities constructed on or before December 31, 2020, but the application period was extended to 2023.[9]

[7] Prepared by NTT Data Institute of Management Consulting, Inc. based on data from SEDA's website (http://seda.gov.my/?omaneg=0001010000000101010)
[8] Ministry of Energy Green Technology and Water : National Renewable Energy Policy &Action Plan
[9] SEDA: Extension of Green Investment Tax Allowance (GITA) & Green Income Tax Exemption (GITE) until 2023 http://www.seda.gov.my/reportal/re-incentive/

Table 6 Green Technology Financing Scheme[10]

<table>
<tr><td colspan="3">Summary</td><td>· The Green Technology Financing Scheme is a financing system established for green business development with an eye to achieving sustainable economic growth for Malaysia
· Enterprises established in Malaysia are eligible
· In the fiscal year following deployment, enterprises pay less taxes due to a roughly 40% corporate tax deduction for the cost of deploying equipment capable of reducing greenhouse gas emissions and energy usage
· MIDA (Malaysian Investment Development Authority) is the point of contact</td></tr>
<tr><td rowspan="10">Details</td><td colspan="2">Companies that can apply</td><td>· Foreign and local companies paying corporate taxes</td></tr>
<tr><td colspan="2">Tax break eligibility</td><td>· Eligible equipment deployment costs</td></tr>
<tr><td colspan="2">Tax break impact</td><td>· Roughly 40% of eligible costs (GITA+CA) reimbursed via corporate income tax refund</td></tr>
<tr><td colspan="2">Application period</td><td>· Extended to the end of 2022</td></tr>
<tr><td colspan="2">Point of contact for application</td><td>· MIDA (Malaysian Investment Development Authority)</td></tr>
<tr><td colspan="2">Corporate income tax refund</td><td>· Deduction from corporation's taxable income in the year following the business year in which equipment investment was made</td></tr>
<tr><td rowspan="4">For solar power</td><td>Eligible equipment</td><td>· Green Mark certified products</td></tr>
<tr><td>Installation work</td><td>· SEDA (Sustainable Energy Development Authority) certified businesses</td></tr>
<tr><td>Power generation amount</td><td>· Assumes self-consumption (up to 75% of maximum power demand as a general rule)</td></tr>
<tr><td>MIDA certifications</td><td>· 318 (RM3,288Mil) (as of December 2016)</td></tr>
</table>

[10] Prepared based on data from the website of the Malaysian Investment Development Authority

1.2.3 The IRDA's greenhouse gas emission reduction initiatives

(1) Iskandar Malaysia's low carbon society plan for 2025

With support from Japan Science and Technology Agency (a National Research and Development Agency) and the Japan International Cooperation Agency (JICA), an international research team comprising members from such organizations as Kyoto University, the National Institute for Environmental Studies, Okayama University, University of Technology Malaysia, and the Iskandar Regional Development Authority began activities in 2010 aimed at Iskandar Malaysia and in November 2012 announced the Low Carbon Society Blueprint toward 2025 ("the Blueprint"). The plan was officially approved as an official document for the development program by the Iskandar Regional Development Authority at a March 20, 2014 meeting of the Approvals and Implementation Committee.

The Blueprint was formulated in response to concerns Iskandar Malaysia development projects would bring about a rapid rise in greenhouse gas emissions following the region's being designated a special economic zone in 2006. The Blueprint, a low carbon society plan aimed at making the region into a low-carbon area, establishes a goal of reducing greenhouse gas emissions by 40% by 2025 in a Business as Usual scenario (56% emission strength compared to 2005). The plan outlines 12 Actions and 281 Programs concerning areas such as transportation systems, construction (green buildings), energy systems, waste management, industrial processes, governance, air pollution, urban structure, and education.

Good progress is being made in conducting the programs: 60 (21%) of the 281 Programs have been completed, 201 (72%) are in progress, and 19 (7%) have not yet begun.

Fig. 5 Blueprint Program progress[11]

1.2.4 Cooperative relationship between Kitakyushu and the Iskandar Regional Development

[11] Prepared by NTT Data Institute of Management Consulting, Inc. based on information gathered from the IRDA

Authority

With the goal of reducing carbon emissions in the Iskandar Development Region, Kitakyushu has worked with the IRDA in fiscal years 2014, 2015, and 2016. The details of these activities are provided below.

(a) Activities in FY 2014

In the FY 2014 Large-scale JCM Project Creation Feasibility Study Project for Realizing Low-carbon Societies in Asia, Kitakyushu conducted a basic study aimed at helping to reduce carbon emissions in an industrial park in the city of Pasir Gudang, while also building a relationship with the city.

The study, which involved holding discussions with Pasir Gudang stakeholders and gathering information from enterprises in the industrial park, proposed a path towards establishing four key programs for a "Pasir Gudang that aspires to be a green and healthy city."

Fig. 6 Path to establishing four key programs for Pasir Gudang

(b) Activities in FY 2015

Kitakyushu conducted the Foundation Building Project for Across-the-Board Expansion of Decarbonization Projects (Kitakyushu-State of Johor Cooperation Project) in Iskandar Malaysia as part of the FY 2015 Cooperation Project for Realization of Low Carbon Societies in Asia. The following three studies were discussed with the goal of industrial park decarbonization in Pasir Gudang.

· Activity 1: Waste heat collection, cogeneration, and energy-saving efforts in industrial

parks

- Activity 2: Industrial waste recycling and general waste power generation
- Activity 3: Developing JCM businesses in Iskandar Malaysia and supporting the design of systems to advance such development

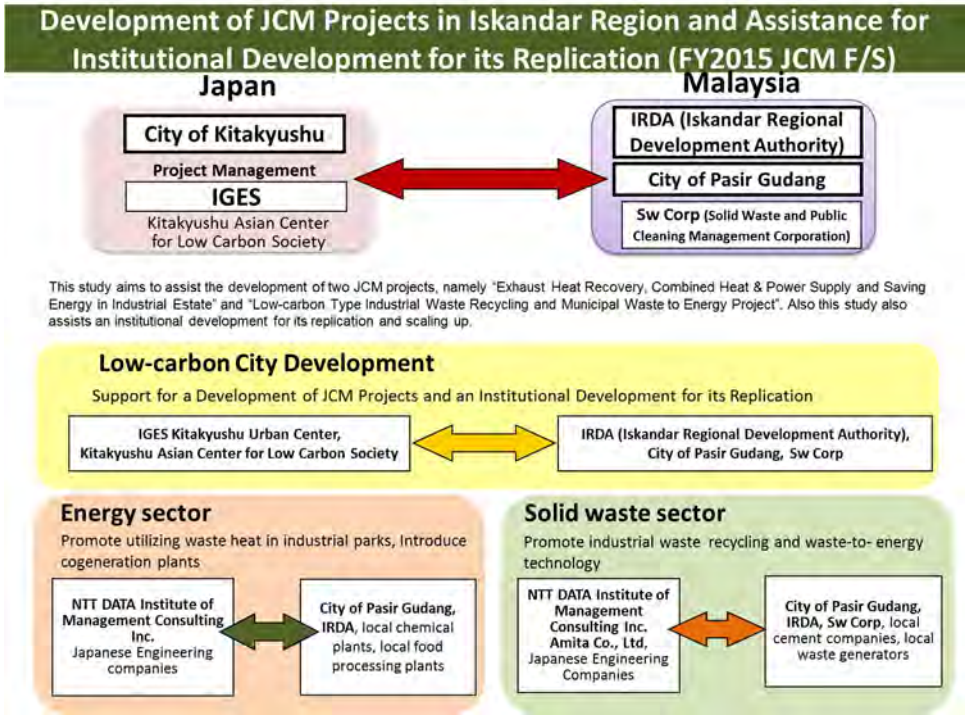

Fig. 7 Overview of activities for developing JCM businesses in Iskandar Malaysia and supporting the design of systems to advance such development

(c) Activities in FY 2016

Kitakyushu conducted the Project to Accelerate Low Carbonization Model Projects in Iskandar Development Area for Expansion of JCM (Kitakyushu-IRDA Cooperation Project) as part of the FY 2016 Large-scale JCM Project Creation Feasibility Study Project for Realizing Low-carbon Societies in Asia. Following on the FY 2015 study, this study targeted mainly local governments and businesses with their own factories or other production facilities and closely examined the feasibility of JCM adoptability. With the goal of promoting activities aimed at establishing model businesses in order to facilitate Malaysia's timely participation in the JCM, the following two energy-saving related projects were studied.

- Activity 1: Deploying cogeneration technologies at factories that require steam
- Activity 2: Promoting energy-saving efforts for factories and buildings inside factories

Table 7 Overview of activities conducted for the Accelerate Low Carbonization Model Projects

in Iskandar Development Area for Expansion of JCM

	Company A	Company B	Company C	Company D	Company E
Project Content	Surfactant production	Epoxy resin production	Styrene monomer production	Polymer production	Paper bag production
Project Possibility	(Low)	(High)	(High)	(Medium)	(Low)
Situation toward Energy saving implementation	At the present time, it is not the time to renew various energy-saving equipment.	Already company B is implementing energy conservation initiatives, but, with further energy conservation, it is considering possibility of using the subsidy scheme.	As projects abandoned due to cost reasons in the past, considering possibility of using the subsidy scheme. Renovation to LED lighting in factory is also considered.	As interested in energy saving project, already have project candidates. Under consideration about possibility of utilization of subsidy scheme	Energy saving targets are set in factories, although there's possibility of energy saving with air conditioners, etc., the equipment will not be renewed on timely basis.
Local status	 Shot at the site	 Shot at the site	 Shot at the site	 Shot at the site	 Shot at the site

On August 22, 2016, Kitakyushu concluded a Letter of Understanding with the IRDA which clearly stipulated the city's intention to promote decarbonization in the Iskandar Development Region.

Fig. 8 Signature ceremony at the IRDA office

(4) Activities in FY2019

Kitakyushu City implemented the "Project for Promoting Low Carbonization in the Iskandar Region (Kitakyushu City -Iskandar Development Area Collaboration Project)" in the "city-to-city collaboration project for realizing a low-carbon society in 2019". In order to achieve the goals set out in the Low Carbon Society Blueprint, we have developed an action plan until 2025 and carried out the following activities with the aim of creating concrete projects using JCM.

・ Activity 1: Examination of action plan based on the blueprint for a low-carbon society that

has already been formulated

- Activity 2 Follow-up survey of surveys conducted in FISCAL 2015 and 2016
- Activity 3 Excavation of waste heat recovery power generation projects with potential

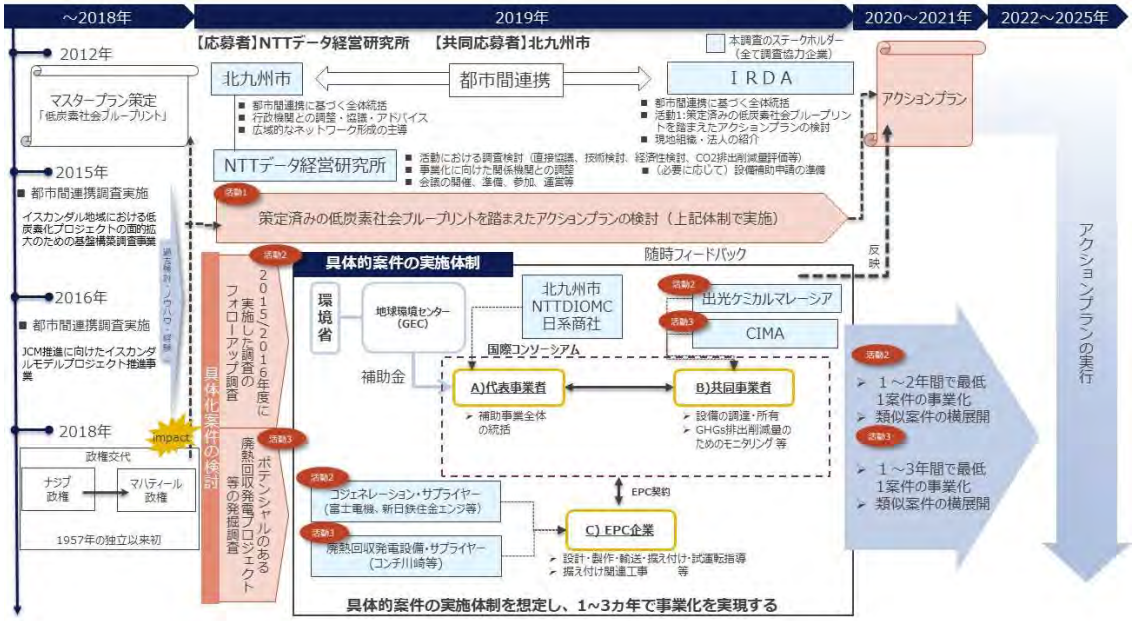

Figure 2 FY2019 activities

The above are among the many steady efforts Kitakyushu has made to engage with the IRDA. By conducting follow-up studies of projects based on past project results, facilitating the development of an Action Plan for Malaysia's Iskandar Development Region, and finding new projects, this project is expected to promote a post-carbon society in the region.

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2.1 Overview of activities

Kitakyushu City implemented the "Project to Promote Low Carbonization in the Iskandar Region (Kitakyushu City -Iskandar Development Area Collaboration Project)" in the "City-to-City Collaboration Project for Realizing a Low Carbon Society in 2019". Among the projects, the Iskandar Regional Development Agency (IRDA) indicated "Industrial Symbiosis" and "Eco Town" as keywords in the activities of the next step of the Low Carbon Society Blueprint.

According to IRDA's concept, industrial symbiosis means building a network that effectively uses emissions from factories in industrial parks as raw fuel for different factories, rather than simple landfills. In addition, eco-towns mean converting energy such as industrial parks into a decarbonized type and promoting eco-friendly housing complexes as a whole.

By integrating these two concepts, **Figure 1**is carbon-free energy such as biomass.

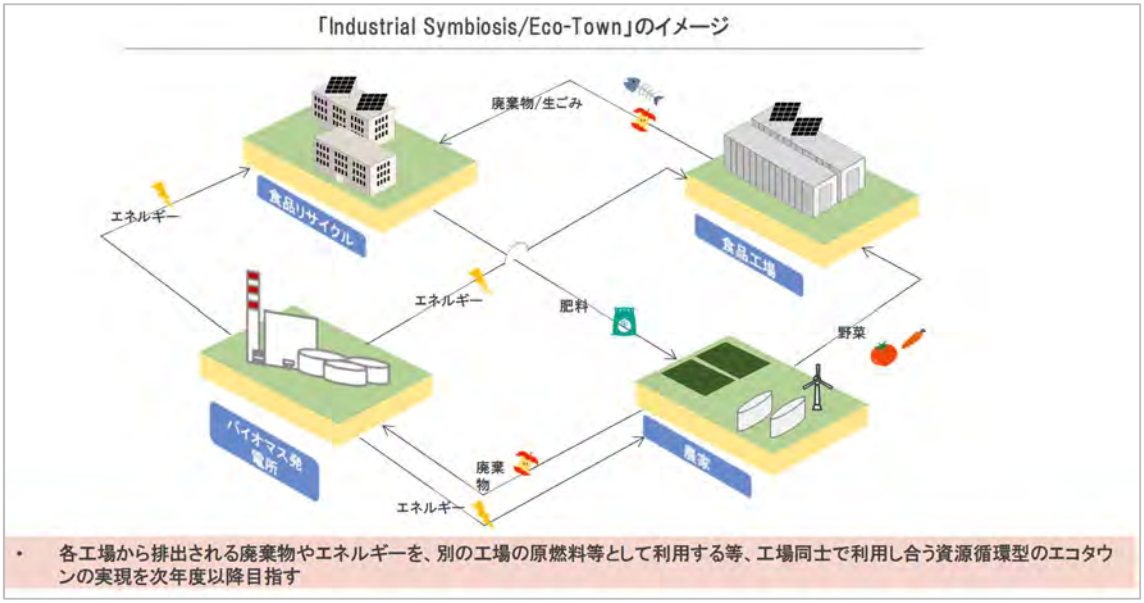


Figure 1 Image of Industrial Symbiosis and Eco-Town[1]

In FY 2019 project, IRDA and IRDA agreed to perform the following five activities with the aim of realizing a pilot project that integrates industrial coexistence and eco-towns as described above in the Iskandar region.

1) IRDA will take the lead in collecting inventory data on waste discharged from factories in industrial parks in the Iskandar region. Review industrial parks (or factories) that are cooperative with IRDA's activities during the collection process of this inventory data and select suitable candidate housing complexes for the pilot project. (See: **Figure 2**1 in Figure **2**)
2) Based on the collected inventory data, matching between factories (matching

[1] NTT DATA Institute of Management Consulting crated based on hearings from IRDA

whether waste from one plant can be used as raw fuel at another plant) is performed. (See **Figure 2** in Figure 2)

3) We will consider the technologies and tools necessary to realize the above matching, and consider methods for cooperation with companies that have these technologies and tools. (See **Figure 2**3 in Figure **2)**
4) In parallel with the above three activities, we will consider policy support (preferential treatment, penalties, etc.) to realize industrial symbiosis and eco-towns in one place. (See: **Figure 2**4 in Figure **2**)
5) The above results of the study will be compiled, a pilot project will be planned, and the goals (KPIs) to be achieved in the pilot project will be considered. (See: **Figure 2**5 in Figure **2**)

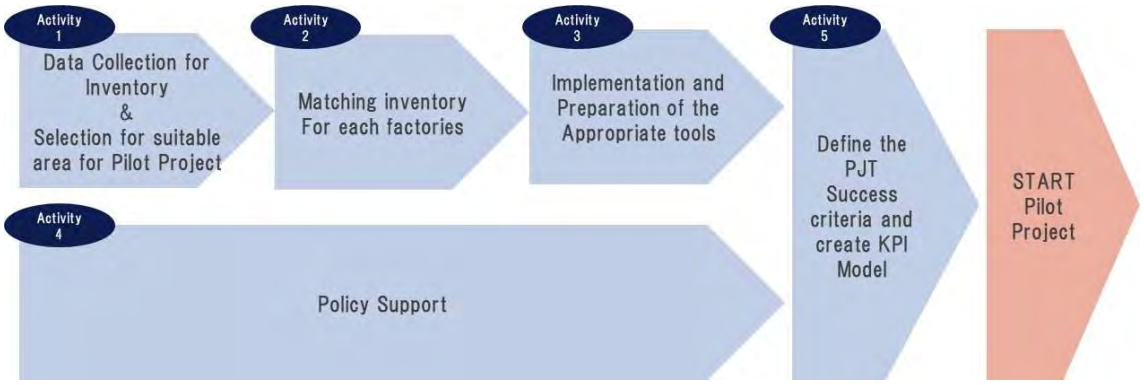


Figure 2 Plan for Realizing an Industrial Symbiotic Eco-Town

In addition, each of the above activities **Table 1**roles as shown in Table **1** below. Activity 3 will only be considered as a basic course this fiscal year.

Table 1 sharing of action plans

No.	Activities	IRDA	北九州市	NTTデータ経営研究所
1	工場から廃棄される廃棄物のインベントリー・データの収集	●		
2	インベントリー・データに基づく工場間のマッチング		●	●
3	（マッチングを実現するために必要な技術やツールの検討）			
4	上記の活動と並行した政策支援のあり方（優遇措置や罰則等）の検討	●	●	
5	全体の検討結果を取りまとめたパイロットプロジェクトの企画	●	●	●

2.2 Collecting inventory data

This fiscal year, since it was difficult to travel to the site due to the corona disaster, IRDA approached local factories, etc., and ordered to collect inventory data.

2.2.1 Creation of questionnaires (data sheets)

In collecting inventory data from each plant, it was necessary to investigate by a common axis based on subsequent analysis and matching between factories. Therefore, after consultation with IRDA and related parties, we have established a questionnaire (data sheet) to be distributed to each plant. The items that we thought needed to be investigated were as follows.

(1) Basic information

- Company name
- Address
- Name of person in charge
- Department
- Contact
- Company size
- Industry
- Product
- Are waste currently used as raw fuel?

(2) Waste emissions

- Classification of waste
  - Large classification: Hazardous designated waste (Scheduled Waste) or other industrial waste(Non-Scheduled Waste)
  - Medium classification: Roughly sorted waste(Scheduled Waste by number)
  - Small classification: Specific items, etc.
- Waste (solid, liquid, gas, etc.)
- The amount of discharge
- Discharge frequency
- Waste disposal(recover / recycle /dispose)
- Companies entrusted with waste disposal, unit price of disposal
- Companies entrusted with the collection and transportation of waste, unit price

(3) Interest in industrial symbiosis

- Is there any waste discharged from the company that can be used as raw fuel by other companies?
- Is there anything that can be used as raw fuel in-house for waste discharged from other companies?
- Are you interested in participating in the framework of industrial symbiosis in the future?

Questionnaires created based on the above items are shown in Attachment 1 of this Chapter.

2.2.2 Holding local workshops

In October 2020, a workshop was held in October 2020 to introduce this project and industrial symbiosis to local companies and to distribute questionnaires created in 2.2.1.

Industrial Symbiosis Knowledge Sharing and Survey Workshop

- Date: October 6, 2020, 9:00 a.m. to 5:00 p.m. Malay time
- Venue: Holiday Villa Hotel, Johor Bahru
- Host :IRDA, Invest Johor, [2]Universiti Teknologi Malaysia (UTM-Low Carbon Asia Research Centre)

The total number of participants was more than 100. Of these, 77 were representatives of factories, etc., and 27 were related to local governments. The program on the day **Table 2**

Table 2 Local Workshop Programs

Time	Programme
9.00 a.m. - 9.30 a.m.	Registration
9.30 a.m. - 10.00 a.m.	Welcoming Remarks - Datuk Ismail Ibrahim, Chief Executive of Iskandar Regional Development Authority (IRDA) Opening Remarks - YB EXCO Tuan Mohd Izhar bin Ahmad, Johor State Chairman of Committee Investment, Entrepreneur Development, Cooperatives and Human Resource
10.00 a.m. - 10.30 a.m.	Break
10.30 a.m. - 1.00 p.m.	Introduction of Industry Symbiosis and Survey Workshop
1.00 p.m. - 2.00 p.m.	Lunch
2.00 p.m. - 5.00 p.m.	Resume of Workshop Knowledge-Sharing and Networking
5.00 p.m.	End

[2] Major Institutions of Industrial Promotion, Facilitation, Coordination, Development and Investment in Johor

In the session from 10:30 a.m., the Research Center for Low Carbonization in Asia at the Malaysian Institute of Technology (UTM) introduced the basic concepts, case studies, and benefits of industrial symbiosis. UTM lecture materials are shown in Attachment 2.

In the session from 2:00 p.m., three guest speakers gave lectures related to industrial symbiosis. First, WANHASHIDAH WAN SALLEH and ShahZUL JAYAWIRAWAN MOHDYUNUS, representatives of Johor Province, took the stage from the Environmental Technology Division of the Malaysian Investment and Development Agency (MIDA) to learn more about the Malaysian government's policies on the environmental technology industry and tax incentives. Next, representatives from the Ministry of the Environment(DOE)of the State Government of Johor took the stage to introduce the Malaysian government's disposal department management measures, how to use waste management systems, and examples that could cause environmental pollution. Finally, MICHELLE ONG, a renowned solar power company based in Johor, gave a lecture on the use of solar power generation in green recovery from coronal disasters.

2.2. 3 Collection, aggregation and analysis of questionnaires

(1) Overall picture of the factories surveyed

After the workshop in 2.2.2, 30 companies submitted questionnaires as a result of follow-up through IRDA to the companies present (**Table 3**).

Table 3 List of Companies Submitting Inventory Data

No.	Company name	Industry
1	L.P. Pacific Films Sdn. Bhd	Papermaking, printing
2	CEE INDUSTRIES SDN BHD	Metal products industry
3	TES-AMM (MALAYSIA) SDN. Bhd.	Recycling and recycling of waste
4	IMPACT RANK (M) SDN. BHD.	Plastic products
5	TAKECHI RUBBER INDUSTRY (M) SDN. BHD.	Rubber products
6	ARTRON PRECISION MALAYSIA SDN. Bhd.	Others
7	MOHM Chemical Sdn Bhd	Others
8	Instruments Technology (Johor) Sdn. Bhd.	Others
9	Clp Industries Sdn Bhd	Recycling chemical products and waste
10	Chawk Technology International Sdn Bhd	Electronics and electrical products
11	Shima Electronic Industry (Malaysia) Sdn Bhd	Electronics and electrical products
12	New Sister Business	Recycling and recycling of waste
13	B.M. Nagang Industries Sdn Bhd	Electronics and electrical products
14	CHIYODA INTEGRE CO. (JOHOR) SDN BHD	Electronics and electrical products
15	CORE PAX (M) SDN BHD	Papermaking, printing
16	DISK PRECISION INDUSTRIES SDN BHD	Electronics and electrical products

17	MATERIALS IN WORKS (M) S/B (WASTE COLLECTION AND UPCYCLING COMPANY)	Recycling and recycling of waste
18	MASTIKA OILS & FATS (M) SDN BHD SEASON	Food manufacturing
19	swancos ind (m) sdn bhd	Chemical products
20	GOLDEN FRONTIER PACKAGING (JOHOR) SDN BHD	Papermaking, printing
21	BEYONICS PRECISION (MALAYSIA) SDN BHD	Electronics and electrical products
22	GORIN TECHNICAL INDUSTRY (MALAYSIA) SDN BHD	Electronics and electrical products
23	TYM Electric & Machinery Sdn. Bhd.	Machinery and equipment
24	Teknoware Asia Sdn Bhd	Electronics and electrical products
25	Yee Cheong Plastic Manufacturer (M) Sdn Bhd	Plastic products
26	NIRO CERMIC (M) SDN BHD	Nonferrous metal products
27	Versa Manufacturing Sdn Bhd	Electronics and electrical products
28	GREAT WALL NUTRITION TECHNOLOGIES SDN BHD	Food manufacturing
29	SNC Industrial Laminates Sdn. Bhd.	Electronics and electrical products
30	Sukano Sdn. Bhd.	Plastic products

Table 3were organized by industrial park and plotted on a map (Table 4, **Figure 3** Pasigdan Industrial Park had the largest number of participating companies.

Table 4 Survey: Aggregates of Factories by Industrial Park

No.	Industrial Park	Number of participants in the survey
1	Sand Warehouse Industrial Estate	12
2	Tampoi Industry Estate	5
3	Tebrau Industrial Estate	3
4	Tanjung Langsat Industrial Complex	2
5	SILC Industrial Park & Nusa Cemerlang Industrial Park	2
6	Tiram Industrial Park & Ulu Tiram	2
7	Larkin Industrial Estate	1
8	Industrial Park Main Kempas	1
9	I-Park @ Indahpura, Kulai	1

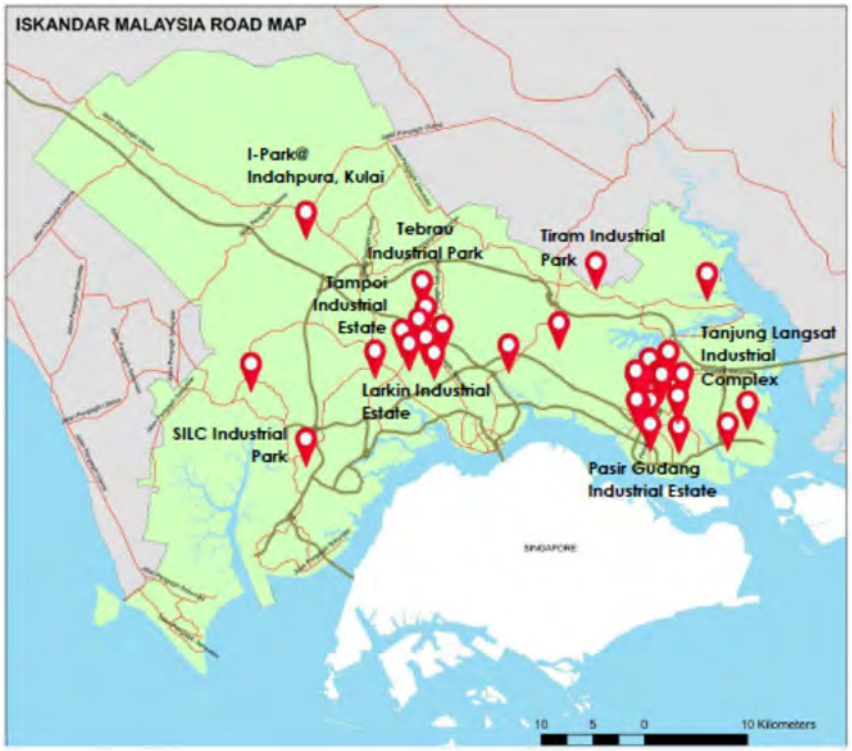


Figure 3of the factory surveyed

(2)Non-Scheduled Waste Emissions

Non-Scheduled Waste, a non-hazardous industrial waste, has less regulations on emissions than Scheduled Waste.

Figure **4** summarizes non-scheduled waste **Figure 4**plants. Wood-based waste with the highest emissions was mainly discharged from factories that produce electronic and electrical products, with many pallets and crates. The next most common was paper waste, which consisted of paper bags and waste paper. Plastic waste, like paper quality systems, was often used for packaging purposes, but on the other hand, many personal armor (Premedical gowns, gloves, masks, etc.) were discharged to avoid adhesion of blood, etc. in medical situations. Factories in the food manufacturing industry are the main source of emissions, but it is expected that emissions are increasing in other industries and the consumer sector due to the corona disaster. Ceramic waste is broken tiles, which are discharged from a single plant.

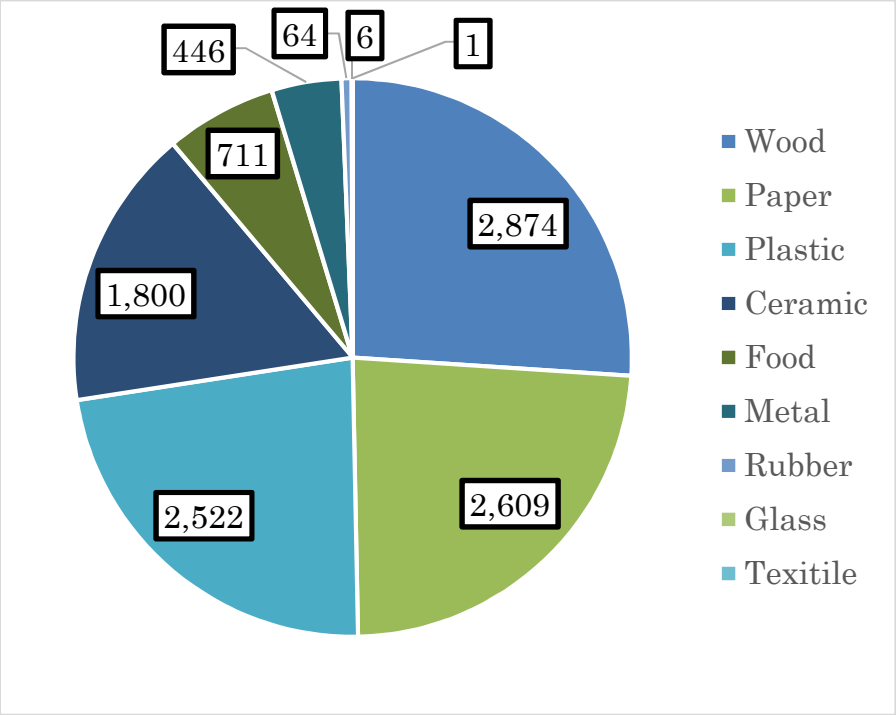


Figure 4 One-Scheduled Waste Emissions from the Factory Surveyed (Tons per Year)

In addition, the recycling rate of each one with a particularly large amount of emissions is summarized and summarized in Table 5. The recycling rate was 70to 90%, which was relatively high compared to the previous survey.

Table 5 Emissions and Recycling Rates of Non-Scheduled Waste with **Particularly**

High **Emissions**

Types of waste	Annual emissions (tons)	Recycling rate (%)
Wood-based waste	2,874	71.7
Paper waste	2,609	91.6
Plastic waste	2,522	90.1
Ceramic waste	1,800	0

(3)Discharge status of Scheduled Waste

Scheduled Waste is a waste that may affect the human body or the environment as defined in the Malaysian Environmental Quality Designated Waste Regulations 2005. Figures 5 and Table **6 Figure 5rates of Table 6**plants surveyed. There are a total of 77 types of designated waste, and when the amount of waste generated is calculated by each type, the waste discharged from each plant is different in category, and the majority of the waste is discharged from 1 to 2 factories by type. Therefore, recycling rates were rarely recycled, or 100%recycled, which was more likely to be extreme. The survey was also available in Malaysia, where the new corona was prevalent, and the number of responses available was limited. In order to grasp the actual situation more, it is also necessary to increase the number of samples.

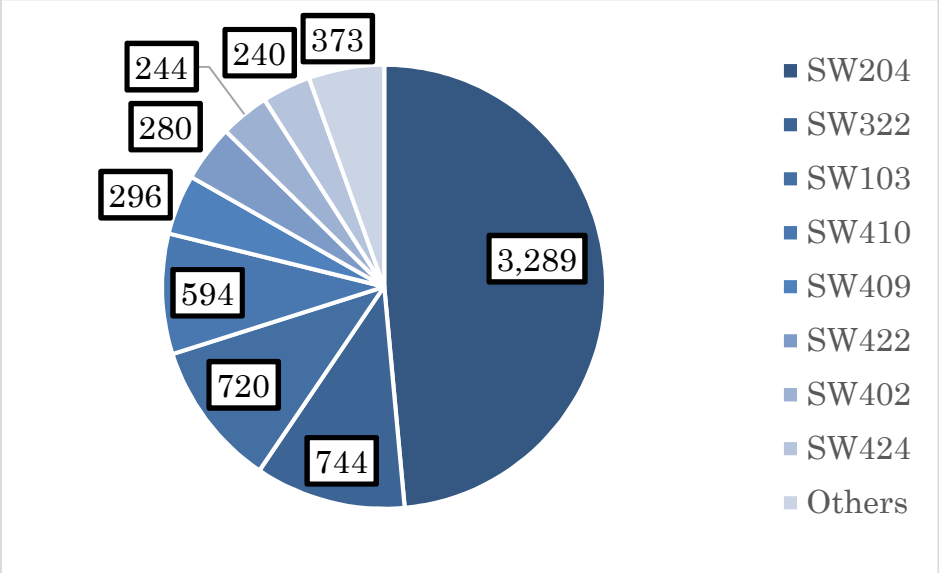


Figure 5 Waste Emissions from Surveyed Plants (Tons per Year)

Table 6 and recycling rates of designated wastes with particularly high emissions

Large classification	Advanced classification		Annual occurrence (tons)	Recycling rate (%)
Sludge	SW204	Sludge containing one or more metals such as chromium, copper, nickel, zinc, lead, cadmium, aluminum, tin, vanadium, and beryllium	3,289	0
Solvent	SW322	Non-halogenated organic solvent waste	744	100
Battery	SW103	Waste from batteries containing cadmium, nickel or mercury, or lithium	720	100
Others	SW410	Rags, plastics, paper and filters contaminated with designated waste	594	2.7
Others	SW409	Containers, bags and tools contaminated and disposed of by chemicals, insecticides, mineral oils and designated waste	296	3.7
Others	SW422	A mixture of designated and non-designated wastes	280	100
Alkaline	SW402	Used alkalis with a corrosive or harmful pH of 11.5 or higher	244	100
Others	SW424	Used oxidants	240	100

2.3 Basic examination of matching and applicable technologies between factories

Based on the survey results up to the preceding paragraph, we examined the possibility of matching between factories, mainly those with relatively low recycling rates (those that are landfill treated without riding the recycling flow) among the wastes with particularly high emissions. In addition, a ling the needs for matching cannot be found at present, we examined the application of the technology of Japanese businesses to waste with high emissions.

2.3.1 Non-Scheduled Waste Review

Among non-scheduled waste, waste that is expected to be matched between factories is as follows. (What is the factory number? **Table 3**

Wood-based waste, paper-based waste

- Factories：#3, 15, 23, 24 ⇒ #20
- What to expect: #20's plants are generating steam in biomass boilers and using it as part of the power source for cardboard box production lines.

Plastic waste

- Factories: #3,4, 10, 17, 30 ⇒ #30, #30.
- Utilization technology: If it can be sorted by type of plastic, it can be used as a recycled raw material for various plastic products.

In addition to the above, a ling matching is difficult, the following wastes were examined as potential recycling wastes by introducing recycling technology in Japan.

Food waste

The utilization of the fattening technology of the food residue that the enterprise in Kitakyushu city has is considered.

Ceramic waste

It was found that companies in Fukuoka Prefecture recycled pottery such as toilet bowls as paving materials on the road surface to improve visibility and prevent falls in rainy weather.

2.3. 2 Examination of designated waste

It was confirmed that the collection and disposal of designated waste is a permit system, and that there are more than 20 licensed businesses in the Iskandar area. As a result of attempting to contact these companies through IRDA**7,** No.1 to3.

Table 7 Waste Recycling Companies in Iskandar Region

No.	Company name
1.	Stage Flora (Johor Bahru) Sdn Bhd
2.	Vast Group Sdn Bhd
3.	Southern Strength (M) Sdn Bhd
4.	C.L.P Industries Sdn Bhd
5.	CBH Recycle (M) Sdn Bhd
6.	CCM Chemical Sdn Bhd
7.	Eng Song Metal Trading Sdn Bhd
8.	Hydro Metal (M) Sdn Bhd
9.	JTS Engineering Sdn Bhd
10.	M&M Recycling Sdn Bhd
11.	Materials Service Complex Sdn Bhd
12.	Metahub Industries Sdn Bhd
13.	New Sister Business
14.	Positive Chemicals Sdn Bhd
15.	Premier Bleaching Earth Sdn Bhd
16.	Pride-Chem Industries Sdn Bhd
17.	Ranama Resource Sdn Bhd
18.	S&J Lubricant Sdn Bhd
19.	SNC Industrial Laminates Sdn Bhd
20.	TES-AMM (Malaysia) Sdn Bhd
21.	Ye Chiu Non-Ferrous Metal (M) Sdn Bhd

TheNo.3 Southern Strength (M) Sdn Ghd provided detailed documentation on local recycling flows (Figure 6).

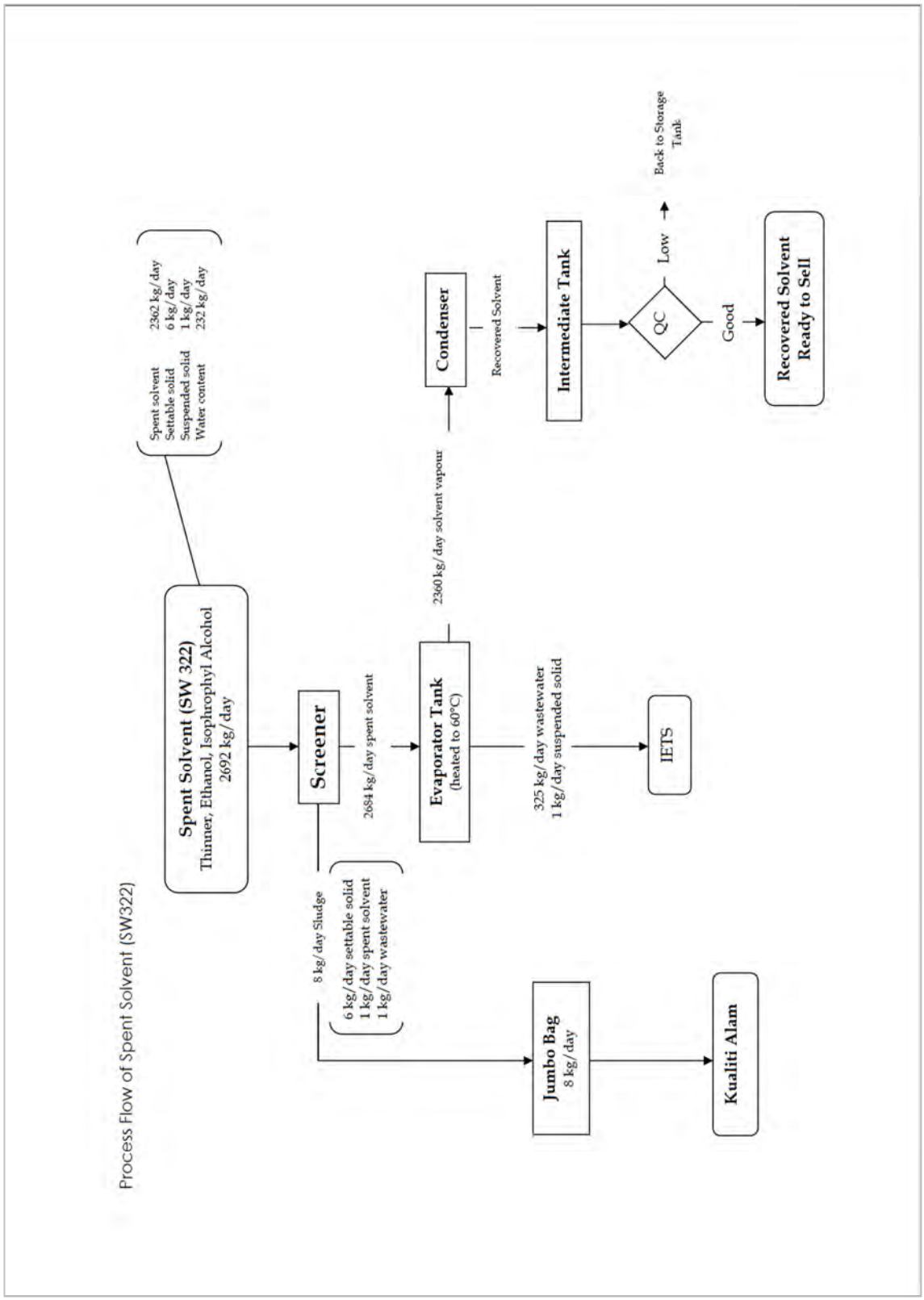


Figure 6 Recycling flow of designated waste

(for example, the flow of SW322 with the highest emissions is attached)

Based on these recycling flows, as a result of technical examination with a recycling company with a business site in Kitakyushu City (hereinafter, Company A), Table 8

Table 8 Southern Strength Key Recycled Items

Types of waste	Daily processing volume (kg)	Recycling rate (%)
Oily waste	12,937	51.4%
Used solvents	8,492	42.8%
Contaminated soil	1,504	34.0%

Among these, for example, oily waste can contribute to the realization of industrial symbiosis by introducing more efficient recycling technology, such as collecting recycled oil with higher purity by utilizing company A's recycling technology.

2.4 Future developments

In this year's survey, we were able to grasp companies that are positive about the idea of industrial symbiosis, companies that have already been recycled but have the potential for further advanced processing. These companies can also be considered companies with the potential for future pilot activities. In the future, it is expected to implement concrete pilot projects in cooperation with companies that are positive about this idea of industrial symbiosis.

On the other hand, in addition to the fact that field surveys could not be carried out due to travel restrictions caused by the corona disaster, restrictions on movement and curfews were issued in Malaysia, which limited the activities of IRDA, a local player, and limited the volume of inventory data, which is a consideration material.

For this reason, from the next fiscal year onwards, we will proceed with discussions with companies that submitted inventory data this fiscal year and local recycling companies such as Southern Strength, which submitted the detailed flow of recycling, aiming to implement a pilot project aimed at realizing an industrial symbiotic eco-town, and we will conduct activities with a view to collecting additional inventory data with a feeling of shortage.

Attachment 1 :
Datasheet

Section 1: Basic Profile

1	**Company Name** (State)	
2	**Address** (State)	

3	**Name** (State)	
4	**Position/Department** (State)	
5	**Contact (Mobile Phone)** (State)	
6	**Contact (Email)** (State)	

7	**Size of Company** (Select)	
8	**Type of Company** (Select) *(see Appendix A)*	
9	**Type of Product** (State/Describe)	
10	**Do your industry use waste material as resource in your manufacturing production** (Select)	

Section 2: Waste Output

2.1 Non-Scheduled Waste

No	Name of Waste (Select) *(see Appendix B)*	Description (State)	Nature of Waste (Select)	Odour (Select)	Generated Volume (Select)			Type of Treatment (Select)	Company of Treatment (State)	Price of Waste		Company of Collection (State)	Price of Waste	
					Quantity Amount (State)	**Unit** (Select)	**Temporal** (Select)			**RM Value** (State)	**Unit** (Select)		**RM Value** (State)	**Unit** (Select)
1														
2														
3														
4														
5														

2.2 Scheduled Waste

No	Name of Waste (Select) *(see Appendix C)*	Description	Nature of Waste (Select)	Odour (Select)	Generated Volume (Select)			Type of Treatment (Select)	Company of Treatment (State)	Price of Waste		Company of Collection (State)	Price of Waste	
					Quantity Amount (State)	**Unit** (Select)	**Temporal** (Select)			**RM Value** (State)	**Unit** (Select)		**RM Value** (State)	**Unit** (Select)
1														
2														
3														
4														
5														

Section 3: Future Recommendation

4.1 From your industry, do you foresee any potential waste material(s) can be valuable resource for other industry? (If yes, please state)

4.2 From your industry, do you foresee any potential of using other waste material(s) as alternative resource for your industry? (If yes, please state)

4.3 Would you like to have industrial symbiosis business matchmaking and networking in the future? (Select)

4.4 Please do feel free to provide us any feedback (State)

Appendix A

No	Type of Industry
1	Basic Metal Products
2	Chemical and Chemical Products
3	Electronics & Electrical Products
4	Fabricated Metal Products
5	Food Manufacturing
6	Furniture & Fixtures
7	Machinery & Equipment
8	Non-Metallic Mineral Products
9	Paper, Printing & Publishing
10	Petroleum Products (Including Petrochemicals)
11	Plastic Products
12	Rubber Products
13	Scientific & Measuring Equipment
14	Textiles & Textile Products
15	Transport Equipment
16	Wood & Wood Products
17	Waste Recovery/Recycling
18	Others

Appendix B

Non-Scheduled Waste

No	Waste	Remarks
1	Paper	
2	Plastic	
3	Metal	Scrap, shaving
4	Rubber	
5	Electronic*	E-waste, appliance
6	Glass	
7	Steam	
8	Ash*	Residue from fires (e.g. Boiler cinder)
9	Food	Food processing waste, cooking oil
10	Textile	Clothes, Leather
11	Wood	Furniture
12	Oil*	
13	Ceramic	

Appendix C

Scheduled Waste (Only applicable if the industry generate scheduled waste)

No	Code	Waste
1	SW 101	Waste containing arsenic or its compound
2	SW 102	Waste of lead acid batteries in whole or crushed form
3	SW 103	Waste of batteries containing cadmium and nickel or mercury or lithium
4	SW 104	Dust, slag, dross or ash containing arsenic, mercury, lead, cadmium, chromium, nickel, copper, vanadium, beryllium, antimony, tellurium, thallium or selenium excluding slag from iron and steel factory
5	SW 105	Galvanic sludges
6	SW 106	Residues from recovery of acid pickling liquor
7	SW 107	Slags from copper processing for further processing or refining containing arsenic, lead or cadmium
8	SW 108	Leaching residues from zinc processing in dust and sludges form
9	SW 109	Waste containing mercury or its compound
10	SW 110	Waste from electrical and electronic assemblies containing components such as accumulators, mercury-switches, glass from cathode-ray tubes and other activated glass polychlorinated biphenyl-capacitors, or contaminated with cadmium, mercury, lead, nickel, chromium, copper, lithium, silver, manganese or polychlorinated biphenyl
11	SW 201	Asbestos wastes in sludges, dust or fibre forms
12	SW 202	Waste catalysts
13	SW 203	Immobilized scheduled wastes including chemically fixed, encapsulated, solidified or stabilized sludges
14	SW 204	Sludges containing one or several metals including chromium, copper, nickel, zinc, lead, cadmium, aluminium, tin, vanadium and beryllium
15	SW 205	Waste gypsum arising from chemical industry or power plant
16	SW 206	Spent inorganic acids
17	SW 207	Sludges containing fluoride
18	SW 301	Spent organic acids with pH less or equal to 2 which are corrosive or hazardous
19	SW 302	Flux waste containing mixture of organic acids, solvents or compounds of ammonium chloride
20	SW 303	Adhesive or glue waste containing organic solvents excluding solid polymeric materials
21	SW 304	Press cake from pretreatment of glycerol soap lye
22	SW 305	Spent lubricating oil
23	SW 306	Spent hydraulic oil
24	SW 307	Spent mineral oil-water emulsion
25	SW 308	Oil tanker sludges
26	SW 309	Oil-water mixture such as ballast water
27	SW 310	Sludge from mineral oil storage tank
28	SW 311	Waste oil or oily sludge
29	SW 312	Oily residue from automotive workshop, service station oil or grease interceptor
30	SW 313	Oil contaminated earth from re-refining of used lubricating oil
31	SW 314	Oil or sludge from oil refinery plant maintenance operation
32	SW 315	Tar or tarry residues from oil refinery or petrochemical plant
33	SW 316	Acid sludge
34	SW 317	Spent organometallic compounds including tetraethyl lead, tetramethyl lead and organotin compounds
35	SW 318	Waste, substances and articles containing or contaminated with polychlorinated biphenyls (PCB) or polychlorinated triphenyls (PCT)
36	SW 319	Waste of phenols or phenol compounds including chlorophenol in the form of liquids or sludges
37	SW 320	Waste containing formaldehyde
38	SW 321	Rubber or latex wastes or sludge containing organic solvents or heavy metals
39	SW 322	Waste of non-halogenated organic solvents
40	SW 323	Waste of halogenated organic solvents
41	SW 324	Waste of halogenated or unhalogenated non-aqueous distillation residues arising from organic solvents recovery process
42	SW 325	Uncured resin waste containing organic solvents or heavy metals including epoxy resin and phenolic resin
43	SW 326	Waste of organic phosphorus compound
44	SW 327	Waste of thermal fluids (heat transfer) such as ethylene glycol
45	SW 401	Spent alkalis containing heavy metals
46	SW 402	Spent alkalis with pH more or equal to 11.5 which are corrosive or hazardous
47	SW 403	Discarded drugs containing psychotropic substances or containing substances that are toxic, harmful, carcinogenic, mutagenic or teratogenic
48	SW 404	Pathogenic wastes, clinical wastes or quarantined materials
49	SW 405	Waste arising from the preparation and production of pharmaceutical product
50	SW 406	Clinker, slag and ashes from scheduled wastes incinerator
51	SW 407	Waste containing dioxins or furans
52	SW 408	Contaminated soil, debris or matter resulting from cleaning-up of a spill of chemical, mineral oil or scheduled wastes
53	SW 409	Disposed containers, bags or equipment contaminated with chemicals, pesticides, mineral oil or scheduled wastes
54	SW 410	Rags, plastics, papers or filters contaminated with scheduled wastes
55	SW 411	Spent activated carbon excluding carbon from the treatment of potable water and processes of the food industry and vitamin production
56	SW 412	Sludges containing cyanide
57	SW 413	Spent salt containing cyanide
58	SW 414	Spent aqueous alkaline solution containing cyanide
59	SW 415	Spent quenching oils containing cyanides
60	SW 416	Sludges of inks, paints, pigments, lacquer, dye or varnish
61	SW 417	Waste of inks, paints, pigments, lacquer, dye or varnish
62	SW 418	Discarded or off-specification inks, paints, pigments, lacquer, dye or varnish products containing organic solvent
63	SW 419	Spent di-isocyanates and residues of isocyanate compounds excluding solid polymeric material from foam manufacturing process
64	SW 420	Leachate from scheduled waste landfill
65	SW 421	A mixture of scheduled wastes
66	SW 422	A mixture of scheduled and non-scheduled wastes
67	SW 423	Spent processing solution, discarded photographic chemicals or discarded photographic wastes
68	SW 424	Spent oxidizing agent
69	SW 425	Wastes from the production, formulation, trade or use of pesticides, herbicides or biocides
70	SW 426	Off-specification products from the production, formulation, trade or use of pesticides, herbicides or biocides
71	SW 427	Mineral sludges including calcium hydroxide sludges, phosphating sludges, calcium sulphite sludges and carbonates sludges
72	SW 428	Wastes from wood preserving operation using inorganic salts containing copper, chromium or arsenic of fluoride compounds or using compound containing chlorinated phenol or creosote
73	SW 429	Chemicals that are discarded or off-specification
74	SW 430	Obsolete laboratory chemicals
75	SW 431	Waste from manufacturing or processing or use of explosives
76	SW 432	Waste containing, consisting of or contaminated with, peroxides
77	SW 501	Any residues from treatment or recovery of scheduled wastes

Industrial Symbiosis Program: Knowledge Sharing and Survey

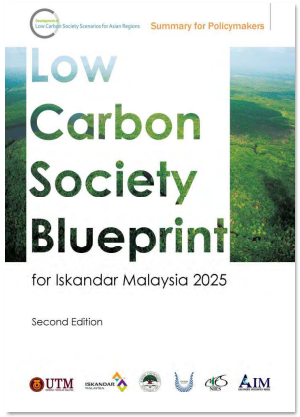
An Introduction to Industrial Symbiosis

6 October 2020
Hotel Holiday Villa, Johor Bahru

Universiti Teknologi Malaysia

Dr Teh Bor Tsong
Dr Gabriel Ling Hoh Teck
Rohayu Binti Abdullah
Umiera Yasmin Binti Ibrahim
Nur Husna Binti Mahizan

Low Carbon Society Blueprint for Iskandar Malaysia 2025



12 Actions Toward Low Carbon Iskandar Malaysia

Green Economy
Action 1: Integrated Green Transportation
Action 2: Green Industry
Action 3: Low Carbon Urban Governance
Action 4: Green Building and Construction
Action 5: Green Energy System and Renewable Energy

Green Community
Action 6: Low Carbon Lifestyle
Action 7: Community Engagement and Consensus Building

Green Environment
Action 8: Walkable, Safe and Livable City Design
Action 9: Smart Urban Growth
Action 10: Green and Blue Infrastructure and Rural Resources
Action 11: Sustainable Waste Management
Action 12: Clean Air Environment

Industrial symbiosis

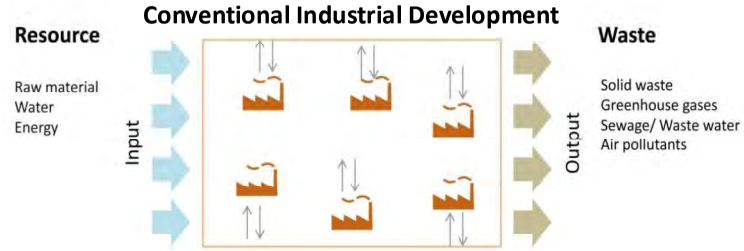
#01 *What is Industrial Symbiosis?*

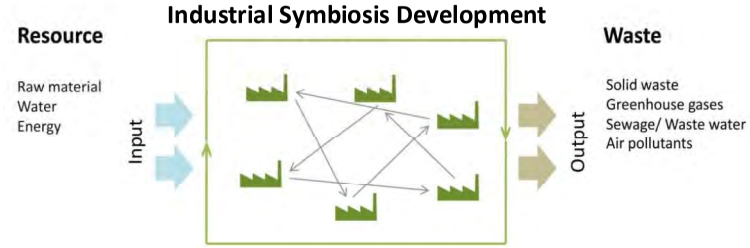
Symbiosis

A terminology derived from biology field used to describe the mutual relationship in nature of which two or more different biological living species are closely interrelate together in benefiting each other.

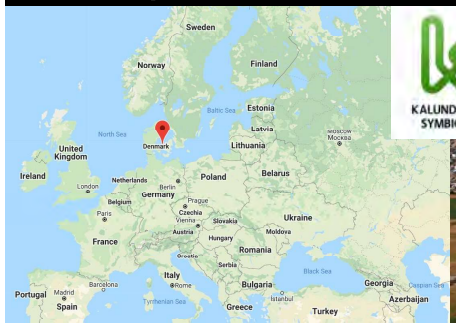
Industrial Symbiosis

An idea that calls for collaboration among industry enterprises to recycle and exchange their by-products in achieving higher resource efficiency, waste minimisation and hence reducing negative impact towards environment.





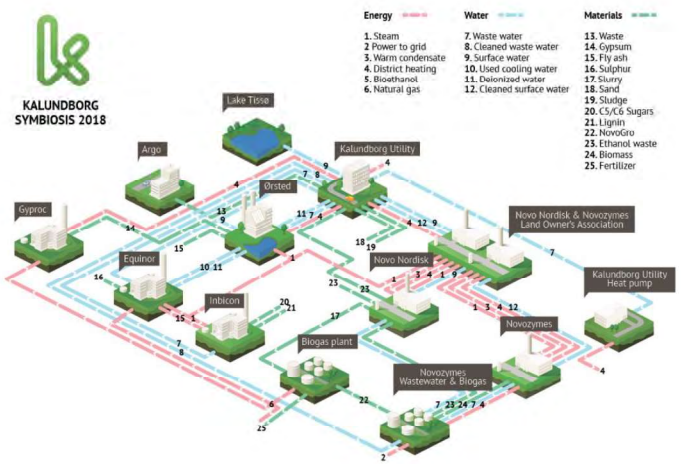
An Example of Best Practice



Kalundborg Industrial Symbiosis

- Location in Kalundborg, Denmark
- 6 private partners
- 3 public partners
- Over 5,000 employees combined
- 25 different waste/resource exchanged

An Example of Best Practice



Kalundborg Industrial Symbiosis Implication

Economic (Annual)

- 24 million EUR (MYR 117 million)

Environment (Annual)

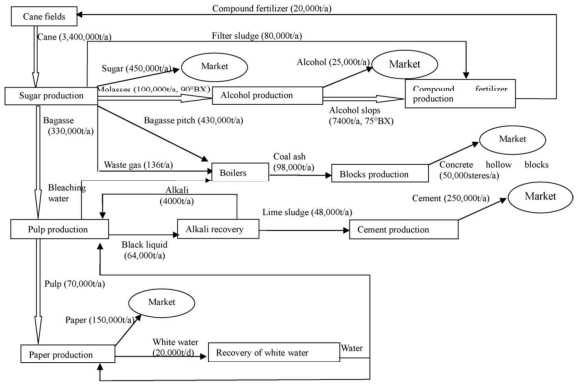
- 635 ktCO2eq
- 3.6 million cubic meter water
- 100GWh of energy
- 87,000 tons of material

#02
Why Industrial Symbiosis?

Industrial Symbiosis = **Profitable Waste Management**

Nanning Sugar Co., Ltd. *(A Case Study from China)*

	Output value (million CNY)	Sales revenue (million CNY)	Tax (million CNY)	Profit (million CNY)
1997	832.6	807.82	107	3.03
2004	2046	2045.11	270.66	170.33
The rate of increment	145%	153%	153%	5521%



Industrial Symbiosis = **Green Business Growth**

Better Image & Reputation

Environmental Friendly =

- **Clean**
- **Safe**
- **Quality**
- **Social Responsibility**

Better Acceptance in Local Market

Eco-Labelling

Registered as **green products and services**

Government Green Procurement (GPP)
Purchasing of green products and services

In 2016, 12 ministries and their agencies have resulted to cumulative value of amounting RM482Million

Better Acceptance in Global Market

International Organisation for Standardisation

ISO 14001 Environmental Management Systems
ISO 14024 Environmental Labels and Declarations
ISO 14067 Greenhouse Gases – Carbon Footprint of Products

Performance, Credibility, Transparency

EMAS
European Union's Eco-Management and Audit Scheme

Better Prepared for Environment Tax in Future

An example - Carbon Tax/Carbon Pricing

(Newspaper Article)

September 2020

"Malaysia is considering to impose carbon tax on future investments to support the sustainability agenda in a bid to tackle climate change, said Environment and Water Ministry (KASA) secretary-general Datuk Seri Zaini Ujang.

According to the World Bank, a carbon tax directly sets a price on carbon by defining a tax rate on greenhouse gas emissions or – more commonly – on the carbon content of fossil fuels."

Thank you for your attention!

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#03
Industrial Symbiosis Survey Workshop

Table of Contents

3.1 Overview of activities

City of Kitakyushu implemented the "Project to Promote Low Carbonization in the Iskandar Region (City of Kitakyushu -Iskandar Development Area Collaboration Project)" in the "City-to-City Collaboration Project for Realizing a Low Carbon Society in 2019". In the project, "Waste to Energy" was indicated as one of the keywords in the activities of the next step of the Low Carbon Society Blueprint from the Iskandar Regional Development Agency (IRDA).

IRDA is planning a project to heat-treat and generate electricity by digging up more than 500 t of waste and already buried waste at the Final Disposal Site of Seelong, which currently landfills and disposes of waste collected from five municipalities. Already, there was a report that discussions on the business model (BOT type, etc.) were being discussed with the central government and are in the process of being finagled, but discussions are already underway with candidate companies responsible for operations there. IRDA expects detailed examinations based on technologies, etc. owned by Japanese companies, so in this year, it was available in cooperation with Japanese companies that have technologies related to waste-to-energy.

With regard to waste-to-energy, it is essential to study from the technical side of generating electricity with heat that can stably heat treat waste, to consider the appropriate division of roles between the public and private sectors, to consider the rules such as chipping fees as waste disposal costs and the sales revenue of generated electricity, and to consider economic aspects such as initial investment and operating costs of waste-to-energy facilities and income obtained from chipping fees and electricity sales. Under the overall management of City of Kitakyushu, NIPPON STEEL ENGINEERING and NTT Data Management Research Institute are in charge of the examination of the role of the public and private sectors at the IGES Kitakyushu Urban Center (KUC), which has been engaged Figure 1).

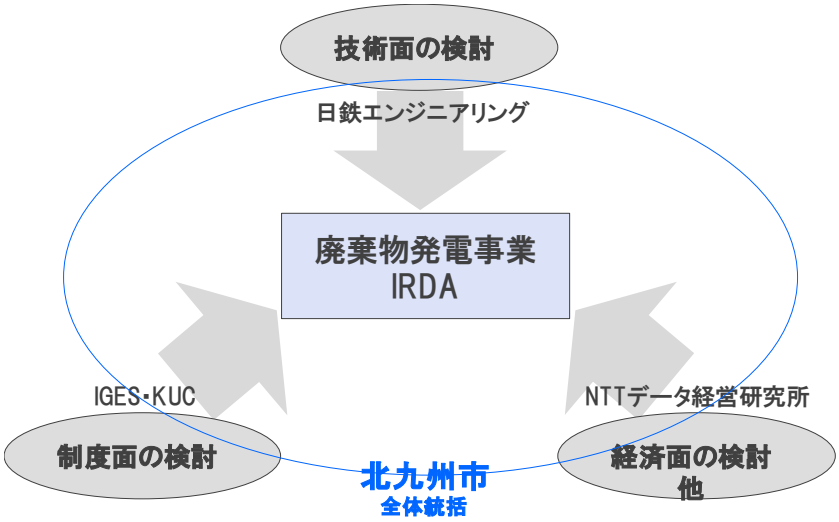


Figure 1　Our team

3.2 Technical Study

3.2.1 Technology Applied

In this Technical Study, grate-type incineration technology is applied as the technology for the presumed WTE plant. Japan is one of the most advanced countries in the world in terms of thermal treatment of MSW. Japan has one the largest number of WTE plants installed, which comprises of WTE plants with various kind of technologies applied, such as grate-type incineration, fluidized-bed-type incineration and gasification, which all successfully demonstrates stable operation for a long period of time. Furthermore, advanced ash treatment and stabilization technologies and flue gas treatment technologies has been developed and installed in the WTE plants, which are propelled by the need to comply with stringent Japanese environmental standards with additional technical requirements implemented by each local governments. Given the above, this Project aims to study the promotion of this advanced Japanese WTE technology in Malaysia.

NSE has a track record of over 500 units of WTE plants installed all over the world. Such WTE plant installed by NSE is designed to be capable of achieving continuous annual operation days of 300 to 330 days, and has been proven to realize long continuous operation. Longer annual operation days generally entails higher annual power generation amount (power sales amount). On the other hand, shorter annual operation days would result in the need to construct a WTE plant with larger waste treatment capacity, in addition to the need to consider alternative methods for disposal of MSW during the non-operational days, whereby resulting in a higher initial investment cost. Therefore, NSE's technology, being able to attain longer annual operational days, is capable of satisfying local needs for achieving proper waste management in a cost effective manner.

In addition, through attaining high steam parameters for boilers, optimizing materials for super heaters, reduction of combustion air ratio, reduction of flue gas temperature and reduction of turbine exhaust pressure, NSE has realized improvements in power generation rate ranging up to 25 to 28%. These efforts which results in higher electric power sales amount through high power generation efficiency, is welcomed by local governments that face problems in securing adequate financial resources for waste management.

NSE's grate-type WTE plant technology proposed in this Technical Study comprises of

the following technological features. Additionally, the overall flowchart (reference only) is shown in Figure2 .

1) Accommodates a wide range of waste quality
   - Stable combustion possible for waste with calorific values ranging from 1,200 kcal/kg up to 5,000 kcal/kg
2) Scale-up properties
   - Treats waste up to a maximum of 1,200 tons/day per line
3) High power generation efficiency
   - Achieves maximum of 30% power generation efficiency
4) Advanced flue gas cleaning system
   - Provides various treatment technologies which suits the client's needs (dry, semi-dry, wet)
5) Long continuous operation
   - Achieves high plant availability of over 8,000 hours

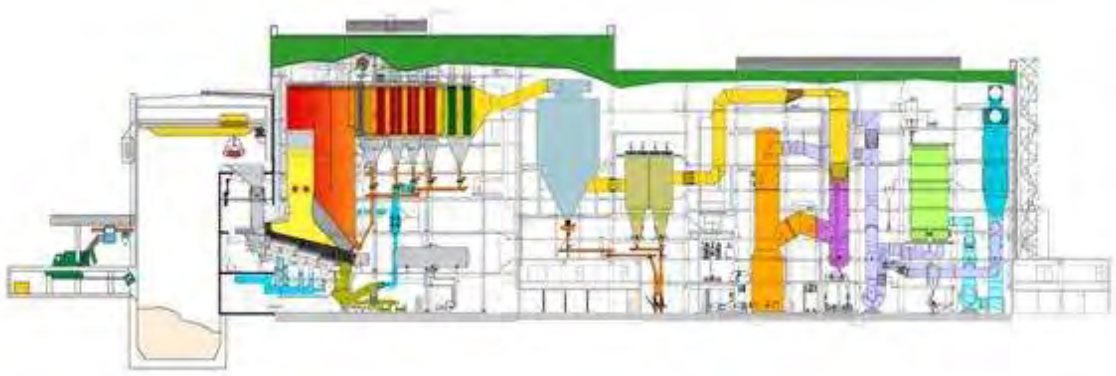


Figure 2 Waste-to-Energy Plant Overall Flowchart (reference)

3.2.2 Premises

Design Waste Throughput

The design waste throughput of the presumed WTE plant is set at 500 tons/day (1 line) after discussion and recommendation by IRDA. The annual availability of the WTE presumed plant is set at 333 days/year (8,000 hours/year).

Design Waste Quality

The design waste quality set for this Technical Study is derived from the published results of the waste details analysis conducted in 2011 and 2013 by Siti Norbaizura and

Professor Takeshi Fujiwara from Okayama University at Seelong Sanitary Landfill Facility in Johor. The percentage values of the chemical composition in the ultimate analysis of the aforementioned published results was adjusted by NSE for the purpose of this Technical Study so that the sum of the chemical composition percentage is equal to the combustible portion in the proximate analysis result is as shown in Table 1.

Table 1 : Design Waste Quality [1]

Parameter		Unit	Standard
Calorific value		kcal/kg	1,591
Proximate analysis	Moisture	wet%	56.90
	Ash	wet %	8.20
	Combustible	wet %	34.90
Ultimate analysis	Carbon (C)	wet %	18.90
	Hydrogen (H)	wet %	2.70
	Oxygen (O)	wet %	12.67
	Nitrogen (N)	wet %	0.39
	Sulphur (S)	wet %	0.05
	Chlorine (Cl)	wet %	0.19

Other Premises

Project Site

Although the project site is not yet confirmed, after discussion and input from IRDA, the project site is assumed in this Technical Study to be located in the land adjacent to the Seelong Sanitary Landfill Facility. In addition, it is assumed that the project site will not have any conditions which will impose constraints in the planning and design of the WTE plant, in terms of the area and dimensions of the land, conditions of approaching roads, electricity and water infrastructures, zoning and land use planning regulations, etc.

Environmental Standards

Environmental standards in Malaysia which are applicable for WTE plants (as investigated and reported by IGES Kitakyushu and local consultants in Malaysia) are shown in (i) - (iv) below. This Technical Study will assume that such environmental standards are applicable for the presumed WTE plant and it will not take into account

[1] *Source: Norbaizura, Siti, M.R. & Fujiwara, Takeshi (2013). Characterization of Household waste in Iskandar Malaysia and its Suitability for Alternative Waste Handling Methods. Journal of Japan Society of Civil Engineers, Ser. G (Environmental Research), Vol.9, No.5 : I_209-I_216., ultimate analysis results adjusted by NSE*

the existence of additional local standards and requirements, if any.

(i) Air Emission Standard

Air emission standard applicable for WTE plants (Environmental Quality (Clean Air) Regulations, 2014) is as shown in **Table 1**.

Table 1: Air Emission Standards in Malaysia[2]

Parameter	Unit	Standard
O_2 reference content	%	11
Total PM	mg/Nm^3	100
NMVOC as total organic carbon	mg/Nm^3	10
Hydrogen chloride (HCl)	mg/Nm^3	40
Hydrogen fluoride (HF)	mg/Nm^3	1
Carbon monoxide (CO)	mg/Nm^3	50
Sum of SO_2 and SO_3 expressed as SO_2	mg/Nm^3	50
Sum of NO and NO_2 expressed as NO_2	mg/Nm^3	200
Mercury and its compounds, expressed as mercury (Hg)	mg/Nm^3	0.05
Cadmium and its compounds, expressed as cadmium (Cd) Thallium and its compounds, expressed as thallium (Tl)	mg/Nm^3	Total 0.05
Antimony (Sb), Arsenic (As), Lead (Pb), Chromium (Cr), Cobalt (Co), Copper (Cu), Manganese (Mn), Nickel (Ni), Vanadium (V), and their compounds expressed as the element	mg/Nm^3	Total 0.5
PCDD/PCDF	$ng\text{-}TEQ/Nm^3$	0.1

(ii) Noise and Vibration, and Odor Standards

Regulations for noise and vibration, and odor pertaining to WTE plants is yet to be implemented in Malaysia. Hence, this Technical Study will assume that limit values which are similar to those in Japan are applicable.

(iii) Wastewater Standard

Wastewater standard applicable for WTE plants (Environmental Quality (Industrial Effluent) Regulations 2009) and Environmental Quality (Control of Pollution from

[2] *source: Environmental Quality (Clean Air) Regulations, 2014*

Solid Waste Transfer Station and Landfill) Regulations 2009) is as shown in **Table 2**.

Table 2 Wastewater Standards in Malaysia[3]

Parameter	Unit	A [1)]	B [1)]	Leachate[2)]
Temperature	□	40	40	40
pH Value	-	6.0-9.0	5.5-9.0	6.0-9.0
BOD at 20□	mg/L	20	50	20
COD	mg/L	120	200	400
Suspended Solids	mg/L	50	100	50
Mercury	mg/L	0.005	0.05	0.005
Cadmium	mg/L	0.01	0.02	0.01
Chromium, Hexavalent	mg/L	0.05	0.05	0.05
Chromium, Trivalent	mg/L	0.20	1.0	0.20
Arsenic	mg/L	0.05	0.10	0.05
Cyanide	mg/L	0.05	0.10	0.05
Lead	mg/L	0.10	0.5	0.10
Copper	mg/L	0.20	1.0	0.20
Manganese	mg/L	0.20	1.0	0.20
Nickel	mg/L	0.20	1.0	0.20
Tin	mg/L	0.20	1.0	0.20
Zinc	mg/L	2.0	2.0	2.0
Boron	mg/L	1.0	4.0	1.0
Iron	mg/L	1.0	5.0	5.0
Silver	mg/L	0.1	1.0	0.10
Aluminum	mg/L	10	15	-
Selenium	mg/L	0.02	0.5	0.02
Barium	mg/L	1.0	2.0	1.0
Fluoride	mg/L	2.0	5.0	2.0
Formaldehyde	mg/L	1.0	2.0	1.0
Phenol	mg/L	0.001	1.0	0.001
Free Chlorine	mg/L	1.0	2.0	-
Sulphide	mg/L	0.50	0.50	0.50
Oil and Grease	mg/L	1.0	10	5.0
Ammoniac Nitrogen	mg/L	10	20	5
Colour	ADMI	100	200	100

(iv) Ash Treatment Standard

Regulations for treatment of bottom ash and APC residue pertaining to WTE plants is yet to be implemented in Malaysia. Hence, this Technical Study will assume that standards which are similar to those in Japan are applicable.

[3] Source: 1) Environmental Quality (Industrial Effluent) Regulations 2009, 2) Control of Pollution from Solid Waste Transfer Station and Landfill) Regulations 2009

Technical Standards

Technical standards (combustion chamber temperature, etc.) for basic specification of WTE plants is now in the progress of drafting by the national government of Malaysia (Technical Guidelines on Selection of Waste Management Technologies) (as investigated and reported by IGES Kitakyushu and Soluwaste Management Consultants, Malaysia). Hence, this Technical Study will assume that standards which are similar to those in Japan are applicable.

Plant Concept

Basic Flow of Waste Treatment

Basic flow of waste treatment in grate-type WTE plant is as shown in Figure 2 below.

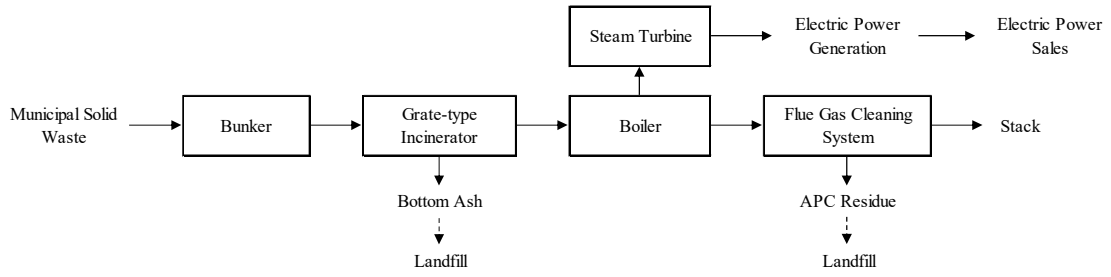


Figure 2 Basic Flow of Waste Treatment

MSW delivered to the WTE plant is first stored in the waste bunker and is then sent directly into the grate-type incinerator by the waste crane. The flue gas generated from incineration of waste, after heat is recovered in the boiler, goes through the flue gas cleaning system where pollutants are removed. The cleaned flue gas then leaves the process to the atmosphere through the stack. Steam generated in the boiler is sent to the steam turbine for producing power. The incineration bottom ash discharged from the incinerator is transferred to landfills and the APC (Air Pollution Control) residues removed at the flue gas cleaning system are taken out to the landfill site.

Material Flow

The outline of material flow is as shown in Figure 3 in the following page. The presumed WTE plant is designed to process 500 tons/day of MSW, with 48 tons/day of incineration bottom ash and 12 tons/day of APC residues are discharged from the plant, respectively.

The electric power sold via the grid is approximately 8.8 MW.

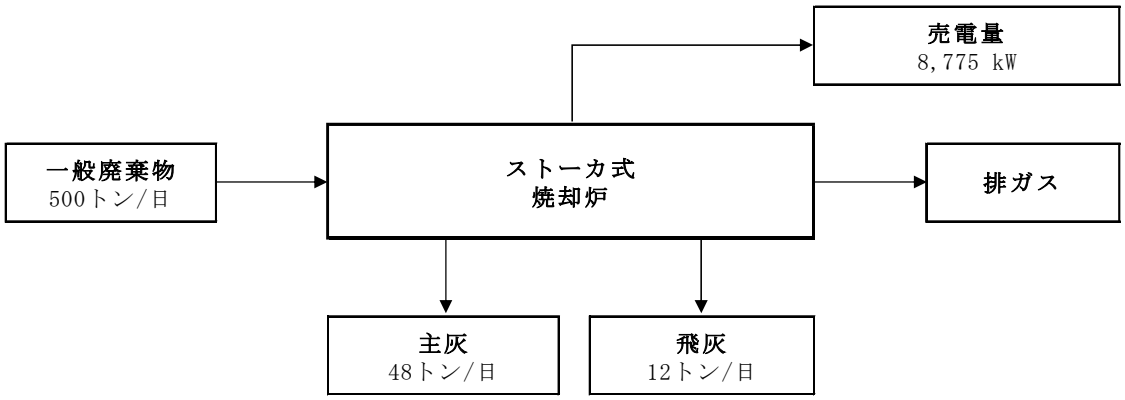


Figure 3　Outline of Material Flow

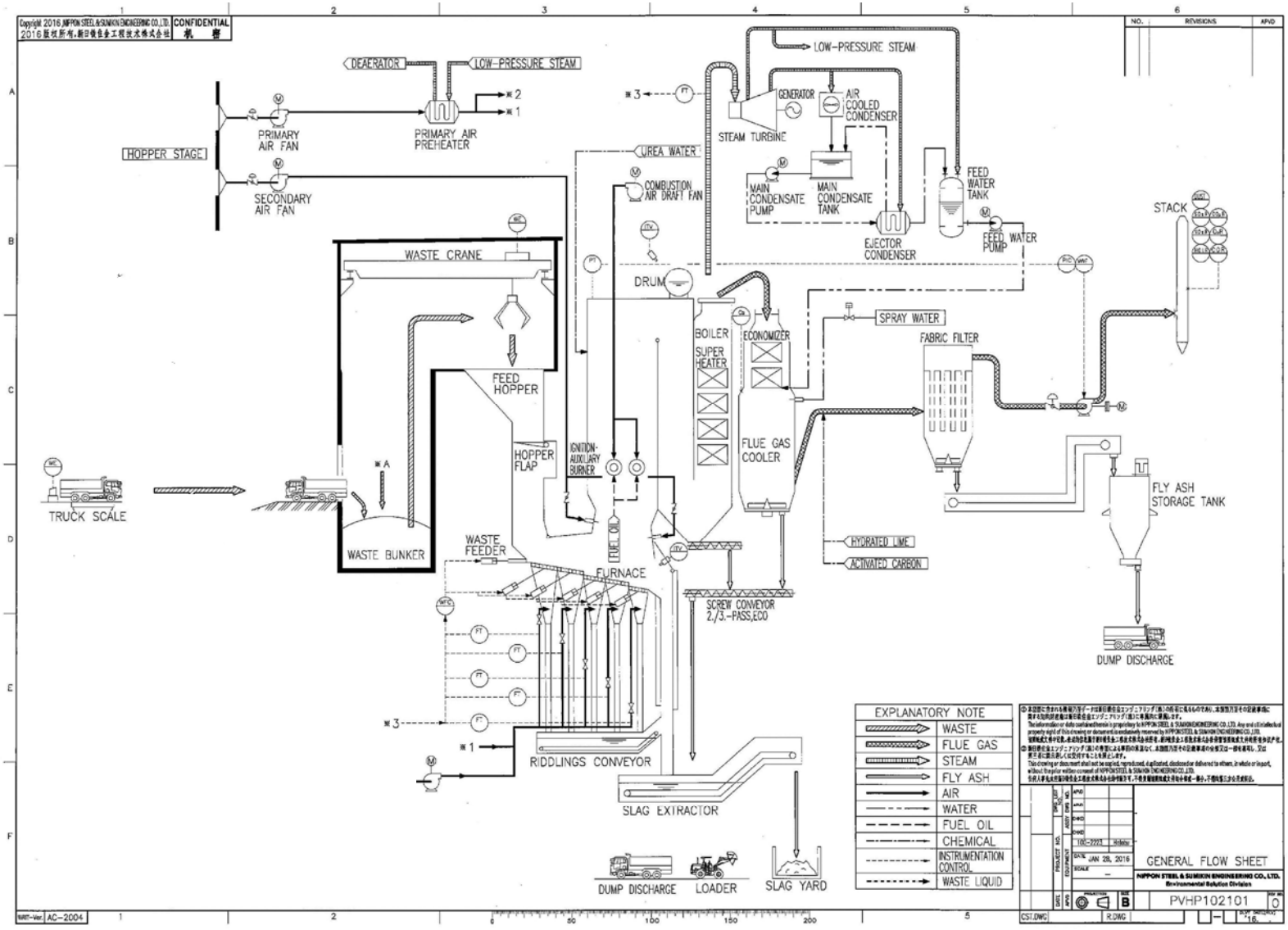
Main Equipment

The presumed WTE plant is composed of a single line from the waste chute to stack. The main equipment comprising the WTE plant are as follows;

1) Waste charging　Pit & crane system
2) Combustion　Grate type incinerator
3) Combustion gas cooler　Steam boiler system
4) Flue gas treatment
   - Dust removal　Filtration type dust collector (fabric filter)
   - HCl, SOx removal　Dry desulfurization system (slaked lime blowing method)
   - NOx removal　Combustion control+ Selective Non-Catalytic Reduction (SNCR) system
   - Dioxins removal　Combustion control + activated carbon b system
5) Generator　Steam turbine (11 MW)
6) Ventilation　Balanced ventilation system
7) Ash removal system　Bottom ash yard & shovel loader transport

(1) Process Flow and Basic Layout

The layout and the longitudinal layout for the presumed WTE plant are shown in the following pages in Figure 5 through Figure 7.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PRIMARY AIR PREHEATER
HOPPER STAGE
SECONDARY AIR FAN
LOW-PRESSURE STEAM
GENERATOR
AIR COOLED CONDENSER
STEAM TURBINE
UREA WATER
COMBUSTION AIR DRAFT FAN
MAIN CONDENSATE PUMP
MAIN CONDENSATE TANK
EJECTOR CONDENSER
FEED WATER TANK
FEED WATER PUMP
STACK
WASTE CRANE
DRUM
BOILER
SUPER HEATER
ECONOMIZER
SPRAY WATER
FABRIC FILTER
FEED HOPPER
HOPPER FLAP
IGNITION-AUXILIARY BURNER
FLUE GAS COOLER
FLY ASH STORAGE TANK
TRUCK SCALE
WASTE BUNKER
WASTE FEEDER
FURNACE
HYDRATED LIME
ACTIVATED CARBON
SCREW CONVEYOR 2./3.-PASS,ECO
DUMP DISCHARGE
RIDDLINGS CONVEYOR
SLAG EXTRACTOR
DUMP DISCHARGE
LOADER
SLAG YARD
EXPLANATORY NOTE
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FLUE GAS
STEAM
FLY ASH
AIR
WATER
FUEL OIL
CHEMICAL
INSTRUMENTATION CONTROL
WASTE LIQUID
GENERAL FLOW SHEET
NIPPON STEEL & SUMIKIN ENGINEERING CO., LTD.
Environmental Solution Division
PVHP102101

Figure 4

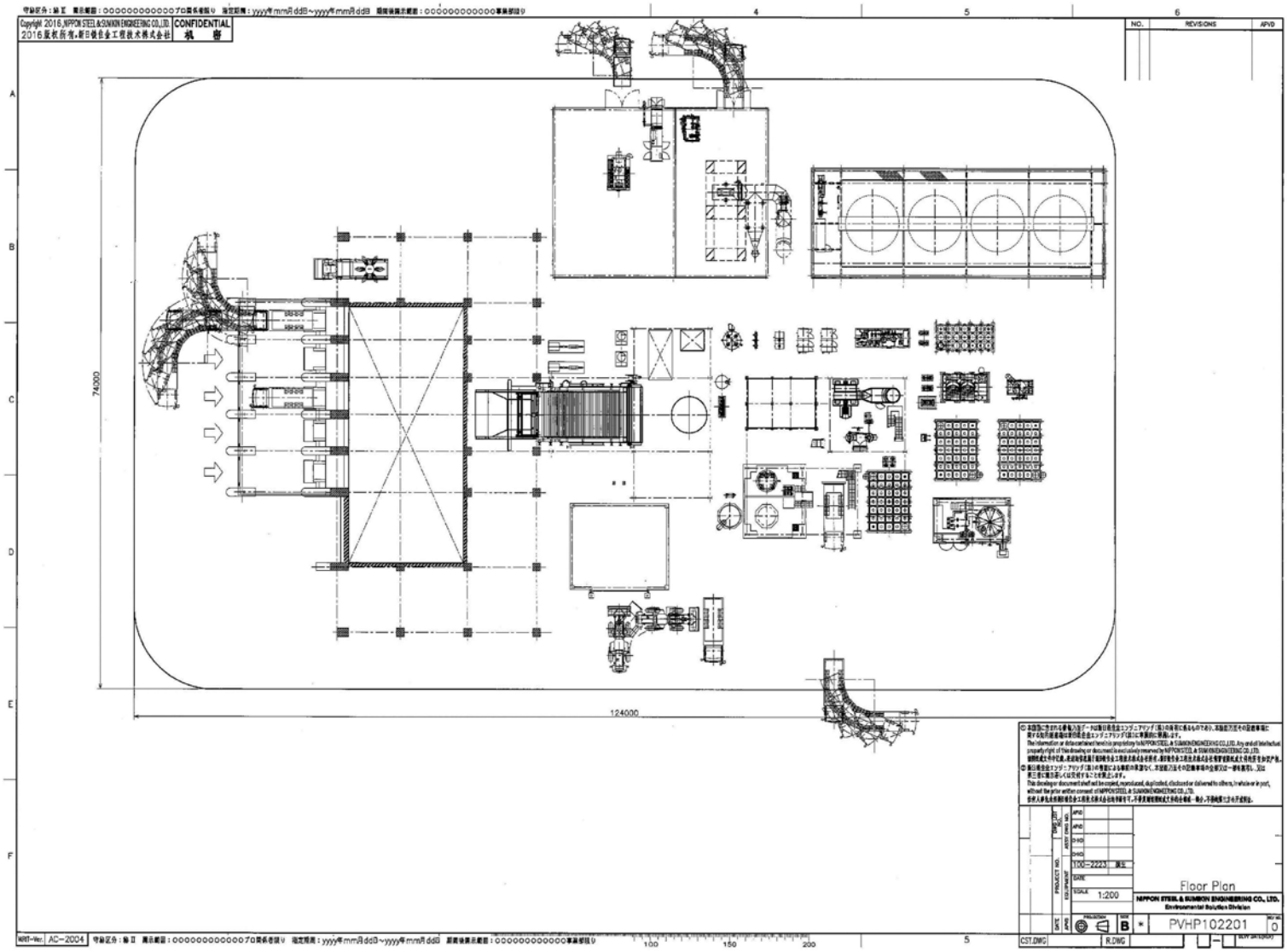
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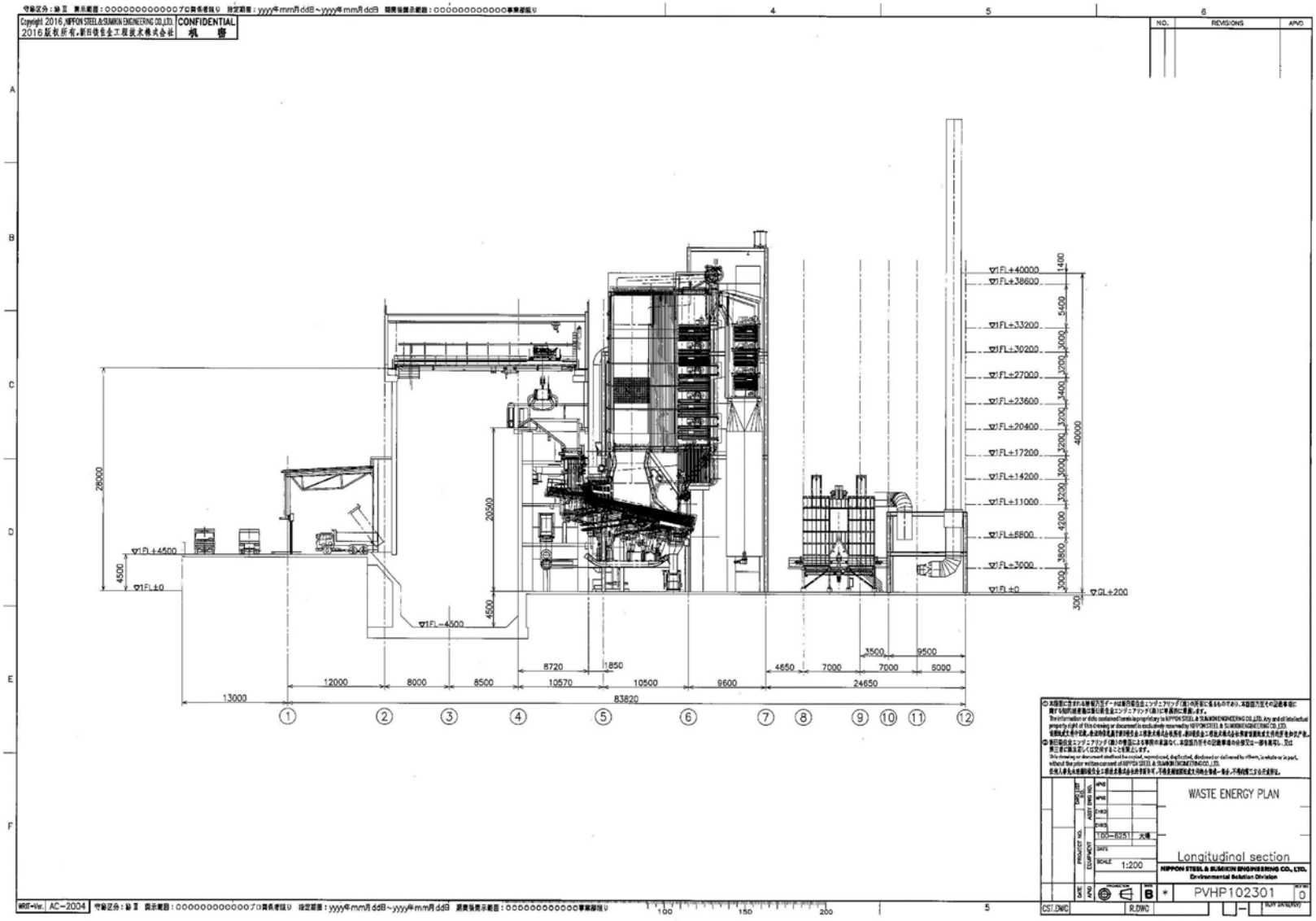
Figure 5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Environmental Solution Division

Figure 6

3.2.3 Preconditions for Project Cost Estimation

The preconditions for calculating the project costs for the presumed WTE plant are as shown in **Table 3**.

Table 3: Preconditions for Project Cost Estimation

Item	Precondition	Remarks
Project period	20 years (operation period)	plus 3 years construction period
Waste throughput	500 tons/day	Single line
Availability	333 days (8,000 hours/year)	-
Steam parameter	430℃、52 barA	-
Possible power sales amount	70,130 MWh/year	Power generation amount minus self-consumption amount
Project site	Land located adjacent to Seelong Sanitary Landfill Facility	Site preparation work assumed to be not necessary

Costs pertaining to the acquisition of project site (including other relevant sites such as storage area), land reclamation and site preparation works, obtainment of necessary permits, completion of environmental impact study, connection works for local grid, etc. are not taken into account in the estimation of the project cost.

3.2.4 Rough Estimation of Project Cost

Construction Costs (rough estimate)

The calculation result of construction costs (rough estimate) are as shown in **Table 4**.

Table 4: Rough estimate of construction costs

Item	Total (billion JPY)	Total (million USD[1)])
Plant	5.9	55.9
Civil & Building	1.8	17.0
Total	7.7	72.9

1) JPY/USD currency exchange rate: 1 JPY= 0.0095 USD (as of 18 February 2021)

Operation and Maintenance Costs (rough estimate)

The calculation results of operation and maintenance costs (rough estimate) are as shown in **Table 5**. "Personnel costs" was derived from estimated local labor unit price and number of operators, and "Maintenance costs" was derived from estimation based on NSE's past operation and maintenance experiences. "Utility costs" was derived based on estimated utility consumption calculated from mass balance and estimated local utility procurement unit price.

Costs for waste collection and delivery, treatment and disposal of bottom ash and APC residues, etc. are not considered in the calculation.

Table 5: Rough estimate of operation and maintenance costs

Item	Total (billion JPY/year)	Total (million USD[1)]/year)
Personnel costs	0.12	1.1
Maintenance costs	0.24	2.3
Utility costs	0.25	2.4
Total	0.61	5.8

1) JPY/USD currency exchange rate: 1 JPY= 0.0095 USD (as of 18 February 2021)

Construction Time Schedule (reference)

The assumed construction period of the presumed WTE plant is as shown in **Table 6**. It is assumed that the basic and detail engineering works is to be completed within 1 year, and the civil & building and erection works is to be completed within 2.5 years, after issuance of notice to proceed of the works. The commissioning works is assumed to be executed for a period of 6 months thereafter.

Table 6: Construction Time Schedule (reference)

Year	1				2				3			
Quarter	□	□	□	□	□	□	□	□	□	□	□	□
Basic Engineering												
Detail Engineering												
Civil & Building												
Erection												
Commissioning												

3.3 Institutional Study

In addition to the legal and institutional framework for solid waste management in Malaysia, the current state of waste management was arranged based on information provided by IRDA, interviews with local stakeholders, and literature surveys.

3.3.1 Legal framework for solid waste management

Solid waste management has traditionally been carried out by local governments, but in 2007 the Waste Management and Public Cleansing Management Act (Act 672) was enacted, transferring the powers of solid waste management in some states to the federal government and placed under the jurisdiction of the National Solid Waste Administration (JPSPN). Johor Province, where the Iskandar region is, also adopts Act 672.

Organize the status of Act672 management compared to local government management **Table** 2 In general, the roles of each state and local government under Act 672 are only partly involved in collecting taxes, raising awareness of solid waste management, and responding to citizen claims. Most of the authority for solid waste management activities such as collection and disposal has been passed on to JPSPN and the Solid Waste and Cleaning Management Corporation (SWCorp).

Table 2 Differences between states that use Act 672 and states that independently manage solid waste

	States adopting Act672	States with their own control
Cost of solid waste management	We contribute expenses related to solid waste management from taxes collected by local governments from households and businesses.	
	A portion of the tax collected by local governments will be paid to the federal government for solid waste management and public cleaning. Smaller local governments, which have low tax revenues and cannot cover the cost of solid waste management, will have their budgets	Local governments will make policies such as solid waste management and public cleaning without receiving subsidies from the federal government. In some cases, the federal government may construct

	distributed by the federal government.	and renovate solid waste management facilities.
Solid waste collection and public health business	It is done by a federally designated session company. In many cases, session companies accept seconders from local governments.	Local governments do it themselves or outsource it to private contractors. Selangor and some other states have established their own statewide session companies.
SWCorp permissions	Monitoring the business execution status of session companies.	They are not particularly authorized Solid waste management is carried out by local governments themselves under the Local Government Law (1974), and local governments themselves monitor contractors.
Planning and policy decisions for solid waste management	The federal government has jurisdiction. It emphasizes standardization of management status and providing high-quality services including trash cans and collection trucks.	Local and state governments have jurisdiction. Some states are trying to standardize their management status.

In Malaysia, there is no official statistical data on waste disposal costs. The Solid Waste Management Lab 2015 report, published in 2015 by the Office of Performance Management and Introduction (PEMANDU) of the Prime Minister's Office, provides the forecasts (budgets) and actuals of waste disposal costs by the Central Government of Malaysia from 2011 to 2015 **Figure** 7 This data includes not only waste disposal costs but also public cleaning costs, and the breakdown is that public cleaning costs are 63% and waste disposal costs are 37%. And 39 percent are spending percentages in local states that comply with Act 672, while the remaining 61 percent is expenditure by the central government. In addition, capital expenditures at waste disposal facilities are not included.

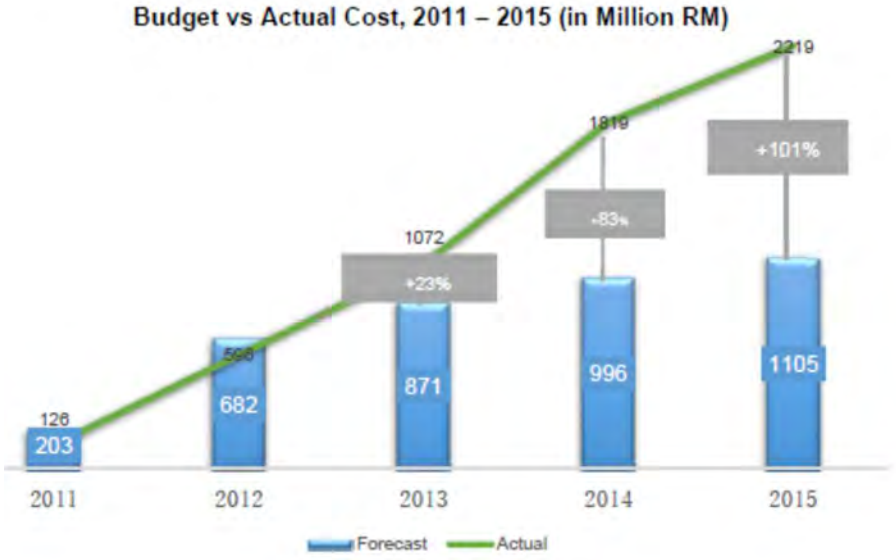

Figure 7 Malaysian Government's Waste-Related Budget and Performance trends for 2011-2015[4]

On the other hand, the budgets of the four local states that do not comply with Act 672 are as shown in Table 9. These budgets are waste collection costs, treatment costs, and public cleaning costs, but they cannot be directly compared because they may include awareness campaigns and repair costs for waste disposal facilities.

Table 3 Disposal Budgets in Rural States That Do Not Comply with Act 672 in Malaysia[5]

No.	State	Local governments	Budget (RM)	Years
1	Penang	Penang Municipal Council (MPPP)	71 million	2020
2	Selangor	Penang Municipal Council (MPPP)	75 million	2019
3	Selangor	Rajang Municipal Council (MPKJ)	33 million	2018
4	Perak	Taiping Municipal Council (MPT)	5.5 million	2019

3.3.2 Institutional Framework for Solid Waste Management

4 Solid Waste Management Lab 2015, GUIDE

5 (1) https://www.malaymail.com/news/malaysia/2019/09/18/penang-island-council-tables-rm14m-deficit-budget-for-2020/1791708
(2) https://selangorkini.my/2019/04/mpsj-belanja-rm75-juta-untuk-pembersihan-pengurusan-sisa-pepejal/
(3) https://selangorkini.my/2018/04/mpkj-peruntuk-rm33-juta-tekad-kurangkan-sisa-pepejal/
(4) https://www.sinarharian.com.my/article/27000/EDISI/Perak/YDP-baharu-fokus-Inisiatif-Taiping-Bersih-90-Hari

In states adopting Act 672, the institutional framework is available to the federal government, as described below.

National Solid Waste Administration (JPSPN)

JPSPN is the top director and has executive authority over all matters related to the management and public health of solid waste.

- Propose policies, plans and strategies for solid waste and public health management.
- Develop a plan for solid waste management, including the location, type and size of new treatment facilities, areas covered by solid waste management facilities, management schemes for supplying solid waste to facilities, and schedules for the implementation of plans.
- Establish standards, specifications and regulations related to all aspects of solid waste management and public health management services.
- Grant approvals and licenses for regulations required under Act 672.

In addition, JPSPN has various authorities in place for the purpose of appropriate management from the generation of solid waste to disposal, treatment, and reuse.

- The management and owner of solid waste is required to hand it over to a permitted facility if it is determined that it has violated Act 672.
- Demand the closure of solid waste management facilities that pose a risk to people's safety and health.
- Have appointed authorities (appointed officers, local authority officers or SWCorp officers) conduct inspections and investigations on solid waste management facilities or land and sites to ensure proper maintenance and hygiene based on Act 672 requirements.
- An unlicensed solid waste management facility installed prior to the enforcement of Act 672 and that could pose a risk to the safety or health of a person can be lodged in writing with the court and demolished based on a court hearing.

Federal, state or local authorities that enforce and manage solid waste and public health management services and facilities before Act 672 comes into force will be permitted to continue executing and managing services and facilities for a specified period of time. Provided, however, that in order for a business operator, facility, or company to continue providing services or managing facilities after the expiration of the authorization period,

a new permit or application for authorization is required. Existing contracts for solid waste and public health management services will also continue to be approved for a period of time after Act 672 comes into force.

Solid Waste and Cleaning Management Corporation (SWCorp)

SWCorp is a larger organization than JPSPN, with the CEO at its head and regional and headquarters offices nationwide. SWCorp's regional offices are responsible for monitoring and overseeing solid waste and public cleanup efforts conducted by session companies and other licensed waste managers.

- Reviews requirements for approval and licensing and monitors and supervises operators to comply with them.
- Proposes and implements policies, plans, strategies and schemes for solid waste management and public health management services, including measures decided by the federal government to improve existing services.
- Recommends standards, specifications and regulations for all aspects of solid waste management services and public health management services to the federal government and monitors compliance.
- Ensure that the functions and duties of persons conducting solid waste management or public cleaning management operations are properly carried out.
- Promotes the improvement of operational efficiency of solid waste management and public health management businesses, including arrangements for the implementation of surveys, assessments, research and advisory services.
- Implement measures to promote the participation of the public in the waste disposal and cleaning management industries and to raise public awareness.
- Develop and implement human resource development, financing and cooperation programs in order to properly and effectively carry out the functions of the Corporation.
- Establish institutions, centers and workshops to conduct research and other activities necessary for the development of solid waste management services and public health management services.
- Determines and imposes fees, fees and other payments for services provided by the Corporation.

Session companies

In order to implement solid waste management and public health management in the Malay Peninsula by the federal government, a long-term contract was signed with the government to create a session company to provide the necessary services.

Figure 8(2011-2033) to provide services in various parts of Peninsular Malaysia. Under the terms of the agreement, the confessing companies provide each household with a standardized 120-litre bin and implement a rubbish collection service with standardized bin lift trucks. The contract is reviewed every seven years.

In the southern region where Johor is located, SWM Environment Sdn Thd (SWMSB), a comprehensive service provider of waste management and public cleaning established in 1997, signed a session agreement. SWMSB currently has more than 8,000 staff in 27 local governments in Malacca, Negelli Sembilan and Johor provinces, providing comprehensive operations for waste collection and cleaning. The company manages more than 1,600 collecting vehicles that service more than 5.1 million people in the region. Like other session companies, SWMSB provides waste collection services to other non-household sectors (institutions, commercial and industrial sectors) in the southern region, in addition to the session area.

SWMSB operates several landfill sites, but is actively looking for waste-to-energy opportunities in the wake of the government's announcement that it will build several WTE plants in southern states, including three to four plants, in the coming years. Among them are Bukit Payong, Batu Pahat, and Sungai Udang of Malacca, where JPSPN has already announced its bid.

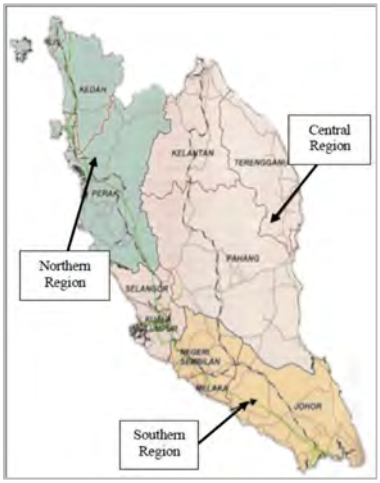

Figure 8 of Session Companies in the Malay Peninsula, 2011

3.3.3 Overview of waste generation and disposal

Amount of waste generated

In Malaysia, there is no statistical data on the amount of waste generated because local governments and collectors are not obliged to report monitoring data to the government. Therefore, the amount of waste generated by various organizations is an infer based on secondary data. According to the latest data from SWCorp, in 2018, solid waste of 37,890 tons per day (1,169 kg/person/day per person) was generated **Table** 4

Table 4 Solid Waste Generation in Malaysia (SW Corp, 2020)

Years	Population	Amount of waste generated		Amount of waste generated per person (kg/person/day)
		Tons per day	Ton/year	
2016	31,190,000	37,000	13,505,000	1.189
2017	31,620,000	37,500	13,687,500	1.186
2018	32,400,000	37,890	13,829,850	1.169

Final disposal amount

In Malaysia, buried disposal at waste disposal sites is the most common waste disposal method. According to data obtained from SWCorp, Malaysia has a total of 311 final landfill sites, of which 138 are operational and 173 have been closed. Of the 138 operations, 19 have adopted sanitary landfills (landfills that have installed a mechanism for laying sheets at the bottom of landfills and collecting and treating leachable, etc.), while the remaining 119 are open dump methods.

As for the final disposal amount, since there is no weight bridge (large weighing table for weighing the vehicle) depending on the final disposal site, data such as estimates from the visible capacity are also included, but when the data obtained from SWCorp is totaled, it reaches 32,840 tons / day.

Table 5 Daily Treatment Volume of Landfills in Malaysia (SW Corp, 2019)

State	Disposal amount per day	State	Disposal amount per day
Perlis	150	Johor	5,457
Kedah	1,680	Pahang	1,401
Penang	3,500	Terengganu	740
Perak	2,285	Kelantan	1,050
Selangor	9,020	Morning	1,410
Kuala Lumpur	2,300	Sarawak	2,102
Negeri Sembilan	755	Laubuan	90
Melaka	900	**TOTAL =**	**32,480**

Sources of waste

In Malaysia, it is difficult to distinguish the source of waste because it is mixed at the time of collection and also at the time of landfill disposal. Currently, waste disposal operators are not obliged to report the type and amount of waste, so there is no complete data showing how much waste is generated from different sources, except for those estimated in the researchers' survey.

A 2012 JPSPN study estimated Table 6below. However, since the amount of waste generated from the private commercial and industrial sectors depends on various factors such as the type and scale of industries and businesses, such estimates are only reference values.

Table 6 Waste Generation in Malaysia (JPSPN, 2012)

	People's livelihood and family sector	Consumer Commerce Division	Industrial sector
Daily waste generation per person (kg/person/day)	0.76kg	0.33kg	0.08kg
Department-wide volume (tons per day)	21.627t	9,224t	2,279t
Percentage (%)	65,3%	27.8%	6.9%

People's livelihood and family sector

In Malaysia, household types range from traditional rural village households to modern households in urban areas. Many waste-related surveys conducted in Malaysia have published findings that differ between "urban" and "rural areas" because living standards and lifestyles can vary widely between urban and rural areas. In rural areas, there are areas that do not provide waste collection services, so waste generated may be buried and incinerated or illegally dumped, reducing waste collection efficiency. In addition, recycling activities at home may not be progressing due to logistical constraints and low environmental awareness.

In 2012, jpspn surveyed the amount of waste generated from households, with about 74% in urban areas and 26% in rural areas. This result is also correlated with the total population of urban and rural areas, but it is only an average percentage of the whole country, and the ratio of urban to rural areas may vary from region to region. It could also change due to Malaysia's rapid development and urbanization.

Consumer Commerce and Industry

Similar to the consumer and family sectors, Figure 10 shows Figure 9JPSPN survey. According to the report, more than 77% of waste from urban areas accounts for more than 77% of the total, while the remaining 23% is from rural areas. However, this figure also shows the average percentage nationwide, and the actual percentage may vary from region to region.

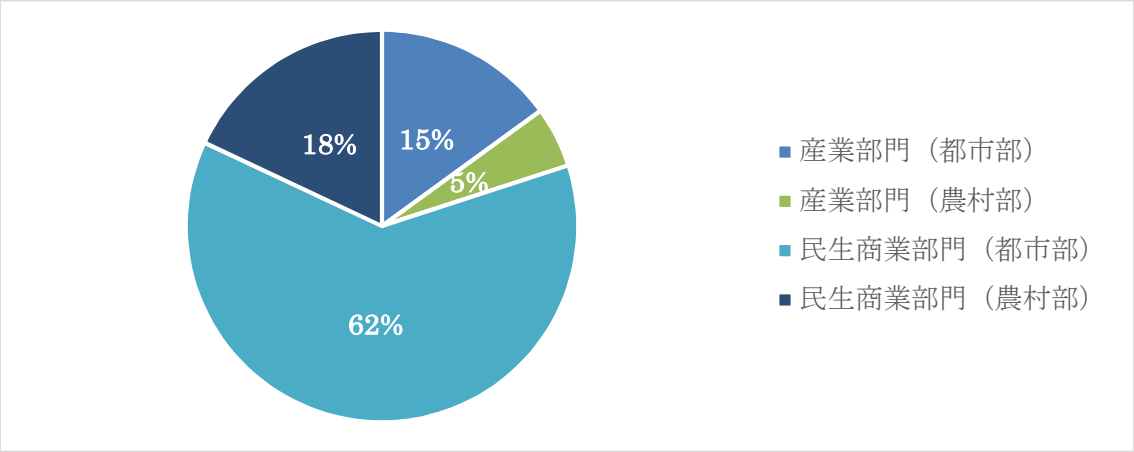

Figure 9 Percentage of Waste Generated in the Consumer Commerce and Industrial Sectors

Other sources

In addition to the above three departments, various wastes may be generated depending on the economic activities of the surrounding area of the disposal site. Especially, the first two kinds of waste are seen in a lot of disposal sites regardless of the region.

- Construction and demolition waste associated with construction and renovation work
- Garbage in green spaces and gardens from landscaping and public cleaning activities
- Agricultural waste associated with agriculture and agricultural activities
- Sludge from wastewater and water treatment facilities
- Special waste from a specific field, such as waste associated with municipal coastal cleanup activities

3.3.4 Actual conditions of solid waste management

Waste storage

A detached house

Malaysia's detached houses usually have individual bins, but in some cases they share larger-sized communal bins in the area. States that use Act 672 offer 120 litters of standard trash cans for single-family homes in each state, with standard bin lifting methods using compactor trucks. On the other hand, in states that do not adopt Act 672, it is left to the judgment of local governments, but for budget reasons, most local governments that do not have a sufficient budget do not provide standard bins for households and purchase bins in each household.

Figure 10 Houses with Standard Trash Cans

120 liters of standard trash cans are used for non-recycled and mixed waste collected for disposal in landfills. In a small percentage of municipalities, where two garbage bins are provided in each household, recyclables and residues can be collected separately. In states that use Act 672, recycled goods are collected once a week, with residents putting them in plastic bags and placed next to trash cans.

For large pieces of trash that can't be placed in a 120-liter trash can, such as furniture, e-waste, or tree branches, you may want to have it collected next to the trash can, or you may pay the necessary costs to call a collector.

A housing complex

In the case of multi-family housing, it is necessary to establish a centralized storage place for waste on the first floor. Depending on the total amount of waste generated per day and the frequency of collection, large communal trash cans and small container-type trash cans are installed in storage areas. In some buildings, a trash can with compression function is installed to maximize the amount of waste stored due to space constraints.

Figure 11 can with compression function installed in a high-rise house

Consumer Commerce, Industrial Sector

In the consumer commerce sector, various waste storage systems are applied. Commercial facilities such as shopping malls, office buildings, government agencies, etc. have adopted the same waste storage system as the apartment building described above, and there is a centralized waste storage place with an appropriate type of trash can on the premises. However, some operators are not in the mall like shopping streets and other business areas, and such operators use their own trash cans - usually 240 or 660 liters of large bins - and are responsible for collecting them by private contractors and contractors.

In the industrial sector, operators may also use individual bins of appropriate capacity and private contractors and contractors may collect them. Due to the large amount of waste generated by the industrial sector, they have also contracted with their own waste contractors who provide communal trash cans for rental.

Figure 12 660-liter trash can used in a garbage bin in a government building

Figure 13 Communal Recycle Bins Used in Factories

Some industrial wastes are not properly managed and are mixed into the normal municipal waste flow. In 2020, Act 672 enacted new regulations on the management of industrial waste from storage to final disposal, including reporting requirements and data management. However, the regulation only applies to industries in states that employ Act 672.

Collecting waste

Means of collection and transportation

The collection of solid waste is carried out by the state by the session operator or local government, and some local governments outsource collection services to private waste collectors. To date, three session operators have won long-term contracts to collect waste from states adopting Act 672 (see section 2.3.2).

Session companies use appropriate bin lift trucks for door-to-door waste collection, primarily from the consumer household sector, in accordance with the standard working procedures for waste collection stipulated in the contract.

Figure 14 Collection by a Session Company

In other areas, local governments and their subcontractors still collect waste. Some of them are collected only on open Lorries or old trucks without the use of appropriate waste compressors. There are also states and municipalities, such as Selangor, that outsource waste collection work to state-owned enterprises.

Figure 15 Collection by Local Governments and Contractors

Collection schemes

In states adopting Act 672, waste collection is carried out in accordance with scheme areas determined by jpspn. The collection scheme in Johor province in the Iskandar Figure 16

Figure 16 in Johor Province, 2011

Waste collectors are required to apply for a waste collection permit issued by SWCorp for each scheme. Those who receive permits are under intense monitoring to ensure that only available waste is recovered and that the collected waste is transported to specific locations, such as disposal sites and relocation sites.

Waste disposal and disposal facilities

Landfills

Landfill is the most common means of waste disposal in Malaysia. According to data obtained from SWCorp, there are a total of 311 disposal sites in Malaysia, 138 of which are still in operation and 173 others closed. The distribution of disposal sites by state in Malaysia is shown below. Of the landfills in operation, sanitation landfills are about 15.2%, and the remaining landfills are open dump methods.

Although there is no statistical data on chipping fees at the final disposal site, it is said that RM 10 to 50 (equivalent to 260 to 1,280 yen) per ton of solid waste generally bringing in.

Table 7 Total Number of Landfills in Malaysia (SW Corp, 2020)

No.	State	Number of landfills			Total
		In operation		Closed	
		Sanitary landfills	Open dump		
1	Perlis	1	0	2	3
2	Kedah	3	1	11	15
3	Penang	1	0	1	2
4	Perak	1	15	15	31
5	Selangor	3	2	15	20
6	Kuala Lumpur	0	0	10	10
7	Negeri Sembilan	1	2	16	19
8	Melaka	1	0	7	8
9	Johor	1	8	28	37
10	Pahang	3	7	22	32
11	Terengganu	1	8	12	21
12	Kelantan	0	10	10	20
13	Morning	1	21	4	26
14	Sarawak	3	43	20	66
15	Laubuan	1	0	0	1
Total		**21**	**117**	**173**	**311**
			138		

Processing status at other facilities

Other facilities that SWCorp understands besides the final disposal site are a waste relay station and a small incinerator.

A waste relay base is a facility established to improve the efficiency of waste collection and transportation, and only relays waste to the last, and no treatment is performed.

Table 8 Waste Relay Stations in Malaysia (JPSPN, 2019)

No.	Place	a relay base	Processing power	Actual amount received
			Tons per day	
1	Johor Bahru	Taruka Transfer Station	400	899
2	Penang (Mainland)	Ampang Jajar Transfer Station	1,100	1,100
3	Penang (Island)	Batu Maung Transfer Station	800	800
4	Shah Alam	Shah Alam Transfer Station	850	150
5	Kuala Lumpur	Taman Beringin Transfer Station	2,300	2,300

Small incinerators are installed on remote islands and in remote areas where final disposal is difficult.

Table 9 Small Incinerators in Malaysia (SW Corp, 2019)

No.	Place	Small incinerator	Processing power (tons per day)
1	Langkawi Island	Langkawi Mini Incinerator Island	100
2	Pangkor Island	Pangkor Mini Incinerator Island	20
3	Cameron Highlands	Cameron Highlands Mini Incinerator	40
4	Tioman Island	Tioman Mini Incinerator Island	15

Recycling

Overview of recycling implementation

In general, recyclable materials discharged from various departments are recovered through multiple stages, separated by the source, or market-driven and collected by various stakeholders between generation and final disposal **Figure** 17

- Separation by household, commercial, institution, and industry sources
- Campaign collection by local communities, government agencies, organizations, and other organizations
- Collection by charity activities

- Collection by school activities and campaigns
- Collection by waste disposal companies, recyclers, and brokers
- Informal sector, collected by individual pickers/scavengers
- Recyclable returns/rejects directly from industrial processes and markets

In rural areas, the logistics costs of transportation are not commensurate, and recyclable materials are generally not recovered for recycling.

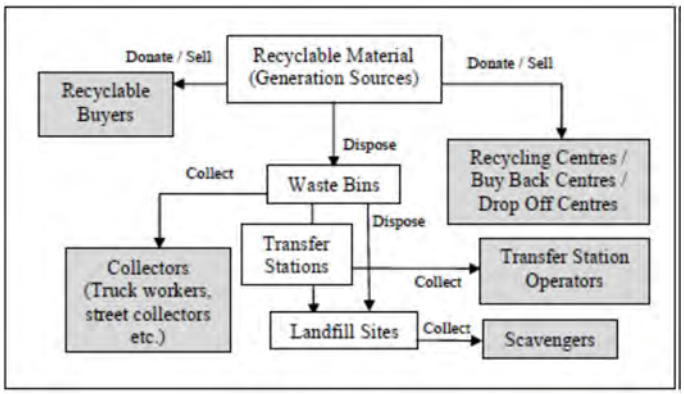

Figure 17 General Recycling Flow in Malaysia (Image)

Trading activities for recyclable materials in the market have already been established, and it is known that some operators have been in this business for more than 50 years. However, not all recycling activities are carried out in a formal way, and non-regular collection activities of recycled goods are also very active.

Non-regular recycling activities

Typical non-regular collection activities currently seen in the Malaysian market include:

- Door-to-Door recyclers buy recyclable materials that are separated from the consumer and commercial sectors.
- Street pickers roam the streets, markets, and public places to pick up recyclables on trolleys, trishaws, motorbikes, and more.
- Recovery truck workers separate recyclable objects along with waste collection activities. Some collectors have banned the collection of recycled items during collection, but most truck workers do so to earn a side income.
- Cleaners at landfill sites also collect recycled materials at landfills. Scavenger activities are prohibited at some sanitary landfills in Malaysia, but scavengers are still active in most landfills.

Non-regular recycling routes rely heavily on market demand for recycled goods. Recyclers and scavengers tend to choose only those with higher selling prices on the market. Low-priced things like glass bottles are less preferred.

Figure 18 Various People Engage in Non-Regular Recycling Activities

Figure 19 Non-regular recycling activities have also caused environmental pollution around the area

Figure 20 Recycling of Waste Plastics

Figure 21 Dismantling E-waste

3.3.5 Status of study on waste-to-energy and related systems

Planned site for waste-to-energy

The Ministry of Housing and Local Government (KPKT) intends to phase out the traditional final landfill-centric treatment method and move to an alternative treatment method, indicating that it intends to introduce waste-to-energy facilities at six locations across Malaysia by 2025, either closed or existing final disposal sites or relay stations. There are two plans in Johor, and the Seelong Landfill site is being considered in this project. Bids are currently being made on the Bukit Payung Closed Landfill site.

Table 10 of candidate sites under consideration for installation of waste-to-energy facilities (JPSPN, 2020)

No.	State	Candidate site	Current amount of received (tons per day)
1	Kedah	Semeling Landfill, Desert	450
2	Penang	Burong Landfill Island, Seberang Prai	2,000
3	Lawsuits	Lahat Landfill, Ipoh	650
4	Selangor	Rapids Landfill, Klang	3,000
5	Kuala Lumpur	Taman Beringin Transfer Station	2,300
6	Melaka	Shrimp River Landfill	900
7	Terengganu	Marang Landfill, Marang	100
8	Pahang	Jabor-Jerangau Landfill, Kuantan	500
9	Negeri Sembilan	Tanah Merah Landfill, Port Dickson	585
10	Johor	Bukit Payung Closed Landfill, B. Chisel	287.5
11	Johor	Seelong Landfill, Johor Bahru	3,164

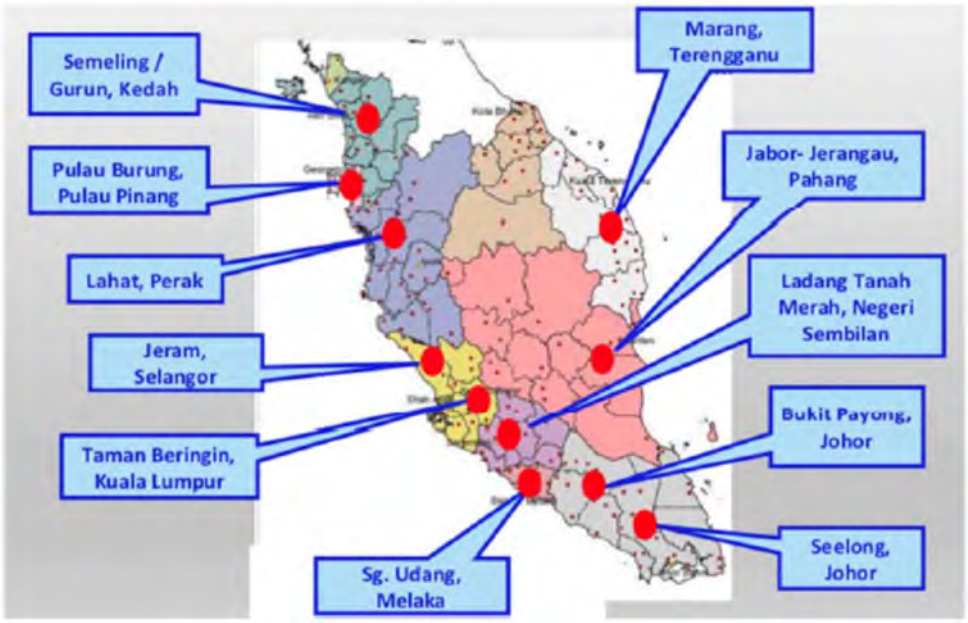

Figure 22 of candidate sites under consideration for installation of waste-to-energy facilities (JPSPN, 2020)

Procurement system

Direct procurement by JPSPN

Jpspn has a Technical Review Committee (JKPTPSK), and all waste disposal technologies proposed to JPSPN cannot proceed to the next formal proposal step unless they are pre-reviewed by the Committee. The committee will be held irregularly when more than four proposals are gathered. Any case that has passed the committee's review will be formally requested (RFP) or tendered.

Outside of the PPP business, JPSPN may procure directly depending on the budget size, etc. PPP projects must go through a private finance initiative unit (UKAS) procurement process within the Prime Minister's Office. In the case of direct procurement by JPSPN, it is to go through the normal procurement process of the central government, and parliamentary approval is not required.

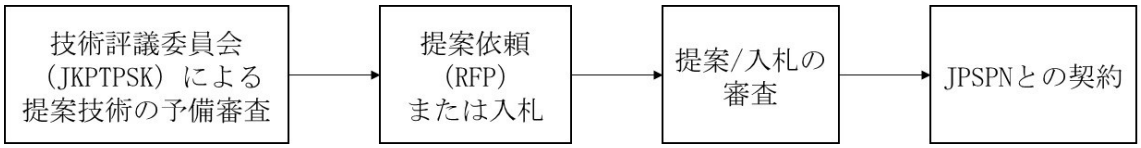

Figure 23 JKPTPSK Role and Review Process Conceptual Diagram[6]

PPP System and Procurement

Under the 9th Malaysia Plan (2006-2010), the Malaysian government introduced the Private Finance Active (PFI) to improve the efficiency of the installation and management of public facilities and to reduce government spending. In 2009, the Private Finance Initiative Unit (UKAS in Malaysian) was established in the Prime Minister's Office to promote the measures.

UKAS classifies the PPP method into two categories: PFI and Privatization.

Table 11 of PPP Methods in Malaysia (**UKAS, 2020**)

PPP way	Project cost	Operating license period	Paid capital
Privatization	RM25 million	7 years or more	RM275,000 or more
PFI	RM100 million	Typically 15-25 years (based on business model)	

[6] Based on an interview with JPSPN by IGES in 2020.

All PPP proposals are proposed by private companies to relevant ministries and agencies, reviewed by relevant ministries, and formally proposed to UKAS for review (see Figure 25 for the review process).

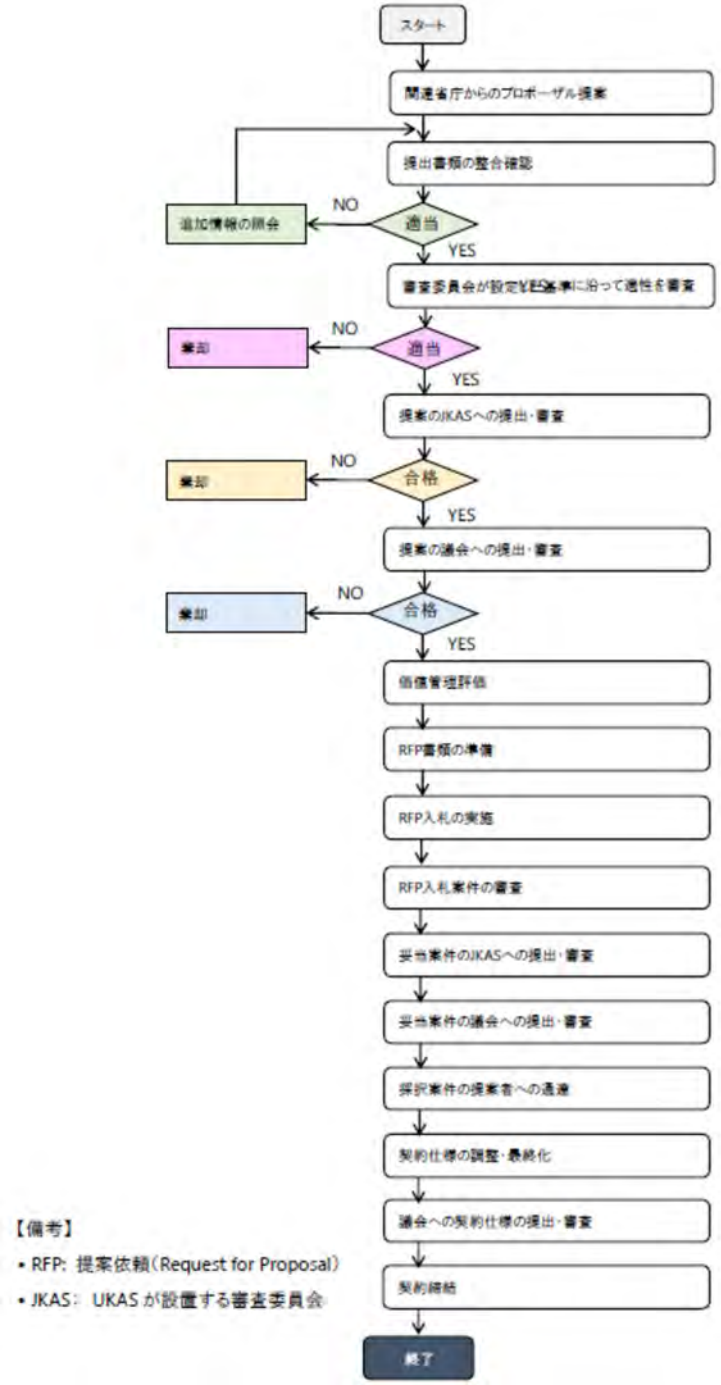

Figure 24 Flow of Procedures for Submission, Examination and Adoption of PPP Proposals in Malaysia[7]

[7] Based on an interview with UKAS by IGES in 2020.

FIT system

In Malaysia, a fixed-price purchase system (FIT) has been issued through the Sustainable Energy Development Agency (SEDA). FIT for waste-to-energy such as incineration power generation and AD corresponds to the biomass (waste) field. The latest FIT unit prices in the field of biomass (waste) are shown in the table below.

Conditions for introduction of renewable energy	FIT unit price(RM/kWh)
(i) More than 10MW	0.3085
(ii) 10MW ultra,20MW or less	0.2886
(iii) 20MW ultra,30MW or less	0.2687
Bonus FIT unit price if one or more of the following requirements are met	
(i) Adoption of gasification technology	+0.0199
(ii) Using the above power generation system, the overall efficiency is 20% or more	+0.0100
(iii) Adopts boilers or gasification produced or assembled in Japan	+0.0500

Status of the latest study on waste-to-energy

According to [8]local media, plans to introduce waste-to-energy in Malaysia have been delayed due to the corona disaster. For example, in order to conduct testing and commissioning (T&C), the person in charge of overseas companies (Korea, Japan, Germany, etc.) who provide technology cannot travel to the site. On the other hand, the government (KPKT) has set out a vision to "build at least one waste-to-energy facility in each state", suggesting that the final disposal site of Seelong in the Iskandar region also plans to introduce waste-to-energy.

[8] The Malaysian Reserve, Malaysia's WTE construction remains challenging (2021 年 1 月 4Date) (https://themalaysianreserve.com/2021/01/04/malaysias-wte-construction-remains-challenging/)

3. 4 Economic Study

3.4.1 Evaluation of business ability

Organizing prerequisites

3.2 Based on the technicaland3.3 institutional considerations, the prerequisites for evaluating business ability are arranged below. For additional information, see the Request for Proposals for the project to build a waste power plant in Bukit Payong, Johor, announced in August2020 （Figure 25）

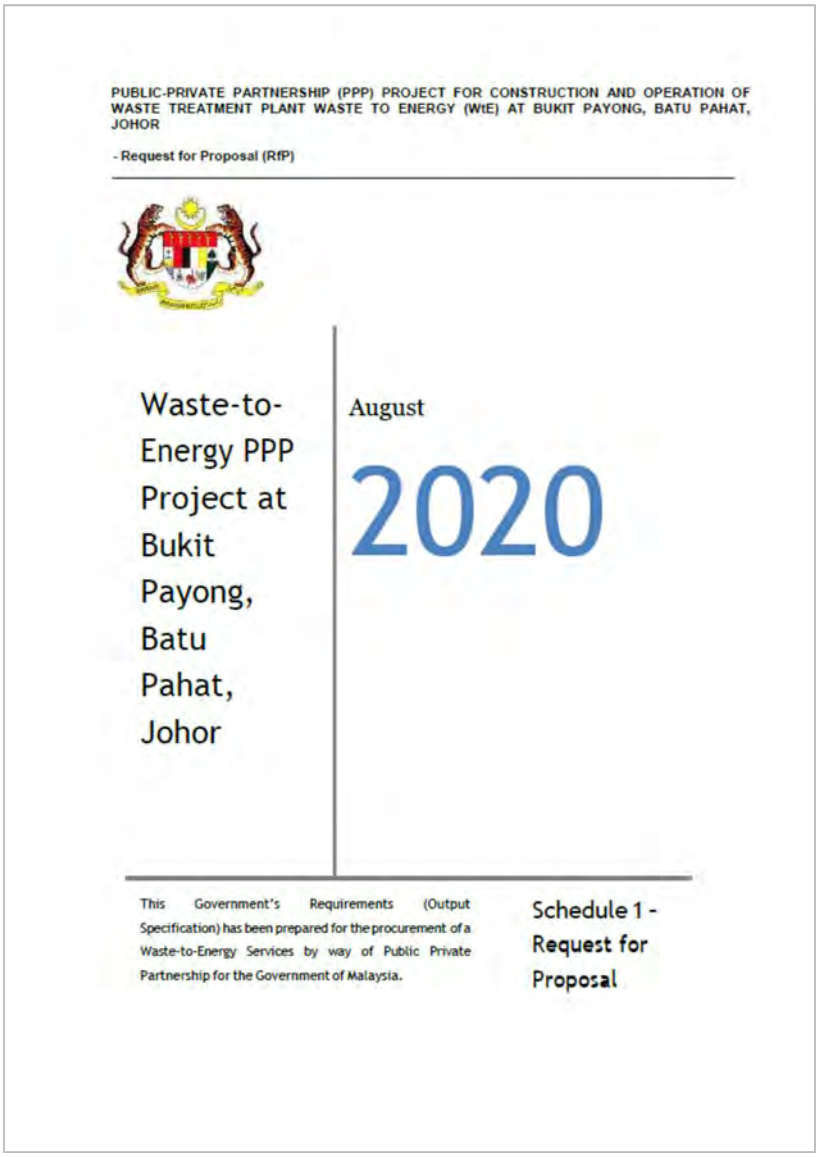

Figure 25 Bid Specifications for Waste-to-energy Project at Bukit Payong (Cover Page)

Table 12 for estimating project costs (re-listed from Table 4)

Project	Prerequisites	Remarks
Application technology	Stoker furnace type waste-to-energy facility	-
Business period	20 years (operation period of the facility)	Construction period is 3 years (including commissioning for half a year)
Processing power	500 tons per day (1 series)	Decision made after consultation with IRDA
Number of days of operation per year	333 days/year (8,000 hours/year)	-
Steam conditions	430°C、52 barA	-
Amount that can be sold	70,130 MWh/year	The amount of power generated less the in-house power
Construction land	Adjacent land of Seelong Final Disposal Site	Does not include land construction work, etc.

Table 13 Estimated construction costs (re-listed from Table 5)

Project	Total (100 million yen)
Plant Division	59.0
Civil engineering department	18.0
Total	77.0

Table 14 operating and maintenance costs (re-listed from Table 6)

Project	Total (100 million yen)
Labor costs	1.2
Inspection and repair costs	2.4
Expenses for use, maintenance, etc.	2.5
Total	6.1

Table 15 Other Prerequisites

Project	Conditions	Remarks
Contract period	24 years	• 3-year construction period including half-year commissioning • 20-year driving period • Closed for one year (the cost of closure is not eligible for mileage accrual this time)
Depreciation	Approximately 510 million yen	Depreciate by straight-line method for 15 years
Income taxes	24%	
Assumed interest rate	Annual rate 1.5%	
Inflation rate	Annual rate 1%	Reflected in O&M costs, tipping fees and electricity sales prices
Exchange	1RM=26JPY	
FIT	0.35RM	

Evaluating business ability

The business ability was evaluated based on the contents up to the preceding paragraph. In order to evaluate the business ability, it is necessary to set the processing cost (Tipping fee, Gate fee Figure 25 needs to set the processing cost. Therefore, this time, the processing cost was set in three cases: 4,000 yen, 5,000 yen, and 6,000 yen per ton. In addition, we assumed the utilization of subsidies such as JCM equipment subsidies, and if there were no subsidies, if we received a 10% subsidy, if we received a 20%subsidy, if we received a 30% subsidy, we simulated IRR etc. in each.

Table 16 1: Project IRR at Processing Cost of 4000 Yen / Ton

	10 years	15 years	20 years
No subsidies	-13%	-5%	1%
10% of the grant	-11%	-2%	3%
20% of the grant	-7%	0%	5%
30% of the grant	-4%	3%	7%

Table 17 Case 2: Project IRR at Processing Cost of 5000 Yen / Ton

	10 years	15 years	20 years
No subsidies	-8%	0%	4%
10% of the grant	-5%	2%	6%
20% of the grant	-2%	5%	8%
30% of the grant	2%	8%	10%

Table 18 Case 3: Project IRR at Processing Cost of 6000 Yen / Ton

	10 years	15 years	20 years
No subsidies	-3%	4%	7%
10% of the grant	0%	6%	9%
20% of the grant	3%	9%	11%
30% of the grant	7%	12%	14%

As shown in Table16, Table 17, and Table 18, IRR is a plus for a20-year operating period. However, if the processing cost is 4,000 yen/ton and there is no subsidy, the IRR is as low as 1%, and few businesses are interested in investing. On the other hand, if the processing cost is 6,000 yen/ton, it is considered that there is business ability even without subsidies.

3.4.2 Division of roles between the public and private sectors

In Figure 2526, the following conditions are imposed on bidders, and bidders are at risk. This is attributed to the government's tendency to hold project bidders accountable, with a small track record of introducing waste-to-energy in Malaysia.

- Bidders must establish an SPC with a local company (up to 49% foreign capital)
- It is necessary for the bidder to take risks, such as the ordered not guaranteeing the amount and composition of waste.
- Bidders need to set and propose gate fees themselves. In addition, penalties, etc. in the event of
  an operation failure are also set.

3.5 Future developments

In this year's survey, we were able to obtain information necessary for the examination of waste-to-energy, estimate business expenses, and evaluate business ability. In addition, we were able to contact a company that has a local waste landfill confessing business (SWM Environment Sdn Vd, SWMSB). Because they already have a track record locally, they can also be considered as a leading candidate for local partners when waste-to-energy is actually introduced. In the future, we will monitor the trends of the Malaysian government's waste-to-energy introduction policy, and by providing information from SWMSB, we will consider introducing more optimal waste-to-energy that reflects regional needs.

SWMSB also recovers and generates landfill gas in the Seelong final treatment plant, and in addition to the waste-to-energy project, which is considered to require relatively long time, it is considered that there is a possibility of cooperation in terms of JCM application. In particular, the current Seelong Landfill site still has about 15 years of disposal capacity, so it is likely that a certain amount of time will be required to

implement the waste-to-energy business. For this reason, it is also meaningful to work with SWMSB to discover projects that can be applied to JCM in the short term.

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4.1 Overview of activities

Kitakyushu City implemented the "Project to Promote Low Carbonization in the Iskandar Region (Kitakyushu City -Iskandar Development Area Collaboration Project)" in the "City-to-City Collaboration Project for Realizing a Low Carbon Society in 2019". In this project, we conducted excavation activities for JCM application projects that can be horizontally deployed with potential, referring to the results of inter-urban collaboration surveys conducted in FISCAL 2015 and 2016. As a result, it was confirmed that the Japanese manufacturing industry that entered Malaysia has a long history, the facilities of the current factory are aging, and the need for investment in renewing various facilities is very high.
Therefore in FY20202, we continued to excavate JCM application projects at factories in Malaysia, mainly in the Iskandar region.

4.2 Follow-up on previous year's excavations

Companies discovered in FY 2019, two companies that had a particularly high need for equipment assistance were conducted by e-mail, online meetings, etc., to conduct a follow-up survey on the status of consideration of the subsequent introduction of equipment and the possibility of equipment assistance.

(1) A major cement manufacturing company (hereinafter, Company A)

Company A was aiming to introduce BOT-type waste heat recovery power generation facilities, but the project was postponed due to the fact that the proposed amount from companies shortlisted in the public offering type bidding procedure did not meet the expected assumptions of the order. As mentioned above, a new type of coronal infection is also prevalent in Malaysia, and as the economy as a whole is stagnant, the utilization rate of cement plants has not increased. For this reason, Company A is in the direction of restraining the entire new investment, and the waste heat recovery power generation business was not restarted.

On the other hand, Company A is still highly interested in the JCM equipment assistance project, so we would like to resume discussions on the utilization of JCM equipment assistance at the right time.

(2) Electronic electrical parts manufacturing company (hereinafter Company B)

Company B entered Malaysia more than 20 years ago, and various facilities at the plant

were aging. Among such facilities, there was a particularly high need for renewal of cleaning facilities for removing oil and the like of products after processing was finished.

Already submitting estimates for the introduction of high-efficiency washing machines sold by Japanese companies at the stage of the last fiscal year, the timing of the name of the station in Malaysia, which is the premise for the application of JCM, is uncertain, while capital investment at the appropriate time is required to continue manufacturing the plant, so basically, we plan to make capital investments independently without utilizing JCM equipment assistance, etc.

4.3 Newly discovered projects this year

This fiscal year, due to the corona disaster, we were unable to travel to the site, so we contacted local companies with capital investment needs by utilizing the network of Japanese companies expanding into the site, and conducted online meeting hearings and introductions of JCM. As a result, a new JCM equipment support candidate project was discovered.

The target company is a rubber glove manufacturer (hereinafter, Company C). Malaysia has several of the world's leading manufacturers of rubber gloves. Due to the corona disaster in 2020, the demand for rubber gloves as sanitary products is increasing worldwide, and Company C has decided to increase the production process at the plant. The facility to be introduced is a gas turbine cogeneration system. The power generation scale is about 16MW, the supply steam scale is 350t/h, and the estimated investment scale is about 2 billion yen.

A system that includes candidates for representative business operators for JCM equipment assistance applications has already been established, and if the timing of Malaysia's participation in the JCM matches, preparations for the application can begin in earnest.

4.4 Future developments

In this fiscal year, we were able to discover a new JCM facility support candidate project, al spite the difficulties of not being able to travel to the site and grasping local needs.

As of the end of FISCAL 2020, the JCM system has not been signed with the Government of Malaysia. On the other hand, again, the Japanese manufacturing industry that entered Malaysia has a long history, and various facilities such as local factories are entering the time of renewal. Malaysia, which is a middle-advanced country

along with Thailand, has a certain number of companies, such as rubber glove manufacturers, and capital investments are also being made. For this reason, if the JCM system can be signed, many companies would like to apply the JCM equipment assistance project and introduce highly efficient facilities.

Even under circumstances where local travel is not possible, as in this fiscal year, we were able to find companies that are very positive about the JCM supplementary project, so the high level of local needs can be in so worked.

Currently, there is a growing interest not only in the Iskandar region and Malaysia, but also globally in green recovery from coronal disasters (as an economic recovery policy from the coronal disaster, which does not simply restore the economic and living conditions before the coronal disaster, but also realizes a sustainable society in response to the climate change crisis and the SDGs). JCM is considered to be a measure that contributes to green recovery. We look forward to the future of continuous inter-government JCM signatures.

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Chapter 5 Workshop Participation

5.1. Workshop on City-to-city Collaboration Program

(1) Overview

Created a video for brief introduction (on-demand) of the individual projects at the Workshop on City-to-city Collaboration Program (Seminar on City-to-city Collaboration) hosted by the Ministry of the Environment. Also attended a closed seminar open only to those affiliated to the program.

(2) Dates

Brief introduction of individual projects (on-demand): Wednesday, January 27 - Wednesday, February 3, 2021

Closed seminar: 2:00pm - 4:00pm on Monday, February 1, 2021

(3) Details

The material used for making the video, and the minutes taken during the attendance in the closed seminar, are attached below.

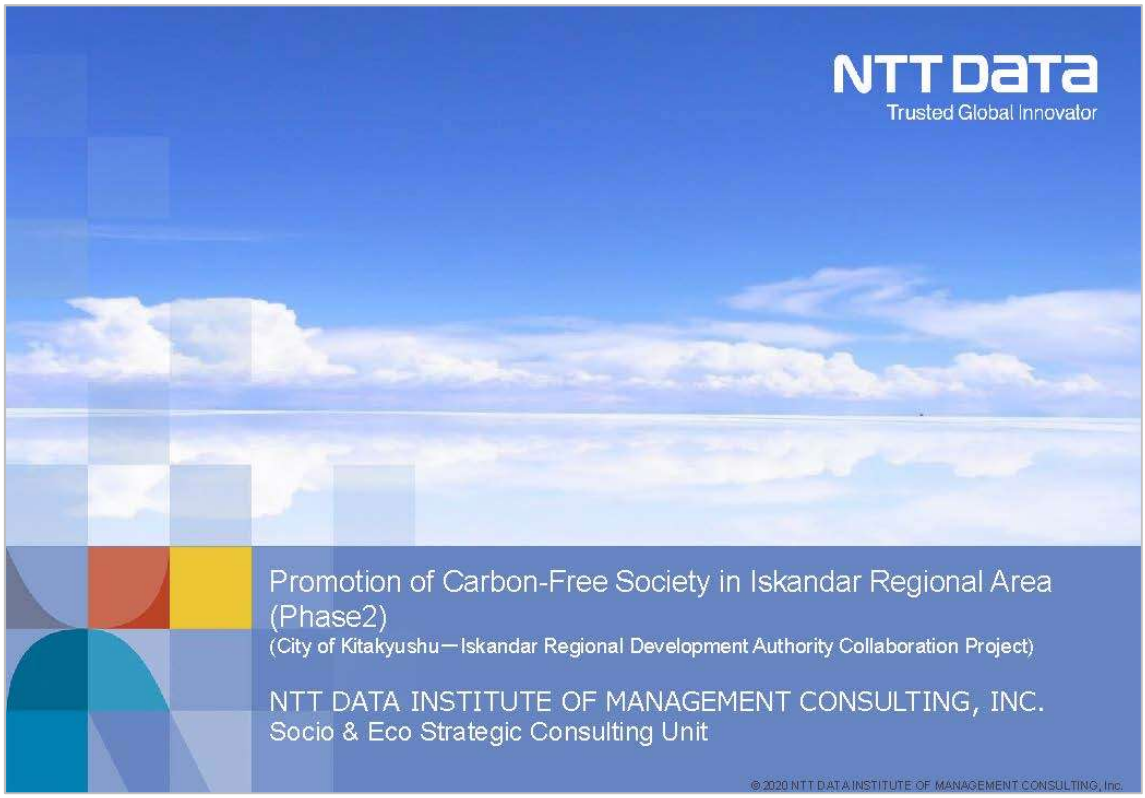
Brief Introduction of Individual Projects (On-demand)

Dates: Wednesday, January 27 - Wednesday, February 3, 2021

The Seminar on Creating Zero-carbon Societies through City-to-city Collaboration hosted by the Ministry of the Environment is usually held in late January every year, bringing together people, from Japan and overseas, affiliated to projects that were adopted for the city-to-city collaboration program. However, given the situation with the COVID-19 pandemic, this fiscal year's event was held fully online.

With the purpose to promote mutual understanding among the program participants and to share information widely on the 20 projects adopted this fiscal year, videos introducing each project were made available on demand for a week, before and after the seminar that was held on Monday, February 1. There were a total of 233 viewers who watched these videos. (As of Monday, February 1, published by the bureau)

The material used for making the video is attached below.



Agenda

I. Project Overview

II. Activity 1 : Realizing Industrial Symbiosis with CO2 Free Energy

III. Activity 2 : Realizing Waste to Energy Project

IV. Activity 3 : Investigation of the potential projects

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Ⅰ. Project Overview

Visons for Low Carbon Society: 58% emission reduction from by 2025 using 2010 as base year

- Iskandar Malaysia, in Johor Malaysia, is the second economic city. (Land Area: 2217km², Population:about 1.95 million people)
- City of Kitakyushu has been cooperated with Iskandar Regional Development Authority to conduct projects in 2015 and 2016.
- IRDA consider the next action after "Low Carbon Society Blueprint for Iskandar Malaysia" (prepared in 2012) and have an interest in Industrial Symbiosis, Eco-town and Waste to Energy.
- Thus, we would like to conduct the activity with IRDA to realize Industrial Symbiosis & Eco-town and Waste to Energy. Furthermore, we would like to continue the activity to fins out potential project applicable to JCM.

Provide Accumulated Know-Hows about Low Carbon Society in 2014
- Introduce low carbon technology which Japanese companies hold
- Introduce Joint Crediting Mechanism to UTM, etc.

Kitakyushu-IRDA Collaboration Project in 2015
- Survey project for expansion of low carbonization project in Iskandar in 2015

Kitakyushu-IRDA Collaboration Project in 2016
- Project to accelerate low carbonization model projects in Iskandar Development Area for Expansion of JCM (Kitakyushu-IRDA Collaboration Project)

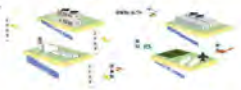
City of Kitakyushu ⟷ Cooperative Agreement (MOU) ⟷ **IRDA (Iskandar Regional Development Authority)**

Provide Accumulated Know-Hows

Kitakyushu-IRDA Collaboration Project in 2019

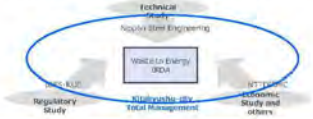
Activity 1: Realizing Industrial Symbiosis with CO2 Free Energy

IRDA is completing the target shown in "Low Carbon Society Blueprint for Iskandar Malaysia" and have an interest in Industrial Symbiosis & Eco-town. Thus, we would like to conduct the study with IRDA to realize a project which integrate Industrial Symbiosis & Eco-town. Realizing target is 3 to 7 years after the start of the activity.



Activity 2: Realizing Waste to Energy Project

IRDA is completing the target shown in "Low Carbon Society Blueprint for Iskandar Malaysia" and have an interest in Waste to Energy. Thus, we would like to conduct the study with IRDA to realize a Waste to Energy project. Realizing target is 3 to 5 years after the start of the activity.



Activity 3: Investigation of the potential projects
(ex. Implementation of Waste Heat Recovery Power Generation)

Factories in Malaysia have strong need renewing the equipment. Thus, we will investigate projects applicable to JCM mainly in Iskandar Area and some projects in Malaysia. We are aiming to find out the projects within 1-3 years.

- Expected Project1: Introduction of waste heat recovery power generation system to cement factories
- Expected Project2: Introduction of High efficiency cleaning system

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Ⅱ. Activity 1 : Realizing Industrial Symbiosis with CO2 Free Energy (1/2)

◆ Based on the action plan agreed with IRDA in FY2019 project, we'll organize a pilot project in FY2021.

No.	Activities	IRDA	Kitakyushu	NTTDIOMC
1	Data Collection for Inventory & Selection for suitable area for Pilot Project	●		
2	Matching inventory for each factory		●	●
3	Policy Support	●	●	
4	Define the PJT Success criteria and create KPI Model	●	●	●

「Industrial Symbiosis/Eco-Town」のイメージ

・ 各工場から排出される廃棄物やエネルギーを、別の工場の原燃料等として利用する等、工場同士で利用し合う資源循環型のエコタウンの実現を次年度以降目指す

Ⅱ. Activity 1 : Realizing Industrial Symbiosis with CO2 Free Energy (2/2)

◆ IRDA held a workshop on Industrial Symbiosis in October.

◆ Over 100 people participated in the workshop, and 30 companies submitted survey sheet about their inventory data.

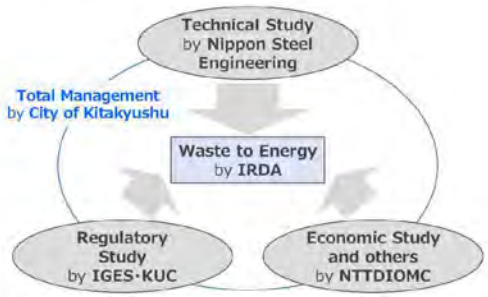
Investigation item on survey sheets

- Company name
- Waste description, nature, odor, and volume
- Waste treatment (recycle / recover / dispose)
- Waste treatment / Collection company and price

Ⅲ. Activity 2 : Realizing Waste to Energy Project

◆ We will also conduct technical, regulatory and economical study of waste-to-energy to realize waste-to-energy project in Iskandar.

The structure of project



Examples of waste composition data

Table 18: Results from Proximate Analysis for Waste at Bakri Landfill

Waste Fraction	Moisture content (% by weight)	Ash Content (%)	Volatile matter (%)	Fixed carbon (%)
Food waste				
Mixed paper				
Plastic				
Diaper				
Yard waste				
Fruit husk				
Newsprint				
Carton boxes				
Textile				
Rubber / Leather				
Metal (non-ferrous)				

Source: Amin and S.Y. Go (2012)

Table 19: Characteristics of Waste from Iskandar Malaysia Areas

Proximate Analysis		Ultimate Analysis	
Moisture content		Carbon (C)	
Combustible		Hydrogen (H)	
Ash content		Nitrogen (N)	
Calorific Value (kcal/kg)		Others	
Measured:	Calculated:		

Source: Siti Norbaizura and Takashi Fujiwara (2013)

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Ⅳ. Activity 3 : Investigation of the potential projects

◆ We are following up on companies visited last year by email, call, etc. (See the table below for the main excavation destinations for FY2019)

◆ Since it is difficult to visit Malaysia, we are also conducting activities to find potential projects in collaboration with local Japanese companies.

Company	Industry	Visit in FY2019	Needs for equipment subsidy application
Company A	Manufacturing	1st,2nd,3rd visit	Strong
Company B	Cement	1st visit	Strong
Company C	Chemical manufacturing	2nd,3rd visit	Strong

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Closed seminar

Attended the Seminar on Creating Zero-carbon Cities through City-to-city Collaboration hosted online by the Ministry of the Environment between 2:00pm - 4:00pm on Monday, February 1, 2020.

The purpose of the event was as follows.

① Sharing and increasing awareness of the results and other relevant matters of the FY2020 city-to-city collaboration program and the Asian Development Bank's (ADB) Japan Fund for the Joint Crediting Mechanism programs

② Networking among operators and local governments and exchange of information on mutually complementary projects

③ Sharing and increasing awareness of information on government support programs for the next fiscal year

④ Exchanging opinions on the trends of international attitude following the pandemic, and how study should be conducted during the pandemic

93 participants from Japan (including the organizer) and 54 participants from overseas partner cities registered to attend the seminar. Among them, seven participants from Japan and three from overseas were affiliated to this program.

Table 5-1: List of participants in the Seminar on City-to-city Collaboration

	Japan/overseas	Participants	Organization/position	
1	Japan	Mr. Yuichi ARITA	Kitakyushu Asian Center for Low Carbon Society, City of Kitakyushu	International Partnerships Promotion Director
2	Japan	Mr. Hiroshi YASUTAKE	Kitakyushu Asian Center for Low Carbon Society, Environment Bureau, City of Kitakyushu	Deputy Director
3	Japan	Mr. Hidetomo SHIRAI	Environment Bureau, International Environmental Strategies Division, City of Kitakyushu	Senior Staff
4	Japan	Mr. Shiko HAYASHI	Kitakyushu Urban Centre, IGES	Programme Director

5	Japan	Mr. Kohei HIBINO	Kitakyushu Urban Centre, IGES	Programme Manager
6	Japan	Mr. Yusuke HAMANAKA	Socio & Eco Strategic Consulting Unit, NTT DATA INSTITUTE OF MANAGEMENT CONSULTING, Inc.	Consultant
7	Overseas	Mr. Boyd D Jouman	Resilient Environment, Iskandar Regional Development Authority (IRDA)	Lead - Resilient Environment
8	Overseas	Ms. Velerie Siambun	Resilient Environment, Iskandar Regional Development Authority (IRDA)	Vice President
9	Overseas	Mr. Ong Hwa Chong	Resilient Environment, Iskandar Regional Development Authority (IRDA)	Assistant Vice President

Table 5-2: Closed seminar program

時間	内容
14:00	**主催者挨拶** 環境省 地球環境局 国際連携課 国際協力・環境インフラ戦略室 室長 杉本 留三
14:05	**脱炭素社会の構築に向けた支援メニューの概要** ・ 脱炭素社会の構築に向けた日本の施策 環境省 地球環境局 国際連携課 国際協力・環境インフラ戦略室 室長 杉本 留三 ・ JCM 関連動向や設備補助事業採択案件の傾向等について 環境省 地球環境局 地球温暖化対策課 市場メカニズム室 国際企画官 小坂一久 ・ JCM 日本基金(JFJCM)の紹介 アジア開発銀行(ADB) 持続可能な開発・気候変動局 気候変動・災害リスク管理課 環境・気候変動専門官 藤井 進太郎 質疑応答
14:55	**【パネルディスカッション】コロナ禍での海外展開の進め方** パネリスト: - 環境省 地球環境局 国際連携課 国際協力・環境インフラ戦略室 室長 杉本 留三 - 北九州市 アジア低炭素化センター 国際連携推進担当課長 有田 雄一 - 日本工営㈱ 環境技術部 部長代理 石川 賢 - ㈱オリエンタルコンサルタンツ・海外事業部 藤井 雅規 - ㈱エイチ・アイ・エス 法人営業本部 商社事業グループ GBA・レンタル HIS 事業 所長 篠原 優花 - ㈱エイチ・アイ・エス 法人営業部 セールスマネージャー 江添 健介 ファシリテーター: - IGES 北九州アーバンセンター プログラムディレクター 林 志浩 質疑応答 閉会(16:00)

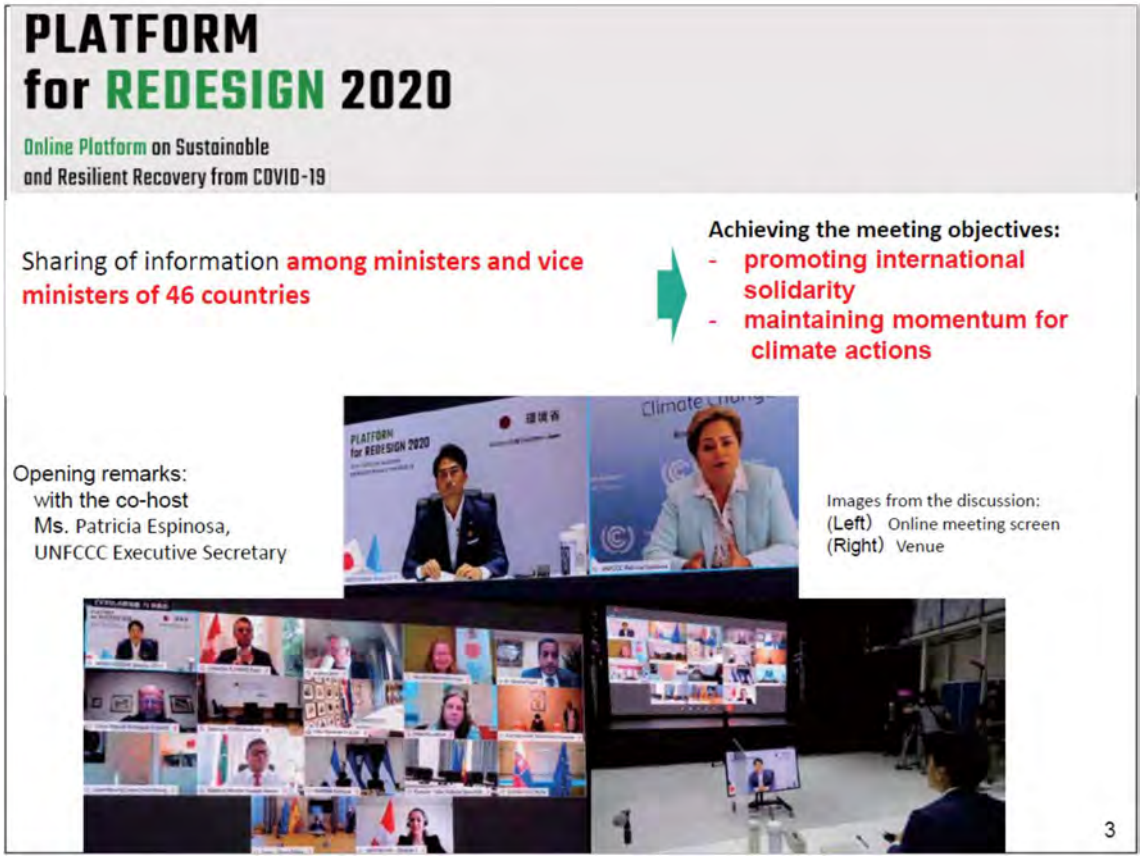
- 2:00pm Organizer opening remarks (5 minutes):
  Director of the International Cooperation and Sustainable Infrastructure Office, International Strategy Division, Global Environment Bureau, Ministry of the Environment: Mr. Ryuzo Sugimoto
  - ✧ In 2020, the social climate changed drastically through the pandemic. At this turning point in history, there is a need to transform social economy into something more sustainable and resilient in pursuit of the SDGs, rather than returning to the pre-pandemic social climate.
  - ✧ In October 2020, the Prime Minister, Mr. Suga declared in his policy speech that the country would aim to achieve virtually zero greenhouse gas emissions and realize a zero-carbon society by 2050. This indicates that cities will play more and more important roles in the realization of a zero-carbon society. As of 2018, only four local governments had declared to become zero-carbon cities, but now this number has jumped to over 200, covering a population of over 90 million.
  - ✧ The Ministry of the Environment is also creating model cases of successful decarbonization in preparation for a carbon-zero "domino" project that would be rolled out throughout the country in a domino-effect style.
  - ✧ A zero-carbon society cannot be achieved by Japan alone, and only by successfully applying the efforts of Japanese local governments in other countries can we contribute to the global decarbonization.
  - ✧ The Ministry of the Environment launched the city-to-city collaboration program in FY2013, and this year marks the program's eighth year. First round of applications were received in FY2020. A record number of 20 projects were adopted in total, including the second round of applications. Proposals were also made on new overseas partner cities and new initiatives.

- 2:05pm: Overview of the support programs for creating a zero-carbon society (50 minutes):
  Announcements were made by the Ministry of the Environment and the Asian Development Bank. These organizations expressed their willingness to provide various types of governmental and financial support to help achieve the SDGs and green recovery from the pandemic, rather than simply aiming for a zero-carbon society.

- (1) Japan's Measures for Creating a Zero-Carbon Society

  Mr. Ryuzo Sugimoto, Director of the International Cooperation and Sustainable Infrastructure Office, International Strategy Division, Global Environment Bureau, Ministry of the Environment

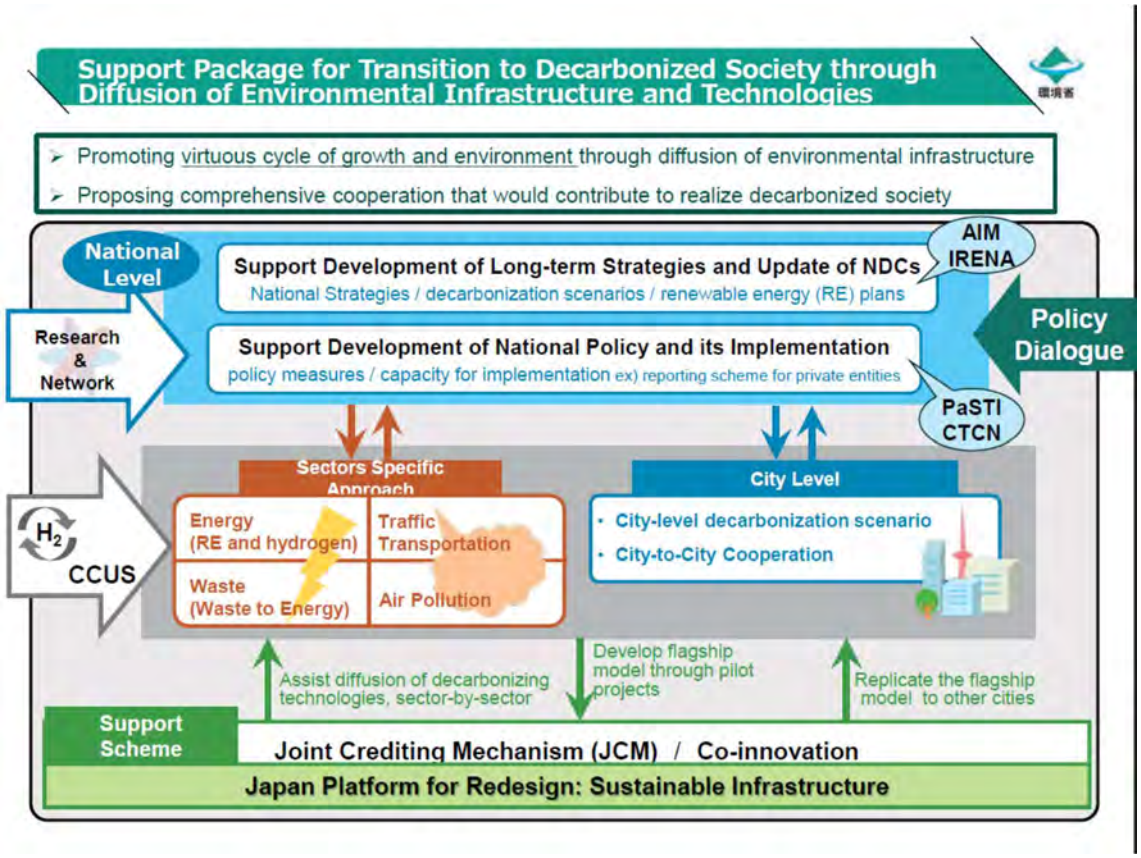
  - In 2020, there was a possibility that the international momentum for climate policy measures would be lost due to the impact of the pandemic, such as the COP26 being postponed. After the decision was made to postpone COP26, Minister of the Environment, Mr. Koizumi proposed the Platform for Redesign 2020, an online platform for ministerial-level meetings about the recovery from the pandemic, and environmental issues such as climate change. Member countries of the United Nations Framework Convention on Climate Change (UNFCCC) were invited to this meeting, which was jointly organized by the Ministry of the Environment and the Secretariat of UNFCCC. Ministers and deputy ministers from 46 countries participated in the meeting, which was designed for promoting international solidarity and maintaining momentum for climate policy measures. The meeting confirmed that many countries are striving for a more sustainable and green recovery from the pandemic, with consideration given both to the current coexistence with the virus, and the post-pandemic future.



- ✧ According to the trends of each country's measures against COVID-19 and climate change, compiled from the information registered on the online platform, measures taken by these countries included sustainable transportation, renewable energy deployment, circular economy, waste management, and other measures in the building sector. These trends indicate that climate policy measures are not just about the energy problem, but also require transformation of the urban structure. There is also a need for synergy between climate policy measures and measures against the pandemic.
- ✧ Following the Prime Minister, Mr. Suga's policy speech, the National-Local Decarbonization Council was established to provide a framework for the national and local governments to collaborate in pursuing a zero-carbon society. The council will formulate a roadmap for the realization of a zero-carbon society by 2050, focusing on areas that are closely related to local initiatives and the citizens' lifestyles.
- ✧ 2025 Policy Program for Promotion of Overseas Infrastructure System was compiled in December 2020 as a government-wide guideline for overseas

development. The goal is to develop high quality infrastructure overseas, which would contribute to achieving carbon neutrality and the SDGs.

✧ A wide range of support, including policy dialogue, support for legislative development in partner countries and for individual projects, will be given to enable overseas development of environmental infrastructure. To promote a zero-carbon society, these support measures are being packaged at various levels: national government, industrial sector, cities, and individual projects. The systems supporting these efforts financially are JCM and Co-innovation.



✧ The city-to-city collaboration program is designed for realizing a zero-carbon society through collaboration between Japanese cities and overseas partner cities. In 2020, a total of 20 projects were adopted, and new countries also participated in the project, including Chile, the first from Latin America, and Palau.

✧ The city-to-city collaboration program is not limited to individual projects, and is also expanding into the area of policy formulation. Tokyo and the City of Kuala Lumpur in Malaysia have gone from developing systems related to energy efficiency to introducing municipal-level policies.

- ✧ It is possible to expand the program from city-to-city collaboration to a JCM equipment subsidy program. Moreover, Co-innovation is supporting the development of new technologies, products, and business models by utilizing Japan's elemental technologies and know-how. The system can also support the formulation of projects tailored to the needs arising from the city-to-city collaboration program.
- ✧ In recent years, the use of ICT technology has also gained prominence. There has been a case where used EV parts were remanufactured into new EVs in Cambodia. There is also a growing need for remote, no-contact, and other technologies for life in the pandemic.
- ✧ An international forum on zero-carbon cities is scheduled to be held in March 2021, so that Japan's efforts, such as those described above, can be introduced to and shared widely with the world.

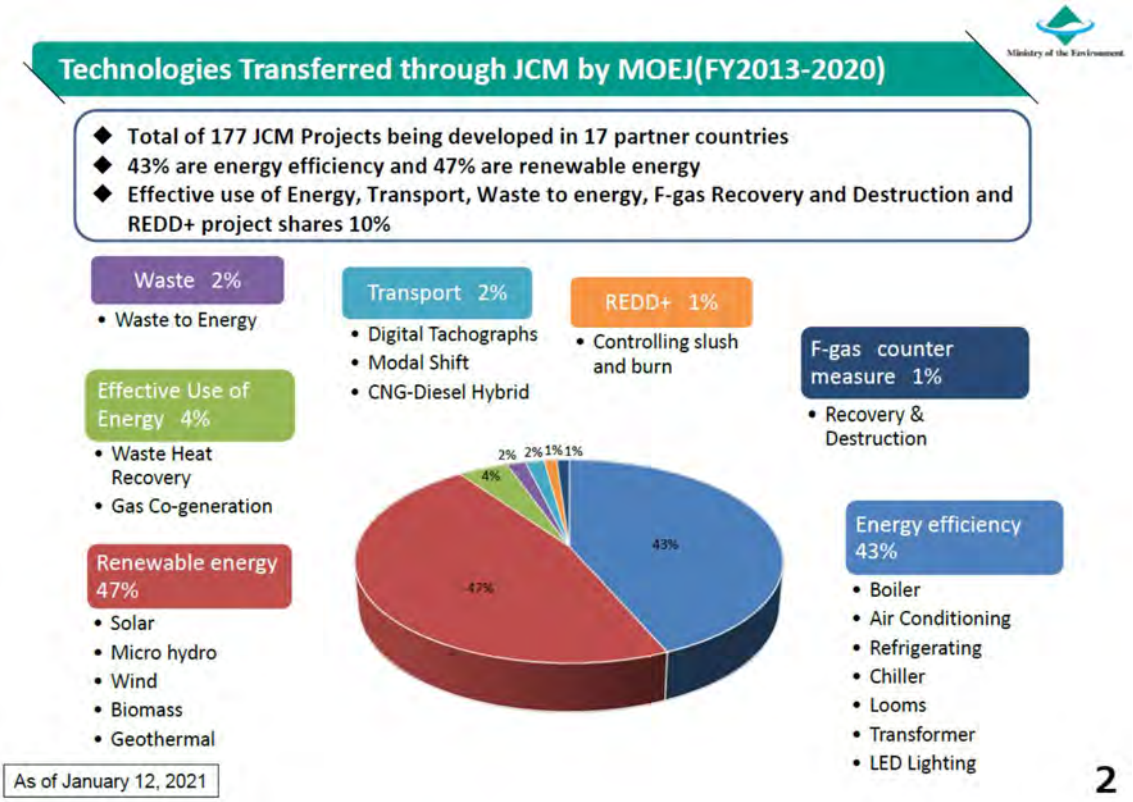
➢ (2) Trends related to the attitude towards JCM and trends in projects adopted for the equipment subsidy program

Mr. Kazuhisa Koakutsu, Senior Coordinator of the Office of Market Mechanisms, Climate Change Policy Division, Global Environment Bureau, Ministry of the Environment

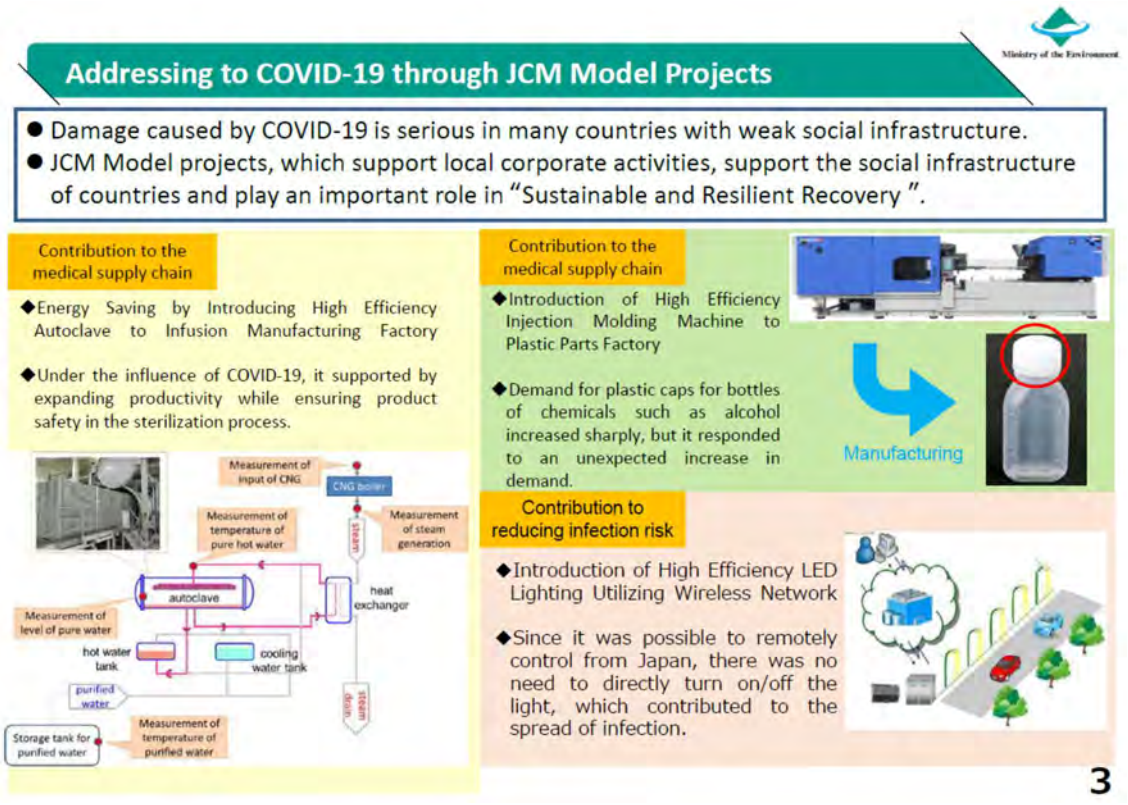
- ✧ There are many projects in the JCM equipment subsidy program that spun out of the city-to-city collaboration program, and these are gaining prominence for fighting global warming in the time of the pandemic.
- ✧ The Ministry of the Environment has implemented 177 JCM equipment subsidy projects in the past. In the breakdown, the highest number of projects was related to renewable energy (47%), followed by energy efficiency (43%), and a wide range of other sectors including waste, transportation, forest management, and CFC gas countermeasures.
- ✧ With regard to renewable energy, the number of solar power generation projects is on the rise on different scales, from those installed on the roofs of houses and other buildings, to large-scale projects reaching several hundred MW. New renewable energies such as geothermal power and biomass power are also on the rise, and zero-carbon efforts are accelerating in many countries.
- ✧ There are many cases where initiatives related to resource recycling and the management and proper disposal of urban waste have led to the introduction

of waste power generation. Currently, there are enquiries from several countries, including Myanmar.

✧ Areas that are expected to grow in the future include the transportation sector and energy efficiency (e.g., introduction of energy-efficient products in factories).



✧ There are also JCM cases in the areas that are gaining prominence in the pandemic. The pharmaceutical industry also has cases of JCM application related to manufacturing facilities for disinfectants and hygiene products. In addition to this, there is also technology for remote operation of equipment overseas, etc.



- ✧ The Ministry of the Environment has implemented 162 JCM equipment subsidy projects in the past, and has secured a total budget of 9 billion yen in FY2020 for three years until FY2022. The ministry plans to request the same amount in FY2021.
- ✧ A JCM equipment subsidy project for the recovery and destruction of CFC gas was also carried out in FY2020. This project targeted automobiles and home appliances, and is gaining more partner countries besides Thailand and Vietnam.
- ✧ In the example of Da Nang City in Vietnam and Yokohama City, the initiative has installed pumps and other equipment in water treatment plants. With the MRV methodology being approved in FY2020, the project is now at the stage of registering for JCM.
- ✧ In the example of Semarang City in Indonesia and Toyama City, the initiative is aiming to operate public buses using CNG gas. With the MRV methodology being approved in both countries in December 2020, the project is now working towards registering for JCM.
- ✧ In the example of Ho Chi Minh City in Vietnam and Osaka City, the initiative has installed energy-efficient equipment in hotels and other facilities. Installation of equipment has reportedly been delayed due to the impact of the

pandemic, but it would be preferable if the initiative could proceed with the early installation in 2021. As exemplified here, the impact of the pandemic on-site is substantial. The impact of the pandemic must still be taken into account when carrying out projects in FY2021 and onwards.

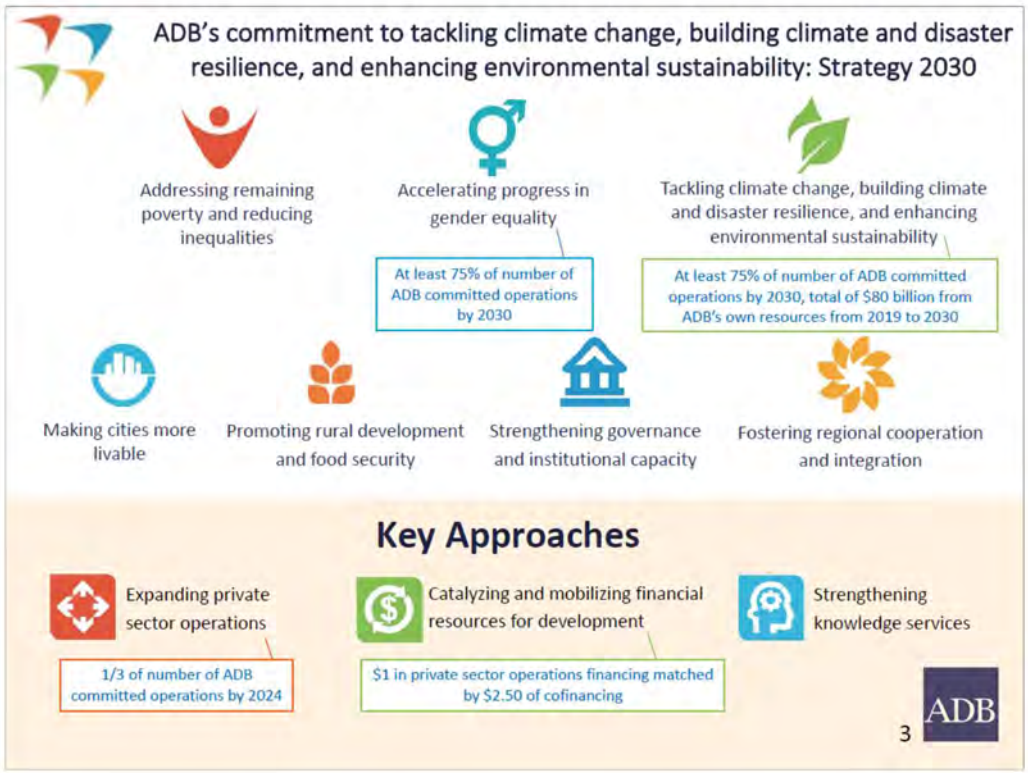
- ✧ In the example of Phnom Penh in Cambodia and Kitakyushu City, the initiative has introduced hybrid power generation equipment of biomass and solar power generation. While this has also been affected by the pandemic, the Ministry of the Environment plans to support the initiative.
- ✧ An example of smart city development in Yangon, Myanmar is introduced, although this is not a project that spun out of the city-to-city collaboration program. Japanese companies are also taking part in this development project by utilizing the JCM equipment subsidy program. In the future, the introduction of smart cities and composite technologies will be an important theme for cities.
- ✧ As part of the JCM Global Partnership, efforts are being promoted in areas such as formulation and implementation of zero-carbon projects, execution of Article 6 of the Paris Agreement, and contribution to the SDGs.
- ✧ For those who have specific needs and solutions, support is given on formulating projects through the JCM Global Match.

➢ (3) Introduction of Japan Fund for the Joint Crediting Mechanism (JFJCM)

Mr. Shintaro Fujii, Environment and Climate Change Specialist, Climate Change and Disaster Risk Management Division, Sustainable Development and Climate Change Department, Asian Development Bank (ADB)

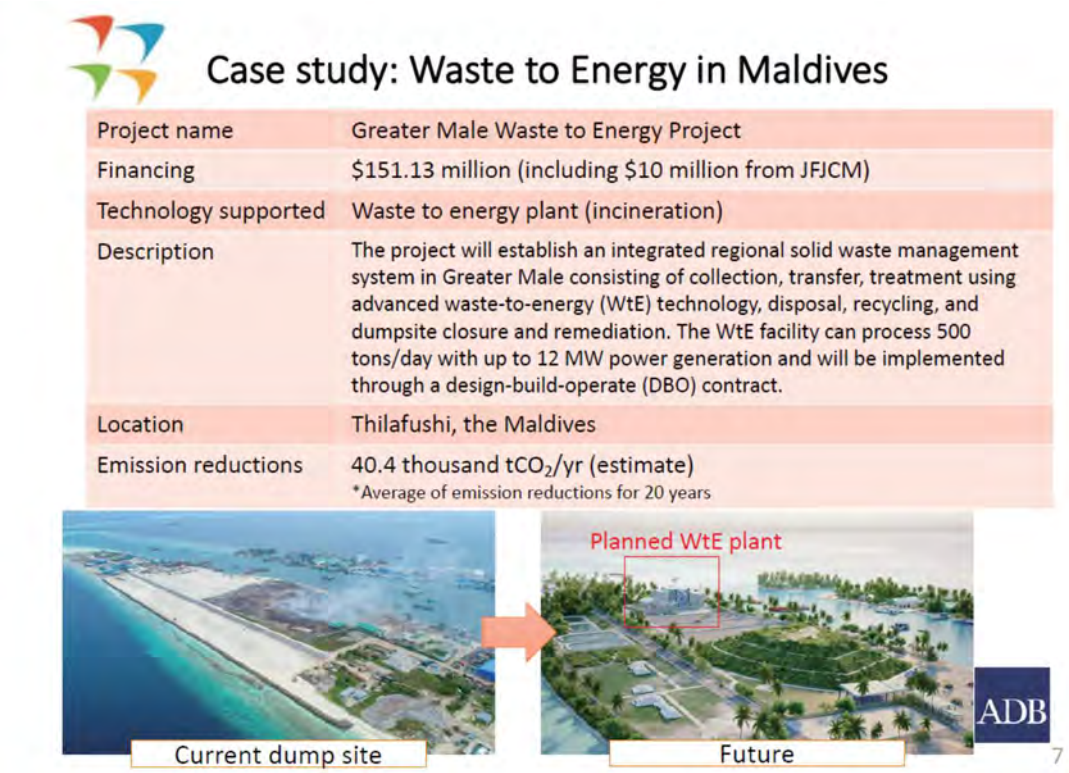
- ✧ ADB was established in 1966 as an international development financial institution. The combination of finance and knowledge has contributed to the promotion of good policy and driving regional cooperation and friendship building. The commitment line for 2019 was approximately $21.6 billion.
- ✧ One of the seven priorities listed in Strategy 2030, ADB's long-term strategy released in 2018, was "Tackling Climate Change, Building Climate and Disaster Resilience, and Enhancing Environmental Sustainability". The ADB has set two target values for this task: (i) at least 75% of ADB's operations support climate change mitigation and adaptation by 2030; (ii) climate finance

from ADB's own resources will reach $80 billion cumulatively from 2019 to 2030. Achieving these targets is also crucial for recovery from the pandemic.



- ✧ One of the carbon market programs being implemented by the ADB is JFJCM. The program is funded by the Ministry of the Environment, and operates as a trust fund. Grants are provided for projects financed by ADB, when these projects utilize JCM.
- ✧ JFJCM targets 11 countries in the Asia-Pacific region. Both sovereign and non-sovereign loans can be used for them, and the maximum amount of subsidy that can be offered is 10% of the total project cost, or $10 million, whichever is less.
- ✧ In the past, there have been six projects that applied JFJCM, all of which were sovereign loans. Technologies eligible for the subsidy include batteries, energy management, wastewater treatment, power lines, solar power generation, buildings, and waste power generation.
- ✧ Most recently, JFJCM was applied to a waste power generation project in the Maldives. The waste power generation facility built through the DBO method can process 500 tons/day, and is expected to generate 12MW of electricity.
- ✧ The current final disposal sites are not properly managed, and open-dumping is causing waste to overflow into the sea, while open-burning is causing

health and environmental problems. In order to tackle these problems, efforts to improve the environment and enhance public health will be carried out through sustainable waste management by addressing the series of waste management stages from collection, transportation, and treatment, to recycling.



- ✧ The three initiatives implemented in this project are as follows:
  (1) Build waste management facilities, including waste power generation facilities, that can cope with climate change
  (2) Repair existing final disposal sites
  (3) Strengthen the capacity of waste management, and raise awareness of the 3Rs and waste power generation
- ✧ In the preparatory phase of this project, staff from the Clean Authority of Tokyo visited the site to provide technical guidance, under the coordination of the Ministry of the Environment. Capacity building by Japanese local governments is crucial.
- ✧ This project has also generated co-benefits that contribute to the achievement of the SDGs. First, a reduction in the total amount of waste can reduce the volume of landfill, improve health problems and marine ecosystems, and extend the life of existing final disposal sites.

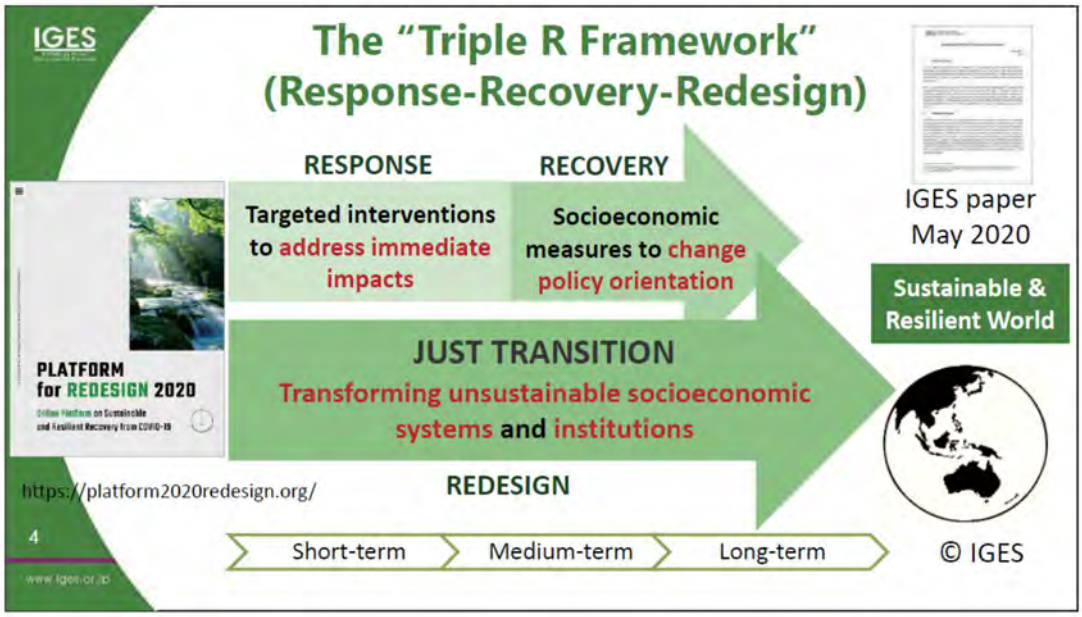
In addition, waste power generation will reduce the use of diesel oil, and contribute to energy security. As seen in this example, low-carbon technologies not only contribute to mitigating climate change, but also create a variety of co-benefits for local communities.

- ✧ It is believed that the city-to-city collaboration program is very effective in addressing the challenges of developing countries with regard to building capacity for project and policy formulation. ADB loans and JFJCM grants are very effective as financial resource options in carrying out projects after the feasibility study conducted by the city-to-city collaboration program.

- 2:55pm: [Panel discussion] How to move forward with overseas development during the pandemic (60 minutes):

After an opening explanation was given by Mr. Hayashi, facilitator at the Kitakyushu Urban Centre, IGES, various projects were introduced by the managers of companies and local governments who worked on city-to-city collaboration programs between cities and businesses during the pandemic. During this event, a panel discussion was held concerning changes in climate policy measures and methods for proceeding with overseas investigations during the pandemic, while also exchanging comments with overseas partner cities. Lastly, H.I.S. Co., Ltd. held a discussion concerning remote investigations overseas.

- ➢ Kitakyushu Urban Centre, IEGS, Programme Director: Mr. Shiko Hayashi
  - ✧ With the start of the year 2020, global decarbonizing initiatives are picking up speed. Along with this, decarbonizing initiatives within individual cities have also accelerated rapidly. Within Japan, the number of cities announcing their commitment to be "Zero-Carbon Cities" has increased. On the international level, also, cities participating in initiatives such as the UNFCCC Race-to-Zero Campaign and ICLEI Daring Cities 2020 are on the increase.
  - ✧ During the last three years, FY2020 saw 20 city-to-city collaboration programs adopted, the greatest number to date. However, due to the pandemic in FY2020, with restrictions on overseas travel, various difficulties have surfaced in proceeding with these projects. As the green recovery needed to overcome the climate change crisis progresses in a post-COVID society, IGES is calling for the "Triple R Framework" (Response-Recovery-Redesign) and is spreading information to promote green recovery.



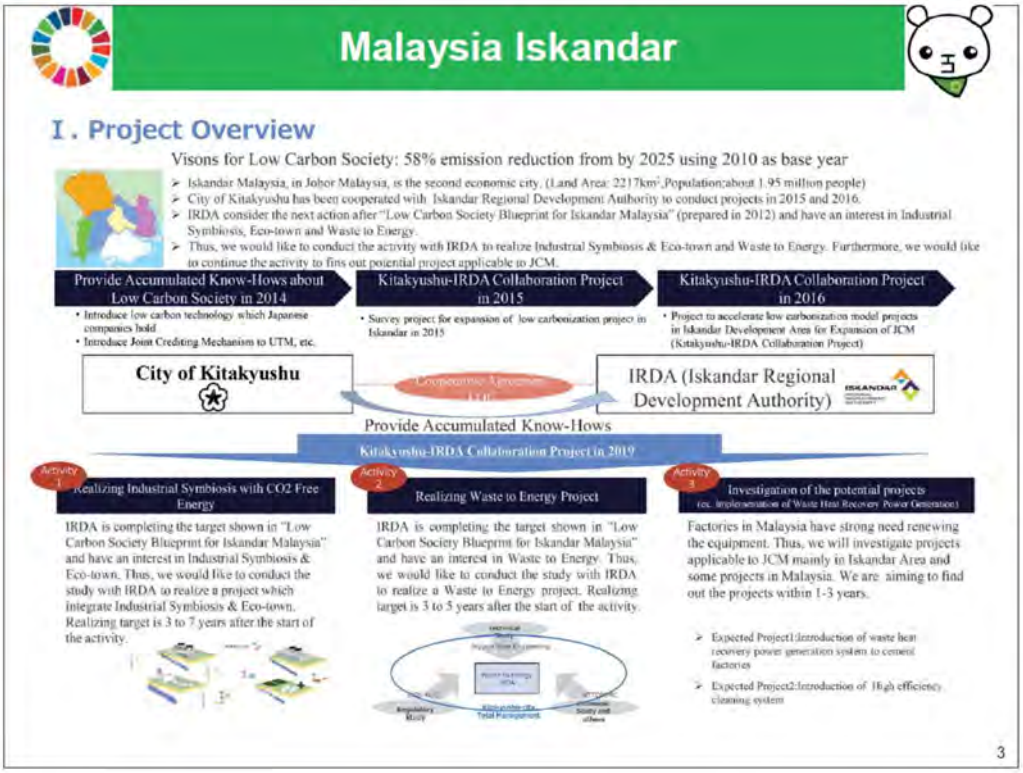
- ✧ Advance hearings were held prior to this seminar between the participating overseas cities and domestic local government operators. As a result, many opinions were expressed sensing issues in overseas cities during the pandemic over changes for moving towards decarbonization, the state of green recovery, and grasping urgent needs. However, in hearings with operators and local governments, issues raised were the lack of ability to probe deeply in online discussions, the difficulty of gathering information, the struggle to form a sense of relationship among the parties involved, obstacles to understanding the project site, and decreasing opportunities for investment.
- ✧ Taking these into consideration, in this panel discussion I would like to discuss the following two points in particular: 1) the changes to climate policy measures in overseas cities during the pandemic and the circumstances regarding need for green recovery; and 2) how to proceed with overseas investigations during the pandemic.

➢ Development Corridor Iskandar and Kitakyushu City Project:
Mr. Yuichi Arita, International Partnerships Promotion Director, Kitakyushu Asian Center for Low Carbon Society, Kitakyushu City

- ✧ Kitakyushu City, which is located approximately 1,000 miles southwest of Tokyo, is a city with a population of approximately 950,000. Located on the northernmost tip of the island of Kyushu, it harmonizes urban functionality

with an abundance of nature.
In 1901 a government-operated steel mill was established; the city is known for iron production and manufacturing industry, and businesses such as Nippon Steel and Yaskawa Electric Corporation operated in this area.
In the 1960s, it suffered serious environmental pollution, but that was overcome through a partnership between private companies and the government administration. Based on this experience, international environmental cooperation with developing nations in Asia, struggling with similar environmental problems, was formed beginning in 1980.
While receiving assistance from the Ministry of the Environment and JICA, we received many visiting experts and trainees, carried out investigations necessary to enter the field of environmental technology, and built numerous networks with Asian cities.

- ✧ Today I would like to introduce the city-to-city collaboration program between Kitakyushu City and the Iskandar Regional Development Authority (IRDA) in Malaysia. This project has been ongoing since FY2019, and is an investigation project regarding the greening of the development corridor Iskandar.
- ✧ The development corridor Iskandar is located in Johor, Malaysia, and is a high-priority regional development project area promoted by the Malaysian government.
- ✧ In the FY2019 project, IRDA was progressing steadily with the initiatives indicated in the low-carbon society blueprint formulated in 2012 together with the international research teams of Kyoto University and others, and confirmed that they were in the process of considering moving to the next step.
- ✧ This fiscal year, taking into consideration the keywords which will be IRDA's future targets: industry symbiosis, eco-town, and waste power generation, and as an effort to discover potential development projects qualifying for JCM based on the investigation results of last year's city-to-city collaboration program, we are working on the following 3 initiatives.
  Initiative 1) Working towards the realization of an eco-town that is symbiotic with industry
  Initiative 2) Working towards the introduction of waste power generation
  Initiative 3) Work towards discovery of potential JCM projects



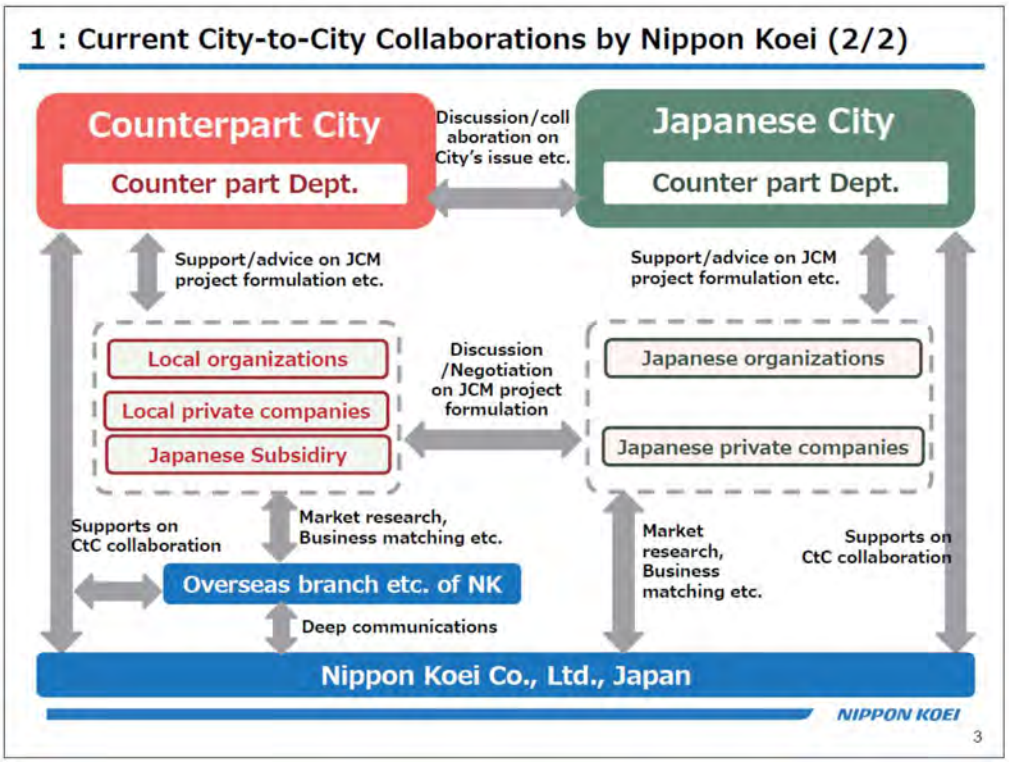
✧ In initiative 1), we are aiming towards the realization in the Iskandar region of a project that unifies eco-town initiatives with industry symbiosis.
The unification of eco-town initiatives with industry symbiosis, as shown in the diagram, indicates a state where the waste matter and raw garbage from some factories becomes materials and fuel for other factories, and the reused energy becomes a carbon-free energy source such as biomass energy.
In FY2020, with the cooperation of our local partner IRDA, we gathered inventory data from local factories, and worked on planning a pilot project for FY2021.
For initiatives 1) and 2), matching between factories is being carried out according to plans which a recycling business in Kitakyushu City helped create, based on the results of the workshop which IRDA held locally in October. More than 100 participants attended the workshop from local companies and local governments, and we received factory inventory data from 30 companies.

✧ In initiative 2), investigations are being carried out in the areas of technology, systems, and economic factors, in preparation for the introduction of waste power generation, which IRDA considers to be the next major theme. The companies in charge of these areas are Nippon Steel Engineering for

technology, IGES for systems, and NTT Data Institute of Management Consulting for economic factors. Currently, studies are proceeding based on information on local waste composition obtained through IRDA and the local consul.

- ✧ For initiative 3), continuing from FY2019, there is a search for high-potential, scalable JCM projects. Follow-up is being carried out on the potential JCM projects discovered in FY2019 by email and phone. Also, due to the difficulty of visiting the site in person, we are working to discover promising potential projects in cooperation with local Japanese businesses.

- ➢ Yangon and Kawasaki City Project, etc.: Mr. Masaru Ishikawa, Deputy Manager of Environmental Science & Engineering Dept. Nippon Koei Co., Ltd.
  - ✧ In FY2020, Nippon Koei carried out seven city-to-city collaboration programs.
  - ✧ Due to the impossibility of visiting the partner city during the pandemic, investigations were carried out using various networks. While carrying out online meetings, we gained cooperation from our own local subsidiaries, local consultants and local Japanese subsidiaries, progressing in negotiations, bridging gaps, and working to eliminate miscommunication.



✧ In consideration of the pandemic, we are moving forward with projects, together with involved parties in Japan and our partner cities, with attention to points such as the following.

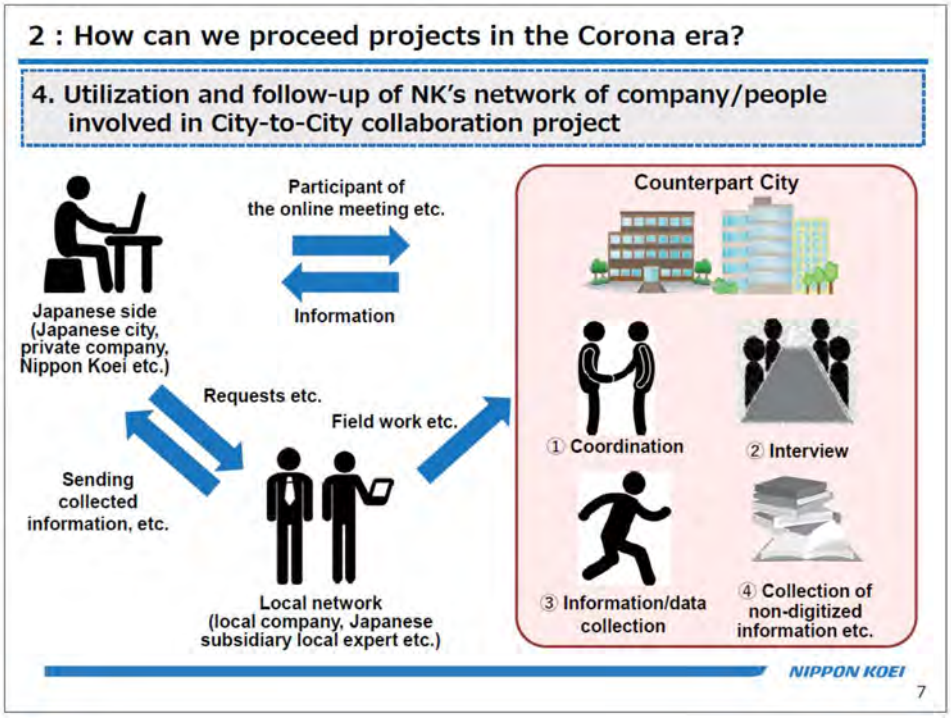
① While maintaining the objective of the city-to-city collaboration program, we are revising our approach to work processes. In order to get an accurate grasp of the situation and accomplish our original objectives even in circumstances such as city-wide lockdowns and restrictions on activities, we are revising our plans and approach in accordance with the circumstances of the parties involved.

② We are providing support towards the realization of a green recovery from the pandemic and of a decarbonized society. We are sharing knowledge and expertise of Japanese local governments and private businesses in consideration of the pandemic and post-COVID.

③ We are holding online meetings and discussions, making use of the specialties and strengths of Japanese local governments. In the case of the collaboration between Yangon in Myanmar and Kawasaki City, Kawasaki City employees are giving video lectures on topics about which Yangon has shared information or expressed an interest. In order to deepen understanding, it is important to not only hold meetings and share documents, but also to have a lecture system.

We also hold the Kawasaki International Eco-Tech Fair every year, in which Kawasaki City presents technologies and so on from companies located in the city. Up until FY2019, business matching with a view to the future was conducted on location in Kawasaki City, but in FY2020, it was held online due to the pandemic. Making use of this opportunity, and thanks to the assistance of Kawasaki City, the Kawasaki International Eco-Tech Fair served as one link through which we were able to call upon Yangon and Jakarta and share information with them.

④ Based upon the cooperation and opinions of Japanese local governments, we are carrying out initiatives through the networks of local private businesses and local consultants drawn up by each city. Without being able to meet directly in person on location, it is difficult to get a thorough grasp of problems, so we are offering as much support as possible using local resources.



⑤ (MC comments) I believe that the progress in conducting investigations using networks of a variety of local subsidiaries and local consultants, and the flexibility of revising approaches and work processes in connection with an understanding of the changing needs of local cities during the pandemic and the need for green recovery in a post-COVID society, will be very effective for proceeding with these projects. (Mr. Hayashi)

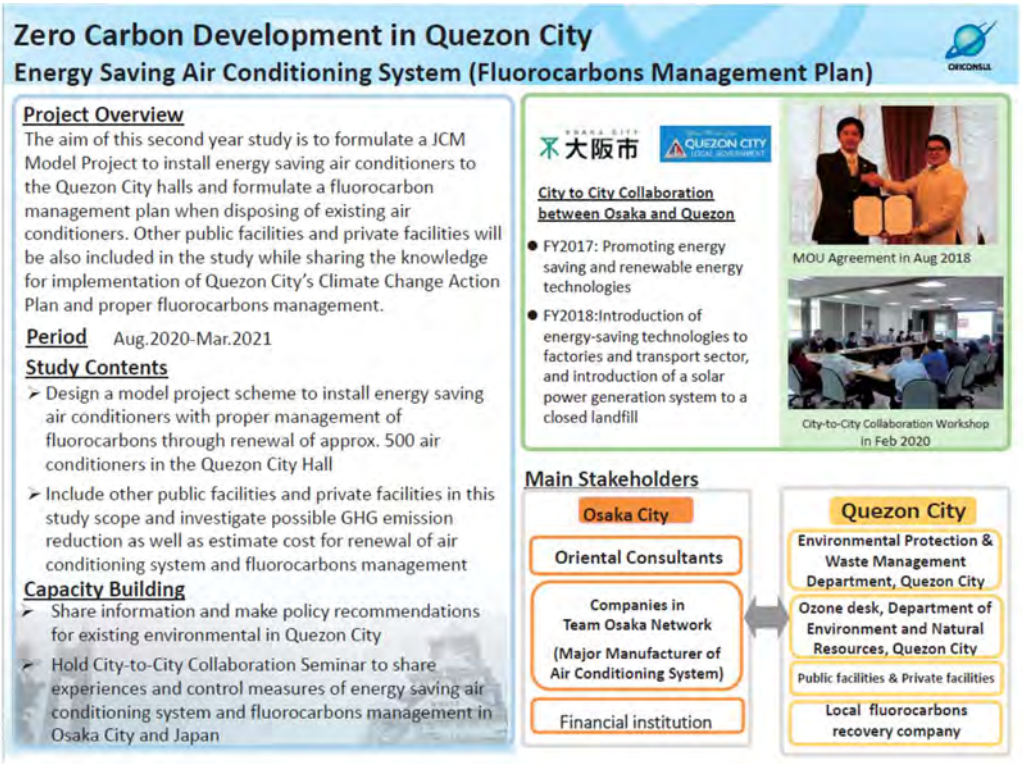
- Quezon City and Osaka City Project; Ulaanbaatar City and Sapporo City Project

  : Oriental Consultants Co., Ltd., Overseas Business Division: Mr. Masanori Fujii

  - ✧ Two projects are currently being conducted: a project to promote energy-saving air conditioning systems and CFC disposal plans as part of a collaboration between Quezon City and Osaka City, and a project to create a low carbon society in cold regions as part of a collaboration between Ulaanbaatar City and Sapporo City.

  - ✧ Quezon City is proactively making efforts to combat climate change, including participating in the C40 (group of global cities leading efforts for climate change). In 2018, a MOU was signed with Osaka City and mayoral level policy conversations have been held on two occasions. In 2019, the cities conducted studies and produced reports on the feasibility of a JCM equipment subsidy project to save energy in air conditioning, and on the state of CFC recovery, reuse, and destruction in the Philippines. The cities plan to hold policy conversations in February 2021 as they move toward renewing their MOU.
  - ✧ In the 2020 survey, two main items were studied.
    - ① Considering means to improve energy-saving in air conditioning in city agency facilities and to optimize CFC disposal.
      Based on the results of the 2019 study, the city is deliberating a model project scheme and an application for a JCM equipment subsidy project. In 2020, the city also conducted studies on the current status of non-agency private facilities, such as shopping malls, hotels, etc., in order to install more energy-efficient air conditioning.
    - ② Osaka City shares its knowledge and information about the Japanese legal system to assist in the environmental policy of Quezon City. Quezon City is currently acquiring detailed information about air conditioners and studying the requirements to adopt a JCM equipment subsidy project in order to deliberate an energy-saving model project.

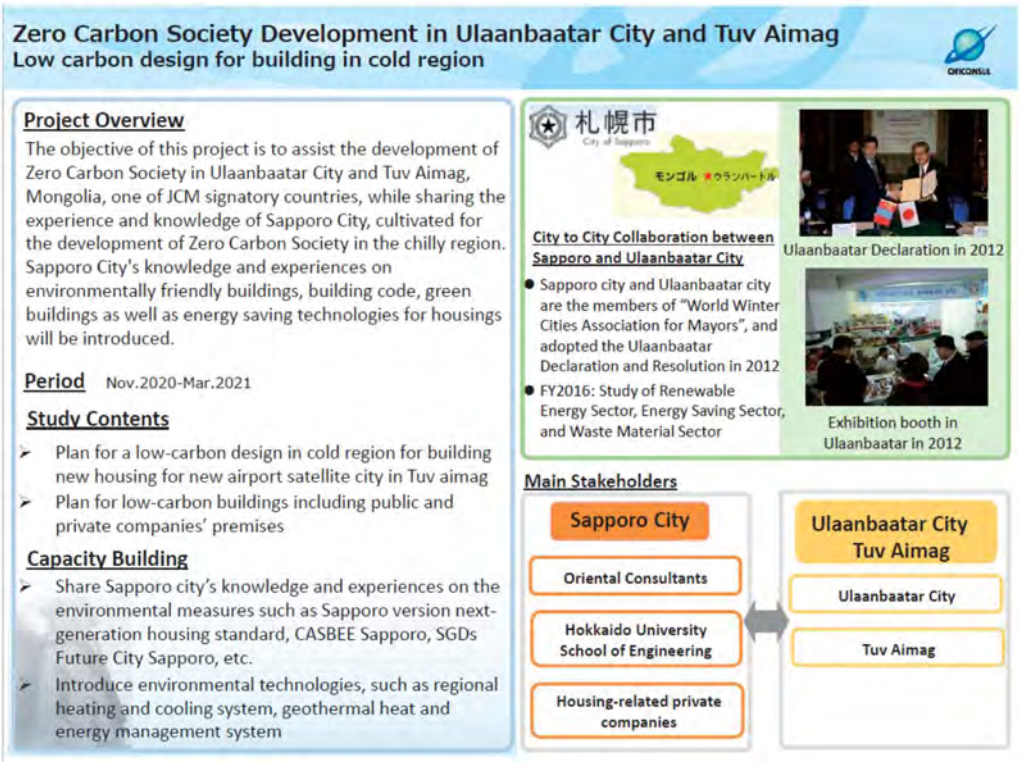
The specific items being studied include economic value, the model for future popularization, current issues, and the requirements for an application to the JCM equipment subsidy project. In February 2021, Osaka City and Quezon City will conduct mayoral level conversations. On February 19, an online workshop will be held with Quezon City as the two cities aim to formulate the 2021 plan.



✧ Issues within the 2020 project include the inability to study and analyze air conditioners used in shopping malls and hotels due to travel restrictions, as well as difficulties in operating online workshops. These issues are being solved through remote meetings and studies that utilize local staff and air conditioner manufacturers. The cities are also recruiting representative companies for the JCM subsidy project.

✧ In the Ulaanbaatar City and Sapporo City project, Sapporo City shares its experience and knowledge on energy saving and environmental improvement in cold-region cities with Ulaanbaatar City, Mongolia, which is the only cold weather region of the JCM signatory countries. The cities aim to achieve a Zero Carbon Society by taking efforts for cold weather residences, renewable energy, and energy saving fields.

- ✧ Sapporo City is proposing to apply its environmental policy initiatives to the residences around the New Ulaanbaatar International Airport, public agency buildings, and buildings of private companies in Ulaanbaatar City.
- ✧ The cities are conducting a document review of building specifications on the ground, holding meetings between persons in charge in Ulaanbaatar City and Japanese companies that have architectural technology for cold regions such as experience of working in Mongolia, and running workshops to introduce the technology of Sapporo City.



- ✧ One issue was that the main person in charge of the project on the Ulaanbaatar City side changed due to a mayoral election in late October 2020, and it was difficult to get in contact with the new person in charge. In addition, flights from Mongolia were suspended and Ulaanbaatar City went into lockdown at the end and start of the year due to the pandemic, making it impossible to make on-site visits and conduct the study according to plan. Furthermore, government officers could no longer be contacted after resigned en masse and the construction of the new airport was postponed to July 2021 due to the impact of the pandemic.
- ✧ Utilizing local Mongolian staff, an online workshop was held in January 2021 with private companies in Sapporo City in order to address these

issues. Even as communication with Ulaanbaatar City grew difficult, Sapporo City and local staff contacted the deputy mayor of Ulaanbaatar City, who attended a meeting with them. Even if travel restrictions and lockdowns continue in the future, there are plans to use local staff to proceed with remote study interviews and efforts with affiliated companies.

- Comment from overseas partner city: Mr. Boyd D Jouman (IRDA)
  - ✧ We asked him about the changes to zero-carbon opportunities due to the pandemic, trends of green recovery for post-COVID society, and new needs for city collaboration
  - ✧ The low-carbon blueprint for the development corridor Iskandar is steadily making progress. National institutions are working together, especially in the energy sector, for a green recovery in post-COVID society. Specifically, renovations are being conducted to save energy in buildings.
  - ✧ In proceeding with the city-to-city collaboration programs, while there are difficulties in shifting everything online, this also increases the number of participants and has the benefit of enabling efficient information transmission and networking.

- (MC) I believe that the biggest change in the study due to the pandemic was the travel restrictions. What specific issues were there and what means did you use to address them? In promoting zero-carbon society in overseas cities, how do the city-to-city collaboration programs and each company/municipality contribute?
  - ✧ (Kitakyushu City) We believe that the biggest changes were being unable to conduct hearings directly on-site and see the situation on the ground. However, the local partner cities are all making very proactive efforts. Since there are movement restrictions on the ground, there are some parts that have not made much progress, but we believe that it is effective to request that they carry out the study. There are venture companies that provide remote digital communication systems in the city. These allow us to lower the hurdle and instruct local workers remotely by

sharing on-site images with a smartphone or other device. While we are proactively collaborating with local partners, we believe that it is necessary to interact directly with locals to uncover new local partners we can trust, a prerequisite for this study, and construct a relationship. Since we are unable to search for new topics that may lead to the next project, dig deep into issues, or make realizations, the idea of fewer opportunities to interact directly with our partner city is a major source of concern.
It is difficult to imagine that there will be fewer opportunities to create a zero-carbon society in a post-COVID world. We believe that city-to-city collaboration programs conducted jointly by local municipalities with overseas cities are an extremely valuable opportunity. We also think that being able to respond flexibly to on-site changes is also an extremely powerful tool. However, Japan does not maintain an overwhelming advantage in terms of technology as it is competing with Europe, the US, China, and Korea. It is necessary to make proposals to partner cities that are more attractive, including economic merits and collaboration with other municipalities, so that the project is not limited to being a simple exchange.

✧ (Nippon Koei) Since we cannot interact in person, we are unable to directly confirm our counterpart's response. As a result, it feels like the speed the partner city is willing to proceed with the project has slowed and their mindset has grown more conservative. Due to the pandemic, it feels like they want to proceed with matters by the shortest route. We are making efforts to remove unnecessary steps from preparations that previously included multiple stages, and ensure that measures lead to actual actions and connect to goals by the shortest route. As a result, proposals without a clear vision or impact have been filtered out, leaving only those that are higher quality.
Based on these changes, the approach to goals, such as long-term strategies like the Paris Agreement, are extremely important. It is necessary to properly grasp the achievements of each municipality in Japan and the needs of local governments and cities, and to proceed with a green recovery that includes the implementation of a JCM equipment subsidy project.

- ✧ (Oriental Consultants) There are elements of the project that will not be able to proceed because they cannot be addressed without conducting a hearing in person on the ground. However, it is possible to absorb some of this impact with regular communication using diverse IT tools (communication tools such as messenger, etc.).
  Even if it is possible to deliberate the agenda for online meetings beforehand, we believe that it is important to communicate directly in person in order to dig deeper into discussions and proceed to the next steps. The project tends not to proceed smoothly if there are not merits for the partner city and local person in charge compared to communicating in person.
  The partner city is also deliberating policies for coexistence with the virus, so the budget and focus of efforts is aimed on recent COVID-19 measures. One question is how much they can focus on city-to-city collaboration programs. However, since the local need for this project has not disappeared, it is necessary to clearly communicate the high economic efficiency and positive environmental impact of this project, so that the local partner will continue with it without hesitation.

- ✧ (MC) I understand that it is necessary for the entity operating the project to make proposals that bear fruit as quickly as possible by clarifying the vision, effects, merits and so on through diverse communication tools, because the opportunities for interaction have decreased due to the pandemic.

➢ Demonstration of overseas remote study:
  Director of Global Business Advance, GBA and Rental H.I.S., Corporate Sales Division, H.I.S. Co., Ltd.: Ms. Yuka Shinohara
  Sales Manager of Corporate Sales Division, H.I.S. Co., Ltd.: Mr. Kensuke Ezoe
  - ✧ Conducted stream with the Ulaanbaatar branch office to demonstrate Rental H.I.S. (on-site remote study service)

- Assistant Director of the International Cooperation and Sustainable Infrastructure Office, International Strategy Division, Global Environment Bureau, Ministry of the Environment: Mr. Satoshi Watanabe
  - ✧ When soliciting applications for city-to-city collaboration programs in the future, we are considering establishing evaluation metrics other than carbon emission reduction volumes. For 2021, applications will be solicited in March 2021.
  - ✧ In order to make attractive proposals for overseas partner cities, it is extremely important to share information with each country. There are plans to hold an international forum related to creating zero-carbon society in cities in March 2021.

END

Reference 1 ：
KoM w/MOE（September 15,2020）

環境省 御中

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Trusted Global Innovator

令和2年度　低炭素社会実現のための都市間連携事業
イスカンダル地域における脱炭素化促進事業（フェーズ2）
キックオフミーティング資料

2020年9月15日
株式会社エヌ・ティ・ティ・データ経営研究所
社会基盤事業本部 社会・環境戦略コンサルティングユニット

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1. 本年度調査事業の概要

目指している低炭素社会の姿：2010年を基準としてGHGsを2025年までに58%削減を達成

- イスカンダル・マレーシアはジョホール南部の主要回廊地域に位置し、面積2217km²、人口約1.95百万人のマレーシア第二の経済都市である。北九州市はイスカンダル地域開発庁（IRDA）と連携し2015年、2016年の都市間連携事業などを連携関係を構築してきた。
- IRDAは国際研究チームの協力を得て、2012年に「低炭素社会ブループリント」を策定しており、同計画に沿って活動を順調に展開中。
- IRDAは「低炭素社会ブループリント」の次のアクションを検討しており、産業共生、エコタウン、廃棄物発電の推進を計画中。
- 2020年度の活動は中長期的にIRDAの次のアクション実現に向けた活動を実施するとともに、更新投資が盛んなマレーシアにおいて短期的に事業化につながる案件の発掘活動を実施する。

2014年 低炭素社会のノウハウ共有
- 日本企業が有する低炭素技術の紹介
- JCMの紹介 等

2015年 アジアの低炭素社会実現のためのJCM案件形成可能性調査事業委託業務
- 平成27年度「イスカンダル地域における低炭素化プロジェクトの面的拡大のための基盤構築調査事業（北九州市―ジョホール市連携事業）」

2016年低炭素社会実現のための都市間連携に基づくJCM案件形成可能性調査事業
- 平成28年度「JCM推進に向けたイスカンダル・モデルプロジェクト推進事業（北九州市－IRDA連携事業）」

北九州市 ⇔ 協力関係 LOU ⇔ IRDA（イスカンダル地域開発庁）

蓄積したノウハウの提供

令和２年度 脱炭素社会実現のための都市間連携事業委託業務

活動1 産業共生型のエコタウンの実現に向けた活動

「低炭素社会ブループリント」に示された活動を順調に展開している中、IRDAが次の重要テーマと考えている産業共生とエコタウンの同時実現を目指して、パイロットプロジェクトの組成に向けた調査活動を実施する。中長期（3~7年以内）の事業化を目指す。

活動2 廃棄物発電の実現に向けた活動

「低炭素社会ブループリント」に示された活動を順調に展開している中、IRDAが次の重要テーマと考えている廃棄物発電の実現を目指して、調査活動を実施する。中長期（3~5年以内）のプロジェクトの具体化を視野に入れる。

活動3 JCM適用案件の発掘活動

工場等において設備更新ニーズの高いマレーシアにおいて、イスカンダル地域を中心にマレ工場等における廃熱回収発電、高効率な真空洗浄機、高効率なボイラーやチラー等の導入案件の事業化を目指す。短期間（1~3年以内）の事業化が目標。但し、JCMへの参画（政府署名）のタイミングに留意する。

- 候補案件１：セメント工場の廃熱回収発電の導入
- 候補案件２：電子電機機器工場における高効率洗浄機の導入

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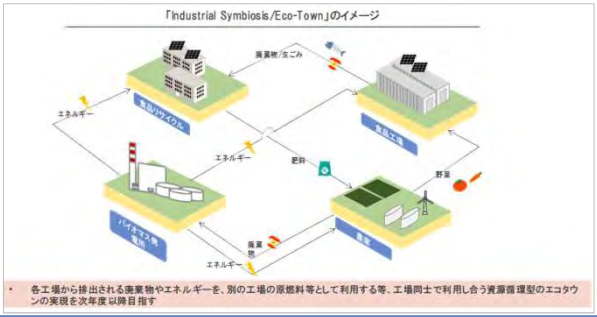
2. 活動計画の詳細
2.1 活動① 産業共生型のエコタウンの実現に向けた活動

✓ 2019年度の事業でIRDAと合意したAction Plan（下表）を実行する。

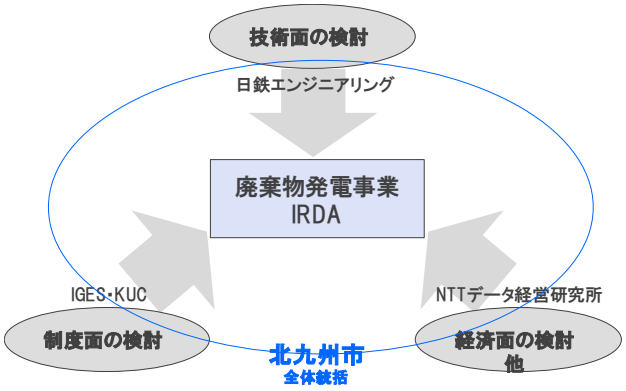
No.	Activities	IRDA	北九州市	NTTデータ経営研究所
1	工場から廃棄される廃棄物のインベントリー・データの収集	●		
2	インベントリー・データに基づく工場間のマッチング		●	●
3	上記２つの活動と並行した政策支援のあり方（優遇措置や罰則等）の検討	●	●	
4	全体の検討結果を取りまとめたパイロットプロジェクトの企画	●	●	●



2. 活動計画の詳細
2.2 活動② 廃棄物発電の実現に向けた活動

✓ IRDAが次の重要テーマとして考えている廃棄物発電の実現に向けて、技術、制度、経済の各側面から調査活動を行う。

検討体制イメージ



2. 活動計画の詳細
2.3 活動③　JCM適用案件の発掘活動

✓ 2019年度調査に引き続き、ポテンシャルが高く、横展開可能なJCM適用案件の発掘を行う。（2019年度の主な発掘先は下表参照）

	企業名	業界	概要	設備補助申請ニーズ
1	A社	製造業	真空洗浄乾燥機	設備補助申請のニーズあり
2	B社	セメント	廃熱回収発電	設備補助申請ニーズあり
3	C社	化学	ボイラー・チラー等のリプレース	設備補助申請ニーズあり

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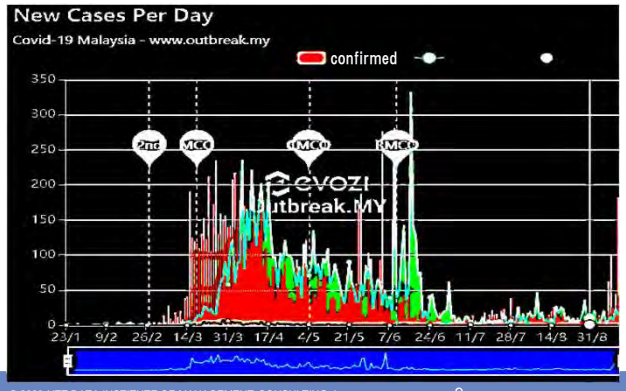
1. マレーシアにおけるCOVID-19の影響

◆ 条件付き活動制限令（Recovery Movement Control Order：RMCO、PKPP）の12月31日までの延長

- ✓海外からマレーシアに入国した者は、マレーシア国民であれ外国人であれ、必ず政府指定の隔離施設での14日間の隔離に服する。
- ✓外国人観光客のマレーシアへの入国は引き続き許可されない。
- ✓関係各所は規制（SOP）を引き続き遵守すること。
- ✓マスク着用、手洗いうがい、人混みを避けること等を徹底すること。



（出典） 在マレーシア日本国大使館「新型コロナウイルス関連情報」他

2.活動① 産業共生型のエコタウンの実現に向けた活動

◆ 工場から廃棄される廃棄物のインベントリー・データの収集をスタート。

◆ 添付のインベントリデータシートをIRDAに送付し、IRDA経由でイスカンダル地域内の工場から情報を収集。IRDAは企業を集めた説明会を開催しデータを収集する準備活動を予定。

◆ インベントリデータシートは添付資料の通り。

◆ 本活動については、もともとIRDAと外注契約を締結する計画であったことから、covid-19の影響で現地活動のスタートが遅延したものの、計画通りの活動を実施できる見込み。

Waste generator				Waste Category	
Department Name	Factory Name	Section Name	Waste Shipping Date	Waste Categoty Code / Non-Scheduled Waste	
XXX department	AAA Factory	DDD Section	2019/1/16	SW 101	Waste containing arsenic or its compound
YYY department	BBB Factory	EEE Section	2019/10/31	Non-SW	#N/A

			weight		Transportation	
Name of Waste	odor	more info (free description)		kg or ℓ	cost per weight	transportation cost (RM)
ABC	○		200	Kg	150	30,000
DEF	×		50	ℓ	200	10,000

.....

2. 活動② 廃棄物発電の実現に向けた活動

- ◆ 次ページ以降の資料を用いてIRDAとディスカッションを行い、計画されている廃棄物発電事業に関する最新情報を入手中。
- ◆ 情報を入手次第、技術検討、法制度検討、経済性検討等を実施する予定。
- ◆ 活動①と同様、もともとIRDAと外注契約を締結する計画であったことから、IRDA経由で入手する情報については、covid-19の影響で現地活動のスタートが遅延したものの、計画通りの活動を実施できる見込み。
- ◆ 一方で、法制度検討や経済性検討等に必要な情報等のうちIRDA経由で入手困難な情報については、現地コンサルタント等に委託して収集する予定。

（参考）1. Realizing Waste to Energy Project

- Japanese side does not have information on the situations of local waste and the aim of IRDA, so can not plan a course of action.
- We would like to discuss on goals and study aspects in FY2020 that Japanese side set.
- We made a list of necessary information for study as follows.

Goals in FY2020	Establishing a basic business plan for special purpose company (SPC) for WtE in the near future	
Study Aspects	Technical study (Nippon Steel Engineering)	Research on refuse disposal system, plants and facilities
	Regulatory study (IGES･KUC)	Research on environmental regulations for WtE facilities in Malaysia
	Economical study and others (NTTDIOMC)	Research and simulation of profitability in future

（参考） 1. Realizing Waste to Energy Project Necessary information from IRDA (1/3)

Necessary information from IRDA		Japanese side action
Supervisor of waste management （廃棄物管理の主管組織）	• At national / state / city level	Economical study and others Regulatory study Technical study
Waste separation method （ごみの分別方法）	• Domestic (non-industrial) waste • Industrial waste	
Waste collection method （ごみの収集方法）		
Present issues in waste disposal and management （ごみ処理・管理に関する現状の課題）		
Future direction of waste disposal and management in Iskandar area （イスカンダル地域におけるごみ処理・管理の将来方針）		
Government subsidy for WtE facility （廃棄物発電施設に対する政府補助金）	• For construction • For operation	

（参考） 1. Realizing Waste to Energy Project Necessary information from IRDA (2/3)

Necessary information from IRDA		Japanese side action
Waste Composition （ごみ質分析） ⇒Required (see P.16)	• Moisture / Ash / Combustible content • Elemental composition	Technical study
Waste generation （ごみ発生量）	• Content per day • Content per month	

Waste sources
（ごみ発生源）
	• The percentage of total waste
	  • Domestic (non-industrial) waste
	  • Industrial waste	

Waste components （ごみ種類組成）	• Paper • Plastic • Cloth • Dust • Noncombustible • Others	

Planned construction site
（建設予定地）
	• Gross area
	• Environmental Regulations
	  • digging depth
	  • Building height etc.
		Regulatory study

（参考） 1. Realizing Waste to Energy Project
Necessary information from IRDA (3/3)

Necessary information from IRDA		Japanese side action
Development and management of facility （事業運営スキーム）	• DBO/BTO/BOT/BOO • Candidate companies for operator	Economical study and others
Tipping fee / electricity sales price （ごみ処理費用と売電価格）	• Escalation	
Waste generation in future （将来のごみ発生量）	• Estimate based on demographic data etc.	
Project Schedule （プロジェクトの計画）	• Countrywide plan • Time of facility completion	
Receiver selection for development operations （受託者の選定方法）	• quasi-mandate contract • Contract	

（参考） 1. Realizing Waste to Energy Project
Waste composition

Table1: Waste Composition

		Low	Average	High
Proximate Analysis	Moisture (%)			
	Combustible (%)			
	Ash(Inert) (%)			
Ultimate Analysis	C (%)			
	H (%)			
	N (%)			
	O (%)			
	S (%)			
	Cl (%)			
LHV (MJ/kg)				
Density (t/m3)				

Be sure to enter “Average”.
If possible, also “Low” and “High”

（参考） 1. Realizing Waste to Energy Project
Another WtE project at BUKIT PAYONG, BATU PAHAT, JOHOR

- We heard that another WtE project is processing in Johor.
- If possible, could you obtain information or some materials about the project? (ex. Request for proposal document)

REQUEST FOR PROPOSAL

WASTE TO ENERGY (WtE) PUBLIC PRIVATE PARTNERSHIP (PPP) PROJECT AT BUKIT PAYONG, BATU PAHAT, JOHOR

DEPARTMENT OF NATIONAL SOLID WASTE MANAGEMENT
MINISTRY OF HOUSING AND LOCAL GOVERNMENT

(TENDER NO.: KPKT/JPSPN/BPT/WTE/1/2020)

This Request for Proposal (RfP) is offered to companies which complied to the following conditions:

- Company with at least 51% Malaysian owned entity;
- Experienced in managing Municipal Solid Waste Treatment Facility and landfilling;
- Experienced in managing similar Municipal Solid Waste Management Facility as proposed by bidder with a minimum capacity of 800 tpd;
- The proposed technology solution has at least 3 years track record; and
- The proposed technology has minimum 8,000 operating hours per annum.

The RfP document can be purchased as follows:

REQUEST FOR PROPOSAL DOCUMENT'S PRICE	DOCUMENT'S PURCHASE VENUE, DATE AND TIME	SUBMISSION CLOSING DATE AND TIME	SITE VISIT DATE, TIME AND VENUE
	Venue: Bahagian Khidmat Pengurusan Jabatan Pengurusan Sisa Pepejal Negara, Aras 24, No.51,Persiaran Perdana, Presint 4, 62100 PUTRAJAYA		Date: 10th August 2020 (Monday) Registration Time:

II. 5月からの進捗
2. 活動③　JCM適用案件の発掘活動

◆ 昨年度、発掘した下記の案件については、メール・電話等でフォロー活動を実施中。JCM設備補助事業に対する関心は依然として高いものの、マレーシア政府のJCMへの参加が見えないことから、関心は以前よりも低下しつつある状況。

◆ 現地訪問が困難なことから、既存ネットワークのある企業様等と連携して可能性のある案件の発掘活動も実施中。

◆ 本活動については、特に現地コンサルタント会社等への外注を想定していなかったことから、外注先の確保、その他の方策を検討中。

	企業名	業界	概要	設備補助申請ニーズ
1	A社	製造業	真空洗浄乾燥機	設備補助申請のニーズあり
2	B社	セメント	廃熱回収発電	設備補助申請ニーズあり
3	C社	化学	ボイラー・チラー等のリプレース	設備補助申請ニーズあり

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III. 今後の予定

◆ 当初年3回の現地調査を想定したが、COVID-19の影響を考慮し、年1回への変更を検討中

～2018
■ City to City Collaboration FS (2015 & 2016)

2019～2021（3 years）

2022～2025
■ Implementation of Action Plan
■ Expanding similar Project

Activity Plan FY 2019	Activity Result FY 2019	FY 2020 (2nd year) 7～9	FY 2020 (2nd year) 10～12	FY 2020 (2nd year) 1～3	2021年～ (3rd year～)
Activity1：Preparation of Action Plan after Blue Print	・Prepared Action Plan with IRDA. 3 Themes Industrial Symbiosis, Eco-town and Waste to Energy ・City of Kitakyushu and concluded LOI	Collecting inventory data of wastes from factories	Matching of factories based on inventory data	Planning of pilot project	Implementation of pilot project → Commercialize (within 3~7 year)
		Investigation of policy support (incentives or penalty and so on)			
Activity 2：Follow-up of Projects found out in 2015, 2016		Technical study (Nippon Steel Engineering)			Project realization, middle term (within 3~5 year)
		Regulatory study（IGES・KUC)			
		Economical study and others (NTTDIOMC)			
Activity 3：Finding out potential Projects	・found out 3 potential projects (1 project was deeply studied) ・found out additional 2 potential project	Activity to find our potential projects ・Introduction of high efficiency boiler, chiller or other equipment to replace the old equipment ・Introduction of waste heat recovery electricity generation in cement factory			Project realization, short term (within 1~3 year) ※Malaysia has to join JCM.
Study in Iskandar		●1st study	●2nd study	(●3rd study)	
Preparation of report		●Contract			
		Monthly report			
Meeting with MOEJ		●kick-off	●interim reporting	●final reporting	(※additional meeting, if necessary)

submission of report

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Reference２：
Monthly Report

月次報告書（令和２年９月）

業　務　名	令和２年度脱炭素社会実現のための都市間連携事業委託業務 （イスカンダル地域における脱炭素化促進事業（フェーズ２）（北九州市－イスカンダル開発地域連携事業））
受　託　者	株式会社エヌ・ティ・ティ・データ経営研究所 (共同事業者：北九州市、日鉄エンジニアリング(株)、(公財)地球環境戦略研究機関・北九州アーバンセンター、イスカンダル地域開発庁(IRDA))
期　　間	令和２年９月３日（木)～令和２年９月３０日（水）

【実績概要】

① ９月３日に、日方関係者と現地プレーヤーであるIRDAとの打ち合わせをオンラインで実施。案件の進捗状況、特に廃棄物発電に関する情報収集に関して議論を行った。

② ９月１５日に、環境省様とのお打ち合わせ（キックオフミーティング）を実施。事前に資料作成・準備、関係者との確認を行った。当日は案件の概要説明、及びこれまでの進捗状況について報告・議論を行った。

③ IRDAへ日本側の検討状況の報告、現地情報に関する確認等のフォローアップをメールベースで実施した。

【打合せ・現地渡航等】

① 関係者打ち合わせ（オンライン）を９月３日に実施。

② 環境省様キックオフミーティングを９月１５日に実施。

以上

月次報告書（令和２年１０月）

業　務　名	令和２年度脱炭素社会実現のための都市間連携事業委託業務 （イスカンダル地域における脱炭素化促進事業（フェーズ２）（北九州市－イスカンダル開発地域連携事業））
受　託　者	株式会社エヌ・ティ・ティ・データ経営研究所 (共同事業者：北九州市、日鉄エンジニアリング(株)、(公財)地球環境戦略研究機関・北九州アーバンセンター、イスカンダル地域開発庁(IRDA))
期　　間	令和２年１０月１日（木）～ 令和２年１０月３０日（金）

【実績概要】

① １０月１５日に、日方関係者で廃棄物発電に関して打ち合わせを実施。現地情報の収集状況や各種検討の進捗状況について報告・議論を行った。

② １１月４日に設定した現地プレーヤーであるIRDAとの打ち合わせに向け、事前の打ち合わせ資料作成、日方関係者との確認を実施した。

③ IRDAへ定期的に日本側の検討状況の報告、現地情報に関する確認等のフォローアップをメールベースで実施した。

④ 年内の現地調査実施が難しいため、現地での代行者を発掘し、代行業務の詰めを行った。

【打合せ・現地渡航等】

① 関係者打ち合わせ（オンライン）を１０月１５日に実施。

以上

月次報告書(令和２年１１月)

業　務　名	令和２年度脱炭素社会実現のための都市間連携事業委託業務 （イスカンダル地域における脱炭素化促進事業（フェーズ２）（北九州市－イスカンダル開発地域連携事業））
受　託　者	株式会社エヌ・ティ・ティ・データ経営研究所 (共同事業者：北九州市、日鉄エンジニアリング(株)、(公財)地球環境戦略研究機関・北九州アーバンセンター、イスカンダル地域開発庁(IRDA))
期　　間	令和２年１１月１日（日）～ 令和２年１１月３０日（月）

【実績概要】

① １１月４日に、現地プレーヤーであるIRDAとの打ち合わせを実施。インベントリー・データの取りまとめ、廃棄物発電に関する情報収集について議論を実施。

② IRDAから提出されたインベントリー・データの中間報告を受け、工場間のマッチングに向けた情報の整理・分析を行った。

③ 現地で行われた廃棄物発電の入札資料を入手し、関係者間で情報の整理・分析を行った。

【打合せ・現地渡航等】

① IRDAとの打ち合わせ（オンライン）を１１月４日に実施。

以上

月次報告書（令和２年１２月）

業　務　名	令和２年度脱炭素社会実現のための都市間連携事業委託業務 （イスカンダル地域における脱炭素化促進事業（フェーズ２）（北九州市－イスカンダル開発地域連携事業））
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期　　間	令和２年１２月１日（月）～ 令和２年１２月３１日（木）

【実績概要】

① １２月９日に、現地プレーヤーであるIRDAとの打ち合わせをオンラインで実施。インベントリー・データを踏まえた産業共生の方針、廃棄物発電に関する検討状況について議論を実施した。

② IRDAから提出されたインベントリー・データの分析を進め、日本国内の適用可能な技術等について調査、検討を行った。

③ IRDAへ定期的に日本側の検討状況の報告、現地情報に関する確認等のフォローアップをメールベースで実施した。

④ JCM設備補助につながる可能性のある案件の発掘を現地で活動する日系企業と連携して実施した。

【打合せ・現地渡航等】

① IRDAとの打ち合わせ（オンライン）を１２月９日に実施。

以上

月次報告書（令和３年１月）

業　務　名	令和２年度脱炭素社会実現のための都市間連携事業委託業務 （イスカンダル地域における脱炭素化促進事業（フェーズ２）（北九州市－イスカンダル開発地域連携事業））
受　託　者	株式会社エヌ・ティ・ティ・データ経営研究所 (共同事業者：北九州市、日鉄エンジニアリング(株)、(公財)地球環境戦略研究機関・北九州アーバンセンター、イスカンダル地域開発庁(IRDA))
期　　間	令和３年１月１日（金）～ 令和３年１月３１日（日）

【実績概要】

① １月１８日に、国内関係者で活動１：産業共生に関する打ち合わせを行い、IRDAから提出されたインベントリーデータを基に、工場間のマッチングや北九州市内の企業の持つ技術の適用可能等について議論を行った。

② １月１８日に、国内関係者で活動２：廃棄物発電に関する打ち合わせを行い、これまでにIRDA等から入手した情報の整理、最終報告書作成の方針等について、議論を行った。

③ １月２１日に、現地プレーヤーであるIRDAとの打ち合わせを実施し、国内での検討状況を報告するとともに、次年度以降の取り組み等についても議論を行った。

【打合せ・現地渡航等】

① 産業共生に関する打ち合わせ（オンライン）を１月１８日に実施。

② 廃棄物発電に関する打ち合わせ（オンライン）を１月１８日に実施。

③ IRDAとの打ち合わせ（オンライン）を１月２１日に実施。

以上

月次報告書（令和３年２月）

業　務　名	令和２年度脱炭素社会実現のための都市間連携事業委託業務 （イスカンダル地域における脱炭素化促進事業（フェーズ２）（北九州市－イスカンダル開発地域連携事業））
受　託　者	株式会社エヌ・ティ・ティ・データ経営研究所 (共同事業者：北九州市、日鉄エンジニアリング(株)、(公財)地球環境戦略研究機関・北九州アーバンセンター、イスカンダル地域開発庁(IRDA))
期　　間	令和３年２月１日（月）～ 令和３年２月２８日（日）

【実績概要】

① ２月１日の都市間連携セミナーに国内都市・現地都市と共に出席し、議事録を作成した。

② ２月１８日に、IRDAと打ち合わせを行い、今年度事業での検討結果、及び次年度以降の活動について議論した。

③ ２月２６日に、IRDA、及びマレーシア現地のコンセッション企業と打ち合わせを行い、現地の廃棄物管理の実情や、廃棄物発電の導入に向けた状況等について、意見交換をした。

④ ３月３日の成果報告会資料、及び最終報告書作成に向けて、関係者と今年度の活動内容の取りまとめを行った。

【打合せ・現地渡航等】

① ２月１日に開催された都市間連携セミナー（オンライン）に参加。

② IRDAとの打ち合わせ（オンライン）を２月１８日に実施。

③ IRDA、現地のコンセッション企業との打ち合わせ（オンライン）を２月２６日に実施。

以上

Reference 3 ：
Final Report to MOE（March 3, 2021）

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1. 本年度調査事業の概要（提案資料から再掲）

目指している低炭素社会の姿：2010年を基準としてGHGsを2025年までに58%削減を達成

- イスカンダル・マレーシアはジョホール南部の主要回廊地域に位置し、面積2217km²、人口約1.95百万人のマレーシア第二の経済都市である。北九州市はイスカンダル地域開発庁（IRDA）と連携し2015年、2016年の都市間連携事業などを連携関係を構築してきた。
- IRDAは国際研究チームの協力を得て、2012年に「低炭素社会ブループリント」を策定しており、同計画に沿って活動を順調に展開中。
- IRDAは「低炭素社会ブループリント」の次のアクションを検討しており、産業共生、エコタウン、廃棄物発電の推進を計画中。
- 2020年度の活動は中長期的にIRDAの次のアクション実現に向けた活動を実施するとともに、更新投資が盛んなマレーシアにおいて短期的に事業化につながる案件の発掘活動を実施する。

2014年 低炭素社会のノウハウ共有
- 日本企業が有する低炭素技術の紹介
- JCMの紹介 等

2015年 アジアの低炭素社会実現のためのJCM案件形成可能性調査事業委託業務
- 平成27年度「イスカンダル地域における低炭素化プロジェクトの面的拡大のための基盤構築調査事業（北九州市―ジョホール市連携事業）」

2016年低炭素社会実現のための都市間連携に基づくJCM案件形成可能性調査事業
- 平成28年度「JCM推進に向けたイスカンダル・モデルプロジェクト推進事業（北九州市－IRDA連携事業）」

北九州市 ⇔ 協力関係 LOU ⇔ IRDA（イスカンダル地域開発庁）

蓄積したノウハウの提供

令和２年度 脱炭素社会実現のための都市間連携事業委託業務

活動1 産業共生型のエコタウンの実現に向けた活動

「低炭素社会ブループリント」に示された活動を順調に展開している中、IRDAが次の重要テーマと考えている産業共生とエコタウンの同時実現を目指して、パイロットプロジェクトの組成に向けた調査活動を実施する。中長期（3~7年以内）の事業化を目指す。

活動2 廃棄物発電の実現に向けた活動

「低炭素社会ブループリント」に示された活動を順調に展開している中、IRDAが次の重要テーマと考えている廃棄物発電の実現を目指して、調査活動を実施する。中長期（3~5年以内）のプロジェクトの具体化を視野に入れる。

活動3 JCM適用案件の発掘活動

工場等において設備更新ニーズの高いマレーシアにおいて、イスカンダル地域を中心にマレ工場等における廃熱回収発電、高効率な真空洗浄機、高効率なボイラーやチラー等の導入案件の事業化を目指す。短期間（1~3年以内）の事業化が目標。但し、JCMへの参画（政府署名）のタイミングに留意する。

- 候補案件１：セメント工場の廃熱回収発電の導入
- 候補案件２：電子電機機器工場における高効率洗浄機の導入

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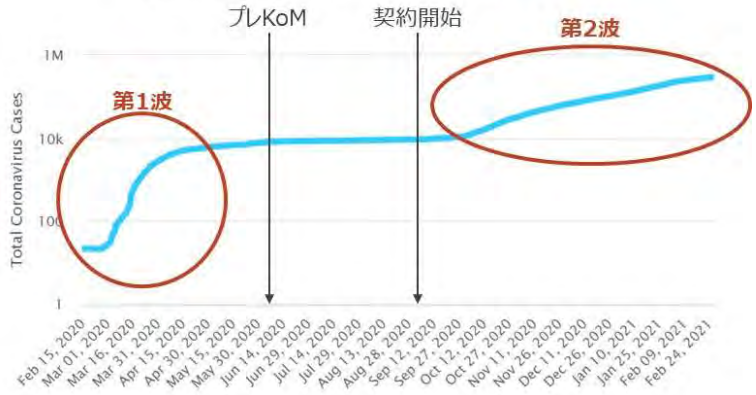
1. 本年度調査事業の概要
（参考）コロナ禍の影響

◆ 2020年10月頃から感染が再拡大した（第2波）ため、2020年度は現地調査を実施できなかった。

◆ 2021年1月には全国を対象とする非常事態宣言が発出（～2021/8/1）。

マレーシア国内の総症例数（累積・対数グラフ）



Source: https://www.worldometers.info/coronavirus/country/malaysia/

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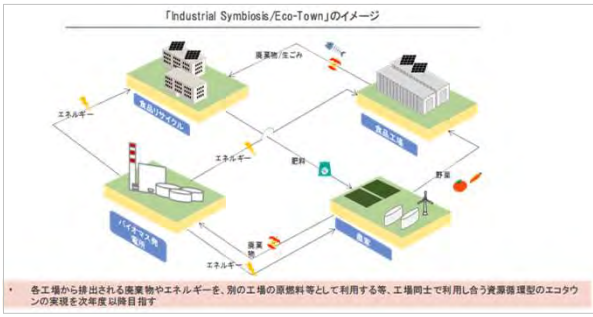
2-1　活動① 産業共生型のエコタウンの実現に向けた活動
活動の概要

◆ 2019年度の事業でIRDAと合意したAction Plan（下表）を実行する。

No.	Activities	IRDA	北九州市	NTTデータ経営研究所
1	工場から廃棄される廃棄物のインベントリー・データの収集	●		
2	インベントリー・データに基づく工場間のマッチング		●	●
3	上記２つの活動と並行した政策支援のあり方（優遇措置や罰則等）の検討	●	●	
4	全体の検討結果を取りまとめたパイロットプロジェクトの企画	●	●	●



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2-1　活動① 産業共生型のエコタウンの実現に向けた活動
インベントリー・データの収集

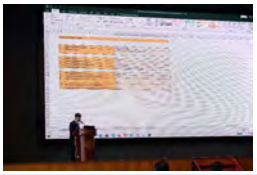
◆ 2020年10月にIRDAが現地でワークショップを実施し、メール等のフォローアップを行った結果、本日までで合計30社からインベントリー・データが提出された。

現地ワークショップ
（Industrial Symbiosis Knowledge Sharing and Survey Workshop）

- 日時　：2020年10月6日
- 場所　：Holiday Villa Hotel, Johor Bahru
- 主催　：IRDA, Invest Johor, マレーシア工科大学（UTA）
- 参加者：現地企業や自治体から100名以上が参加

Time	Programme
9.00 a.m. - 9.30 a.m.	Registration
9.30 a.m. - 10.00 a.m.	Welcoming Remarks - Datuk Ismail Ibrahim, Chief Executive of Iskandar Regional Development Authority (IRDA) Opening Remarks - YB EXCO Tuan Mohd Izhar bin Ahmad, Johor State Chairman of Committee Investment, Entrepreneur Development, Cooperatives and Human Resource
10.00 a.m. - 10.30 a.m.	Break
10.30 a.m. - 1.00 p.m.	Introduction of Industry Symbiosis and Survey Workshop
1.00 p.m. - 2.00 p.m.	Lunch
2.00 p.m. - 5.00 p.m.	Resume of Workshop Knowledge-Sharing and Networking
5.00 p.m.	End





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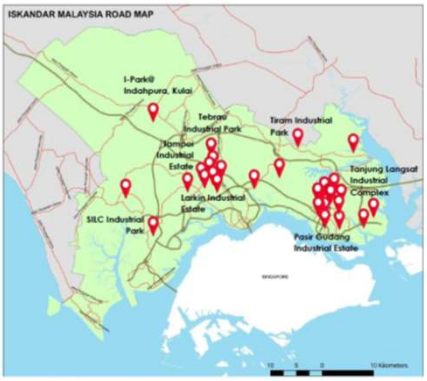
2-1　活動① 産業共生型のエコタウンの実現に向けた活動
（参考）インベントリー・データの提出企業一覧

No.	Company Name	Type of Company
1	L.P. Pacific Films Sdn. Bhd	Paper, Printing & Publishing
2	CEE INDUSTRIES SDN BHD	Fabricated Metal Products
3	TES-AMM (MALAYSIA) SDN. BHD.	Waste Recovery/Recycling
4	IMPACT RANK (M) SDN. BHD.	Plastic Products
5	TAKECHI RUBBER INDUSTRY (M) SDN. BHD.	Rubber Products
6	ARTRON PRECISION MALAYSIA SDN. BHD.	Others
7	MOHM Chemical Sdn Bhd	Others
8	Instruments Technology (Johor) Sdn. Bhd.	Others
9	Clp Industries Sdn Bhd	Chemical and chemical product / Waste recovery
10	Chawk Technology International Sdn Bhd	Electronics & Electrical Products
11	Shima Electronic Industry (Malaysia) Sdn Bhd	Electronics & Electrical Products
12	Perniagaan Saudara Baru	Waste Recovery/Recycling
13	B.M. Nagang Industries Sdn Bhd	Electronics & Electrical Products
14	CHIYODA INTEGRE CO. (JOHOR) SDN BHD	Electronics & Electrical Products
15	CORE PAX (M) SDN BHD	Paper, Printing & Publishing
16	DISK PRECISION INDUSTRIES SDN BHD	Electronics & Electrical Products
17	MATERIALS IN WORKS (M) S/B (WASTE COLLECTION AND UPCYCLING COMPANY)	Waste Recovery/Recycling
18	MUSIM MASTIKA OILS & FATS (M) SDN BHD	Food Manufacturing
19	swancos ind (m) sdn bhd	Chemical and Chemical Products
20	GOLDEN FRONTIER PACKAGING (JOHOR) SDN BHD	Paper, Printing & Publishing
21	BEYONICS PRECISION (MALAYSIA) SDN BHD	Electronics & Electrical Products
22	GORIN TECHNICAL INDUSTRY (MALAYSIA) SDN BHD	Electronics & Electrical Products
23	TYM Electric & Machinery Sdn. Bhd	Machinery & Equipment
24	Teknoware Asia Sdn Bhd	Electronics & Electrical Products
25	Yee Cheong Plastic Manufacturer (M) Sdn Bhd	Plastic Products
26	NIRO CERMIC (M) SDN BHD	Non-Metallic Mineral Products
27	Versa Manufacturing Sdn Bhd	Electronics & Electrical Products
28	GREAT WALL NUTRITION TECHNOLOGIES SDN BHD	Food Manufacturing
29	SNC Industrial Laminates Sdn. Bhd.	Electronics & Electrical Products
30	Sukano Sdn. Bhd.	Plastic Products



※工業団地別の集計

No.	工業団地	調査参加数
1	Pasir Gudang Industrial Estate	12
2	Tampoi Industry Estate	5
3	Tebrau Industrial Estate	3
4	Tanjung Langsat Industrial Complex	2
5	SILC Industrial Park & Nusa Cemerlang Industrial Park	2
6	Tiram Industrial Park & Ulu Tiram	2
7	Larkin Industrial Estate	1
8	Kempas Utama Industrial Park	1
9	I-Park @ Indahpura, Kulai	1

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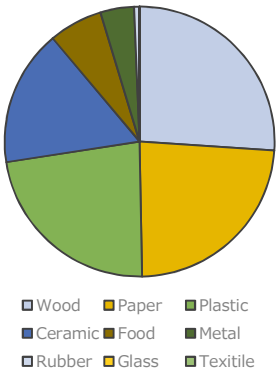
2-1　活動① 産業共生型のエコタウンの実現に向けた活動
インベントリー・データの分析（Non-Scheduled Waste）

- ◆ 産業廃棄物のうち、有害性のないNon-Scheduled Wasteの多くは、**すでにリサイクルが行われていた**。
- ◆ 一方で、排出後にそのまま埋立処分されている廃棄物も一定量あることが確認できた。

調査した工場からのNon-Scheduled Waste発生量（トン/年）



特に発生量の多いNon-Scheduled Wasteのリサイクル率

廃棄物の種類	年間発生量（トン）	リサイクル率（%）
木質系廃棄物	2,874	71.7
紙質系廃棄物	2,609	91.6
プラスチック系廃棄物	2,522	90.1
セラミック系廃棄物	1,800	0

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2-1　活動① 産業共生型のエコタウンの実現に向けた活動
適用可能な技術（Non-Scheduled Waste）

◆ 特に発生量の多い廃棄物のうち、リサイクルが行われず、埋立処分されているものに対して、日本国内の事業者の持つ技術を活用できないか、調査・検討を行った。

工場間でマッチングが想定される廃棄物

廃棄物の種類	排出工場 ⇒ 利用工場（P.9の番号で記載）	活用技術
木質系廃棄物 紙質系廃棄物	#3,15,23,24 ⇒ #20	#20の工場は、バイオマスボイラで蒸気を発生させ、段ボール箱の生産ラインの動力源の一部として活用している。
プラスチック系廃棄物	#3,4,10,17,30 ⇒ #30, etc.	種類ごとに分別することができれば、様々なプラスチック製品の再生原料として利用可能と考えられる。

マッチングは難しいものの、リサイクル可能な廃棄物

廃棄物の種類	活用技術
食品系廃棄物	北九州市内の企業（ウエルクリエイト）の持つ食品残渣のたい肥化技術の活用が考えられる。
セラミック系廃棄物	視認性向上、雨天時の転倒防止のための路面の舗装材としての活用が考えられる。 （福岡県内に技術を持つ事業者あり）

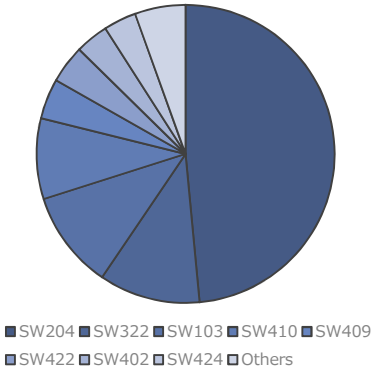
Source: https://www.well-c.co.jp/merrys, https://jp.toto.com/company/csr/environment/resources/manufacture.htm

2-1　活動① 産業共生型のエコタウンの実現に向けた活動
インベントリー・データの分析（Scheduled Waste）

◆ 化学産業、金属加工等が盛んなイスカンダル地域では、有害性のあるScheduled Waste（以下SW）も、一定量排出されており、その多くはサーマル/ケミカルリサイクルされている。

◆ イスカンダル地域には20社以上のSWのリサイクル企業があることが判明した。

調査した工場からのScheduled Waste発生量（トン/年）



特に発生量の多いScheduled Wasteのリサイクル率

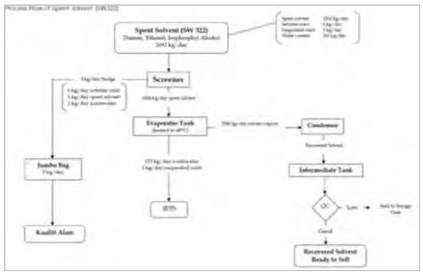
	分類	年間発生量（トン）	リサイクル率（%）
SW204	スラッジ	3,289	0
SW322	溶剤	744	100
SW103	電池	720	100
SW410	その他	594	2.7
SW409	その他	296	3.7
SW422	その他	280	100
SW402	アルカリ	244	100
SW424	その他	240	100

2-1　活動① 産業共生型のエコタウンの実現に向けた活動
現地のリサイクル技術の分析（Scheduled Waste）

◆ 有害性のあるSWの回収・処分は許可制となっており、IRDA経由でジョホール州で許認可を受けている事業者3社とコンタクトを取ることができた。
- Southern Strength (M) Sdn Bhd
- Vast Group Sdn Bhd
- Pentas Flora (Johor Bahru) Sdn Bhd

◆ うちSouthern Strength社から**リサイクル処理フローに関する詳細資料を入手**したため、北九州市内の企業の協力のもと、技術的な詳細分析を行い、産業共生のモデル事業を見据えた、より高効率なリサイクル方法の導入可能性等について検討した。

現地のリサイクルフロー（一例・SW322）



Source: Southern Strength (M) Sdn Bhd

主なリサイクル品目

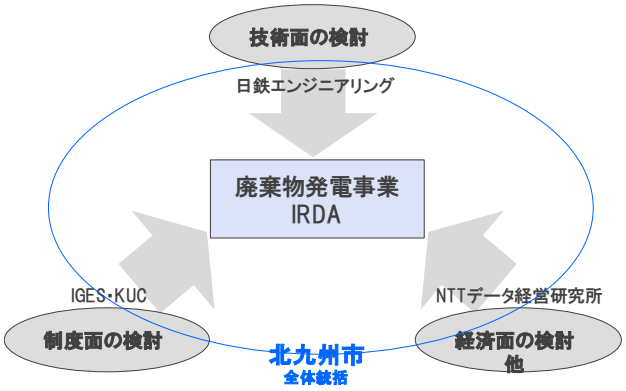
廃棄物の種類	日別処理量(kg)	リサイクル率(%)
油性廃棄物	12,937	51.4%
使用済み溶剤	8,492	42.8%
汚染土	1,504	34.0%

目次

2-2　活動② 廃棄物発電の実現に向けた活動
活動の概要

◆ IRDAが次の重要テーマとして考えている廃棄物発電の実現に向けて、技術、制度、経済の各側面から調査活動を行う。

検討体制イメージ



2-2　活動② 廃棄物発電の実現に向けた活動
想定される廃棄物発電事業の概要

◆ イスカンダル地域の位置するジョホール州では、都市ごみの管理は連邦政府によって行われているため、廃棄物発電の導入も連邦政府によって決定される。

◆ ジョホール州では、2020年にBukit Payongで廃棄物発電事業の入札が開始されたため、入札書類を入手し、分析を行った。

「固形廃棄物・公共清掃管理法（Act 672）」（2007）
(the Waste Management and Public Cleansing Management Act)

Act 672を順守している州	Act 672を順守していない州
連邦政府の指定したコンセッション企業によって固形廃棄物の回収・公共清掃事業が行われる。	**地方自治体自身**が、あるいは委託された民間業者が、固形廃棄物の回収・公共清掃事業を行う。
左記以外の11州 （イスカンダル地域のあるジョホール州も含まれる）	Pulau Pinang Selangor Selangor Perak

Bukit Payungの入札書類

- 技術提供者は、現地企業と**JVを組む**必要がある
- **民間事業者にリスクが大きい**
  （提案に必要な現地情報（廃棄物の発生源、組成、日別の収集量 等）の収集を独自に行う必要がある）
- **処理費（Gate fee）を自ら設定**する必要がある。また、運用が失敗した場合の**ペナルティ**等も設定される。

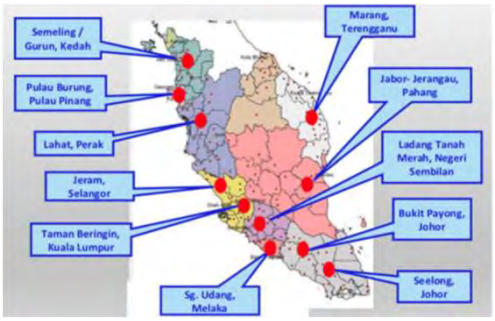
⇒IRDAの想定する廃棄物発電施設（Seelong最終処分場隣接地）でも同様の入札条件が課される可能性が高いと考えられる。

Source: Request for Proposal (RfP) of Waste-to- Energy PPP Project at Bukit Payong, Batu Pahat, Johor

2-2　活動② 廃棄物発電の実現に向けた活動
（参考）連邦政府の廃棄物発電候補サイト一覧

◆ 住宅自治省（KPKT）は、従来の最終処分場中心の処理方法をフェーズアウトし、代替処理方法に移行する意向であり、2025 年までにマレーシア全土で6ヵ所、将来的には各州に少なくとも1つの廃棄物発電施設を導入する方針。

No.	州	候補サイト	現状の受入量（トン/日）
1	Kedah	Semeling Landfill, Gurun	450
2	Pulau Pinang	Pulau Burong Landfill, Seberang Prai	2,000
3	Perek	Lahat Landfill, Ipoh	650
4	Selangor	Jeram Landfill, Klang	3,000
5	Kuala Lumpur	Taman Beringin Transfer Station	2,300
6	Melaka	Sungai Udang Landfill	900
7	Terengganu	Marang Landfill, Marang	100
8	Pahang	Jabor-Jerangau Landfill, Kuantan	500
9	Negeri Sembilan	Tanah Merah Landfill, Port Dickson	585
10	Johor	Bukit Payung Closed Landfill, B. Pahat	287.5
11	Johor	Seelong Landfill, Johor Bahru	3,164



最新のSWM Environmentへのインタビューでは、1,800～2,000トンとのことだった

Source :国家固形廃棄物管理局(JPSPN, 2o2o)、The Malaysian Reserve(https://themalaysianreserve.com/2021/01/04/malaysias-wte-construction-remains-challenging/)

2-2　活動② 廃棄物発電の実現に向けた活動
現地コンセッション企業とのコンタクト

◆ IRDAからの紹介で、マレー半島南部のコンセッション事業を連邦政府から委託されているSWM Environment Sdn. Bhd. とコンタクトを取ることができた。

SWM Environment Sdn. Bhd.
(SWM Environment)

- 1997年設立
- マレー半島南部のMelaka、Negeri Sembilan、Johor各州の計27自治体、510万人以上の人々に対して、コンセッション事業を展開
- 8,000人以上のスタッフ、1,600台以上の収集車を管理
- 非家庭部門（ICI= institutions, commercial and industrial sectors）にも廃棄物収集サービスを展開
- IRDAの廃棄物発電候補地である**Seelong最終処分場を管理**
- 連邦政府が発表した**廃棄物発電計画への参入に意欲**を示している

Source: SWM Environment Sdn. Bhd.

2-2　活動② 廃棄物発電の実現に向けた活動
計画ごみ質

◆ IRDAより処理対象ごみのごみ質データを入手できなかったため、岡山大学大学院環境学研究科の藤原健史教授らの研究グループにより2011年及び2013年に実施された、Seelong最終処分場のごみ質調査結果を転用し、本検討の基準ごみとして設定した。

計画ごみ質

項目		単位	基準
低位発熱量		kcal/kg	1,591
三成分	水分	wet%	56.90
	灰分	wet%	8.20
	可燃分	wet%	34.90
化学組成	炭素 (C)	wet%	18.90
	水素 (H)	wet%	2.70
	酸素 (O)	wet%	12.67
	窒素 (N)	wet%	0.39
	硫黄 (S)	wet%	0.05
	塩素 (Cl)	wet%	0.19

注）ごみの化学組成の各割合は、その和が可燃分組成割合と等しくなるように、日鉄エンジニアリングにて補正を行った。

Source: Norbaizura, Siti, M.R. & Fujiwara, Takeshi (2013). Characterization of Household waste in Iskandar Malaysia and its Suitability for Alternative Waste Handling Methods.『土木学会論文集G（環境）』Vol.9, No.5 : I_209-I_216. 掲載のデータを基に日鉄エンジニアリングが作成

2-2　活動② 廃棄物発電の実現に向けた活動
制度面の検討

◆ 廃棄物発電施設の検討に必要なマレーシアの環境基準について調査した。

排ガス基準

項目	単位	基準値
酸素濃度	%	11
ばいじん	mg/Nm³	100
塩化水素 (HCl)	mg/Nm³	40
フッ化水素 (HF)	mg/Nm³	1
一酸化炭素 (CO)	mg/Nm³	50
二酸化硫黄 (SO2)	mg/Nm³	50
窒素酸化物 (NOx)	mg/Nm³	200
水銀 (Hg)	mg/Nm³	0.05
カドミウム (Cd)、タリウム (Tl)	mg/Nm³	合計 0.05
鉛 (Pb)、他の重金属合計	mg/Nm³	合計 0.5
PCDD PCDF	ng-TEQ/Nm³	0.1

Source: 環境質法（大気）規制 (Environmental Quality (Clean Air) Regulations, 2014)

注）廃棄物発電施設に適用される騒音・振動基準及び臭気基準は未整備である。
従い、本検討では、日本と同水準の基準値を前提に施設仕様を決定した。

排水基準

項目	単位	A 基準 1)	B 基準 1)	浸出液 2)
温度	℃	40	40	40
pH	-	6.0-9.0	5.5-9.0	6.0-9.0
BOD (20℃)	mg/L	20	50	20
COD	mg/L	120	200	400
浮遊固体	mg/L	50	100	50
水銀	mg/L	0.005	0.05	0.005
カドミウム	mg/L	0.01	0.02	0.01
六価クロム	mg/L	0.05	0.05	0.05
三価クロム	mg/L	0.20	1.0	0.20
ヒ素	mg/L	0.05	0.10	0.05
シアン化物	mg/L	0.05	0.10	0.05
鉛	mg/L	0.10	0.5	0.10
銅	mg/L	0.20	1.0	0.20
マンガン	mg/L	0.20	1.0	0.20
ニッケル	mg/L	0.20	1.0	0.20
スズ	mg/L	0.20	1.0	0.20
亜鉛	mg/L	2.0	2.0	2.0
ホウ素	mg/L	1.0	4.0	1.0
鉄	mg/L	1.0	5.0	5.0
銀	mg/L	0.1	1.0	0.10
アルミニウム	mg/L	10	15	-
セレン	mg/L	0.02	0.5	0.02
バリウム	mg/L	1.0	2.0	1.0
フッ化物	mg/L	2.0	5.0	2.0
ホルムアルデヒド	mg/L	1.0	2.0	1.0
フェノール	mg/L	0.001	1.0	0.001
遊離塩素	mg/L	1.0	2.0	-
硫化物	mg/L	0.50	0.50	0.50
油	mg/L	1.0	10	5.0
アンモニア性窒素	mg/L	10	20	5
色素	ADMI	100	200	100

Source:排水に係る基準値（環境質法（排水）規制（Environmental Quality (Industrial Effluent) Regulations 2009）及び環境質法（固形廃棄物の中継基地及び埋立処分場の汚染管理）規制（Environmental Quality (Control of Pollution from Solid Waste Transfer Station and Landfill) Regulations 2009)

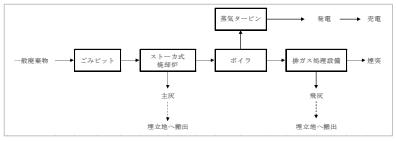
2-2　活動② 廃棄物発電の実現に向けた活動
技術面の検討（1/2）

◆ IRDAからの情報共有や現地関係者へのヒアリングから、前提条件（計画ごみ処理量、計画ごみ質 等）を整理した。

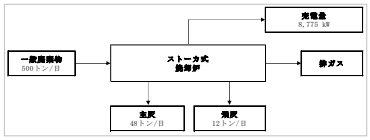
事業費算出のための前提条件

項目	前提条件	備考
適用技術	ストーカ炉式廃棄物発電施設	-
事業期間	20年（本施設の運営期間）	建設期間は３年間 （半年間の試運転を含む）
処理能力	500トン/日	IRDAと相談の上決定、1系列
年間稼働可能日数	333日/年 (8,000時間/年)	-
蒸気条件	430℃、52 barA	-
売電可能量	70,130 MWh/年	発電量から所内動力を差し引いた値
建設用地	シーロン最終処分場の隣接地	土地の造成工事等は含まない

ごみ処理基本フロー



概略物質フロー



NTT DATA

2-2　活動② 廃棄物発電の実現に向けた活動
技術面の検討（2/2）

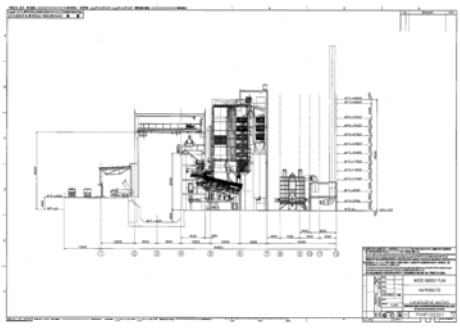
◆ 前項までの内容をもとに、事業費（概算）の試算を行った。

建設費（概算）

項目	合計（億円）
プラント部門	59.0
土建部門	18.0
合計	77.0

運転・維持管理費（概算）

項目	合計（億円）
人件費	1.2
点検補修費	2.4
用役・維持費など	2.5
合計	6.1



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2-2　活動② 廃棄物発電の実現に向けた活動
経済面の検討

◆ これまでの検討結果を基に、事業性の分析・評価を行った。

その他の前提条件

項目	条件	備考
契約期間	24年	• 半年間の試運転を含む3年間の建設期間 20年間の運転期間 • 1年間で閉鎖 （閉鎖の費用は今回は積算対象外とする）
減価償却	約5.1億円	15年間にわたり、定額法により減価償却を行う
法人税	24%	
想定金利	年率1.5%	
インフレ率	年率1%	O&Mコスト、tipping fee、売電価格に反映
為替	1RM=26JPY	
FIT	0.35RM	

処理費=4000Yen/t

IRR	10Year	15Year	20Year
補助金なし	-13%	-5%	**1%**
補助金10%	-11%	-2%	**3%**
補助金20%	-7%	0%	**5%**
補助金30%	-4%	3%	**7%**

処理費=5000Yen/t

IRR	10Year	15Year	20Year
補助金なし	-8%	0%	**4%**
補助金10%	-5%	2%	**6%**
補助金20%	-2%	5%	**8%**
補助金30%	2%	8%	**10%**

処理費=6000Yen/t

IRR	10Year	15Year	20Year
補助金なし	-3%	4%	**7%**
補助金10%	0%	6%	**9%**
補助金20%	3%	9%	**11%**
補助金30%	7%	12%	**14%**

※活動③の成果には関係者外秘の情報が含まれるため
報告書上は割愛させていただく

目次

3. 今後の展開

◆ 2021年度（3か年計画の3年目）に向けた検討方針は以下の通り。

活動	2020年度の成果・課題	2021年度の検討方針
活動① 産業共生型のエコタウンの実現に向けた活動	**成果** • インベントリーデータの収集・分析、リサイクル技術のマッチングを行った。 **課題** • コロナ禍による活動制限で、現地プレーヤーも工場等へ訪問しての調査が難しく、データのボリュームが小さくなってしまった。	• 産業廃棄物のうち、未だリサイクルされていないもの、正規のリサイクルルートに乗っていないものを中心に、産業共生のモデル事業を検討する。 • 既存のリサイクル事業者に対して、日本国内企業の優れたリサイクル技術が適用できないか検討・調査を行う。
活動② 廃棄物発電の実現に向けた活動	**成果** • 廃棄物発電事業の検討に必要な情報を入手し、事業費の概算を行った。 • 現地のコンセッション企業（SWM Environment）とコンタクトを行った。	• 政府の廃棄物発電導入政策の動向をウォッチしつつ、現地企業（SWM Environment）等との連携により精密な検討基礎データ（ごみ量・ごみ質等）を入手するほか、地域ニーズを反映させた、最適な廃物発電施設の導入検討を行う。 • SWM Environmentとは、食品廃棄物のバイオガス化など、廃棄物発電以外の連携の可能性についても検討する。
活動③ JCM適用案件の発掘活動	**成果** • コロナ禍で現地調査ができない中でも、新規の案件を発掘した。	• マレーシアがJCMに署名次第、JCM設備補助事業申請に向けた準備を進める。

3. 今後の展開
（参考）リモート調査に関する検討

◆ 現地渡航ができない場合に、北九州市内の企業の技術を活用して、各工場の廃棄物の発生状況や、現地の最終処分場などを直接確認することも、次年度以降検討していきたい。