

FY2022 Commissioned Project on Intercity Collaboration for

**Realizing a Decarbonized Society**

Decarbonized Society Formation Support Project Through  
Development of Carbon Technology Projects via Intercity  
Collaboration Between Da Nang city and Yokohama city

**Final Report**

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Attachments

Document 1 : Policy Recommendations: The Role of Local Governments in Promoting a Decarbonized Society to Achieve Net Zero Emissions in Vietnam by 2050  
- The Case of Da Nang City

Document 2: Simple Analysis of Rooftop Solar Power Generation in Da Nang City Enterprises

Document 3: Overview of Projects Under Consideration for JCM Commercialization

Document 4: Business Pitch Summarizing Low-carbon Technologies Owned by Companies in Yokohama

Document 5: First Workshop Presentation Materials

Document 6: Second Workshop Presentation Materials

## **1. Project summary**

### **1.1. Project purpose**

Da Nang, a centrally-controlled municipality in Vietnam, is promoting construction plans of a hub port and development plans for a base of trade as the nexus of this central region's economy. It is also developing as a tourist city with beautiful beaches. However, such rapid development has made the problem of environmental pollution readily apparent. Climate change is also affecting the area in the form of coastal erosion, making the sustainable urban development an important policy issue. In 2008, the city of Da Nang formulated a 10-year Environmental Plan covering the period of 2010 to 2020. Its results were evaluated in 2020, leading to a revised plan that spans from 2021 to 2030. Based on the plan, Da Nang has prepared a Local Climate Change Action Plan (LCCAP). This plan was developed mainly for risk assessment and adaptation measures.

At the time this project started (2020), neither the Vietnamese government nor Da Nang were clearly aiming for decarbonization. Rather, the aim was to first reduce emissions based on a foundation for promoting it as an environmental city, with plans to support decarbonization in the future. Therefore, under the framework of intercity collaboration to promote environmental cities developed by Yokohama and Da Nang, the first steps, based on the request of Da Nang City, are to revise the 10-year Environmental Plan (2021-2030), provide support for the formulation of LCCAP and improvement of climate change education at elementary and junior high schools, conduct commercialization studies in Da Nang using applicable low-carbon technologies, and finally to apply for a JCM Model Projects. The goal is to encourage Da Nang to commit to decarbonization through this approach.

### **1.2. Project implementation framework**

The implementation framework is shown in Figure 1 below.

The Japanese participants in this project are as follows.

- Yokohama: The city has a track record of working closely with Da Nang, jointly holding the Da Nang City Urban Development Forum a total of 11 times with the Da Nang, exchanging opinions on information, policies, and system design, and providing information. In the course of this project, Yokohama will create Da Nang's 10-year Environmental Plan, a climate change action plan, share knowledge contributing to environmental and climate change education, and make appropriate proposals.
- Osumi Co., Ltd., Macnica, Inc.: Through the Da Nang City Urban Development Forum, etc., these companies have a track record of interacting with local stakeholders and implementing projects, with a particularly strong track record as local companies in the

area of energy-saving diagnostics. As companies located in Yokohama, they have a wide range of achievements in contributing to the city's overseas collaboration projects. In this project, they will conduct a survey of JCM candidate projects.

- Murata Keisokuki Service Co., Ltd.: The company conducted JICA's small and medium-sized enterprise overseas expansion support project (project feasibility study) and field survey on industrial wastewater management in Da Nang. Additionally, a project based on the results of the survey was adopted as a JICA dissemination, demonstration, and commercialization project last year. They also have a track record of measurement, monitoring and environmental assessment of air, noise and soil pollution. In this project, they will review and propose Da Nang's 10-year Environmental Plan, and provide sewage treatment technology, etc., to companies in Da Nang.
- Yokohama Urban Solution Alliance (YUSA): This entity possesses a network of member companies in Yokohama, and knowledge on business matching. At workshops held in Japan, Da Nang, etc., relevant information (local environmental improvement needs, low-carbon business needs, etc.) will be shared with member companies in Yokohama through the YUSA office. The Alliance is also expected to serve as a conduit for promoting technical exchange and business matching with corporations in Da Nang. They are also expected to play a role in supporting member companies' full-scale participation in environmental infrastructure projects such as JCM Model Projects.
- Institute for Global Environmental Strategies (IGES): This group has experience in creating urban GHG inventories for multiple Asian cities and supporting the creation of city-level climate change action plans. In Da Nang as well, through JICA's grassroots projects in the field of waste management, they have built a collaborative framework with the Department of Natural Resources and Environment (DONRE), the counterpart of this project in Da Nang, and local governments, etc., which are stakeholders. They also have a track record in local information surveys and field surveys for JCM subsidized projects. They will be responsible for overall coordination and implementation of this project.

In Da Nang, the DONRE is in charge of environmental management and climate change policy, and will be the direct counterpart in this project. However, the Department of Industry and Trade will take charge of energy conservation projects, the Department of Transportation for clean transportation, the Department of Construction for green buildings, the Department of Education and Training for environment and climate change education, and the Department of Planning and Investment for overall plans and

investment plans. Where cooperation with other relevant departments is essential, we will work closely with the Da Nang People's Committee. In the JCM survey, we will obtain the cooperation of related organizations in Da Nang (Investment Promotion Center, Hi-Tech Park Management Board, etc.), companies and business associations.

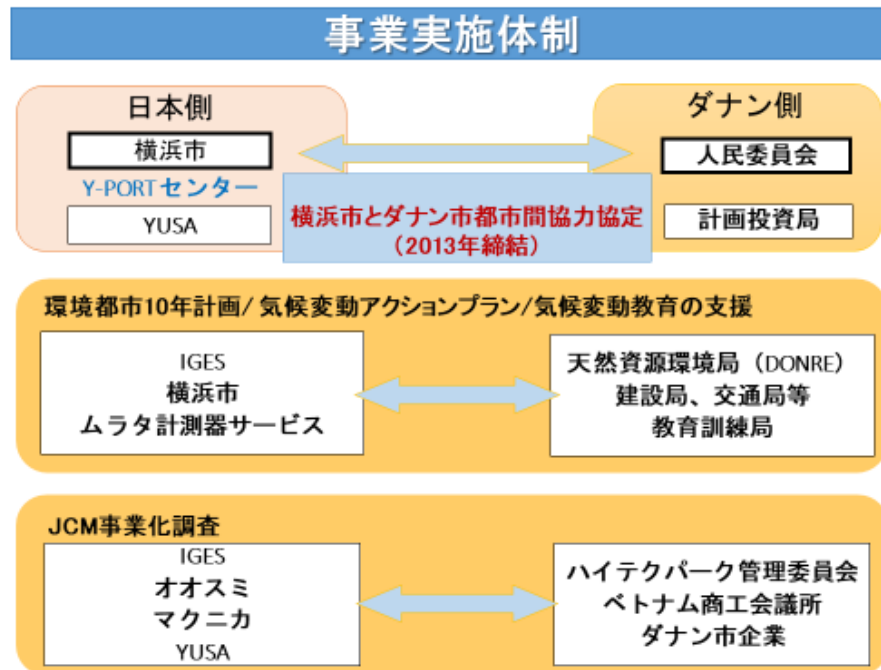


Figure 1: Project implementation framework

## 2. Achievements in 2020 and 2021

This project is a three-year plan, with this being the third year. The results of the past two years are shown below.

### 2.1. Support for the formulation of the 10-year Environmental Plan (2021-2030)

Based on Yokohama's experience and knowledge, we provided information and made proposals on environmental management plan goals and indicators, on raising public awareness, on participating in environmental initiatives, and engaging in low-carbon activities such as smart energy, green buildings, and green transportation projects. The 10-year plan was approved by the Da Nang People's Committee on April 2, 2021. Priority programs/projects are listed in the final draft of the 10-year Environmental Plan. Among them, the following items have been proposed by Japan, or are related to proposals.

- Investigate, verify and propose solutions to make Da Nang a low-carbon city.

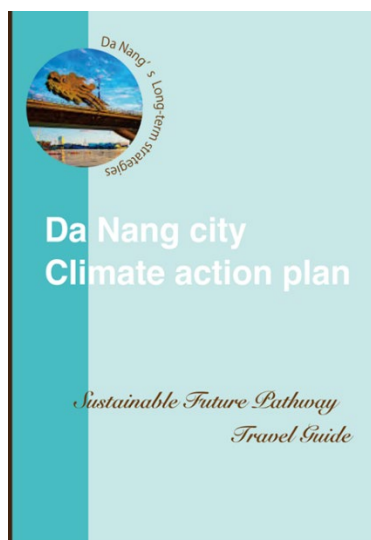
- Build an information disclosure system and use IT (a website) to share environmental monitoring results.
- Investigate and evaluate the current state of complaints and reports from citizens regarding environmental pollution, and work to raise public awareness of environmental protection and efficient use of natural resources.
- Survey and evaluate the people's satisfaction with environmental quality.

What should be emphasized in particular is that although the term "low-carbon city" was not included in the initial draft prepared by Da Nang DONRE, it is clearly stated in the final draft.

## **2.2. LCCA preparation support**

After organizing the analysis methods of climate change policies in other cities, we shared the information with research institutes such as the University of Da Nang, and established a collaborative framework to jointly analyze the data requirements in Da Nang. Specifically, along with organizing the core information in "The World in 2050" (TWI2050), the backcasting and modeling analysis project for carrying out structural transformations necessary for achieving the SDGs, information related to climate change policies in Yokohama, London, etc., and information related to regional circular and ecological sphere, we analyzed the GHG reduction potential in the construction and transportation sectors of Da Nang.

In order to propose a climate change action plan, together with a research team from the University of Da Nang, we have established a support framework for international research institutes that are IGES partners. We developed the direction and structure of the climate change action plan and held a workshop with the relevant departments in Da Nang under the chairmanship of DONRE, finally publishing the paper "Da Nang City Climate Action Plan - A conceptual framework for sectoral climate actions" based on the results. ([Da Nang climate action plan\\_Final draft\\_25Aug.indd \(iges.or.jp\)](#)). In the future, it is expected that Da Nang will use this as a reference when creating a decarbonization action plan.



### **2.3. Support for climate change education in elementary and junior high schools**

In this project, pilot lessons (training) on climate change were conducted three times online, and course materials (guidance) necessary for training students and teachers were created. Online training was aimed at 4th and 5th graders at Tran Cao Van Primary School (90 attendees), 8th graders at Ty Son Middle School (117 attendees), and middle school teachers in 7 districts of Da Nang (52 attendees).

Through these efforts, recent environmental education in Da Nang has focused on reducing plastic waste and sorting waste at the source. Various issues were also revealed such as the lack of opportunities to touch on climate change in classes, and that climate change education requires not only knowledge, but also field visits, surveys by students, and specific climate change countermeasure activities, however, the COVID-19 pandemic has hampered education based on these types of actual experiences. Teachers also commented on the lack of teaching materials, training opportunities, and exchange of experiences among teachers to teach about climate change. Course materials necessary for training students and teachers were prepared as a deliverable of this project.





#### 2.4. JCM project development study

As a basic study on the possibility of introducing specific energy-saving technologies, use of waste heat from Da Nang Steel, introduction of LED lightbulbs on street lights, and radiant air conditioner was examined. In order to visualize the energy-saving performance of LEDs and radiant cooling, evaluation devices were installed on the premises of the Investment Promotion Center under the auspices of the Department of Industry and Trade in offices. Despite clear energy-saving effects, issues for consideration such as the scale of the business for appropriate cost effectiveness and adding value other than energy conservation were also identified.

With the cooperation of DONRE, in January 2022, the Da Nang People's Committee formally approved a feasibility study on introducing renewable energy and energy conservation using the JCM system as part of the support project for creating a decarbonized society based on the Yokohama-Da Nang Intercity Collaboration Project, and the Danang Hi-Tech Park and Industrial Zones Authority (DHPIZA) was appointed as the department in charge of project implementation. With the DHPIZA's commitment of cooperation, we have laid the groundwork for JCM development project this year.



## **2.5. Leading to Da Nang decarbonization declaration**

The most important achievement of both years in the project was that Da Nang has clearly stated its commitment to carbon neutrality in 2050. With the Vietnamese government's declaration of carbon neutrality in 2050 at COP26 in November 2021, the city of Yokohama has stepped up its efforts to decarbonize the city of Da Nang. Specifically, in November 2021, at the Da Nang City Urban Development Forum co-hosted by Yokohama and Da Nang, Yokohama and IGES mentioned the possibility of cooperation on decarbonization in Da Nang based on the decarbonization declaration of the Vietnamese government, which elicited positive statements from the deputy director general of DONRE, the department responsible for climate action.

As a follow-up, the city of Yokohama held discussions with related organizations, including Da Nang's DONRE, and has been making the arrangements in line with Da Nang's 2050 decarbonization declaration. As a result, on March 10, 2022, Da Nang participated in the second Zero Carbon City International Forum hosted by the Ministry of the Environment of Japan and the U.S. Special Presidential Envoy for Climate. It was announced that Da Nang will work toward decarbonization by 2050 using materials related to LCCAP formulation support conducted in this project in 2021 (Ministry of the Environment press release <https://www.env.go.jp/press/110703.html>).

## **3. Purpose of current year's project**

As mentioned above, since Da Nang has made it clear that it is aiming for decarbonization, this year (third year) will focus on realizing JCM projects that will contribute to decarbonization in the future. Specifically, we will conduct a business feasibility study on introducing solar power generation, storage batteries, and low-carbon technology at several companies, mainly in the Hoa Khanh Industrial Park selected in 2021, and prepare to apply for the JCM Model Projects with the main purpose to create a business plan proposal. At the same time, we will prepare policy proposals that will contribute to future decarbonization plans created by Da Nang, and create a framework for promoting technology exchange and business matching between companies in both cities, keeping in mind scaling up JCM projects in the future.

Project details	2020			2021				2022				2023
	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
ダ 画 支 援 小 気 低 査		■										
Support for formulation of the Da Nang 10-year Environmental												
ダ シ 成 小 気 低 査			■									
Support for preparation of the Da Nang Climate Change Action Plan (CCAP)												
小 気 低 査				■								
Support for climate change education among elementary and												
低 査		■										
Investigation for low-carbon JCM												

#### 4. Current year activity details

In the current year, we will support the establishment of a system for the formulation of a decarbonization action plan in Da Nang, and implement the following activities in the formulation of JCM projects that contribute to the reduction of greenhouse gas emissions centered on renewable energy.

<Institutional support domain>

In view of the creation of a zero-carbon city in Da Nang by 2050, we will discuss related strategies and approaches, including efforts of a decarbonized area in Yokohama, the Major Metropolis Decarbonization Model Challenged by Public-Private Partnerships in the Minato Mirai 21 District, summarize the experience, summarize policy proposals, and discuss the relevant information with Da Nang.

< Model development support domain for low-carbon and decarbonization technologies >

We will conduct a business feasibility study using solar power, storage batteries, and low-carbon technology, targeting companies mainly in Hoa Khanh Industrial Park. We aim to

create a business plan to apply for JCM Model Projects.

< Awareness raising support domain for decarbonization such as energy saving and renewable energy >

From the perspective of expanding the above model in Da Nang even after the completion of this project, it is necessary to assist in creating a framework to share technical information on low-carbon and environmental technologies between companies in Da Nang and Yokohama, and to promote consultation based on this information. In addition, we will share the experience of Yokohama and others regarding more concrete measures for urban development in line with decarbonization.

<Workshops>

Information on the progress of this year's project will be shared among the parties concerned, and opinions will be exchanged on matters where this project can contribute to the Vietnamese government's commitment to carbon neutrality in 2050, future issues, and the direction of cooperation.

## **5. Current year activities and achievements**

### **5.1. Institutional support domain**

#### **5.1.1. Preparation and discussion of policy proposals for decarbonization plan formulation in Da Nang**

Recommendations on policies, strategies, and approaches toward the realization of a decarbonized society have been compiled to serve as a reference when Da Nang creates a roadmap to achieve decarbonization. After providing an overview of Vietnam's national commitment to carbon neutrality and its progress, we introduced examples in Yokohama, Kitakyushu, and Kuala Lumpur, Malaysia, identifying items that could be used as a reference for Da Nang's policy and basic plan formulation. After organizing Da Nang's climate change strategies and action plans and how they can contribute to the country's net zero goal, we have compiled policy recommendations that will help them achieve net zero carbon emissions. (Refer to Document 1).

In the cases of other cities, Yokohama identified the essentials of 5.3.2 below. Kitakyushu, like Da Nang, has the highest GHG emissions in the industrial sector. Kitakyushu's promotion of electrification strategies in the industrial sector, etc., and the

creation of a renewable energy (wind power) development base that is advantageous in terms of location will serve as a reference for Da Nang. Kuala Lumpur has announced their Climate Action Plan 2050, in which the method of prioritizing climate change measures is to reduce greenhouse gas emissions and increase resilience to climate change. In addition to considering the synergistic effect between the two, the benefits need to be brought to particularly vulnerable communities, which is why this information could serve as a reference for Da Nang.

Below are the main points from the experience of these cities.

**[Set ambitious targets for energy conservation, renewable energy, and clean energy supply, while promoting electrification and reducing fossil fuel consumption]**

First, we will engage in thorough energy conservation efforts. At the same time, we will expand renewable energy usage. Regarding the greenhouse gas reduction targets to be set in 2035 with an eye to 2050, we will set ambitious targets for energy conservation, renewable energy, and clean energy supply. On that basis, it is necessary to identify industrial domains that can switch over to electric power, such as the manufacturing industry, transportation industry, and construction industry, and to convert fossil fuel energy in production processes, power sources, and air conditioning, to electricity.

Based on the maximum amount of renewable energy and clean energy that can be produced in Da Nang, those energy supply targets should be clarified. When doing so, if it is not possible to secure the target renewable energy/clean energy supply in Da Nang, one of the options is to procure renewable energy/clean energy from other cities and municipalities. If the cost of procured energy is lower than that produced in Da Nang, the difference is expected to be returned to the cities and municipalities supplying renewable and clean energy to Da Nang.

Therefore, it is necessary to promote the development of renewable energy and clean energy as well as energy conservation in the city, and to review the current energy policy and system in order to promote electrification in the industrial sector.

**[Priority determination considering synergies and impacts on vulnerable communities in climate change countermeasures]**

To achieve effective results with limited resources, it is important to prioritize climate change measures. When considering the priority of climate change countermeasures, it is necessary to consider not only the effect of reducing greenhouse gas emissions and

adapting to climate change, but also the co-benefits of contributing to sustainable urban development.

For example, electrification of industry, transport and buildings can reduce greenhouse gas emissions as well as air pollution by replacing fossil fuels with clean electricity. Biomass, biogas energy, and composting from organic waste at food processing industries, food markets, restaurants, and households can reduce waste in landfills that contributes to greenhouse gas emissions. A decentralized renewable energy production and supply system is resilient in the face of emergencies when national power grids are cut off due to disasters such as typhoons and floods. Lush, green parks and green spaces not only act as carbon sinks, but also serve to reduce heatwaves, absorb rainwater and provide comfort to citizens.

The Da Nang Climate Action Plan – Conceptual Framework for Sectoral Climate Actions, released by IGES, presents various climate action options with co-benefits for building a sustainable city, such as energy, transport, food and agriculture.

Another important point is how to make the social benefits available to vulnerable people and communities in the city.

### **[Strengthening measures to promote a shift to a lifestyle that contributes to net zero carbon emissions]**

In order to realize a decarbonized society, it is necessary to change the lifestyles of city residents. For example, many city residents use motorbikes and cars powered by fossil fuel engines, so how can they switch to public transportation and electric vehicles? First, it is necessary to understand why a decarbonized society is necessary, and then to learn about available options. Of course, these must be satisfactory for users. In public transportation options, such as buses, in order to attract more users, it is important to provide good service at a reasonable price. To avoid traffic congestion, it is necessary to secure dedicated bus lanes, improve access to bus stops, and enable efficient transfer to other modes of transportation to reach the final destination.

Lifestyle changes that contribute to reducing greenhouse gas emissions include purchasing low-carbon products, reducing food loss and waste, and protecting natural resources such as forests. Such lifestyle changes will also change the nature of businesses that provide products and services to end users.

Therefore, in the net zero action plan, it is necessary to touch on concrete measures to induce such lifestyle changes among city residents.

### **[Implementation of decarbonization model projects in target areas]**

In general, implementing a model project makes it possible to study technological innovation, new business models, public-private cooperation, public participation, funding schemes, necessary systems, etc., and to learn important lessons. In addition, model projects will make it easier for society to see what climate change countermeasures are, and their results, promoting understanding among citizens.

In Da Nang, industrial parks with carbon-intensive factories and buildings are considered suitable for starting model projects in view of a decarbonized society. To make such a model project successful, an organization that is responsible for managing the target area and coordinating among the parties concerned is essential. The Danang Hi-Tech Park and Industrial Zones Authority has jurisdiction over industrial parks and high-tech parks in the city, and has built good relationships with business people inside and outside the park. In addition, because the committee manages advanced technology companies in high-tech parks, it is expected that the committee will consider using its technology for decarbonization model projects.

On the other hand, the GHG emission status of Da Nang, scenario analysis, and characteristics in the energy sector are summarized as follows. In 2016, IGES engaged in joint research with Kyoto University, the National Institute for Environmental Studies, the VNU Central Institute for Natural Resources and Environmental Studies, and the Da Nang Climate Change Coordination Office. According to this study, Da Nang will grow rapidly in terms of population, transportation demand, and industrial activity by 2030, and GHG emissions will increase fourfold from 2.665 million tons of CO<sub>2</sub> in 2013 in a normal scenario to 13.563 million tons of CO<sub>2</sub> e in 2030. On the other hand, in a scenario with measures based on the Asia-Pacific Integrated Model (AIM), smart buildings (proliferation of low-energy houses and buildings using as solar water heaters, etc.), smart industry (energy-efficient facilities, promotion of fuel conversion, etc.), energy efficiency, etc. (proliferation of highly energy-efficient equipment and appliances, etc.), smart transportation (improved automobile fuel efficiency, promotion of a modal shift to public transportation, introduction of buses that use compressed natural gas, etc.), green energy (proliferation of renewable energy such as solar power, wind power, small scale hydroelectric power, etc.), it is estimated that GHG emissions will be reduced by 16% (2.226 million tons of CO<sub>2</sub> e) by working on climate change countermeasures in the five domains of power generation. (See table below)

GHG Emission Forecast Analysis for Da Nang (2016)

Sector	2013 GHG emissions Unit: 1,000 tons CO <sub>2</sub> e	2030 GHG emissions (no countermeasures)	2030 GHG emissions (with countermeasures)
Industry	880 (33.0%)	5,779 (42.6%)	4,950 (43.7%)
Freight transport	626 (23.5%)	3,531 (26.0%)	2,878 (25.4%)
Passenger transport	546 (20.5%)	1,838 (13.5%)	1,537 (13.6%)
Homes/housing	459 (17.2%)	1,235 (9.1%)	1,000 (8.8%)
Commercial	151 (5.7%)	1,169 (8.6%)	961 (8.5%)
Agriculture	2 (0.1%)	12 (0.1%)	12 (0.1%)
<b>Total</b>	<b>2,665</b>	<b>13,563</b>	<b>11,338</b>

(Source) IGES, Kyoto University, National Institute for Environmental Studies, VNU Central Institute for Natural Resources and Environmental Studies, and the Da Nang Climate Change Coordination Office AIM Scenario Analysis, 2016

From this analysis, the contributions of climate change countermeasures in the five domains to a greenhouse gas reduction of 2.226 million tons CO<sub>2</sub> e in 2030 are as follows. Smart transportation: 0.954 million tons CO<sub>2</sub> e (42.9% of 2.226 million tons CO<sub>2</sub> e), smart industry: 0.829 million tons of CO<sub>2</sub> e (37.2% of the same), energy efficiency: 0.298 million tons CO<sub>2</sub> e (13.4% of the same), smart buildings: 0.106 million tons of CO<sub>2</sub> e (4.8% of the same), and green energy: 0.036 million tons of CO<sub>2</sub> e (1.6% of the same). The results suggest that the transport and industrial sectors of Da Nang have high potential for reducing GHG emissions, and that energy efficiency and green energy may further facilitate GHG reduction in these sectors.

The fast-growing city of Da Nang is facing major challenges in meeting growing energy



demand and decarbonizing its energy system at the same time. Da Nang, which does not possess large-scale power plants, relies mainly on imported electricity from neighboring provinces such as Quang Nam (hydropower) and Quang Tri (coal power). The state-owned electricity company, Vietnam Electricity (EVN), controls distribution and retail of electricity nationwide, including in cities such as Da Nang. As a result, Da Nang currently has little direct control over the electricity it consumes.

However, Da Nang can increase its power self-sufficiency rate by developing solar power generation. Da Nang has a large potential for solar power with 1,138 MW rooftop installations, 394 MW ground installations, and 163 MW floating installations. Of the ground solar power installations, 250 MW could come from mines that have closed after operations are complete. Under the national feed-in tariff (FIT) scheme, Da Nang achieved 81 MW of solar power generation at the end of 2020. Other renewable energy includes biomass, solid waste and biogas. Although they are relatively small at 15 MW, 36 MW, and 6 MW, respectively, they can contribute to environmentally-friendly power supply.

Da Nang's renewable and clean energy targets for 2025 and 2050 are only 9.71% and 9.69% of the primary energy supply, respectively. Only solar power and biomass energy have specific targets. Together, they will account for about 9% of Da Nang's electricity mix by 2035. On the other hand, in the Vietnamese government's Just Energy Transition Partnership (JETP) initiative announced in December 2022, the national target for renewable energy is set at 47% of the power generation mix by 2030. Incidentally, the renewable energy ratio in 2020 was 21%.

The target for rooftop solar is 170 MW in 2025 (contributing about 4% of the electricity mix), 293 MW in 2030 (5% of the same) and 402 MW in 2035 (5% of the same). Targets for ground-mounted solar power are set at 75 MW by 2025 and 175 MW by 2035. Da Nang has a large area of water suitable for floating solar power, but no target has been set. A target for solar power is set at only about 577 MW by 2035, or 34% of the potential. Solar power targets can be made more ambitious by raising targets for ground installation solar power and setting ambitious targets for floating solar power. (See table below)

Da Nang solar power targets

Type of renewable energy	2025	2030	2035	Renewable energy Development potential
Rooftop installation (percentage of total power generation)	170MW (4%)	293MW (5%)	402MW (5%)	1,138MW
Ground installation	75MW	N.A	175MW	394MW
Floating installation	N.A	N.A	N.A	163MW
<b>Total</b>				<b>1,695MW</b>

(Source) Da Nang city government decision document (1737/QĐ-UBND) 2021

Incentives for renewable energy development have not yet been defined. A city council resolution dated December 7, 2018 contains policies regarding interest rate support for important investment projects. However, it is considered insufficient to encourage investment in solar power, especially after the national FIT for solar power ended at the end of 2020. Introduction of FIT with a net metering mechanism to sell surplus electricity after self-consumption may promote self-consumption solar power generation in Da Nang, which will lead to self-sufficiency in electricity and also reduce the need for grid expansion.

Ambitious targets are only meaningful when backed by city-level plans, policies, strategies and monitoring tools (such as city-level GHG inventories). Actually, Government Decree No. 06/2022/ND-CP and related Decision No. 01/2022/QĐ-TTg require certain high energy consuming businesses/facilities in the transport, industry and waste sectors to implement GHG inventories, to develop mitigation actions, and report regularly to the Ministry of Natural Resources and Environment. Da Nang is strengthening the expertise and structures necessary to implement regulations on GHG inventory reporting and facilitate private sector plans to reduce GHG emissions.

Bearing in mind the above knowledge from other cities, based on the policies and plans of the Vietnamese government regarding carbon neutrality and the current state of efforts related to decarbonization in Da Nang, the city will formulate an action plan for decarbonization in the future. We have compiled the following policy recommendations for the preparation of the guidelines.

- It is necessary to reflect national commitments and increase the ambition of energy efficiency targets. In addition to raising public awareness of energy conservation, consultations are needed to gain public support for raising electricity tariffs. This is because an increase in the electricity rate serves as an incentive to improve energy efficiency.
- Setting ambitious targets for solar power will significantly accelerate city decarbonization. Da Nang may consider applying its own FIT by negotiating with EVN to promote solar power generation. Mechanisms such as direct power purchase agreements could also allow major power consumers in Da Nang to buy solar and wind power from other provinces. For example, purchasing solar power from Gia Lai province and offshore wind power from Binh Dinh province. If DPPA is applied to Da Nang, discussions with EVN and the Ministry of Industry and Trade will be necessary on the premise that it will be implemented as a provisional pilot project. In order to promote the purchase of solar and wind power generated electricity from neighboring provinces, it is necessary to develop a power grid connecting those provinces. Da Nang has more than 30 potential sites for 2 GWh pumped storage energy storage within a 50 km diameter. In other words, it is possible to store energy by pumping water into a dam using electric power generated by solar power or wind power. Da Nang has the potential to increase the penetration rate of solar and wind power, as there are places in the vicinity where there is plenty of room for pumped storage power development.
- By setting ambitious targets for electric vehicles, we can steer the greening of the transport sector. Electrification could start with government vehicles and public transport, including taxis. The current target of 25% electric buses by 2030 could be more ambitious. 100% of official cars and public transport should be electric by 2030.
- Da Nang has the potential to contribute to increasing the national carbon sinks through forest protection and forestation. The forest area of Da Nang is about 64,000 ha, which occupies about 47% of the city area. Increasing the forest area can reduce GHG emissions. Conservation of marine ecosystems also contributes to carbon fixation. Specific goals for land and sea conservation can be set out in separate guidance

documents or integrated into existing legal documents, such as action plans to address climate change. Setting goals to expand marine protected areas is a possibility. It is also important to control wastewater and solid waste pollution from inland factories and households, and priority should be placed on reducing marine plastic waste.

- In order to strengthen the necessary expertise related to GHG inventories, a possible starting point is to set up a local government operations (LGO) GHG inventory which only covers emissions from government business (usually only 3-7% of the total city emissions), and monitor the progress of GHG reduction. One of the key benefits of LGO inventories is that they help identify problems and opportunities for efficiency improvements within city services. For example, the city of Shah Alam, Malaysia undertook a baseline energy audit (cost of 13,000 USD) of the main government building in 2015 in a low-carbon city pilot project. Based on this, energy efficiency measures and retrofitting measures were introduced, and by 2017, the building's GHG emissions were reduced by more than 4.4%, and nearly 350,000 USD was saved in electricity bills. This has empowered city officials with GHG inventories, building energy efficiency, and a PDCA (Plan-Do-Check-Act) project management approach.

The proposal was translated into Vietnamese and shared with DONRE in Da Nang. Later, at a workshop held in Da Nang in February this year, we held a discussion with related city departments. The content is described in the section on the workshop in 3.4 below.

## **5.2. Model development support domain for low-carbon and decarbonization technologies**

### **5.2.1. Implementation of a simple analysis on the possibility of utilizing the JCM equipment subsidy scheme**

Osumi Vietnam, the co-sponsor of this project, interviewed local companies that have networks in Da Nang, finding companies that are considering introducing solar power, and obtained the minimum necessary information from such companies. A rough analysis was conducted to determine the extent to which the CO<sub>2</sub> reduction cost (= subsidy amount for CO<sub>2</sub> emission reduction amount), which is one of the important conditions of the JCM equipment subsidy system, can be cleared. When doing so, we examined a case using only solar power and a case introducing storage batteries and an energy management system (EMS) together.

The prerequisites for the simple analysis are:

- (1) Currently in Vietnam, the operation of the electricity purchase system (FIT) is being reviewed from 2021, and for Japanese (Yokohama) companies, rooftop solar power business is, considering investment in solar power generation in Vietnam, will be a good opportunity to accumulate knowledge related to confirmation of profitability and permits, operations after the start of commercial operation, and development of local networks. Therefore, the first target will be rooftop solar power for self-consumption (note). At that time, the power from the solar power generation system installed by the company that owns and manages the solar power equipment in spaces such as the site and roof provided by the facility owner is provided to the power users of the facility for a fee, assuming a so-called PPA (Power Purchase Agreement) method. The contract period shall be set at 20 years. A 10% discount from the electricity selling price of the Vietnam Electricity Group (EVN) for the first 10 years, and a 15% discount thereafter is assumed.

*(Note) Vietnam's legal regulations stipulate that in the case of 1 MW or more, an additional application for a project in the power development master plan stipulated by the People's Committee of each province and the Ministry of Industry and Trade and related procedures are required. On the other hand, if the capacity is less than 1 MW, there is no need to apply for additional power development master plans, making it possible to carry out development via very simple procedures. It is said that if the development time is 1 MW or more, it will take at least six months to one year or more. On the other hand, even when developing multiple rooftop installations, each connection point for multiple projects of less than 1 MW will be set up at different points, so that individual projects will be handled at less than 1 MW, resulting in a total of more than 1 MW. It is also possible to develop projects above 1 MW overall under Vietnamese law.*

- (2) The price of equipment to be introduced will be set erring on the side of caution, as detailed designs have not yet been completed.
- (3) The JCM subsidy rate for solar power is 30%, the same subsidy rate is 50% when storage batteries and EMS are also introduced, and the service life is 12 years.
- (4) Information on each company's power consumption, power usage patterns, EVN pricing, and the amount of solar radiation in Da Nang is obtained from each company and related organizations.

The CO<sub>2</sub> reduction costs, etc. were calculated and summarized in the table below based on the above assumptions. A detailed analysis is shown in Document 2.

According to the results of a simple analysis, if the JCM methodology (Note) for combining solar power and storage batteries is used, the amount of CO<sub>2</sub> reduction with the storage batteries assumed to be introduced this time will be almost the same as with solar power

alone. Therefore, even if the CO<sub>2</sub> reduction cost is met by solar power alone, the introduction of storage batteries will only increase the cost, so the CO<sub>2</sub> reduction cost cannot be met.

*(Note) In the methodology, "CO<sub>2</sub> reduction effect = amount of power produced by solar power (excluding charge amount) + discharge amount." In other words, unless the discharge amount is significantly larger than the amount of charge, the amount of CO<sub>2</sub> emission reduction will not be significant. Since the discharge amount and storage battery charge assumed to be introduced in this project is almost the same, the amount of CO<sub>2</sub> reduction will be almost the same as that of solar power generation alone.*

In the case of solar power in Vietnam, the current CO<sub>2</sub> reduction cost standard is 2,500 yen/t-CO<sub>2</sub>, however, in the current simple analysis, a thorough investigation of introduction equipment costs has not been conducted, and because a reference price was used, it is slightly higher than the same standard. The cost has been set erring on the side of caution, and considering future equipment selection and cost reduction efforts, it is thought that the level will be able to clear the standards.

Simple analysis of CO<sub>2</sub> reduction costs, etc. for companies wishing to introduce rooftop solar power

	Company A	Company B	Company C
Industry	Fishing equipment manufacturing	Housing equipment manufacturing	Clothing accessory manufacturing
Panel footprint	11,150m <sup>2</sup>	8,479m <sup>2</sup>	5,358m <sup>2</sup>
Power generation capacity	2,205kWp	1,676.7kWp	1,065.2kWp
Average power generation	8,001kWh/Day	6,083.9kWh/Day	3,865kWh/Day
Surplus power	0	638kWh	1,658kWh
Annual power bill reduction (reduction rate %)	① First 10 years 2,685,720 yen (2.9%)	① First 10 years 2,308,890 yen (4.2%)	① First 10 years 799,750 yen (5.7%)
	② Next 10 years 4,028,59 yen (4.3%)	② Next 10 years 3,463,34 yen (6.3%)	② Next 10 years 1,199,62 yen (8.6%)
<b>Solar power generation equipment only</b>			
Annual CO <sub>2</sub> emission reduction	972.46 t- CO <sub>2</sub> /year	739.47 t- CO <sub>2</sub> /year	469.76 t- CO <sub>2</sub> /year

CO <sub>2</sub> reduction cost	2,854 yen/t- CO <sub>2</sub>	2,923 yen/t- CO <sub>2</sub>	3,127 yen/t- CO <sub>2</sub>
Investment recovery period	① 6 years	① 5.3 years	① 8.5 years
① Utilization of JCM subsidies	② 7.2 years	② 6.4 years	② 10.4 years
② No JCM subsidy			
<b>Solar power generation + storage battery + EMS</b>			
Annual CO <sub>2</sub> emission reduction	972.46 t- CO <sub>2</sub> /year	739.47 t- CO <sub>2</sub> /year	469.76 t- CO <sub>2</sub> /year
CO <sub>2</sub> reduction cost	7,584 yen/t- CO <sub>2</sub>	8,590 yen/t- CO <sub>2</sub>	11,065 yen/t- CO <sub>2</sub>
Investment recovery period No JCM subsidy	8.4 years	8.5 years	9.8 years

Exchange rate: 1 yen = 170 VND (Vietnamese dong)

### 5.2.2. Technical exchange meeting with local companies

In August 2022, we held a technical exchange meeting on the introduction of solar power equipment under the JCM equipment subsidy system, co-sponsored by DHPZA. About 40 people participated from about 15 companies, mainly local PPA operators and industrial park management companies. In order to foster understanding of the conditions for compatibility with the JCM system, the content of the simple analysis on the feasibility of utilizing the JCM equipment subsidy scheme was explained in detail. The economic benefits (reduced electricity costs) of introducing solar power were also explained. After the meeting, individual opinions were shared with local companies (Solar BK, CAS) interested in the JCM system.

Representatives from the Yokohama International Affairs Bureau also participated in the meeting.



Workshop at DHPIZA held on August 2, 2022

### 5.2.3. Companies that have discussed JCM commercialization

Thanks to the technical exchange meeting with the local companies mentioned above, Osumi Vietnam's network, and the cooperation of YUSA member companies, etc., business possibilities based on exchanges of opinions with companies interested in utilizing the JCM system in the solar power business are being considered. The status of consideration as of February 2023 is shown in the table below. The names of the target companies have been withheld due to confidentiality obligations. Even after the completion of this project, Osumi Vietnam, YUSA, etc. are planning to continue discussions with target companies for JCM commercialization.

List of companies considering JCM projects (as of February 2023)

Target company	Company overview	Technology for introduction	Companies that considered JCM commercialization
A	Housing aluminum products manufacturing and sales	Rooftop solar power	Osumi Vietnam Macnica Kansai Electric Power Company (YUSA member)
B	Fishing tackle manufacturing	Rooftop solar power	Osumi Vietnam Macnica Kansai Electric Power Company
C	Coils for electronic	Rooftop solar power	Osumi Vietnam



Target company	Company overview	Technology for introduction	Companies that considered JCM commercialization
	devices/in-vehicle use manufacturing		Macnica Kansai Electric Power Company
D	Bread crumbs production and sales	Rooftop solar power	Osumi Vietnam Kansai Electric Power Company
E	Non-woven fabrics manufacturing and sales	Rooftop solar power	Osumi Vietnam Kansai Electric Power Company
F	Automobile resin processing	Rooftop solar power	Osumi Vietnam Kansai Electric Power Company
G	Plastic film manufacturing	Rooftop solar power	Osumi Vietnam Kansai Electric Power Company
H	Solar system construction/operator	Rooftop solar power (30 MW)	Osumi Vietnam
I	Assuming multiple companies	A combination of solar power, energy conservation, etc.	Osumi Vietnam Kansai Electric Power Company
J	Renewable energy providers, such as hydroelectric power plants and solar power	Mega solar power generation (100 MW)	JGC (YUSA member)

#### 5.2.4. Overview of JCM subsidy application candidate projects

The reasons why JCM commercialization is difficult from among companies that have considered this option are as follows.

- Abandoned the JCM scheme because the target company aims to acquire RE100 and must secure all GHG reductions on its own. (Company A above)
- In order to utilize the JCM equipment subsidy system, it is necessary to establish an

international consortium leader company in Japan, but a candidate has not been determined. (Companies H and I above)

- Regarding the mega solar power array, we are awaiting the prime minister's approval, but the timing is uncertain. Also, we will sign a contract to sell power to EVN, but the effectiveness of the contract is unclear at this stage. (Company J above)

In the following six cases, we are in the process of creating detailed business plans with the ultimate goal of applying for JCM equipment subsidies. An overview of the JCM projects of these companies is shown in Document 3.

Target company	Company overview	Technology for introduction	Consideration status	Annual CO <sub>2</sub> reduction plan
<b>B</b>	Fishing tackle manufacturing	Rooftop solar power	Under consideration for introduction in 2023. Conducted on-site survey. Currently considering using JCM.	1.348 tons
<b>C</b>	Coils for electronic devices/in-vehicle use manufacturing	Rooftop solar power	The new factory is scheduled to be completed in August 2023, and subsequent introduction will be considered. Currently considering using JCM.	Currently under review
<b>D</b>	Bread crumbs production and sales	Rooftop solar power	Conducting field surveys for introduction in 2023. Currently considering using JCM.	612 tons
<b>E</b>	Non-woven fabrics manufacturing and sales	Rooftop solar power	Conducting field surveys for introduction in 2023. Currently considering using JCM.	282 tons
<b>F</b>	Automobile resin processing	Rooftop solar power	Conducting field surveys for introduction in 2023. Currently considering using JCM.	252 tons
<b>G</b>	Plastic film manufacturing	Rooftop solar power	Conducting field surveys for introduction in 2023. Currently considering using JCM.	610 tons

### **5.3. Awareness raising support domain for decarbonization such as energy saving and renewable energy**

#### **5.3.1. Building a technology exchange platform for low-carbon and environmental technologies**

In this section, we will consider an approach to expand the model of this project in Da Nang in the future. From this perspective, support will be provided to companies in Da Nang to contribute to the creation of a system that promotes technical exchange, such as providing low-carbon technology information owned by companies in Yokohama, and consultation based on such information.

##### **5.3.1.1. Support for promotion of technical exchange related to carbon technology**

- **Creating a business pitch**

In cooperation with YUSA, we prepared briefing materials (a business pitch) to encourage companies in Da Nang to introduce low-carbon technologies owned by companies in Yokohama. The business pitch consists of three parts. Specifically, it describes the need for renewable energy and energy-saving technologies in Vietnam, information on low-carbon technology from companies in Yokohama (10 companies), and an overview and examples of the JCM equipment subsidy program. Information on low-carbon technology information by companies in Yokohama that are members of YUSA and Yokohama Y-PORT, and are interested in low-carbon projects in Da Nang City or Vietnam have been organized into two pages for easy understanding. Each company also provided contact information.

Low-carbon technology information can be added and updated if so requested by other Yokohama-related companies in the future. The Japanese version of the business pitch was completed in August 2022, translated into Vietnamese, introduced at the first workshop (see below) held in Da Nang in October, and distributed to workshop participants and other stakeholders. Document 4 shows the business pitch.

- **Building relationships with the Vietnam Chamber of Commerce and Industry**

For Yokohama and Da Nang to expand the JCM business model of this project in Da Nang after the project is completed, a framework is required for continued technical exchange, such as information and consultations on low-carbon technologies between companies in both cities. To this end, it would be realistic for each city to first set up a contact point for coordination between companies.

We asked DONRE, the counterpart of this project, to introduce us to an organization that could serve as a coordinator for companies in Da Nang and promote technical exchange with Yokohama. They introduced the Vietnam Chamber of Commerce and Industry (VCCI) Da Nang branch as a candidate. VCCI celebrates its 65th anniversary this year, and has about 1,600 official members nationwide, with about 800 in the central region, including Da Nang. They provide members with support for sharing various types of information and improving knowledge and awareness.

YUSA, which aims to expand overseas business opportunities for companies in Yokohama and contribute to solving urban issues in emerging countries, will play a central role as a coordinating contact in Yokohama. Specifically, in order to support the overseas expansion of YUSA member companies, they have established an overseas cooperation office in Da Nang that carries out local coordination, support for sales activities, proposals for research schemes, etc. Osumi Vietnam, a local subsidiary in Da Nang, is responsible for this role. In order to add more member companies, YUSA will not only allow member companies, but also Yokohama-related companies that are considering business development in Da Nang, to participate in technical exchanges with companies in Da Nang.

In October 2022, Osumi Vietnam, the YUSA Danang City Overseas Liaison Office, and IGES visited the VCCI Da Nang branch to talk about the possibility of future cooperation, including technical exchanges. Along with the overview of this project and the activities at YUSA, we also explained the business pitch mentioned above. A few days later, the VCCI Da Nang branch visited Osumi Vietnam and talked about cooperation, including technical exchanges. Since then, information has been exchanged on the technological needs of companies in Da Nang, technological seeds in Yokohama, and measures to match the needs and seeds.

- Preparation for technology exchanges between companies

Through talks between Osumi Vietnam, which is the YUSA Danang City Overseas Liaison Office, and the Danang branch of VCCI, we decided to conduct a trial technical exchange between companies in both cities regarding specific low-carbon technologies. Specifically, the companies in Yokohama have created a simple list of what kind of solutions the companies in Yokohama could offer regarding energy-saving and environment-related technologies and services, and what kind of companies in Da Nang we would like to provide them to, then presented it to VCCI. In creating this list, we reached out to YUSA member companies and those who have registered to participate in events held by YUSA in the past (Y-PORT workshops, YUSA waste section study

group, business matching, etc.), especially companies that are considering expanding business in Asia. Additionally, the scope continues to expand, including business matching companies participating in the Asia Smart City Conference and companies participating in the Yokohama Chamber of Commerce and Industry.

The list is shown in the table below (the person in charge at each company, and company profile URLs are omitted from the list). Based on this information, VCCI considered what form of technical exchange would be best, and based on that, they consulted with the YUSA Danang City Overseas Liaison Office. This resulted in agreeing to hold a technical exchange meeting in Da Nang (or another city in central Vietnam) sometime between March and April 2023. In the future, the two organizations will discuss the details of the exchange meeting.

A list of solutions that Yokohama companies can provide in energy conservation, renewable energy, and environment-related fields (As of February 2023)

(A) Energy conservation/renewable energy related

Company	Main technologies and services	Desired business partner	Business scale (large, medium and small)
Osumi Vietnam Co., Ltd.	<ul style="list-style-type: none"> <li>· Energy-conservation services for reducing CO<sub>2</sub> emissions and power consumption. One stop service for energy-conservation diagnosis &gt; Proposal and implementation of countermeasures &gt; Countermeasures: visualization of effects</li> <li>· Indoor work environment monitoring and</li> </ul>	<ul style="list-style-type: none"> <li>· Factories and commercial facilities that use significant electricity</li> <li>· Companies that are interested in or are promoting energy conservation activities</li> <li>· Companies that are interested in or in the process of improving employee tasks</li> </ul>	Small and medium

Company	Main technologies and services	Desired business partner	Business scale (large, medium and small)
	<p>diagnostic services for employee health maintenance and productivity improvements</p> <ul style="list-style-type: none"> <li>· Consultation on introducing rooftop solar power equipment</li> </ul>		
<p>Kansai Energy Solutions (Vietnam) Co., Ltd. Wholly owned subsidiary of Kansai Electric Power Company</p>	<ul style="list-style-type: none"> <li>· Solar on-site service</li> <li>· Energy conservation consulting</li> <li>· I-REC service (a service to procure and provide the environmental value of electricity generated by overseas renewable energy sources as an international environmental certificate "I-REC")</li> </ul>	<p>Japanese companies with factories</p>	<p>Small and medium</p>
<p>iFORCOM Co., Ltd.</p>	<ul style="list-style-type: none"> <li>· Worker monitoring service for construction, civil engineering and manufacturing industries</li> <li>· Energy saving and CO<sub>2</sub> reduction in hotels, malls, schools,</li> </ul>	<ul style="list-style-type: none"> <li>· Construction, civil engineering, and manufacturing</li> <li>· Hotels, malls, schools, offices etc.</li> <li>· Road construction/operating companies and regional infrastructure</li> </ul>	<p>Small and medium</p>

Company	Main technologies and services	Desired business partner	Business scale (large, medium and small)
	<ul style="list-style-type: none"> <li>offices, etc.</li> <li>· Road construction/operating companies and regional infrastructure development</li> <li>· Energy demand forecast for solar power companies</li> </ul>	<ul style="list-style-type: none"> <li>development</li> <li>· Solar power operator</li> </ul>	
JGC Vietnam Co., Ltd.	<p>Comprehensive engineering and construction work in the field of infrastructure and energy</p> <ul style="list-style-type: none"> <li>· Renewable energy (solar, wind, biomass, etc.)</li> <li>· Industrial factory/plant</li> <li>· Water and sewage</li> <li>· LNG receiving terminal</li> <li>· CCS/CCUS</li> <li>· SAF (sustainable aviation fuel)</li> <li>· Hydrogen, ammonia, etc.</li> </ul>	Companies considering investment/development in the infrastructure/energy domains on the left	Large
T.K.K.Evolution Co.,Ltd.	<ul style="list-style-type: none"> <li>· Air conditioner power saving</li> <li>· Restoration without replacing water pipes</li> <li>· BOD load reduction</li> </ul>	<ul style="list-style-type: none"> <li>· Companies looking for power saving technology</li> <li>· Companies desiring to take measures against</li> </ul>	Small and medium

Company	Main technologies and services	Desired business partner	Business scale (large, medium and small)
	<ul style="list-style-type: none"> <li>· Total solutions for water supply and drainage equipment</li> </ul>	<ul style="list-style-type: none"> <li>deterioration of water supply pipes</li> <li>· Companies interested in restoring the water environment</li> </ul>	
ShinMaywa Industries, Ltd.	<ul style="list-style-type: none"> <li>· Energy-saving equipment for aeration tanks at wastewater treatment facilities</li> <li>· Energy saving diagnostics through wastewater treatment equipment</li> <li>· Support through local dealers (inventory, before/after support)</li> </ul>	<ul style="list-style-type: none"> <li>· Significant electricity consumers (public and private sector)</li> <li>· Companies promoting energy conservation</li> <li>· Companies requiring wastewater treatment</li> </ul>	Large
MURATA Keisokuki Service Co., Ltd.	<ul style="list-style-type: none"> <li>· Sales of Automatic Monitoring Systems (AMS) for water quality</li> <li>· Providing consulting services such as optimization of wastewater treatment (improvement of water quality, reduction of electricity consumption)</li> </ul>	Owners of industrial parks, companies operating in industrial parks	Small and medium



Company	Main technologies and services	Desired business partner	Business scale (large, medium and small)
Tripac Inc.	<ul style="list-style-type: none"> <li>· Domestic and overseas promotion and sales of the latest next-generation LED lighting Azteca Super Light, which offers energy savings and produces a brightness equivalent to several mercury lamps</li> <li>· Environmental coordinator for one-stop solutions (power saving, red rust countermeasures, grease drainage, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>· Factories, facilities, and construction companies that are promoting LED conversion due to mercury lamp regulations</li> <li>· Companies actively engaged in energy conservation</li> </ul>	Small and medium
ENERES Co.,Ltd.	<ul style="list-style-type: none"> <li>· Rooftop solar installations, etc.</li> <li>· Storage battery/EV, etc., control</li> <li>· Power transactions using blockchain technology</li> <li>· Business advice, etc. in the energy domain</li> <li>· Issuance of credits from environmental value, JCM subsidy procedures, etc.</li> </ul>	<ul style="list-style-type: none"> <li>· Factories and commercial facilities that use significant electricity</li> <li>· Companies that are interested in or are promoting decarbonization</li> <li>· Companies interested in acquiring JCM subsidies</li> <li>· Companies that can provide demonstration sites in Vietnam</li> </ul>	Small and medium

(B) Other environmental domains

Company	Main technologies and services	Desired business partner	Business scale (large, medium and small)
Aitec System Co.,Ltd.	<ul style="list-style-type: none"> <li>· Industrial LED lighting and UV irradiators reduce the defective rate of all products and improve quality control</li> <li>· Product defect inspection. (Instant noodle soup bag tear/defect inspection, ice cream chocolate coating status, food and drinking water contamination inspection, etc.)</li> </ul>	Companies or trading companies that handle LED lighting products, industrial cameras, image analysis software, and automation equipment	Small and medium
TESCO Environment Solution Vietnam Co. Ltd. (TESCO ESVN)	<ul style="list-style-type: none"> <li>· Design, implementation and maintenance of highly efficient factories and building water treatment plants</li> <li>· Design, implementation and maintenance of high- efficiency water and waste recycling</li> </ul>	<ul style="list-style-type: none"> <li>· Companies considering new construction, expansions, or renovation of factories/buildings.</li> <li>· Companies looking to improve water quality.</li> <li>· Companies considering recycling water and waste materials.</li> </ul>	Small and medium

Company	Main technologies and services	Desired business partner	Business scale (large, medium and small)
MT AquaPolymer Inc.	<ul style="list-style-type: none"> <li>· Manufacturing and sales of polymer flocculants for wastewater treatment</li> <li>· Selection of chemical brand according to wastewater (Sludge volume reduction, dehydrated cake moisture content reduction)</li> <li>· Technical follow-up implementation</li> </ul>	<ul style="list-style-type: none"> <li>· Water treatment engineering companies and water environment related companies</li> <li>· Livestock related companies with large farms (Companies engaged in in-house water treatment)</li> </ul>	Small and medium
Street Design Corp.	<ul style="list-style-type: none"> <li>· Sales of technology system equipment for converting organic waste into energy such as green power, heat, green hydrogen, and ethanol</li> <li>· Sales of EV conversion kits for converting automobile engines (garbage trucks, buses, trucks, taxis, motorcycles, etc.) that run on fossil fuels such as gasoline or diesel into motors</li> </ul>	<ul style="list-style-type: none"> <li>· Major environment-related companies (including government)</li> <li>· Sources of organic waste such as industrial parks (companies interested in converting organic waste such as sewage sludge into energy)</li> <li>· Companies that can convert internal combustion automobiles to EVs</li> </ul>	Small and medium

Company	Main technologies and services	Desired business partner	Business scale (large, medium and small)
Enebloom Inc.	<ul style="list-style-type: none"> <li>· Molded water pipe cleaning equipment that does not use chemicals</li> <li>· Energy-conservation system for heat exchangers, ball cleaning equipment</li> <li>· Descaling equipment for cooling tower piping</li> </ul>	<ul style="list-style-type: none"> <li>· Company interested in selling injection molding plants and mold cleaning equipment</li> <li>· Engineering company whose customers are factories, malls, and hotels that have installed water-cooled turbo chillers</li> </ul>	Small and medium
Kawaguchi Seiki Co., Ltd	<ul style="list-style-type: none"> <li>· Manufacturing and sales of dehydrators for improving the extraction efficiency of coconut milk, fruit juice, extracts, etc.</li> <li>· Reduction of waste that contains water, such as vegetables and fruits (can be reduced to about 1/3)</li> <li>· Environmentally friendly proposals such as converting dehydrated waste into animal feed</li> </ul>	<ul style="list-style-type: none"> <li>· Food factory liquid and juice extraction</li> <li>· Food factories that discharge food waste containing water (prepared dishes for convenience stores, cut vegetables, etc.)</li> </ul>	Small and medium

### 5.3.2. Organization of items that can be used as a reference for Da Nang related to formulating a plan for decarbonization in Yokohama

From the perspective of helping Da Nang to improve its knowledge on decarbonization planning, we will organize information that will be helpful in formulating Yokohama's decarbonization plans. The main points are to be compiled into the policy recommendations mentioned in 5.1.1 above and shared with Da Nang.

#### 5.3.2.1. Comparison of urban structure of both cities

This section summarises basic policy and specific initiatives on decarbonisation in Yokohama City, with a particular focus on those aspects that serve as a reference to Da Nang City, which is in the process of developing its own decarbonisation plan. The underlined sections in the text are those that Da Nang City may wish to refer to in particular.

1. Comparison of urban structure of Yokohama and Da Nang from the standpoint of greenhouse gas (GHG) emissions

Feature	Da Nang	Yokohama
Area	1,283 km <sup>2</sup>	438 km <sup>2</sup>
Population	1,200,000	3,770,000
Population density	945/km <sup>2</sup>	8,616/km <sup>2</sup>
Ratio of urban population	86.9%	80%
Industrial structure	Manufacturing industry (machinery, electronics, shipbuilding, chemicals, pharmaceuticals, textiles, handicrafts) and tourism are the leading industries. Agriculture, forestry and fisheries also flourish in this large city.	Commercial and service sectors account for nearly 80%, with manufacturing at around 20%. Agriculture in suburban areas thrives despite urbanisation trend.
Total GHG emissions (t-CO <sub>2</sub> eq.)	2.7 mil./year (2013)	16.47 mil./year (2020)
Major GHG emitting sectors (highest to lowest)	Manufacturing, transportation, household	Household, transportation, business, energy
Per capita GHG emissions	2.7 tonnes	4.4 tonnes

Source: Wikipedia for Da Nang City (2018 data); GHG data from "A Study on Da Nang

Low Carbon City" (NIES/IGES et al. 2016); Statistical information on city's website for Yokohama City (2021 data).

Both Yokohama and Da Nang are large port cities, but Da Nang's industry is centred on manufacturing, while Yokohama's is on the commercial and service industries. In addition, both cities have highly concentrated urban populations, but similarly these neighbor agricultural land. Where urban and agricultural lands are adjacent, linkages between the two could be facilitated through decarbonisation initiatives (see below for details). In terms of GHG emissions, the cities' population densities differ by a factor of nearly 10, and a similar disparity can be seen in total GHG emissions. Meanwhile, the gap in per capita GHG emissions is extremely small compared to the difference in terms of total emissions. The manufacturing industry is the sector with the largest GHG emissions in Da Nang, while transportation and households occupy a relatively large share in both cities. Therefore, decarbonisation measures in the transportation and household sectors in Yokohama can be considered a useful reference for reducing GHG emissions in Da Nang.

## 2. Yokohama City's policies and basic plan on decarbonisation

In October 2020, the Government of Japan declared it would achieve carbon neutrality by 2050, but Yokohama's work on decarbonisation predate this declaration. This section summarises Yokohama's main policies and basic plan on decarbonisation that could prove useful for Da Nang.

### (1) Yokohama City Action Plan for Global Warming Countermeasures (revised 2018)

The plan sets achieving net zero greenhouse gas emissions (decarbonisation) by 2050 as the city's goal in combating global warming. Eight basic policies are set out to achieve this goal. The main points are as follows.

<b>Basic policy</b>	<b>Course of Action</b>
1. Promotion of initiatives based on the efforts of citizens and collaboration with business	(1) Government develops strategic publicity and dissemination activities. (2) Courses and events on climate change measures and eco-lifestyles promoted in cooperation with citizen groups, companies, universities, etc.
2. Realisation of state-of-the-art smart city	(1) Promote the use of renewable energy, unused energy and decentralised energy, and energy management systems for homes, buildings and

	<p>communities.</p> <p>(2) Build next-generation energy supply systems mainly based on renewable energy, using AI and IoT.</p> <p>(3) Cooperation with other municipalities with high renewable energy potential.</p>
3. Virtuous cycle between environment and economy	<p>(1) Promote lifestyles that incorporate environmental considerations.</p> <p>(2) Provide training on environmental management to small and medium-sized enterprises in cooperation with financial institutions to promote investment.</p>
4. Inter-city cooperation and international communication	Facilitate international city-to-city cooperation on climate change action.
5. Comprehensive energy conservation	<p>(1) Energy saving for housing and introduction of energy-saving appliances and equipment for households; energy saving in buildings and introduction of energy-saving facilities and equipment for businesses; diffusion of EVs and other low-carbon forms of transport.</p> <p>(2) City hall taking the lead to catalyse energy-saving activities</p>
6. Sustainable urban planning	<p>(1) Build systems that harmonise a low-carbon transition and high convenience in each of the model districts in city centre and suburban areas.</p> <p>(2) Establish systems that harmonise low-carbon transport with smooth mobility.</p> <p>(2) Promote efficiency improvements for the port and logistics by reducing GHG emissions from ships and introduction of renewable energy.</p> <p>(3) Strengthen measures on GHG sinks and adaptation based on the conservation and utilisation of forests and agricultural land.</p> <p>(4) Promote a low-carbon transition at all stages of waste collection, transport and disposal. Also,</p>

	promote low-carbon initiatives such as the conversion of sludge generated from sewage treatment into fuel.
7. Maximised adoption of renewable energy and realisation of hydrogen society	(1) Adopt solar power and other forms of renewable energy at public facilities, and prompt citizens and businesses to do so too. (2) Promote cooperation with companies and other municipalities that are actively using renewable energies.
8. Strengthening of adaptation measures	Promote adaptation measures in the fields of agriculture and natural environment, wind/flood and landslide disasters, heat stroke/infectious disease, and industry and the economy.

(2) Yokohama City Strategy on the Use of Renewable Energy (2019)

The aims of this strategy are to make the action plan in (1) above more concrete, to steadily achieve the 2030 mid-term target, and to review future reduction targets.

The key points of the strategy are as follows.

Realisation of maximum energy saving	<b>[Goal]</b> Reduce energy consumption 50% by 2050 compared to 2013 (18% reduction by 2030). <b>[Major measures]</b> Promote the spread of high-efficiency energy-saving equipment in households and companies, and infrastructure facilities such as electric and fuel cell vehicles, recharging facilities and hydrogen stations.
Strategic expansion of renewable energy	<b>[Goal]</b> Shift 100% of electricity consumption in the city to renewable energy by 2050. <b>[Major measures]</b> Expanded adoption of solar power generation using various business models, creation of renewable energy supply schemes in cooperation with external



	actors, formulation of an information dissemination platform to increase the number of renewable energy users.
Leading actions at Yokohama City Hall	<p><b>[Goal]</b> By 2050, 100% of the electricity used throughout city hall will be shifted to renewable energy; by 2030, greenhouse gas emissions throughout city hall will be reduced by 30% (compared to 2013).</p> <p><b>[Major Measures]</b> Promote the introduction of renewable energy facilities for new construction, expansion and remodeling of public facilities, and further reduce carbon emissions from electricity based on the "Yokohama City Green Energy Procurement System".</p>

(3) Establishment of Yokohama City Ordinance for Promotion of Formulating Carbon Neutral Society (2021)

This ordinance clarifies the responsibilities of the municipal government, business and citizens, and sets out the basic matters for necessary measures to promote the formulation of a decarbonised society in Yokohama. The main points are as follows.

Municipal government responsibilities	<ul style="list-style-type: none"> <li>· Close cooperation with national government, other local governments, universities, businesses and citizens in the formulation and implementation of measures.</li> <li>· The construction and maintenance of city-owned facilities and electricity used in these facilities.</li> <li>· City takes the initiative in promoting the introduction of renewable energies in the procurement of energy.</li> </ul>
Basic plan	<ul style="list-style-type: none"> <li>· Comprehensive, medium- and long-term targets and basic measures for promoting the introduction of renewable energies.</li> <li>· Basic measures contributing to the development of industries related to promotion of the formation of a decarbonised society, a circular economy in the city, and sustainable development.</li> <li>· Support business activities in the city that consume and make effective use of renewable energy produced within the city</li> </ul>

	limits. · Measures to increase introduction into the city of renewable energy produced outside city limits.
Increasing demand for renewable energies	· Support for businesses and citizens using renewable energy to stimulate demand.
Promotion of learning and dissemination of knowledge	· Measures such as provision of information to businesses and citizens to promote reductions through the development and conservation of forests that absorb equivalent amounts of GHGs elsewhere in cases where reduction of GHG emissions is problematic.

The above summarises Yokohama City's policies and basic plan for decarbonisation. Certain points that could be of use to Da Nang City include the following.

- (1) First, maximum energy savings should be thoroughly attempted. In parallel, the introduction of renewable energies should be promoted. If unable to supply 100% of energy from renewable energy sources in the city, it is necessary to consider introducing renewable energy from other municipalities and returning the profits to them.
- (2) Work to ensure that decarbonisation efforts are linked to sustainable urban development, including comfortable urban living, convenient transportation and resource recycling, including waste management.
- (3) Work closely with citizens, businesses and universities in the development and implementation of decarbonisation plans. In doing so, consider awareness-raising, learning and events to encourage behavioural change (including lifestyle changes) towards decarbonisation.
- (4) The city government should take the lead in implementing decarbonisation measures and make them visible to citizens and businesses. For example, ambitious energy saving in city-owned facilities, introduction of solar power, conversion of waste to energy and resource recycling, etc.

### 3. Hints from decarbonisation model projects in designated areas in Yokohama

As one measure to promote decarbonisation, Yokohama City has adopted the approach of selecting areas in the city to lead in decarbonisation, concentrating human and financial resources in these areas, aiming to expand to other areas of the city based on the results there. The following section summarises suggestions for Da Nang based on Yokohama's

"Urban Decarbonisation Model in Minato Mirai 21 District based on public-private partnership", which has been recognised as a "decarbonisation leading area" supported by the Ministry of the Environment. Reference is made to the proposal for the model project prepared by Yokohama City.

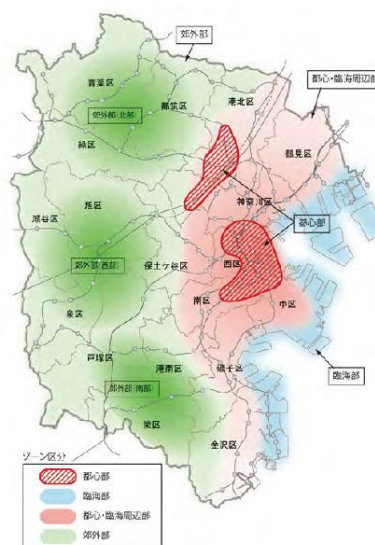
The model project focuses on the household, business and transportation sectors, which could prove useful as these sectors also have relatively high GHG emissions in Da Nang City.

*(Note) "Decarbonisation Leading Areas" supported by the Ministry of the Environment: areas that are to achieve net zero CO2 emissions from electricity consumption in the residential and commercial sectors (household, business and other sectors) by FY2030, as well as other GHG reductions including transportation and heat use, in line with Japan's overall FY2030 target, according to regional characteristics.*

(1) Overview of model project

The Minato Mirai 21 (MM21) district, located in the city's waterfront area, is a designated decarbonisation leading area. In addition to its offices and commercial and residential facilities, MM21 is a district where a diverse range of functions have come together, including corporate headquarters, R&D facilities, music halls, universities and international event sites. Approximately 10% of the city's energy consumption for the business sector is concentrated in the district. The model project targets 32 of the 64 facilities in the district.

【Photo of MM21 district and map location of MM21 district within the entire city of Yokohama】



【Overview of district】

MM21 District		【Reference】 Yokohama overall
Area	1.86 km <sup>2</sup>	437 km <sup>2</sup>
No. of businesses	1,820	155,000
No. of employees	117,000	1,690,000
GHG emissions	286,000 tonnes/year	16,470,000 tonnes/year

(2) Advantages of a model project targeting one area of the city

- (i) More effective decarbonisation can be achieved by combining initiatives in multiple sectors (e.g. waste management and renewable energy use).
- (ii) Enables effective implementation of decarbonisation activities in partnership with residents and companies.
- (iii) Enables opportunities to partner with other areas through decarbonisation activities (e.g. procuring renewable energy from suburban areas outside the district and returning some of the revenue to those areas).
- (iv) Possible synergies between decarbonisation activities and adaptation measures (e.g. roof-mounted solar power and use of EV vehicles as emergency power sources).

(3) Reasons for selecting MM21

- (i) Due to its high energy consumption density, the decarbonisation effect of energy saving and conversion to renewable energy is relatively high.
- (ii) Yokohama Minato Mirai 21 (YMM) is a general incorporated association that manages the entire area through urban development, environmental measures, and cultural and promotional activities. YMM is operated by its approximate 90 private company members. In September 2021, YMM established a Zero Emissions Subcommittee under its Environmental Measures Committee to discuss decarbonisation initiatives for the MM21 district as a whole.
- (iii) A private enterprise has provided heating and cooling of the MM21 district since 1989 and has a long-term track record in area management in the energy sector. Together with (ii) above, the district possesses the system infrastructure to promote decarbonisation initiatives.

(4) Approaches to decarbonisation in MM21

- (i) The area has limited space for solar power installations due in part to the large number of high-rise buildings. Although many companies are looking for additional renewable

energy sources, the renewable energy potential in the area is low. Accordingly, in addition to comprehensive energy saving to reduce energy consumption to the maximum extent possible, the city aims to partner with suburban districts within city limits and other local governments, and to create a mechanism to return profits to these areas.

(ii) Reduce the large volume of waste generated (e.g. food residue, plastic bottles), engage in resource circulation initiatives based on recycling, and advance initiatives to encourage behavioural change involving workers, visitors and residents in order to reduce emissions.

(iii) Aim for decarbonisation efforts and improved disaster preparedness by securing power sources in the event of blackouts utilising EVs and power sources owned by some companies in the district for the purposes of disaster preparedness. From this perspective, efforts will be made to improve charging infrastructure, introduce EV car sharing, and promote the use of storage batteries in order to encourage the spread of EVs.

(iv) Make existing public transport (railways and buses) low-carbon, and employ digital solutions to increase the convenience of travel within the city and surrounding districts (e.g. MaaS: Mobility as a Service, which optimally combines multiple public transport and other mobility services to meet the trip-based mobility needs of individual local residents and travelers, and provides consolidated search, reservation, and payment).

(5) Specific initiatives

<b>Sector</b>	<b>Subsector</b>	<b>Activities</b>
<u>Zero GHG emissions from electricity consumption in the residential and commercial sector</u>	Renewable energy within MM21	<ul style="list-style-type: none"> <li>· Solar power generation on rooftops of facilities</li> <li>· Biomass power generation from waste</li> </ul>
	Procurement of renewable energy power from outside MM21	<ul style="list-style-type: none"> <li>· Renewable energy at city schools, municipal housing, regulating ponds</li> <li>· Electric power from waste incineration plants in the city, wind power</li> <li>· Procurement of renewable energy from other municipalities</li> </ul>
	Energy saving within MM21	<ul style="list-style-type: none"> <li>· Expanded conversion to LED</li> <li>· Adopt ZEB (Net Zero Energy Building) for new building construction and refurbishment</li> <li>ZEB: Energy-saving through high efficiency thermal insulation, solar shading, use of natural energy and high-efficiency equipment</li> </ul>

		while maintaining comfortable indoor environments, and buildings such as offices, schools, hospitals, and hotels, where energy is generated through solar power.
	Energy management within MM21	Connecting multiple facilities to optimise energy demand and supply and promoting the introduction of renewable energy
<u>Zero GHG emissions from non-electricity sources in the residential and commercial sector</u>	Decarbonisation of heat within MM21	<ul style="list-style-type: none"> <li>· Decarbonisation of fuels and raw materials for district heating and cooling</li> <li>· Energy efficiency and decarbonisation of heating and cooling equipment in various facilities</li> </ul>
	Decarbonisation of transportation within MM21	<ul style="list-style-type: none"> <li>· Fuel conversion of public transport such as buses</li> <li>· Expanded introduction of EVs and recharging functionality using renewable energy sources</li> <li>· EV car sharing</li> <li>· Use of EVs as mobile storage batteries in emergencies</li> </ul>
	Reduction and recycling of waste within MM21	<ul style="list-style-type: none"> <li>· Reduction of waste</li> <li>· Recycling of food residue, plastic bottles, etc.</li> </ul>
	Promoting activities through decarbonisation within MM21	<ul style="list-style-type: none"> <li>· Decarbonisation activities that also contribute to the SDGs (e.g. waste management, convenient and environmentally-friendly transport)</li> <li>· Behavioural change of workers and visitors</li> </ul>

(6) Cooperation with communities outside the MM21 district

- (i) Suburban areas outside the MM21 region are facing challenges such as securing means of transport and maintaining safe and secure living environments due to the rapidly advancing ageing population and falling birthrate. Therefore, part of the electricity fees for renewable energy electricity generated in suburban areas and transmitted to the MM21 region will be returned as funds for regional revitalisation. For example, support could include power supply during disasters, local community bus services, installation of

security cameras, pruning of plants and trees, etc.

- (ii) Establish a resource recycling model whereby food residue generated within MM21 is recycled into fully matured compost and soil improvement material, provided and sold to farmers, and vegetables cultivated using these are purchased within the MM21 district and other parts of the city.

(7) Quantifying decarbonisation within the MM21 district

Through quantification, clarify target values for each measure aimed at achieving decarbonisation. The electric power field in the residential and commercial sector should be included in deliberations. The following data and formula are used to quantify decarbonisation.

**Data**

- (i) Electricity demand = 297,524,442 (kWh/year)

Electricity use at target facilities (using results of energy consumption questionnaire survey)

- (ii) Electricity supply from renewable energy = 264,331,909 (kWh/year)

Supply target values from within MM21 district and outside (including outside prefecture)

- (iii) Reduction in electricity consumption through energy saving = 33,192,533 (kWh/year)

Target value of reduction in electricity consumption based on energy saving at target facilities

- (iv) Volume of renewable energy generated in the entire city of Yokohama = 41,423,369 (kWh/year)

**Formula**

To achieve net zero in the electric power sector in MM21, the amount of electricity demand ((i) above) minus the amount of electricity consumption reduced through energy saving (iii) must be the same as or less than the amount of electricity supplied by renewable energy (ii). In other words, (i) – (iii) = < (ii).

**Calculation**

$$297,524,442 \text{ (kWh/year)} - 33,192,533 \text{ (kWh/year)} = < 264,331,909 \text{ (kWh/year)}$$

As described above, in order to achieve net zero, it is important to set target values for the amount of electricity reduction from energy saving and the amount of renewable energy supply needed to meet the total electricity demand.

Moreover, renewable energy supply ((ii) above) can also be procured from outside the MM21 district, but the amount of renewable energy that can be generated in Yokohama City (iv) is 41,423,369 (kWh/year), which would cover 15.7% of the of 264,331,909 (kWh/year) electricity demand required in the MM21 district (after taking into account electricity reduction through energy saving). In other words, nearly 85% of renewable energy must be procured from sources outside Yokohama City.

(8) Key performance indicators

Key performance indicators (KPIs) are set from among the specific decarbonisation activities listed in (5) above that contribute to solving local problems and improving the quality of life of residents. Specifically, they are as follows.

- (i) In order to expand the model project across the entire MM21 district, the use of 100% renewable energy for facilities will be expanded to those not covered by the model project in addition to the facilities covered by the model project area. The aim is to achieve 100% renewable energy in the entire MM21 district (64 facilities) by 2035.

KPI: Number of facilities achieving 100% renewable energy (entire MM21 district)	
As of February 2022: 32	Target for FY2030: 42

- (ii) To contribute to the reduction of food waste by utilising food residue generated by restaurants, hotels, etc., for biomass power generation and composting. In addition, the compost generated will be used by farmers in Yokohama, and the fruit and vegetables produced will be consumed at restaurants in the MM21 district and other parts of the city, thereby contributing to the achievement of a circular economy.

KPI: Number of food residue collection facilities	
As of February 2022: 2	Target for FY2030: 12

- (iii) When utilising electricity from renewable energy generated in the suburban areas of Yokohama and outside the city (including other municipalities), such as renewable energy used in municipal housing and regulating reservoirs, a sustainable community contribution can be expected by returning part of the electricity fees to the suburban areas and areas outside the city as regional revitalisation funds.

KPI: Number of facilities procuring electricity from renewable energy that contribute to returning funds to suburban areas and other municipalities	
As of February 2022: 1	Target for FY2030: 10

- (iv) As a way of promoting renewable energy itself in the city center where installations



are problematic, regulating capacity will be created that can respond to the capacity market's trigger power supply in order to address supply and demand adjustment on the demand side.

KPI: Scale of electricity produced	
As of February 2022: 0 kW	Target for FY2030: 1,000 kW

(9) Implementation system for decarbonisation model projects

Both a system to promote each activity within the model project as well as a system to manage and evaluate the progress of the project are required.

(i) Promotion structure

The Global Warming Prevention Headquarters, which has jurisdiction over global warming countermeasures in Yokohama City, and the Urban Development Bureau, which has jurisdiction over the development and management of the MM21 district, and which is in charge of the port area, serve as the Secretariat. Yokohama Minato Mirai 21 (YMM), the general incorporated association that manages the entire MM21 district, also participates in the Secretariat. YMM promotes the implementation of various activities through communication with its approximately 90 member companies, as well as other companies and tenants in the district.

(ii) Progress management and evaluation system

Progress management and evaluation of all activities will be carried out under the Zero Emissions Subcommittee (established in 2021) under the Environmental Measures Committee run by YMM, and also under working groups on each of the following topics: renewable energy, energy saving, decarbonised transportation, behavioural change and local management. The overall progress of the project will be assessed by the Environmental Action Commission and the Environmental Action Committee, and consideration will also be given to inviting experts in the energy sector to serve as advisors.

Regarding energy use in the MM21 district and KPIs that measure the amount of activity which are necessary for checking progress, a questionnaire survey of business operators, which has been conducted for some time, will be continued and the necessary information collected.

### 5.3.3. Providing information to Da Nang regarding smart cities and regional circular and ecological sphere

With Da Nang City, we have continued to revise the “Da Nang City Climate Change Action Plan - A conceptual framework for sectoral climate actions” which was created cooperatively in 2021, and in contribution to the formulation of this conceptual framework for sectoral climate actions promoted by Da Nang City, the sectors are being expanded and input and information is being provided by Japan. As part of this process, an expert workshop was organized in Da Nang City in January 2023 with experts from multiple disciplines from The University of Da Nang, to discuss the revision of the existing basic plan, new items, basic smart city and eco-city policy, and the drafting of a roadmap.

This workshop was attended by officials from the Da Nang City Department of Sea and Islands (DASI), which has responsibility for climate change policy, as well as 15 experts from The University of Da Nang, mainly in the Department of Architecture, in fields such as urban planning, agriculture planning, energy efficiency, AI planning, forest planning, and waste, etc.

1. **Time and Date:** 2pm to 4:30pm, January 6, 2023
2. **Location:** The University of Da Nang, University of Technology

	Time	Content	Presentator, Coordinator
1	5 mins	Opening Remarks	Associate Professor Nguyen Anh Tuan
2	15 mins	Explanation of the overall project and purpose of discussion	Kamei (IGES) (Interpreted by Minh Hai)
3	90 mins	Information sharing, comments, and suggestions from experts Open discussion	15 experts Da Nang City
4	10 mins	Feedback from the climate action and roadmap development team	Kamei (IGES) Associate Professor Nguyen Anh Tuan (Interpreted by Minh Hai)



Below are the highlights of the discussion of developing smart cities and a regional circular and ecological sphere.

#### <Smart City>

- There is great potential for introducing renewable energy to industrial development zones such as High-tech Park, etc. (Hoa Vang district etc.)
- Renewable energy accounts for about 3% of the energy consumption of Da Nang City. While there are prospects for widespread use in the future, there will need to be a price-related mechanism such as FIT etc.
- Vietnam actually has great potential for wind power generation. Land needs to be used effectively.
- There is great potential for smart agriculture. A small-scale pilot project is already underway in Da Nang City, leading to the spread of urban green spaces and the effective use of water and resources in the city.
- There are still some difficulties with smart urban transportation because public transport has not yet spread, but in the future it will be necessary to build a transportation network that fully utilizes ICT, etc.
- There are still a lot of issues related to making buildings smarter. It is necessary to form integrated regional plans including for commercial facilities within city plans.
- Waste management is currently planned separately from city planning, etc., but from the perspective of building a smart city this will need to be planned in an integrated manner with city infrastructure plans such as those above, and positioned effectively in terms of resource recycling and the reduction of GHG emissions. This is also associated with the energy sector.

#### Regional Circular and Ecological Sphere

- The forest area in Da Nang City is decreasing significantly due to development. Experts have recommended securing green areas using vacant land in the city, but currently these are not being managed sufficiently and soil degradation is increasing.
- More publicity is needed in conjunction with local stakeholders to spread conservation activities in nature reserve areas. There is a need to raise greater awareness among local businesses about the protection of natural areas.
- The use of detailed monitoring data such as land use needs to be promoted. Also, opening up such data will be very effective for creating regional plans.
- Adaptation needs to be enhanced for areas that will be impacted by rising sea levels due to climate change.
- The current Master Plan is focused mainly on the development zone of Da Nang City, but it is effective to share city planning concepts over a wider area including neighboring urban areas. It is important to proceed with the regional link plan to reinforce the strengths of each region and compensate for each other's risks.

Regarding the Da Nang City Climate Change Plan, with the cooperation of Da Nang City and based on the above discussion, feedback from experts, and feedback from relevant departments of Da Nang City, as well as the addition of new outside experts (Vietnam National Institute for Climate Change Research, Columbia University, etc.), the plan has been revised and new sections have been added (such as waste and forestry, etc.), with the second "Da Nang City Climate Change Action Plan - A conceptual framework for sectoral climate actions" to be submitted to Da Nang City.

Newly added items for smart city and the regional circular and ecological sphere will be integrated into each section (climate action for the sectors of construction, transportation, and energy, etc.) Regarding the regional circular and ecological sphere, a section on regional urban planning has been added to propose a methodology for specific measures.

## **5.4. Workshops**

Two workshops were held during the project period this year. The outline of each workshop is described below.

### **5.4.1. First workshop**

- **Purpose**

To share the progress and expected results of this project, and exchange opinions on

measures to promote information exchange and consultation on low-carbon projects among companies in Da Nang. Additionally, we will discuss how intercity cooperation between Da Nang and Yokohama can contribute to decarbonization in the Vietnam National Climate Change Strategy to 2050, which was approved by the Prime Minister in July 2022.

- Date: October 19, 2022, 13:30-17:00 (Vietnam time)
- Venue: Da Nang Administrative Center conference room
- Participants:
  - From Da Nang: Department of Natural Resources and Environment, Department of Industry and Trade, Regional Agricultural Development Department, Department of Education and Training, Da Nang Hi-Tech Park Management Committee, Da Nang Urban Environment Joint Stock Company, Soi Cau (renewable energy company), Da Nang Institute For Socio - Economic Development, Da Nang Today
  - From Japan: (Local) IGES, Osumi Vietnam, Kansai Energy Solutions (Vietnam) (Online) City of Yokohama, Ministry of the Environment, YUSA, Osumi Co., Ltd., Macnica Inc., Murata Keisokuki Service Co., Ltd. Also, 13 companies that are interested in intercity collaboration among YPORT and YUSA members
- Agenda

The conference consisted of two sessions: one with administrative bodies and one with business entities.

[First session]

Discussion on how to contribute to Da Nang's efforts to become a decarbonized city in National Climate Change Strategy to 2050, etc. The aim is to convey to Vietnam that decarbonization efforts through intercity collaboration in this project can serve as a model for promoting decarbonization at the national level in Vietnam. Da Nang gave a presentation on the key points of the national climate change strategy and DONRE's future response, and we gave a presentation on policies that promote urban decarbonization in Japan (Ministry of the Environment) and on decarbonization initiatives in Yokohama. Afterward, a discussion was held on the following: (1) How to measure the co-benefits of decarbonization and other SDGs, (2) Measures for companies and citizens to actively participate in climate change measures including decarbonization, and (3) How formulating decarbonization actions in Da Nang should be prioritized.

[Second session]

Talked about how the low-carbon project model proposed in this project can be disseminated and scaled up in the future. Opportunities and challenges for promoting business related to low-carbon technology, especially solar power and energy-saving in Da Nang were shared among stakeholders in both cities, with the aim being to create a base for the development of low-carbon businesses in Da Nang and Yokohama after the completion of this project as well. The Da Nang Branch of the Vietnam Chamber of Commerce and Industry, which supports member companies throughout Vietnam, including Da Nang, by sharing various types of information and improving knowledge and awareness, introduced efforts in working to build a sustainable society, including low-carbon initiatives. A Vietnamese company planning mega solar array and is expecting JCM equipment subsidies also gave a presentation. From Japan, along with an overview of YUSA initiatives, we provided a presentation on briefing materials (business pitch mentioned above) to encourage Da Nang companies to introduce low-carbon technologies. Also, Osumi Vietnam gave a presentation on energy conservation efforts in Vietnam, and Kansai Energy Solutions (Vietnam) talked about solar power initiatives in Vietnam.

[Agenda] Presentation materials are shown in Document 5.

Time	Content	Speaker
15:30-15:35	Greetings from Da Nang	Mr. Vo Nguyen Chuong DONRE deputy director
15:35-15:40	Greetings from Yokohama	Ryoichiro Orii City of Yokohama Director general, International Cooperation Bureau (online)
15:40-15:50	Project progress and expected outcomes	Naoki Mori IGES Program director
<b>First session</b>		
15:50-16:10	Introduction of Vietnam National Climate	MONRE

Time	Content	Speaker
	Change Strategy to 2050	
16:10-16:20	Introduction of policies to promote decarbonized cities by the Japanese government	Satoshi Watanabe Ministry of the Environment Deputy counselor, Global Environment Bureau (online)
16:20-16:30	Introduction of examples of decarbonization measures in Yokohama Yokohama's Global Warming Countermeasures: Aiming for a Sustainable City	Kazuaki Takahashi City of Yokohama General manager, Global Warming Countermeasure Headquarters (online)
16:30-16:45	Efforts towards decarbonization based on experiences of Da Nang as an environmental city: Opportunities and challenges	DONRE
16:45-17:15	In order to consider high-priority initiatives for decarbonization in Da Nang, we introduced the experiences of Yokohama and exchanged views with the officials of Da Nang on the following perspectives. (1) How do we incorporate elements of decarbonization into urban planning? (2) How can we promote the participation of businesses and citizens in decarbonization action? (3) How should we prioritize the various actions necessary for decarbonization?	All participants
15 minute break		
<b>Second session</b>		
17:30-17:40	The role and experience of the business	Mr. Ho Anh Tuan

Time	Content	Speaker
	community in realizing a sustainable society, including measures against climate change, in Vietnam	Vice president, Vietnam Chamber of Commerce and Industry
17:40-17:50	Promotion of business exchange between companies in Da Nang and Yokohama: YUSA role	Rie Kimura Yokohama Urban Solution Alliance (YUSA) Manager (online)
17:50-18:00	Introduction of financial support system by the Japanese government through JCM, and case studies in Vietnam	Pham Ngoc-Bao IGES Deputy program director
18:00-18:10	Proposal of financial support scheme through JCM for green energy projects in Vietnam	Vi Viet Dung Song Cau Joint Stock Company Chairman of the Board
18:10-18:20	Opportunities for renewable energy business in Vietnam	Ryujiro Ishihara Kansai Energy Solutions (Vietnam) President
18:20-18:30	Opportunities related to energy conservation business in Vietnam	Yoshiharu Yoneda Osumi Vietnam President Nguyen Quyet Thang Osumi Vietnam Energy Engineer
18:30-18:45	Q&A and discussion	All participants
18:45-18:55	Closing remarks	DONRE IGES

- Summary of key results
  - The National Climate Change Strategy to 2050 sets a target for the nation's GHG



emissions to peak in 2035 and then rapidly decrease to net zero by 2050. It identifies energy, agriculture, land use/forestry, waste management, and industrial processes as priority sectors for GHG reduction. Cross-cutting issues include policy and institutional development and improvement, community awareness raising, human resource development, science and technology development, financial mobilization, and promotion of international cooperation. In addition, provincial governments have been instructed to formulate 10-year climate change countermeasure action plans for local provincial and People's Committees (targets, issues, and solutions according to the actual situation of the provinces are integrated into the basic plan and the socio-economic development plan), strengthened inspection and oversight of GHG emissions and GHG emission reduction activities, prioritized budget allocation for activities to implement the strategies, and increased public communication and awareness.

- DONRE in Da Nang pointed out the following decarbonization challenges: (1) There is no mechanism or roadmap for a zero-carbon society, (2) Companies are not proactive about a zero-carbon society, (3) Access to renewable energy and clean energy is lacking, and (4) The community's awareness of zero carbon society is low. Important future efforts covered expectations of international cooperation in the creation of a roadmap for action plans to reduce GHG emissions in view of a zero-carbon city, utilization of GHG inventories, and technology transfer related to the use of wave power in marine areas.
- Vietnamese companies also commented that Da Nang will create strategies and plans in line with the national strategy for decarbonization, the details of which will be explained to companies and residents, etc., and that there is a need for communication between the government, the private sector, and citizens regarding implementation.
- Participants mentioned that from among the experiences of Yokohama, adding energy saving and decarbonization elements to new infrastructure, introducing wide-area measures such as the Minato Mirai 21 selected as an advanced decarbonization area model project, and the virtual power plant (VPP), which has benefits for both renewable energy and climate adaptation, were useful references for Da Nang.
- Japanese companies provided information on the environmental effects (including GHG reduction) of energy conservation and renewable energy as well as the economic effects of reducing electricity bills, and information on JCM equipment

subsidies, in which Vietnamese companies showed interest. The Da Nang branch of the Vietnam Chamber of Commerce and Industry pointed out that, due to COVID-19, improving productivity, namely, reducing operating costs, has become an important issue for companies to recognize, and the question of how to position low-carbon efforts in that context. The Da Nang branch also said that It is important for small and medium-sized enterprises to start with simpler energy-saving measures, and once the results are achieved, the next step is to tackle new domains such as renewable energy.

- DONRE commented that while it was good that we were able to exchange opinions from both governmental and corporate perspectives at the workshop, they proposed clearly dividing the sessions for more effective implementation the next time, as interests may be slightly different. Because they have limited contact with private companies and lack sufficient knowledge about which companies to target and invite to workshops, the opinion is that it would be better for the Vietnam Chamber of Commerce and Industry to host the workshop.

#### **5.4.2. Second workshop**

- Purpose

In addition to sharing the results of the three-year project, we will talk about priority issues in Da Nang's future efforts toward decarbonization and possible areas of cooperation with Yokohama.

- Date: February 22, 2023, 14:00-16:30 (Vietnam time)
- Venue: Da Nang Administrative Center conference room
- Participants:

Da Nang: People's Committee, DONRE and other relevant departments, Da Nang branch of the Vietnam Chamber of Commerce and Industry, Da Nang Hi-Tech Park Management Committee, Da Nang enterprises, University of Da Nang, Ministry of Natural Resources and Environment

Japan: Project team members, companies affiliated with Yokohama, Ministry of the Environment, Consulate General of Japan in Da Nang, JICA (headquarters, Vietnam office)

- Agenda: Presentation materials are shown in Document 6.

<b>Time</b>	<b>Content</b>	<b>Speaker</b>
<b>5 minutes</b>	Greetings: Da Nang	Da Nang city representative
<b>5 minutes</b>	Greetings: Yokohama	Yokohama city representative
<b>20 minutes</b>	Vietnam National Climate Change Strategy (Vietnam National Strategy on Climate Change to 2050"): Overview and progress of the project and expectations for the city	Ministry of Natural Resources and Environment
<b>15 minutes</b>	Project purpose and results (3 year span)	Naoki Mori IGES Program director
<b>10 minutes</b>	Current year project result 1: Overview of solar power business assuming JCM	Ryujiro Ishihara Kansai Energy Solutions (Vietnam) President
<b>15 minutes</b>	Promotion plan for eco-industrial parks by utilizing environmental and low-carbon technologies in Da Nang	Da Nang Hi-Tech Park Management Committee
<b>10 minutes</b>	Question-and-answer session	All participants
<b>15 minutes</b>	Current year project result 2: Current status and future plans for technology exchange on low-carbon and environmental technologies between companies in both cities	Yoshiharu Yoneda Osumi Vietnam President Nguyen Quyet Thang Osumi Vietnam Energy Engineer
		Mr. Ho Anh Tuan Vice president, Vietnam Chamber of Commerce and Industry
<b>10 minutes</b>	Policy recommendations for decarbonization of Da Nang	Naoki Mori IGES Program director

<b>Time</b>	<b>Content</b>	<b>Speaker</b>
<b>30 minutes</b>	Discussion on the decarbonization of Da Nang	
	(1) Issues related to creating a decarbonization action plan for Da Nang (GHG inventory management and operation, setting GHG reduction targets, creating a GHG reduction action plan, etc.)	(1) DONRE
	(2) Comments on (1) above and IGES policy recommendations	(2) All participants
	(3) Exchange of opinions on future possible areas of cooperation with Yokohama regarding decarbonization of Da Nang	(3) All participants
<b>5 minutes</b>	Closing remarks	DONRE, IGES

- Summary of key results:
- The following comments were made in relation to the policy recommendations toward decarbonization in Da Nang City presented by IGES.

(1) While the 7th Electricity Plan for 2020 has been completed and the FIT system is under review, the approval of the Prime Minister for the 8th Electricity Plan starting in 2021 has been delayed. Since Da Nang City has great potential for solar power generation, the FIT system is a major issue, and it is necessary to promote rooftop solar power generation for self-consumption until the FIT system is clarified.

(2) Da Nang City is in the process of renovating the offices and facilities of public institutions. It would be effective to seize this opportunity to introduce photovoltaic power generation to these facilities. An approach that extends the results to private offices and facilities is also needed.

(3) From DONRE's perspective, it is extremely important to raise awareness for decarbonization, especially among government employees. It is also essential to prepare a GHG inventory in order to monitor GHG reduction plans and their implementation. However, since the expertise in this area is not sufficient, we would like to obtain cooperation from Yokohama City and IGES.

(4) Creating a GHG inventory requires data from a variety of sectors, but in Da Nang the data is scattered. A system is needed to centralize these data and update them on a regular basis.

- According to a recent study by Da Nang City, electricity consumption costs account for 10-12% of business costs, with many companies reaching 15%. From a business perspective, it must be based on economic efficiency as well as GHG reduction. Osumi Co. has a rich experience and knowledge from this perspective, and we would like to ask for cooperation in energy-saving processes and technologies for local companies. We also hope that YUSA and VCCI will cooperate with Osumi Vietnam to connect companies in Yokohama with those in Da Nang City and the central region of Vietnam.
- DONRE would like to propose that we will cooperate with VCCI to establish a forum for dialogue with companies about their needs related to the environment and energy efficiency and conservation. For example, a survey could be conducted to understand the needs of companies, and based on the results, appropriate themes could be selected in consultation with YUSA and IGES, and the program could include exchanges of opinions between companies in Da Nang and Yokohama, as well as visits of companies in Da Nang's industrial parks that are implementing energy conservation measures.
- Yokohama City is taking a step-by-step approach to GHG inventory implementation, starting with a rough inventory and gradually increasing it to a more detailed one. In this process, it is necessary for all stakeholders involved in data collection, calculation, verification, etc. necessary for inventory creation to participate. The city of Yokohama has established clear procedures and methods. We are not yet familiar with the regulations for inventorying in Vietnam, but we believe that there are areas where Yokohama City can cooperate in this area. Yokohama City and YUSA would like to continue to cooperate with Da Nang city in the future, taking advantage of the results of this three-year project. Yokohama city will discuss with the Ministry of the Environment of Japan on specific cooperation with Da Nang City. There is an inventory expert at IGES who has experience in technical cooperation by JICA for the development of the national GHG inventory of Vietnam. For example, workshops and training on inventory preparation by this expert may be possible.

## **6. Lessons learned from this project (3 year span)**

- Utilization of local coordinators

When Da Nang created a draft of the 10-year Environmental Plan, Japan initially provided input directly to DONRE, however, hiring local coordinators as part of COVID-19 countermeasures streamlined the input and feedback process from Da Nang, enabling greater efficiency.

The local coordinators quickly translated the input from Japan into Vietnamese, talked with DONRE, and appropriately conveyed the intentions of Japan. On the other hand, the opinions from DONRE at that time were promptly shared with Japan, which was helpful when preparing subsequent input. This made it possible to track which parts of the final version of the 10-Year Environmental Plan by DONRE were revised due to input from Japan.

- Central government involvement

DONRE held several consultations during the preparation of the 10-Year Environmental Plan, and before the final draft was prepared, they invited the deputy minister of the Ministry of Natural Resources and Environment (MONRE). Japan was also invited to participate in the consultation, and presentations were requested. The Japanese input in the 10-Year Environmental Plan (enhancement of public participation, promotion of low-carbon initiatives, disclosure of environmental monitoring results, etc.) in the presentation were approved by the deputy minister of MONRE, and the final plan was adopted, showing the likely effectiveness in incorporating such information in the final proposal.

- Demonstrating the superiority of Japanese technology

As JCM candidate projects, it is difficult to clearly demonstrate the superior performance of technologies such as LED streetlights, radiant heat cooling, rooftop solar power, and ESM.

For this reason, LED streetlights, for example, can be used from the perspective of smart energy, such as automatically lowering the brightness on roads with little pedestrian or vehicular traffic at night, or installing additional automatic air monitoring equipment in addition to streetlights, showing that an approach which includes multipurpose proposals is conceivable.

Expanding on this premise, it would be useful to show the superiority of technology in promoting low-carbon projects in terms of what kind of co-benefits can be created with other sustainability goals of the SDGs.

- Collaboration with local academic institutions

In examining the low-carbonization and decarbonization plans of Da Nang, the relevant data and survey results published in Da Nang are not abundant. In promoting low-carbon intercity cooperation, from the perspective of gaining consensus from stakeholders based on scientific data, it is important to consider cooperation not only with city governments and the business world, but also with the academic world.

## **7. Future direction**

The most significant outcome of this project (three year span) is that Da Nang made it clear at an international conference in March 2022 that it will work toward decarbonization. Six projects are under consideration for JCM commercialization, and we plan to apply for the JCM equipment subsidy system within the year, then proceed with the project. Furthermore, in order to develop private-sector-led projects such as JCM, the Da Nang Branch of the Vietnam Chamber of Commerce and Industry and YUSA are building a framework for cooperation and coordination to promote technological exchanges related to low carbon and environmental initiatives between companies in Da Nang and Yokohama and lead to solid business matching.

In parallel, as institutional support to promote Da Nang decarbonization policies, over the past three years we have supported the creation of the 10-year Environmental Plan and a climate change action plan, supported school education related to climate change, and made policy recommendations toward decarbonization.

Based on this foundation, there is considerable room for supporting decarbonization in Da Nang through the urban collaboration framework that Yokohama and Da Nang City have been using for more than 10 years. For example, JCM projects have so far been developed mainly for energy conservation and renewable energy (solar power) by individual companies. However, using the area in Da Nang as a model, it is important to take a comprehensive approach to optimize energy supply and demand, improve business efficiency, alleviate air pollution, water pollution, and waste problems, and significantly reduce GHG emissions. From this point of view, it would be a good idea to consider such an approach in the eco-friendly industrial parks promoted by Da Nang. Such a comprehensive approach will also provide opportunities for more companies in Yokohama and Da Nang to participate in the project.

Additionally, Da Nang needs to formulate a concrete decarbonization action plan and create a policy system to support it, and they expect cooperation from Yokohama in this regard. However, in order to do so, it will be necessary to invest a considerable amount of resources in areas such as knowledge sharing with Da Nang city officials and support for human resource development, so narrowing down the areas where cooperation is possible in terms of policy systems and then moving forward in this regard is realistic.

## Attachments

Document 1 : Policy Recommendations: The Role of Local Governments in Promoting a Decarbonized Society to Achieve Net Zero Emissions in Vietnam by 2050 - The Case of Da Nang City

Document 2: Simple Analysis of Rooftop Solar Power Generation in Da Nang City Enterprises

Document 3: Overview of Projects Under Consideration for JCM Commercialization

Document 4: Business Pitch Summarizing Low-carbon Technologies Owned by Companies in Yokohama

Document 5 : First workshop presentation materials

Document 6: Second Workshop Presentation Materials