Feasibility Studies on Joint Crediting Mechanism Projects towards Environmentally Sustainable Cities in Asia

Feasibility Study on a Large-Scale GHG Emissions-Reduction Project Development in the Iskandar Development Region, Malaysia

Final report

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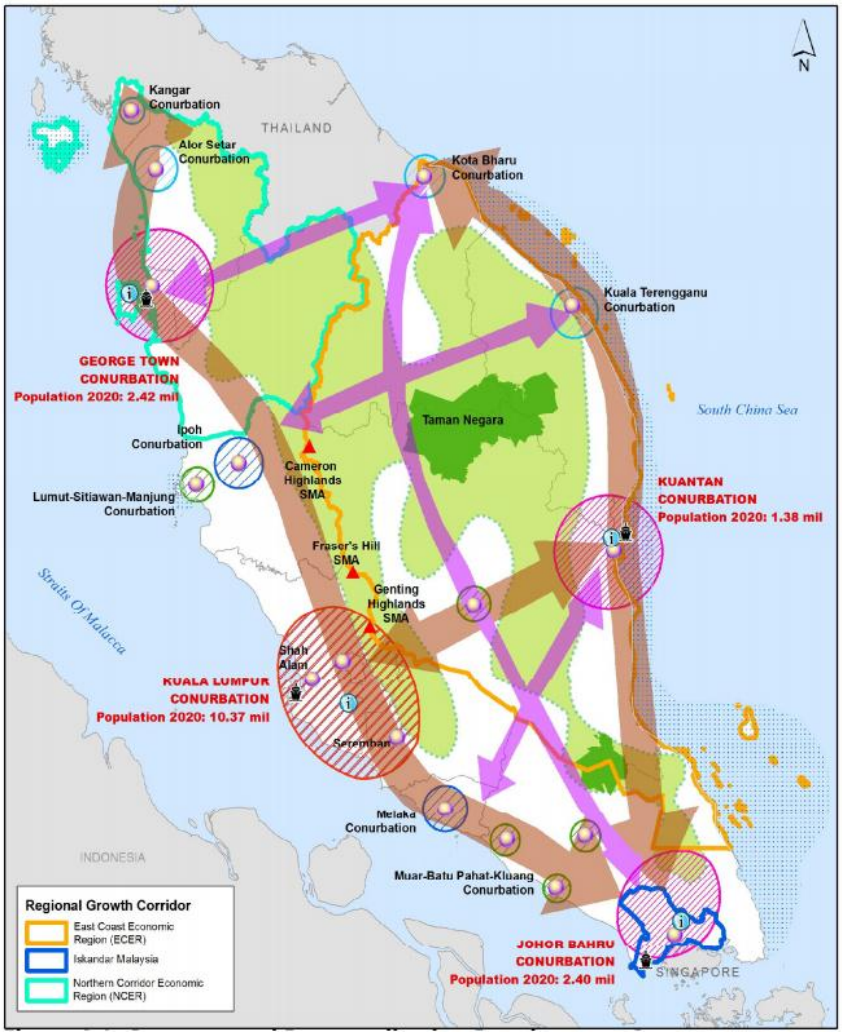
I. Results of the Survey

1. Survey background and purpose

1-1. Background of the survey

Iskandar Malaysia was selected as a target area of the environmental project based on the idea that the future urban development will require addressing the climate change and global warming issues, setting a low carbon footprint target, promoting green economy through increased investments in environmental resources, green technologies, and green products, and proactive support. To be more specific, the project will create "Low-Carbon Society Blueprint for Iskandar Malaysia 2025" (hereinafter called "LCSBP"), which is a road map for building the low-carbon society to achieve socially, economically, and environmentally sustainable development, and plan to implement the blueprint.

Figure 1-1-1: Malaysia's national development plan



Source: Malaysian National Physical Plan

For the development in Iskandar Malaysia, Iskandar Regional Development Authority (herein after called "IRDA") was interested in Japanese technologies and products, and Japanese companies were capable of making a practical implementation plan based on their respective knowledge and experience. As a result, multiple project feasibility researches were conducted in Iskandar Malaysia in 2013. A "project plan for implementation of LCSBP" created by Panasonic attracted interest from IRDA and local companies and is more likely to be implemented as it would contribute to building a low-carbon city overall. Two companies that showed a strong interest in the use of low-carbon technologies and their development projects were selected after discussion with multiple property companies in 2013. From now on, specific "systems" of the low-carbon society will be introduced from the town planning stage.

Figure 1-1-2: Outline of the Iskandar Development Region

Zone	Area name	Main purpose
Zone A	Johor Bahru City Centre	Business district
Zone B	Nusajaya	New city hall and high-class residential district
Zone C	Western Gate	Transportation base
Zone D	Eastern Gate	Educational district and industrial park
Zone E	SENAI SKUDAI Airport	Transportation base

Source: Adapted from the SJER CDP 2006 - 2025

ESCO project proposed by Japan Facility Solutions promotes LCSBP and, therefore, attracted the interest from IRDA. They selected a target building (commercial facility (shopping mall): 1 block, office building: 1 block) in advance and conducted an energy saving assessment. The results showed the commercial facility is especially effective in energy saving, and ESCO project is likely to be implemented. However, ESCO project has not been integrated into Malaysia. It requires amendment of the contract form and implementation process to suit the local business practice.

As described above, research in 2013 found a direction of low-carbon development in residential and commercial buildings in Iskandar Malaysia. However, Iskandar Malaysia is located in the state of Johor, where the manufacturing industry contributes to 30% or more of the state GDP, being a highly industrial area (Table 1). Therefore, another big challenge is the low-carbon development in industrial facilities as well as residential and commercial facilities. The discussion with IRDA also concluded they would like to address this issue.

In such situation, one of the authors of LCSBP, Prof. Ho, suggested that Pasir Gudang City Council among five councils in Iskandar Malaysia is willing to implement the project applied to industrial cities. However, to facilitate low-carbon development, Pasir Gudang made a request to tie up with Kitakyushu City, Japan, which has a profound experience as a low-carbon industrial city.

As stated above, for residential and commercial areas, the road map is currently being laid down for engagement of local stakeholders and implementation of the project based on the progress of the research in order to achieve low-carbon development across Iskandar Malaysia. For industrial areas, participation of local councils with knowledge and experience could develop collaboration between urban cities, which may lead to the implementation of the project.

1-2. Purpose of the survey

In the international negotiation over greenhouse gas emission reduction, it is very important to limit the global average temperature rise to 2℃ or less (“2 degrees target”) compared to that before the Industrial Revolution, and it is a massive challenge to close the “gigatonne gap” (short of target reduction rate). It is required to raise the level of emission reduction target/behavior that each country presented in order to close the gigatonne gap. Especially for Asia Pacific countries that see rapid economic growth, it is important to build a sustainable low-carbon society based on low carbon emission and low resource consumption while improving the living standards through economic development. As each of these countries is in the process of economic growth, they may repeat the path of energy/resource-wasting development that developed countries had trodden for economic and social reasons.

Meanwhile, Japan has realized the importance of 2℃ target and set its own greenhouse gas emission reduction target to close the gigatonne gap as well as promote greenhouse gas emission reduction, using Japanese outstanding technologies and products through JCM. There has already been an MoU for JCM among Mongolia, Bangladesh, Indonesia, and Vietnam. Since there is an increased understanding and interest of JCM in developing countries in Asia, it is required to explore, create, and implement a greenhouse gas emission reduction project by JCM as the next step to achieve a low-carbon society. Although there was BOCM/JCM project feasibility research in the past, very few CDM project feasibility researches led to real projects.

Therefore, it is important to conduct the project feasibility research taking account of the specific project plan.

To plan project feasibility research, taking account of a specific project plan, it would be effective to select an area, select a counterpart in another country that has an interest and a right for the development and the project plan in such area, and have an agreement and adapt the specific project while closely understanding each other. It would help matching Japan's needs and the counterpart's needs well and making use of the counterpart's development plan. As a result, it would make it possible to create a large-scale greenhouse gas emission reduction project. We would suggest that we conduct project feasibility research while we consider the counterpart as the starting point and get stakeholders of both companies engaged in the JMC framework, which we believe will increase the feasibility of the project.

Based on the understanding the above statement, the project selects Iskandar Malaysia—an important development area in Malaysia—as a target area and is based on LCSBP, which is a road map for building the low-carbon society that was planned under cooperation between Japan and Malaysia. We aim to promote a large-scale JMC project plan for greenhouse gas emission reduction.

2. Research plan

2.1. Overview and schedule of research

Our research will provide a road map for the demonstration project to start a broad-scope/large-scale greenhouse gas emission reduction project in Iskandar Malaysia after identifying the current situation and needs of such region and IRDA after selecting Japan's appropriate low-carbon technologies and products, taking account of the results from last year's research.

We will add the low-carbon development for industrial areas as well as residential areas and buildings to the project scope, which is different from last year, to plan a broad-scope/large-scale project. Table 2 shows the overview of this year's project plan.

i. Low-carbon development for residential areas

We conducted information collection and analysis for provisional programs in 12 sectors selected by LCSBP in the research in 2013. Then we formulated the demonstration project plan after selecting the sectors where Japan's low-carbon technologies and products can be used. To formulate the project plan, we set multiple requirements, compared development projects carried out by over 10 developers, and repeatedly discussed with developers considered appropriate for the demonstration project. As a result, we selected the development projects of Developer A and Developer B as the projects we would get involved in to lead to the demonstration project.
In 2014, we will use "Fujisawa SST (sustainable smart town) model" for large-scale development, promoted by Panasonic based on the project plan results in 2013, and formulate a more specific project plan for low-carbon development in residential areas and the demonstration plan. The Fujisawa SST model first identifies required services in residents' daily life to make a master plan for a smart city. Then it designs the entire town including the most appropriate type of houses and facilities as smart space and optimizes and builds smart infrastructure that supports the new lifestyle in the end.

For example, we will continue to discuss with the two selected developers and participate in the basic design and detailed design of the residential area to build a low-carbon town. In addition, we will get involved in installation and management of the show village (the entire town model as well as residential model house) and appeal to the local area with Japan's low-carbon technologies, products, and systems in 2014.

ii. Low-carbon development for industrial areas

As described above, the manufacturing industry contributes 33% to the GDP of Iskandar Malaysia (in Johor). This is higher than the average percentage the manufacturing industry contributes to the GDP of the whole Malaysia. This would imply that low-carbon development for industrial areas is as

important as for residential areas. Pasir Gudang in Iskandar Malaysia is an industrial city. It has a strong intention to promote low-carbon development. Pasir Gudang, in fact, has made a request for a tie-up with Kitakyushu City, which is a leading "low-carbon industrial city" in Japan.
For these reasons, we will use the so-called "Kitakyushu model," a scheme for low-carbon development promoted by Kitakyushu City in its industrial area and build a system for collaboration between cities and councils to achieve low-carbon development in industrial areas. For example, we will conduct research on the current situation in Pasir Gudang to implement the collaboration between Pasir Gudang and Kitakyushu City and create discussion opportunities for continuous consultation as well as identify sectors/areas where Kitakyushu's involvement in such research and discussion can help in low-carbon development, and Japan's low-carbon technologies, products, and systems can be applied.

iii. Low-carbon development for buildings

In the research conducted in 2013, we selected local ESCO project operators, made an agreement with the operators, and selected ESCO target buildings as well as made an assessment and report on energy saving and created ESCO service proposal.
We selected TNB Energy Services (TNB-ES), which is a 100% subsidiary of TNB (Tenaga Nasional Berhad: Malaysian national electricity company), and entered into an agreement as of November 26, 2013. As target buildings, we selected an office building and a commercial facility (shopping mall) where aged deterioration of equipment was predicted among three building blocks selected by TNB-ES with the help of IRDA. Energy saving assessment was conducted by TNB-ES from November 25 to December 6, 2013, and by Japan Facility Solutions from December 2 to December 5, 2013. The results showed the standard ESCO plan is highly feasible in the commercial facility between two building blocks where energy saving assessment was made.
In 2014, we will meticulously undertake following preparation work for ESCO project initiated at the beginning of 2015 "second (detailed) assessment on energy saving effect," "drawing up the standard contract," "review of project scheme," "review of finance scheme," and "capacity building for local staff." in order to start ESCO project in well-prepared way and build a foundation towards large scale development in the future.

3. Survey results

3-1. Outline of the survey field

3-1-1. The survey filed

(1) Basic information on Malaysia

Malaysia is located in the middle of Southeast Asia. The national land contains the Malay Peninsula and part of Borneo Island with the states of Sabah and Sarawak. The total land area of the Malay Peninsula and part of Borneo Island is about 330,000 square kilometers, a little under 90% of the size of Japan.

By administrative divisions, Malaysia consists of thirteen states and three federal territories, including the capital Kuala Lumpur[1]. Eleven out of the thirteen states are situated in the Malay Peninsula and the two other states are situated on Borneo Island.

About 70% of Malaysia's land is covered by tropical rainforests. Its climate is also a tropical rainforest climate. The temperature difference between regions is not large, but the rainfall varies according to the region.

Malaysia is a multiethnic country with a population of about 29 million including the majority Malay (67%), Chinese (25%) and Indian (7%) ethnic populations. Multiple languages are used such as the native language Malay, as well as Chinese, Tamil and English.

In Malaysia, the population living in urban areas increased rapidly up to the 1990s so that the urban population reached 50% in 1990 from less than 20% in 1950. Even today, the urban population is increasing gradually but the pace of growth is expected to slow.

[1] The thirteen states are: Johor, Kedah, Kelantan, Mulaka, Negeri Sembilan, Pahang, Pulau Pinang, Perak, Perlis, Selangor, Terengganu, Sabah, and Sarawak. The three federal territories are: WP Kuala Lumpur, WP Labuan, and WP Putrajaya.

The following lists general data on Malaysia.

Table 3-1-1 : Outline of Malaysia

Profile	Data
Total area	329,847 km²
Population	28,334,135 (in 2010)
Capital	Kuala Lumpur
Number of households	6,396,174 (in 2010)
Average household size	4.43 persons
Population Density	85.9 people/km²
Ethnic composition	Bumiputra: 61.8%, Chinese: 22.6%, Indian: 6.7%, Others: 0.7%, and Foreigners: 8.2%
Language	Official language: Malay Others: English, Chinese and Tamil
Religion	Established religion: Islam
Political system	Federal constitutional monarchy (Commonwealth member)
Currency	Ringgit (1 ringgit ≒ 31 yen: Average in 2013)
GDP	30.473 billion USD
Per-capita GDP	10,344 USD
Japanese living in Malaysia	10,411 persons (in 2011)
Number of Japanese companies	1,407 (in 2010)

Source: Prepared by the survey mission based on various materials

Johor Bahru City is the capital of and the largest city in Johor State. This city, situated at the southernmost point of Johor, functions as the gateway to Singapore.

The population of this city was about 1.39 million in 2010 and the population density is 1,304 people per square kilometer. In terms of ethnic composition, Bumiputra account for 47.5%, while Chinese account for 34.2%, or one-third of the population. The area of this city accounts for only about 5% of the total area of the state, while the population accounts for about 40% of the total population of the state, which makes this a comparatively large city. In addition, about 90% of the Japanese live in Johor Bahru City.

The “Iskandar Project” is an urban development project implemented for the long-term urban improvement of this city. The project aims at developing an exciting area with seamless

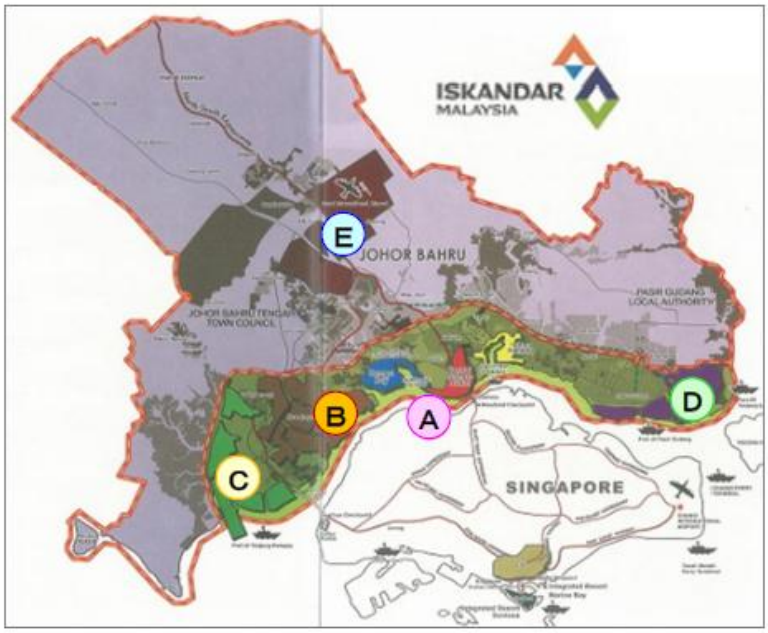
urban functions including living, entertainment, tourism and business, as the most developed area in the southern Malay Peninsula.

Iskandar is trying to optimize the use of the geographical characteristic of its close proximity to Singapore. Its "advantages" as recognized by the IRDA are the following conditions:

- It is possible to travel between other growth centers in Asia such as Bangalore, Dubai, Hong Kong, Seoul, Shanghai, Taipei and Tokyo within 6-8 hours;
- This area has easy access to the sea, being close to the three major ports of Pasir Gudang, Tanjung Pelepas and Tanjung Langsat; and
- This area, connected to Singapore by two connecting bridges with a railroading plan, has good access to this 8-million consumer market in Asia.

Iskandar has promoted a policy of utilizing the advantages of Malaysia's workers including their globally competitive wage levels, the low inflation rate, the high rate of retention of workers, the world-class levels of education, and the multilingual human resources, by providing the best business environment in the southern Malay Peninsula.

Figure 3-1-2: Main development areas in the Iskandar Project



Source:IRDA

In the Iskandar Project, a policy to enhance functions by utilizing the characteristics of each area has been promoted.

Table 3-1-3: Development details of the main development areas in the Iskandar Project

Zone	Outline
A	● Target: Johor Bahru city center ・ Improvement as a financial district ・ Improvement as a business center ・ Waterfront development ・ Improvement of the Johor-Singapore Causeway
B	● Target: Area centering around Nusajaya ・ Improvement as an administrative complex in Johor ・ Improvement as a medical hub ・ Improvement as an educational city ・ Improvement as an international resort ・ Improvement as a logistics base ・ Improvement of residential districts
C	● Target: Area around Tanjung Pelepas Port ・ Improvement as a customs-free free-trade zone ・ Improvement as a sub-transportation route between Malaysia and Singapore ・ Protection and improvement of environmental assets
D	● Target: Pasir Gudang Port and Tanjung Langsat Port ・ Improvement around the Tanjung Langsat Technology Park ・ Improvement of warehouses and logistics centers
E	● Target: Senai-Sukdai Area ・ Improvement around Senai International Airport ・ Improvement of warehouses and logistics centers

The area to be developed in the Iskandar Project is 2,217 square kilometers. The set development period is the twenty years from 2006 to 2026. Up to the end of 2010, 69.4 billion RM (Malaysian Ringgit) was invested. This investment amount exceeds the initial target set at 47.0 billion RM.

● Outline of the main areas in Johor Bahru City

This city can be divided into several areas according to its geographical features. It is characteristic of this city that urban areas spread concentrically around the city center connected to Singapore by the Joho-Singapore Causeway. The western coast has been developed over a long period as a high-class residential district and administrative district, while residential

districts have spread to the northwest. Recently, new houses and condominiums have been actively developed in the east and Taman Molek.

Area	Outline
City center	This is the southernmost gateway to Malaysia and the central urban area of Johor Bahru, which is connected to Singapore by the Johor-Singapore Causeway. The largest complex in the city, the "City Square", is a high-rise building with 36 stories above ground. Levels up to the 5th floor are used for commerce while the 6th floor and upwards is used as offices. The tenants include many local subsidiaries of Japanese companies.
Northwest	This is a residential area with a small number of high-rise office buildings or condominiums and a large number of terraced houses or detached houses in which local people live. There are a small number of relatively new houses.
Western coast	This area has many detached houses with large premises and some residences of powerful local figures. An atmosphere as a high-class residential area can be enjoyed from the coastal road through the interior. There are many public facilities as well.
Nusajaya	This area is designed as an accumulation of offices, houses, commerce, government facilities, hotels, entertainment, education, medical facilities, etc., in the Iskandar Project. The land, which used to be covered by large plantations, was cleared to build the state government building of Johor. Currently, in the interior, a residential district centering on a golf course is being developed. In March 2013, ferry services linking Nusajaya to the center of Singapore started.
Eastern coast	This area is under development as a new residential area. In the vicinity, the large JUSCO commercial facility can be seen. In the northeastern residential district Seri Alam, a Japanese school is located and its school bus goes around waterfront condominiums. This is why the families of many Japanese representatives live there.
Taman Molek	This is a mature, popular residential area with orderly districts. Many Japanese who immigrated after their retirement or who have been assigned as representatives live in a series of condominiums constructed by Taisei Corporation (Molek Pine),
Austin	A large rubber plantation used to cover this area and housing development has been implemented over a period of 20-30 years. In particular, in the western part, a new residential district that began to be developed as Seri Austin consists of rows of relatively new semi-detached houses and cluster houses.

3.2. Low-carbon development for residential areas

3.2.1. Participation in the discussion on basic town design

We conducted information collection and analysis for the provisional programs in 12 sectors selected by LCSBP in the research in 2013. Then we formulated the demonstration project plan after selecting sectors where Japan's low-carbon technologies and products can be used. To formulate the project plan, we set multiple requirements, compared development projects carried out by over 10 developers, and repeatedly discussed with developers considered appropriate for the demonstration project. As a result, we selected the development projects of Developer A and Developer B as the projects we would get involved in to lead to the demonstration project.

We discussed the basic town design with companies A and B, used "Fujisawa SST (sustainable smart town) model" for large-scale development, promoted by Panasonic based on the project plan results in 2013, and formulated a more specific project plan for low-carbon development in residential areas and the demonstration plan.

Fujisawa SST model first identifies required services in residents' daily life to make a master plan for a smart city. Then it designs the entire town including the most appropriate type of houses and facilities as smart space and optimizes and builds smart infrastructure that supports new lifestyle in the end.

In addition, we will get involved in the installation and management of the show village (the entire town model as well as residential model house) and appeal to the local area with Japan's low-carbon technologies, products, and systems in 2014.

To review the concept of town, we i) broke down the proposal for smart and sustainable lifestyle from residents' perspective and ii) discussed the specification of solutions and the budget for each development phase with developers. For example, we classified the lifestyle proposal into six groups—"energy," "security," "mobility," "healthcare," "community" and "finance"—and identified priorities in each development phase. Then we visualized the image of residents' lifestyle, using a VR system, and discussed the specification of solutions to be introduced and the budget.

i) Breakdown of the proposal for smart and sustainable lifestyle from residents' perspective

To break down the proposal for smart and sustainable lifestyle from residents' perspective, we conducted research on residents' lifestyle in five towns in Iskandar Malaysia. The research items are as follows:

A) Town management
B) Security
C) Water
D) Air
E) Health

F) Education

G) Ecology

For the above items, we gave an interview to 20 households in the town about the reasons for choosing the current residence, satisfactory aspects (including previous residence area and environment), the use of town management services, degree of satisfaction, and services required in the future. The interview results are shown below.

Table 3 2-1: The results of the interview with the town residents

Item	Interview results
Town management	● Services offered by the management association include security, water leak, wall painting, and tree pruning for landscape maintenance. There is a high degree of satisfaction for each service. ● Most residents were satisfied with the responses from the management association. Although some residents were unsatisfied, there was no big problem. ● Most residents have a request for ongoing improvement as for the future use of services. They regard good maintenance as a valuable service.
Security	● There are some issues with security guards, for example, miscommunication due to a language barrier, napping at work, and management of visitors. ● Residents are not well aware of the security cost. ● Most residents who live in a detached house have a burglar alarm (including those who have decided to buy one).
Water	● Rainwater is not used in the town. Many residents said there was no problem with water in the shared facilities (mainly swimming pool) as it is clean. ● All the households have a water filter. Some have one only in the kitchen, and others have one in different places at home. Drinking water is filtered, boiled, or purchased at a shop. ● Almost all residents consider “drinking water” their top priority for filtering. Many are concerned about the safety of water. As they do not have confidence in their government, they filter, buy, or boil water.
Air	● They are concerned about air pollution in the haze season, but they

	are not aware that they have substantial damage. ● They often open windows to let air into the house. They use an electric fan and an air conditioner depending on the time and temperature. Some residents close windows in the evening to prevent mosquitoes coming in.
Health	● As they are not satisfied with public hospitals, those who have higher income use private hospitals. Some use private hospitals or hospitals in Singapore depending on their conditions. ● Many have either personal or company-supported basic health checkup annually. ● Some residents are cautious about dengue fever, but most residents are not concerned about it at home.
Education	● They send their children to a tutoring school or private preparatory school or hire a home tutor to have them study after school. They regard English education highly, and many send their children to an international school or a school in Singapore. The main extracurricular activities chosen by boys are taekwondo and badminton, and those by girls are piano or ballet. ● High tuition fee is a burden to the parents in a way, but they want their children to have good education. Therefore, they do not want to be stingy to invest in children's education.
Ecology	● Some residents are aware of environmental issues. They said that it is necessary to make efforts or consideration for address the issues and the government needed to provide environmental education. ● Many residents take part in reducing the issues by, for example, recycling plastic bags and paper, take their own bag to shopping, saving water, and reducing the amount of rubbish. ● They are interested in solar power generation although it requires a large initial investment. Some said they did not know the system or suppliers they could trust, as it is still a new technology.

3.2.2. Basic agreement on project promotion with developers

After an agreement on the basic town design was made at the developer's board meeting at the end of 2013, we entered into an MoU for the joint master planning. Then we made a proposal on Fujisawa model's landscape and buildings. As our proposal was approved, we are currently refining the project plan. We will continue to refine the project plan to receive an approval at the developer's board meeting and implement the development plan after the next year.

3.2.3. Drawing up a show village plan

It is planned to introduce the low-carbon system and products provided by Panasonic to the show village. It could raise awareness about low-carbon development among local people before the completion of the town.

We have already made a proposal of the basic design to Company B, which will build the show village. Although Company B's work was in progress, there was a delay in the process of application/approval of development by Company B in Johor. As a result, currently detailed design cannot be planned.

As an alternative plan, we will make an assessment on introduction of a device in advance in Company B's property located in Kuala Lumpur. The overview of the introduction of a device is described below:

Overview

- The developer will use the unused space in the office building and conduct a solar panel energy generation project to reduce fossil fuel energy.
- FIT has been introduced in Malaysia in recent years, promoting the introduction of solar panels. However, FIT for nonresidential facilities has a strictly limited budget. Therefore, currently nonresidential facilities have dropped a plan for solar panels' installation and FIT application.
- The developer is currently looking into the profitability in domestic consumption of energy generated by solar panels, with the rise in electricity cost in January 2014. For further diffusion of solar panels, it would be socially beneficial to demonstrate profitability of the project that does not rely on FIT. However, it requires the developer to make a larger initial investment. Therefore, they need to prove by a supplementary project the greenhouse gas reduction effects and the profitability of the project.

- They will introduce a solar energy generation facility. Solar panels, inverters, data loggers, and monitors/data control servers will be installed in unused space on the rooftop of the office building.
- They will also closely manage the installation, and install equipment to monitor the operation of the facility and energy production in order to prevent the decrease of energy production level due to accidents or breakdown.

3.2.4. Designing a detailed demonstration project plan

In 2015, local Developer A's project will complete the construction, and residents will start to move into the property. The total facility cost is expected to be approx. 4 billion yen. In 2016, local Developer B will complete the construction, and residents will start to move into the property. The total facility cost is expected to be approx. 3 billion yen. We expect the greenhouse gas emission reduction will be implemented from the respective year.

Panasonic will mainly participate in the project as a designer and equipment supplier. The total facility cost paid by the local developer will be Panasonic's main income from the project. As the properties are privately owned flats, O&M cost will not be incurred.

After 2016, the horizontal development of the smart town project will be carried out in Iskandar Malaysia and across Malaysia. This is the core of the large-scale development project. The total project cost is expected to be 100 billion yen.

For the implementation of the project, Panasonic will be the solution partner that is in charge of the basic design and detailed design of residential areas, based on the Fujisawa model. Panasonic will collaborate with local developers including companies A and B—the counterparts in Malaysia. They are currently discussing the project with companies A and B.

Furthermore, they are planning to expand their business opportunities in terms of geography and business operation through the implementation of this project. They have made an approach to governmental developers and independent developers that have high environmental awareness through this project. They expect to make use of their association with developers in Malaysia and their achievement in Iskandar Malaysia and make an approach to the top developers as well as get involved in demonstration projects conducted by governmental developers.

In addition, they will undertake the horizontal development of the smart city based on the Fujisawa model in Malaysia as well as other Southeast Asian countries, making use of their knowledge and experience obtained in Iskandar Malaysia.

3.3. Low-carbon development for industrial areas

3.3.1. Current situation of Pasir Gudang

3.3.1.1. Overview of Pasir Gudang

Pasir Gudang is located in Iskandar Malaysia in Johor, specified as an important development area in the south of Malaysia. This industrial area has Pasir Gudang Port, Tanjung Langsat Port, Pasir Gudang Industrial Park, and Tanjung Langsat Industrial Park. The city is also located in Zone D, one of the most important zones in Iskandar Malaysia. Iskandar Regional Development Authority (IRDA) is in charge of planning and promotion of Iskandar Malaysia and promotion of investment into Iskandar Malaysia. Pasir Gudang has many different industries: chemicals (petrochemicals, oleochemicals, and chemical products), electric products, food, steel, logistics, printing and papermaking, nonferrous metals, furniture, and apparel. The five main industries are chemicals (23%), electric products (18%), food (15%), food (13%) , and steel (12%), which account for 81% of the whole industries in Pasir Gudang.

Situated along the shoreline, Johor Port and Tanjung Langsat Port are the base of active logistics operations. Johor Port is located in the south end of Peninsular Malaysia, has 8,000 acres of land, and is the center of Pasir Gudang Industrial Park. Main industries are petrochemicals, furniture, telecommunication, electronic products, and food. Johor Port Service (JPS) provides container services, bulk and break bulk services, marine services, and logistics services.

Tanjung Langsat Port (TLP) is at the heart of Southeast Asia, 12.0 nautical miles from one of the busiest international shipping lanes in the world. It has 1,000 acres of land and a 4.5 km shoreline. The port is divided into four zones: storage terminals, oil field services and equipment (OFSE), regional marine supply center, and offshore fabrication and maritime hub. The liquid jetty with water depth of 15.0 m can cater vessels ranging from 5,000 to 120,000 dwt. The dry jetty can cater vessels up to 40,000 dwt.

The Industrial park has over 300 factories and over 30,000 employees. Main industries are electric products and electrochemical, oleo chemicals, biofuel refining, food, engineering, plastics, port management, logistics, and warehouse. There are also R&D facilities. Majority of the activities are electric and electronic products, petrochemicals and oleo chemicals, food, and farm produce processing.

3.3.1.2. Development and environmental plan in Pasir Gudang

The development plan formulated by IRDA has been implemented in Pasir Gudang located in Iskandar Malaysia. IRDA's development plan includes the following infrastructure development plan in Zone D, where Pasir Gudang is situated:

Table 3 3-1: Iskandar Malaysia Zone D project and progress

Development area	Development property	Status
Pasir Gudang	Pasir Gudang Special Hospital	Completed in 2012, in practice
Bandar Seri Alam	Masterskill University College of Health Science	Founded in 2010
	UniKL MITEC (University of Kuala Lumpur Malaysian Institute of Industrial Technology)	Founded in 2011
	Malaysian Arts School	Founded in 2013
	Excelsior International School	Founded in 2013
	Aman Sari Hotel	Completed in 2012, in practice
Bandar Baru Permyjaya	Renaissance Hotel Permas Jaya	Opened in 2013

3.3.2. Current environment in Pasir Gudang

3.3.2.1. Air pollution in Pasir Gudang

Atmospheric environment in Johor in 2013 was measured real-time with an automatic air quality monitoring device placed in four places: Kota Tinggi, Larkin, Muar, and Pasir Gudang. As shown on Map 2.1, air quality was also monitored in five places in total: three places in Johor Bahru, one place in Pasir Gudang, and one place in Batu Pahat.

Measurements of atmospheric environment at CAQM stations were taken on PM10, sulfur dioxide (SO2), nitrogen dioxide (NO2), ozone (O3), and carbon monoxide (CO). The Air Pollution Index (API) is calculated from these measurements. API is reported with five classifications: good (0–50), moderate (51–100), unhealthy (101–200), very unhealthy (201–300), and hazardous (>300). Air pollution in Pasir Gudang is worse than any other areas in Johor. In this research, Pasir Gudang was classified as "unhealthy." Table 5 shows values for reference on June 4, 2014.

*Calculated from the measurements of average concentration of nitrogen dioxide, sulfur dioxide, PM10, ozone, and carbon monoxide per day.

Table 3 3-2: Degree of air pollution in Johor measured by the Department of Environment, Ministry of Natural Resources and Environment in Malaysia

04-06-2014 (Wednesday) - 06:00AM - 11:00AM

NEGERI / STATE	KAWASAN/AREA	MASA/TIME 06:00AM	MASA/TIME 07:00AM	MASA/TIME 08:00AM	MASA/TIME 09:00AM	MASA/TIME 10:00AM	MASA/TIME 11:00AM
Johor	Kota Tinggi	49*	49*	50*	49*	48*	47*
Johor	Larkin Lama	48*	48*	48*	48*	47*	47*
Johor	Muar	42*	43*	43*	43*	43*	44*
Johor	Pasir Gudang	45*	46*	48*	47*	47*	47*

Petunjuk / Legend

Baik / Good 0-50 | Sederhana / Moderate 51-100 | Tidak Sihat / Unhealthy 100-200 | Sangat Tidak Sihat / Very Unhealthy 200-300 | Berbahaya / Hazardous > 300

Source; Ministry of Natural Resources and Environment in Malaysia

The Ministry of Natural Resources and Environment in Malaysia stated that the air pollution is caused by industrial/development activities, automotives, power generation, cultivation, open burning, and forest fire (haze caused by forest fire in Indonesia is a serious issue). Especially in Pasir Gudang, traffic congestion is caused by repair work on the motorway. It is suggested that the traffic congestion as well as the industrial park activities are the causes of air pollution.

As described in detail hereinafter, the petrochemical plant produces emission that causes bad odor and low-frequency vibration. As a result, the business activities around the plant are subjected

to harmful effects. Therefore, the resident companies have been requesting for government control over air pollution and instructions.

3.3.4.3. Current situation and issues of waste disposal in Pasir Gudang

Malaysia has experienced a rapid population growth, urbanization, and industrialization. Its stable politics has brought steady economic growth, a low unemployment rate, and access to a large amount of resources, which are equivalent to those of a developed country. On the other hand, its rapid urbanization and industrialization have caused the increase of waste resulting in harmful effects on the environment.

The Malaysian government has introduced various laws and regulations in order to reduce the effects of waste on the environment. When it was found that the Environmental Quality Act 1974 and the Local Council Act 1976 were inadequate, the government revised especially the chapter for the treatment of industrial waste and hazardous waste in order to improve the environmental quality.

They introduced the Action Plan for a Beautiful and Clean Malaysia (ABC) in 1988, the National Policy on the Environment (NPE) in 2002, and the Environmental Quality (Scheduled Wastes) Regulations and the National Strategic Plan (NSP) in 2005. Furthermore, they continued to introduce laws and regulations pertaining to solid wastes including the National Waste Management Policies in 2006 and the Solid Waste and Public Cleaning Management Act (SWPCM) in 2007.

On the other hand, the amount of solid waste has been continuously increasing in urban areas along with a rapid increase of the amount and types of waste caused by a rapid economic growth, population movement from farming villages to urban cities, and changes in lifestyle in Malaysia. As a result, waste management is a serious issue. The amount of solid waste generated per person a day in a city was 0.5–0.8 kg in 2003. However, it has increased to 0.5–2.5 kg in recent years. Especially, major cities such as Kuala Lumpur have seen a notable increase of waste. This is also a problem in Penang and Johor, the second and third largest cities, respectively, in Malaysia.

The National Strategic Plan (NSP) pertaining to waste management suggests that population growth and solid waste generation are directly associated. It is predicted that waste generation will increase by 3.59% every year, if calculated based on the prediction of population growth from 2002 to 2020. Based on this prediction, the total waste generation in Peninsular Malaysia will increase up to 30,000 ton/day in 2020, although it was 2,300–2,500 ton/day from 2010 to 2012.

Each state in Malaysia is more or less in the same situation. The amount of general waste is expected to increase in any of the states. Table 6.2 shows Selangor produced the largest amount of general waste, followed by Kuala Lumpur and then Johor.

It is predicted that the waste generation in Iskandar Malaysia will be doubled between 2011 and 2025. General waste will account for approx. 70%. It is also predicted that the waste generation in Pasir Gudang will increase at a rate higher than the population growth rate.

There are no recent data available for the composition of waste in Malaysia. Therefore, researchers and government officials are speculating the composition of waste, using different

methods. In general, waste comprises of paper and plastics in most of the countries in the world. Also, it is known that approx. 75 % of the whole waste is organic substances.

Table 3 3-3 shows that solid waste generated in Malaysia mainly comprises of organic substances. Organic substances account for 32–68.4% of the waste, although the percentage varies, depending on the researcher. Currently, food, paper, and plastics account for approx. 70% of the total solid waste generation in most of areas/cities in Malaysia.

Table 3-3-3: solid waste generated in Malaysia

Component (%)	2001 (i)	2002 (ii)	2003 (iii)	2004 (iv)	2005 (v)	2007 (vi)	2010 (vii)
Food waste & organics	68.4	56.3	37.4	49.3	47.5	42	43.5
Mix Plastic	11.8	13.1	18.9	9.7	NA	24.7	25.2
Mix Paper	6.3	8.2	16.4	17.1	18.5	12.9	22.7
Textiles	1.5	1.3	3.4	NA	2.13	2.5	0.9
Rubber and Leather	0.5	0.4	1.3	NA	NA	2.5	NA
Wood	0.7	1.8	3.7	NA	4.41	5.7	NA
Yard wastes	4.6	6.9	3.2	NA	2.72	NA	NA
Ferrous	2.7	2.1	2.7	2	NA	5.3	2.1
Glass	1.4	1.5	2.6	3.7	NA	1.8	2.6
Pampers	NA	NA	5.1	NA	NA	3.81	NA
Other	2.1	8.4	5.3	18.2	21.93	2.6	1.8
Total	100	100	100	100	100	100	100

Source; Listed sources in the following

(i) Hassan et al "Solid waste management in Southeast Asian countries with special attention to Malaysia", 8th international waste management and landfill symposium 2001. A data taken from Kuala Lumpur

(ii) Nazeri A.R a report on solid waste composition from a study conducted at Taman Beringin landfill in 2000

(iii) S. Kathirvale et al “Energy potential from municipal waste in Malaysia” Journal of Renewal Energy, 2003(data for kuala lumpur)

(iv) JICA “The Study on National Waste Minimisation in Malaysia” July 2004 –June 2006

(v) Sampling by Bukit Tagar Sanitary Landfill 2005

(vi) Muhammad Abu Eusuf et al “An overview on waste generation characteristic in some selected local authorities in Malaysia” proceedings of international Conference on Sustainable Solid Waste Management September 2007

(vii) Siti Rohana M. Yatim “Household Solid Waste Characteristic and management in low cost apartment in petaling Jaya, Selangor, 2010.

Research in 2007 found that the total waste comprises of 46% of decomposed waste, 14% of paper, and 15% of plastics. It suggested that the amount of waste is likely to decrease in developed countries mainly because the percentage of packaging materials and organic substances is decreasing. It can be said that Malaysia is in the transition period to achieve the national target set in 2020.

Especially in Iskandar Malaysia, food waste accounts for the largest percentage of the total waste, followed by paper and plastics. However, JICA conducted the research in 2005. As Iskandar Malaysia has rapidly developed since 2005, the composition of waste may have changed.

In general industrial cities, it is predicted that the percentage of paper, plastics, and man-made products will increase and the percentage of food waste will decrease. This prediction is based on the idea that the ratio of packaging materials will increase, while that of organic substances will decrease in developed countries. Therefore, the ratio of paper and plastics suggested in JICA’s research is likely to increase in the future.

However, the treatment of industrial solid waste differs from that of household waste. As the amount of industrial waste is large and its nature is different, mainly private disposal operators treat and dispose industrial waste in Malaysia. Industrial waste in Malaysia is divided into the following two categories:

a) Solid waste generated from products or during the production process
b) Toxic and hazardous waste that can be expected to be generated in advance

It is speculated that industrial waste generation across Malaysia increased from 7,721.58 ton/day in 1994 to 11,519.24 ton/day in 2005. Hazardous waste generation also varied from 1994 to 2005. Hazardous waste generation in 1994 was 417,413 ton in 1994 and it increased to 632,521 ton in 1996. Then, it decreased up to 548,916 ton by 2005.

For the scheduled waste, which can have harmful effects on people or the environment, regulated by the Environmental Quality (Scheduled Wastes) Regulations 2005, the amount of scheduled waste in Johor increased from 313,235 ton in 2008 to 344,157 ton in 2012. Johor aims to increase the amount of recycling by 2% every year, while waste generation is increasing by 3.17% every year.

3.3.5.2. Problems with companies in Pasir Gudang

We preliminary sent out questionnaires about environmental problems to be improved to 34 Japanese companies in Pasir Gudang. After that, we conducted interviews to seven of them in Pasir Gudang from January 7, 2014. The results are as follows:

With respect to the electricity supply, more than half of companies have no problems in particular, and power outages do not occur often, either. Approximately 15% of the companies feel electricity charges are expensive. On the other hand, what is notable is that exhaust heat and gas are not utilized and energy saving devices such as LED lighting are not introduced.

Most companies outsource the environmental tasks and waste disposal because of the lack of relevant technique and knowledge, although they have some requests of improvement. On the other hand, they are highly motivated to reduce and recycle waste.

Representative comments of interviewed companies are as follows:

Task	Comments of interviewed companies
Bad odor and dust	• Emissions of a neighboring petrochemical plant are releasing a bad odor, which interferes with our operation. • Being affected by emissions and dust of a neighboring factory including the deterioration of appearance of our vehicles, we negotiated with the factory, but in vain.
Noise	• Low-frequency noise associated with emission causes our window glasses to vibrate, which affects our operation badly.
Pests	• The flour used in a neighboring food factory was infested with worms, and bugs are flying to our company.
Insufficient public correspondence	• Although we filed a claim to the administration office of the industrial complex, they did not make efforts to improve the situation. • The DOE in charge of environmental preservation has not provided a sufficient level of directions and supports including CSR. They have not conducted a sufficient level of information disclosure of the air pollution and water contamination. Problems will not be solved without even more leadership of the government. • Information disclosure about the environment is not enough.
Securement of manpower	• Manpower cannot be secured as people refuse to move in because they are afraid of the deterioration of the environment.
Bumpy roads	• Pavement is defective, and roads sag repeatedly, and are covered

	with water.
Thorough environmental measures	• To make environmental measures of the whole industrial complex thorough, a system to evaluate each company such as environmental certification by the government would be effective. Such a system is suitable to Malaysian society, which is sensitive to governmental directions and in which people like awards. It is desirable that environmental business using such a system can be established. For example, if there will be a rule that to obtain a license, a company has to commission waste disposal to a recycling agent approved by the government, the company would not sell the waste to a suspicious agent.

The current situation is that the management of the industrial complex is not appropriate, and troubles with neighboring factories have to be solved on their own. The deterioration of the surrounding environment affected securement of manpower badly. The planning of problem solution method using the G-to-G framework is needed.

3.3.6.2. The proposal from Kitakyushu Asian Center for Low Carbon Society

In February 2015, Pasir Gudang MPPG and the Kitakyushu Asian Center for Low Carbon Society (hereafter, Kitakyushu) held a discussion and workshop about the environmental problem. In the discussion, Kitakyushu proposed measures to improve environment in Pasir Gudang. The proposal is divided into four areas based on NBPG.

Table 3 3-4: The proposal for green industry

Theme	Measures
Cleaner production	➢ Provision of information about cleaner production ➢ Training of engineers and implementation of the model project
Efficient management of energy	➢ Cogeneration project in the industrial complex ➢ Implementation of the energy saving checkup, and the training of energy consultants
Prevention of pollution (drainage measures and exhaust emission controls)	➢ Strengthening of inspection and direction in cooperation of DOE and MPPG (strengthening of on-the-spot inspections and disclosure of malicious companies) ➢ Government offers a necessary advice and direction while imposing a fine ➢ Provision and disclosure of information about drainage measures and exhaust emission controls
Recycling of industrial waste	➢ Thorough implementation of manifest system to secure appropriate disposal ➢ Promotion of entry to the recycling business, and introduction of eco-town project (e.g., sludge made into cement raw material and fuels)
Production of eco-products	➢ Making of the certification system unique to the city ➢ PR activity of certificated products (pamphlets for display)
Utilization of government's support to promote green industry	➢ Promotion of utilization of governmental support such as green industry incentive system ➢ Enhancement of addresses by green industry companies ➢ Making of certification system of factory environment
Cooperation of companies in the industrial complex	➢ Making of management system and organization for companies to solve problems of environmental pollution in cooperation with MPPG ➢ Reviewing of making an education center for the green industry

Source: Kitakyushu City

Table 3 3-5: The proposal for sustainable waste management

Theme	Measures
Municipal waste reduction (at the stage of emission)	➢ Separate collection and composting of raw garbage ➢ Making of intermediate treatment site and collection of recyclable materials ➢ Conducting of “2 plus 1 collection” in cooperation of PPSPPA and MPPG
Promotion of recycling	➢ Systemization of existing collection of recyclable materials ➢ Supporting of NGOs involved in recycling activities
Appropriate disposal of waste (from the introduction of thermal disposal site to waste power generation)	➢ Diffusion of composting of raw garbage at home ➢ Separate collection and methane fermentation of raw garbage; electricity generation by using it ➢ Reviewing of introduction of incineration plant ➢ Incineration of waste after intermediate treatment and electricity generation by it
Securing of the final disposal site	➢ Life extension by waste reduction and sanitary closing and stabilization of the site ➢ Introduction of efficient and effective treatment technology of seeping water ➢ Securing of a new final disposal site
Measures to prevent illegal dumping	➢ Strengthening of patrolling ➢ Setting monitoring cameras at places where illegal dumping often happens ➢ Introduction of reporting by citizens

Source: Kitakyushu City

Table 3 3-6: The proposal for low-carbonized society

Theme	Measures
Promotion of diffusion of public transportation system	➢ Enhancement of convenience and service level of public bus (introduction of IC cards and the bus lane, etc.)
Introduction of low-pollution car	➢ Diffusion of electric buses and automobiles ➢ Active dispatch of information about low-pollution cars (data of fuel cost, preferential treatment, etc.)
Energy saving at home and office	➢ Introduction of specific examples and technologies ➢ Promotion of energy saving businesses including ESCOs
Introduction of recyclable energy	➢ Promotion of utilization of exhaust heat at power plants, etc. ➢ Purchase of solar power ➢ Promotion of the feed-in tariff
Measures against climate change	➢ Low carbonization of public facilities and dispatching information as model cases (LED lighting, temperature

	setting of air conditioning, recycling, etc.) ➢ Making of the inventory of greenhouse effect gas at the city level

Source: Kitakyushu City

Table 3 3-7: The proposal for green community

Theme	Measures
Urban greening and securing of natural environment	➢ Planting of trees at the inner periphery of factories, which makes a buffer zone with inhabited areas ➢ Opening of nature observation events and nature preservation events
Environment education and learning	➢ Development of educational materials which are easy to understand ➢ Promotion of unique activities by each school, and information exchanges ➢ Making of recycling centers at the center of communities ➢ Nurturing of human resources involved in environment education and enlightenment
Practice of eco-lifestyle	➢ Nurturing and supporting of NGOs leading community activities ➢ Enhancing incentives to participate in activities (gifts and prizes)
Making a monitoring system	➢ Enhancement of monitoring spots and items in cooperation with DOE and MPPG ➢ Making of a system managing data in an integrated fashion ➢ Disclosure and posting of monitoring data

Source: Kitakyushu City

After discussions, Pasir Gudang City continuously seeks to build partnership with Kitakyushu in the next year and later to improve environment. Although the theme and method that can be possibly introduced depends on the specific development of the discussion, the first step toward partnership building between the two cities has been taken.

3.4. Low carbonization of buildings

3.4.1. Background and survey content

In the last year, buildings and customers for ESCO business were found, and energy saving checkups for the buildings were conducted. As a result, we made sure that there would be enough energy reduction for the implementation of ESCO. Based on the result, the review and making of specific ESCO scheme, the first draft of the ESCO contract, and the MRV plan were conducted this year as stated below.

For the implementation, design and construction of equipment were conducted in cooperation with local subsidiaries of Japanese companies, which was contributory to the overseas development of Japanese companies. Also, for the introduction of cooling machines, the possibility of introduction of Japanese products was reviewed.

i. Detailed energy saving checkups (the secondary checkups) conducted

In this year, the secondary checkups were conducted to fix the energy saving effect based on the result of review in the previous year. This time, to check the correct flow volume and temperature of the target water system, an ultrasonic flowmeter was set in the chilled-water system after the heat insulator was excluded, and not the cooling water system, which is easy to be checked. That was the main point of the checkup this time. The water temperature was checked not on the outer surface of the plumbing, but in the protective tube of the thermometer, with a highly accurate thermometer in place of the thermometer usually set there. The checkup took a week to collect as much performance data of each machine (mainly cooling machines) as possible.

ii. Making of M&V plan document

When the ESCO service is started, it should be done based on the agreement of the M&V (measurement and verification of energy saving) with customers. This time the verification method was reviewed by the two companies based on our know-how, and the procedure of the M&V of two cases was summarized. The details of the M&V plan document can be seen in 3.2.

iii. The accomplishment of the original plan of the ESCO agreement

As a result of the energy saving checkup, a target of the project Angsana Johor Bahru Mall was evaluated to be promising for the ESCO, so the content of the ESCO agreement was reviewed based on a case of agreement in the United States. And the TNB-ES version of ESCO agreement (shared savings method) consistent with the Malaysian law was developed by the two companies. For details, see 3.3 and 5.4.

iv. Making of the ESCO proposal

Based on the necessary factors of the ESCO scheme to be adopted by customers, the general ESCO service charge was calculated.

v. Making of the plan after 2015

In 2013, promising targets of the ESCO were successfully chosen, and in 2014, detailed checkups were conducted and the energy saving amount was fixed. Moreover, the TNB-ES version of ESCO agreement and the ESCO proposal based on the original plan making of M&V plan document were accomplished.

3.4.2. The result

Specific work items conducted this year to make up the ESCO project in Iskandar area were as follows:

i. At the local area
ii. The implementation of the secondary checkup and its summary
iii. Making of the M&V plan document
iv. Making of the original plan of the ESCO agreement
v. Making of the final version of the ESCO proposal

Details of each item are stated below.

3.4.3.1. The implementation of the secondary checkups

The secondary checkup was conducted by TNB-ES under the guidance of JFS, for two weeks from the end of May. The aim of the measurement is as follows:

(1) Detailed review including the measuring of energy saving effect at the beginning of the ESCO project
(2) Reconfirmation of the operating hours and lighting time
(3) Verification of details of specifications of the equipment
(4) On-site survey about repair work for energy saving

Points to be checked about the energy saving effect are as follows:

(1) Performance of cooling machines
- Measurement of cold production level, and the temperature of cold water at the intake of cooling machines
- Measurement of electricity input of cooling machines
- Measurement of the temperature of coolant water at the intake of cooling machines
- Reconfirmation of number of machines operated for a year and operating hours

(2) Power consumption and flow volume of pumps (cold water and coolant water)
- Measurement of electricity input of pumps
- Measurement of circulated flow of pumps
- Measurement of the temperature of inflow and outflow of the cold water and the coolant water

(3) Real power consumption of light devices

- Measurement of power consumption of a single light device on sampling
- Reconfirmation of lighting time of checked lighting devices
- Reconfirmation of the number of lumps of lighting devices

3.4.3. Summary of the checkups

This year, same as last year, secondary checkups of energy saving were conducted, the energy reduction amount was fixed, and the ESCO proposal document was made.
For the checkups, the cold water flow, which could not be checked last year, was checked after excluding heat insulator, using an ultrasonic flowmeter. Temperature was checked using protective tubes, with measuring sensors set in them, trying to measure as close to the truth as possible. As a result, the measuring result almost same as last year could be obtained, and it became clear that the measuring data of last year were accurate.

As a result of the secondary checkups, same as last year:

About Wisma Daiman Office Building

i. Inverter control of coolant water pumps
ii. Energy saving of lighting devices (changing fluorescent tubes)

About Angsana Johor Bohru Mall

i. Renewal of cooling machines
ii. Inverter control of cold water pumps
iii. Energy saving of lighting devices (changing fluorescent tubes)

Energy saving methods as stated above were reconfirmed to be adoptable.

Moreover, the secondary checkups confirmed that the following points must be considered:

About Wisma Daiman Office Building

- A little longer operation data are necessary to decide the baseline of the ESCO
- It is recommended that cool air packages should be overhauled to improve performance

About Angsana Johor Bohru Mall

- A little longer operation data are necessary to decide the baseline of the ESCO (cooling machines and pumps)
- Deterioration diagnosis of plumping is necessary out of concern of the deterioration of coolant water plumping with long-term use
- Energy saving by the automatic operation control of escalators is considerable
- Manual flush valves are used. Significant reduction of water usage is possible by introducing automatic valves (because clean water is cheap, it would not make much difference as the ESCO).

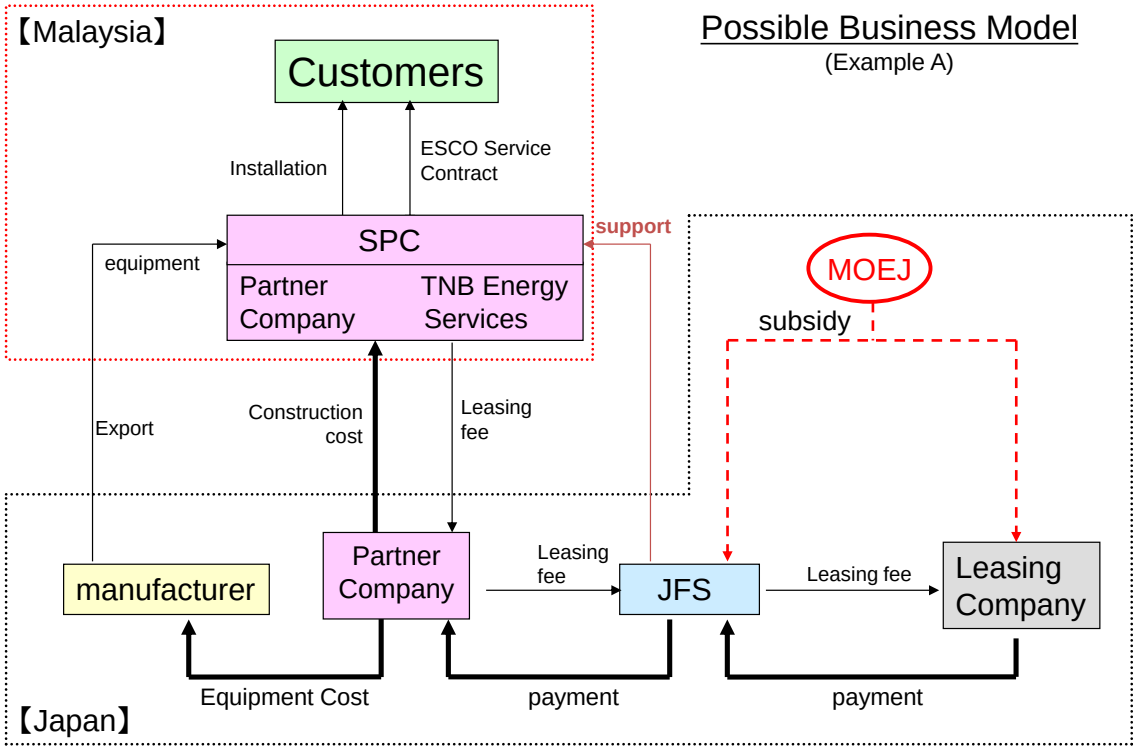
Installation cost to materialize these methods was estimated again, which showed about 15%

increase than last year, and payout time became longer. As a result, it was confirmed unfortunately that the ESCO proposal was not very attractive.

3.4.5. Change of situation and countermeasures

On the business trip in September this year, our partner TNB-ES argued "To conduct this project, it is indispensable that SPC invested jointly by Japanese companies and TNB-ES in Malaysia would be established" (Figure 1). This idea was from the president of TNB-ES at the time of business trip in June, and the possibility was asked in e-mails after that, but the word "indispensable" was said for the first time.

Figure 1: The business model TNB-ES demands



Since the beginning, our company has proposed the business model stated in Table-2, and communicated that the establishment of local company and investment are impossible because of our circumstances. On the other hand, a local company of Japanese constructor, which was expected to invest into the JV, demanded the model in Figure 2, saying that "We will cooperate as a constructor but cannot join in the establishment of SPC." We requested the Japanese constructor to rethink, but its conclusion did not change due to their experience in the local area. Major opinions of each company are summarized in the Table 3.

Figure 2: Business model the local company of a Japanese constructor demands

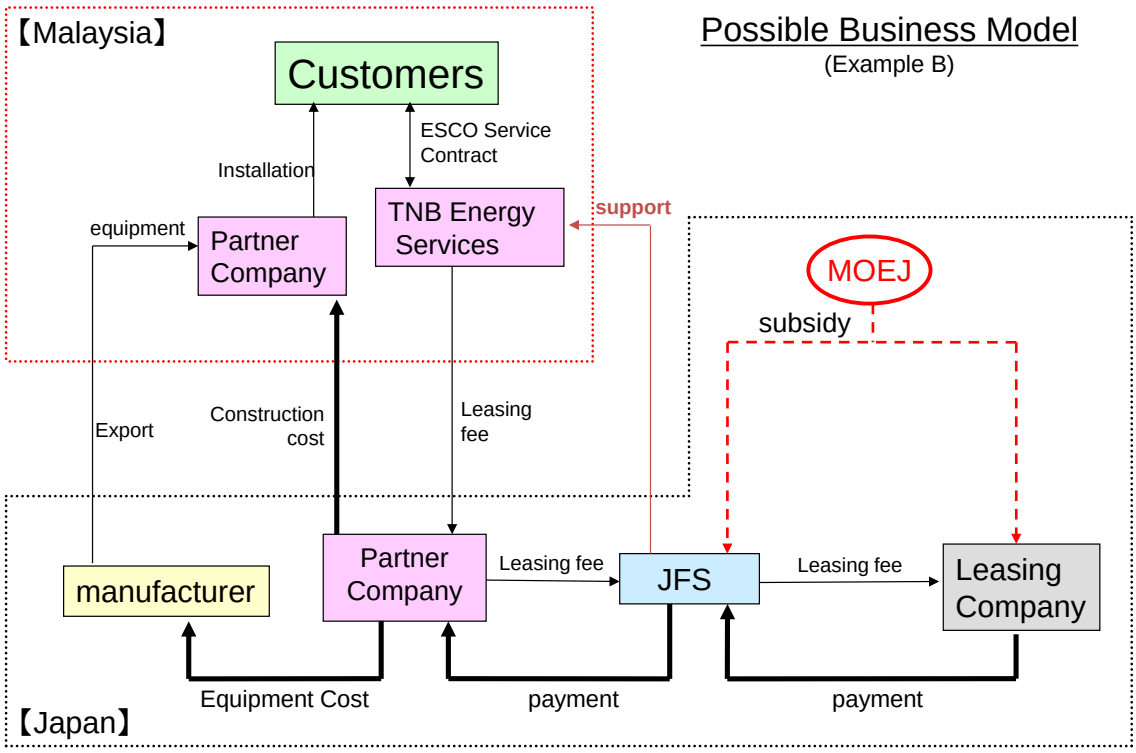


Table 3: Summary of opinions

TNB Energy Services	Japan side
Hope to establish an SPC by joint investment with Japanese companies. Without capacity to take intrinsic risks in the ESCO business, hope to share them with Japanese companies.	Partner Japanese company: From our experience, there is a high possibility that we will be left with all risks, although they mentioned that they share risks with us.
	JFS: Not capable to establish local company or invest in it. We have proposed the business model based on that thought since the beginning.

After that, our company continued our efforts to take over the outcome we had achieved to an appropriate Japanese company. The result is shown in Table 4.

Table 4: Response of Japanese companies asked for the handover

Company A (Energy company, Tokyo)	Incidentally, we jointly established a similar company with a local gas-supplying company in Malaysia at the almost same time, and cooperating with a local electric power company would betray our cause. So we cannot take over the business.
Company B (Equipment service company, Tokyo)	The reason why the partner Japanese company rejected investment makes us hesitate to take over and joint investing. We cannot take over.
Company C (Equipment service company, Tokyo)	The reason why the partner Japanese company rejected investment gives us pause in taking over and joint investing. We cannot take over.

The Japanese companies we asked for the handover did not evaluate the case positively, and we cannot change the idea of the Malaysian side. We think it is hard to continue this project.

4. Calculation of reduction effect of greenhouse gas emission

4.1. Calculation of reduction effect of greenhouse gas emission concerning low carbonization of residential areas

The specific project for the low carbonization of residential areas is energy saving of residences by introducing equipment for energy saving, energy generation, reservation of energy, etc., to newly built residences. In the review done in 2013, a methods plan was studied, and in 2014, information collection and analysis were conducted for the comparative group used in the baseline scenario of emission, which will become necessary for the calculation of reduction effect of greenhouse gas based on the method plan.

(1) Method overview

A methods plan was made for residences in Iskandar, Malaysia, where low carbonization of the residential area will be conducted. This methods plan is focused on not increasing obstacles to the implementation of project and burden of monitoring.

The methods plan based on the idea stated above is as follows. The name of method and eligibility conditions are subject to change depending on future review.

1. Name of method

   Project to introduce energy saving residence in Malaysia

2. Eligibility conditions

   This method can be adopted when all conditions stated below are satisfied:

   - Newly built residences with equipment and function as follows:
   - Two or more technologies and products utilized in Japanese smart town (e.g., Fujisawa SST) are introduced.
   - Energy saving equipment including inverter home electronics is introduced.

3. Boundary

   All devices operated with electric power introduced in the residence are inside the boundary.

4. Baseline emission

   Baseline emission is “the average of annual electricity consumption of residences in the comparative group” times number of residences targeted for the project.

   “The average of annual electricity consumption of residences in the comparative group” is total annual electricity consumption of all residences in the comparative group divided by the number

of residences belonging to the comparative group. The annual electricity consumption of each residence in the comparative group is calculated by adding electricity consumption of each month described on the bills from the electric power company, which were submitted by each residence.

Residences that belong to the comparative group must satisfy the following conditions:

i. The number of the household members is above a certain number.
ii. Total floor space is above a certain level.
iii. Having electricity-operated coolers (more than one) and a refrigerator powered by electricity.

Also, the number of residences belonging to the comparative group must be 100 or more, regardless of the number of residences targeted for the project.

Baseline emission is calculated by the following formula:

$$BE_y = \sum_{i=1}^{m}\left(EM_{i,y}\right) \times \frac{1}{m} \times n \times \frac{1}{1-l_y} \times EF_y \qquad \text{(Formula 1)}$$

Sign	Definition	Unit
BE_y	Annual baseline emission	tCO_2/year
$EM_{i,y}$	Annual electricity consumption of the residence *i* belonging to the comparative group	kW h/year
m	Number of residences belonging to the comparative group	—
n	Number of residences targeted for the project	—
l_y	Annual system loss	%
EF_y	Combined margin emission coefficient in Malaysia	tCO_2/kW h

5. Emission in the project activity

Emission in the project activity is total electricity consumption at residences targeted for the project.

The annual electricity consumption is calculated by adding electricity consumption of each month described on the bills from the electric power company, which are submitted by each residence.

Project emission is calculated by the following formula:

$$PE_y = \sum_{i=1}^{n}\left(EP_{i,y}\right) \times \frac{1}{1\text{-}l_y} \times EF_y \qquad \text{(Formula 1)}$$

Sign	Definition	Unit
PE_y	Annual project emission	tCO_2/year
$EP_{i,y}$	Annual electricity consumption of residence *i* targeted for the project	kW h/year
n	Number of residences targeted for the project	-
l_y	Annual system loss	%
EF_y	Combined margin emission coefficient in Malaysia	tCO_2/kW h

6. Leakage emission

For the project for which the method can be adopted, leakage emission is not supposed.

7. Emission reduction

As the reduction in the project activity and the leakage emission are supposed to be zero, the emission reduction equals baseline emission. The following formula is used for the calculation:

$$ER_y = BE_y - PE_y \qquad \text{(Formula 1)}$$

Sign	Definition	Unit
ER_y	Annual emission reduction	tCO_2/year
BE_y	Annual baseline emission	tCO_2/year
PE_y	Annual project emission	tCO_2/year

8. Monitoring method

Monitoring items and examples of monitoring method necessary to calculate baseline emission and emission in the project activity are stated in the table below.

(2) Calculation of reduction effect of greenhouse gas emission according to the method plan

i. Overview of review of the comparative group

Residences in Iskandar, Malaysia, which can belong to the comparative group according to the method plan, are extracted, and a default value, which can be used generally for the future implementation of the project, is set through the collection and analysis of real electricity consumption data.

By setting the default value, the implementer of the project does not have to make and monitor the comparative group, and the participation into the project and project itself are promoted further.

In 2014, as a preparatory review to decide the comparative group, a review of electricity consumption and home electronics owned is implemented centering on Iskandar, Malaysia, under the following conditions:

Table 4 1: Overview of review of the comparative group

Aim	Review of electricity consumption, etc., of residences for high-income people in Iskandar, Malaysia
Sort of residences interviewed	Detached houses and complex housings
Number of households	100 or more
Area	Centering on customers of the developer working with us, area is set depending on the number of households that can be interviewed
Overview of residences interviewed	• Total floor space: 70 m^2 (approx. 750 ft^2) or more • Number of persons: 2 or more • With air conditioning and refrigerators
Items interviewed	• Electricity usage per month (on the voucher base: kW)/electric power charge per month • The sort of buildings • Total floor space/number of persons/number of rooms • Home electronics introduced—air conditioners, refrigerators, TVs, etc.

ii. The result of review of the comparative group

As a result of survey of power consumption, etc., centering on customers of the developer working with us, answers were got from 119 households (55 detached houses and 64 complex housings).

Average total floor spaces of 43 detached houses and 61 complex housings (total 104 houses, after exclusion of abnormal value, etc.) are 2,141 ft^2 (approx. 200 m^2) and 30 ft^2 (approx. 77 m^2). As the targets of the survey are comparatively rich people with residences in Iskandar, Malaysia, the total floor spaces of detached houses in particular are larger than those in Japan. The number of rooms and persons in households are also larger than in Japan: 4.1 rooms and 4.9 persons for detached houses and 3.01 rooms and 4.3 persons for complex housings.

Power consumption is 438 kW h/month for detached houses, and 364 kW h/month for complex housings, which is 1.21–1.46 times of Japan's 300 kW h/month. This is thought to reflect differences of climate and power saving quality of home electronics used.

(3) Trial calculation of estimated emission reduction

In this review, as a power consumption survey for the project case could not be conducted, emission in the project cannot be set. Therefore, the reduction effect of greenhouse gas emission for the supposed substantiative project cannot be calculated.

Reference emission was set for each of detached houses and complex housings as follows, based on the power consumption gained in the survey in 2014:

Sort of residences	Annual power consumption	Annual greenhouse gas emission	Reference: total floor space
Detached houses	5,257 [kW h]	3.62 [tCO_2]	2,141 [ft^2]
Complex housings	4,374 [kW h]	3.01 [tCO_2]	830 [ft^2]

✧ Emission coefficient: 0.689 $kgCO_2$/kW h

As a reference of emission reduction by the project, in the case of Fujisawa SST by Panasonic, the reduction effect of greenhouse gas emission is 50% of the whole residences. If the same reduction effect of greenhouse gas emission is supposed for the substantiative project, the GHG emission reduction at each site is as follows.

	CO_2 emission reduction	Reference
Development case by Company A	4,520 tCO_2/year	3,000 complex housings
Development case by Company B	664 tCO_2/year	300 complex housings and 200 detached houses

✧ Emission coefficient: 0.689 tCO_2/MW h

4.2. Calculation of reduction effect of greenhouse gas emission due to the low carbonization of buildings

Concerning the low carbonization of buildings, a method plan was reviewed targeting the refurbishment of existing buildings for energy saving, such as office buildings and shopping malls on which energy saving checkups had been conducted in the 2013 review. As a result, the method plan was made about the reduction effect of greenhouse gas emission concerning air conditioning, because the average temperature in Malaysia is consistent and high, and burden on the air-conditioning system is relatively large.

In 2014, it was planned that the project (building) targeted for low carbonization would be specified, the general method plan would be reviewed including the whole reduction effect of greenhouse gas emission of energy saving equipment such as not only air conditioning, but also lighting and power system, and the study would be conducted from the viewpoints of possibility of conservative estimation of the emission reduction and accumulation of default values and reference data. But as the project (building) targeted for low carbonization could not be specified, the review of the calculation of reduction effect of greenhouse gas emission concerning the low carbonization of buildings was decided to be suspended.

5. The review of the activity and action plan of the next year and later

5.1. Project concerning the low carbonization of residential area

5.1.1. The review of the activity of the year

The feasibility study conducted this year developed the process of consensus formation with local developers, and made it possible to grasp the details of life of people living in Iskandar area, equipment introduced, and equipment and service they hoped to have in future, as well as to make the true situation of power consumption of residents clear.

Especially, in the consensus formation with local developers, a specific proposal could be made about the project centering on detached houses related to Company A through discussion with the company. Although the final decision is expected to be made in March or later, it is planned that the groundwork will be begun in accordance with the proposal in 2015, and the operating organization of town blocks utilizing the Fujisawa model will be studied.

Concerning the project of Company B, although property development application has not been done yet, we have prospects that equipment that contributes to energy saving and low carbonization such as a solar power system and monitoring system are introduced in advance at the properties owned by the company. We expect that this process will deepen the understanding of JCM on the Malaysian side, and bring about an effect such as smooth development of the project in Iskandar area.

5.1.2. Plan of the next year and later

In 2015 and later, processes of i) and ii) as stated below will be developed in the cases of both companies A and B. In the future, development all over Malaysia and to the neighboring countries as stated in iii) is brought into view.

i) The smart project on the high-rise residence and commercial complex in the central area of Iskandar. Total project cost is more than 40 billion yen, including 3,000 units of condominiums and tenants.
ii) The smart town project in the east area of Iskandar. Building about 500 residences on 26 ha of land. Total project cost is about 30 billion yen.
iii) The lateral spread of the smart town project in Iskandar and all over Malaysia. Spreading to the areas including periphery of Kuala Lumpur, against a backdrop of booming demand for residences. Total project cost is expected to be more than 100 billion yen.

5.1.3. Funding support scheme expected in the time of commercialization

The utilization of funding support scheme is supposed in 2015 or later.

To launch the project on a commercial basis after the completion of F/S in 2014, it is important to build and sell residences based on the master plan with a concept of Japanese technology, and verify the merchantability. Therefore, the utilization of “the subsidiary project for the project equipment through the bilateral credit system (JCM)” is supposed to supplement equipment cost, which will be more expensive than usual.

5.2. Project concerning the low carbonization of industrial areas

5.2.1. The review of the activity of the year

In the feasibility study in this year, we could forge a good relationship with Pasir Gudang City, and the groundwork for the future proposal was laid. Moreover, the environmental problems including air, river water, groundwater, and waste disposal and the energy problem in Pasir Gudang City could be confirmed though cooperation with Universiti Teknologi Malaysia. Also, the needs and tasks of Japanese companies could be grasped though an interviewing survey of local Japanese companies.

Especially, according to the interview and questionnaire to Japanese companies, the management system of industrial complexes is not appropriate, and the current situation is that the companies have to solve disputes with neighboring factories on their own, and the deteriorated surrounding environment affects the securement of manpower badly. The planning of task solution method using G-to-G framework is required.

At the time the discussion and workshop were held between Pasir Gudang City and Kitakyushu Asian Center for Low Carbon Society, Kitakyushu made a counterproposal for the improvement of environment to Pasir Gudang. The proposal is divided into four areas including “green industry,” “sustainable waste management,” “low-carbonized society,” and “green community.”

After discussions, Pasir Gudang City continuously seeks to build partnership with Kitakyushu in the next year and later to improve environment. Although the theme and method that can be possibly introduced depends on the specific development of the discussion, the first step toward partnership building between the two cities has been taken.

5.2.2. Plan in the next year and later

The target of the next year and later is developing the cooperation between the two cities of Kitakyushu and Pasir Gudang, and proposing and commercializing the low-carbonization project, mainly by companies in Kitakyushu City. Some Japanese companies are interested in the

commercialization in the local area. In the next year, we are expecting the implementation of detailed design, needs survey, and presentation toward cooperation with Pasir Gudang and the commercialization.

5.2.3. Funding support scheme expected at the time of commercialization

Utilization of the funding support scheme is expected in 2016 or later. In 2015, we plan to develop projects in each domain with certain private businesses, and after that the utilization of “the subsidiary project for the project equipment through the bilateral credit system (JCM)” is supposed and secure strong incentive for companies in industrial complexes.

5.3. Project concerning low carbonization of buildings

5.3.1. The review of the activity of the year

Detailed checkups of energy saving and proposal were conducted, and the proposal with merit also for Malaysian side could be made. On the other hand, our partner TNB-ES argued, “To conduct this project, it is indispensable that SPC invested jointly by Japanese companies and TNB-ES in Malaysia would be established.” This project was originally planned without the establishment of SPC, and it is impossible to found a local company and invest in it, because of the circumstances of the Japanese company. Moreover, a local company of Japanese constructor, which was expected to invest into the JV, said, “We will cooperate as a constructor but cannot join in the establishment of SPC.” We continued our efforts to take over the outcome we had accumulated to an appropriate Japanese company, and we asked other companies to participate in the business, but they did not evaluate the case positively, and we cannot change the idea of the Malaysian side. Therefore, it became hard to continue the project.