FY2021 Project for Ministry of the Environment Japan

FY2021
City to City Collaboration for Zero-carbon Society

Promotion of Carbon-Free Society in Iskandar Regional Area (Phase 3) (City of Kitakyushu-Iskandar Regional Development Authority Collaboration Project)

Report

March 2022

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 calls for accelerating climate change by nongovernmental entities, including municipalities and cities, in addition to the central government, and the "Online Conference" on Recovery from the New Coronavirus and Climate Change and Environmental Measures held in September 2020 was a key event in this regard. The "Platform" ministerial-level meeting also confirmed the need for local government decarbonization policies for activities directly related to communities and the importance of a local community-led development approach. In Japan, too, the goal of a decarbonized society by reducing overall greenhouse gas emissions to zero by 2050 has been declared, and the number of municipalities declaring virtually zero CO2 emissions has skyrocketed to more than 300.

As described above, the role of cities and municipalities in considering and implementing specific local climate change measures and projects is becoming increasingly important. 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, especially in Asia, where economic growth is remarkable, and there is a growing international movement to support cities' efforts toward decarbonization and low-carbon cities, which are places of activity that support socioeconomic development. The number of companies that are currently in the process of developing their own business models is increasing.

In addition, under the current situation of the spread of the novel coronavirus, cities are being forced to readjust and consider new measures to achieve sustainable development while dealing with challenges related to the spread of the virus, and it is extremely important to build new methods and new cities through collaboration among cities.

In light of the above, this project aims to develop a new approach and new cities through collaboration between Kitakyushu City and the Iskandar Regional Development Authority (IRDA), both of which have experience and expertise in the formation of decarbonized societies, and to develop a new approach for the realization of a decarbonized society as well as a new approach for the creation of new cities that can achieve sustainable development. The project will conduct research to support efforts by overseas municipalities, etc. to form a decarbonized and low-carbon society, realize a decarbonization domino, and introduce facilities that contribute to the formation of a decarbonized and low-carbon society, targeting the realization of eco-towns that are symbiotic with industry and that also contribute to reductions in waste-to-energy.

(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: Activities to realize an eco-town with industrial symbiosis
- Activity 2: Activities to realize waste-to-energy generation
- Activity 3: Proposal for a decarbonization action plan (tentative name)
- Activity 4: Identification of 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	Feasibility study of advanced treatment of designated waste already being recycled	Conduct an evaluation study to determine if advanced treatment is possible by combining technologies of Japanese companies for designated wastes that are already being recycled. If more

		advanced treatment is possible than the current treatment, a study will be conducted with an eye toward collaboration between Japanese companies and local waste treatment/recycling companies (establishment of JVs or SPCs).
②	Study the feasibility of using wood, paper, and plastic wastes that are disposed of in landfills as raw fuel at another plant	In cooperation with the Iskandar Regional Development Authority (IRDA), explore the possibility of using wood and paper waste and plastic waste, which are disposed of in landfills, as raw fuel at other plants in the Iskandar region.
③	Feasibility study on conversion of landfilled food wastes and ceramic wastes into raw fuel	Explore the possibility of collaboration with Japanese companies that have technology to utilize raw fuel for food and ceramic wastes that are currently disposed of in landfills.
④	Feasibility study of introducing renewable energy to industrial parks	Through meetings with local operators in Malaysia who have expertise in introducing renewable energy, etc., the possibility of introducing renewable energy in an eco-town with industrial symbiosis will be examined.

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

	The activity item	What's in the activity?
①	Confirmation of the progress of the waste-to-energy project in Johor, Malaysia	Information on the ongoing waste power generation project in Johor, including the contractor selection process and the status of facility construction, will be collected and utilized for consideration of future waste-to-energy projects in the Iskandar region.
②	Investigation of possible collaboration with local companies	Continue discussions with local concessionaire SWM Environment Sdn. Bhd. and others to explore possible future collaboration on waste-to-energy and other business opportunities.

(3) - 3. Activity 3: Proposal for a decarbonization action plan

Given that this is the final year of the three-year plan, we will summarize our past activities in collaboration with IRDA and compile an action plan (action plan) for future decarbonization efforts.

(3) - 4 Activity 4: Identification of JCM-applicable projects

While keeping an eye on the timing of Malaysia's participation in JCM, if possible, we will proceed with the materialization of the projects identified in FY2020. In addition, we will continue to identify projects by utilizing the local networks we have established.

(4) Performance period

August 31, 2021 to March 10, 2022

(5) 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, 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
Iskandar Regional Development Authority(IRDA)	・ Collection of inventory data on waste discharged from factories Collection of local information on waste power generation

(6) Study schedule

The three-year business plan envisioned for this project is shown in Figure 1. This year is the third of the three-year period.

Note that the activities of the government and companies were restricted in Malaysia due to the spread of the new coronary disease, and activities that were possible within the limits of the restrictions were carried out.

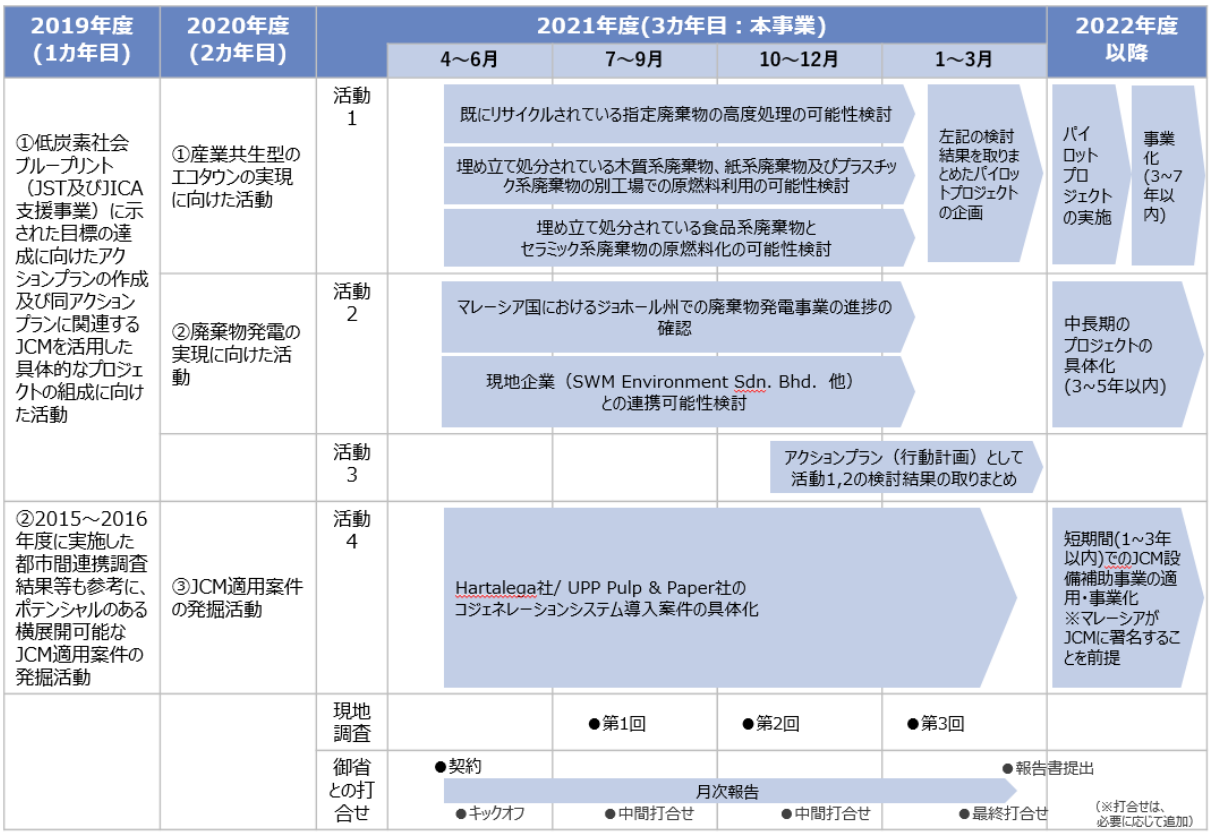

Fig. 1 Tentative study schedule

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.

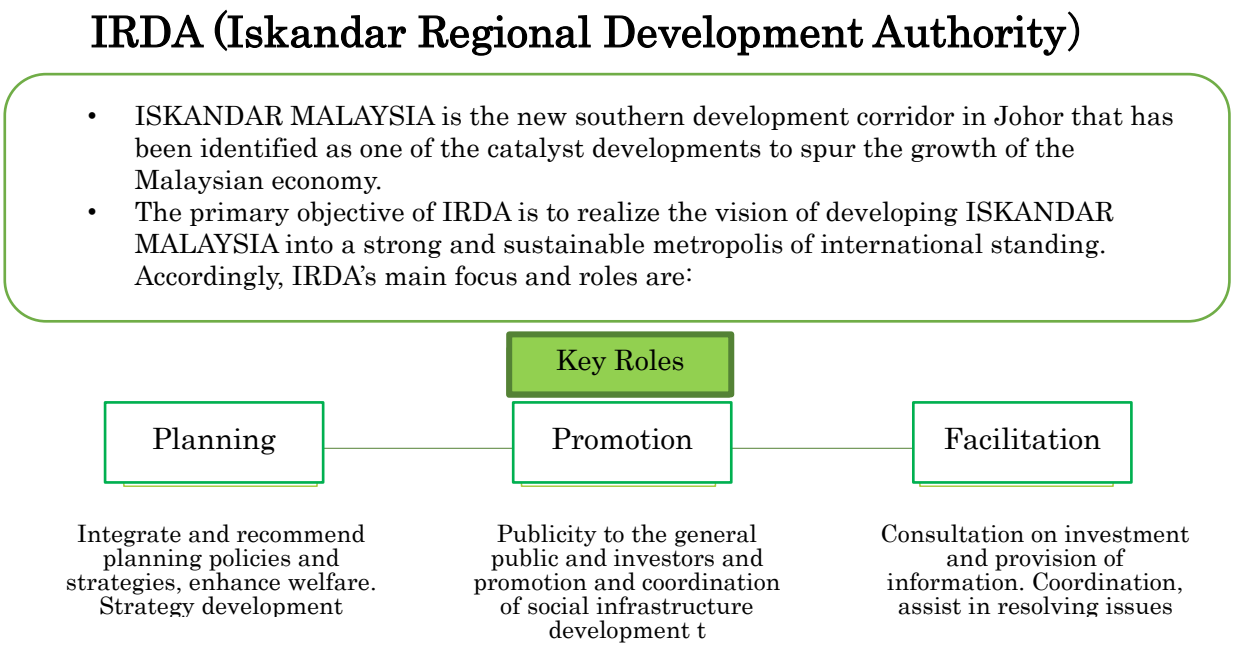

Fig. 2 Functions of the Iskandar Regional Development Authority[1]

(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

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

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

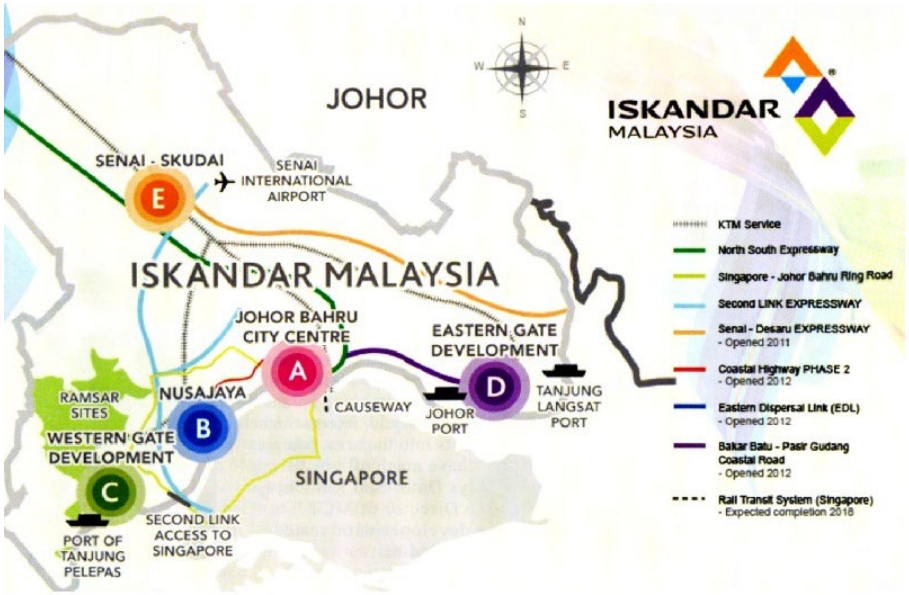

Fig. 3 Map of the Iskandar Development Region[2]

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

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

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 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

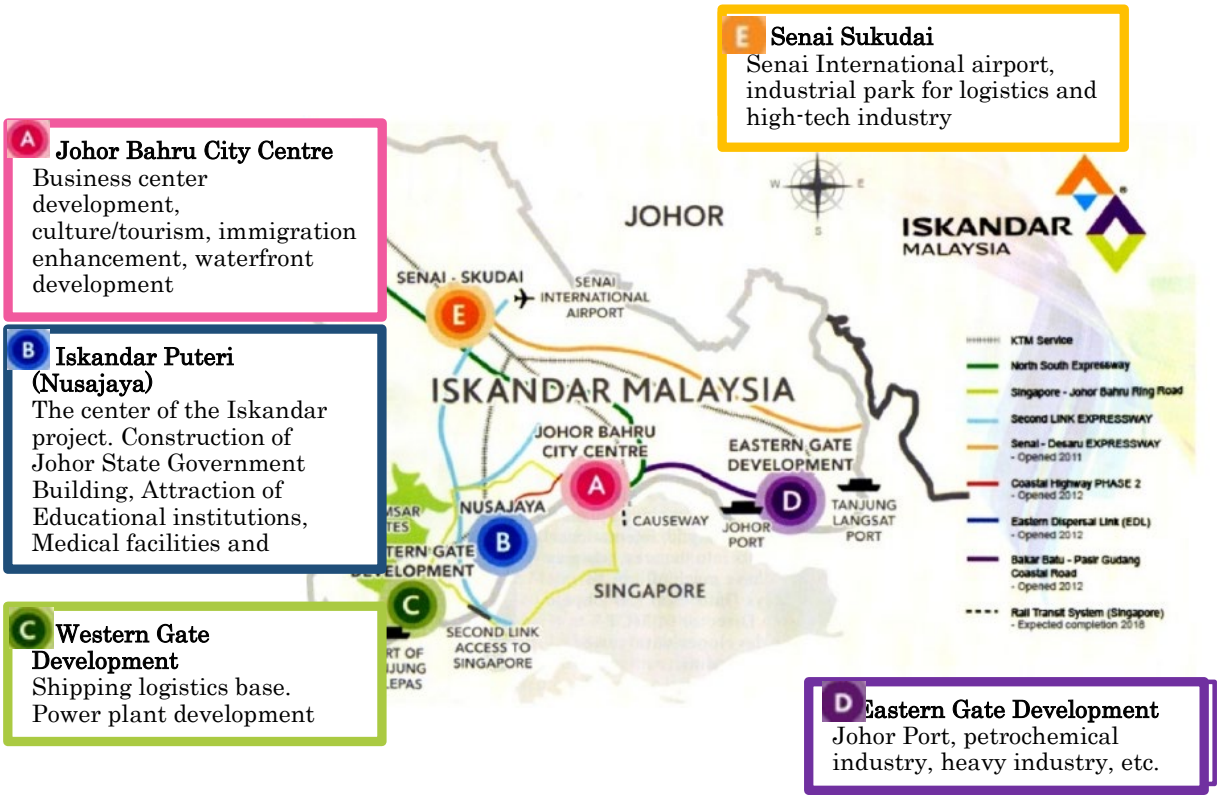

Fig. 4 Characteristics of the Iskandar Development Region's flagship zones

(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) Environmental Administration in Malaysia

Prior to the 2018 general elections, ministries dealing with environmental and climate change issues included the Ministry of Natural Resource and Environment and the Ministry of Energy, Green Technology and Water (The Mahathir administration, formed in May 2018, merged them into the Ministry of Energy, Green Technology, Science, Environment and Climate Change (Ministry of Energy, Green Technology, Science and Climate Change (MEGTSCC), a new ministry responsible for environment and climate change, waste management (designated garbage), and social experimentation.

The Muhyiddin administration, which came to power in March 2020 after a realignment of the ruling and opposition parties, reorganized the ministries again, with the Ministry of Science, Technology and Innovation (MSTI) and other ministries operating independently of

MEGTSCC. The The Ismail Sabri administration that subsequently came to power in August 2021 has not renamed or reorganized any ministries from the previous administration.

(2) Efforts in the Environmental Sector under the 12th Malaysia Plan

(Summary)

In September 2021, Malaysian Prime Minister Ismail Sabri announced the 12th Malaysia Plan (12MP) (2021-25), a new five-year plan for national development. The three major objectives of the Plan are as follows.

(1) To create a prosperous, inclusive, and sustainable Malaysia

(2) Economic revitalization under the Corona

(iii) Laying the foundation to position Malaysia as a country with high technological and economic power.

It is also positioned as "the first five years of the Shared Prosperity Vision 2030" and "the final reform within the National Recovery Plan.

(Scheme)

Three pillars of the plan and four supporting policies are presented, and 14 game changers have been established for each.

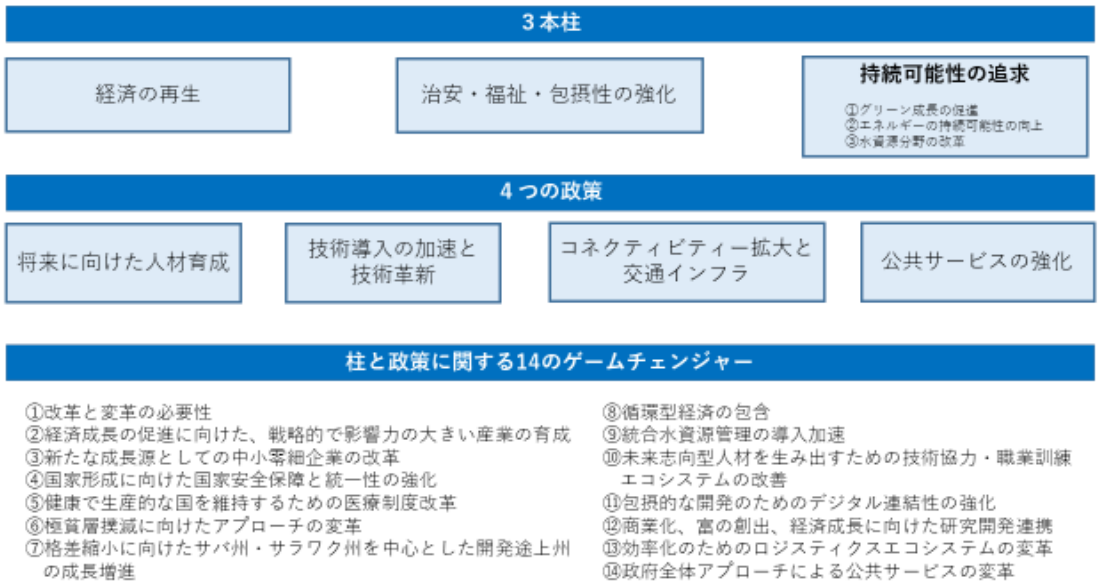

Figure 5 Overall picture of the 12th Malaysia Plan

(Theme 3: Pursuit of Sustainability)

The pursuit of sustainability not only promotes continued economic growth and improved quality of life, but also preserves the environment and natural resources. It is also important to understand that economic development does not necessarily have negative impacts on the environment or result in unsustainable use of natural resources.

Therefore, Theme 3 sets forth three strategies. Promote green growth to enhance

sustainability and resilience in the country, in light of recent global trends such as the shift toward sustainable economic activities and lifestyles. Energy and water resources will be managed holistically and sustainably, taking into account the balance between supply and demand. These three strategies to achieve Theme 3 complement Themes 1 and 2.

I. Promoting Green Growth

To promote green growth, society as a whole must share the responsibility of transitioning to a low-carbon society, as well as properly manage natural resources and equally share the benefits derived from them. It is also important to accelerate the formation of a circular economy, which will not only generate more responsible business and investment, but also expand green markets and generate new business opportunities.

(→ Game Changer 8: Inclusion of the Circular Economy)

<Indicators>

Reduce greenhouse gas emission intensity to GDP to 45% of 2005 levels by 2030.

Increase the percentage of green procurement by the government to 25

Increase the percentage of land and inland water conservation to at least 20

Increase the percentage of coastal and marine areas to at least 10%.

Introduce legislation on disaster risk management

II. Improving Energy Sustainability

Improving energy sustainability requires adequate supply of energy and related infrastructure, as well as proper addressing of the energy trilemma problem (3E problem). To this end, a comprehensive national energy policy should be developed that integrates existing energy-related policies and provides a framework for addressing various issues in the energy sector. In addition, the use of renewable energy as an alternative energy source should be expanded, focusing on the demand side.

<Indicators>

Introduce a comprehensive domestic energy policy.

Increase the share of renewable energy to 31%.

III. Reform of the water resources sector

The highest priority for Integrated Water Resources Management (IWRM) will be to achieve the government's long-term goals of water resource management efficiency, wealth creation, and job security. (→ Game Changer 9: Accelerating the adoption of Integrated Water Resources Management) To this end, the focus will be on strengthening water resources governance and sustainable financial conditions.

<Indicators>

Increase the percentage of people with access to clean and safe water to 98% in rural areas.

(Consideration of a carbon tax on businesses)

In presenting the 12th Malaysia Plan to the Parliament, Prime Minister Ismail Sabri said, "We aim to achieve virtually zero carbon emissions by 2050 at the earliest. Detailed decarbonization policies will be announced after the completion of the long-term review of low-carbon development strategies at the end of 2022. In addition to a carbon tax, the government is also considering the introduction of a domestic emissions trading scheme (DETS) as an economic policy (carbon pricing).

Although reliable CO2 data is necessary for implementation, it will be difficult to realize this as an immediate policy since many companies are currently only at the Scope 1 (source adjustment) and Scope 2 (identification of some indirect emissions) stages, and few have reached Scope 3 (identification of all CO2 emissions in the value chain).

(Penang Institute's Forecasts and Proposals)

If applied to the electricity, transportation, oil, and gas sectors, the carbon tax would cover more than 70% of annual domestic CO2 emissions. It is also proposed that the initial price of the carbon tax be set at RM35/tCO2 and increased to RM150/tCO2 by 2028. Furthermore, the introduction of the carbon tax is projected to increase annual revenue by RM218 to 246 specie over the next 10 years.

(2) Efforts to reduce greenhouse gas emissions (Green Technology)

In 2009, the Malaysian government established the "Green Technology Policy" based on the belief that green technology will drive economic growth and sustainable development. The policy designates four core areas of green technology: energy, buildings, wastewater and waste, and transportation.

In its National Green Technology Master Plan, the Malaysian government has set a target of 1.5% of GDP (RM60 billion) to come from green businesses by 2030 by promoting the adoption of these green technologies. The goal is to make up a portion of the total.

(National Energy Policy)

The main renewable energy-related policy initiatives in Malaysia are as follows.

Malaysia's basic energy policy aims to "develop the economy through secure and cost-effective energy supply and promotion of efficient energy use" in the 11th National Five-Year Plan (2016-2020), with the goals of "reducing unproductive consumption" and "minimizing environmental additions. In addition, of the budget categorized by the seven strategies in the plan, RM4,342 million (4.9% of the total) has been allocated to "Pursuing green growth for sustainability and resilience".

The main policies related to renewable energy in Malaysia are shown in Table 3. A feed-in tariff (FIT) system was established under the Renewable Energy Act released in 2011 to

promote the use of renewable energy in order to maintain domestic energy production. The 12th Malaysia Plan in the table is scheduled to be submitted to the National Assembly by March 2021 due to the economic uncertainty caused by the Corona disaster. Currently available information indicates that the plan will focus on "economic empowerment" (creation of new sources of growth such as digital and aerospace industries), "environmental sustainability" (green technology, renewable energy, climate change adaptation and mitigation, etc.), and "economic growth and development" (economic development, economic growth and development, etc.). The plan will combine three aspects of "social reengineering" (increasing people's purchasing power, strengthening social security networks, improving people's well-being, etc.).

Table 3 Malaysia's line of policy on renewable energy[5]

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.

[5] 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

Solar power, for example, carries a premium price with no degression rate, creating advantageous conditions for companies producing in Malaysia.

Table 4 Renewable energy deployment (installed capacity, unit: MW)[6]

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[7]

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**

The FIT system will be abolished in 2019, and NEM (Net Energy Metering) is being introduced as its successor. Under this system, electricity generated by solar panels installed on the roofs of buildings is first consumed by the installers themselves, and then the power company purchases the surplus. The NEM 3.0 scheme, which runs from 2021 to 2023, includes three different schemes: one for households, one for the government and its agencies, and one for commercial and industrial use.

[6] Prepared by NTT Data Institute of Management Consulting, Inc. based on data from SEDA's website (http://seda.gov.my/?omaneg=0001010000000101010)
[7] Ministry of Energy Green Technology and Water : National Renewable Energy Policy &Action Plan

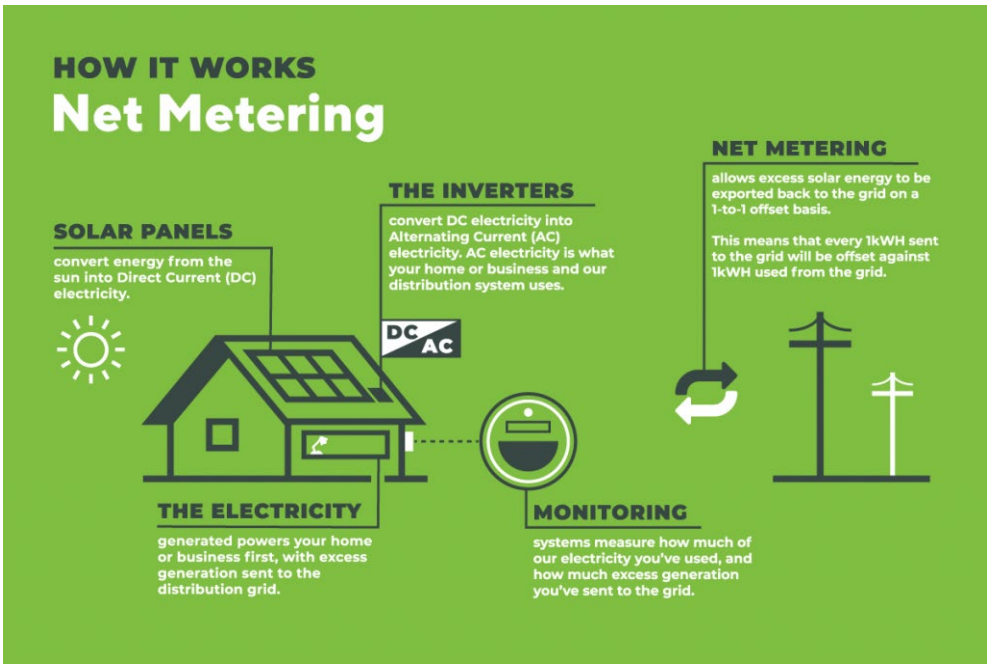

Figure 6: Diagram of the NEM System

	Rakyat Domestic	GoMEn Government Buildings	NOVA Commercial, Industrial, Agriculture and Mining Buildings
Quota Allocation	100 MW	100 MW	600 MW
Mechanism (Roll-over)	1:1 (12 Months)	1:1 (12 Months)	Average SMP (1 Month)
Offer Period	until 31st Dec 2023	until 31st Dec 2023	until 31st Dec 2023
Offset Rate	Prevailing Gazetted Energy Rate	Prevailing Gazetted Energy Rate	Average System Marginal Price (SMP)
Offset Period	10 Years	10 Years	10 Years
Condition after 10 years	Self-Consumption (SelCo)	Self-Consumption (SelCo)	Self-Consumption (SelCo)
Capacity limit	Single Phase : 4kWac Three Phase : 10kWac	1 MWac	Nett offset : 1MWac Nett offset + Virtual aggregation : 5MWac
Eligibility	TNB registered consumer under domestic tariff	Goverment agencies under commercial tariff	Non-domestic account holder

Figure 7 Scheme in NEM3.0

(Green Technology Financing Scheme)

The program is designed to encourage producers and users of environmental technologies and green energy providers to incorporate environmental elements into specific projects related to six areas. The government will subsidize 2% of the interest rate for the first seven years and guarantee 60% of the environmental loans received from financial institutions. The GTFS 2.0 will only cover environmental technology or environmental-related costs financed by participating financial institutions and banks.

The program was launched in 2010 and is still ongoing. Certified companies can be found on the official website, but as it has not been updated since August 2017, it may have ceased to function as GTFS 2.0. The program will continue for two years until 2022 as GTFS 3.0 with a total loan amount of RM2 billion; details of GTFS 3.0 are yet to be determined, but it is expected to be similar to GTFS 2.0.

<Examples by field>

(1) Energy: Construction and operation of biomass plants and production of energy efficient products

(2) Water: Recycling of batteries, clothes, and furniture, plastic bag reduction projects

(3) Buildings and cities: Construction of buildings with low heat transmissivity, installation of high-efficiency air conditioning systems

4) Transportation: Bioenergy generation from grain, production of hydrogen and electric vehicles

(5) Waste: Recycling business, fertilizer production from waste

(6) Manufacturing: Use of renewable energy in the manufacturing process

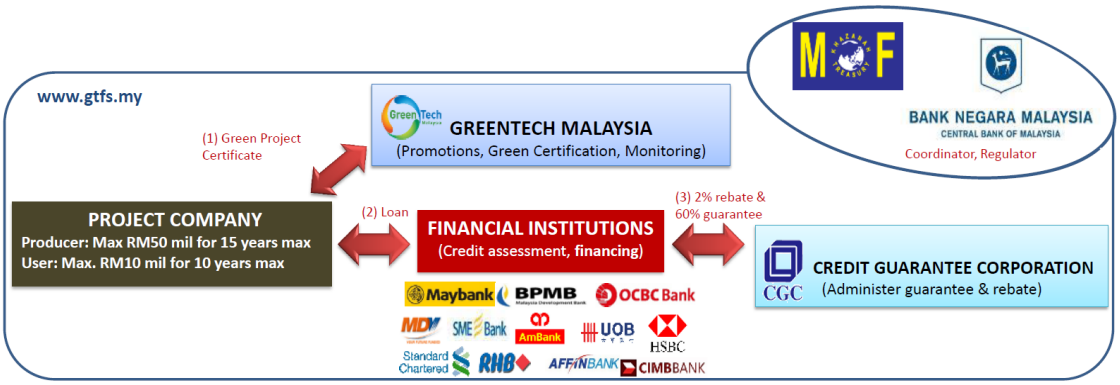

Figure 8 Overall view of GTFS

(Tax incentives for green technology)

To achieve the goal of increasing the share of renewable energy in the country's power supply mix to 20% by 2025, it is expected that RM33 billion worth of renewable energy investment will be required. Therefore, in order to encourage the private sector to invest in renewable energy, a green investment tax credit (GITA) for the purchase of green technology equipment and assets and a green income tax exemption (GITE Both GITA and GITE will continue until the end of 2023, as decided in the 2020 national budget.

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.

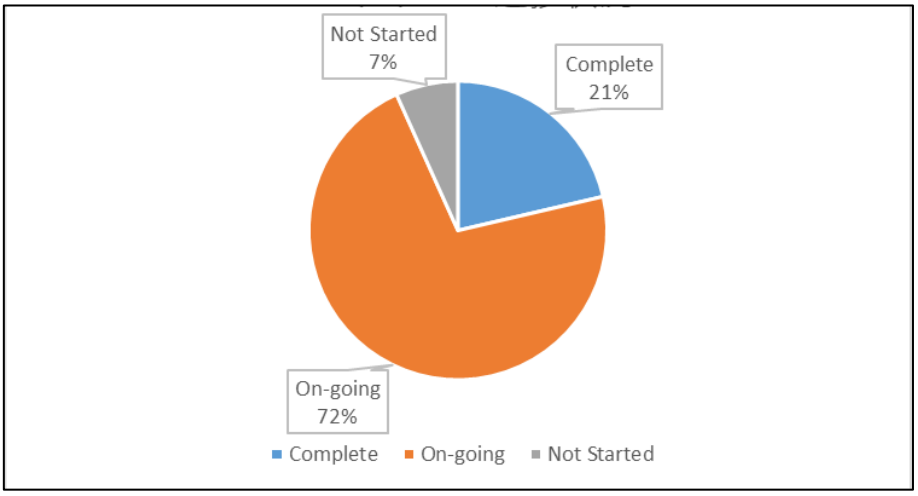

Fig. 9 Blueprint Program progress[8]

1.2.4 Cooperative relationship between Kitakyushu and the Iskandar Regional Development 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.

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

(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. 10 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

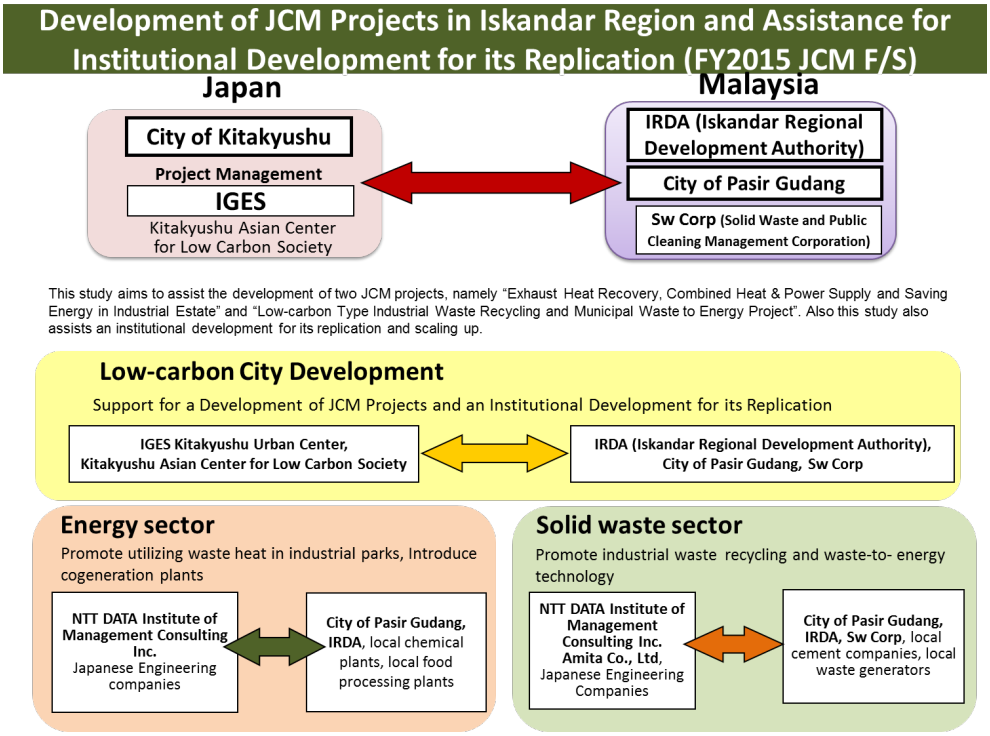

Fig. 11 Overview of activities for developing JCM businesses in Iskandar Malaysia and supporting the design of systems to advance such development

(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. 12 Signature ceremony at the IRDA office

(d)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

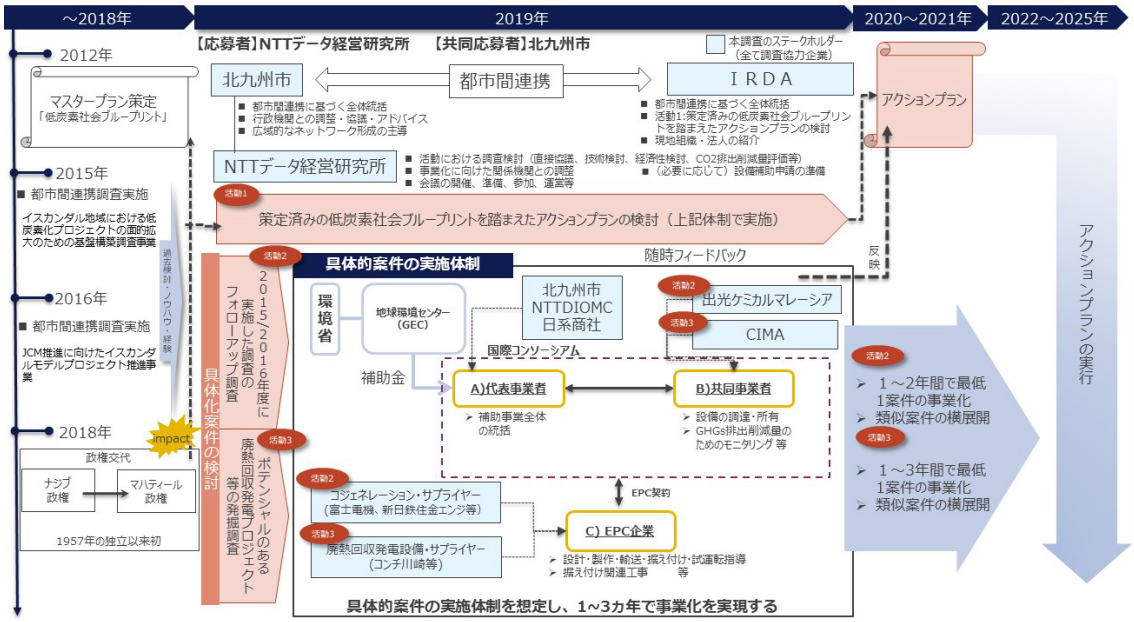

Figure 13 FY2019 activities

(e) Activities in FY2020

The City of Kitakyushu implemented the "Low Carbon Promotion Project in Iskandar Region (Kitakyushu-Iskandar Development Region Collaboration Project)" as part of the "Intercity Collaboration Project for Realization of Low Carbon Society in FY2028. In the course of the study in FY2048, the activities indicated in the Blueprint for a Low Carbon Society were steadily developed, and the following three themes were identified by IRDA as important: "Industrial Symbiosis," "Eco Town," and "Waste to Energy". The following three activities were carried out under the keywords.

Activity 1: Activities to realize an eco-town with industrial symbiosis

Activity 2: Activities to realize waste-to-energy generation

Activity 3: Identification of JCM-applicable projects

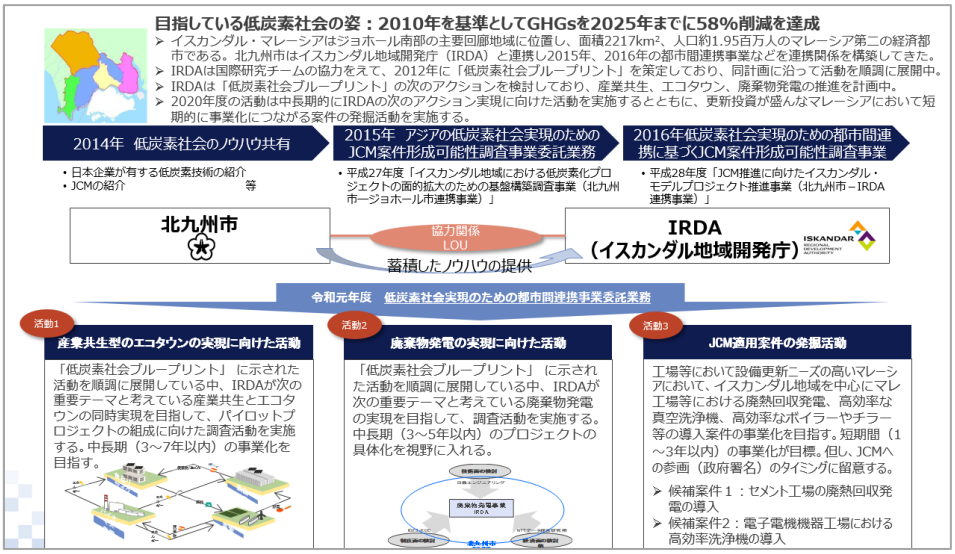

Figure 14: Activities in FY2020

As mentioned above, Kitakyushu has steadily built up its interactions with IRDA. In this project, based on the results of past projects, a follow-up survey will be conducted for each project. In addition, activities for the realization of an eco-town with industrial symbiosis and waste power generation, which were promoted in the FY2020 project, will continue to be undertaken. In addition, as this is the final year of the three-year plan, the results of the past three years' activities will be compiled into an action plan for decarbonization in the Iskandar Development Region, which will be used as the basis for future decarbonization efforts in the region. The project is being implemented with the expectation that it will contribute to the realization of a society.

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Chapter 2　Activities to Realize an Industrial Symbiotic Eco-Town

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,　for **example, as shown in Fig. 1,** waste and garbage discharged from plant A become raw materials and energy sources of another plant, and the energy used is carbon-free energy such as biomass.

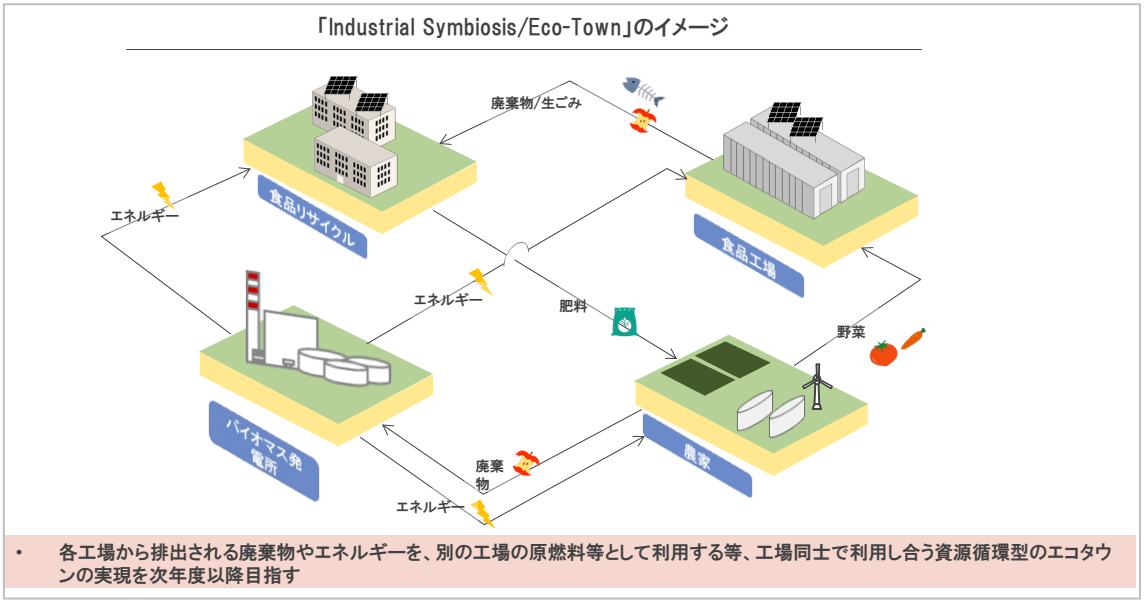

Figure 1 Image of Industrial Symbiosis and Eco-Town[1]

In the FY2020 project, IRDA took the lead in collecting inventory data on waste generated from factories in industrial parks in the Iskandar region, with the aim of simultaneously realizing Industrial Symbiosis and Eco Town.

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

In this year's project, based on the results of the activities in FY2020, several studies were conducted for the realization of Industrial Symbiosis and Eco Town. First, we evaluated the possibility of advanced treatment of scheduled waste, which is already being recycled, by combining the technologies of Japanese companies. If more advanced treatment is possible than the current treatment, we will consider the possibility of collaboration between Japanese companies and local waste treatment and recycling companies (establishment of JVs and SPCs). As for wood, paper and plastic wastes, which are currently disposed of in landfills, there is a possibility that they can be used as raw fuel in other plants in the Iskandar region, and we will explore this possibility in cooperation with IRDA.

As far as the food and ceramic wastes that are currently disposed of in landfills, which were identified in FY2020, we explored the possibility of collaborating with Japanese companies that have the technology to use them as raw fuel. In addition to waste treatment, it is also important to consider the decarbonization of energy by introducing renewable energy sources in order to realize an industrial symbiosis and eco-town. Therefore, in this year's activities, we also decided to study the possibility of introducing renewable energy to the industrial park.

In summary, the activities for FY2021 are as follows.

1) Investigating the possibility of advanced treatment of scheduled waste
2) Investigating the possibility of using wood, paper and plastic wastes disposed by landfill as raw fuel in another plant
3) Investigating the possibility of using food and ceramic wastes disposed by landfill as raw fuel
4) Investigating the possibility of the introduction of renewable energy in industrial parks

In addition, each of the above activities will be advanced based on the division of roles as shown in Table 1 below.

Table 1 sharing of action plans

No.	Activities	IRDA	City of Kitakyushu	Other companies in City of Kitakyushu	NTTDIOMC
1	Investigating the possibility of advanced treatment of scheduled waste	●		●	●
2	Investigating the possibility of using wood, paper and plastic wastes disposed by landfill as raw fuel in another plant	●			●
3	Investigating the possibility of using food and ceramic wastes disposed by landfill as raw fuel	●	●		●
4	Investigating the possibility of the introduction of renewable energy in industrial parks	●			●

2.2 Collecting inventory data

When considering collaboration between Japanese companies and local waste treatment and recycling companies this year, local companies were selected based on the inventory data collected last year. In this section, we describe the method of collecting inventory data. 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?

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
- Location: Holiday Villa Hotel, Johor Bahru
- Sponsor: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 is as shown in 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.

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	Recycling and recycling of waste

	COLLECTION AND UPCYCLING COMPANY)	
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

The plants in Table 3 were 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

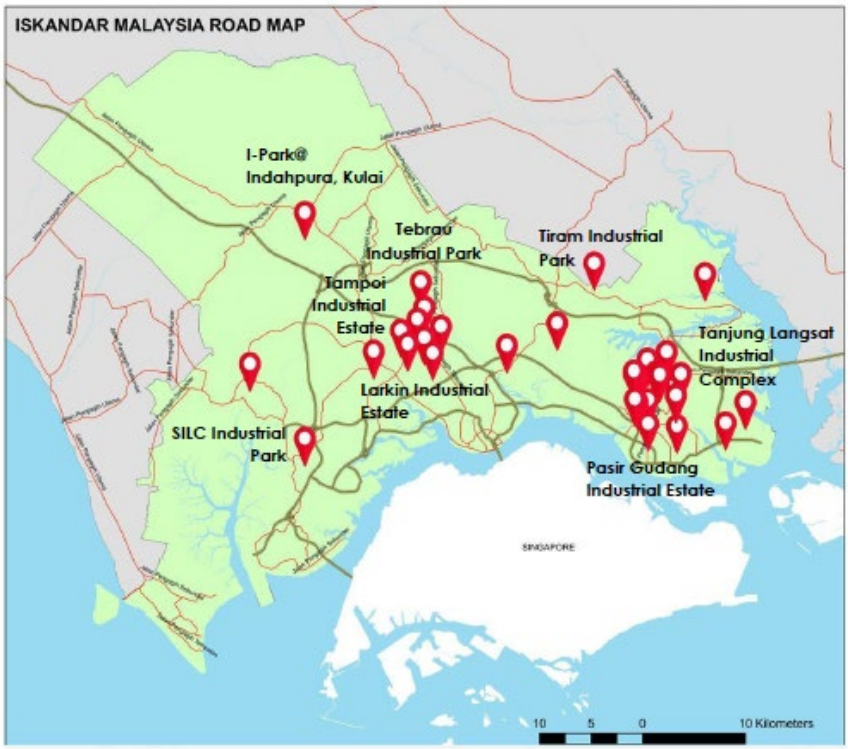

Figure 2of the factory surveyed

(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 emissions from research 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.

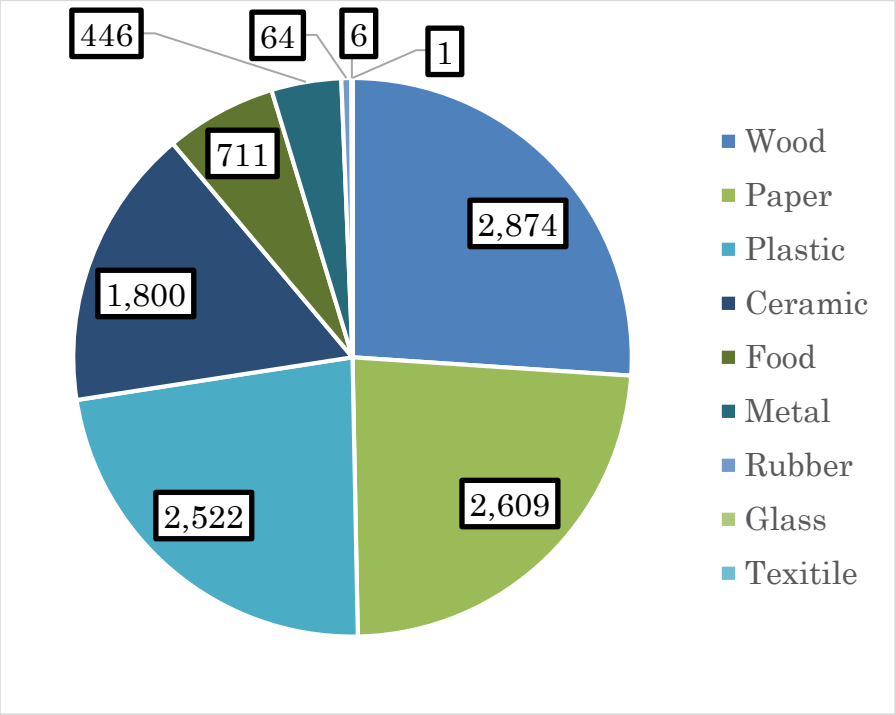

Figure 3 One-Scheduled Waste Emissions from the Factory Surveyed (Tons per Year)

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** show the status of emissions and **recycling rates of** designated **wastes** from the 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.

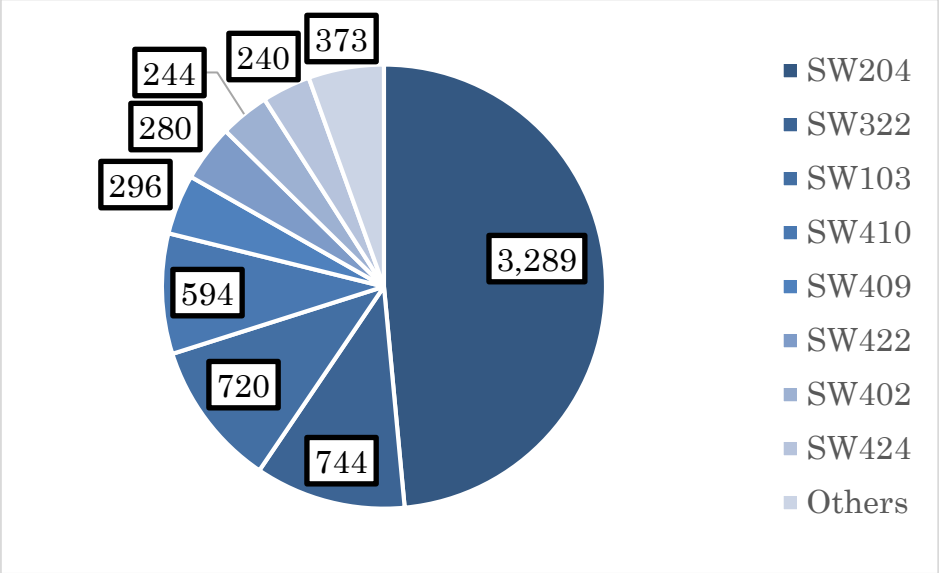

Figure 4 Waste Emissions from Surveyed Plants (Tons per Year)

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? **See Table 3.**

<u>Wood-based waste, paper-based waste</u>

- 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.

<u>Plastic waste</u>

- 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.

<u>Food waste</u>

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

<u>Ceramic waste</u>

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).

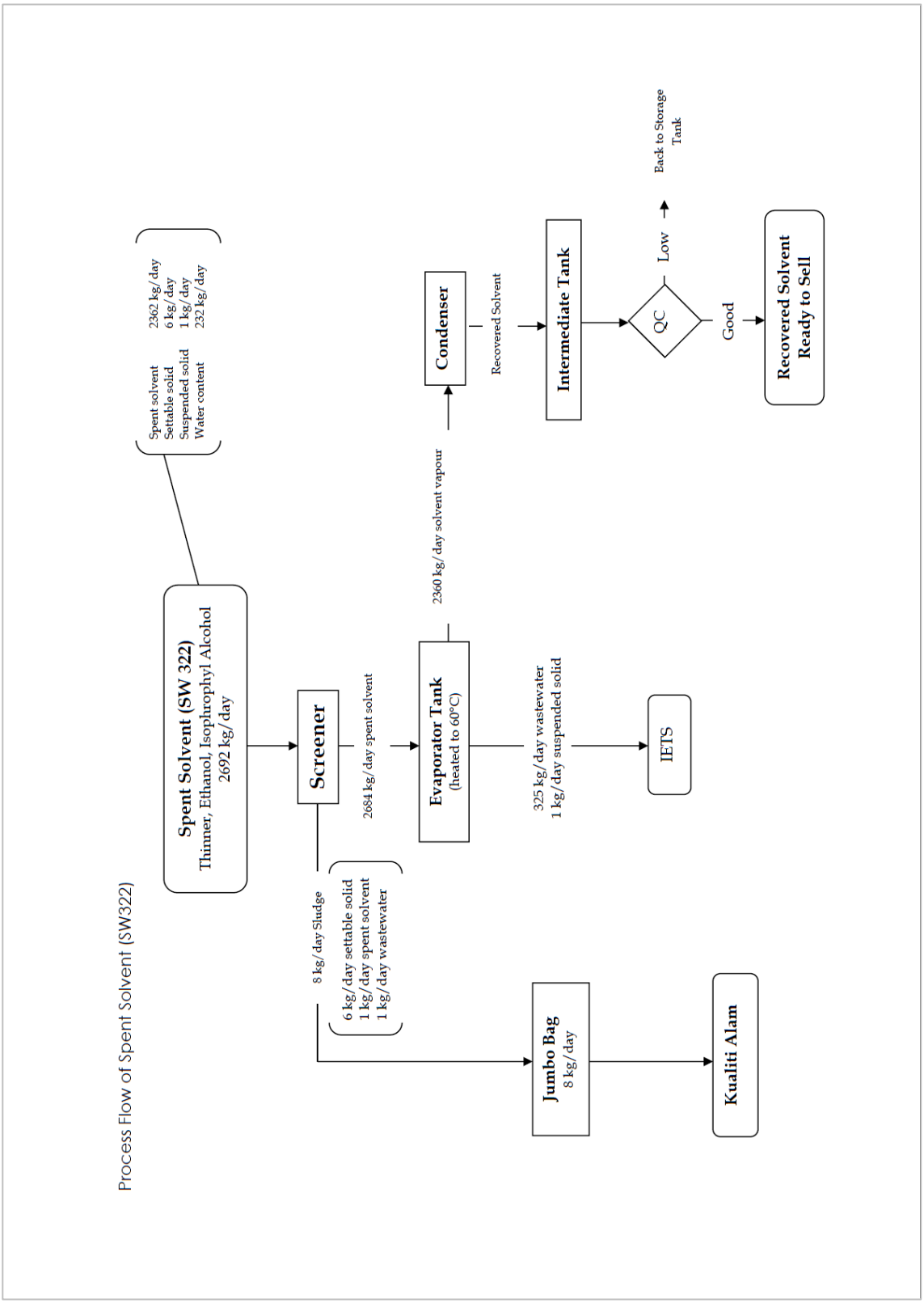

Figure 5 Recycling flow of designated waste

(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), we were able to organize the main designated waste in the local area and its recycling rate as shown in 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 Feasibility Study on the Advanced Treatment of Scheduled Waste Already Being Recycled

This fiscal year, in order to study whether advanced treatment of waste already being recycled was possible, we decided to conduct interviews with local companies, led by Company A, an industrial waste treatment company. Out of around 20 companies that obtained licenses for scheduled waste in the Iskandar region in the past fiscal year, we were able to obtain information on local recycling technology etc. from three companies, Pentas Flora (Johor Bahru) Sdn Bhd, Vast Group Sdn Bhd, and Southern Strength (M) Sdn Bhd. Therefore, we approached these three companies first, through the IRDA. As a result, we were able to interview Pentas Flora (Johor Bahru) Sdn Bhd (hereinafter referred to as "Pentas Flora").

2.4.1 Overview of Pentas Flora Sdn Bhd

Pentas Flora Sdn Bhd (Pentas Flora) belongs to the Exsim Group of Companies, one of the country's leading real estate developers. The company is one of the largest suppliers of refined fuel oil in Malaysia, and offers services related to the management of scheduled waste to clients in a wide range of industries. It aims to create a sustainable green environment for all by providing end-to-end solutions for hazardous waste management. The company provides four main services: 1) scheduled waste management, which involves the proper treatment and recovery of waste engine oil, lubricating oil, petroleum, etc.; 2) petroleum re-refining, which involves the recovery and re-refinement of useful petroleum products such as gasoline, diesel, and heavy oil, in order to produce reusable energy; 3) protection and preservation of the marine environment; and 4) analytical testing services for petroleum-based products such as engine oil, diesel, base oil, etc.

The company's main plant is located in Banting, a major city in the Kuala Langat district of Selangor State. It is located in a safe industrial zone, within 18 km from Kuala Lumpur International Airport, and is built in compliance with the Department of Environment's (DOE) safety and pollution control standards and requirements. Their business model is focused on minimizing waste and maximizing recovery rates.

2.4.2 Contents of the Interview

(1) Interview Summary

The meeting began with an introduction of the business activities of Pentas Flora and Company A. After that, Company A asked questions about the specific recycling methods utilized by Pentas Flora, and the current status of recycling in Malaysia. The meeting date, time, attendees, and interview questions are listed below.

Meeting Name	Interview on City-to-City Collaboration (Kitakyushu City – Iskandar) (Pentas Flora)	
Dates	August 4, 2021 3:30 p.m. – 5:00 p.m.	
Location	Microsoft Teams	
Attendees	Pentas Flora	Mr. Chiau Shis-sun, Mr. Pengsoon Chan
	IRDA	Ms. Velerie Siambun, Mr. Mamdoh B Dato
	City of Kitakyushu	Mr. Nagahara, Mr. Yamane
	Company A	Two persons in charge
	NTTDIOMC	Muraoka, Hamanaka, Yoshikawa (notes)

Interview Questions:

- From the pictures on your website it looks like a petroleum processing plant, but do you do distillation regeneration?
- What is the product recycled from the process?
- Where is it used? Is there a standard for it?
- What is the actual throughput?
- Is anything other than used oil filters also distilled at this plant? Is the mixture used as raw material?
  - E.g. 8(glycol), 16(inks), etc.
- According to your website, you try to minimize by-products, but what by-products do you produce and how do you dispose of them?
- Is there any waste water generated? How are they treated?
- Do you manufacture recycled fuel oil and auxiliary fuels for cement calcination?
- Do you need a permit to produce them?
- Are there any product standards? Are there any relevant regulations for the fuel?
- Do you think there is a demand for this recycled fuel in Malaysia?

(2) Interview Results

From the interview, we learned that Pentas Flora utilizes a recycling method in which spent engine oil is collected, filtered, and then vacuum distilled to produce refined base

oil, lubricating oil, and light oil. (See Fig. 6 for more information) The company distills 12,000 tons of engine oil per month, and the products manufactured are currently being sold to engine oil manufacturers.

The by-products generated during this process (asphaltene, wastewater, sludge) are also treated separately and recovered as industrial fuel oil (see Figure 8). Also, the wastewater generated in this process is used for cleaning cars and factories.

Since 95% of base oil can be recovered from waste oil, whereas only 5% of base oil can be extracted from crude oil, the high recovery rate is a distinct advantage. But since collecting the waste oil costs extra, we learned that this is not necessarily cheaper than producing base oil from crude oil. However, as in Europe and the U.S., demand for extracting base oil from spent engine oil exists in Malaysia. Furthermore, the cost of collecting the oil can be kept down, as automobile companies and others are currently collecting spent oil at waste collection centers in an efficient manner.

When asked about alternative fuel used for incineration in cement plants, they told us that cement plants in Malaysia often use solid waste as alternative fuel because air pollution control equipment is installed in their kilns. We also learned that while Pentas Flora can produce 10,000 tons of base oil, the average monthly fuel consumption of cement plants in Malaysia is 4,000 to 5,000 tons, and that the quality of Pentas Flora's base oil was too high to be used as alternative fuel.

The details of the statements made during the interview are described below.

i. Pentas Flora's Business

- The company handles scheduled waste, hazardous waste, and automobile-related waste, etc., and sells them mainly in containers and tankers.
- The company has obtained Green Label certification.
- They also provide training and consultation services to clients regarding oil leaks and other matters.
- The company also collects and recycles waste from electric products, including EVs, and does business with Toyota, Honda, Mitsubishi, etc.
- They have also worked with the University of British Columbia, in Canada, on a study investigating what type of waste oil, when converted into fuel, can reduce CO2 emissions, and by how much.
- 30% of the total is sold as fuel to Vietnam, and for the domestic market, it is produced for cement plants.
- The capital is 100% Malaysian.

ii. Recycling Methods Utilized by Pentas Flora

- The reclamation process of spent engine oil and transmission oil proceeds in the following manner:
  - After the engine oil is collected from the car, it goes through a process of filtration. This produces water and solids, and also produces sludge as a by-product. After such pretreatment, 1 ml of mercury is processed through vacuum distillation at 300°C.
  - Base oil and fuel oil is produced by solvent extraction and blending in the product tank. The base oil is blended with lubricant, passes through the packaging line, and reaches the lubricant manufacturing stage.
  - The oil is formulated etc. according to each purpose. Fuel oil for boilers is marketed to clients.
- As for the recycling volume processed, the company distills 12,000 tons of engine oil per month.
- Gear oil and automatic transmission fluid are blended during the distillation process.
- The manufactured products are sold to engine oil manufacturers in 22-ton units (maximum 200 liters). The company plans to sell it to end users of engine oil starting from next year.
- Since 95% of base oil can be recovered from waste oil, whereas only 5% of base oil can be extracted from crude oil, the high recovery rate is a distinct advantage. However, it is difficult to say whether it can be produced at a lower cost than producing base oil from crude oil, because of the cost incurred when collecting waste oil.
- The distillation column is built by an American company, and the manufacturer is Indian.

iii. Disposal of By-Products

- The by-products comprise asphaltene and wastewater. Wastewater treatment involves breaking down the oil and transferring it to an industrial wastewater treatment plant. The oil separated from the wastewater is further dehydrated and sold as a product.
- Glycol-based refrigerants are subjected to pretreatment, during which oil is generated. After adjusting the quality, applying chemical treatment, such as pH adjustment or coagulation, generates sludge. Afterwards, industrial wastewater is generated as the process moves on to biological treatment and third-stage treatment. The wastewater is used to for cleaning cars and factories.

iv. Recycled Heavy Oil and Alternative Fuel for Cement Firing

- In Malaysia, there is a market for base oil extraction. Toyota and other companies are efficiently recovering oil that exceeds acceptance thresholds at waste collection centers, which also keeps costs down.
- They are not selling spent oil to cement companies as an alternative to coal, but are considering dehydrating the oil and supplying it for use as fuel. Since there is a demand for refining base oil from engine oil, emphasis is placed on that. The quality is too high to be used as alternative fuel for firing. While Malaysian cement plants use 4,000 to 5,000 tons of fuel per month, Pentas Flora's production capacity for alternative fuel is 10,000 tons.
- Solid wastes and other materials are often used as alternative fuel. However, this is only possible because cement plants are also equipped with air pollution control equipment in their kilns.

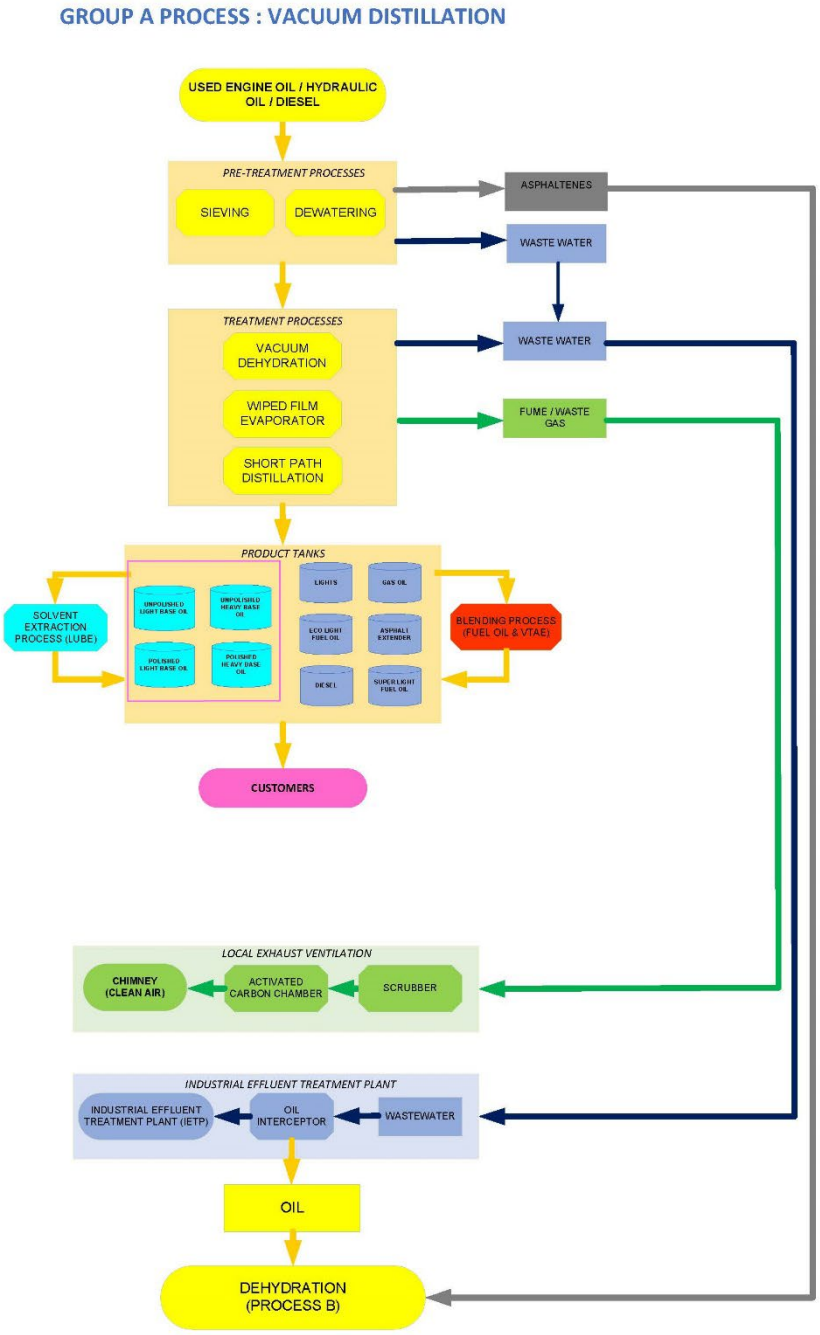

Figure 6. Vacuum distillation process for recovering base oil, lubricating oil, and diesel oil from spent oil

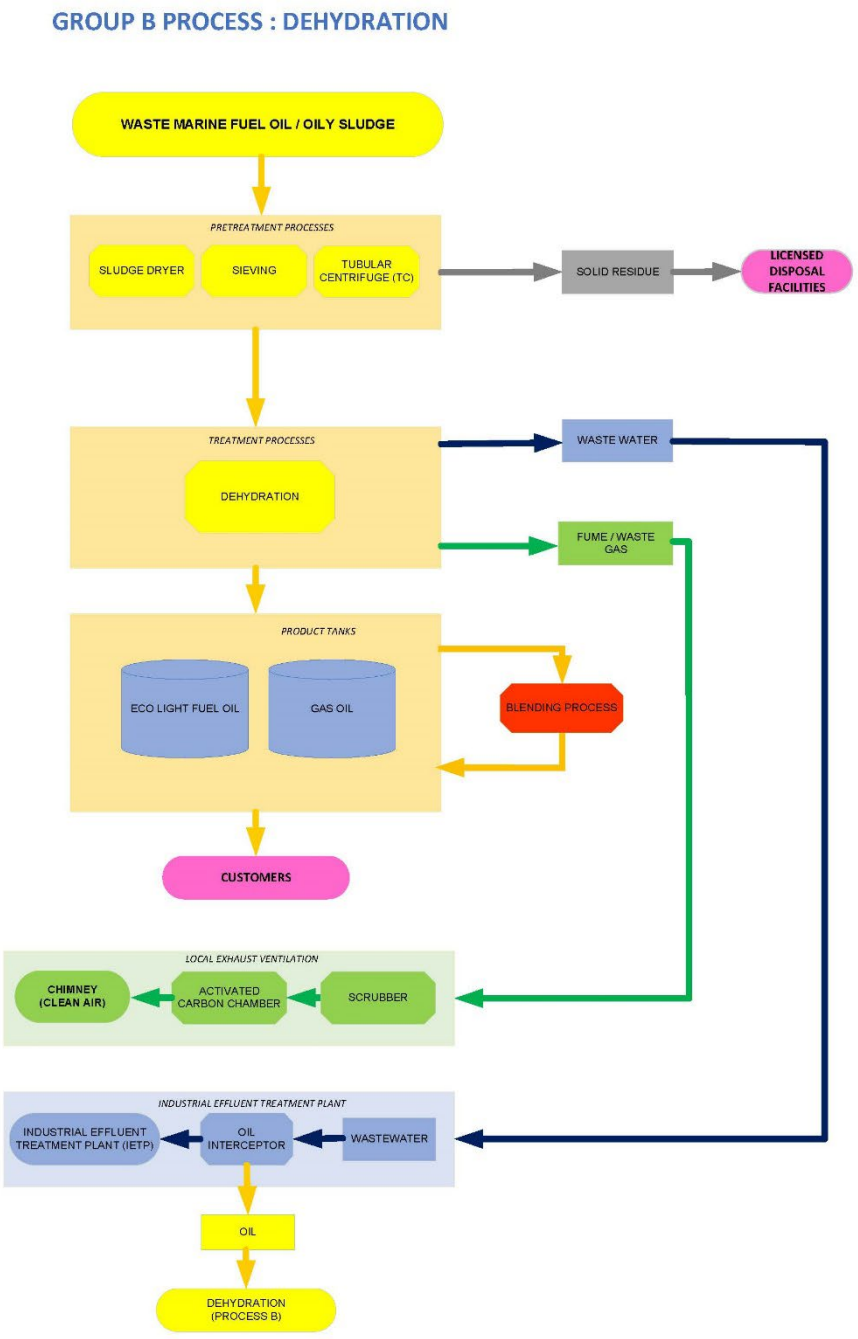

Figure 7. Dehydration process to treat waste oil and oily sludge and reclaim it as industrial fuel oil

2.5 Feasibility Study on the Use of Wood, Paper and Plastic Waste Disposed of in Landfills as Raw Fuel in Other Plants

Based on the inventory data collected in the past fiscal year, we expected to be able to match local factories regarding wood, paper, and plastic waste, among the non-scheduled waste. Therefore, this fiscal year, we decided to conduct a feasibility study on the utilization of these types of waste as raw fuel.

2.5.1 Identifying Local Companies with Potential for Collaboration

As a first step, we drew up a list of companies with potential for collaboration, in order to match waste-generating companies with plants that could potentially use the waste as recycled fuel. Among the companies that indicated their interest in business matching under the industrial symbiosis approach, the companies that generate wood, paper, or plastic waste, along with those that may possibly use the waste as alternative fuel, are listed below.

Table 9. List of companies that generate wood, paper, or plastic waste, and companies that may use such waste as alternative fuel

No.	Company Name	Waste that can be Reused as a Resource	Possibility of Using Other Waste as an Alternative Resource
3	TES-AMM (MALAYSIA) SDN. BHD.	Plastic, paper	Already utilizes waste from electrical and electronic product assemblies generated by the manufacturing industry
4	IMPACT RANK (M) SDN. BHD.	Contaminated plastic waste	No
10	Chawk Technology International Sdn Bhd	Plastic (PVC, plastic pipes, stationery, pallets, etc., are recycled, or crushed and remade)	Depends on the client's decision
17	MATERIALS IN WORKS (M) S/B (WASTE COLLECTION AND UPCYCLING COMPANY)	Recovered cellulose and plastics (PP, PE, PET)	Conducts continuous research and development on solid wastes (e.g. cigarette butts, disposable diapers, etc.)
30	Sukano Sdn. Bhd.	Plastic (only if the material type can be separated and granulated)	Recycled plastic

2.5.2 Results of Matching Between Companies

This time, we approached the companies on the above list through the IRDA, in order to set up meetings to introduce the concept of industrial symbiosis and to study whether collaboration among plants was feasible, but we were unable to obtain their consent. The reason for this is due to the fact that the prolonged Covid-19 pandemic led companies to lose interest in an Eco-Town based on industrial symbiosis. Due to worsening business conditions, the companies were reluctant to make new investments, and circumstances made it difficult to hold meetings even with the companies that had cooperated last year

by providing inventory data. In addition, since in-person meetings were restricted again this year due to Covid-19, there was a limit to how much the IRDA could follow through with local companies, which prevented us from achieving the desired results.

2.6 Feasibility Study on the Conversion of Food and Ceramic Waste Disposed of in Landfills into Raw Fuel

Studies conducted in the past fiscal year identified food and ceramic waste as the types of waste that, although difficult to match between plants, had the potential to be recycled by introducing recycling technologies utilized in Japan. For this reason, we decided to identify companies in Malaysia and Japan with the potential for mutual collaboration, and to conduct a feasibility study on the conversion of these types of waste into raw fuel through matching such companies.

When we approached local companies through the IRDA, Niro Ceramic, which generates ceramic waste, indicated its interest, so we set up a meeting to introduce the technology of Company D, which possesses technology used for recycling ceramic waste. The details will be discussed later.

2.6.1 Identifying Local Companies with the Potential for Collaboration

As a first step, we drew up a list of local companies that generate food or ceramic waste. We identified five companies that generated food waste, and one company that generated ceramic waste. In particular, we consider companies that are currently disposing of their waste as is to be likely to be more open to the possibility of collaboration.

Table 10. List of companies that generate food or ceramic waste

No.	Company Name	Waste Type	Details	Odor	Amount Generated			Measure Taken
					Quantity	Unit	Period	
1	ARTRON PRECISION MALAYSIA SDN. BHD.	Food	General food waste	Yes	10	Kg	weekly	Disposed
2	Instruments Technology (Johor) Sdn. Bhd.	Food	General waste (Larkin plant)	Yes	6202	Kg	monthly	Disposed
		Food	General waste (Tebrau plant)	Yes	8868	Kg	monthly	Disposed
3	B.M. Nagang Industries Sdn Bhd	Food		No				Recycled
4	CHIYODA INTEGRE CO. (JOHOR) SDN BHD	Food	Food waste from the company cafeteria	Yes	5000	Kg	weekly	Disposed
		Food	Raw material waste generated during the manufacturing process	No	5000	Kg	weekly	Disposed
5	GREAT WALL NUTRITION TECHNOLOGIES SDN BHD	Food	Production waste	No	200	Kg	weekly	Recycled
6	NIRO CERMIC (M) SDN BHD	Ceramic	Recovered scrap material and broken tiles that were fired	No	150	Ton	monthly	Disposed

2.6.2 Identifying Japanese Companies with the Potential for Collaboration

We also conducted a survey of Japanese companies that were likely to collaborate with local companies. As a result of the survey, we were able to identify companies engaged in food waste recycling and ceramic waste recycling, both in Kitakyushu City.

(1) Food Waste

With regard to food waste, collaboration may be possible with Company B, a company that possesses the technology to convert food residue into fertilizer. Company B's technology compacts and initiates fermentation in food waste on the spot where it is generated, in food factories, hospitals, restaurants, municipalities, etc. without collecting or transporting it, and after secondary and tertiary fermentation, recycles it into fully mature compost. The resulting compost will be used by cooperating farmers, and the vegetables produced there will be used in restaurants, etc., thus creating a cycle in which food waste is recycled within the community.

(2) Ceramic Waste

We were able to identify two companies that possessed the technology to recycle ceramic waste. Company C can recycle 100% of various types of industrial waste through its extensive domestic and international network. Company C's unique recycling technology can turn more than 4,000 types of waste into raw fuel, and this includes ceramic waste.

Meanwhile, Company D manufactures environmentally friendly resin-based anti-slip paving materials by utilizing waste materials consisting of tiles and ceramics. Using more than 50% recycled materials makes it possible to conserve resources by reducing the use of virgin materials, and contributes to reducing the environmental impact by lessening the amount of industrial waste. As for Company D, we held a meeting with Niro Ceramic, the Malaysian company that generates ceramic waste, and introduced Company D's recycling technology.

The results of the interview will be described in "2.6.4. Contents of the Interview."

2.6.3 Overview of Niro Ceramic (M) Sdn. Bhd.

NIRO CERAMIC (M) SDN. BHD. (Niro Ceramic) is a company manufacturing clay and refractory products, located in Selangor State, Malaysia. The company started manufacturing in Switzerland in 1979, and Niro Ceramic Malaysia was established in 1988. In addition to Malaysia, the company is expanding its network in Indonesia, China,

and Vietnam. In 2013, the company also acquired Zirconio, a leading tile brand in Spain. With its global, diverse network, it is a leading supplier capable of quick delivery, with assured reliability and customer satisfaction. In addition, the company has obtained ISO 14001:2015 (environmental management systems) and MS ISO 13006:2014 (ceramic tiles) certifications.

2.6.4 Contents of the Interview

(1) Interview Summary

Meeting Name	Interview on City-to-City Collaboration (Kitakyushu City – Iskandar) (Niro Ceramic)	
Dates	February 24, 2022 6:00 p.m. - 7:35 p.m.	
Location	Microsoft Teams	
Attendees	Niro Ceramic	Mr. Abdul Hafez Hanani, Mr. Cahi Kian Fah, Mr. Mohamad Syafiq Syazwan Bin Ramlee, Mr. Rajedran A/L Narayamasamy
	IRDA	Ms. Kamisah Mohd Ghazali, Ms. Velerie Siambun, Mr. Mamdoh B Dato,
	City of Kitakyushu	Mr. Arita, Mr. Nagahara
	Company D	Two persons in charge
	NTTDIOMC	Muraoka, Hamanaka, Yoshikawa (notes)

(2) Interview Results

As a result of the interview with Niro Ceramic, the company concurred with the concept of industrial symbiosis, and it was decided that they would positively consider collaborating with Company D. Regarding the proposal by Company D of producing brick products by recycling ceramic waste, we found that there was a possibility of utilizing the ceramic waste generated by Niro Ceramic.

In the future, we wish to proceed with the collaboration, following analysis of the marketability of recycled brick products in Malaysia. First of all, Niro Ceramic will determine the demand and economic feasibility in the Malaysian domestic market, based on a rough quote of Company D's recycled products. We will continue to follow up on the possibility of collaboration between the two companies, even after the completion of this project.

In addition, Niro Ceramic generates not only ceramic waste but also a significant amount of sludge containing metals (SW204), and the company wishes to collaborate with Japanese companies that possess the technology to recycle this. Therefore, Niro Ceramic will also consider collaborating with companies other than Company D on recycling methods that utilize sludge.

The details of the statements made during the interview are described below.

1. Company D

- One of the easiest products to utilize recycled waste for is a brick product called Porous Road. The raw material mainly consists of tile shards, and includes other materials such as glass cullet and molten slag. The ratio of recycled materials is 95%. It is characterized by high water permeability. It also retains water, and can be effective against torrential rains and the heat island effect.
- If we are to develop a product, we will first check the ceramic waste ourselves, for safety and possible problems. We will consider this project with the understanding that, after production, we are to sell the product to Niro Ceramic at an established price.
- Tile shards include ceramic fragments and products that have become defective.

2. Niro Ceramic

- The tile manufacturing process consists of (1) preparation, (2) pressing, (3) glazing, (4) firing, (5) molding, and (6) packaging. First, the raw materials are mixed with water over nine hours, then spray dried with hot air. Then, the powdered material is subjected to pressing. The shape of the product is then adjusted based on the client's request. At this point, the tiles are not strong enough, so the firing process is used to reinforce them. The kiln is 90 meters long, and modification occurs by applying steam. The company processes 6,000 tons per day. Finally, the product is finished by trimming.
- The moisture content is reduced from 4.5%–5% to less than 0.3% in the drying process.
- After the glazing process, the decoration is done using a digital printer.
- The final product is available in four sizes (30 x 30 cm, 30 x 60 cm, 60 x 60 cm, and 60 x 120 cm).
- The products are mainly used as floor tiles for the home (indoor and outdoor).
- The company has obtained ISO 14001:2015 (Environmental Management Systems) and MS ISO 13006:2014 (Ceramic Tiles) certifications, as well as SIRIM Eco-Labelling Scheme certification, etc.

3. Waste Generated by Niro Ceramic

- According to Niro Ceramic, in addition to ceramic waste, they also wish to treat sludge containing metals (SW204). Currently, a local company called Eco Green Build is in charge of collecting the waste and recycling it into building materials, but the volume collected is not enough. Since they wish to increase the processed volume, they are wondering whether it is possible to collaborate with a Japanese company for recycling.

- It is difficult to manufacture bricks if they contain hazardous substances (Company D).

4. Possibility of Collaboration

- While inspection is necessary, there seems to be a possibility of using Niro Ceramic waste as recycled material, based on their explanation (Company D).
- The cost of exporting waste to Japan, having Company D manufacture it, and then having it sent back to Malaysia may be quite high, which is a concern. Will it be possible to recoup the costs, considering the price of the brick products? Also, it is questionable whether there is demand in the Malaysian market in the first place (Niro Ceramic).
- In order to introduce Japanese technology to the Iskandar region, it is also necessary to investigate whether there are any legal or regulatory issues. The objectives of this project include investigating such matters in order to promote industrial symbiosis and a circular economy (IRDA).
  - We think the idea of industrial symbiosis and a circular economy is very important. We would very much like to conduct a survey to see if it is marketable (Niro Ceramic)
- First of all, we would like to ask you to provide us with a few kilograms in order for us to analyze the waste, and see if it can be made into a product. As ceramic waste cannot be imported, you will have to export it as items of value (Company D).
  - We will check if that is possible (Niro Ceramic).
  - If it is possible to send a sample, we would like a sample of SW204 too. We will analyze that as well (Company D).
- Wouldn't it be better to draw up a rough quote first, and verify whether it is marketable? (Company D)
  - We would like to look at the quote and determine whether it is marketable (Niro Ceramic).
  - Since the cost of marine containers is rising, we would like to determine whether there is a market for it with this in mind (Company D).

2.7 Feasibility Study on the Introduction of Renewable Energy to Industrial Parks

In order to study the possibility of introducing renewable energy to industrial parks, we conducted an interview with Ditrolic Solar, a company who made a presentation at the workshop held in Malaysia in the past fiscal year. During the interview, we asked about local awareness regarding the introduction of renewable energy, and examined the possibility of using Japanese solar panels as part of a JCM equipment subsidy program.

2.7.1 Overview of Ditrolic Solar

Ditrolic Solar is a pioneering solar power generation company in the Southeast Asian region, including the first solar power plant in Malaysia. The company has also obtained ISO 9001 certification (guaranteeing customer satisfaction through an effective quality management system).

The company has four offices in Malaysia, including its head office, and has set up overseas branches in Singapore, the Philippines, and Bangladesh. The company also plans to open branches in China, Indonesia, and Thailand in the future. The total installed and developed capacities of the 38 projects in four countries funded by Ditrolic Solar reaches 283.6 MW.

The company's main clients are major corporations in the respective countries, including FORTUNE Global 500 companies, and it is also approaching Japanese companies operating in Southeast Asia.

2.7.2 Contents of the Interview

(1) Interview Summary

The meeting started with a presentation by Ditrolic Solar introducing their business. Afterwards, NTT DATA Institute of Management Consulting, Inc. gave an overview of the JCM program, and asked questions about the introduction of renewable energy in the Iskandar region. The meeting date, time, attendees, and interview questions are listed below.

Meeting Name	Interview on City-to-City Collaboration (Kitakyushu City – Iskandar) (Ditrolic Solar)
Dates	July 27, 2021 4:30 p.m. - 6:00 p.m.

Location	Microsoft Teams	
Attendees	Ditrolic solar	Ms. Michelle Ong, Mr. Wong Choon Fuan
	IRDA	Ms. Velerie Siambun, Mr. Mamdoh B Dato, Mr. Hamizah A Rahman
	City of Kitakyushu	Mr. Arita, Mr. Nagahara, Mr. Shirai
	NTTDIOMC	Muraoka, Hamanaka, Yoshikawa (notes)

Interview Questions:

- Malaysia is promoting the use of renewable energy as a national strategy. How is this affecting the industrial parks in the Iskandar region?
- Does the Iskandar region have a renewable energy policy?
- Is there any demand for the introduction of renewable energy in industrial parks?
- Are you using subsidies to introduce renewable energy?
- (In case Malaysia signs a JCM agreement in the future) Is it possible to use Japanese solar panels as a JCM equipment subsidy program? Also, are there any restrictions?

(2) Interview Results

From the interview with Ditrolic Solar, we were able to verify matters concerning regulations related to industrial parks, and the demand for energy conservation and renewable energy in Malaysia. First of all, we found out that the projects the company works on are basically as independent power producers (IPP) of renewable energy, and that whether ownership was transferred to the plant owner after the termination of the contracted period depended on the government or the project. As for off-site power generation, due to Malaysian policy regulations, it is necessary to submit the project details to the Energy Commission for prior consultation in order to obtain a power generation license.

As for solar sharing, which has recently been attracting considerable attention in Japan, the company remarked that it had carried out related projects in Bangladesh, but since land is cheap in Malaysia, there is not much demand for the dual use of land for agriculture and power generation.

In response to a Japanese participant's comment on future plans to introduce solar power generation, namely that they were considering introducing solar power generation starting with Japanese companies operating in the region, Ditrolic Solar said it could offer support with policy and the technical feasibility of connecting to the national grid. Although the talks did not culminate in a concrete project this time, we consider that future collaboration may be possible when solar power generation equipment is introduced, mainly aimed at Japanese companies operating in the region. In addition, as Ditrolic Solar has experience in carrying out JCM equipment subsidy programs in other

countries, the likelihood of Ditrolic Solar becoming a local partner is high, once a JCM agreement is signed with the Malaysian government.

The details of the statements made during the interview are described below.

i. Ditrolic Solar's Activities

- Received the Solar Company of the Year Award for three years, 2018, 2019 and 2021.
- The company started its activities in 2009, and has installed mini solar systems such as off-grid systems ranging from 2kW to 20kW in countries such as Myanmar, Indonesia, the Philippines, Singapore, and Malaysia. They launched a renewable energy project recently in China as well.
- In the global energy sector, they are involved in project development, which includes identifying locations, feasibility studies, research, engineering, design, and regulatory compliance.
- In Malaysia, the company has 160MW worth of energy assets, which it sells to customers such as TNB (electricity company), Malaysia Airports, universities (USM: Universiti Sains Malaysia), and municipal governments.
- They offer two solutions, of which the first is residential power generation, and the second is geared towards power plants. The company usually operates as an independent power producer (IPP) of renewable energy. Whether ownership is transferred to the plant owner after the termination of the contracted period depends on the government or the project.
- To date, they have developed projects worth US$225 million. (Approx. 38 projects)
- Typically, Japanese clients do not use their services, but conclude EPC contracts because they are interested in purchasing systems.
- They have carried out a 50MW solar power plant construction project in Bangladesh under the JCM equipment subsidy program. However, the subsidy was returned because they switched from Japanese solar panels to those made in China.
- They do not have experience in handling cases related to Eco-Towns based on industrial symbiosis.

ii. Current State of Solar Power Generation in Malaysia

- Regarding Malaysia's regulatory system for industrial parks, there are two ways to go about off-site power generation. The first is to distribute power through the TNB grid, but it is impossible to resort to that method at present, due to Malaysian policy. The second method is to connect to other private companies' electric cables, following the so-called prior consultation. In addition, prior consultation is required to obtain a license to generate electricity. The applicant

needs to submit the details of the project to the Energy Commission, as the Energy Commission needs to understand the project comprehensively before granting the license.

- Comparing Malaysia to the Philippines, Japanese companies operating in the region pay relatively high electricity costs in the Philippines. In Malaysia, because there is a subsidy system in place, the cost is relatively less.
- Compared to European countries, Malaysia is still slow in implementing initiatives such as SBT, but from around the end of last year, inquiries about renewable energy have been on the rise in Malaysia as well, due to the influence of SBT etc.
- Since Ditrolic Solar has the knowledge required to improve energy efficiency, they can provide us with some numbers we need when considering whether energy efficiency figures and financial returns related to services are in line with the direction of future activities.
- They have the experience of carrying out a project related to solar sharing in Bangladesh. However, since land is cheap in Malaysia, there is not much demand for dual use of land.

iii. Other

- They are interested in the technology that is being developed in Japan these days, of using waste lithium-ion batteries as energy storage devices.
- They are considering introducing solar power generation to Japanese companies operating in the region. They consider it possible to support us with policy and the technical feasibility of connecting to TNB.

2.8 Future Directions

Based on inquiries conducted this fiscal year, we were able to identify companies with a high potential for collaboration from among the companies we collected inventory data from last year, and were able to arrange for them to meet with Japanese companies. Due to the ongoing lockdowns in the region caused by Covid-19, and the economic exhaustion of local companies triggered by Covid-19 and their loss of interest in the Eco-Town based on industrial symbiosis, we were unable to proceed up to the point of discussing concrete ways of collaboration. However, we were able to establish relationships for future industrial symbiosis pilot projects.

In the future, it will be necessary to consider specific ways to collaborate with each company in order to realize the concept of industrial symbiosis. Once the border restrictions in both Japan and Malaysia are relaxed, we would like to work towards fleshing out pilot projects, by arranging for in-person visits to local companies to observe the actual facilities and waste treatment conditions, and encouraging the exchange of opinions face-to-face.

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Chapter 3 Realizing Waste-to-Energy Project

3.1 Overview of Activities

In the "Project to Promote Low Carbonization in the Iskandar Region (City of Kitakyushu -Iskandar Development Area Collaboration Project)" implemented in FY2019, "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 Seelong Landfill, which currently landfills and disposes of waste collected from five municipalities. IRDA expects detailed examinations based on technologies, etc. owned by Japanese companies, so in the previous 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. In the FY2021 project, 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).

Since we were unable to travel to the site due to the COVID-19, we carried out research activities from various aspects in cooperation with local consultants and estimated the technical specifications and feasibility of waste-to-energy facilities at candidate sites in the Iskandar region.

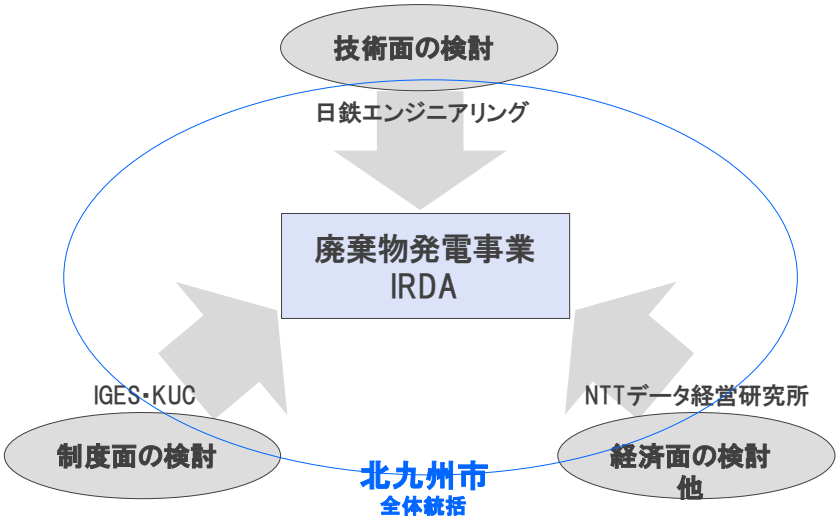

Figure 1　Our team

In this fiscal year, based on the results of the activities in FY 2020, we confirmed the progress of the waste to energy project being promoted by the Malaysian government and continued our discussions with SWM Environment Sdn. Bhd. (a company that undertakes waste management concessions in the southern Malay Peninsula. The company also manages the Seelong Landfill, a potential site for a waste-to-energy facility.), with which we had a meeting via web conference last year, to explore the possibility of collaboration and other business opportunities for future waste to energy facilities.

In summary, activities in FY2021 were as follows.

1) Review of the progress of the Waste-to-Energy project in Johor, Malaysia
2) Investigate the possibility of collaboration with local companies (SWM Environment Sdn. Bhd., etc.)

3.2 Current Status of Waste Management in Malaysia

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.

3.2.1 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 1). 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 1 **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 2). 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.

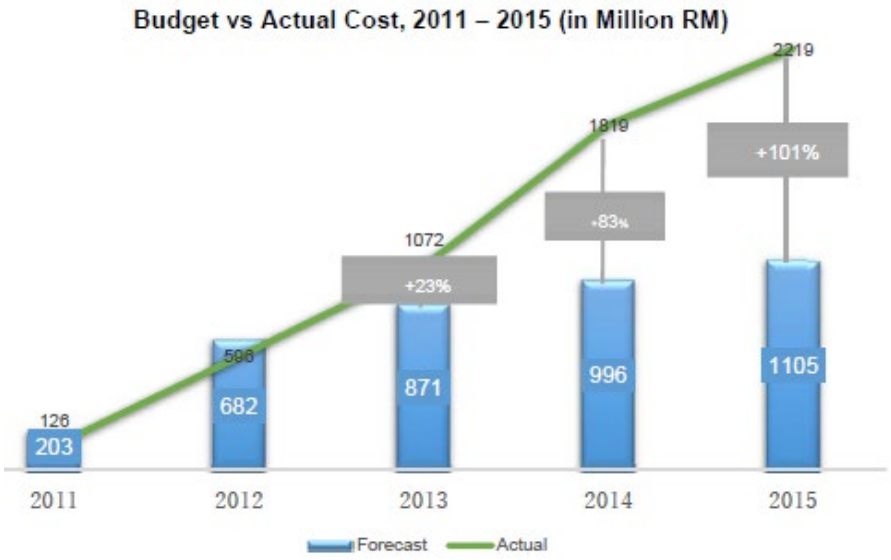

Figure 2 Malaysian Government's Waste-Related Budget and Performance trends for 2011-2015[1]

On the other hand, the budgets of the four local states that do not comply with Act 672 are as shown in Table 2. 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 2 **Disposal Budgets in Rural States That Do Not Comply with Act 672 in Malaysia**[2]

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

1 Solid Waste Management Lab 2015, GUIDE

2 (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

3.2.2 Institutional Framework for Solid Waste Management

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 3 (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.

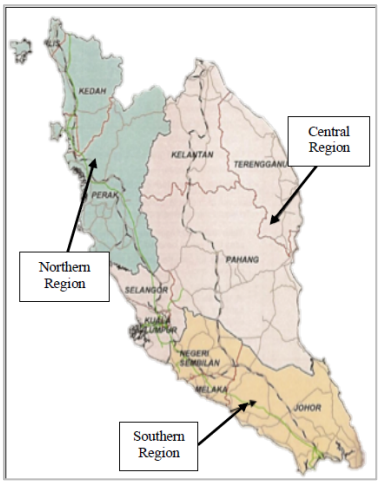

Figure 3 of Session Companies in the Malay Peninsula, 2011

3.2.3 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 3).

Table 3 **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 4 **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 5 below. 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 5 **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 4 JPSPN 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.

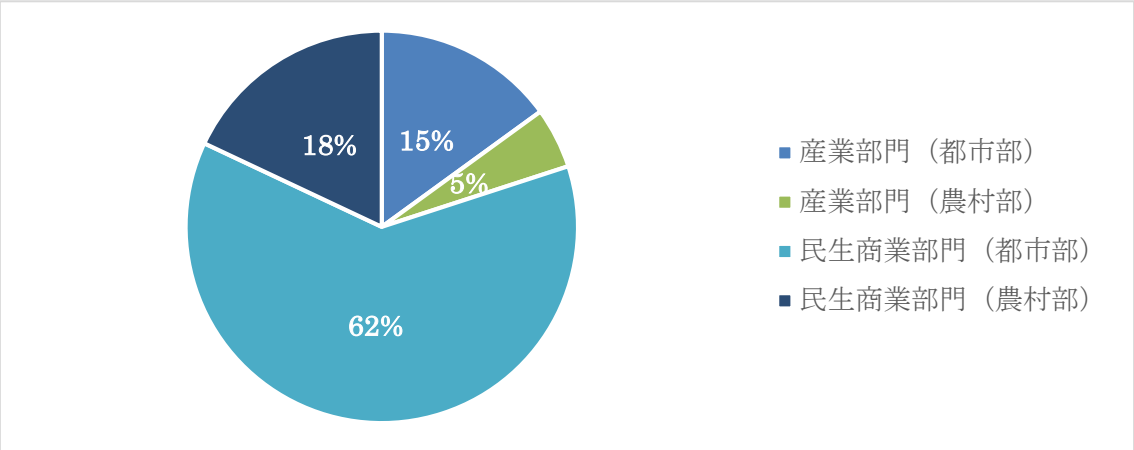

Figure 4 Percentage of Waste Generated in the Consumer Commerce and Industrial Sectors

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

3.2.4 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 5 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 6 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 7 660-liter trash can used in a garbage bin in a government building

Figure 8 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 3.2.2).

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 9 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 10 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 11

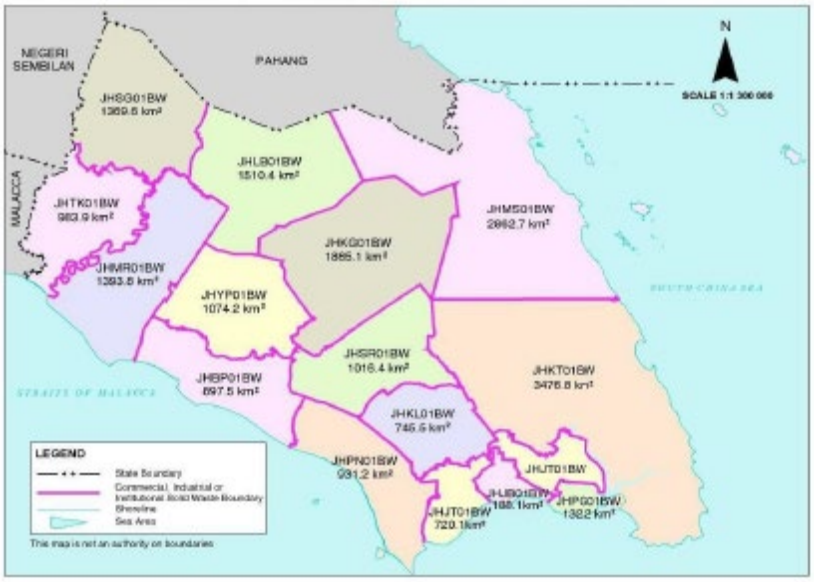

Figure 11 in Johor Province, 2011

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 6 **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 7 **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 8 **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 12).

- 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.

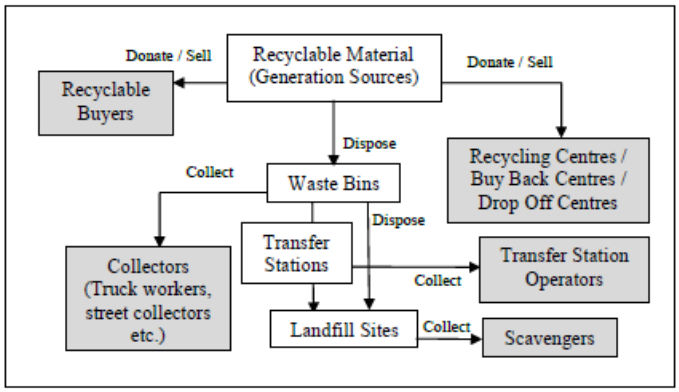

Figure 12 General Recycling Flow in Malaysia (Image)

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 13 Various People Engage in Non-Regular Recycling Activities

Figure 14 Non-regular recycling activities have also caused environmental pollution around the area

Figure 15 Recycling of Waste Plastics

Figure 16 Dismantling E-waste

3.2.5 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 9 **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

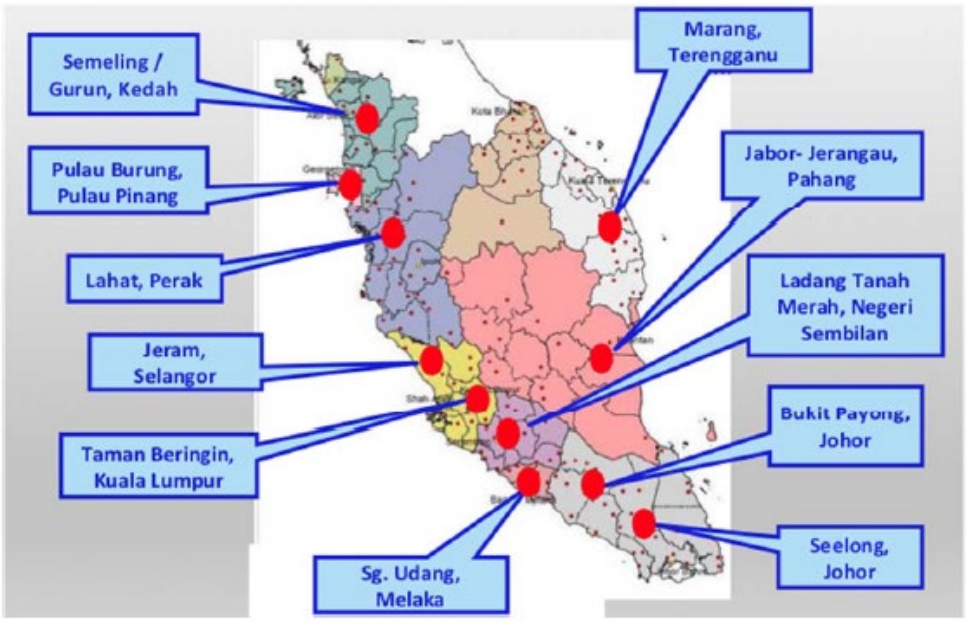

Figure 17 of candidate sites under consideration for installation of waste-to-energy facilities (JPSPN, 2020)

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.

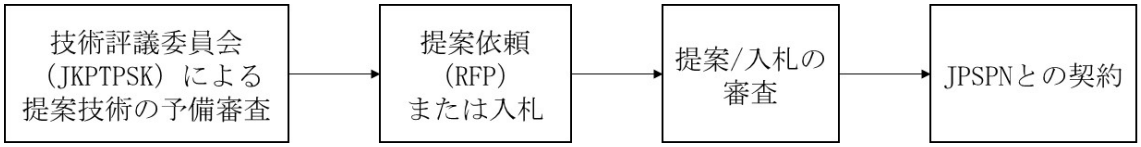

Figure 18 JKPTPSK Role and Review Process Conceptual Diagram[3]

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 10 **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)	

[3] 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).

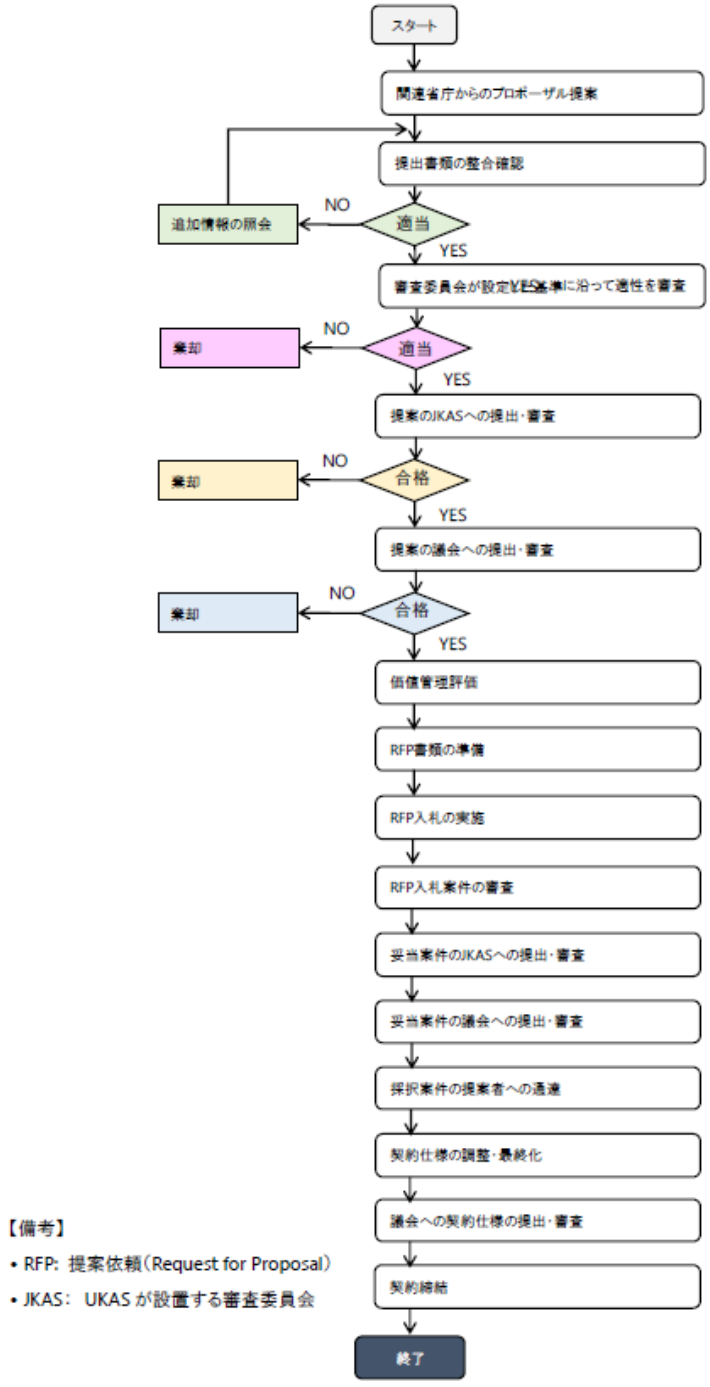

Figure 19 Flow of Procedures for Submission, Examination and Adoption of PPP Proposals in Malaysia[4]

[4] 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 [5]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 Seelong Landfill in the Iskandar region also plans to introduce waste-to-energy.

[5] 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/)

3.3 Review of the progress of the Waste-to-Energy project in Johor, Malaysia

In this year's project, we confirmed the progress of the waste-to-energy project being promoted by the Malaysian government.

According to the federal government's plan, 11 waste-to-energy projects are planned in Malaysia as a whole and two in Johor (see the table below). The target project in Iskandar region is No. 11 in the table below.

Table 11 candidate sites under consideration for installation of waste-to-energy facilities

No.	州	候補サイト	現状の受入量 (t/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	2,875
11	**Johor**	**Seelong Landfill, Johor Bahru**	**3,164**

There are two potential waste-to-energy sites in Johor: the Seelong Landfill (No. 11 in the above table) and the Bukit Payung Closed Landfil (No. 10 in the above table). Of these two sites, one site outside the Iskandar region (Bukit Payong) has started bidding for the waste-to-energy project in 2020. We believe that there is a possibility that a similar tender will be held for waste-to-energy in the Iskandar region, so we will check the progress of the tender for Bukit Payong.

3.3.1 About the Waste-to-Energy Facility Construction Project in Bukit Payong

According to the Request for Proposal (RFP) announced in August 2020 for the construction of a waste-to-energy facility in Bukit Payong, Johor, and the project will be implemented through a PPP contract for design, construction, financing, operation, maintenance and closure. At the end of the concession period, the concessionaire will dismantle all the facilities and transfer the land and related assets to the Malaysian government. Payment will be based on performance and service level compliance.

As a project requirement, the Government of Malaysia requires the procurement of a solid waste management facility with a capacity of at least 800 t/day (292,000 t/year), including commercial, industrial and institutional waste generated from the northern part of Johor. In addition, bidders will need to demonstrate compliance with the following parameters.

- 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 tonnes per day;
- the proposed technology solution has at least 3 years track record; and
- the proposed technology has minimum 8000 operating hours per annum.

In addition to the treatment and disposal of contracted solid waste, the concession agreement shall also include the management of all outputs from waste management, including the movement and sale of recovered materials or products (including energy (or power)), and the movement, transportation, and disposal of waste and processing residues. The bidder shall include in the solution details regarding the management and disposal of all contracted solid waste when the facility is not operational due to planned and unplanned maintenance. All costs related to the above items shall be recovered through gate fees and shall not be payable separately by the Government of Malaysia.

The Schedule is given in Table 12. This schedule lists the key dates associated with the project that are either critical in terms of overall delivery or have contractual implications in case of delay.

Table 12 Key Dates

Milestone	Date	Contractual Consequence
Contract signing	1 August 2021	

DEIA completion	31 July 2022	
Planning application submission	31 July 2022	
Planning permission	31 July 2022	
Planning Application Longstop Date	31 October 2022	Failure to submit Planning Application by Planning Application Longstop Date by the Longstop may lead to CA being void.
Planned Works Commencement Date	1 August 2022	Failure to commence the Works by 6 Months after the Planned Works Commencement Date is a Concessionaire's Default
Testing and Commissioning Period	1 May 2025 to 31 July 2025	
Planned Services Commencement Date	1 August 2025	
Readiness Longstop Date	6 Months after the Planned Readiness Date	Failure to obtain Readiness Certificate by Readiness Longstop Date is a Concessionaire's Default
Acceptance Longstop Date	6 Months after the Planned Services Commencement Date	Failure to obtain Acceptance Test Certificate by Acceptance Longstop Date is a Concessionaire's Default

Expiry Date	The 25th anniversary of the Services Commencement Date, unless extended by mutual agreement	

3.3.2 Progress

This year, we collected information through IRDA on the project to build a waste power plant in Bukit Payong, including the progress of contractor selection and the candidates for selection, but we were not able to obtain reliable information. One of the reasons for this is the delay in the schedule due to COVID-19. According to the plan, the contract with the selected contractor was scheduled to be signed in August 2021, but as of March 2022, the results of the bidding had not been announced.

Even after the selection of the contractor, environmental assessment and other procedures will still be required, so the construction period is expected to be pushed back from the original schedule. As a result, the waste-to-energy project at the Seelong Landfill is likely to take more time.

3.4 Investigate the possibility of collaboration with local companies

In order to realize a more optimal introduction of waste-to-energy that reflects the needs of the region, we held discussions with SWM Environment Sdn. Bhd. (SWMSB) to examine the possibility of collaboration with local companies. As mentioned earlier, in areas that have accepted the Solid Waste and Public Cleansing Management Act (Act 672), waste disposal (currently, landfill disposal) is outsourced to the private sector in the form of concessions. In the southern part of the Malay Peninsula, the waste management concessionaire is SWMSB, and one of the final disposal sites it manages is the Seelong Landfill. As mentioned above, the Seelong and Bukit Payong landfills are two of the potential waste-to-energy sites in Johor. As the bidding for the waste-to-energy project in Bukit Payong is scheduled to start in 2020, we analyzed the RFP and found that the bidding conditions are considerably more risky than PFI-type bidding for waste-to-energy projects in Japan, including the following three points.

- The technology provider needs to **form a JV** with a local company.
- **There is a large risk for the private sector** (the private sector needs to collect the local information necessary for the proposal (source, composition, daily collection volume, etc.) on its own).
- It is necessary **to set the treatment fee (gate fee) by oneself**. In addition, **penalties will be set** in case of operational failures.

Therefore, in order to work on the project, it is necessary to collect information on the nature and amount of waste as much as possible in cooperation with local companies. In this fiscal year, we aimed to acquire data on the quality and quantity of local wastes through continuous discussions with SWMSB.

3.4.1 Discussions with SWM Environment Sdn. Bhd.

(1) Outline of implementation

Discussions with SWMSB were held twice during the project period. The outline of each discussion is described below.

① The First meeting

Meeting Name	City-to-City Collaboration Project (Kitakyushu-IRDA): Knowledge sharing session (SWM Environment)	
Dates	October 18th , 2021 5:00 p.m. - 6:00 p.m.(JST)/ 4:00 p.m. - 5:00 p.m.(MYT)	
Location	Microsoft Teams	
Attendees	SWMSB	Mr. Mohd Norlisam Bin Mohd Nordin
	IRDA	Ms. Velerie Siambun
	City of Kitakyushu	Mr. Arita, Mr. Yamane
	NSE	Mr. Kinoshita, Mr. Manako, Mr. Tanigaki, Ms. Endo
	NTTDIOMC	Muraoka, Hamanaka, Yoshikawa

② The Second Meeting

Meeting Name	City-to-City Collaboration Project (Kitakyushu-IRDA): Knowledge sharing session (SWM Environment)	
Dates	November 19th , 2021 10:00-10:30 a.m. (JST)/ 9:00 p.m. - 9:30 p.m.(MYT)	
Location	Microsoft Teams	
Attendees	SWMSB	Mr. Mohd Norlisam Bin Mohd Nordin
	IRDA	Ms. Velerie Siambun
	City of Kitakyushu	Mr. Arita, Mr. Nagahara, Mr. Shirai
	NSE	Mr. Kinoshita, Mr. Manako, Mr. Tanigaki, Ms. Endo
	NTTDIOMC	Hamanaka

(2) Results of Discussions

1. The First Meeting

The first meeting was held in October with the aim of establishing a framework for cooperation with SWMSB. NIPPON STEEL ENGINEERING (NSE), which is studying the technical aspects of waste-to-energy for this project, explained its business activities and SWMSB shared information on the progress of waste-to-energy in the

Iskandar region.

i. Treatment capacity of waste-to-energy

In the technical study conducted by NSE in FY2020, the assumed figure for municipal solid waste (MSW) was 500 tons/day. However, in discussions with SWMSB, it was found that the actual figure would be three to four times higher at 1500 to 2000 tons at the Iskandar region and the Seelong Landfill. Therefore, it was necessary to update the assumptions of the technical specifications based on the amount of waste received.

ii. Waste-to-energy in Malaysia

After the award of the Seelong Landfill, SWMSB has been managing the landfill and disposal site according to the scope of work of the contract. SWMSB has made several proposals to the government on how to improve waste management and treatment facilities in Malaysia, but the concessionaire has not been able to expand the scope of its activities because it cannot deviate from the scope of its contract with the government. They also said that they were not sure if they would be able to recoup their investment in waste-to-energy with the amount of money they were given for normal landfill operations if they were to start waste-to-energy.

Therefore, if a pilot project is to be implemented at the Seelong Landfill, they said, it would be possible to build a waste-to-energy plant if they could get financial and technical support from Japan. He was also positive about using NSE's technology and asked if it would be possible to solicit investment mainly from IRDA.
Since SWMSB has no prospect of implementing the waste-to-energy project, they need the support of IRDA and Japanese companies. SWMSB is currently working on waste-to-energy projects in the northern state of Johor and in the state of Melaka, but it is unclear whether it will be able to win because of the political situation in Malaysia. According to the SWMSB, they have been approached several times by technology providers regarding WtE, and they used to provide information as part of their contribution to the country. However, they have not been able to gain any benefit from the information provided, so if they are going to provide information, they would like to have a contract between the two parties so that SWMSB can be involved until the end of the implementation.

In this meeting, we agreed to continue our discussions for collaboration and to provide the data of the Seelong Landfill, and we agreed to continue our communication by e-mail.

2. The Second Meeting

The second meeting was mainly conducted to discuss the waste quality of the waste being treated at the Seelong Landfill.

Discussions were held on the provision of waste quality data and it was found that SWMSB does not conduct waste quality analysis as it is not within the scope required by the government. In addition, the SWMSB supports a group of universities and government agencies to conduct waste analysis at the Seelong Landfill, but they do not have waste quality data because the results of the analysis are usually not shared with the SWMSB.

The SWMSB presented the following four proposals on how to obtain waste quality data.

1) UTM (Universiti Teknologi Malaysia) will conduct a waste analysis study at the Seelong Landfill, and we will ask them to provide us with the results of their waste analysis (calorific value, chemical composition, ash/moisture/combustibles content).
2) NSE will visit the Seelong Landfill to conduct the survey. (Not feasible considering the current quarantine requirements for entry into Malaysia under COVID-19)
3) Waste samples (50 kg) will be sent to Japan for waste analysis in Japan. (This is not practical due to legal and regulatory issues regarding waste exports)
4) SWMSB will introduce a local company that can conduct the waste analysis on the condition that NSE will provide detailed instructions on the survey method. (This may not be possible to complete within the project period)

Since the most realistic proposal is 1), we requested SWMSB to provide us with the survey data of UTM. However, due to the delay in the waste analysis survey by UTM, we were not able to obtain the data within the period of this project. We will continue to keep in touch with SWMSB to obtain waste quality data, and aim to develop business using MSW, including waste-to-energy.

3.5 Technical Study

3.5.1 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 which has utilized its grate-type incineration technology and been 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 Figure 23 in the following page.

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

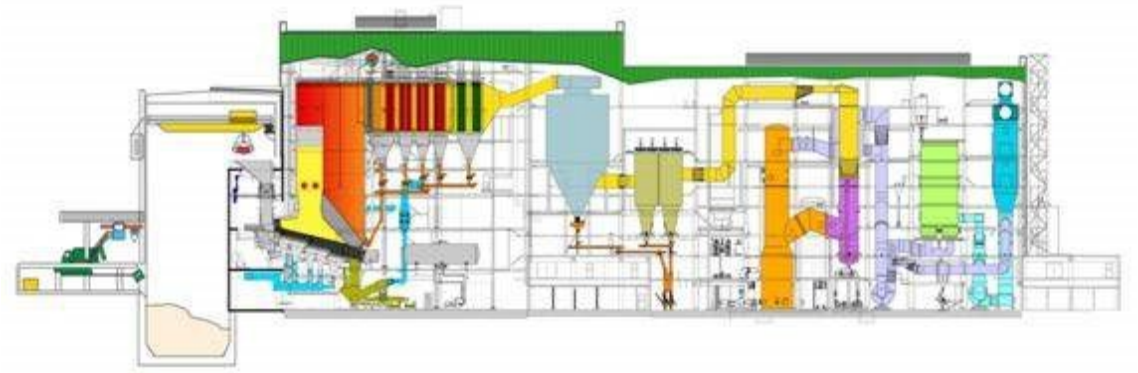

Figure 20 **Waste-to-Energy Plant Overall Flowchart (reference)**

3.5.2 Method of Study

This Technical Study for FY2021 Project aims to revisit and develop the basic technical specification, and calculate the rough estimates of the construction, operation and maintenance costs of the WTE plant obtained in the preliminary study under the FY2020 Project. The Technical Study will base its preconditions of study on the latest information provided by the other implementing partners of the FY2020 and FY2021 Project, namely Institute for Global Environmental Strategies Kitakyushu Urban Centre (IGES Kitakyushu) for information on legal, institutional frameworks and current status of municipal solid waste management (including data on waste generation and waste

quality) in Malaysia, and IRDA for information on the needs of the national and local governments of Malaysia and other general local information.

Site investigation activity in Iskandar Malaysia was not conducted, due to the continuing travel restriction imposed in Malaysia in response to the global spread of COVID-19.

3.5.3 Premises

Design Waste Throughput

In the investigation of FY 2020 Project, the design waste throughput of the presumed WTE plant was set at 500 tons/day (1 line) after discussion and recommendation by IRDA.

For this FY 2021 Project, discussions with IRDA and SWM Environment Sdn. Bhd. revealed that the amount of waste to be treated in Iskandar Malaysia is approximately 1,500 tons/day. Hence, the design waste throughput of the presumed WTE plant for this FY2021 Project is set at 1,500 tons/day. Two case studies are conducted; Case 1 with 500 tons/day x 3 lines, and Case 2 with 750 tons/day x 2 lines, each with the same total waste throughput of 1,500 tons/day but with different waste throughput per line.

Further, the annual availability of the WTE presumed plant is set at 333 days/year (8,000 hours/year) for both Case 1 and Case 2.

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 (See

Table 13 **Design Waste Quality**).

Table 13 **Design Waste Quality**

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

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.

Other Premises

(1) 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.

(2) Environmental Standards

Environmental standards in Malaysia which are applicable for WTE plants (as investigated and reported by IGES Kitakyushu and Soluwaste Management Consultants, 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 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 14**.

Table 14: Air Emission Standards in Malaysia

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

Source: Environmental Quality (Clean Air) Regulations, 2014

(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 Solid Waste Transfer Station and Landfill) Regulations 2009) is as shown in **Table 15**.

Table 15 Wastewater Standards in Malaysia

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
Aluminium	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
Ammoniacal Nitrogen	mg/L	10	20	5
Colour	ADMI	100	200	100

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

(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) 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

(1) Basic Flow of Waste Treatment

Basic flow of waste treatment in grate-type WTE plant is as shown in Figure 21 below. Further, basic flow is the same for both Case 1 and Case 2.

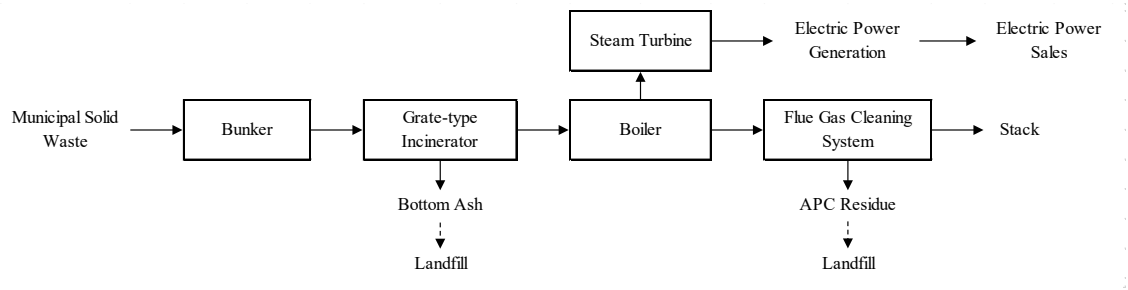

Figure 21 **Waste Processing Basic Flow**

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.

(2) Material Flow

The outline of material flow is as shown in Figure 22 in the following page. The presumed WTE plant is designed to process 1,500 tons/day of MSW, with 145 tons/day of incineration bottom ash and 35 tons/day of APC residues are discharged from the plant, respectively. The electric power sold via the grid is approximately 26.3 MW.

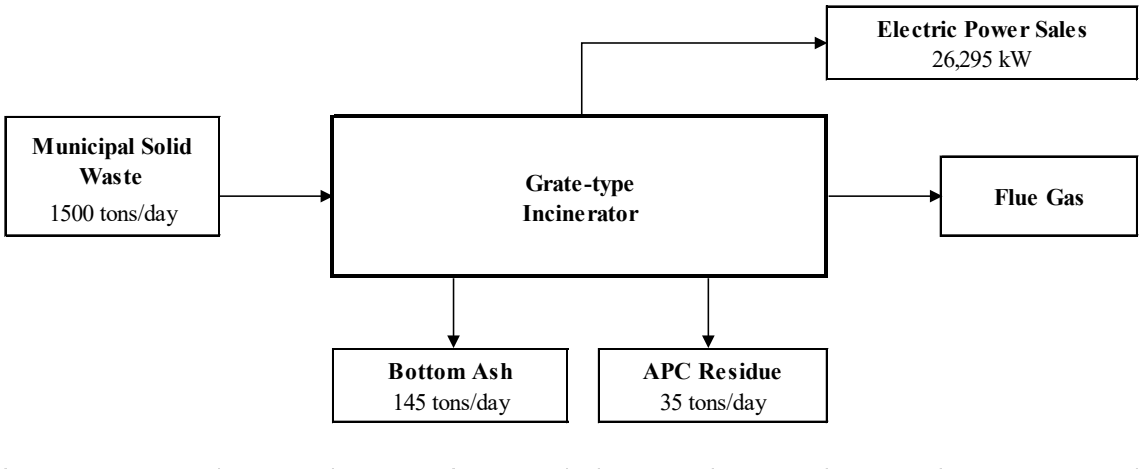

Figure 22 **Outline of Material Flow**

(3) 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

(4) Process Flow and Basic Layout

The layout and the longitudinal layout for the presumed WTE plant are shown in the following pages in Figure 23 through Figure 25.

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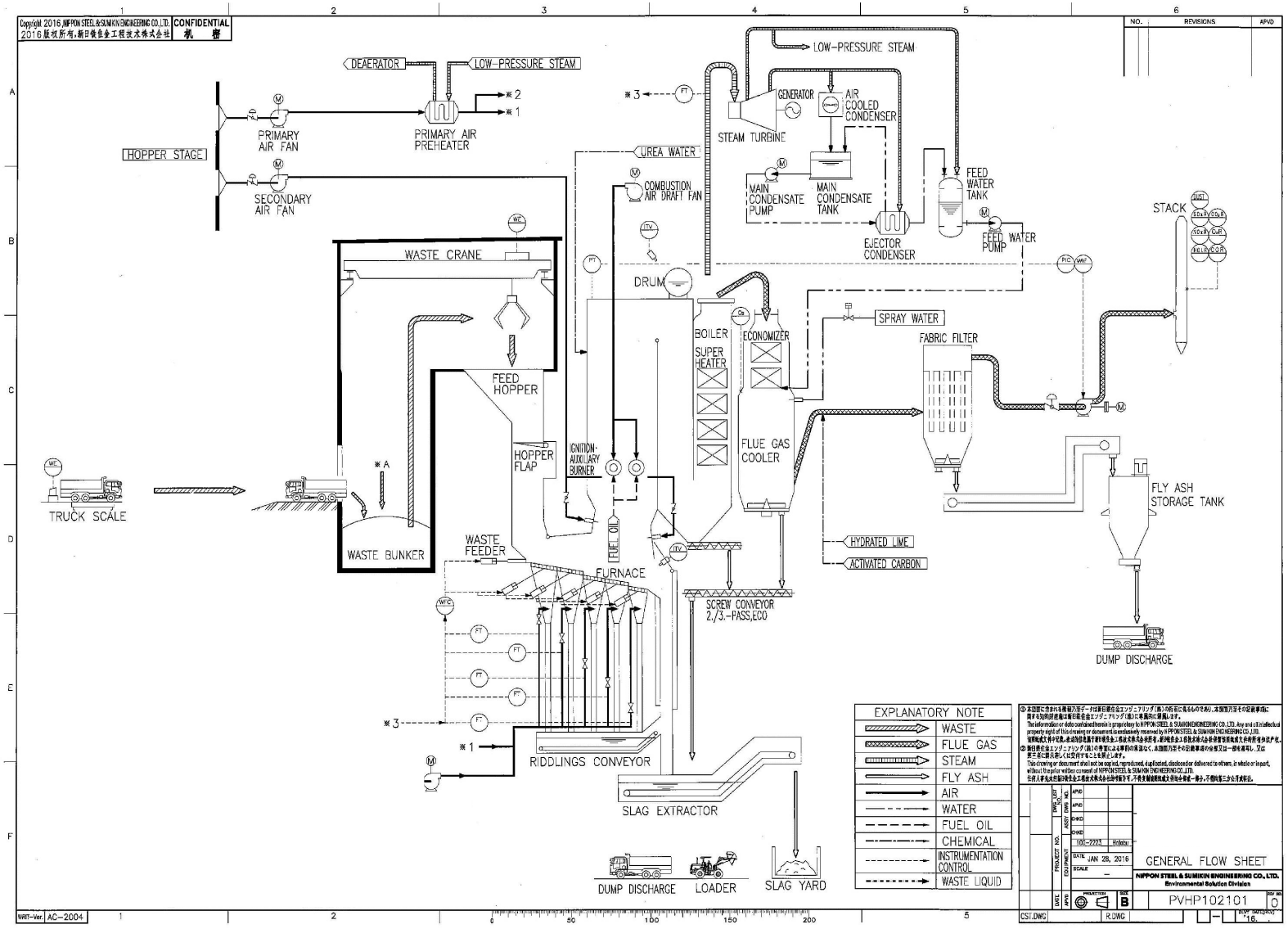


Figure 23 Process Flow Diagram

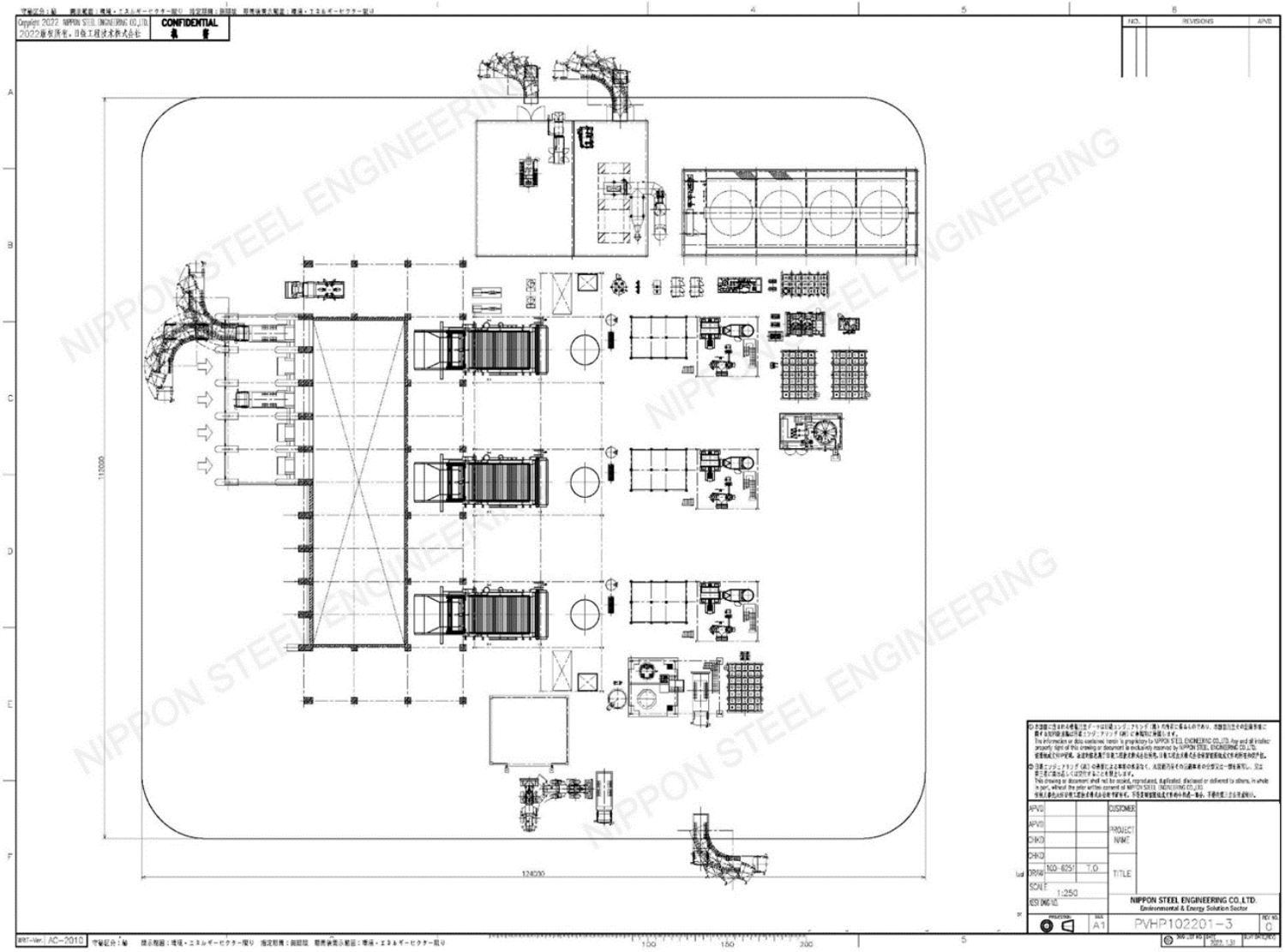


Figure 24-1 Layout (Case 1)

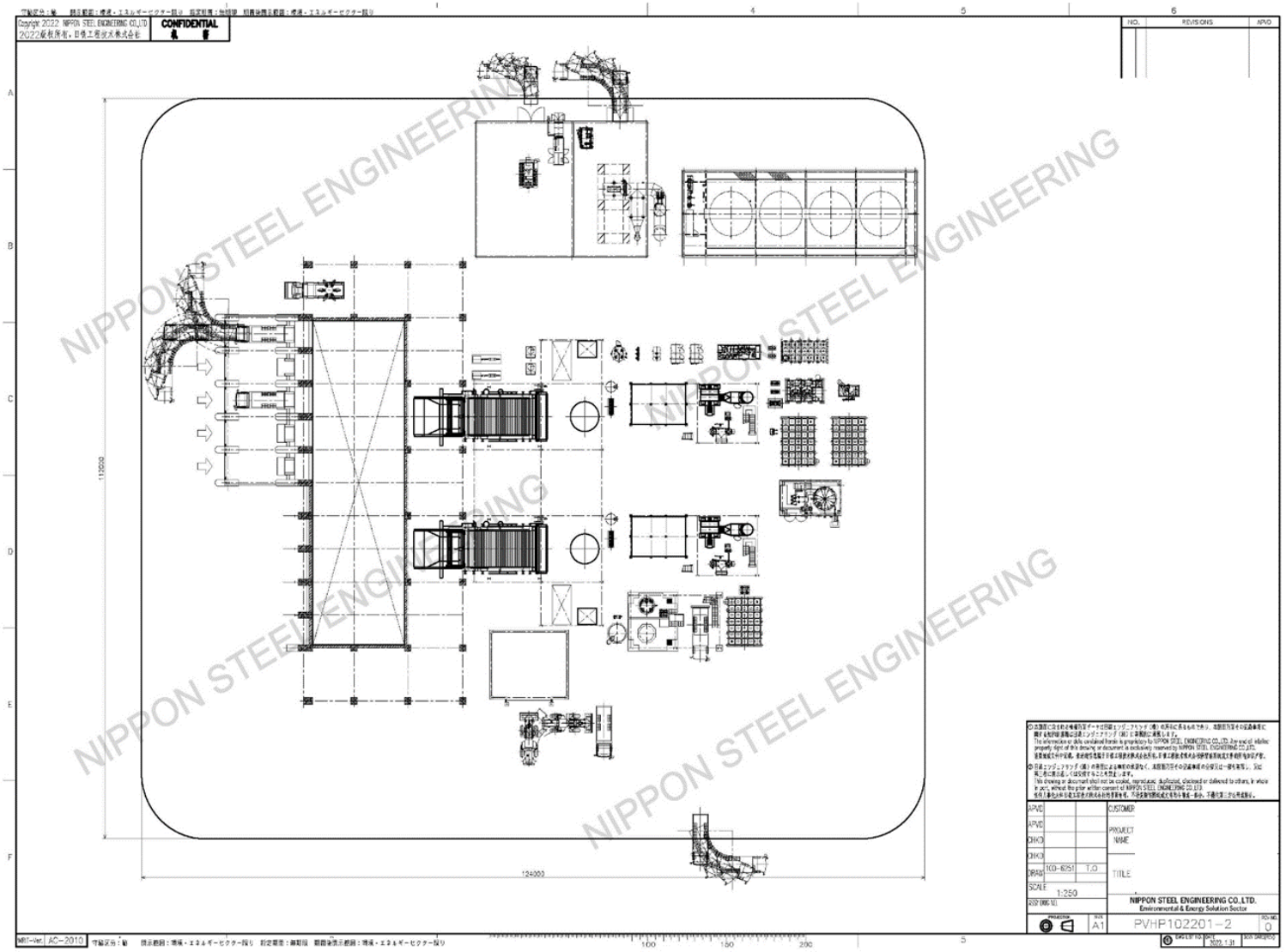


Figure 24-2: Layout (Case 2)

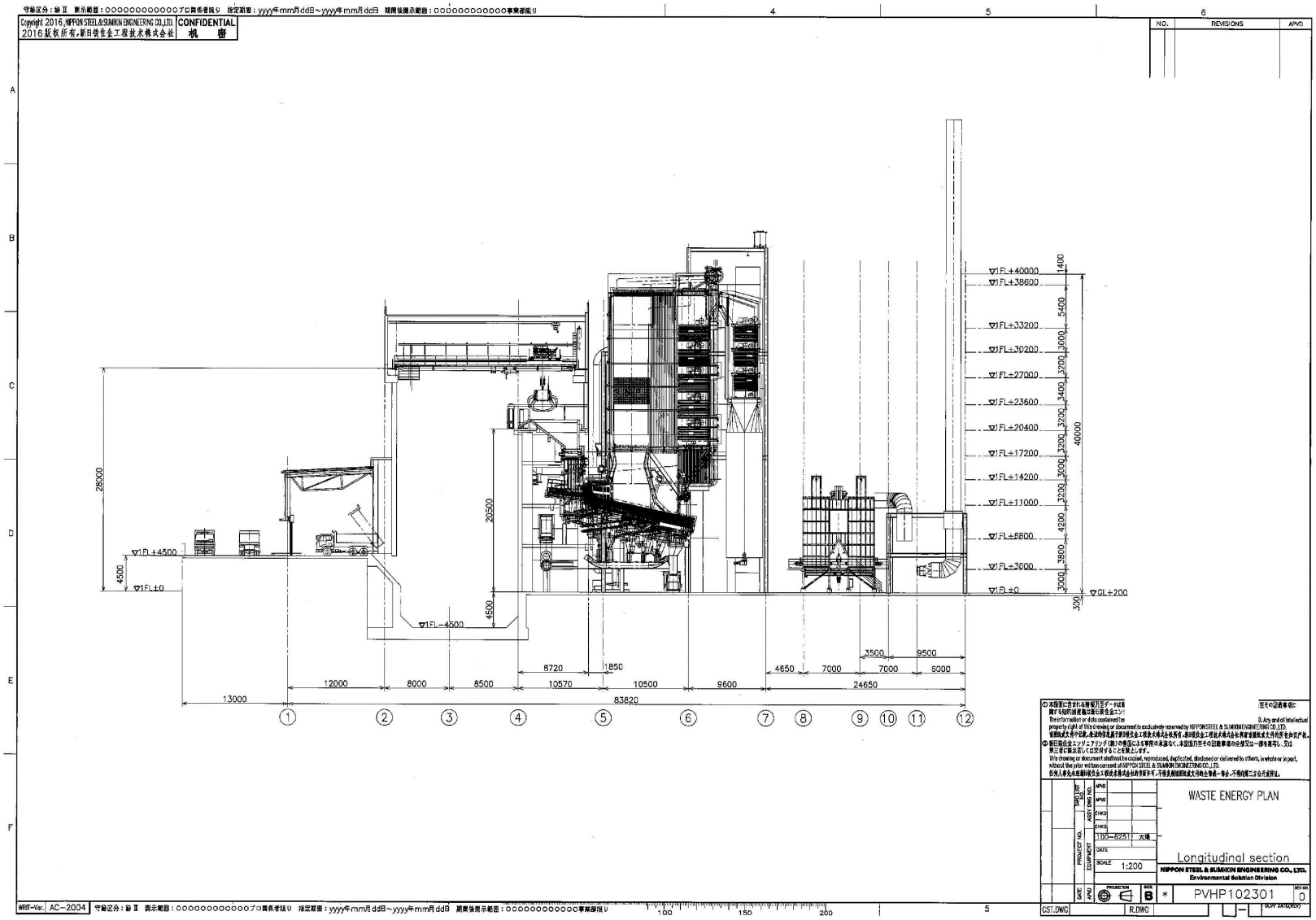


Figure 25 Longitudinal Layout (common for both Case 1 and Case 2)

3.5.4 Preconditions for Project Cost Estimation

The preconditions for calculating the project costs for the presumed WTE plant are as shown in **Table 16**.

Table 16 Preconditions for Project Cost Estimation

Item	Precondition		Remarks
	Case1	Case2	
Waste throughput	500 tons/day x 3 lines	750 tons/day x 2 lines	-
Project period	20 years (operation period)		plus 3 years construction period
Availability	333 days (8,000 hours/year)		-
Steam parameter	430℃、52 barA		-
Possible power sales amount	210,150 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.

3.5.5 Rough Estimation of Project Cost

Construction Costs (rough estimate)

The calculation result of construction costs (rough estimate) are as shown in **Table 17**. Civil & building costs are the same for both Case 1 and Case 2, because the capacity of waste pit is the same. (Note: The capacity of waste pit is determined by waste throughput, and waste throughput is the same for both Case 1 and Case 2.) On the other hand, plant cost of Case 2 is approximately 15% less than that of Case

1, because Case 2 (2 lines) has less equipment than Case 1 (3 lines).

Table 17 Rough estimate of construction costs

Item	Case 1 500 tons/day x 3 lines		Case 2 750 tons/day x 2 lines	
	(billion JPY)	(million USD[1)])	(billion JPY)	(million USD[1)])
Plant	17.7	154.0	15.1	131.4
Civil & Building	3.5	30.5	3.5	30.5
Total	21.2	184.5	18.6	161.9

1) JPY/USD currency exchange rate: 1 JPY= 0.0087 USD (as of 8 February 2022)

From the above estimate, construction cost (Total) of Case 2 is approximately 12% less than that of Case 1.

Operation and Maintenance Costs (rough estimate)

The calculation results of operation and maintenance costs (rough estimate) are as shown in **Table 18**. "Personnel costs" was derived from estimated local labor unit price and number of operators, and "maintenance cost" 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.

Personnel cost remained same as the cost calculated in FY2020 Project because WTE plant is basically an automatic operation. Maintenance costs of Case are more expensive than those of Case 2 because Maintenance cost increases in proportion to construction cost. Utility costs estimated are the same for Case 1 and Case 2, since the total waste throughput are the same for both cases (difference in number of lines or waste throughput per line does not affect the utility cost as long as the total waste throughput remains the same).

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

Table 18 Rough estimate of operation and maintenance costs

Item	Case 1 500 tons/day x 3 lines		Case 2 750 tons/day x 2 lines	
	(billion JPY)	(million USD[1)])	(billion JPY)	(million USD[1)])
Personnel costs	0.12	1.0	0.12	1.0
Maintenance costs	0.64	5.6	0.56	4.9
Utility costs	0.75	6.5	0.75	6.5
Total	1.51	13.1	1.43	12.4

1) JPY/USD currency exchange rate: 1 JPY= 0.0087 USD (as of 8 February 2022)

Operation and maintenance costs of Case 2 are less expensive than those of Case 1 as with construction costs.

From these results, it can be concluded that when constructing a WTE plant, it is desirable to increase the waste throughput per line as much as possible to achieve economies of scale. However it must be noted that this does not mean that further scale-up exceeding 1,000 tons/day is even more desirable since there will be technical issues in such scale-up.

Construction Time Schedule (reference)

The assumed construction period of the presumed WTE plant is as shown in **Table 19**. 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 19 Construction Time Schedule (reference)

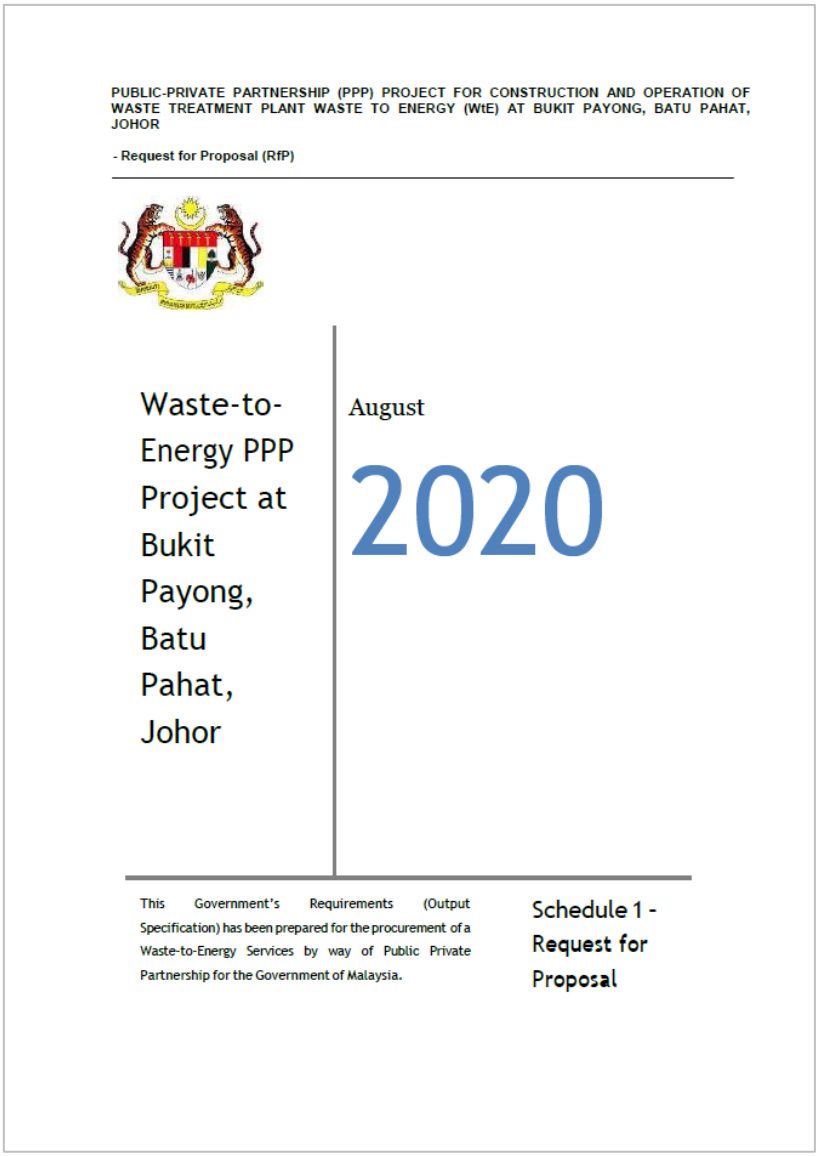
Year	1				2				3			
Quarter	I	II	III	IV	I	II	III	IV	I	II	III	IV
Basic Engineering												
Detail Engineering												
Civil & Building												
Erection												
Commissioning												

3.6 Economic Study

3.6.1 Evaluation of business ability

Organizing prerequisites

Based on the 3.2 Current Status of Waste Management in Malaysia and 3.5 Technical Study, 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 26).


PUBLIC-PRIVATE PARTNERSHIP (PPP) PROJECT FOR CONSTRUCTION AND OPERATION OF WASTE TREATMENT PLANT WASTE TO ENERGY (WtE) AT BUKIT PAYONG, BATU PAHAT, JOHOR

- Request for Proposal (RfP)

Waste-to-Energy PPP Project at Bukit Payong, Batu Pahat, Johor

August

2020

This Government's Requirements (Output Specification) has been prepared for the procurement of a Waste-to-Energy Services by way of Public Private Partnership for the Government of Malaysia.

Schedule 1 - Request for Proposal

Figure 26 Bid Specifications for Waste-to-energy Project at Bukit Payong (Cover Page)

Table 20 for estimating project costs (re-listed from Table 16)

Item	Precondition		Remarks
	Case1	Case2	
Waste throughput	500 tons/day x 3 lines	750 tons/day x 2 lines	-
Project period	20 years (operation period)		plus 3 years construction period
Availability	333 days (8,000 hours/year)		-
Steam parameter	430℃、52 barA		-
Possible power	210,150 MWh/year		Power generation amount

sales amount		minus self-consumption amount
Project site	Land located adjacent to Seelong Sanitary Landfill Facility	Site preparation work assumed to be not necessary

Table 21 Estimated construction costs **(re-listed** from **Table 17)**

Item	Case 1 500 tons/day x 3 lines		Case 2 750 tons/day x 2 lines	
	(billion JPY)	(million USD[1)])	(billion JPY)	(million USD[1)])
Plant	17.7	154.0	15.1	131.4
Civil & Building	3.5	30.5	3.5	30.5
Total	21.2	184.5	18.6	161.9

1) JPY/USD currency exchange rate: 1 JPY= 0.0087 USD (as of 8 February 2022)

Table 22 operating and maintenance costs (re-listed from **Table 18)**

Item	Case 1 500 tons/day x 3 lines		Case 2 750 tons/day x 2 lines	
	(billion JPY)	(million USD[1)])	(billion JPY)	(million USD[1)])
Personnel costs	0.12	1.0	0.12	1.0
Maintenance costs	0.64	5.6	0.56	4.9
Utility costs	0.75	6.5	0.75	6.5
Total	1.51	13.1	1.43	12.4

1) JPY/USD currency exchange rate: 1 JPY= 0.0087 USD (as of 8 February 2022)

Table 23 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 feeFigure 23needs 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 24　1: Project IRR at Processing Cost of 4000 Yen / Ton

	Case1			Case2		
	10 years	15 years	20 years	10 years	15 years	20 years
No subsidies	-7%	0%	5%	-3%	4%	7%
10% of the grant	-4%	3%	6%	0%	6%	9%
20% of the grant	-1%	5%	8%	3%	9%	11%
30% of the grant	3%	8%	11%	7%	12%	14%

Table 25 Case 2: Project IRR at Processing Cost of 5000 Yen / Ton

	Case1			Case2		
	10 years	15 years	20 years	10 years	15 years	20 years
No subsidies	-2%	4%	8%	2%	8%	11%
10% of the grant	1%	7%	10%	5%	10%	13%
20% of the grant	4%	9%	12%	9%	13%	15%
30% of the grant	8%	13%	15%	13%	17%	18%

Table 26 Case 3: Project IRR at Processing Cost of 6000 Yen / Ton

	Case1			Case2		
	10 years	15 years	20 years	10 years	15 years	20 years
No subsidies	2%	8%	11%	7%	12%	14%
10% of the grant	5%	10%	13%	10%	14%	16%
20% of the grant	9%	13%	15%	13%	17%	19%
30% of the grant	13%	17%	18%	18%	21%	22%

Table 24, Table 25, Table 26, IRR is a plus for a 20-year operating period. Assuming that an IRR of 5% or higher is considered an investable project, even if the processing cost is 4,000 yen/ton and there is no subsidy, the project is considered to be feasible.

3.7 Future Directions

In this year's survey, we had several discussions with SWMSB, which is running a concession project for landfill disposal of waste in the area, and were able to establish a relationship between NSE and SWMSB. In addition, we were able to obtain information necessary for the study of waste-to-energy during the discussions and update the project cost estimate and feasibility assessment conducted in the FY2020 project.
We also collected information on the progress of the project selection and the candidates for the project to build a waste power plant in Bukit Payong through IRDA in order to monitor the trend of the waste-to-energy introduction policy of the Malaysian government. However, due to the delay in the schedule caused by COVID-19, we were not able to obtain highly accurate information.

From next year onwards, SWMSB, which already has a good track record in the region, will be considered as a leading candidate for the local partner company, and discussions will be continued with the aim of Japanese participation in the bidding process for waste-to-energy projects in the Iskandar region. In addition, we will continue to follow up on the status of bidding in Bukit Payong.

In addition, since the actual introduction of waste-to-energy depends largely on the government's actions, it would be meaningful to apply for the JCM equipment subsidy project for the introduction of environmental infrastructure such as methane gas recovery using municipal solid waste (MSW) in addition to waste-to-energy projects.

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Chapter 4　Proposal for a decarbonization action plan (tentative name)

4.1　Overview of Activities

Since 2019, the "Project for the Promotion of Decarbonization in the Iskandar Region (Kitakyushu-Iskandar Development Area Cooperation Project)" has been underway, and this year's project is the final year of a three-year plan. Based on this, we will summarize the past activities in cooperation with the Iskandar Regional Development Agency (IRDA) and compile an action plan for decarbonization in the future.

During the implementation of the project in FY2019, IRDA indicated "Industrial Symbiosis", "Eco Town" and "Waste to Energy" as the key words in the activities of the next step of the Low Carbon Society Blueprint. We have been implementing activities to realize these goals. This year, we discussed with IRDA how to apply the results of our activities to the decarbonization of the Iskandar region.

4.2 Activities and results of the project in FY2019

4.2.1 Activities in FY2019

The City of Kitakyushu has been building a partnership with IRDA for the low-carbon development of the Iskandar region from FY2014, FY2015, and FY2016. In the first year of this project, with the aim of promoting decarbonization in Malaysia and the formation of JCM projects to contribute to it, based on the partnership between the Iskandar Regional Development Authority of Malaysia (IRDA) and Kitakyushu City that has been established up to now. The details of the activities are described below.

Activity 1: Consideration of an action plan based on the blueprint for a low-carbon society already developed

In Activity 1, we developed an action plan to achieve the goals set in the Blueprint for a Low Carbon Society (supported by JST and JICA) developed by an international research team consisting of Kyoto University, National Institute for Environmental Studies, Okayama University, Universiti Teknologi Malaysia and IRDA. In addition, we carried out a project to organize a concrete project using JCM related to the action plan. The specific activities are shown in the table below.

Table 1 Activities in 2019: Activity 1

	Activities	Activities
1)	Direct discussions with IRDA	Direct consultations will be held with relevant local government agencies to share the objectives of the project. We will also assess the impact of policy changes and local needs, and build consensus on the policy to be considered.
2)	Review of the draft action plan	Based on the blueprint for a low carbon society that has already been developed, and taking into account the impact of policy changes, we will consider an action plan for the period up to 20502012 to achieve the goals set out in the blueprint.
3)	Discussions and exchange of views with IRDA on the basis of the draft Action Plan	Based on the draft action plan reviewed, consultations and exchanges of views will be held with relevant government agencies to support the development of IRDA's action plan.

Activity 2:2015 Follow-up survey of the surveys carried out during the 2016year

Based on the results of the 2015yearly and 2016annual inter-city cooperation surveys carried out by Kitakyushu City, Activity 2 was a follow-up survey to confirm the cogeneration needs of Japanese factories already operating in Malaysia, the need to increase the efficiency of chillers in refrigerated warehouses, and the need to combine renewable energy generation and heat shielding effects of roof-mounted photovoltaic systems. The potential of the project was also confirmed. In addition, the latest status of the needs for power generation from waste heat recovery from cement plants and power generation from landfill gas recovery, for which the potential was confirmed, will be added to the above Action Plan based on the Blueprint for a Low Carbon Society. Details of the activities are given in the table below.

Table 2　Activities in 2030: Activities2

	Activities	Activities
1)	Consultations with Japanese companies and others with needs	Direct consultations will be held with companies and others whose needs have been identified in previous years' surveys to understand their detailed plans and to share their policies for decarbonization.
2)	Technical, economic and CO2 reduction studies	Based on consultations with the candidate companies for the project, basic studies of the technologies to be introduced, economic studies of the amount of investment, payback period and internal rate of return, and the effect of CO2 emission reductions due to the introduction of the equipment will be examined.
3)	Review of the implementation structure of the JCM equipment subsidy project	Confirm the willingness of the representative company and local companies to participate in the JCM equipment subsidy project, and discuss the specifics of the project; in case of applying for JCM equipment subsidy, prepare for it (consider the schedule, confirm the contract method, study the implementation system, and identify issues).

Activity 3: Identification of potential waste heat recovery and power generation projects

With regard to waste heat recovery power generation for existing cement plants in

Malaysia, there are some projects that have not yet been selected as the preferred bidder, although they have been invited to implement the projects on a BOT basis. In addition, there are some landfill gas recovery power plants in Malaysia that are subject to the CDM, but they generate surplus gas and there is a potential to utilize this surplus gas effectively.

The aim of Activity 3 is to identify projects that have plans for a low-carbon future, but have not yet been realized, so that they can be applied to JCM at an early stage. Details of the activities are given in the table below.

Table 3 Activities in 2030: Activity 3

	Activities	Activities
1)	Direct consultation with private companies with potential	We will identify and directly consult with potential projects in the Iskandar region and elsewhere in Malaysia, including waste heat recovery and ride-fill gas recovery.
2)	Technical, economic and CO2 reduction studies	Based on consultations with the candidate companies for the project, basic studies of the technologies to be introduced, economic studies of the amount of investment, payback period and internal rate of return, and the effect of CO2 emission reductions due to the introduction of the equipment will be examined.
3)	Review of the implementation structure of the JCM equipment subsidy project	Confirm the willingness of the representative company and local companies to participate in the JCM equipment subsidy project, and discuss the specifics of the project; in case of applying for JCM equipment subsidy, prepare for it (consider the schedule, confirm the contract method, study the implementation system, and identify issues).

4.2.2 Results of activities in FY2019

Activity 1: Consideration of an action plan based on the low carbon society blueprint already developed

The activities outlined in the Blueprint for a Low Carbon Society formulated in 2012 are progressing well as of the end of FY2019, "72% of the 281 programs formulated are

in progress, 21% are completed, and only 7% have not yet started. It was confirmed that IRDA is at the stage of considering the transition to the next step of the Low Carbon Society Blueprint. As the next step, IRDA would like to develop activities based on the following three keywords.

- Industrial Symbiosis
- Eco Town
- Waste to Energy

In FY2019, we agreed with IRDA to continue our activities in FY2020 with the aim of realizing a pilot project that integrates industrial symbiosis and eco-town as described above in the Iskandar region. Activities in FY2020 are shown in 4.3.2 Results of FY2020 Activities.

Activity 2 Follow-up of the surveys carried out during FY2015, FY2016

The Japanese manufacturers in Malaysia have a long history in the country, and the current facilities in their factories are aging, and the need for investment in the renewal of various facilities is very high. We then identified a three number of potential JCM projects with high potential for horizontal deployment. The table below shows an overview of the projects we have identified.

Table 4 Candidates for JCM projects identified in FY2049

Companies with needs	Overview
1) MIZUHO PRECISION ENGINEERING SDN.BHD.	Replacement of ageing vacuum cleaning machines
2) Cement Industries of Malaysia Berhad (CIMA)	Installation of waste heat recovery systems
3) Hitachi Chemical (Johor) Sdn. Bhd.	Installation of PV, boilers, chillers, etc. (new installations and replacements)

The company in 1) in the table above manufactures electrical and electronic components and is planning to upgrade its vacuum cleaning equipment (hydrocarbon type) which is used in the process of cleaning the components after manufacture and before shipment. The company is keen to install high efficiency equipment and is considering installing high efficiency type cleaning equipment in Japan.

Activity 3: Identification of potential waste heat recovery and power generation projects

In addition to identifying the projects listed in Activity 2, we also conducted workshops on JCM equipment subsidy projects for local cement companies and Japanese company officials in Malaysia. After the workshop, several companies consulted with us about specific JCM projects, as waste heat recovery facilities have not been introduced in

cement factories in Malaysia. About 15 Japanese manufacturing companies attended the meeting to raise awareness of the JCM equipment subsidy program.

4.3 Activities and results of the project in FY2020

4.3.1 Activities in FY2020

In FY2020, based on the results of the first year, we have developed a plan to implement the following3 activities, which IRDA considers important as the next theme of the Low Carbon Society Blueprint (see the figure below).

- Realization of an eco-town in industrial symbiosis
- Realization of waste-to-energy
- Investigation of high-potential JCM application projects

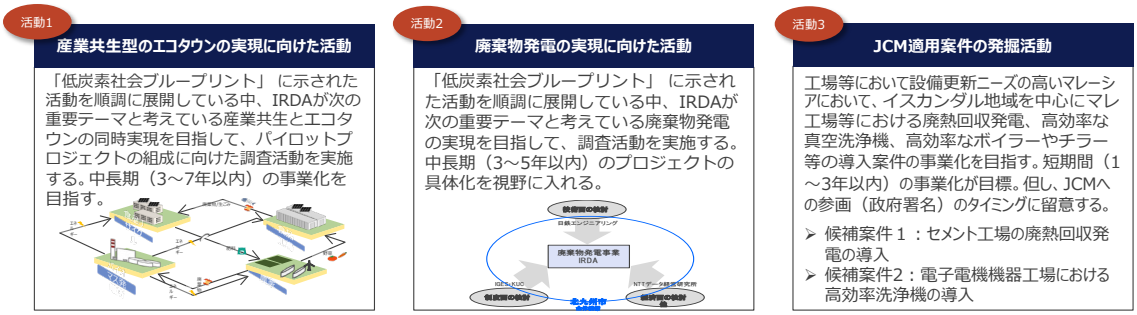

Figure 1 Business Activities in 22045

Activity 1: Realization of an eco-town in industrial symbiosis

The first activity aimed at the simultaneous realization of Industrial Symbiosis and Eco Town, the next step in IRDA's Blueprint for a Low Carbon Society. Specifically, the following4 activities were carried out

1) IRDA will take the lead in collecting inventory data on waste generated by factories in industrial estates in the Iskandar region.
2) Based on the inventory data collected, matching between plants (i.e. matching whether waste from one plant can be used as raw fuel in another plant) is carried out.
3) We will examine the technologies and tools needed to achieve the above matching and consider ways to collaborate with companies that have these technologies and tools.
4) In parallel with the above3 activities, we will consider how to provide policy support (incentives, penalties, etc.) to achieve industrial symbiosis and eco-towns in an integrated manner.

Activity 2: Realization of waste-to-energy

The second activity is a research activity on the realization of waste-to-energy, which IRDA considers as the next important theme of the Low Carbon Society Blueprint. The initial plan was to carry out research activities on the technical, institutional and economic aspects of waste-to-energy (see below). The companies in charge of each research activity are as follows

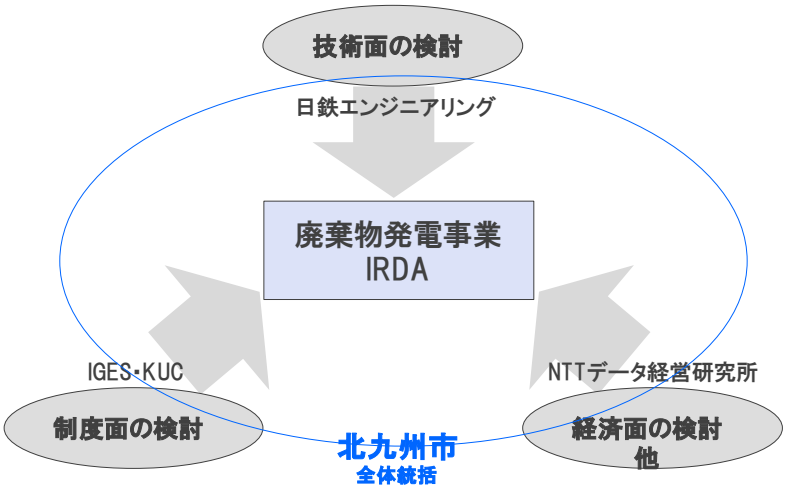

Figure 2　Structure of Activities2

Activity 3: Investigation of high-potential JCM application projects

The third activity in FY2020 was to identify JCM-applicable projects mainly in the Iskandar region. The plan was to follow up on three projects identified in the first year of the project and to quickly apply for the JCM equipment subsidy project.

4.3.2　Results of business activities in FY2020

Activity 1: Realization of an eco-town in industrial symbiosis

Although we were unable to travel to Malaysia due to the outbreak of the new coronary disease, we carried out the activities in cooperation with IRDA as planned. Firstly, IRDA distributed questionnaires to the companies in the industrial parks in the Iskandar region with the cooperation of the Japanese side, and held workshops with related factories to collect inventory data from a total of 30 factories. Next, we analysed the inventory data to examine the possibility of matching between plants. The inventory data confirmed that much of the non-hazardous non-scheduled waste in the industrial waste stream is already being recycled.

On the other hand, it was confirmed that a certain amount of waste was disposed of directly to landfill after discharge. In this study, we examined the possibility of matching the use of raw materials and fuels between factories and the possibility of advanced recycling and reuse of these wastes by using the technologies of Japanese companies.

In addition, we checked with IRDA on the availability of policy measures (such as subsidy schemes) in Malaysia. As of FY2020, there are no available subsidies in Malaysia, and it is difficult for IRDA to implement its own policies.

Activity 2: Realization of waste-to-energy

As for the activity2, although it was not possible to travel to the area and there were considerable difficulties in collecting information, we carried out research activities from 3three aspects: technical, institutional and economic, in cooperation with local consultants.

Firstly, an overview of waste-to-energy projects, including institutional aspects, was investigated. In Malaysia, the Solid Waste and Public Cleansing Management Act (Act 672) was enacted in 20072006, and the management of municipal solid waste is now the responsibility of the Federal Government. However, the decision to comply with the Act is left to the state governments, and some states have their own municipal solid waste management systems in place. The state of Johor, where Iskandar is located, is subject to the Solid Waste and Public Cleansing Management Act (Act 672), which means that the introduction of waste-to-energy is also decided by the federal government. At present, there are two potential waste-to-energy sites in Johor, the Seelong Landfill and the Bukit Payong Landfill. Of these two sites, the Bukit Payong, which is outside the Iskandar region, was the first to go out to tender for a waste-to-energy project in 2020. Considering the possibility of a similar tender for waste-to-energy in the Iskandar region, we obtained and analysed the RPF of Bukit Payong.

The planned waste quality of the waste to be treated in the waste-to-energy plant and the environmental standards to be observed in its operation were confirmed, and a technical study was carried out on the basis of this. Based on the results of this study, the economic efficiency of the project was examined. The results are as follows. When the treatment cost is 4,000 yen/t, the IRR is plus 1% after 20 years of operation. On the other hand, if the subsidy rate is 30%, the IRR will be 7% at 4,000 yen/t. It can also be seen that if the treatment cost is 6,000 yen/t, the IRR will be 7% even without subsidy. Assuming an investment hurdle rate of 5%, the waste-to-energy business is a potential investment project.

Table 5　Results of economic study

Processing Cost=¥4000/t	Case 1			Case 2		
IRR	10 years	15 years	20 years	10 years	15 years	20 years
No subsidies	-7%	0%	5%	-3%	4%	7%
10% of the grant	-4%	3%	6%	0%	6%	9%
20% of the grant	-1%	5%	8%	3%	9%	11%
30% of the grant	3%	8%	11%	7%	12%	14%

Processing Cost=¥5000/t	Case 1			Case 2		
IRR	10 years	15 years	20 years	10 years	15 years	20 years
No subsidies	-2%	4%	8%	2%	8%	11%
10% of the grant	1%	7%	10%	5%	10%	13%
20% of the grant	4%	9%	12%	9%	13%	15%
30% of the grant	8%	13%	15%	13%	17%	18%

Processing Cost=¥6000/t	Case 1			Case 2		
IRR	10 years	15 years	20 years	10 years	15 years	20 years
No subsidies	2%	8%	11%	7%	12%	14%
10% of the grant	5%	10%	13%	10%	14%	16%
20% of the grant	9%	13%	15%	13%	17%	19%
30% of the grant	13%	17%	18%	18%	21%	22%

Activity 3: Investigation of high-potential JCM application projects

As for the activity3, we were able to carry out follow-up activities for the materialization of the project as planned, although it was remote because we had already identified individual companies. However, of the three projects, we decided not to apply for the JCM equipment subsidy program for the project ① in the table below because the plan to update the equipment in the plant had already started and the timing of Malaysia's signing of the JCM was not clear. As for the other two projects, we are still interested in JCM, and we will explore the possibility of JCM in conjunction with the timing of Malaysia's signing of the JCM.

Table 6　Follow-up cases for FY2020

Companies with needs	Situation
1) MIZUHO PRECISION ENGINEERING SDN.BHD.	• Although we had reached the stage of submitting a quotation in the first fiscal year of 2040, we plan to make capital investment

	basically on our own because the timing of the signing of the JCM by Malaysia, which is a precondition for the application of the JCM, is not clear, and on the other hand, capital investment at an appropriate time is necessary to continue manufacturing at the plant.
2) Cement Industries of Malaysia Berhad (CIMA)	• The project was originally intended to be a BOT-based waste heat recovery and power generation system, but was postponed due to the shortlisted companies' proposals not meeting the client's expectations. • Continued interest in the JCM equipment subsidy program, with plans to resume it at the right time
3) Hitachi Chemical (Johor) Sdn. Bhd.	• 2020No capital investment for the year • Continued interest in the JCM equipment subsidy program, with plans to resume it at the right time

In addition, although remote, the following new projects were identified through ongoing discussions with companies with local channels.

Table 7 New projects in 2020

Excavation projects	Outline
Overview	○ Background ・ Malaysia is home to some of the world's leading manufacturers of rubber gloves. ・ The spread of new coronary infections has led to an increase in demand for rubber gloves. ・ The world's leading rubber glove company decides to build a new production line at its plant. ○ Project overview ・ For the time being, electricity will be provided by the grid and hot water for the production process will be provided by a gas-fired hot water boiler, but we are considering the introduction of gas turbine cogeneration to save energy. ・ The construction of the new production process will be carried out in three phases, with the third phase scheduled for completion in June 2023. ・ The cogeneration system is planned to be operational at the same time.
Equipment to be installed	• Gas turbine cogeneration systems • Power generation scale: approx. 16 MW • Steam supply scale: 350 t/h • Estimated investment size: approx. 2 billion yen
Outlook for the future	• We have already established a structure including a potential representative entity for JCM equipment subsidy applications. • If the timing of Malaysia's participation in the JCM is right, there is great potential for a full-scale

4.4 Develop an action plan

We discussed with IRDA how to apply the results obtained during the 3years of implementation of the project from FY2049 to the present year to the decarbonization of the Iskandar region. We discussed with IRDA on how to apply the results obtained during the year of the project up to the fiscal year 2019 to the decarbonization of Iskandar region. We agreed to include the concept of "Industrial Symbiosis", "Eco Town", "Waste to Energy" and the future activities in the Comprehensive Development Plan (CDP).

4.4.1 Comprehensive Development Plan (CDP)

The CDP is a major plan to guide the economic, social and environmental planning and management of Iskandar Malaysia towards the establishment of an internationally viable and sustainable metropolis[1]. As Iskandar Malaysia is an economically and geographically significant region, the CDP requires the involvement of stakeholders at all levels. These include, indeed, federal, state and local governments, as well as players from the business community and global industry.

In preparing the CDP, IRDA consulted with the National Physical Planning Council, the State Planning Commission and the local authorities in Iskandar Malaysia to ensure that all the proposals in the CDP are consistent with national and state policies. LCS Blueprints have also been prepared as detailed guidelines for the implementation of the CDP.

CDP adopts a holistic and resilient approach to sustainability, with a core focus on a continuum of Wealth generation, Wealth Sharing and Inclusiveness, Optimising the resources and focusing on low carbon.

(1) Wealth generation

Wealth generation ensures a continuous, stable, strong and resilient income generation fot the people living in Iskandar Malaysia. In order to enhance the generation of income of the people in Iskandar Malaysia, three Strategic Thrusts are introduced:

1) Deepen Cluster Linkages and Enhance Enabling Ecosystem
2) Increase Skilled Job Opportunities and Labour Productivity
3) Mainstream Green Economy to Support Low Carbon Initiatives

[1] https://iskandarmalaysia.com.my/our-development-plan/

(2) Wealth sharing and inclusiveness

Wealth Sharing and Inclusiveness promotes socilal equity and improves quality of life. In order to promotes social equity and improves quality of life in Iskandar Malaysia, three Strategic Thrusts are introduced:

1) Increase Economic Participation Through Knowledgeable and Skilled Human Capital
2) Reduce Inequality and Improve Access to Higher Income and Capital Gain
3) Provide Social Connectedness and Build a Well-Informed and Self-Driven Society

(3) Resource optimization and low carbon

Optimizing the resources and focusing on low carbon will ensure Iskandar Malaysia going towards a sustainable and dynamic economic region

This is achieved by promoting sustainability and efficient resource-use in Five Strategic Thrusts:

1) Promote Balanced Regional Growth
2) Protect and Enhance Natural Ecology and Green Areas
3) Plan and Manage Built Environment
4) Enhance Urban Connectivity and Mobility within Region
5) Promote Integrated Infrastructure Resources

The CDP is reviewed and updated every five years, and currently the plan is in place until FY2025 (CDP: 2006-2025, CDP2: 2014-2025). The latest version, CDP3, is currently under preparation and will cover the period up to 2030. The concepts of "Industrial Symbiosis", "Eco Town" and "Waste to Energy" will be included in the newly developed CDP3.

4.4.2 Relationship with other policies in Malaysia

As mentioned above, IRDA has referred to national and state policies in preparing the CDP. The table below summarises the current low carbon city policy framework and reporting criteria in Malaysia.

Table 8 Low Carbon Cities Policy Framework and Reporting Criteria in Malaysia

Low Carbon Cities Policy Tool and GHG Reporting	Executive summary

Standard	
National Low Carbon Cities Masterplan (NLCCM)	• Developed for Ministry of Environment and Water in 2019 by the Green Technology Application for the Development of Low Carbon Cities (GTALCC) Project with UNDP Malaysia / Global Environment Facility (GEF) fund. • The 3M Approach – Measurement, Management & Mitigation • Policy support for all levels of government • A hybrid document of bottom up and top down policy measures • Roll-out plan in tandem with the 5-years Malaysia Plan (Rancangan Malaysia) • Target: Carbon neutrality for the 33 biggest cities and regions of Malaysia by 2050 and beyond
Low Carbon Cities Framework and Assessment System (LCCF)	• Launched in 2011; Version 2 launched in 2017 • Implemented by Malaysian Green Technology and Climate Change Center (MGTC) • Consists of a framework and assessment system which allows for performance of carbon reduction measures in a city or a township • MGTC introduced the LCC Challenge 2030 a programme to accelerate the transformation towards low carbon cities. The goal of the program is to establish 200 low carbon zones in state capitals and major urban areas by 2030. The LCCF document will be used as a reference in this program. Participating cities annual GHG emission reduction in energy, water, mobility and waste is assessed.
Low Carbon Society (LCS)	• The Low Carbon Society (LCS) blueprints of Putrajaya, Iskandar Malaysia and Kuala Lumpur incorporates a methodology using the internationally recognised Asia—Pacific Integrated Model (AIM) to project GHG emissions under various scenarios i.e. Business as Usual (BAU) and Counter Measure (CM) • The term “Low Carbon Society” in the LCS blueprints is created to project the blueprints as a peoplecentric plan. • All the LCS blueprints were developed by Universiti Teknologi Malaysia-Low Carbon Asia Research Centre (UTM-LCARC) based on a research collaboration between UTM-LCARC, Kyoto University, Okoyama University and the National Institute of

	Environmental Studies
Global Protocol for Community-Scale Greenhouse Gas Emissions Inventories (GPC)	・ GHG Protocol standard developed by World Resources Institute (WRI), C40 Cities Climate Leadership Group and Local Governments for Sustainability (ICLEI) ・ Launched in 2014 ・ The GPC is a robust framework for accounting and reporting city-wide GHG emissions. ・ Local authorities and regional authority which have used GPC as a reporting standard: Majlis Bandaraya Petaling Jaya, Majlis Perbandaran Ampang Jaya, Majlis Perbandaran Hang Tuah Jaya, Dewan Bandaraya Kuala Lumpur and Iskandar Regional Development Authority (IRDA) ・ One of the key actions in the NLCCM is to align the existing GHG reporting format to GPC

NLCCM (National Low Carbon Cities Masterplan)

The NLCCM is designed as a policy document to guide policy makers at all levels of federal, state and local government in their efforts to achieve low-carbon cities, and to address policy gaps in meeting national GHG reduction targets in mitigating climate change. The NLCCM is not intended to replace the policy tools currently used by local governments to achieve low carbon cities, but to extend the National Climate Change Policy of the 2009.

- Absolute carbon reduction targets

NLCCM has proposed GHG reduction targets in the top 33 cities and regions in Malaysia, divided into three implementation phases. The reduction targets, which exceed Malaysia's GHG reduction commitments (the 11th Malaysia Plan sets a 45% reduction in carbon emissions by 2030 compared to 2005 levels), are intended to encourage more influential GHG reduction plans to achieve the targets. The Iskandar region is included among those cities.

The schedule and absolute carbon reduction targets for the target cities for the period 2030-2050 are as follows The Iskandar region is included in Group 1.

Table 9　Carbon reduction schedule for target cities

Fiscal year	Each group of target cities	Contents
2021,2022	Group1	Develop a GHG inventory including baseline emissions and set a target to reduce absolute GHG emissions by 33% by 2030year
2026	Group2	Create a GHG inventory and set a target to reduce absolute GHG emissions by 33% by the 2032035year
2030	Group1	33% absolute reduction in GHG emissions and declaration of a "carbon neutral year".
2031	Group3	Develop a GHG inventory including baseline emissions and set a target to reduce absolute GHG emissions by 33% by 2040year
2035	Group2	Declared a "carbon neutral year" by reducing absolute GHG emissions by 33%.
2040	Group1 Group3	Group1 cities reduce absolute GHG emissions by 66%. Group3 cities reduce their GHG emissions by 33% and declare a "carbon neutral year
2045	Group2	Reduction of absolute GHG emissions by 66%, with carbon neutrality planned for the 2055year
2050	Group1 Group3	Group1's cities achieve carbon neutrality Group3 cities reduce absolute GHG emissions by 66% and achieve carbon neutrality by the 2060year

- Key Challenges

The following 7 key challenges were recognized as barriers to low carbon pathway in most Malaysian cities. There is a fragmentation of policy and direction at national and federal levels regarding low-carbon initiatives in Malaysia, and the impact of this fragmentation has resulted in the lack of a defined broad flow of Malaysian policy and other initiatives. This has resulted in a lack of coherence in local initiatives and weak linkages with existing development plans. The incentives for each region are also stagnant due to the lack of funds to promote the initiatives. In addition, these conditions have led to a lack of necessary human resources and inaccurate or missing GHG inventory data. This situation makes it difficult to gain public understanding.

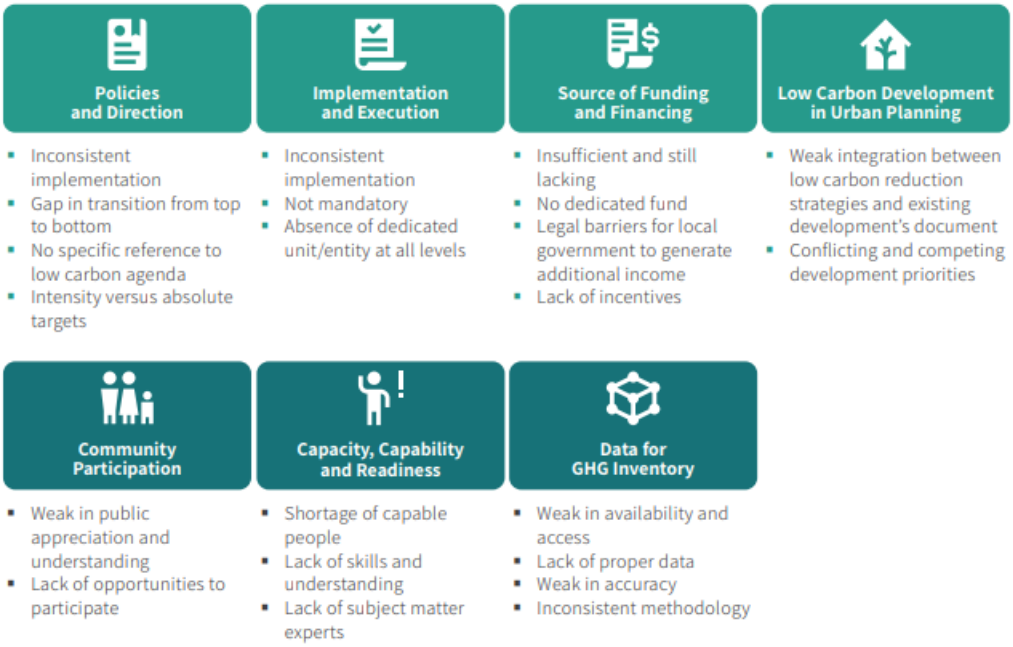

Figure 3　Key challenges to a low-carbon future

- Action plan overview

The following action plan is recommended to shape the pathway for low carbon development in Malaysia. The 9 key directions include the development of low-carbon related policies and strategies, the provision of financing and loans, improved data management on low carbon and the establishment of assessment methodologies.

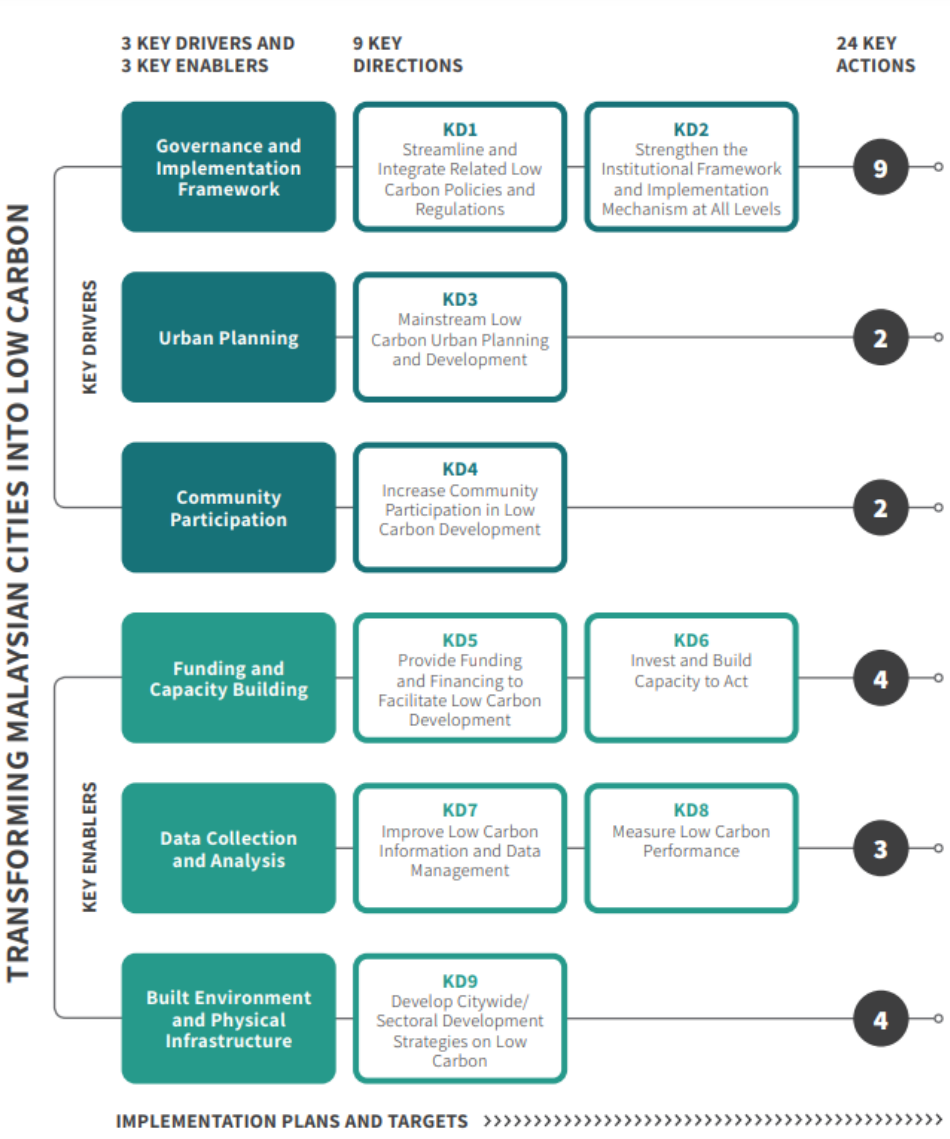

Figure 4　Action Plan for NLCCM

- Introduction of the 3M approach

As one way of taking these action plans forward, NLCCM has introduced the 3M approach, which aims to position cities as major players in climate change mitigation, as well as set an example for the development of emission reduction strategies at the local level. The 3M approach consists of three actions (see Figre5).

Figure 5　3M Approach

4.4.3 Formulation of CDP3

IRDA states that in preparing the CDP3, it will refer to the NLCCM, which is a policy document by the Federal Government of Malaysia. As mentioned above, based on the NLCCM, a total of 33 local governments have been selected as target cities, and Iskandar region is one of them. However, IRDA does not plan to include an absolute GHG emission reduction target for Group 1 in CDP3 at this time. Instead, it plans to use a target of 58% reduction in carbon intensity by 2025, using 2010 as the base year, based on the 2025 Low Carbon Society Blueprint. However, we also support the commitments made in the 11th Malaysia Plan to reduce the economy-wide carbon intensity (relative to GDP) by 45% by 2030 compared to 2005 levels, and to achieve carbon neutrality by 2050.

As mentioned earlier, the Iskandar region is using the Asia-Pacific Integrated Assessment Model (AIM) in its 2025 Low Carbon Society Blueprint. However, according to IRDA, this model is only used to estimate GHG emissions, and GHG emissions will be calculated and reported in accordance with GPC BASIC+ when actual monitoring is conducted. Under CDP3, GPC BASIC+ will also be used to calculate and report GHG emissions. The scope of GHG emissions reporting under GPC BASIC+ is as follows: monitoring will cover stationary energy, transport, waste, industrial process and product use (IPPU) and agriculture, forestry and other land use (AFOLU).

Table 10　Reporting range according to GPC BASIC+.

Stationary energy	
Residual buildings	Scope3
Commercial and Institutional buildings and facilities	Scope3

Manufacturing and construction	Scope3
Energy industry	Scope3
（Energy generation supplied to the grid）	—
Agriculture, forestry and fisheries	Scope3
Non-specified emission sources	Scope3
Fugitive emissions from the mining, processing, storage and transport of coal	Scope1
Fugitive emissions from oil and natural gas systems	Scope1
Transport	
On-road	Scope3
Railways	Scope3
Ships	Scope3
Aviation	Scope3
Off-road	Scope2
Waste	
Disposal of solid waste generated in the city	Scope3
Biological treatment of waste generated in the city	Scope3
Incineration and open burning of waste generated in the city	Scope3
Wastewater generated in the city	Scope3
(IPPU) Industrial processes and product use (non-energy greenhouse gas emissions)	
Emissions from industrial processes within the city boundary	Scope1
Emissions from products use within the urban boundary	Scope1
(AFOLU) Agriculture, forestry and other land uses (greenhouse gas emissions from non-energy sources)	
Emissions from livestock within the urban boundary	Scope1
Emissions from land within the urban boundary	Scope1
Greenhouse gas emissions from agricultural soils within the urban boundary	Scope1
Other sources of Scope 3 emissions	
Other emissions from Scope 3	—

4.5 Future Directions

This year, it was agreed to incorporate the concepts and future activities of "Industrial Symbiosis", "Eco Town", and "Waste to Energy", which have been worked on through this project, into the CDP, the development plan to be formulated by IRDA. It is considered a great achievement that the activities of this project have contributed to the decarbonization efforts in the Iskandar region, and it is hoped that the inclusion of the project in the CDP will increase the awareness of the project and make it easier to cooperate with related businesses when promoting the activities in the future.

In order to promote decarbonization in the Iskandar region in the future, as mentioned in the NLCCM, there are a number of issues that need to be addressed, including concrete policies and measures, lack of implementation capacity, financial resources, and experts, and lack of GHG inventory data. City of Kitakyushu will continue to provide decarbonization know-how to promote city-to-city collaboration, and will also need to work on visualizing GHG emissions in order to make concrete reductions. Based on the visualized emissions, a city-wide/sector-specific strategy for decarbonization will be formulated.

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Chapter 5　Investigation of high-potential JCM application projects

5.1　Overview of activities

The City of Kitakyushu implemented the "Project for Promoting Low Carbon Emission in the Iskandar Region (Kitakyushu-Iskandar Development Region Collaboration Project)" as part of the "FY2019 Intercity Collaboration Project for Realizing a Low Carbon Society. As part of the project, activities were conducted to identify potential JCM projects that could be developed horizontally, referring to the results of the city-to-city collaboration survey. As a result, it was confirmed that the Japanese manufacturers that have advanced into Malaysia have a long history and their current factory facilities are aging, and there is a great need for investment in the renewal of various facilities.

Therefore, in FY2021, following on from FY2020, we conducted activities to identify JCM-applicable projects for factories and other facilities in Malaysia, mainly in the Iskandar region.

In addition, while assessing the timing of Malaysia's participation in JCM, we also studied the materialization of the two projects identified in FY2020.

5.2　Follow-up of projects discovered in the previous year

A follow-up survey was carried out on two companies discovered in FY2020, by e-mail and telephone conference, regarding the status of their subsequent consideration of the introduction of equipment and the possibility of equipment assistance.

(1)　A leading global glove manufacturer in Malaysia ("Company A")

Company A decided to add a new production process at its factory because of the increased demand for rubber gloves as hygiene products all over the world due to the Corona disaster in 2020.

The equipment to be installed is a gas turbine cogeneration system. The power generation scale is about 16MW, the steam supply scale is 350t/h, and the estimated investment scale is about 2 billion yen.

We have already established a structure including a potential representative entity for the JCM equipment subsidy application, including obtaining a letter of interest. Therefore, we prepared a draft application for JCM equipment subsidy, but had to abandon the application because we could not reach a JCM signature with Malaysia.

(2) A Singapore-owned Malaysian paper company ("Company B")

Company B is considering the installation of a gas turbine cogeneration system in order to achieve a good performance and to be environmentally friendly. The power generation scale is expected to be about 5.6MW and the supply steam scale is 13t/h. If Malaysia were to participate in the JCM, there was a high possibility that it would be eligible for JCM equipment subsidy, although it would be necessary to select a candidate for the representative company. However, discussions on the use of JCM subsidies have been stalled due to uncertainty about the timing of Malaysia's signature on the JCM, which is a precondition for JCM application.

5.3 New projects identified this year

This year, as in the previous year, we explored the possibility of collaboration with Japanese companies operating in the region, as travel to the region was difficult due to the effects of the Corona disaster. Using our corporate network, we contacted local companies with capital investment needs and introduced them to JCM. As a result, one new candidate project for JCM equipment assistance was identified.The target company is a retailer ("Company C") which operates a large scale shopping mall in Malaysia and is interested in installing high efficiency chillers (cooling water circulators) and solar power generation in its shops. In 2021, discussions on the installation of these systems have just begun, and the company plans to discuss specific installation plans in the next year and beyond.

5.4 Future Directions

In FY2021, we were able to identify one new candidate project for JCM equipment subsidy, although it was difficult to understand local needs due to the lack of travel to the site.

As of March 2021, the JCM system has not been signed with the Malaysian government. On the other hand, Malaysia, which was one of the first ASEAN countries to attract manufacturing companies, has been experiencing the aging of various facilities of Japanese factories. As the time has come to replace the old equipment, many companies would like to apply for the JCM Subsidy Program to introduce high-efficiency equipment if they can sign the JCM Program. For example, according to “2020 JETRO Survey on Business Conditions of Japanese Companies Operating Overseas(Asia and Oceania)", 43.2% of the companies operating in Malaysia answered that they will "expand" their

business in the next 1-2 years, 51.1% of respondents chose "maintain status quo" and 4.7% chose "reduce". In other words, Malaysia is a region where Japanese companies have been able to secure a certain level of profit and intend to continue their activities in the future.

The high level of local needs can be inferred from the fact that we were able to identify companies that were very positive about the JCM equipment subsidy project, even in circumstances where local travel was not possible, as was the case this year. We look forward to continued intergovernmental encouragement to sign JCM in the future.

月次報告書（令和３年９月）

業　務　名	令和３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３）（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)、イスカンダル地域開発庁(IRDA))
期　　間	令和３年９月１日（水)～令和３年９月３０日（木）

【実績概要】

① ９月１７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。案件の進捗状況として産業共生型エコタウンに関わるヒアリング先の確認や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２９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１７日に実施。

② 環境省様キックオフミーティングを９月２９日に実施。

以上

月次報告書（令和３年１０月）

業　務　名	令和３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３）（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)、イスカンダル地域開発庁(IRDA))
期　　間	令和３年１０月１日（金）～令和３年１０月２９日（金）

【実績概要】

① １０月１８日に、ジョホール州Seelong最終処分場のコンセッション企業であるSWM Environmentへのヒアリングを実施。日鉄エンジニアリング（株）より企業概要や活動内容の説明をしたのち、マレーシア・イスカンダル地方における廃棄物発電に関するディスカッションを実施した。

② 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 現地企業（SWM Environment）へのヒアリング（オンライン）を１０月１８日に実施。

以上

月次報告書（令和３年１１月）

業　務　名	令和３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３）（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)、イスカンダル地域開発庁(IRDA))
期　　間	令和３年１１月１日（月）～令和３年１１月３０日（火）

【実績概要】

① １１月１９日に、ジョホール州Seelong最終処分場のコンセッション企業であるSWM Environmentと打ち合わせを実施。日鉄エンジニアリング（株）が中心となってマレーシア・イスカンダル地方における廃棄物の質に関する議論や、廃棄物管理・廃棄物発電に関する議論を実施した。

② 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 現地企業（SWM Environment）との打ち合わせ（オンライン）を１１月１９日に実施。

以上

月次報告書（令和３年１２月）

業　務　名	令和３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３）（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)、イスカンダル地域開発庁(IRDA))
期　　間	令和３年１２月１日（水）～令和３年１２月２８日（火）

【実績概要】

① 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。

② 日鉄エンジニアリング（株）からSWM Environmentへ、ジョホール州Seelong最終処分場における廃棄物の質に関する議論について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】

なし

以上

月次報告書（令和４年１月）

業　務　名	令和３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３）（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)、イスカンダル地域開発庁(IRDA))
期　　間	令和４年１月４日（月）～令和４年１月３１日（月）

【実績概要】

① １月７日に、環境省様への中間報告を実施。事前に資料作成・準備、関係者との確認を行った。当日は過去２年間事業の概要説明と活動結果、及び９月に実施したキックオフミーティングからの進捗状況について報告・議論を行った。

② １月１２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。案件の進捗状況として産業共生型エコタウンに関わるヒアリング先へのアプローチ状況の確認や廃棄物発電に関する情報収集、アクションプランとしてComprehensive Development Plan3に入れ込む内容について議論を行った。

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 環境省様中間報告（オンライン）を１月７日に実施。

② 関係者打ち合わせ（オンライン）を１月１２日に実施。

以上

月次報告書（令和４年２月）

業　務　名	令和３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３）（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)、イスカンダル地域開発庁(IRDA))
期　　間	令和４年２月１日（火）～令和４年２月２８日（月）

【実績概要】

① ２月２４日に、セラミック廃棄物を排出している現地企業（Niro Ceramic）へのヒアリングを実施。日本企業が持つリサイクル技術を紹介し、Niro Ceramicが排出しているセラミック廃棄物が活用可能かディスカッションを行った。

② 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 現地企業へのヒアリング（オンライン）を２月２４日に実施。

以上

環境省 御中

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令和3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3）
キックオフミーティング資料

2021年9月29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えて、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）」

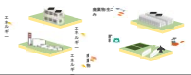
北九州市 ⇔ 協力関係 LOU ⇔ IRDA（イスカンダル地域開発庁）

蓄積したノウハウの提供

令和3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4 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：Hartalega社のコジェネレーションシステム導入案件
- 候補案件2：UPP Pulp & Paper社のコジェネレーションシステム導入案件

活動3 脱炭素化行動計画（仮称）の提案

過去2年間の活動も含め活動1と活動2の結果をとりまとめ、アクションプラン（行動計画）を作成する

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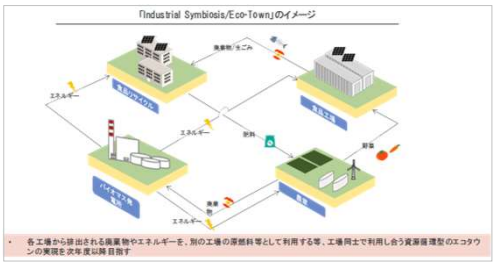
2. 活動計画の詳細
1) 活動① 産業共生型のエコタウンの実現に向けた活動

◆ 2020年度の活動成果を踏まえ、産業共生型のエコタウンの実現に向けて以下の活動を実行する

No.	Activities	IRDA	北九州市	北九州市内企業	NTTD経営研究所
1	既にリサイクルされている指定廃棄物の高度処理の可能性検討	●		●	●
2	埋め立て処分されている木質系廃棄物、紙系廃棄物及びプラスチック系廃棄物の別工場での原燃料利用の可能性検討	●			●
3	埋め立て処分されている食品系廃棄物とセラミック系廃棄物の原燃料化の可能性検討	●	●		●

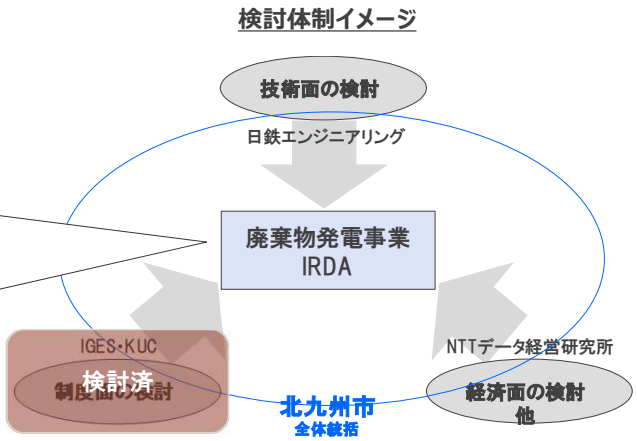


2. 活動計画の詳細
2) 活動② 廃棄物発電の実現に向けた活動

◆ マレーシア政府が進める廃棄物発電事業の進捗を確認するとともに、現地企業(SWM Environment Sdn. Bhd.)との連携可能性を検討する

SWM ENVIRONMENT

- マレー半島南部で廃棄物処理のコンセッションを請け負っている企業
- 廃棄物発電の対象サイトであるSeelong最終処分場の管理も行っている
- 昨年度、Web会議で打合せを実施



2. 活動計画の詳細
3) 活動③　脱炭素化行動計画（仮称）の提案

◆ 本年度が3年計画の最終年度であることを踏まえ、今後の脱炭素化に向けた取組みをアクションプラン（行動計画）として取りまとめる

- 過去2年間のIRDAとの連携活動も含め活動①と活動②の結果をとりまとめる
  - ✓ 今年度の活動の中でIRDAと協議しながらアクションプランを作成

2. 活動計画の詳細
4) 活動④　JCM適用案件の発掘活動

◆ 2020年度に発掘した以下2社のJCM適応案件のコジェネレーションシステム導入の具体化を進める

現地企業 (共同事業者候補)	JCM設備補助対象可能性	代表事業者候補
マレーシアの世界的グローブ製造大手企業	非常に高い • 上場企業であり財務的には極めて健全 • 新型コロナ感染症対応のため工場の稼働は極めて好調	あり （関心表明書入手済）
製紙会社。シンガポール資本のマレーシア企業	高い • 業績は好調 • 環境対応を行うためにコジェネレーションの導入を検討中	なし （代表事業者候補の選定等を行う必要性あり）

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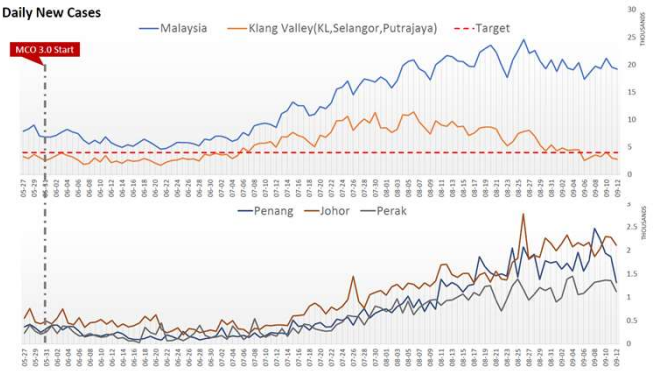
II. 6月からの進捗

1. マレーシアにおけるCOVID-19の影響

◆ **ジョホール州は「国家回復計画（NRP）」第1段階に指定されており、厳しい規制がされている**

- ✓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

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Ⅱ. 6月からの進捗

2. 活動① 産業共生型のエコタウンの実現に向けた活動

◆ 既にリサイクルされている指定廃棄物の高度処理の可能性検討としてダイセキを中心に現地企業へのヒアリングを実施。処理方法の詳細についてやマレーシアでの廃棄物処理の現状について聞き取りを行った。

◆ 今後も引き続き現地企業とのヒアリングの実施をすることで日本企業との連携可能性について探っていく。

No.	Activities	Progress
1	既にリサイクルされている指定廃棄物の高度処理の可能性検討	• 現地リサイクル企業であるPentas Floraへのヒアリングを実施 (8/4)
2	埋め立て処分されている木質系廃棄物、紙系廃棄物及びプラスチック系廃棄物の別工場での原燃料利用の可能性検討	• IRDAを通じて現地企業へヒアリングの実施をアプローチ中
3	埋め立て処分されている食品系廃棄物とセラミック系廃棄物の原燃料化の可能性検討	• 北九州市より双方の廃棄物の処理技術を持つ企業を三社発掘済み （食品廃棄物1社、セラミック系廃棄物2社） • IRDAにマッチングできる現地企業へのアプローチを依頼中
4	工業団地への再生エネルギー導入可能性検討（新）	• 太陽光発電事業者であるDitrolic Solarへのヒアリングを実施 (7/27)

Ⅱ. 6月からの進捗

2. 活動② 廃棄物発電の実現に向けた活動

◆ 昨年度Web会議を実施したSeelong最終処分場の管理を行っているSWM Environmentとコンタクトを取り、今度イスカンダル地域における廃棄物発電についてのディスカッションを10月初旬に実施予定。
日鉄エンジニアリングを中心に現時点での廃棄物発電に関する情報共有を行う。

◆ また、現在マレーシア政府が進めるBukit Payongにおける廃棄物発電事業の進捗をIRDAを通じて確認中。
当初予定では入札が終わり選定業者が決まっている段階だが、コロナの影響によりスケジュールが遅れていることが予想されるため、その進捗状況や選定候補者の情報含めIRDAに関係者にコンタクトを取っていただいている状態。

（参考）WtE project at BUKIT PAYONG, BATU PAHAT, JOHOR

- Bukit Payongのプロジェクトにおける当初スケジュールは以下の通り。

Milestone	Date	Contractual Consequence
Contract signing	1 August 2021	
DEIA completion	31 July 2022	
Planning application submission	31 July 2022	
Planning permission	31 July 2022	
Planning Application Longstop Date	31 October 2022	Failure to submit Planning Application by Planning Application Longstop Date by the Longstop may lead to CA being void.
Planned Works Commencement Date	1 August 2022	Failure to commence the Works by 6 Months after the Planned Works Commencement Date is a Concessionaire's Default
Testing and Commissioning Period	1 May 2025 to 31 July 2025	

II. 6月からの進捗

2. 活動③ 脱炭素化行動計画（仮称）の提案

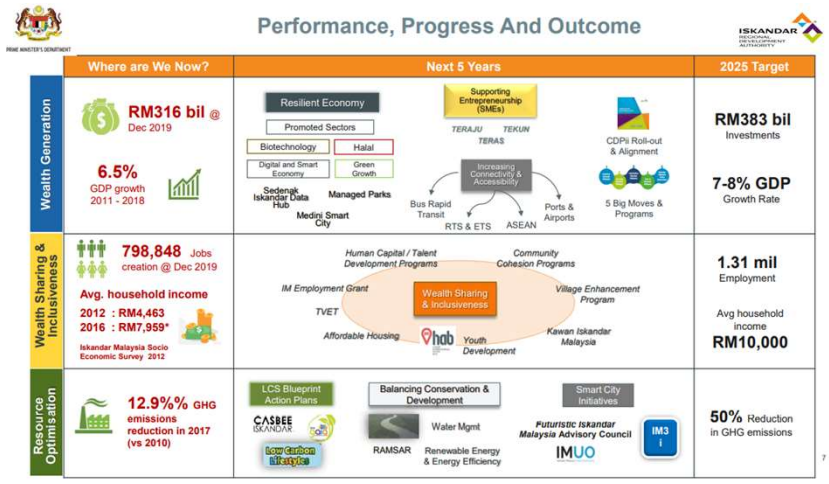
◆ IRDAとアクションプランの作成に関して協議した所、今年度IRDAが作成を検討しているComprehensive Development Plan3（CDP3)の中に、本プロジェクトで今まで進めてきた産業共生型社会や廃棄物発電の考えを盛り込むことで合意した。
（CDPの詳細は次頁）

◆ CDPは5年ごとに見直され、更新されており、現在は2025年度までの計画が策定されている。

◆ 今年度作成を検討しているプランは2030年度までの活動計画である。

（参考）Comprehensive Development Plan

◆ CDPは、マレーシアのイスカンダル地方の物理的、経済的、社会的発展を強化するために、全体的な開発の枠組み、ビジョン、主要な方向性を策定するもの。



（出典） IRDA `Iskandar Malaysia Updates` (2020)

II. 6月からの進捗

2. 活動④ 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。

◆ しかし、Hartalega社は申請書のドラフト作成まで行ったが、マレーシアのJCM採択がされていないことから提出を断念。

◆ 新規案件の発掘活動に関しては、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。

現地企業 (共同事業者候補)	進捗状況
マレーシアの世界的グローブ製造大手企業	• JCM設備補助申請ドラフトを作成したが、GECよりマレーシアではJCMが採択されていないため断られ、提出を断念
製紙会社。シンガポール資本のマレーシア企業	• フォローアップ中

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III. 今後の予定

◆ 引き続き、産業共生型のエコタウンの実現に向けた活動については現地企業とのヒアリングをまず実施し、可能であればリモートツールを活用したプラント視察を検討する。

◆ 廃棄物発電においてはSWM Environmentとの打ち合わせを10月初旬に実施予定。協議を続けていく中で将来の廃棄物発電に関する連携可能性やその他のビジネス機会を探る。

◆ 脱炭素化行動計画（仮称）の提案についてはCDPに盛り込む具体的な内容についてIRDAと引き続き協議を実施する。

◆ JCM案件組成活動のフォローアップも引き続き実施する。

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（参考）事業計画

～2018年
■ 都市間連携調査実施（2015年&2016年）

2019～2021年（3カ年）

2022～2025年
■ アクションプランの遂行
■ 発掘案件の横展開

2019年度	2020年度		2021年度(3カ年目：本事業)				2022年以降
	内容	結果	4～6月	7～9月	10～12月	1～3月	
活動1：策定済みの低炭素社会ブループリントを踏まえたアクションプランの検討	活動1：産業共生型のエコタウンの実現に向けた活動	・産業共生の考え方に前向きな企業、既にリサイクルは行っているものの更なる高度処理の可能性のある企業等を把握	既にリサイクルされている指定廃棄物の高度処理の可能性検討 埋め立て処分されている木質系廃棄物、紙系廃棄物及びプラスチック系廃棄物の別工場での原燃料利用の可能性検討 埋め立て処分されている食品系廃棄物とセラミック系廃棄物の原燃料化の可能性検討			左記の検討結果を取りまとめたビジネスベースでのパイロットプロジェクトの企画	パイロットプロジェクトの実施 事業化（3～7年以内）
活動2：2015、2016年度に実施した調査のフォローアップ調査	活動2：廃棄物発電の実現に向けた活動	・廃棄物発電の事業費の概算、事業性評価を実施 ・廃棄物発電を導入する際の現地パートナー企業の有力候補とコンタクトを取った	マレーシア国におけるジョホール州での廃棄物発電事業の進捗の確認 現地企業（SWM Environment Sdn. Bhd.他）との連携可能性検討				中長期のプロジェクトの具体化（3～5年以内）
					アクションプラン（行動計画）として活動1,2の検討結果の取りまとめ		
活動3：ポテンシャルのある廃熱回収発電プロジェクト等の発掘調査	活動3：JCM適用案件の発掘活動	・新たに1 件のJCM 設備補助候補プロジェクトを発掘	JCM適用案件のコジェネレーションシステム導入の具体化				短期間(1～3年以内)でのJCM設備補助事業の適用・事業化 ※マレーシアがJCMに署名することを前提
現地調査				●第1回	●第2回	●第3回	
報告書の作成御省との打合せ				●契約 月次報告 ●キックオフ	●中間打合せ	●報告書提出 ●最終打合せ	（※打合せは、必要に応じて追加）
			●プレキックオフ				

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環境省 御中

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令和3年度　脱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3）
中間報告資料

2022年1月7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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1.1 2019年度事業概要

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えて、2012年に「低炭素社会ブループリント」を策定しており、同計画には、目標達成のために3つのテーマと12の活動が定められており、これまで45件のプログラムを展開する活動が実施されている。
- 今後の活動として、政権交代（2018年）の影響を踏まえるとともに、目標達成を見据えた現実的なアクションプランの策定が必要である。また、実現に至っていないプロジェクトも調査対象とすることで、早期のJCM適用プロジェクト発掘につなげることを目指す。

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

平成31年度 低炭素社会実現のための都市間連携事業委託業務

活動1 策定済みの低炭素社会ブループリントを踏まえたアクションプランの検討

北九州市が有する計画策定から個別の具体的な取組みまでをマスタープラン的な形で取りまとめるノウハウを活用し、既存の低炭素社会ブループリントをベースとしたアクションプランの策定を実施する。

活動2 2015、2016年度に実施した調査のフォローアップ調査

2015、2016年度に実施した都市間連携調査のフォローアップ活動を実施する。具体的には、以下の候補案件のフォローアップ調査を実施し、1～2年間で最低1件を事業化し、類似案件の横展開を目指す。

- 候補案件1:マレーシアの工業団地に進出している出光ケミカルマレーシアにおけるコジェネレーション導入
- 候補案件2:工業用冷蔵倉庫のチラーの高効率化と遮熱効果も期待した屋根置き太陽光発電設備の設置

活動3 ポテンシャルのある廃熱回収発電プロジェクト等の発掘調査

2016年度に実施した都市間連携調査等でポテンシャルがあることを確認している以下の候補案件の調査を実施する。1～3年間で最低1件を事業化し、類似案件の横展開を目指す。

- 候補案件1:セメント工場への廃熱回収発電システムの導入
- 候補案件2:廃棄物処分場からのランドフィルガス回収発電事業

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1.2 2019年度事業結果

活動項目	目標	達成レベル
活動1 策定済みの低炭素社会ブループリントを踏まえたアクションプランの検討	IRDAと連携し、低炭素社会ブループリントのアクションプランを策定すること	• IRDAと連携し、低炭素社会を実現するための「Industrial Symbiosis/Eco-Town」のパイロットプロジェクト実現に向けたアクションプラン、WBSを策定 • IRDAと北九州市が本PJのLOIを署名
活動2 2015、2016年度に実施した調査のフォローアップ調査	JCM設備補助申請に向けた事業化案件を発掘すること	• 実現する可能性の高いプロジェクトを3件(うち深堀検討1件)発掘 • マレーシア外での派生案件を2件発掘
活動3 ポテンシャルのある廃熱回収発電プロジェクト等の発掘調査		

1.3 2020年度調査事業概要

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

1.4 2020年度事業結果

活動項目	目標	達成レベル
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を実行すること 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	• IRDAが現地でワークショップを実施し、合計30社からインベントリー・データを取得 • 現在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 • 現地のリサイクル技術に関しても分析することで高効率なリサイクル方法の導入可能性等について検討
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こと	• 2020年に開始されたBukit Payongでの廃棄物発電事業入札書類を入手し、分析を実施 • 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 • 前提条件(計画ごみ処理量、計画ごみ質 等)を整理し、事業費(概算)の試算、事業性の分析・評価を実施
活動3 JCM適用案件の発掘活動	JCM設備補助申請に向けた事業化案件を発掘すること	• ガスタービンコージェネレーションの導入を検討しているマレーシアの世界的グローブ製造大手企業の案件を発掘

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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えて、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
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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）」

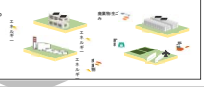
北九州市 ⇔ 協力関係 LOU ⇔ IRDA（イスカンダル地域開発庁）

蓄積したノウハウの提供

令和3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　脱炭素化行動計画（仮称）の提案

過去2年間の活動も含め活動1と活動2の結果をとりまとめ、アクションプラン（行動計画）を作成する

活動4　JCM適用案件の発掘活動

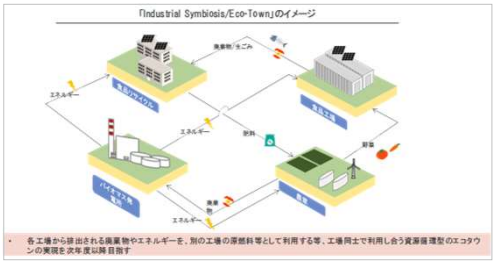
工場等において設備更新ニーズの高いマレーシアにおいて、イスカンダル地域を中心にマレ工場等における廃熱回収発電、高効率な真空洗浄機、高効率なボイラーやチラー等の導入案件の事業化を目指す。短期間（1～3年以内）の事業化が目標。但し、JCMへの参画（政府署名）のタイミングに留意する。

- 候補案件１：Hartalega社のコジェネレーションシステム導入案件
- 候補案件2：UPP Pulp & Paper社のコジェネレーションシステム導入案件

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

◆ 2020年度の活動成果を踏まえ、産業共生型のエコタウンの実現に向けて以下の活動を実行する

No.	Activities	IRDA	北九州市	北九州市内企業	NTTD経営研究所
1	既にリサイクルされている指定廃棄物の高度処理の可能性検討	●		●	●
2	埋め立て処分されている木質系廃棄物、紙系廃棄物及びプラスチック系廃棄物の別工場での原燃料利用の可能性検討	●			●
3	埋め立て処分されている食品系廃棄物とセラミック系廃棄物の原燃料化の可能性検討	●	●		●



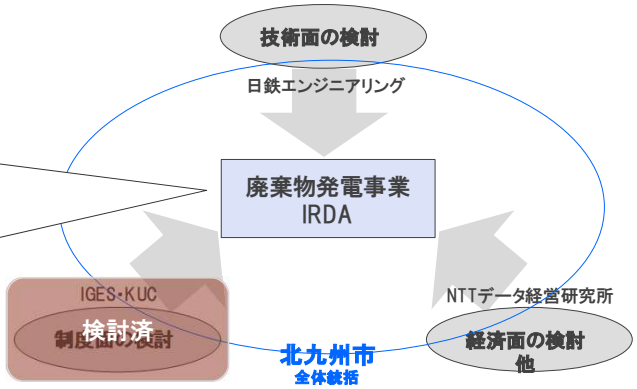
2. 活動計画の詳細
2) 活動② 廃棄物発電の実現に向けた活動

◆ マレーシア政府が進める廃棄物発電事業の進捗を確認するとともに、現地企業(SWM Environment Sdn. Bhd.)との連携可能性を検討する

SWM ENVIRONMENT

- マレー半島南部で廃棄物処理のコンセッションを請け負っている企業
- 廃棄物発電の対象サイトであるSeelong最終処分場の管理も行っている
- 昨年度、Web会議で打合せを実施

検討体制イメージ



2. 活動計画の詳細
3) 活動③ 脱炭素化行動計画（仮称）の提案

◆ 本年度が3年計画の最終年度であることを踏まえ、今後の脱炭素化に向けた取組みをアクションプラン（行動計画）として取りまとめる

- 過去2年間のIRDAとの連携活動も含め活動①と活動②の結果をとりまとめる
  - ✓ 今年度の活動の中でIRDAと協議しながらアクションプランを作成

2. 活動計画の詳細
4) 活動④　JCM適用案件の発掘活動

取扱注意

◆ 2020年度に発掘した以下2社のJCM適応案件のコジェネレーションシステム導入の具体化を進める

現地企業 (共同事業者候補)	JCM設備補助対象可能性	代表事業者候補
マレーシアの世界的グローブ製造大手企業	非常に高い • 上場企業であり財務的には極めて健全 • 新型コロナ感染症対応のため工場の稼働は極めて好調	あり （関心表明書入手済）
製紙会社。シンガポール資本のマレーシア企業	高い • 業績は好調 • 環境対応を行うためにコジェネレーションの導入を検討中	なし （代表事業者候補の選定等を行う必要性あり）

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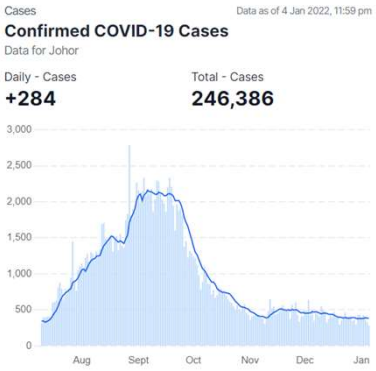
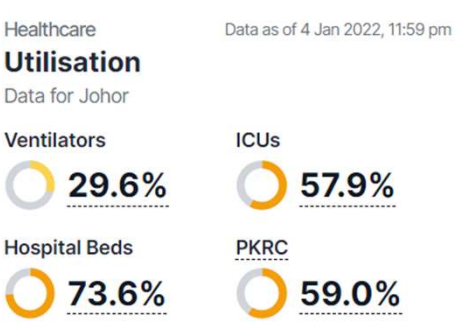
Ⅲ. 9月からの進捗

1. マレーシアにおけるCOVID-19の影響

◆ <u>ジョホール州は「国家回復計画（NRP）」第4段階に指定されており、9月時点に比べ規制は緩和されている</u>
✓ジョホール州におけるワクチン接種者数は80%を超えている

◆ ただし、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、ワクチン接種者の場合7日間、ワクチン接種者でない場合11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。





（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

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Ⅲ. 9月からの進捗

2. 活動① 産業共生型のエコタウンの実現に向けた活動

◆ 主に#2,3に関して、日本企業との連携可能性を探るためアプローチすべき現地企業をリストアップし、IRDAを通じてミーティングの実施を打診。
⇒しかし、現在のコロナの状況によってミーティング参加への前向きな返事を頂けていない

No	Activities	Progress（9月時点）	Progress（1月時点）
1	既にリサイクルされている指定廃棄物の高度処理の可能性検討	• 現地リサイクル企業であるPentas Floraへのヒアリングを実施 (8/4)	–
2	埋め立て処分されている木質系廃棄物、紙系廃棄物及びプラスチック系廃棄物の別工場での原燃料利用の可能性検討	• IRDAを通じて現地企業へヒアリングの実施をアプローチ中	**⇒ミーティング参加への前向きな返事を頂けていない** • 全国的な移動規制の影響やコロナによる自社製品やサービスへの需要減少によって環境に対する意識レベルが下がっている • IRDAによると、実際に会って話を聞くなど関係構築をする必要があり、ミーティングの実施にはかなり時間がかかる可能性があるとのこと
3	埋め立て処分されている食品系廃棄物とセラミック系廃棄物の原燃料化の可能性検討	• 北九州市より双方の廃棄物の処理技術を持つ企業を三社発掘済み（食品廃棄物1社、セラミック系廃棄物2社） • IRDAにマッチングできる現地企業へのアプローチを依頼中	
4	工業団地への再生エネルギー導入可能性検討	• 太陽光発電事業者であるDitrolic Solarへのヒアリングを実施 (7/27)	–

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Ⅲ. 9月からの進捗

2. 活動② 廃棄物発電の実現に向けた活動

◆ Seelong最終処分場の管理を行っているSWM Environmentとコンタクトを取り、10月中旬にイスカンダル地域における廃棄物発電についてのディスカッションを実施。

◆ 11月中旬にも再度フォローアップミーティングを実施。その際にSeelong最終処分場にて廃棄物データを取得するための方法について議論した。

◆ 現在はSeelongにて分析調査を実施しているUTMからデータを頂けないか交渉中。

No	収集方法	実現可能性
1	NSEがSeelongに出向いて調査を行う	⇒現在のCOVID-19のマレーシア入国検疫要件を考慮すると、実現不可能
2	UTM（マレーシア工科大学）が近々Seelongで廃棄物分析調査を実施する予定であるため、UTMの廃棄物分析結果（発熱量、化学組成、可燃物量等）を共有していただくように依頼する	⇒一番実現可能性が高いため、現在情報取得が可能か確認中
3	（UTMがデータを共有できない場合） 廃棄物サンプル（50kg）を日本に送り、日本で廃棄物分析を行う	⇒廃棄物の輸出に関する法律や規制、また廃棄物サンプルの浸出液などの懸念から、現実的ではない
4	（UTMがデータを共有できない場合） SWM Environmentが、NSEが調査方法を詳細に指示することを条件に、廃棄物分析を実施できる現地企業を紹介する （NSEは、廃棄物のサンプリングと選別をウェブモニタリングする）	⇒あくまでUTMデータを得られない場合の代替案であり、環境省への報告書提出期限に間に合う場合にのみ検討する予定

Ⅲ. 9月からの進捗

2. 活動② 廃棄物発電の実現に向けた活動

◆ また、現在マレーシア政府が進めるBukit Payongにおける廃棄物発電事業の進捗をIRDAを通じて引き続き確認中。

◆ 業者選定スケジュールの進捗状況や選定候補者の情報含めIRDAに関係者にコンタクトを取っていただいている状態だが、現時点で信頼性の高い情報は得られていない。

- COVID-19の影響によりスケジュールが遅れており、入札結果はまだ発表されていない。
- 事業者選定後もEIAなどの手続きが必要となるため建設時期も当初スケジュールより後ろ倒しになると予想される

（参考）WtE project at BUKIT PAYONG, BATU PAHAT, JOHOR

- Bukit Payongのプロジェクトにおける当初スケジュールは以下の通り。

Milestone	Date	Contractual Consequence
Contract signing	1 August 2021	
DEIA completion	31 July 2022	
Planning application submission	31 July 2022	
Planning permission	31 July 2022	
Planning Application Longstop Date	31 October 2022	Failure to submit Planning Application by Planning Application Longstop Date by the Longstop may lead to CA being void.
Planned Works Commencement Date	1 August 2022	Failure to commence the Works by 6 Months after the Planned Works Commencement Date is a Concessionaire's Default
Testing and Commissioning Period	1 May 2025 to 31 July 2025	

Ⅲ. 9月からの進捗
2. 活動③ 脱炭素化行動計画（仮称）の提案

◆ IRDAとアクションプランの作成に関して協議した所、今年度IRDAが作成を検討している Comprehensive Development Plan3（CDP3)の中に、本プロジェクトで今まで進めてきた産業共生型社会や廃棄物発電の考えを盛り込むことで合意した。
（CDPの詳細は次頁）

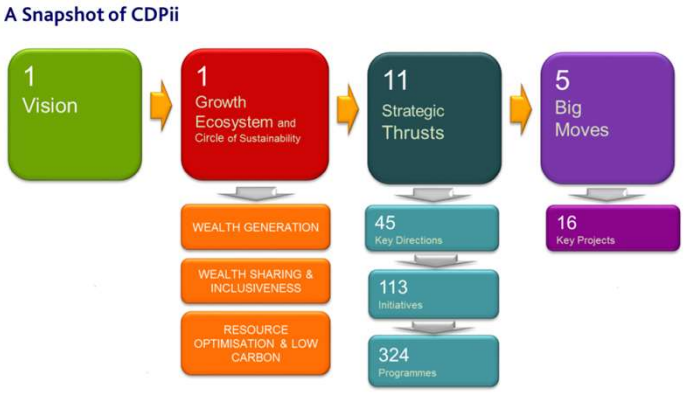
◆ CDPは5年ごとに見直され、更新されており、現在は2025年度までの計画が策定されている。
- CDP：2006～2025年
- CDP2：2014～2025年
- CDP3：2020～2030年（作成検討中）

◆ 現在CDP3は作成検討中であり、完成次第サマリーレポートをIRDAより提出していただく予定。

（参考）Comprehensive Development Plan Ⅱ（2014～2025年）

◆ CDPは、マレーシアのイスカンダル地方の物理的、経済的、社会的発展を強化するために、全体的な開発の枠組み、ビジョン、主要な方向性を策定するもの。

◆ CDP2は「富の創出」「富の共有と包括」「資源最適化・低炭素化」とした考え方を中心に、戦略的推進力として各プログラムを設定したり、メインとなるプロジェクトを定めたりしている。



（出典） IRDA 'COMPREHENSIVE DEVELOPMENT PLAN II ISKANDAR MALAYSIA, 2014 – 2025' (2017)

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（参考）Comprehensive Development Plan Ⅱ（2014～2025年）

◆ CDP2の中心的な考え方の一つである「富の創出」の戦略や方向性は以下の通り。

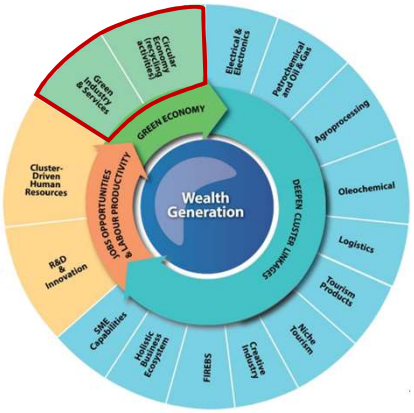
◆ CDP3として内容を見直す際に産業共生型社会や廃棄物発電の関する考え方は「WG3：低炭素社会を支えるグリーンエコノミーの主流化」に含まれると想定。

In order to enhance the generation of income of the people in Iskandar Malaysia, Three Strategic Thrusts are introduced:

- **WG1** : Deepen Cluster Linkages and Enhance Enabling Ecosystem
- **WG2** : Increase Skilled Job Opportunities and Labour Productivity
- **WG3** : Mainstream Green Economy to Support Low Carbon Initiatives

In summary, there are:

3 Strategic Thrusts
15 Key Directions
42 Initiatives
148 Programmes



（出典） IRDA 'COMPREHENSIVE DEVELOPMENT PLAN II ISKANDAR MALAYSIA, 2014 – 2025' (2017)

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Ⅲ. 9月からの進捗

2. 活動④ JCM適用案件の発掘活動

取扱注意

◆ 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。

◆ 新規案件の発掘活動に関しては、現地訪問が困難なことから、日系企業を中心に連携可能性のある案件発掘活動を実施し、現在はイオンへコンタクト中である。

現地企業 (共同事業者候補)	進捗状況
マレーシアの世界的グローブ製造大手企業	• JCM設備補助申請ドラフトを作成したが、GECよりマレーシアではJCMが採択されていないため断られ、提出を断念
製紙会社。シンガポール資本のマレーシア企業	• フォローアップ中
マレーシア小売り業界にてトップシェアを誇る日系企業	• コンタクト中

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IV. 今後の予定

◆ 引き続き、産業共生型のエコタウンの実現に向けた活動については現地企業へアプローチを実施する。しかし、前述の通り時間がかかることが予想されるため、資源循環だけでなく再生可能エネルギーの導入に関する活動も進める。

◆ 廃棄物発電においてはSeelong最終処分場の廃棄物データを得るために、SWM Environmentと引き続きコンタクトを取り、UTMの分析データがいただけないか交渉する。

◆ 脱炭素化行動計画（仮称）の提案については、CDPに盛り込む内容をIRDAと引き続き協議し、具体性を深める。

◆ JCM案件組成活動のフォローアップも引き続き実施する。

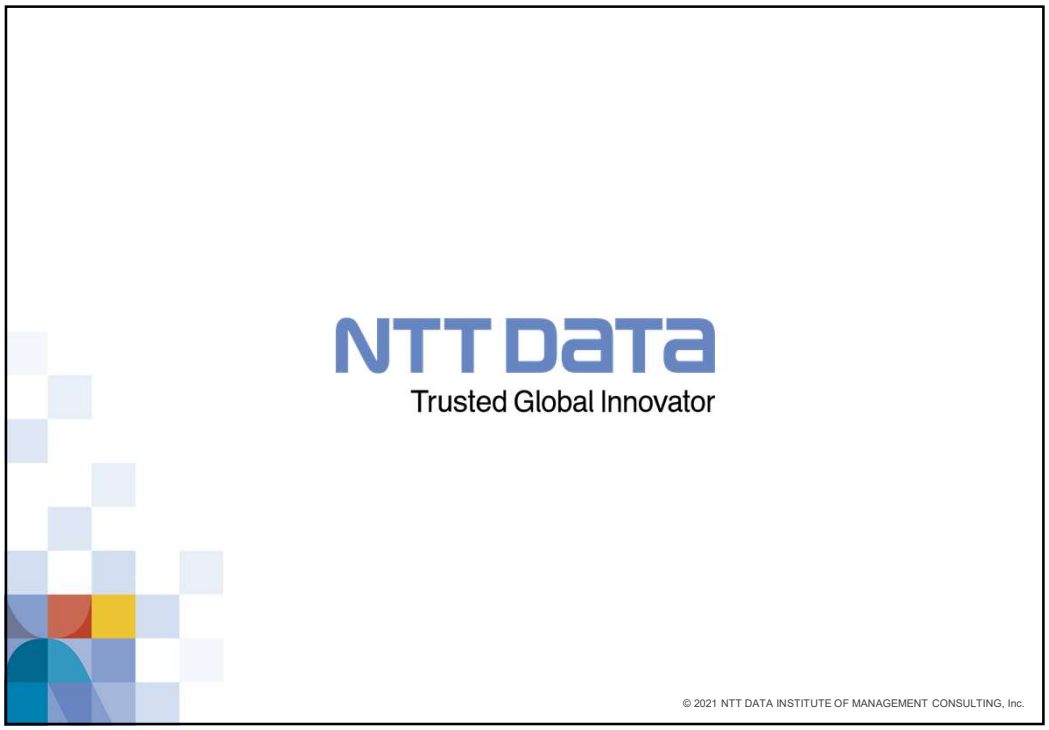
（参考）事業計画

～2018年
■ 都市間連携調査実施（2015年&2016年）

2019～2021年（3カ年）

2022～2025年
■ アクションプランの遂行
■ 発掘案件の横展開

2019年度	2020年度		2021年度(3カ年目：本事業)				2022年以降
	内容	結果	4～6月	7～9月	10～12月	1～3月	
活動1：策定済みの低炭素社会ブループリントを踏まえたアクションプランの検討	活動1：産業共生型のエコタウンの実現に向けた活動	・産業共生の考え方に前向きな企業、既にリサイクルは行っているものの更なる高度処理の可能性のある企業等を把握	既にリサイクルされている指定廃棄物の高度処理の可能性検討 埋め立て処分されている木質系廃棄物、紙系廃棄物及びプラスチック系廃棄物の別工場での原燃料利用の可能性検討 埋め立て処分されている食品系廃棄物とセラミック系廃棄物の原燃料化の可能性検討			左記の検討結果を取りまとめたビジネスベースでのパイロットプロジェクトの企画	パイロットプロジェクトの実施 事業化（3~7年以内）
活動2：2015、2016年度に実施した調査のフォローアップ調査	活動2：廃棄物発電の実現に向けた活動	・廃棄物発電の事業費の概算、事業性評価を実施 ・廃棄物発電を導入する際の現地パートナー企業の有力候補とコンタクトを取った	マレーシア国におけるジョホール州での廃棄物発電事業の進捗の確認 現地企業（SWM Environment Sdn. Bhd. 他）との連携可能性検討				中長期のプロジェクトの具体化（3~5年以内）
					アクションプラン（行動計画）として活動1,2の検討結果の取りまとめ		
活動3：ポテンシャルのある廃熱回収発電プロジェクト等の発掘調査	活動3：JCM適用案件の発掘活動	・新たに1 件のJCM 設備補助候補プロジェクトを発掘	JCM適用案件のコジェネレーションシステム導入の具体化				短期間（1~3年以内）でのJCM設備補助事業の適用・事業化 ※マレーシアがJCMに署名することを前提
現地調査				●第1回	●第2回	●第3回	
報告書の作成御省との打合せ				●契約 月次報告 ●プレキックオフ	●キックオフ	●中間打合せ	●報告書提出 ●最終打合せ（※打合せは、必要に応じて追加）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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えて、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	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	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
・日本企業が有する低炭素技術の紹介 ・JCMの紹介 等	・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）」	・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3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 脱炭素化行動計画（仮称）の提案

過去2年間の活動も含め活動1と活動2の結果をとりまとめ、アクションプラン（行動計画）を作成する

活動4 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：Hartalega社のコジェネレーションシステム導入案件
- 候補案件2：UPP Pulp & Paper社のコジェネレーションシステム導入案件

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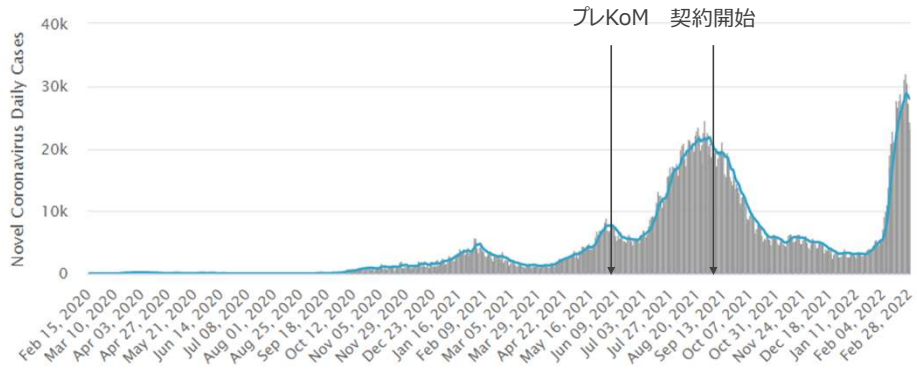
1. 本年度調査事業の概要
（参考）コロナ禍の影響

◆ ジョホール州では「国家回復計画（NRP）」によって厳しい規制がされていたため、昨年度に引き続き、2021年度も現地調査を実施できなかった。

マレーシア国内新規感染者数



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

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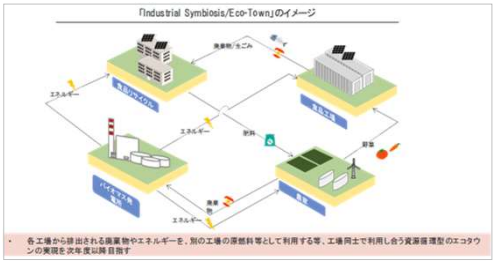
2. 各活動の成果
1) 活動①　産業共生型のエコタウンの実現に向けた活動

◆ 2020年度の活動成果を踏まえ、産業共生型のエコタウンの実現に向けて以下の活動を実行する

No.	Activities	IRDA	北九州市	北九州市内企業	NTTD 経営研究所
1	既にリサイクルされている指定廃棄物の高度処理の可能性検討	●		●	●
2	埋め立て処分されている木質系廃棄物、紙系廃棄物及びプラスチック系廃棄物の別工場での原燃料利用の可能性検討	●			●
3	埋め立て処分されている食品系廃棄物とセラミック系廃棄物の原燃料化の可能性検討	●	●		●
4	工業団地への再生エネルギー導入可能性検討※	●			●

※提案書から新たに追加



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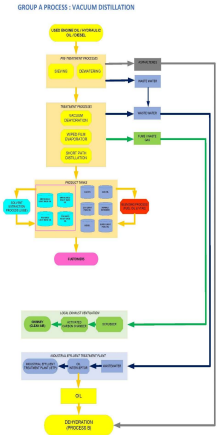
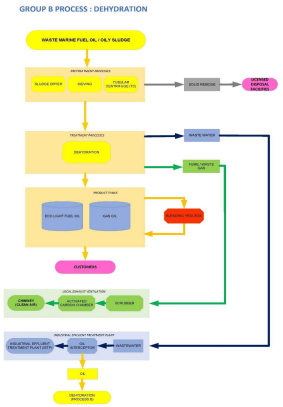
2-1　活動① 産業共生型のエコタウンの実現に向けた活動
既にリサイクルされている指定廃棄物の高度処理の可能性検討

◆ 昨年度現地のリサイクル技術等に関する情報を得ることができた企業に本年度アプローチした結果、Pentas Floraとヒアリングを実施することが出来た。

◆ 既に一定レベルのリサイクルが実現されており、今後も状況に応じて協議を実施していくことに同意した。

- Pentas Floraでは、使用済エンジンオイルを回収した後、ろ過を行い、その次に真空蒸留にて基油、潤滑油、軽油を精製するというリサイクル方法を取っている
- この工程の中で生じた副産物に関しても別途排水処理を行い、工業用燃料油として回収している





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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
埋め立て処分されている木質系廃棄物、紙系廃棄物及びプラスチック系廃棄物の別工場での原燃料利用の可能性検討

◆ 廃棄物排出元と廃棄物を再生燃料として使用する可能性がある工場のマッチングを図るため、連携可能性がある企業をリストアップした

◆ IRDAを通じて、リストに記載されている企業に対して打ち合わせを打診したが、承諾を得ることは叶わなかった。原因としては、長期にわたるコロナ禍により、産業共生型エコタウンに対する企業の関心が薄れてしまったところにある。

No.	会社名	資源として再利用可能な廃棄物	他の廃棄物を代替資源として利用する可能性があるか
3	TES-AMM (MALAYSIA) SDN. BHD.	プラスチック, 紙.	製造業から排出されている電気・電子機器組立品からの廃棄を活用済み
4	IMPACT RANK (M) SDN. BHD.	プラスチック汚染廃棄物	なし
10	Chawk Technology International Sdn Bhd	プラスチック （PVC、プラスチックパイプ、文房具、パレットなどにリサイクルまたはクラッシュして作り直す）	顧客判断による
17	MATERIALS IN WORKS (M) S/B (WASTE COLLECTION AND UPCYCLING COMPANY)	回収したセルロースとプラスチック (PP、PE、PET)	固形廃棄物(例：タバコの吸殻、紙おむつなど)に関する継続的な研究開発を実施
30	Sukano Sdn. Bhd.	プラスチック (材料の種類を分離して造粒できる場合のみ)	リサイクルプラスチック

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
埋め立て処分されている食品系廃棄物とセラミック系廃棄物の原燃料化の可能性検討

◆ IRDAを通じて地元企業にアプローチしたところ、セラミック廃棄物を排出しているNiro Ceramicから関心をいただけたため、セラミック廃棄物のリサイクル技術を持つ株式会社D社の技術を紹介するべく打ち合わせを実施した。

◆ ヒアリングの結果、D社のリサイクル製品に、Niro Ceramicの廃棄物の活用可能性があることが分かった。今後は、リサイクルレンガ製品のマレーシアにおける市場性を分析した上で、連携を進めていく。

マレーシア現地企業（Niro Ceramic）			日本企業（D社）	
概要	粘土製品・耐火物製造企業	廃棄物提供 →	概要	耐火物やファインセラミックス製造企業
排出廃棄物	割れた焼成タイルやスクラップ 発生量：150トン/月	← リサイクル製品を製造・販売	技術	瓦やセラミック廃材を活用し環境に優しい樹脂系すべり止め舗装材を製造

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
工業団地への再生エネルギー導入可能性検討

◆ 昨年度開催した現地ワークショップにて登壇いただいたDitrolic Solarへヒアリングを実施した。

◆ ヒアリングの結果、Ditrolic Solarから政策面とナショナルグリッドへの接続に関する技術的実現性の面で、サポートが可能といった言葉を頂けた。今後現地の日系企業を主な対象に太陽光発電設備を導入する際に連携していくことが考えられる。

ditrolic solar

Towards Energy Independence

Ditrolic Solar

- マレーシア国内初の太陽光発電所をはじめ、東南アジア地域における太陽光発電のパイオニア企
- マレーシアには本社を含め4拠点を展開。海外ではシンガポール、フィリピン、バングラデシュにも支店がある
- Ditrolic Solarの出資する4カ国38プロジェクトの総設置・開発容量は283.6MWに達している。

CORPORATE HEADQUARTER

Malaysia Offices
Kuala Lumpur Petaling Jaya, Malaysia
(Ditrolic Sdn. Bhd.)

Johor Bahru
Johor Bahru, Malaysia
(Ditrolic Sdn. Bhd.)

East Malaysia
Kota Kinabalu, Malaysia
(Ditrolic Solar (Sabah) Sdn. Bhd.)

North Malaysia
Penang, Malaysia
(Ditrolic Solar (Sdn. Bhd.)

Regional Office
Singapore - *Ditrolic (S) Pte. Ltd*

Philippines
Manila, Philippines
Ditrolic Solar Philippines, Inc.
Magnus Ditrolic Solar Inc.

Bangladesh
HDFC Sinpower Ltd.
(Associate Co. of Ditrolic (S) Pte Ltd)

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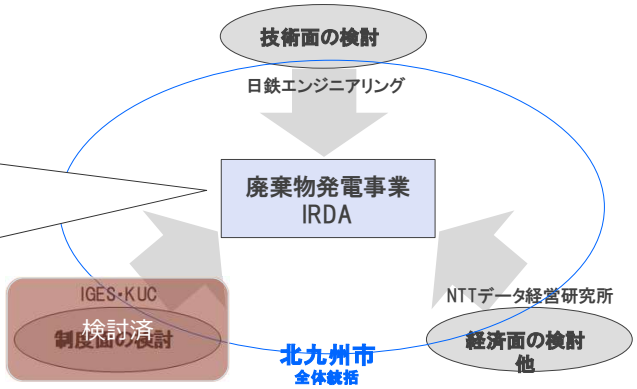
2. 活動計画の詳細
2) 活動② 廃棄物発電の実現に向けた活動

◆ マレーシア政府が進める廃棄物発電事業の進捗を確認するとともに、現地企業(SWM Environment Sdn. Bhd.)との連携可能性を検討する

SWM ENVIRONMENT

- マレー半島南部で廃棄物処理のコンセッションを請け負っている企業
- 廃棄物発電の対象サイトであるSeelong最終処分場の管理も行っている
- 昨年度、Web会議で打合せを実施

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。

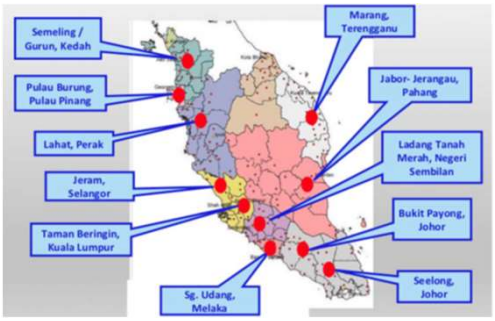
⇒IRDAの想定する廃棄物発電施設（Seelong最終処分場隣接地）でも同様の入札条件が課される可能性が高いと考えられる。

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、1,500～2,000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/)

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2-2　活動② 廃棄物発電の実現に向けた活動
Bukit Payongにおける廃棄物発電事業の進捗状況の確認

◆ 本年度は、現在マレーシア政府が進めるBukit Payongにおける廃棄物発電事業の進捗をIRDAを通じて確認した。
- 業者選定スケジュールの進捗状況
- 選定候補者の情報　etc.

◆ IRDAに関係者にコンタクトを取っていただいたが、現時点で確度の高い情報は得られていない。
- COVID-19の影響によりスケジュールが遅れており、入札結果はまだ発表されていない。
- 事業者選定後もEIAなどの手続きが必要となるため建設時期も当初スケジュールより後ろ倒しになると予想される。

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2-2　活動② 廃棄物発電の実現に向けた活動
（参考）WtE project at BUKIT PAYONG, BATU PAHAT, JOHOR

- **Bukit Payongのプロジェクトにおける当初スケジュールは以下の通り。**

Milestone	Date	Contractual Consequence
Contract signing	1 August 2021	
DEIA completion	31 July 2022	
Planning application submission	31 July 2022	
Planning permission	31 July 2022	
Planning Application Longstop Date	31 October 2022	Failure to submit Planning Application by Planning Application Longstop Date by the Longstop may lead to CA being void.
Planned Works Commencement Date	1 August 2022	Failure to commence the Works by 6 Months after the Planned Works Commencement Date is a Concessionaire's Default
Testing and Commissioning Period	1 May 2025 to 31 July 2025	

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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協議（1/2）

- **◆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. (SWMSB)とコンタクトを取り、協議を実施した。**

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.

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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協議（2/2）

◆ **IRDA及びSWMSBとの協議を経て、地域内の廃棄物焼却対象ごみ量は約1,500 トン/日である事が明らかになった**

◆ **ごみ質データに関してはSeelong最終処分場にて分析調査を実施しているUTMからデータを頂けないか交渉したが、調査に遅延が生じたことで、本事業期間内にはデータを得ることが出来なかった。**

#	実施日	協議内容	成果
1	10/18	• 本事業で廃棄物発電の技術面での検討を実施している（株）日鉄エンジニアリングの事業内容説明やイスカンダル地域における廃棄物発電の進捗状況についての情報共有を実施した。	• イスカンダル地域・Seelong最終処分場における都市廃棄物(MSW)の焼却対象量は1500～2000トン/日になることがわかった。
2	11/19	• Seelong最終処分場で処理されている廃棄物のごみ質についての議論を主として実施された。	• 一番取得可能性が高い方法として、SWMSBがUTM（マレーシア工科大学）に廃棄物分析調査結果の共有を依頼することを承諾した。 ⇒UTMの調査の遅延により、本事業期間内に取得することは出来なかった。

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

◆ **UIM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、昨年度と引き続き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

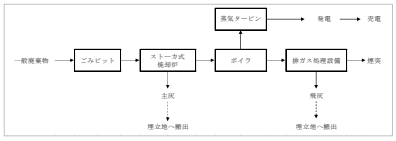
2-2　活動② 廃棄物発電の実現に向けた活動
技術面の検討のアップデート（1/2）

◆ SWMSBからの情報提供により、昨年度整理した事業費（建設費及び運営・維持管理費）試算の前提条件をアップデートした。

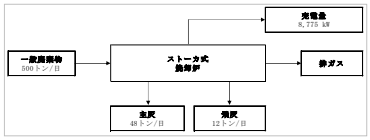
事業費算出のための前提条件

項目	前提条件		備考
	ケース①	ケース②	
処理能力	500トン/日×３炉	750トン/日×２炉	
事業期間	20年（本施設の運営期間）		建設期間は３年間
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	210,150 MWh/年		発電量から所内動力を差し引いた値
建設用地	Seelong 最終処分場の隣接地		土地の造成工事は不要と想定

ごみ処理基本フロー



概略物質フロー



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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）

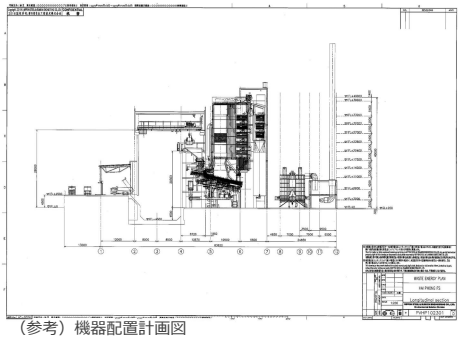
◆ アップデートした前提条件を基に、事業費（概算）の試算を行った。

建設費（概算）

項目	ケース① 500トン/日×３炉 （億円）	ケース② 750トン/日×２炉 （億円）
プラント部門	177	151
土建部門	35	35
合計	212	186

運転・維持管理費（概算）

項目	ケース① 500トン/日×３炉 （億円）	ケース② 750トン/日×２炉 （億円）
人件費	1.2	1.2
点検補修費	6.4	5.6
用役・維持費等	7.5	7.5
合計	15.1	14.3



（参考）機器配置計画図

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2-2　活動② 廃棄物発電の実現に向けた活動
経済面の検討のアップデート

◆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	

Project IRR

処理費=4000円/t	ケース①			ケース②		
IRR	10年間	15年間	20年間	10年間	15年間	20年間
補助金なし	-7%	0%	5%	-3%	4%	7%
補助金10%	-4%	3%	6%	0%	6%	9%
補助金20%	-1%	5%	8%	3%	9%	11%
補助金30%	3%	8%	11%	7%	12%	14%

処理費=5000円/t	ケース①			ケース②		
IRR	10年間	15年間	20年間	10年間	15年間	20年間
補助金なし	-2%	4%	8%	2%	8%	11%
補助金10%	1%	7%	10%	5%	10%	13%
補助金20%	4%	9%	12%	9%	13%	15%
補助金30%	8%	13%	15%	13%	17%	18%

処理費=6000円/t	ケース①			ケース②		
IRR	10年間	15年間	20年間	10年間	15年間	20年間
補助金なし	2%	8%	11%	7%	12%	14%
補助金10%	5%	10%	13%	10%	14%	16%
補助金20%	9%	13%	15%	13%	17%	19%
補助金30%	13%	17%	18%	18%	21%	22%

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2. 活動計画の詳細
3) 活動③　脱炭素化行動計画（仮称）の提案

◆ 本年度が3年計画の最終年度であることを踏まえ、今後の脱炭素化に向けた取組みをアクションプラン（行動計画）として取りまとめる

- 過去2年間のIRDAとの連携活動も含め活動①と活動②の結果をとりまとめる
  - ✓ 今年度の活動の中でIRDAと協議しながらアクションプランを作成

2-3　活動③　脱炭素化行動計画（仮称）の提案
IRDAとの協議

◆ IRDAとアクションプランの作成に関して協議した所、今年度IRDAが作成を検討しているComprehensive Development Plan3（CDP3)の中に、本プロジェクトで今まで進めてきた「産業共生及びエコタウン」や「廃棄物発電」の考えを盛り込むことで合意した。
（CDPの詳細は次頁）

◆ CDPは5年ごとに見直され、更新されており、現在は2025年度までの計画が策定されている。
- **CDP：2006～2025年**
- **CDP2：2014～2025年**
- **CDP3：2020～2030年（作成検討中）**

（参考）Comprehensive Development Plan Ⅱ（2014～2025年）

◆ CDPは、マレーシアのイスカンダル地方の物理的、経済的、社会的発展を強化するために、全体的な開発の枠組み、ビジョン、主要な方向性を策定するもの。

◆ CDP2は「富の創出」「富の共有と包括」「資源最適化・低炭素化」とした考え方を中心に、戦略的推進力として各プログラムを設定したり、メインとなるプロジェクトを定めたりしている。

A Snapshot of CDPii

（出典） IRDA 'COMPREHENSIVE DEVELOPMENT PLAN II ISKANDAR MALAYSIA, 2014 – 2025' (2017)

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（参考）Comprehensive Development Plan Ⅱ（2014～2025年）

◆ CDP2の中心的な考え方の一つである「富の創出」の戦略や方向性は以下の通り。

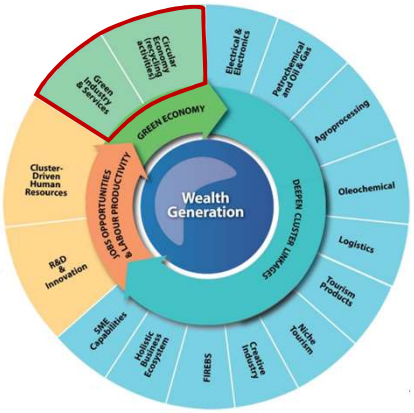
◆ CDP3として内容を見直す際に産業共生型社会や廃棄物発電の関する考え方は「WG3：低炭素社会を支えるグリーンエコノミーの主流化」に含まれると想定。

In order to enhance the generation of income of the people in Iskandar Malaysia, Three Strategic Thrusts are introduced:

- **WG1** : Deepen Cluster Linkages and Enhance Enabling Ecosystem
- **WG2** : Increase Skilled Job Opportunities and Labour Productivity
- **WG3** : Mainstream Green Economy to Support Low Carbon Initiatives

In summary, there are:

3 Strategic Thrusts
15 Key Directions
42 Initiatives
148 Programmes



（出典） IRDA 'COMPREHENSIVE DEVELOPMENT PLAN II ISKANDAR MALAYSIA, 2014 – 2025' (2017)

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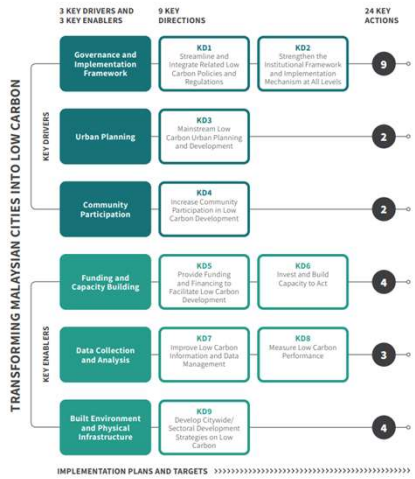
2-3 活動③ 脱炭素化行動計画（仮称）の提案 CDP3の作成（1/2）

◆IRDAによると、CDP3はマレーシア連邦政府による政策文書であるNLCCM（National Low Carbon Cities Masterplan）を参考にするとしている。



（出典） GTALLC 'National Low Carbon Cities Masterplan' (2021)

- UNDPマレーシア／地球環境ファシリティ（GEF）基金による「低炭素都市開発のためのグリーンテクノロジー応用プロジェクト」により、2019年に環境省管轄のプランとして作成。
  - ✓ 3Mアプローチ（Measurement, Management, Mitigation）
  - ✓ 全レベルの政府に対する支援
  - ✓ ボトムアップとトップダウンの両立した政策手段
  - ✓ マレーシア計画と連動した展開計画
  - ✓ 目標：2050年以降、マレーシア上位33都市・地域がカーボンニュートラルになること（イスカンダル地域も対象に含まれている）

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2-3 活動③ 脱炭素化行動計画（仮称）の提案 CDP3の作成（2/2）

◆CDP3では、NLCCMが勧めているGPC BASIC+をGHG排出量の算定・報告に活用する予定である。

◆ただ、GHG排出量の削減目標については、2025年の低炭素社会ブループリントに基づき、2025年までにGHG排出原単位を2010年比58%削減するという目標を使用する。

GPC BASIC+による報告範囲

固定エネルギー		**廃棄物**	
民生家庭	Scope3	固定廃棄物の処理	Scope3
民生業務	Scope3	廃棄物の生物処理	Scope3
製造業・建設業	Scope3	廃棄物の焼却と野焼き	Scope3
エネルギー産業	Scope3	排水処理と排水放出	Scope3
グリッド供給したエネルギー	—	**(IPPU) 工業プロセス及び製品使用（非エネルギー起源の温室効果ガス排出量）**	
農林水産業	Scope3	都市境界内の工業プロセスに伴う排出	Scope1
非特定排出源	Scope3	都市境界内の製品の使用に伴う排出	Scope1
石炭の採掘、加工、貯蔵、輸送に伴う漏洩排出	Scope1	**(AFOLU) 農業、林業及びその他土地利用（非エネルギー起源の温室効果ガス排出量）**	
石油・天然ガスシステムからの漏洩排出	Scope1	都市境界内の家畜からの排出	Scope1
運輸		都市境界内の土地からの排出	Scope1
自動車	Scope3	都市境界内の農耕地土壌からの排出	Scope1
鉄道	Scope3	**その他のスコープ３排出源**	
船舶	Scope3	その他のスコープ３からの排出	—
航空	Scope3		
特殊運輸媒体	Scope2		

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2. 活動計画の詳細
4) 活動④　JCM適用案件の発掘活動

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◆ 2020年度に発掘した以下2社のJCM適応案件のコジェネレーションシステム導入の具体化を進めた

現地企業 (共同事業者候補)	JCM設備補助対象可能性	代表事業者候補
マレーシアの世界的グローブ製造大手企業	非常に高い • 上場企業であり財務的には極めて健全 • 新型コロナ感染症対応のため工場の稼働は極めて好調	あり （関心表明書入手済）
製紙会社。シンガポール資本のマレーシア企業	高い • 業績は好調 • 環境対応を行うためにコジェネレーションの導入を検討中	なし （代表事業者候補の選定等を行う必要性あり）

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2-4　活動④ JCM適用案件の発掘活動
2020年度までの候補プロジェクトの状況

Confidential

◆ 2020年度までの活動で発掘したJCM適用可能性のあるプロジェクトの状況は以下の通り

◆ 主にメール・電話等にてフォロー活動を実施した

現地企業 (共同事業者候補)	進捗状況
マレーシアの世界的グローブ製造大手企業	• 関心表明書を入手しているなどJCM設備補助申請のための代表事業者候補を含めた体制は既に構築済みであったため、JCM設備補助申請ドラフトを作成した • しかし、マレーシアとのJCM署名に至らなかったため、申請を断念せざるを得なかった
製紙会社。シンガポール資本のマレーシア企業	• JCM適用の前提となるマレーシア国のJCMへの署名のタイミングが不透明であることから先方でJCM設備補助の活用について議論が停滞してしまっている

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2-4　活動④ JCM適用案件の発掘活動
2021年度の発掘プロジェクト

Confidential

◆ 2021年度の活動で発掘したJCM適用可能性のあるプロジェクトは以下の通り

◆ 新規案件の発掘活動に関しては、現地訪問が困難なことから、日系企業を中心に連携可能性のある案件発掘活動を実施した

現地企業 (共同事業者候補)	進捗状況
マレーシア小売り業界にてトップシェアを誇る企業	• 店舗への高効率のチラー（冷却水循環装置）や太陽光発電の導入に興味あり • 本年度は導入に関してディスカッションを始めた段階であり、今後具体的な設備導入計画について検討を進めていく予定である

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3. 今後の展開

◆ 来年度以降に向けた検討方針は以下の通り。

活動	2021年度の成果・課題	2022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** • マレーシア現地企業とのヒアリングを実施し、関係性を構築した。 **課題** • 具体的な連携方法まで議論を進めることは叶わなかった	• 現地企業を直接訪問し、実際の設備や廃棄物の処理状況の見学、対面での意見交換等を通じてパイロットプロジェクトの具現化を進めていく。
活動② 廃棄物発電の実現に向けた活動	**成果** • 現地のコンセッション企業（SWM Environment）と協議を実施し、関係性を構築した。 • 廃棄物発電事業の検討に必要な情報を入手し、事業費の概算のアップデートを行った。	• SWMSBを、現地パートナー企業の有力候補とし、本邦企業の参入を目指して協議を継続して実施していく。 • 廃棄物発電プロジェクト以外にも、都市ごみを活用したメタンガスの回収等の環境インフラの導入にあたり、JCM設備補助事業の適用を目指す。
活動③ 脱炭素化行動計画（仮称）の提案	**成果** • IRDAが策定する開発計画であるCDPに「産業共生及びエコタウン」、「廃棄物発電」のコンセプトを盛り込むことに合意した	• 引き続き北九州市の持つ脱炭素化ノウハウを提供するとともに、具体的な温室効果ガス削減へとつなぐために温室効果ガス排出量の可視化などにも取り組む。
活動④ 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。

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3. 今後の展開
来年度調査事業概要

都市間連携に基づく、ゼロカーボン先行エリア創出事業

- イスカンダル・マレーシアはジョホール南部に位置し、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。
- 2019年度～2021年度まで、北九州市の経験とノウハウを生かして産業共生・エコタウン・廃棄物発電の事業化を検討。3か年の活動成果をCDP（Comprehensive Development Plan）Ⅲに反映させる計画。
- 2022年度からは、イスカンダルエリアにおいてゼロカーボン先行エリアを生み出すべく、北九州の有するゼロカーボンシティ実現のための計画策定ノウハウ等を活用し、産業分野・業務分野・家庭分野・運輸分野を組合せたゼロカーボン計画を策定。あわせて、わが国の先端的な技術を用いた先行エリアの設定、同エリアにおける先行プロジェクトの創出を目指す。

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

我が国企業・北九州市関連企業が有するゼロカーボンノウハウ	イスカンダル地域・IRDAが有するニーズ
○ゼロカーボンシティ実現に向けた計画策定のノウハウ ○産業分野、業務分野、家庭分野、運輸分野等における計画策定ノウハウ ○ゼロカーボン実現に向けた官民連携、ビジネスモデル　等 ➢ バイオマス、再エネ電源からの水素製造（ガス化、水電解など） ➢ 水素輸送（吸蔵合金、ガス、液体、MCHなど） ➢ 水素利用（ボイラー、燃料電池、輸送用車両など） ➢ 公共施設ゼロカーボン ➢ 高度エネルギーマネジメント ➢ 廃棄物発電 ➢ 炭素吸収 ➢ EV、FCVの導入と調整力の提供 ➢ 省エネ技術　等	○世界的なゼロカーボンに向けた対応の必要性増大 ○イスカンダルエリア全体のGHGs排出量の現状把握と2050年ゼロカーボンに向けた検討 ○産業分野、業務分野、家庭分野、運輸分野等におけるポテンシャルと取組みの検討 ○先行モデル創出に向けた先行エリアの検討 ○先行エリアにおける現在の状況を踏まえた、ビジネスモデル、適用技術の抽出　等 ➢ PPAモデルを用いた家庭分野への再エネ導入 ➢ 未利用資源を利用した水素の製造・輸送・利用 ➢ 車両の電動化・水素化 ➢ エリア全体におけるエネルギーマネジメント　等

ゼロカーボン・マスタープラン＋先行エリアの具体的なプロジェクト

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