FY2021　Project for Ministry of the Environment Japan

# FY2021
# City-to-City Collaboration Programme for Zero-carbon Society

## Project to Promote SDGs Future City with Renca, Santiago

# Final Report

March 2022

Nippon Koei Co., Ltd.
Toyama City

# FY2021
# City-to-City Collaboration Programme for Zero-Carbon Society
## Project to Promote SDGs Future City with Renca, Santiago

# Report

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# Abbreviations

| | |
|---|---|
| COP | Conference of the Parties |
| COVID-19 | Coronavirus Disease - 19 |
| CSR | Corporate Social Responsibility |
| DDF | Diesel Dual Fuel |
| ESCO | Energy Service Company |
| EV | Electric Vehicle |
| GEC | Global Environment Centre Foundation |
| GHG | Greenhouse gas |
| JCM | Joint Creditting Mechanism |
| KPI | Key Performance Indicator |
| LED | Light Emitting Diode |
| MW | Mega Watt |
| NDC | Nationally Determined Contribution |
| OECD | Organisation for Economic Co-operation and Development |
| PPA | Power Purchase Agreemen |
| PV | Photovoltaic |
| SDGs | Sustainable Development Goals |
| SPEC | Special Presidential Envoy for Climate |

# CHAPTER 1. BACKGROUND AND OBJECTIVES

## 1.1 BACKGROUND

Paris Agreement which entered into force in November 2016 and into implementation stage from 2020, mentions that not only central governments but also non-governmental actors and local governments and cities need to accelerate their countermeasures to climate change. Also, in "Ministerial meeting of the "Online Platform" on a Sustainable and Resilient Recovery from COVID-19" held in September 2020, the necessity of zero-carbon policies of local governments leading directly to communities and the importance of development approach by initiatives of local communities were confirmed. In Japan, the Government declared that Japan is aiming to become a zero-carbon society by achieving zero emission of overall greenhouse gas (GHG) by 2050 and more than 300 local governments declared net zero emissions.

Roles of cities and local governments are becoming more important to consider and implement climate change countermeasures and projects in each region. Toward realization of zero-carbon society in the entire globe, it is necessary to accelerate movements to sustainable and zero-carbon society especially in Asia where economic growth is remarkable. Thus, international supports for city activities have been promoted for realization of zero/low-carbon society with supporting activities for development of society and the economy.

Also, under current situation of COVID-19 pandemic, while tackling issues related to the pandemic, cities are required to re-coordinate and consider new policies to achieve sustainable development. From this perspective, it is important to develop new measures for cities by collaboration between cities.

In 2020, the Chilean Government updated its nationally determined contribution (NDC) and set an interim target of 95 $MtCO_2eq$ of greenhouse gas (GHG) emissions by 2030, an emissions peak by 2025, and a carbon budget not exceeding 1,100 $MtCO_2eq$ from 2020 to 2030 with a vision to achieve carbon neutrality by 2050[1]. In 2019, Government also announced a plan to close all coal-fired power plants by 2040 and achieve carbon neutrality in the energy sector by 2050, and to aim at 70% of the energy mix to be based on renewable energy by 2030.[2] To achieve these government targets as well as green recovery from COVID-19 pandemics, there are high expectations for reduction of GHG emissions and financial support by JCM model projects mechanisms.

At the municipal level, Renca Municipality, located in the capital city of Chile, Santiago, is one of the municipalities where GHG emission sources such as thermal power plants and factories are concentrated. Renca has been actively committed to climate change issues and announced participation in Race to Zero campaign at COP26 in 2021, as a first municipality of Chile. As one of the solutions to achieve the target of Race to Zero, there are high expectations

[1] https://mma.gob.cl/wp-content/uploads/2020/07/Ingles-21-julio.pdf

[2] https://www.gob.cl/noticias/presidente-pinera-presento-plan-para-cerrar-todas-las-centrales-energeticas-carbon-para-que-chile-sea-carbono-neutral/

for knowledge and information sharing through city-to-city collaboration projects and financial support through JCM model projects.

## 1.2 OBJECTIVES OF THE PROJECT

The purpose of this project is to introduce and transfer the knowledge of the SDGs Future City Plan and various know-how and technologies of Toyama City, which takes an advanced approach to climate change based on strategies such as compact city, to Renca Municipality, which is actively working on climate change, and to pave the way to solve the problems of Renca Municipality. Specifically, the following activities were carried out in order to support Renca Municipality to formulate and implement its climate change action plan through JCM model projects schemes.

＜City-to-city collaboration activities: Support for policy formulation＞

- Sharing information on energy-saving and renewable energy technologies and target-setting methods for the SDGs Future City Plan
- Sharing information on the Zero Carbon City Declaration

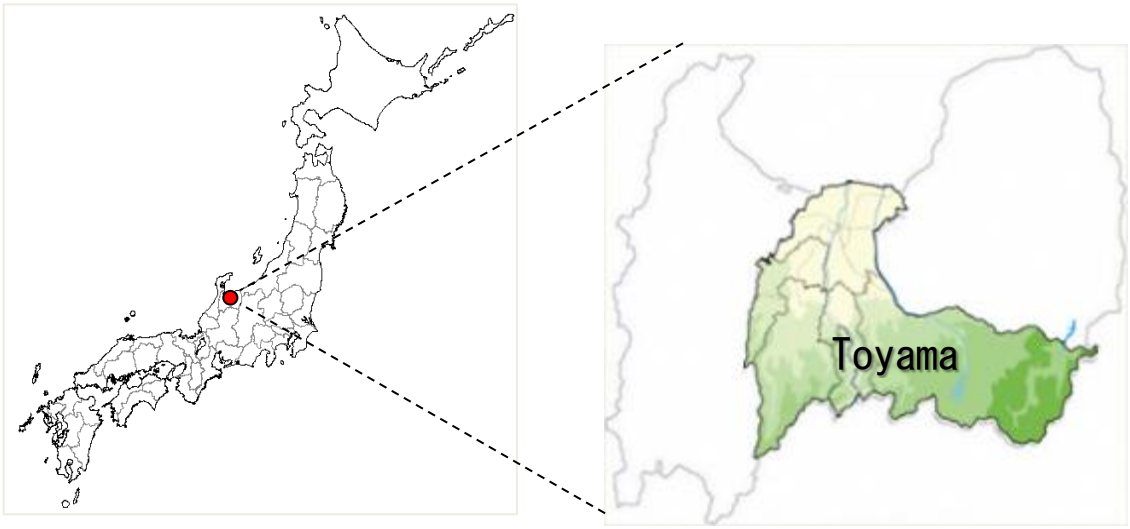
＜JCM project formation activities＞

- Consideration of JCM model projects

## 1.3 CITIES THAT PARTICIPATED IN THE PROJECT

### 1.3.1 Toyama City

Toyama City is the capital and the largest city of Toyama Prefecture, located in the central and southeastern part of the prefecture, and is designated as a core city. The location map of Toyama City is shown in the following figure, and the main statistics of the city are shown in the following table.




Source: Toyama City

**Figure 1-1 Location map of Toyama City**

**Table 1-1 Outline of Toyama City**

| # | Item | Overview |
|---|---|---|
| 1 | Area | 1,241.70 km2 |
| 2 | Population | 410,976 (as of January 2022) |
| 3 | Population density | 331 people/km2 (as of January 2022) |
| 4 | Number of households | 182,291 (as of January 2022) |
| 5 | Number of businesses | 22,883 (Economic Census for Business Frame in 2019) |
| 6 | Major industries | Wholesale and retail trade:348 establishments (% of18.6 total)<br>Real estate and goods leasing:238 establishments (% of12.8 total)<br>Construction industry:197 establishments (% of10.6 total)<br>(Basic Survey of Economic Census, 2030) |

Source: Prepared by Nippon Koei based on the Toyama City

Toyama City has been actively publishing its efforts to build a sustainable city both in Japan and abroad (Table 1-2). Toyama City has experience of international cooperation in environmental and agriculture fields, including the Ministry of the Environment's City-to-City Cooperation Project, mainly in Southeast Asia, especially in Indonesia.

The major initiatives by Toyama are summarized as follows.

**Table 1-2 Activities of Toyama City for Sustainable Urban Development and City-to-City Collaboration**

| Year | Item | Overview |
|---|---|---|
| 2008 | ECO Model City | Efforts to shift to a "low-carbon society" and $CO_2$ reduction plan based on the compact urban development were highly evaluated. |
| 2011 | Environmental Future City | The strategic proposal for a compact city was considered to be a model for solving the problems faced by local cities. It also plays a role in disseminating Toyama City's knowledge and various initiatives both nationally and internationally. |
| 2014 | Sustainable Energy for All | A plan aimed at improving energy efficiency was formulated to achieve the targets proposed by the United Nations SE4ALL. |
| 2014 | 100Resilient City | Toyama City was selected by the Rockefeller Foundation as one |

| Year | Item | Overview |
|---|---|---|
| | | of 100 Resilient Cities (RC100) that have resilience to risks and challenges faced by cities, such as natural disasters. |
| 2016 | G7 Toyama Environment Ministers Meeting | Promoting city-to-city collaboration for development of resilient cities that have the best balance between quality of life, economic growth and the environment. Mayor Mr. Mori summarized the discussions in the parallel session "The Role of Cities" as the Chair of session. |
| 2018 | FY2018 City-to-City Collaboration Project between Toyama City and Bali, Indonesia | Toyama City, as a diverse environmental city, shared their knowledge with Bali, and examined the application of JCM model projects with low-carbon projects (energy saving, renewable energy, fuel conversion, etc.) in which companies in Toyama City have. |
| 2018 | SDGs Future Cities and model project for SDGs of local government | Toyama City was selected by the Cabinet Office as a municipality that integrally commit to a wide range of social and environmental issues. |

Source: Prepared by Nippon Koei based on information provided by Toyama City.

The background of start city-to-city collaboration between Toyama City and Renca Municipality is summarized in the following table.

**Table 1-3 City-to-City collaboration between Toyama City and Renca Municipality**

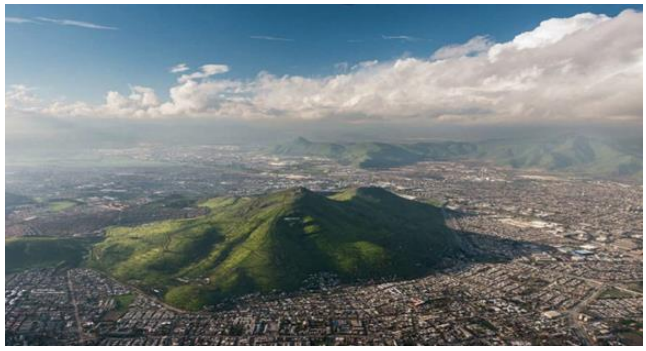
| # | Period | Overview |
|---|---|---|
| 1 | March 2019 | Mayor of Toyama and Renca exchanged their opinions at OECD Meeting. |
| 2 | May 2019 | Toyama and Renca signed a cooperation agreement. |
| 3 | December 2019 | Discussions between Renca and Toyama in Madrid (during COP25 of UNFCCC) was made on renewable energy and city-to-city collaboration project. Toyama provided information on its initiative for SDGs. Mayor of Renca expressed his interest in city-to-city collaboration project with Toyama. |
| 4 | March 2020 | Information sharing on the municipal response to Covid-19. |
| 5 | September 2020 | Started city-to-city collaboration project of Ministry of the Environment, Japan |
| 6 | August 2021 | Started the second year of city-to-city collaboration project |

Source: Prepared by Nippon Koei based on information from Toyama City

### 1.3.2 Renca Municipality, Santiago City

The partner city, Renca Municipality, is one of the 32 administrative municipalities of Santiago City, the capital of Chile, and has the following characteristics.

Estimated population: 608,470,000 (of which 11.9% is over 65) (as of 2020)
Area: 24.20km$^2$
Population density: 6,647/km$^2$ (as of 2020)
Climate: Mediterranean climate,
Annual rainfall about 281.0mm (Santiago City)
Geology: Renca hill is the symbol of Renca Municipality, located on the border with Kilicula Municipality to the north.

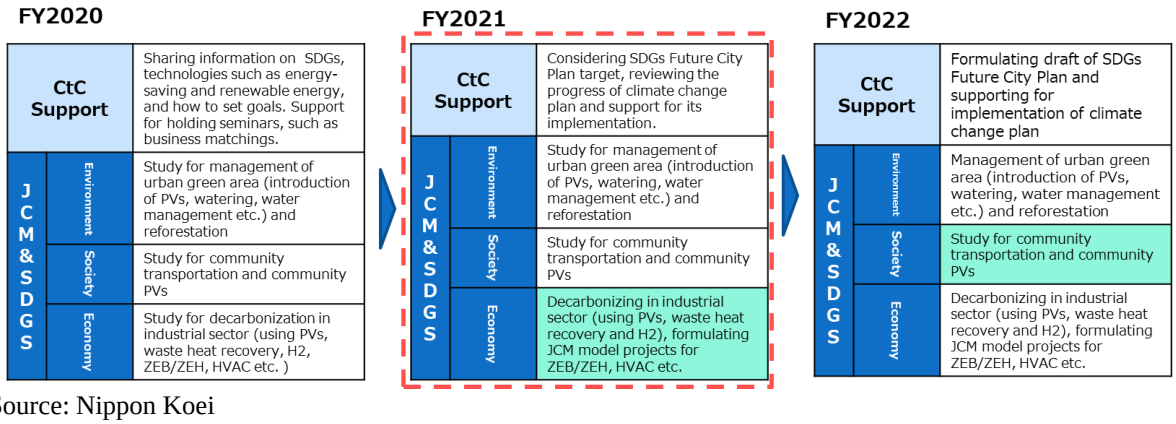



Source: Prepared by Nippon Koei from Instituto Nacional de Estadísticas

**Figure 1-2 Location map of Renca Municipality and Renca Hill**

## 1.4 THREE-YEAR PLAN

In this project, based on the analysis of needs and issues of Renca Municipality, potential activities were examined as follows: 1) administrative support by city-to-city collaboration, 2) formulation of JCM model projects that contribute to the decarbonization of the city and 3) promotion of SDGs. The activities and targets for the three-year were planned as follows.



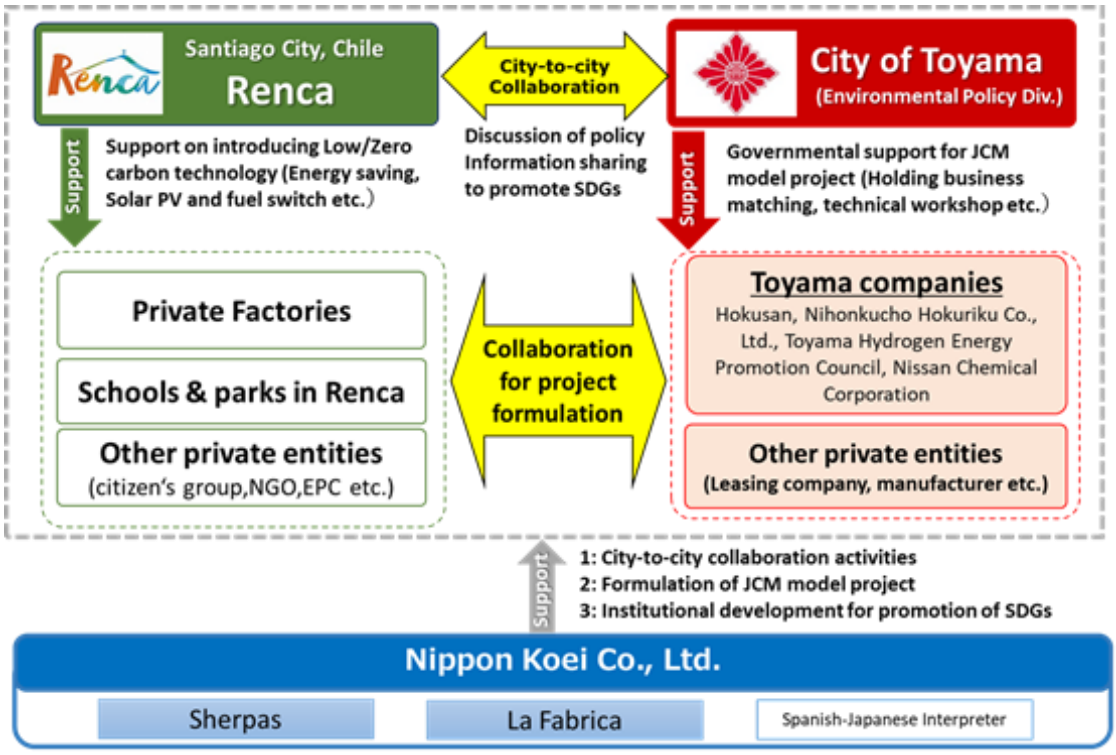

Source: Nippon Koei

**Figure 1-3 Three-year plan**

## 1.5 IMPLEMENTATION STRUCTURE OF THE PROJECT

The implementation structure of this project is shown in the following figure. Under the umbrella of collaboration between the two local governments, companies of both cities carried out activities for JCM model project formulation, and Nippon Koei plays a role of supporting the whole process as a consultant.

Since it was difficult to travel to Chile due to the global pandemic of COVID-19, implementation structure in Chile was strengthened to facilitate smooth discussions and conduct research activities with Renka Municipality and local companies by subcontracting with public enterprises of Renca and local consultants.




Source: Nippon Koei

**Figure 1-4 Implementation structure**

## 1.6 SCHEDULE

The schedule of this project is shown in the following figure.

| # | Project overview | August | September | October | Nobember | December | January | February | March |
|---|---|---|---|---|---|---|---|---|---|
| City-toCity Project | | | | | | | | | |
| 1 | Meetings between Toyama and Renca | | | | | | | | |
| | 1)Sharing SDGs activities and technologies such as energy-saving and renewable energy and target settings | | | | | | | | |
| | 2)Sharing information on Zero Carbon City Declaration | | | | | | | | |
| 2 | Introduction of IT/DX technologies for SDGs actions | | | | | | | | |
| JCM Formulation | | | | | | | | | |
| 1 | Meetings and survey for JCM formulation | | | | | | | | |
| | Survey on hydrogen fields | | | | | | | | |
| 2 | Discussions on the consortium for JCM applications | | | | | | | | |
| 3 | Planning MRV draft for JCM application | | | | | | | | |
| 4 | Preparation for JCM formulation after FY2021 | | | | | | | | |
| Others (regular meetings and events) | | | | | | | | | |
| 1 | Monthly progress report | | | ▼ | ▼ | ▼ | ▼ | ▼ | ▼ |
| 2 | Report meeting to MOEJ (about 3times) | | ▼ | | | ▼ | | ▼ | |
| 3 | Workshop in Chile (Webinar) | | | | | | ▼ | | |
| | Meeting with Renca (online) about onece or twice a month | | ▼ | ▼ | ▼ | | ▼ | ▼ | |
| 4 | Meeting designated by the MOEJ: Chile (online) | | | | | | | ▼ | |
| 5 | Meeting designated by the MOEJ: Japan (online) | | | | | | | | ▼ |
| Survey and report | | | | | | | | | |
| 1 | Survey in Chile and sharing information | | | ▼ | | ▼ | ▼ | | |
| 2 | Meetings in Japan (Toyama City or Tokyo) | | ▼ | | ▼ | | ▼ | ▼ | |
| 3 | Final report | | | | | | | | ▼ |

Source: Nippon Koei

**Figure 1-5 Project Schedule**

## 1.7 OVERVIEW OF THE FIELD SURVEY

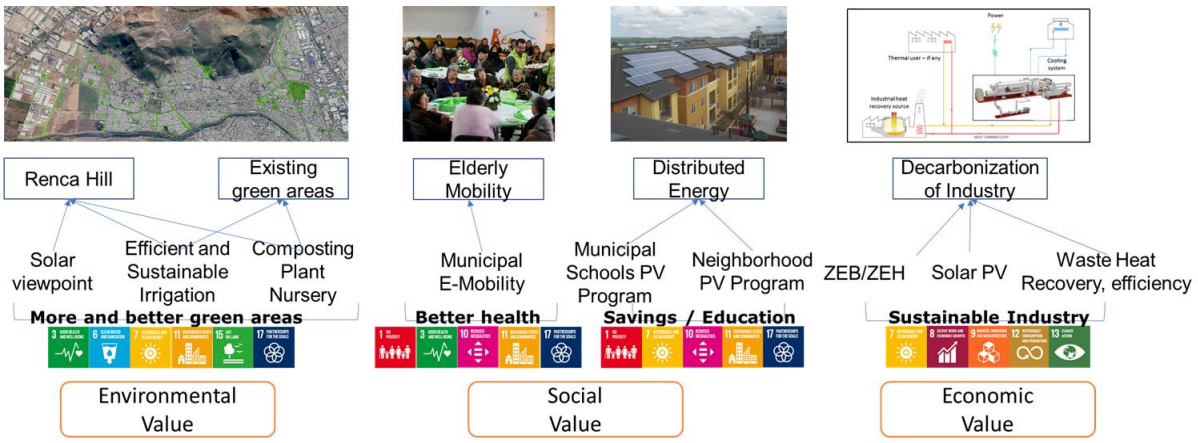
Since field survey from Japan to Chile were difficult to conduct in this year due to the pandemic of COVID-19, implementation structure to subcontracts to local companies was established for smooth implementation of the activities in Renca Municipality.

The online meetings are mainly described in Chapter 4 and the JCM model projects formulation activities are described in Chapter 2.

# CHAPTER 2. ACTIVITIES RELATED TO ENERGY CONSERVATION, RENEWABLE ENERGY, AND TRANSPORTATION INFRASTRUCTURE

## 2.1 NEEDS OF RENCA MUNICIPALITY FROM VIEWPOINTS OF ENVIRONMENTAL, SOCIAL AND ECONOMIC VALUES

The needs of Renca Municipality identified in the first year of CtC collaboration project is shown in the following figure. The needs were categorized into environmental, social and economic values related to SDGs, which refer to the "Toyama City SDGs Future City Plan". Needs by category are outlined in the next section.




Source: Nippon Koei

**Figure 2-1 Direction of project formation based on the needs of Renca Municipality**

### 2.1.1 Needs related to environmental values

#### (1) Reforestation of the Renca hill and urban green space

Renca has a hill with an altitude of about 900m in the north, and occupies about 20% of the municipality's area. Reforestation and park development of the hill are listed as one of the measures in the Renca Municipality Climate Change Plan (2019). Renca developed the Master Plan for the area of 207 ha owned by the municipality in the hill in a participatory manner for involvement of the inhabitants. The plan includes activities such as plantation of native tree species, development of park facilities (parking lots, walkways, sightseeing platforms, gymnasium, etc.). Renca has started implementation of the Master Plan since 2017 together with contractors and residents. Technical needs related to implementation of the plan are presented by Renca as follows: i) development of sustainable irrigation facilities for tree plantation, and ii) introduction of solar power generation systems and lighting equipment to the park facilities (seedlings nursery, parking lots, and lookouts, etc.). The image of some of the facilities is shown in the following figure.

In FY2021, based on the Lenca Municipality preferences, a survey was conducted to introduce PV facilities into the parking lot at Lenca Hill. (Projects targeting urban green space were not considered this year).. The results of the study are shown in Figure 2-2.

Image of eco-nursery of Renca hill

Image of lookout of Renca hill

Source: Renca Municipality

**Figure 2-2 Example of Facilities in Renca Hill**

### 2.1.2 Needs related to social values

#### (1) Improvement of transportation for welfare of the elderly

In Chile, aging of population has progressed significantly in recent years, and welfare of the elderly people has become an important issue. In June 2019, Japan and Chile signed a Memorandum of Understanding on Cooperation for an Aging Society, and it is of high interest to provide technical assistance from Japan, which has a wealth of experience in the welfare of the elderly. Approximately 15% of Renca municipality's population accounts for over 60 years of age, of which 65% receive basic solidarity pensions which are supposed to be provided to the elderly people with lower pension income. Since it was found that the cost of transportation to hospitals and government offices is a significant burden for elderly people, Renca started to development of free transportation for the elderly as a part of welfare services. In 2020, an electric vehicle was introduced as a part of CSR activities from a private company, and pilot activity of this welfare service was started. In the future, in order to increase the number of buses for expansion of the target area and increase of circulation routes, introduction of electric/hydrogen vehicles was presented as a need by Renca.

In FY2021, Toyama Hydrogen Energy Promotion Council was subcontracted for technical proposals related to the introduction of hydrogen and fuel cell vehicles (FCV). The results of the study are summarized in 2.3.1.

#### (2) Development of off-grid power sources for schools and social houses

Renca has more than 10 municipality schools and some social houses for low-income people. In order to strengthen sustainability of the facility, Renca presented a need for development of

off-gird power sources through introduction of PV (PV) power generation systems for backup power source and reduction of electricity costs.

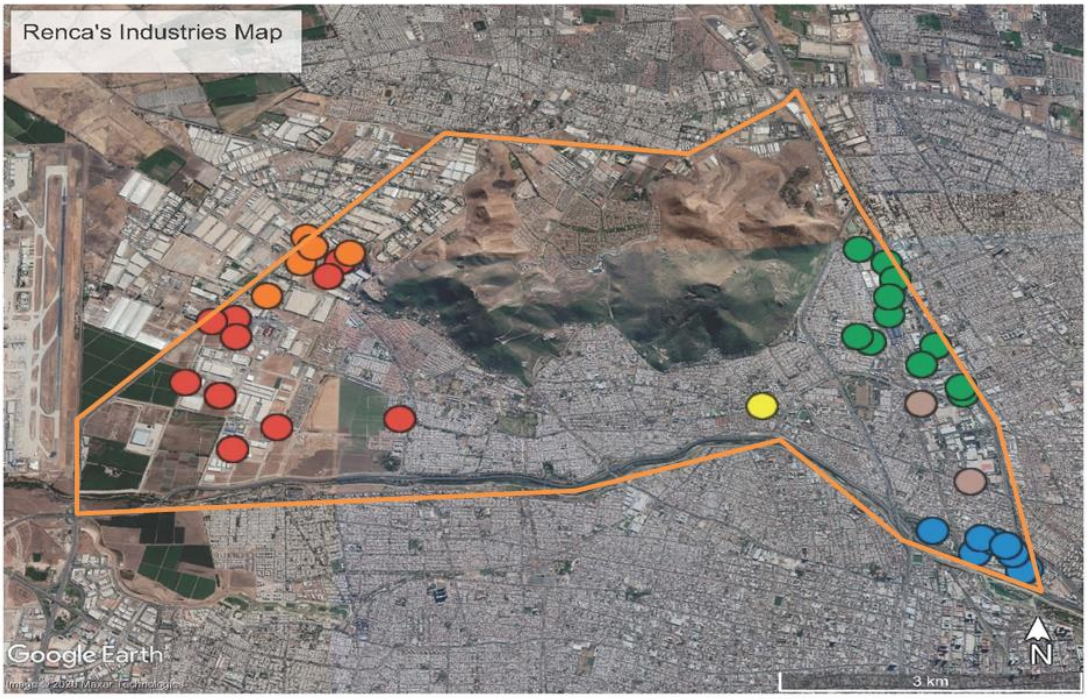
As a result of reviewing these needs, the feasibility of a health center was higher than that of schools and social houses, so JCM model projects formation was considered through outsourcing to Nihonkucho Hokuriku Co., Ltd., La Fabrica, and Sherpas. The results of the study are summarized in 2.2.1.

### 2.1.3 Needs related to economic value

#### (1) Decarbonization of Renca Municipality-related Companies

Since Arturo Merino BenIez International Airport is located just outside the western edge of Renca, there are many factories, warehouses, etc. of enterprises (e.g., beverage manufacturers, refrigerated warehouses, etc.) engaged in industrial activities within Renca for better access to distribution and transportation. These companies and facilities are the main sources of GHG emission of Renca, thus Renca presented its need for promotion of decarbonization of the companies/factories by formulation of JCM projects. As decarbonization technologies, the following potential technologies were presented: energy saving of factory buildings, energy saving in industrial processes (waste heat recovery power generation, etc.), and private power generation by PV system, etc.

Since the needs for the introduction of green hydrogen production equipment and the hydrogen mobility were identified this year, Hokusan Co. Ltd. was subcontracted to implement an overall study on the JCM model project formulation as a candidate for a representative company. In addition, In addition, Sherpas conducted coordination and discussions with local stakeholders. The results of the study are summarized in 2.3.1.




*Orange line: area of Renca Municipality (overview) Coloured circles: main industrial centres

Source: Renca Municipality

* The color of the circle is the geographical classification of factories by region as a cluster by Lenca Municipality.

**Figure 2-3 Location of Main Industrial Facilities in Renca**

### (2) JCM model projects identified in the 1st year of the CtC collaboration project

The following table summarizes the results of preliminary study for identification of potential JCM model projects conducted in the 1st year of the project. The identified potential JCM model projects are grouped into the following five categories: i) introduction of PV power generation system on the roof of the factory (private enterprise facilities and public facilities), ii) reduction in volume of industry waste which contributes to reduction of traffic load, iii) energy conversion of vehicles (forklifts, trucks, etc.) (conversion of fuel to DDF/natural gas/electrification), iv) introduction of hydrogen/electric bus, and v) wastewater treatment. Among these, three potential projects highlighted green color in the following table had feasibility study for formulation of JCM projects, and the results of the study are described in the next section.

**Table 2-1 Results of Preliminary Study for Identification of Potential JCM Model Projects Conducetd in the 1st year of the Project**

| | Company/ Organization Name | Industries, products and services | Potential applicable technologies | Progress/ result of discussion | Future plans |
|---|---|---|---|---|---|
| Economic Value (Decarbonization of Industrial Sector) | Company A | Chemical manufacturers | PV power generation (1-3 MW) | Interest in introducing PV system to facilities (warehouses) consuming 5 MW.<br>Obtained information on the roof shape of the subject facility.<br>Examine potential of expansion of the target facilities to the ones of group companies<br>Started discussions with ESCO company. | Examine applicability of PV panel fixtures produced Sekino Solar System based on the information on roof shape and material.<br><br>Define target facilities, scale of power generation, implementation structure etc. |
| | Company B | Warehouse | Rooftop PV system (max 0.3MWp) | Obtained drawings of warehouse.<br>Under study of structure of rooftop | Upon obtaining information on roof structure, confirm applicability of PV panel fixtures of Sekino Solar System<br><br>Define target facilities, scale of power generation, implementation structure etc. |
| | Company C | Warehouse | PV power generation<br>LED<br>High-efficiency chiller<br>Insulation material<br>Improvement of efficiency of compression machine for waste cardboard<br>Disposal of waste pallets | Under discussion with company C for planning the details of the projects<br><br>Under confirmation of potential companies in Toyama which has technology on cardboard compression and waste pallet disposal | Collection of information on target facilities and equipment |
| | Company D | Metal | Emission reduction from vehicles (forklifts, etc.) by conversion of fuel to natural gas, electrification, etc. | Under internal discussion on model project in Company D<br><br>Under collection of information on the potential target vehicles | After confirming the results of internal discussions, feasibility of introducing natural gasification technology will be studied based on the information on the target vehicles. |

| | Company/ Organization Name | Industries, products and services | Potential applicable technologies | Progress/ result of discussion | Future plans |
|---|---|---|---|---|---|
| Environmental value (Reforestation of Renca hill) Social value (provision of water resources) | Company E | Foods and beverages | Wastewater Treatment, Recycled Water, etc. (under discussion) | Interested in activities that contribute to social welfare as well as energy saving and emission reduction in its own manufacturing processes. It is necessary to formulate an activity plan for three years by the end of February.<br>Another beverage manufacturer compnay has provided treated wastewater to the local communities free of charge. Similar activity for production of irrigation water for Renca hill reforestation is proposed and under discussion.<br>Plantation of Renca hill will begin in May 2021 and terminate in FY 2021 as a memorial for those who passed away by Covid-19. | Continue discussion for formulation of model project based on the there year plan. |
| Social value (transportation | Company F | Energy | Fuel cell (FC) bus | Donated an electric bus. Interested in donating a fuel cell bus as well.<br>Under internal discussion of the company for application to JCM scheme. | After confirming the results of tinternal discussion, preliminary feasibility study of introduction of FC bus will be implemented. |
| Environmental value (Reforestation and development of Renca hill metropolitan park) | Renca Municipality | Local governments | PV system (max 1MW) | Memorial monuments and forest parks are to be developed for those who havepassed away by Covid-19. Installation of PV system to the roofs of parking lots for visitors, gymnasiums, and office etc. Generated power will be self-consumed, and surplus power is transmitted to the grid system.<br>Under discussion on details of the master plan and implementation plans with the personnel in charge. | Study on the structure of roof, capacity of PV to be installed, etc.<br>Confirm institutional barriers in implementation of power generation by local governments. |

Source: Nippon Koei

## 2.2 FEASIBILITY STUDY FOR FORMULATION OF JCM MODEL PROJECTS

### 2.2.1 Installation of rooftop PV system to the facilities of Renca Municipality and factories of a Renca-based company, Company A

#### (1) Overview of the project

Among the potential projects identified in the 1st year, in this year, feasibility study was conducted for the following two potential projects considering higher motivation of the potential participants to apply for JCM model projects: i) PV system installation to facilities owned by Renca Municipality and ii) PV system installation to some factories of Company A, a company in Renca Municipality. Since the scale of the project i) is too small to apply for JCM model project independently, integration of these projects and application as one JCM model project were proposed, and both potential partner participants agreed. The overview of the project is shown in the following table.

**Table 2-2 Overview of a JCM model project studied in the 2nd year (draft)**

| | |
|---|---|
| **Project title** | Installation of roof-top solar PV to facilities of Renca Municipality and factories of Company A |
| **Implementation structure** | Representative participant: Nihonkuucho Hokuriku Co., Ltd.<br>Partner participants: (1) Renca Municipality (2) Company A Group (3) ESCO operators |
| **Background** | Increase of renewable energy is one of the prior challenges for Renca Municipality to achieve Race-to-Zero. Renca municipality would like to lead acceleration of introduction of renewable energy starting with the Municipality's public facilities.<br>Needs of decarbonization in energy of the private sector |
| **Activities** | Installation of roof-top PV system to Renca Municipality facilities (car park and gymnasium)<br>Power generation capacity: 0.09 MWp<br>Project power generation: total 140 MWh/year<br>Estimated emission reductions: 53.37 tCO/year$_2$<br>Installation of roof-top PV system to the factories of Company A Group, a company based in Renca Municipality<br>Power generation capacity: 1.47 MWp<br>Project power generation: 2,253 MWh/year<br>Estimated emission reductions: 852 $tCO_2$<br>*Increase of capacity is under evaluation |

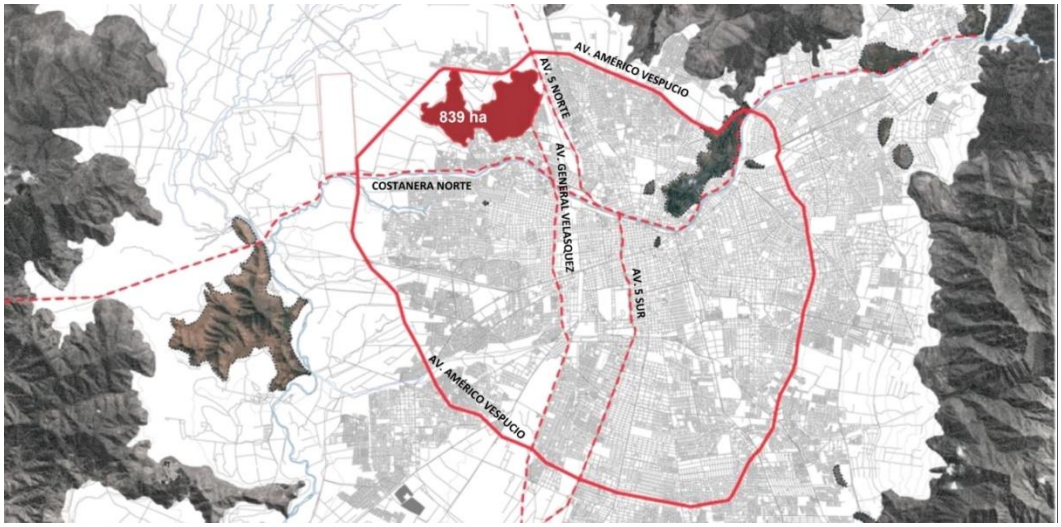
Source: Compiled by Nippon Koei based on ESCO operators' proposals

#### (2) Target facilities

■ **Target facilities proposed by Renca Municipality**

The following figures show the location and appearance of the target facilities in Renca Municipality. All of the proposed facilities are located in the park of Renca Hill in the northern part of Renca Municipality. Renca Municipality is planning to build a monument to those who died from COVID-19 in a park, and is proposing to install rooftop PV system to the car parking

for the visitors, and the gymnasium by JCM model project. It is assumed that the power generated by the PV system will be consumed on site and any surplus will be connected to the grid.




Location of Renca hill where target facilities exist/ to be built (Red colored area: Renca hill, Red line: boarder of Santiago)

Target facility to be installed (Orange frame): Car parking

Target facility: Gymnasium

Source: Nippon Koei

**Figure 2-4 Location and overview of the target facilities proposed by Renca Municipality**

In addition to the two target facilities described above, Renca municipality proposed some additional facilities including health clinic for installation of rooftop PV system. From the end of February to March, Esco company will visit the proposed facilities to assess possibility of installation, and capacity of power generation.

■ **Target facilities proposed by Company A Group in Renca Municipality**

The following figures show the location and appearance of the proposed facilities by Company A Gropup, a company based in Renca Municipality, which started its business in the field of polymer production about 40 years ago and currently operates 7 companies providing polymer and metal products and services to major mining and construction companies in Chile and abroad. The three factories are located in the northwest of Renca Municipality, and Company A Group proposed to install rooftop PV system for GHG emission reduction from their factories by JCM model project.

The structural strength of both the Renca and Company A Gropup facilities for the installation of rooftop PV panels was confirmed by a strength assessment carried out by a local specialist company.

### (3) Plan for installation of PV systems

■ **Plan for the installation of PV systems to the target facilities proposed by the Renca Municipality**

The plan for the installation of the PV system to the target facility was developed by a Chilean ESCO company. The following table outlines the plan.

**Table 2-3 Draft plan for the installation of PV system to the facilities proposed by Renca Municipality**

| No. | Target facilities | Power generation capacity<br>Number of solar panels | Amount of electricity generated<br>(MWh) |
|---|---|---|---|
| 1 | Car park | 60.48 kWp<br>112 panels | 97.63 |
| 2 | Gymnasium | 29.16 kWp<br>54 panels | 43.2 |
| | Total | 89.64 kWp<br>166 panels | 140.83 |

Source: Compiled by Nippon Koei based on ESCO companys' proposals

The layout of the rooftop PV panels in the target facility has been proposed by each ESCO companies.

■ **Plan for the installation of PV systems to the facilities of Company A Group**

The following table outlines the plan for installation of PV systems to Company A Group facilities.

**Table 2-4 Draft plan for the installation of PV systems to Company A Group facilities**

| No. | Company/ Target facilities | Power generation capacity Number of solar panels | Amount of electricity generated (MWh) |
|---|---|---|---|
| 1 | X/ Metalworking plant | 541.08 kWp 1, 002 sheets | 797 |
| 2 | Y/. Drainpipe and film production plant | 481.14 kWp 891 sheets | 753 |
| 3 | Z/ PVC Pipe Manufacturing Plant | 449.28 kWp 832 sheets | 703 |
| | Total | 1,471.5 kWp 2725 sheets | 2,253 |

Source: Compiled by Nippon Koei based on ESCO business proposals

The layout of the rooftop PV panels in the target facility has been considered by ESCO companies, and the information has been collected (This report does not include that information due to confidentiality).

### (4) Calculation of estimated GHG emission reduction

The GHG emission reductions from this project were estimated by using the JCM methodology CL_AM001 "Installation of Solar PV System" as shown below.

$ER_p = RE_p - PE_p$
$= RE_p$

$ER_p$ : Emission reductions during the period *p* [tCO/p2].
$RE_p$ : Reference emissions during the period *p* [tCO/p2].
$PE_p$ : Project emissions during the period *p* [tCO/p2] = 0

$$RE_p = \sum_i \left(EG_{i,p} \times EF_{RE,i}\right)$$

$RE_p$ : Reference emissions during the period *p* [tCO/p2].
$EG_{i,p}$ : Quantity of the electricity generated by the project solar PV system *i* during the period *p* [MWh/p].
$EF_{RE,i}$ : Reference emission factor of the project solar PV system *i* [tCO/MWh2].

| Parameters | Description of data | Source |
|---|---|---|
| $EF_{RE,i}$ | Reference emission factor of the regional grid and/or captive power generator which is displaced by the project solar PV system *i*.<br>The value for $EF_{RE,i}$ is selected from the list of emission factors in the following manner:<br>PV Case 1: In case the solar PV system(s) in a proposed project activity is connected to a regional grid including through internal grid which is not connected to a captive power generator, $EF_{RE,i}$ is set as follows per the connected regional grid:<br><br>Regional grid name: Emission factor for PV Case 1:<br>SEN (National System) 0.404 $tCO/MWh_2$<br>Aysén System 0.176 $tCO/MWh_2$<br>Magallanes System 0.361 $tCO/MWh_2$<br><br>PV Case 2: In case the solar PV system(s) in a proposed project activity is connected to an internal grid connected to both a regional grid and a captive power power generator, $EF_{RE,i}$ is set as follows per the connected regional grid:<br><br>Regional grid name: Emission factor for PV Case 2:<br>SEN (National System) 0.404 $tCO/MWh_2$<br>Aysén System 0.176 $tCO/MWh_2$<br>Magallanes System 0.361 $tCO/MWh_2$<br><br>PV Case 3: In case the solar PV system(s) in a proposed project activity is connected to an internal grid which is not connected to the regional grid, $EF_{RE,i}$ is set at 0.533 $tCO/MWh_2$. | The default emission factor is obtained from a study of electricity systems in Chile and the most efficient diesel power generator (49% heat efficiency).<br><br>The default value is revised if deemed necessary by the JC. |

Source: JCM Methodology CL_AM001 "Installation of Solar PV System".

The following table shows the estimated GHG emission reductions from the installation of PV systems to facilities of Renca Municipality and Company A Group based on this methodology.

**Table 2-5 Estimated GHG emission reductions from installation of PV system to facilities of Renca Municipality and Company A Group**

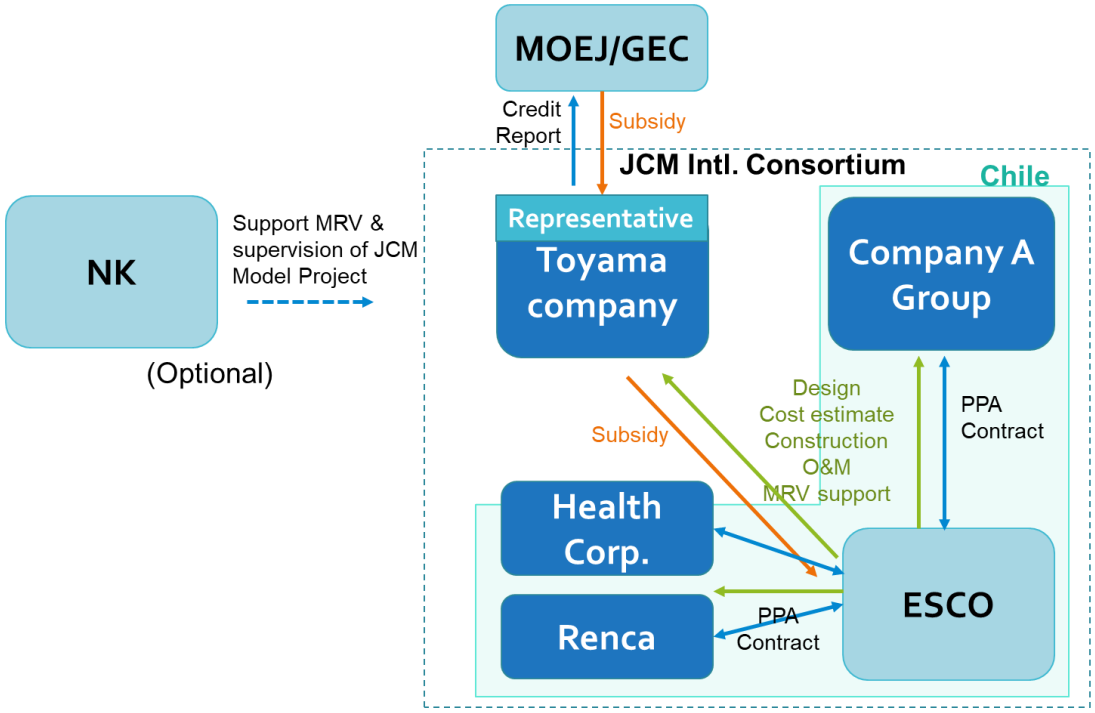
| No. | Joint Operators | Eligible facilities | Amount of electricity generated (MWh/yr): EG | Emission Factor ($tCO_2/MWh$): EF | Emission reductions ($tCO_2$/year) |
|---|---|---|---|---|---|
| 1-1 | Renca Municipality | Car park | 97.63 | 0.533 | 52.04 |
| 1-.2 | | Gymnasium | 43.2 | | 23.03 |
| 2-1 | Company A | X / Metal process plant | 797 | | 424.8 |
| 2-2 | | Tehmco S.A./ Drainpipe and film production plant | 753 | | 401.35 |

| | | | | | |
|---|---|---|---|---|---|
| 2-3 | | Tehmco PVC/ PVC Pipe Manufacturing Plant | 703 | | 374. 7 |
| Total | | | 2, 393. 83 | - | 1, 275. 91 |

Source: Prepared by Nippon Koei based on ESCO company proposal and JCM methodology CL_AM001 "Installation of Solar PV System".

### (5) Implementation structure

The proposed implementation structure of the project is shown in the following figure. Renca Municipality, Company A Group, and health corporation of Renca, will sign a Power Purchase Agreement (PPA) with a same ESCO company, which will act as the power generator, install PV systems and sell electricity to the building owners (Renca Municipality, Company A Group, and health corperation). Renca Municipality, Company A Group, health corperation and an ESCO will form a JCM international consortium with a representative participant, a Toyama City-based company. The term of PPA contract has been adjusted by discussion with the potential participants so that the contract period could cover the legal durable years of the equipment to be installed in the project.




Source: Nippon Koei

**Figure 2-5 Draft implementation structure**

The main roles of the members of the international consortium are shown in the following table.

**Table 2-6 Major roles of the members of the international consortium**

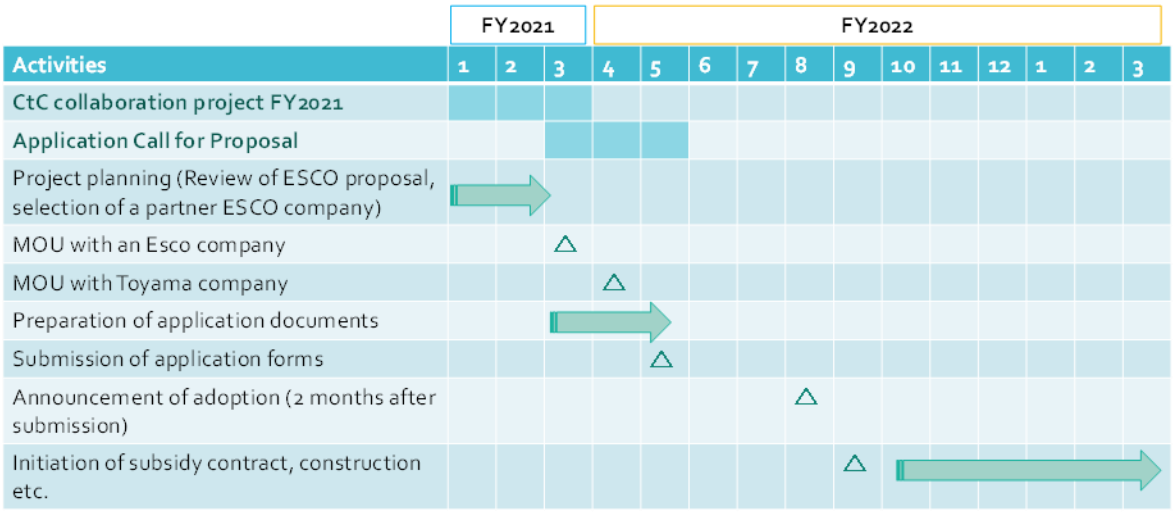
| Members | Major roles |
|---|---|
| ESCO operator | Responsible for design, estimation, construction, O&M of the PV system as the owner of the equipment during the PPA contract period, and provide the representative company with the data necessary for the MRV required for JCM model project. |
| Representative participant | Supervise installation and operation of the equipment, transfer subsidy to the ESCO company, submit credit reports to MOEJ, submit necessary information for audits based on the data provided by the ESCO company. |
| Renca Municipality and Companies in Renca municipality | During the term of the PPA: cooperate with MRV, maintain the building where the PV system is installed, and pay the electricity bill to ESCO company based on PPA.<br>After expiry of the PPA contract: transfer the equipment to MRV and will be responsible for the maintenance of the equipment. |

Source: Nippon Koei

### (6) Project schedule

The following figure shows a proposed schedule of the project from January FY 2021 to the end of FY 2022.

From January FY 2022 to May FY 2022, discussion with the consortium participants and preparation of application documents for the JCM model project of FY 2022 will be conducted. Once adoption is announced, a contract on subsidy and PPA contract between the ESCO company and the Renca Municipality/Renca Municipality companies will be started, and procurement will be completed in about 2 months, installation will be completed within five months, and operation of the installed equipment will be started in 2022/23.




Source: Nippon Koei

**Figure 2-6 Proposed implementation schedule**

## 2.3 FEASIBILITY STUDY FOR FORMULATION OF FINANCING PROGRAMME TO DEMONSTRATE DECARBONIZATION TECHNOLOGY FOR REALIZING CO-INNOVATION

### 2.3.1 Renca Municipality Fuel Cell Vehicle Installation Project

#### (1) Overview of the project

One of the potential projects identified in the first year, the project to introduce hydrogen technologies in Renca complex for energy transition in the Republic of Chile requires advanced technologies such as the production and use of green hydrogen. Considering the characteristics of the project, in consultation with the Ministry of the Environment, it was confirmed that this project fits more to the scheme "Financing Programme to Demonstrate Decarbonization Technology for Realizing Co-Innovation" (hereinafter called "Co-innovation project") than JCM model project. Hence, in this year, a feasibility study for formulation of Co-innovation project was conducted with the proponent company "Company F", Renca Municipality, and Hokusan Co., Ltd., a company based in Toyama city. With the Chilean stakeholders, expected specifications of the equipment to be installed (water electrolyser, hydrogen station, fuel cell vehicle) were discussed. Based on such expected epscification, possibility of procurement of equipment satisfying the needs, schedule, and cost were discussed with Hokusan, Japanese equipment manufacturers and distributors. The proposed project outline is shown in the following table.

**Table 2-7 Draft outline of the project studied for formulation of Financing Programme to Demonstrate Decarbonization Technology for Realizing Co-Innovation**

| | |
|---|---|
| **Project title** | Project to introduce hydrogen technologies in Renca complex for energy transition in the Republic of Chile |
| **Structure** | Representative participant: Hokusan Co., Ltd.<br>Partner participants: Company F (Company operated jointly by a Chilean company and a French company) |
| **Background** | National policy<br>[Chile] Government of Chile developed national green hydrogen strategy in 2020, in which it announced that it aims to become a green hydrogen exporting country by 2040.<br>[Japan] Government of Japan promotes international collaboration to realize a hydrogen society. It considers hydrogen procurement from Latin America.<br><br>Needs<br>[Renca Municipality]<br>In step with the aging of the population, welfare services need to be improved and strengthened. It needs expansion of mobility services for the elderly (e.g. circulating buses). Based on participation in the Race to Zero campaign, Renca municipality is accelerating decarbonisation to achieve the plan announced for RtZ.<br><br>[Company F]<br>Thermal power generation company in Renca Municipality. Company F is interested in hydrogen mixed-combustion and hydrogen burning plant for decarbonisation. In order to learn about the technologies and regulations related to hydrogen production and use, |

| | |
|---|---|
| | Company F is interested in producing green hydrogen and use for FCV as a first step. As a company based in Renca Municipality, Company F would like to contribute to Renca Municipality through its CSR activities likewise its experience in the past, contribution to Renca by donation of an electric bus for mobility for the elderly.<br><br>[Hokusan]<br>Toyama City company participating in the project. In the CtC project with Jakarta, Indonesia, Hokusan introduced Dual Diesel Fuel for the public buses of Jakarta. Hokusan is interested in participating in the hydrogen import business in the future. |
| **Activities** | Installation of one unit of 1 MW water electrolysis for hydrogen production and hydrogen station in Company FGM's facility in Renca Municipality.<br>Procurement of one FC bus and FC sedan cars to Renca Municipality, and donation to Renca municipality (number and type of cars to be discussed with Toyota and Mitsui)<br>Hydrogen is produced by water electrolysis installed in the activity 1 above by electricity generated by CompanyF's rooftop PV, and used for FCVs mentioned in activity 2, which are then used for public mobility, mainly for the elderly. |

Source: Nippon Koei

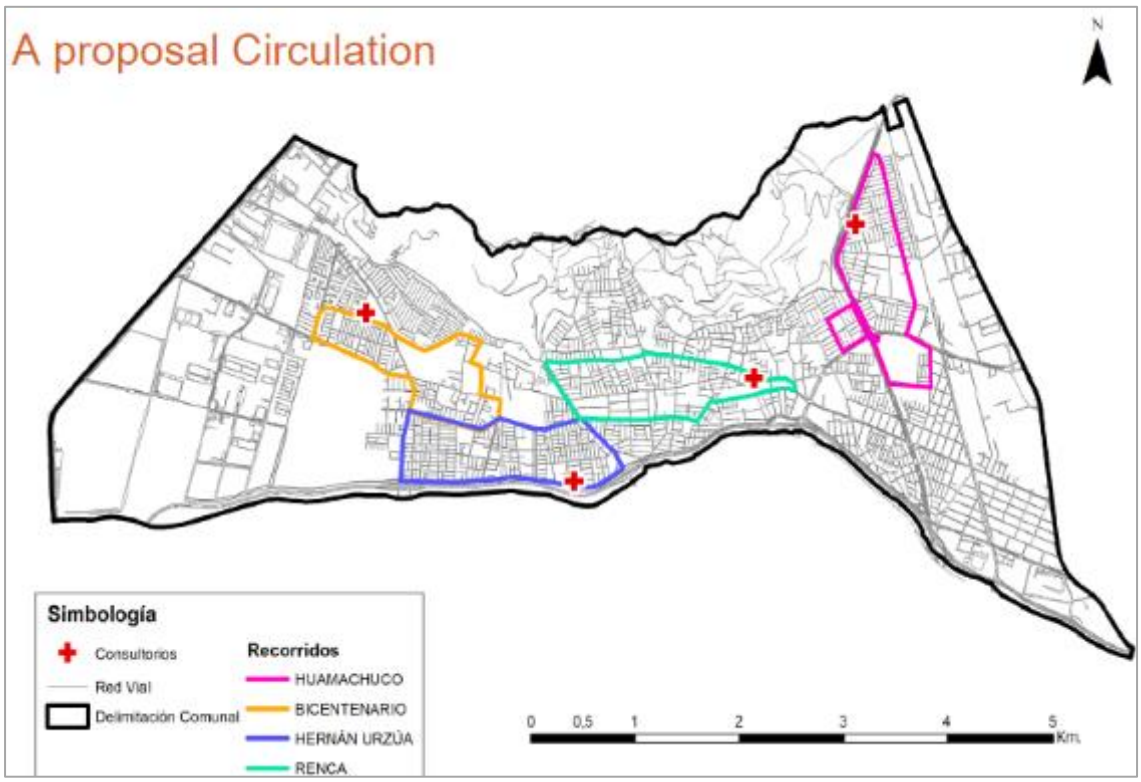
### (2) Target facilities where the equipment will be installed

■ **Water electrolysis hydrogen production equipment and filling equipment (hydrogen station)**

The water electrolysis hydrogen production unit and the hydrogen station will be installed in Company F's thermal power plant located in the south-eastern part of Renca Municipality.

■ **Fuel cell vehicles**

Both FCVs and buses will be installed in Renca Municipality (local government itself) and will travel on the public roads within the municipality area. The FC buses will be used as a public circulating mobility service to enable the elderly residents of the municipality to travel between their homes and clinics free of charge. The following figure shows the bus routes planned in 2019. All routes planned covered a distance of approximately 120 km per day. The FCVs will be used for business transportation of the personnel of the local government, and no fixed routes are envisaged.




Source: Renca Municipality

**Figure 2-7 Proposed FC bus circulation route map by Renca Municipality**

### (3) Overview of equipment for installation

■ **Water electrolysis hydrogen production equipment and filling facility (hydrogen station)**

As the equipment for hydrogen production and filling, on-site hydrogen station including electrolyzer called “Simple Fuel” of PDC machines was proposed by Hokusan, and the outline of this proposed project for co-innovation scheme was explained to the Japanese representative of PDC machines. The company expressed interest in the project and the introduction of hydrogen stations in Chile, and began to confirm the requirements of the fuel cell vehicles/buses to be introduced, to adjust specifications as appropriate, and to prepare a quotation. Simple Fuel was introduced as a reference by the Ministry of Economy, Trade and Industry (METI) at the Hydrogen and Fuel Cell Strategy Committee meeting held in August 2021[3]. The following table gives an overview of PDC Machines.

[3] https://www.meti.go.jp/shingikai/energy_environment/suiso_nenryo/pdf/027_02_00.pdf

**Table 2-8 Overview of PDC Machines Ltd.**

| | |
|---|---|
| **Foundation** | 1977 |
| **Employee** | About 180 |
| **Production base** | USA Pennsylvania (ISO 09001 certified factory, ASME Section VIII, Division 1 certified factory) |
| **Sales base** | USA, China, Korea, Japan, Germany |
| **CEO** | Kareem Afzal |
| **Product** | diaphragm compressors/ hydrogen station |
| **Delivery record** | In total of 4,000 units of compressors sold all over the world.<br>In total of 520 units of hydrogen station installed (share 60% of the market) |
| **Certification/Standard-compliance** | ASME, ANSI, AWS, CSA, CE< SQL.KGS, KOSHA, NEC, NFPA, OSHA, KHK, UL |

Source: https://www.meti.go.jp/shingikai/energy_environment/suiso_nenryo/pdf/027_03_00.pdf

The following table gives a basic specification of Simple Fuel introduced by the Ministry of Economy, Trade and Industry in its meeting for hydrogen-FC strategy committee.

Simple fuel is package-type station containing water electrolyzer, developed by PDC machines, a company of USA.
Although the capacity of hydrogen dispense is limited and dispense rate is slower, since it is small and can save space, it has possibility to be installed in distribution outlets of vehicles. It also can save cost of installation and O&M as well.
It can function as initial station for smaller demand, and will function as backup station in remote areas where current ST has not yet been installed.

（出典）FCエキスポHP、PDCマシンズ日本法人より資源エネルギー庁作成

| | |
|---|---|
| Type | SF70-10/20 |
| Capacity | 10kg/day・20kg/day |
| Dispense pressure | 70MPa |
| Accumulator capacity | 25kg |
| Dispense rate | 10-15 mins (3kg) |
| Electrolyzer | PEM (purified water) |
| Size | 3m x 1.5m x 2.5m (for 1 FCV) |
| Durability | 10 years |
| Remark | 3 units of smaller station were installed for forklift in Japan |

Simple Fuel have been installed in Japan for forklift, and in Europe for Caetano's FC bus. Caetano's FC bus is considered as one of the proposed FC buses for the project. The hydrogen station for FC buses installed in Europe has a hydrogen dispenser facility only, does not have water electrolyzer. Thus the size of the hydrogen tank and other factors will have to be adjusted in case of introduction as package type station to Chile for FC bus. The system configuration of Simple Fuel is shown in the following diagram.

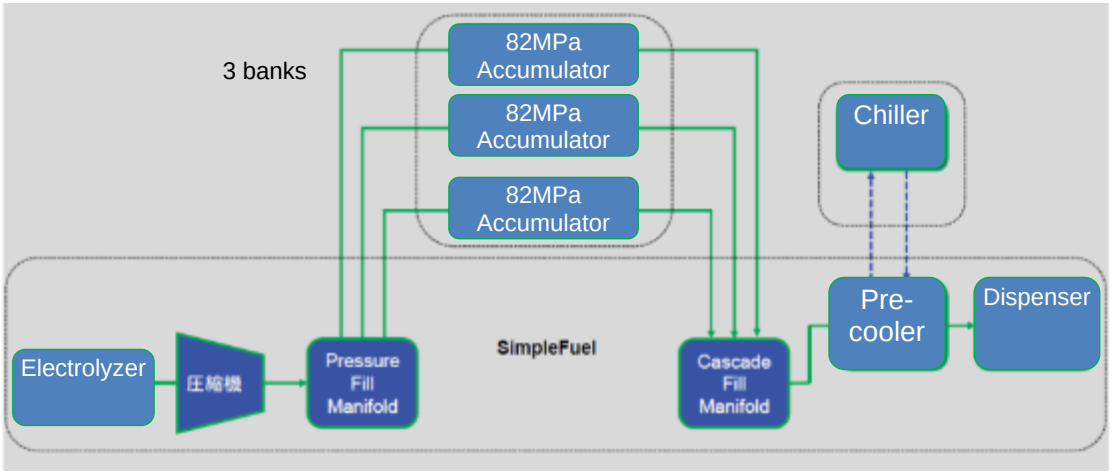



**Figure 2-8 Structure of simple fuel system**

The water electrolysis hydrogen generator, diaphragm compressor, pre-cooler, dispenser section and control system are integrated in the main unit, while the control panel, accumulator, chiller and water purification system (optional) are located separately.

■ **Fuel cell vehicles**

The outline of this proposed project for co-innovation scheme was explained to Toyota Motor Corporation and Toyota Chile (Mitsui & Co., Ltd.) and possibility of delivery of FC bus and FCVs for this project is under discussion.

Toyota Motor Corporation has confirmed that it is possible to introduce to Chile some “Mirai” fuel cell vehicles manufactured by Toyota Motor Corporation and a FC bus manufactured by Caetano SA equipped with Toyota Motor Corporation's fuel cell system, and the maintenance and quality assurance system in Chile is under study by Toyota team. On the other hand, Mitsui & Co. expressed concern about the impact of this project on the development of the fuel cell vehicle market in Chile and the future prospects of the fuel cell vehicle market in Chile. Information related to the expected market impact and the market of FCV and bus in Chile were provided.

Toyota Mirai FCV


Caetano FC bus

**Figure 2-9 FCVs proposed and studied in the project**

Source: Mirai: https://toyota.jp/mirai/grade/equipment/
Caetano:https://www.sustainable-bus.com/fuel-cell-bus/barcelona-receives-first-caetano-hydrogen-bus/

The following table shows the main characteristics of fuels of fuel cell vehicles.

**Table 2-9 Specification related to hydrogen fuels of FCV and FC bus studied**

| Item | Mirai | Caetano fuel cell bus |
|---|---|---|
| Fuel | Compressed hydrogen | |
| Storage method | High-pressure tank (3 tanks) | High-pressure tank (4 tanks) |
| Tank capacity L | 141 | 312<br>(max. 37.5 kg: 350 bars) |
| Operation pressure MPa | 70 | 35 |
| FC stack model and type | FCB130<br>polymer electrolyte fuel cell | polymer electrolyte fuel cell |
| Maximum output kW (PS) | 128(174) | 60 |
| Cruising range per full hydrogen charge km | 750-850<br>(depending on grade, environment and method of operation) | 400 |
| Fuel consumption km/kg | 105 | 16.7 |

Source: Compiled by Nippon Koei based on the following websites
Mirai : https://toyota.jp/mirai/grade/equipment/ https://toyota.jp/mirai/station/faq/index.html
https://www.meti.go.jp/committee/kenkyukai/energy/nenryodenchi_fukyu/pdf/005_04_02.pdf
Caetano :https://caetanobus.pt/en/buses/h2-city-gold/ https://caetanobus.pt/en/esta-ai-o-h2-city-gold-o-novo-autocarro-caetano-a-hidrogenio/

### (4) Permissions and safety regulations in Chile relevant to the project

#### ■ Permission procedures

In Chile, the implementing institution of hydrogen-related projects are required to submit an application for project permission to the Superintendencia de Electricidad y Combustibles (SEC)[4].

#### ■ Safety regulations

In Chile, hydrogen is classified as a flammable gas and a hazardous substance, and the Ministry of Public Health regulates the environment in which it is stored and used. The Ministry of Economic Development and Construction regulates the use of liquid and gaseous fuels for energy, but at present there is no safety regulation specific to hydrogen energy. A summary of the safety regulations for hazardous substances, including hydrogen, enacted by the Ministry of Public Health's is given in the table below.

**Table 2-10 List of hydrogen-related safety regulations in Chile**

| Provisions | Outline of the contents |
|---|---|
| Supreme Decree N° 43 | Regulations for the storage of dangerous goods. Specific provisions on the maximum storage volume and the distance between dangerous goods and combustion equipment. |
| Supreme Decree N° 594 | Regulations on health and the environment at work governing the handling of flammable substances, including hydrogen, in the workplace and fire prevention. |
| Exempt Resolution N° 408 | List of designated dangerous goods. Designation of liquids and compressed hydrogen gas as dangerous goods. |

Source: Nippon Koei

[4] https://energia.gob.cl/sites/default/files/guia_proyectos_especiales_hidrogeno_2021.pdf

### (5) Approach for estimation of GHG emission reduction

Estimate of GHG emission reduction will be made after determination of the number of FCVs/FC buses to be introduced, and their conditions of use. A draft approach for estimation of GHG emission reduction is shown in the table below.

**Table 2-11 Approach for estimation of GHG emission reduction**

| | |
|---|---|
| **Calculation of reference emissions** | Setting of reference emissions:.<br>Emissions from the operation of vehicles (fossil fuel vehicles/electric vehicles) that would have been used for public transport services circulating in the borough.<br><br>Calculation of reference emissions:.<br>$\boldsymbol{RE_y = \sum_i \left(SFC_i \times NCV_{RF,i} \times EF_{RF,i} \times DD_{i,y} \times N_{RF,i,y}\right)}$<br>$RE_y$ Total reference emissions in year $y$ ($tCO_2$/year)<br>$SFC_i$ Specific fuel consumption of reference vehicle category $i$ (l/km)<br>$NCV_{RF,i}$ Net calorific value of fossil fuel consumed by reference vehicle category $i$ (MJ/l)<br>$EF_{RF,i}$ Emission factor of fossil fuel consumed by reference vehicle category $i$ ($tCO_2$/MJ)<br>$DD_{i,y}$ Annual average distance travelled by project vehicle category $i$ in the year $y$ (km/year)<br>$N_{RF,i,y}$ Number of reference vehicles in category $i$ in year $y$ |
| **Calculation of project emissions** | Calculate the fossil fuel consumption in the water electrolysis production of green hydrogen consumed in the project operation. (e.g. fuel consumption of vehicles for transporting water resources needed for hydrogen production, etc.) However, this will be based on the green hydrogen production process to be detailed in the future. |

Source: Compiled by Nippon Koei based on the results[5] of the feasibility study of JCM for 25adults commissioned by GEC

### (6) Implementation structure

The proposed implementation structure of the project is shown in the following figure. Renca Municipality and Company F will form an international JCM consortium with a representative partner, a company of Toyama City.

[5] https://gec.jp/gec/jp/Activities/fs_newmex/2013/2013ds01j_PM.pdf

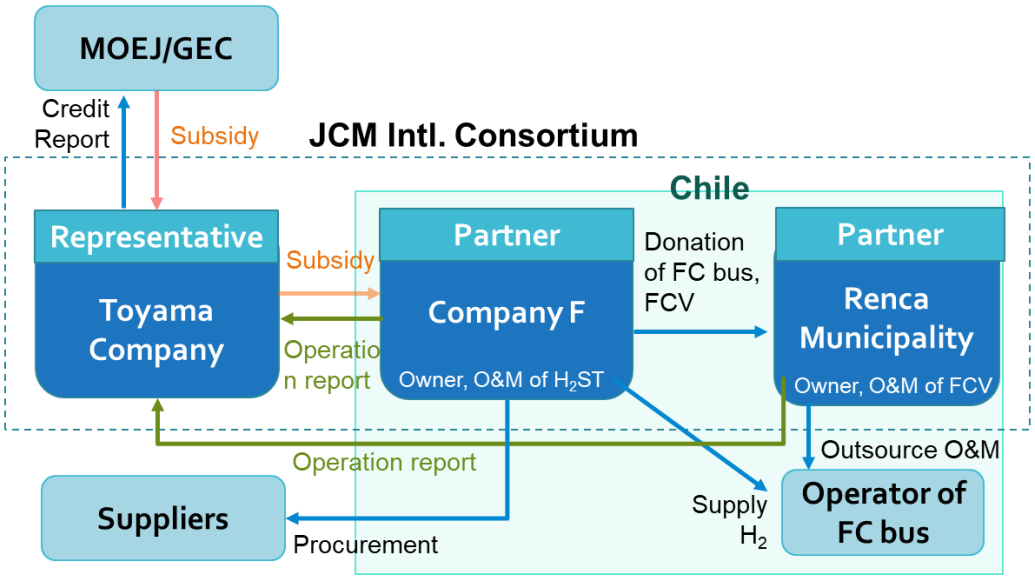



**Figure 2-10 Draft implementation structure**

The major roles of the members of the international consortium are shown in the following table.

**Table 2-12 Major roles of the members of the international consortium**

| Members | Major roles |
|---|---|
| Representative business | Supervise installation and operation of the equipment, transfer subsidy to the partner participants, and submit credit reports to MOEJ and provide necessary information for audit based on data provided by the partner participants. |
| Company F | Install an electrolyser for hydrogen production and a hydrogen station in its premises, and as the owner of the installed equipment, operate and monitor the operational status such as amount of hydrogen produced and filled to FCVs, and report to the monitored results to the representative participant.<br>Under the guidance of the equipment manufacturer, responsible for the maintenance of the equipment installed.<br>Together with Renca Municipality, request necessary permit to the government of Chile, promote public awareness raising on the hydrogen mobility for dissemination of FCV in Chile. |
| Renca Municipality | Owner of the fuel cell vehicle after donation from Company F.<br>Decide tFC bus circulation route with the bus/vehicle operator.<br>Select a bus/vehicle operator for outsourcing bus operation. Obtain vehicle running records the bus operator and report to the representative partner.<br>Together with Company F, request necessary permit to the government of Chile, promote public awareness raising on the hydrogen mobility for dissemination of FCV in Chile. |

Source: Nippon Koei

### (7) Project schedule

The following figure shows a proposed schedule of the project from January FY 2021 to the end of FY 2023. Although the implementation period of the project for Financing Programme to Demonstrate Decarbonization Technology for Realizing Co-Innovation is supposed to be maximum 3 years, the proposed schedule shows until the end of FY2023 according to the budget period of MOEJ for this scheme. This shorter project perios is one of the concerns of

the project, since procurement, construction and starting operation might not be able to be completed within this shorter project period. In the course of preparation for application to the scheme, discussion with MOEJ will be continued.

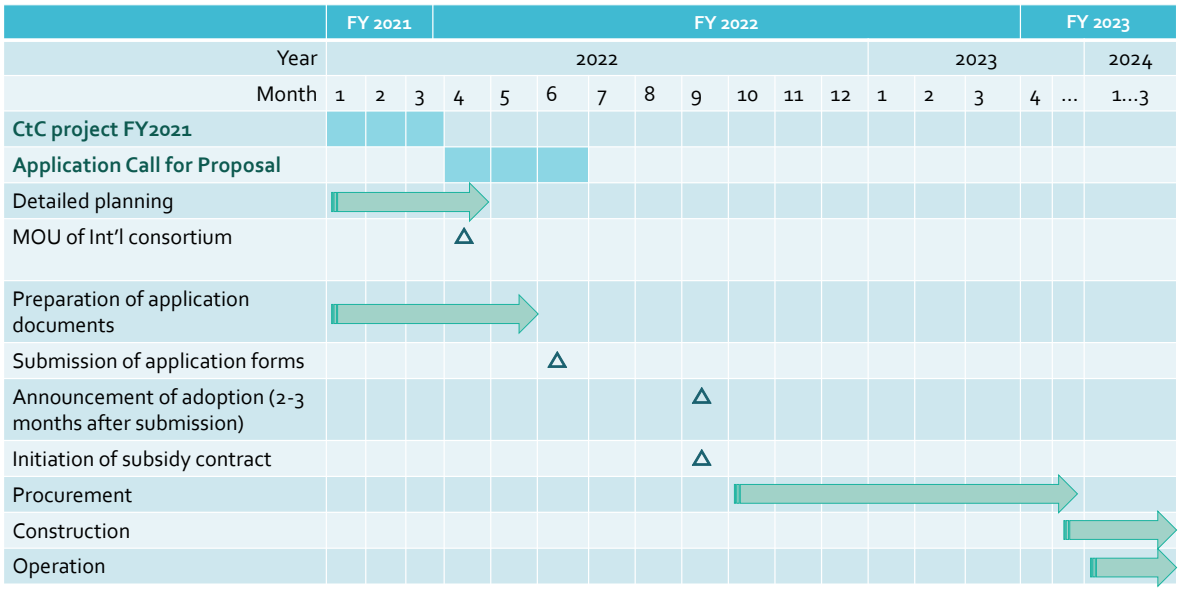



**Figure 2-11 Proposed implementation schedule**

Source: Nippon Koei

# CHAPTER 3. SUPPORT FOR INSTITUTIONAL DEVELOPMENT

## 3.1 SHARING EXPERIENCES OF SDGS AND ZERO CARBON CITY DECLARATION

The project aims to promote SDGs and decarbonization efforts by sharing information and knowledge related to SDGs and Zero Carbon City declaration of Toyama City with Renca Municipality, Santiago City.

In June 2018, Toyama City was selected by the Japanese Cabinet Office as both a "SDGs Future City" and a "Local Government SDGs Model Project." "SDGs Future Cities" are local governments that propose excellent approaches to achieve SDGs among Japanese municipalities. In the first year of 2018, 29 local governments, including Toyama City, were selected. In addition, the "municipal SDGs model project" refers to a project that is making particularly leading SDGs efforts, and 10 projects were selected in the first year of FY2018, including the project of Toyama City.

For this reason, Toyama City, which is actively engaged in SDGs among Japanese municipalities, can provide information and innovations on actual initiatives from SDGs planning through city-to-city collaboration. Therefore, sharing activities of Toyama City is considered to be very useful for Renca Municipality, which is also considering the promotion of SDGs.

For Toyama City, SDG actions are a good example not only for Toyama City, but also for overseas cities, and that they are positioned as one of the initiatives for international cooperation is in line with SDGs's goals. Therefore, the promotion of SDGs has significant merits for both cities.

Toyama City declared Zero Carbon City as the fifth city in Toyama Prefecture in March 2021, in response to the growing momentum toward carbon neutrality by 2050 in Japan. In order to achieve the goal of carbon neutrality, Toyama City has established the "Toyama Regional Circular and Ecological Sphere Model Formation Platform" with local energy companies, universities, financial institutions and local government since 2019. Through this platform, they have been discussing measures to be taken by the public and private sectors. In March 2021, “Toyama City Energy Vision” was published, which sets out policies and reduction targets for achieving carbon neutrality. These Toyama City's efforts through the public-private partnership can be helpful for Renca Municipality, which has interest in decarbonisation and announced its participation in the Race to Zero campaign at COP26.

In FY2021, Toyama City shared information about Toyama City's efforts on SDGs and the Toyama City Energy Vision through the technical meeting. In addition, Toyama City shared

information on the KPI setting method of the energy vision, according to the request of Renca Municipality. In the workshop, the two municipalities and companies introduced examples of their efforts to decarbonisation, and shared knowledge on how to promote activities through public-private partnerships.

## 3.2 OVERVIEW OF SDGS FUTURE CITY PLAN

In recent years, plans formulated by local governments based on national guidelines require the establishment of key performance indicators (Key Performance Indicators, hereinafter referred to as KPIs). For this reason, KPIs have been established in the Toyama City SDGs Future City Plan since the first version. First of all, Toyama City has set three values, namely "economy", "society" and "environment" as its ideal vision for 2030, and shows KPI and priority goals and targets for each value.

The project also promotes initiatives that contribute to the promotion of municipal SDGs in five areas: urban shapes, citizens' livelihoods, energies, industries, and cities and regions. These initiatives are aimed at deepening the content that Toyama City has been working on to date and creating an autonomous virtuous cycle of the Compact City strategy by promoting cross-sectoral and complex initiatives in collaboration with diverse stakeholders for the value of each area of the economy, society, and the environment.

**Table 3-1 Key points of Toyama City's initiatives contributing to the promotion of SDGs**

| # | Item | Overview |
|---|---|---|
| 1 | Shape of the city | Realization of compact city development based on the public transportation |
| 2 | Daily lives of the citizens | Building a healthy and transportation city and establishing a high-quality lifestyle |
| 3 | Energy | Building a safe and environmentally friendly smart city and a self-supporting distributed energy system |
| 4 | Industry | Building technological and social innovation by improving industrial vitality |
| 5 | Cities and regions | Enhancing urban branding through collaboration with various stakeholders |

Source: Toyama City SDGs Future City Plan (2nd)

## 3.3 OUTLINE OF TOYAMA CITY ENERGY VISION

Toyama City Energy Vision, which was formulated in March 2021, is a vision to realize carbon neutrality by 2050 and SDGs targets, and is positioned as a plan to promote efforts in the energy sector among the 5 promotion sectors in Toyama City SDGs Future City Plan. Toyama City Energy Vision aims to promote comprehensive energy policy in collaboration with various stakeholders by promoting renewable energy and energy saving business to encourage local production and local consumption of energy. The target period is 10 years from 2021 to 2030 with a vision to 2050.

In order to set targets in this vision, the potential of renewable energy in Toyama City was firstly assessed. The potential for the introduction of renewable energy in Toyama City is estimated to be 4.09 billion kWh, which is about double the actual amount of 2.01 billion kWh introduced in 2019. Among the renewable energy, the main source is PV power generation,

and there is also potential for medium hydraulic power generation using agricultural water, and biomass power generation using forest resources. The following table compares the actual and potential amount of renewable energy introduced in Toyama City.

**Table 3-2 Amount of the renewable energy introduced as of 2019 and the potential amount to be installed in Toyama City**

| Renewable energy type | Installed amount (FY2019) | Potential amount |
|---|---|---|
| Solar power generation<br>(Housing)<br>(Non-housing) | 125,116,000 kWh<br>27,347,000 kWh<br>97,769,000 kWh | 1100,000,000 kWh<br>kWh<br>kWh |
| Small and medium scale hydropower generation<br>Large scale hydro power generation | 70,991,000 kWh<br><br>1811,568,000 kWh | 760,000,000 kWh<br><br>1810,000,000 kWh |
| Wind power generation (onshore) | 0.0 kWh | 100,000,000 kWh |
| Biomass power generation<br>(Wood)<br>(Digestive gas) | 3281,000 kWh<br>0.0 kWh<br>3281,000 kWh | 320,000,000 kWh<br>310,000,000 kWh<br>8460,000 kWh |
| Total (*excluding large hydro) | 21,010,000,000 kWh | 41,090,000,000 kWh |

Source: Prepared by Nippon Koei from Toyama City Energy Vision

## 3.4 SETTING KPIS IN TOYAMA CITY ENERGY VISION

Based on the above renewable energy introduction potential, Toyama City Energy Vision sets the mid-term targets of renewable energy introduction to double the current level by 2030 (2.21 billion kWh, about 47% of electricity consumption) and increase by 5 times the current level by 2050 (2.81 billion kWh, about 65% of electricity consumption). This milestone align with the target figure set in the national Green Growth Strategy, which is 50%-60% of renewable energy in 2050.

In order to achieve the renewable energy introduction target, Toyama City Energy Vision sets out 16 measures based on 4 policies. The details of the measures are as follows.

**Table 3-3 Policies and measures in Toyama City Energy Vision**

| Policies | Measures |
|---|---|
| Policy1: Renewable energy<br>Expanding the introduction of renewable energy | (1) Expanding PV using PPA model<br>(2) Expanding micro- hydropower generation<br>(3) Promoting biomass energy<br>(4) Promoting EV sharing<br>(5) Promoting hydrogen energy |
| Policy2: Promoting energy conservation | (6) Dissemination of energy-saving technologies and energy resources<br>(7) Improving energy efficiency in private buildings<br>(8) Improving energy efficiency in public buildings |
| Policy 3: Revitalizing the energy business | (9) Modelling of self-sufficient distributed energy system |

| Policies | Measures |
|---|---|
| | (10) Promoting green finance<br>(11) Developing local production of local consumption model of RE<br>(12) Expanding city know-how and companies' technology |
| Policy4: Collaboration with various stakeholders | (13) Promoting energy projects through PPP<br>(14) Expanding energy project base<br>(15) Human resources development for energy projects<br>(16) Considering wide area collaboration in en ergy |

Source: Prepared by Nippon Koei from Toyama City Energy Vision

Toyama City aims to reduce greenhouse gas emissions by 850,390 t-$CO_2$ by 2030 and 3,504,142 t-$CO_2$ by implementing 16 measures based on 4 policies, and to steadily develop measures to achieve carbon neutrality by 2050.

## 3.5 SPECIFIC MEASURES BASED ON TOYAMA CITY ENERGY VISION

Among the 16 measures in the Toyama City Energy Vision, 2 measures, which are particularly important, were shared with Renca Municipality.

1) Expanding PV using the Power Purchase Agreement (PPA) model

Though Toyama City has promoted support for the introduction of solar power generation through subsidy schemes, the number of new installations of solar power generation equipment has been decreasing due to the decline in the feed-in tariff (FIT) purchase price. Therefore, Toyama City has promoted the switch from the power sales model to the self-consumption model and the use of PPA models in public facilities. In addition, Toyama City aims to supply energy to municipal elementary and junior high schools, which are designated as evacuation sites in the regional disaster prevention plan, so that the generating energy can be used as emergency power sources. Toyama City aims to expand the introduction of solar power generation equipment in public and private facilities by utilizing the PPA model, and it will be double by 2030 and five times the current situation by 2050. KPI's targets are as follows.

**Table 3-4 KPIs for the expansion of solar power**

| Item | Current situation | FY2030 | FY2050 |
|---|---|---|---|
| Solar power installations | 125,120,000 kWh | 250,240,000 kWh (Double the current level) | 625,600,000 kWh (Five times the current level) |
| Estimated GHG reductions | - | 101,844 t-CO2 | 254,611 t-CO2 |

Source: Prepared by Nippon Koei from Toyama City Energy Vision

2) Promoting EV sharing

In Toyama City, obtaining local mobility has become an issue due to the declining birth rate and ageing population and declining population in the suburbs. Therefore, Toyama City has installed EV charging stations in suburban administrative centres and 25 EV vehicles to enhance mobility. In the national road map, the target of introduction of EV is 90% by 2050, Toyama City also aims to increase EV 30% by 2030 and 90% in 2050 by promoting EV sharing. The KPIs for promoting EV sharing as follows.

**Table 3-5 KPIs for promotion of EV sharing**

| Item | Current situation | FY2030 | FY2050 |
|---|---|---|---|
| EV introduction rate | - | 30% | 90% |
| Estimated GHG reductions | - | 241,783 t-CO2 | 725,329 t-CO2 |

Source: Prepared by Nippon Koei from Toyama City Energy Vision

**Images of EV**

## 3.6 EXAMPLES OF SDGS AND DECARBONISATION ACTIONS THROUGH PUBLIC-PRIVATE PARTNERSHIPS

The realization of a decarbonized society cannot be achieved only by the efforts of the local government itself, it is important to strengthen collaboration with the private sector, including businesses and citizens. Toyama City Energy Vision also states that collaboration with various stakeholders including the private sector is one of the basic policies, and aims to promote measures through public-private partnership. Therefore, in this city-to-city collaboration project, Toyama City introduced some examples of public-private partnerships to Renca Municipality.

1) Registration of SDGs supporters

Toyama City recruits “SDGs supporters” who promote SDGs for companies, citizen groups and individuals above high school students, and introduces examples of their efforts in the newspapers and the city website. As of 2021, about 900 individuals and 230 organizations and companies have registered as SDGs supporters.

2) Toyama City SDGs Promotion Communicator Training Project

Toyama City has been training "Toyama City SDGs Promotion Communicators" who promote SDGs in their communities and workplaces and implement activities by themselves since 2020. The number of certified communicators is over 70 people, and Toyama City prepares the opportunities for training courses and presenting their activities.

3) Toyama City SDGs Week / Forum

Toyama City holds SDGs week and forum every year to raise awareness of SDGs among citizens and companies. In the SDGs week and forum, there are various events such as workshops, classes for elementary schools, and experience-based events at various locations in the city.

4) Formation of Autonomous Decentralised Energy System Model Project

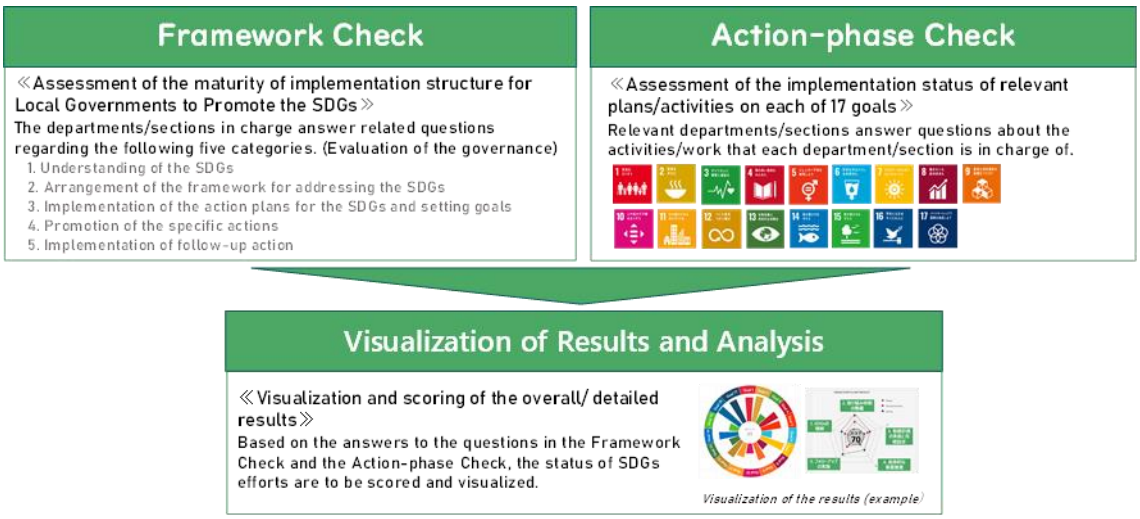
Toyama City and Hokuriku Electric Power Company in Toyama City have introduced PV facilities, storage batteries, EV and EV chargers/dischargers, and energy management system into the city gymnasium, which has been designated as an evacuation site during disasters to promote "energy saving and CO2 reduction" and "BCP function" of energy. They have also considered the introduction of EV sharing to the gymnasium to utilize EV by offering EV to city staff and local residents during normal periods.

## 3.7 DEMONSTRATION EXPERIMENT OF TSUMUGI@: SDGS ASSESSMENT TOOL FOR LOCAL GOVERNMENT

In order to understand the status of the SDGs initiatives conducted by the Renca Municipality and share its strengths and issues among related parties, a demonstration experiment was implemented using the SDGs assessment tool for local government "TSUMUGI @" developed by Nippon Koei.

### (1) Overview of TSUMUGI@

TSUMUGI@ is an online application tool that local governments can easily assess their status of the SDGs initiatives and their status of development of implementation structure, by answering a set of questions on the website. As shown in Figure 3-1, it consists of the Framework Check that assesses the status of construction of the implementation structure to promote SDGs, and the Action-phase Check that assesses the status of SDGs initiatives implemented by local governments for each of 17 goals. The assessment results can be displayed when all questions of each Checks are answered by the related departments and sections of the local government.




Source: Nippon Koei Co., Ltd.

**Figure 3-1 Overview of TSUMUGI@**

### (2) Demonstration Experiment of TSUMUGI@

In the TSUMUGI@ demonstration experiment, the outline of the tool was explained by Nippon Koei at the 2nd Regular Technical Meeting, and the intention of the Renca Municipality was confirmed. Also, the tool was introduced at the Race to Zero / Zero Carbon City Conference in January 2022. After demonstration procedure was explained and discussed at the 3rd Regular Technical Meeting, a series of interviews were conducted to collect the answers to questions with each department in charge as shown below.

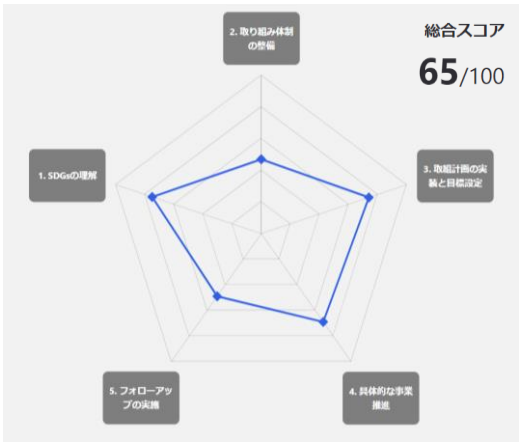
**Table 3-6 Interview to relevant department on the TSUMUGI@ Demonstration**

| Department | Date | Implementation Content |
|---|---|---|
| Department of the Environment, Cleanliness and ornament (DIMAO) | Feb. 15, 2022 9:00-10:00 | Framework Check |
| Inclusion and Gender Department | Feb. 15, 2022 11:30-12:30 | Framework Check／ Action-phase Check |
| Social Department | Feb. 15, 2022 16:00-17:00 | Framework Check／ Action-phase Check |
| Department of Local Economic Development (DEL) | Feb. 16, 2022 16:00-17:00 | Framework Check／ Action-phase Check |
| Community Development Directorate | Feb. 17, 2022 9:30-10:30 | Framework Check／ Action-phase Check |
| DIMAO | Feb. 21, 2022 13:00-14:00 | Action-phase Check |

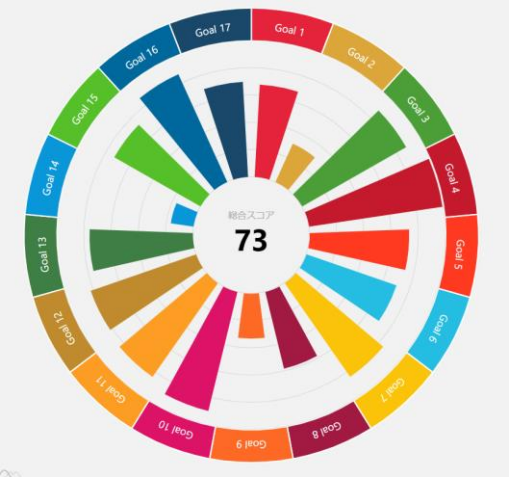
Source: Nippon Koei Co., Ltd.

(3) Demonstration Experiment of TSUMUGI@

Some of the assessment results are shown below. Feedback will be given to the Renca Municipality regarding the analysis results of the Framework Check and the Action-phase Check in February-March, 2022.




**Framework Check**




**Action-phase Check**

Source: Nippon Koei Co., Ltd.

**Figure 3-2 Assessment Result of Renca Municipality (example)**

(4) Next Year's Activities

Based on discussions with the Renca Municipality, in the next fiscal year, the prioritized actions to be conducted for SDGs promotion will be selected in consultation with the Renca Municipality in reference to the assessment results of the Renca Municipality. In parallel, Toyama City's efforts for the SDGs and some best practices related to the Renca's prioritized actions will be shared with the Renca Municipality to consider and examine how to apply them into the Renca's plan. Some of them will be taken action if possible.

In the last step, the Renca Municipality will take the assessment examination again by using TSUMUGI@ at the end of the fiscal year around January to February 2023 to assess the implementation status of the SDGs efforts of Renca Municipality.

# CHAPTER 4. RESULTS OF SEMINARS AND MEETINGS

This chapter summarizes the results of holding various workshops and seminars, as well as regular technical meetings at the working level. Since it was difficult to visit Chile due to the COVID-19 situation, all meetings were held online. Through these meetings, the needs and issues of Renka Municipality were identified and discussed specific support by Toyama City from the perspective of Toyama City SDGs Future City. At the same time, it was considered that the possibility of JCM projects for existing projects and facilities with high potential for renewable energy and energy conservation.

## 4.1 KICK-OFF MEETING WITH MINISTRY OF THE ENVIRONMENT, JAPAN (21 SEPTEMBER 2021)

The kick-off meeting for FY2021 Toyama-Renca city-to-city collaboration project was held online. The summary and results of the kick-off meeting are shown in the table below.

**Table 4-1 Summary of the kick-off meeting with MOEJ**

| **Item** | **Kick-off meeting with MOEJ** |
|---|---|
| **Implementation method** | Online |
| **Date and time** | 21 September 2021, 16:00-16:30 |
| **Overview** | Kick-off meeting for city-to-city collaboration project between Toyama City and Renca Municipality |
| **Objective** | Explain the project outline to MOEJ and exchange opinions regarding the project implementation strategy. |
| **Agenda** | 1.Overview of the project<br>2.Comments and questions on the outline of the project plan and implementation strategy |
| **Participants** | MOEJ (2 people)<br>Toyama City (2 people)<br>Nippon Koei (3 people) |
| **Results** | MOEJ expected to formulate JCM model projects from the needs of the projects identified in last year's activities.<br>MOEJ commented that Renca Municipality has been actively committed to a decarbonization, so it could be useful to share why and how they join Race to Zero. |

Source: Nippon Koei

## 4.2 RACE TO ZERO/ ZERO CARBON CITY SEMINAR (19 JANUARY 2022)

Online Race to Zero / Zero Carbon City seminar was held to promote the Race to Zero activities in Renca Municipality to companies in the Municipality, and to promote decarbonization through public-private partnerships. In addition to the introduction of activities of Renca Municipality and Toyama City, two companies in Renca Municipality and one company in Toyama City made presentations to introduce the examples of collaboration with local governments. Refer to **Appendix-1** for the presentation materials.

**Table 4-2 Overview of the Race to Zero/ Zero Carbon City seminar**

| Item | Race to Zero/ Zero Carbon City Seminar |
|---|---|
| **Implementation method** | Online |
| **Date and time** | 19 January 2022, 20:30-22:30 |
| **Overview** | In addition to the introduction of Renca Municipality's activities for Race to Zero and Toyama City's activities for Zero Carbon City, companies from Renca Municipality and Toyama City make presentations as examples of collaboration activities with local governments to achieve decarbonized society. |
| **Objective** | Promoting decarbonization domino from Toyama City and Renca Municipality.<br>Sharing Mayor of Renca experiences at COP26.<br>Sharing knowledge on how local governments and the private companies can work together to achieve decarbonization goals. |
| **Agenda** | 1. Seminar Opening Remark: Renca Municipality (5min)<br>2. Objective of the Seminar and introduction about "Race to Zero" and "Zero Carbon City: Nippon Koei (10min)<br>3. Renca's Race to Zero: Mayor of Renca Municipality (20min)<br>-Steps in short and mid-term period to be taken to achieve the goals<br>-Key outcomes of COP 26<br>4. Introduction of Toyama City and City-to-City collaboration between Renca Municipality and Toyama City / Good practice for zero carbon city in collaboration with municipality and businesses: Toyama City (20min)<br>5. Seminar session photo with all attendance (2 min)<br>6. Commitment toward net-zero emission by 2050 in collaboration with Renca municipality : Polpaico Sodimac (15min)<br>7. Commitment toward net-zero emission by 2050 in collaboration with Toyama city: Hokuriku Electric Power Company (10min)<br>8. Introduction of SDGs assessment tool "TSUMUGI" for the local government: Nippon Koei (10min)<br>9. Comment from Ministry of the Environment, Japan (5min)<br>10. Comment from Invest Chile in Japan (5min)<br>11. Question and Comments (15min)<br>12. Closing Remark: Toyama City (5min) |
| **Participants** | MOEJ<br>Toyama City and companies in Toyama City<br>Renca Municipality (including mayor), companies and NGOs in Renca Municipality<br>Invest Chile in Japan<br>Nippon Koei, local staff<br>Interpreters (Japanese to Spanish) |
| **Results** | -The importance of collaboration between local governments and private companies to achieve carbon neutrality was emphasized. In addition, sharing experiences and challenges of advanced cases of public-private partnerships led to raise participants awareness of achieving Net Zero in 2050.<br>-Renca Municipality sent invitations to companies and NGOs in the Municipality, and about 70 people attended the event.<br>-Mayor of Renca shared his experience of participating in several side events, including the Japan Pavilion at COP26.<br>-Nippon Koei introduced TSUMUGI, an SDGs assessment tool for municipalities, and agreed to proceed with a demonstration with Renca Municipality.<br>-MOEJ expected that the two cities would continue to work together as Toyama City declared Zero Carbon City and Renca Municipality joined Race to Zero.<br>-The Embassy of Chile expected that this city-to-city collaboration would be a model for other cities interested in decarbonization. |

Source: Nippon Koei


Opening remark

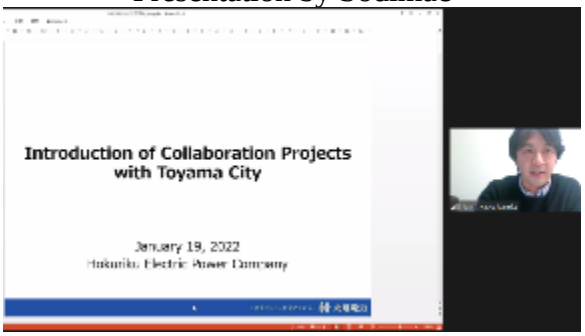

Objectives of seminar


Presentation by Renca Municipality

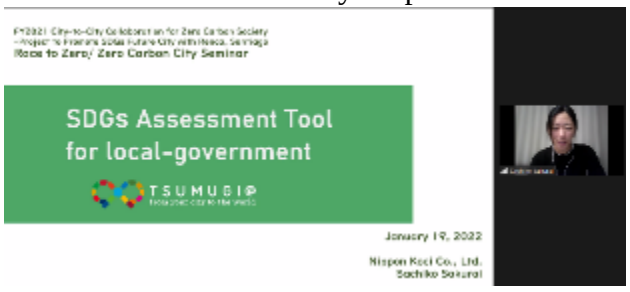

Presentation by Toyama City


Presentation by Sodimac


Presentation by Polpaico



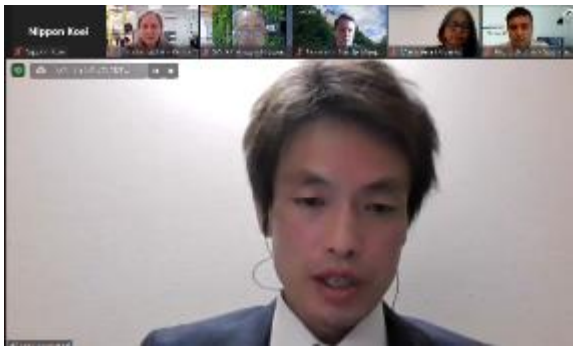

Presentation by Hokuriku Electric Power Company




Introduction of TSUMUGI

Comments from MOEJ


Comments from InvestChile




Closing remark

## 4.3 WEBINAR ON THE JCM IMPLEMENTATION IN CHILE – INNOVATION FOR CARBON NEUTRALITY THROUGH JCM (2 FEBRUARY 20222)

The JCM Chile Webinar "Webinar on the Joint Crediting Mechanism (JCM) Implementation in Chile – Innovation for Carbon Neutrality through JCM", organized by the Global Environment Centre (GEC), was held on 2 February 20222. As a representative of city-to-city collaboration projects, Nippon Koei made a presentation titled "Project to Promote SDGs Future City with Renca, Santiago (City-to-City Collaboration between Renca Municipality and Toyama City, 2021) and JCM Project Development in Chile ", which outlined the project, introduced the activities of two cities, and explained the approach of the city-to-city collaboration project based on SDGs. Refer to **Appendix-2** for the presentation materials.


Introduction of city-to-city collaboration project

## 4.4 THE SECOND ZERO CARBON CITY INTERNATIONAL FORM (9-10 MARCH 2022)

The online city-to-city collaboration seminar originally scheduled for this year was integrated into the Second Zero Carbon City International Forum hosted by the Ministry of the Environment, Japan on 9-10 March 2022. MOEJ together with the Office of the Special Presidential Envoy for Climate (SPEC), U.S. State Department organized the Forum as a part

of the "Global Subnational Zero Carbon Initiative" launched by the in the Side Event at Japan Pavilion of the COP26.

In this forum, leading subnational climate policies and actions and city-to-city collaborations to expanding "Decarbonization Domino Effect" ware shared, and both Toyama City and Renca Municipality introduced their activities.

In addition, **Appendix- 3 was submitted** as result report documents (Japanese and English PPT), which was posted during the Forum.

## 4.5 FINAL MEETING WITH MOEJ (24 FEBRUARY 2022)

The final meeting with MOEJ was conducted to report the results of city-to-city collaboration project between Toyama City and Renca Municipality in FY2021 and the plan for next year's activities.

The summary and results of the final meeting are shown in the table below.

**Table 4-3 Overview of final meeting with MOEJ**

| Item | Final meeting with MOEJ |
|---|---|
| **Implementation method** | online |
| **Date and time** | 24 February 2022, 13:00-14:00 |
| **Overview** | Final meeting of the city-to-city collaboration project between Toyama City and Renca Municipality |
| **Objective** | Report to MOEJ on the results of this year's project and plans for next year. |
| **Agenda** | 1.Report on the results of the project and explanation of the plans for next year<br>2.Comments and questions |
| **Participants** | MOEJ<br>Toyama City<br>Nippon Koei |

Source: Nippon Koei

## 4.6 REGULAR TECHNICAL MEETINGS

In FY2021, three regular technical meetings were held at the working level to confirm the progress of JCM model projects formation and to support the establishment of the system. In the technical meetings, Toyama City shared their activities toward decarbonization with Renca Municipality and identified Renca's needs and issues, and potential projects/technologies for JCM model projects formulation. One of the achievements of the project was that the meetings led to the promotion of understanding and the building of a relationship of trust between the two cities. Refer to **Appendix - 4** for the presentation material.

**Table 4-4 Overview of the regular technical meetings**

| Regular meetings | Date | Overview |
|---|---|---|
| 1st | 12 October 2021 | 1.Purpose of the meeting: Nippon Koei (2min)<br>2. Opening remark: Mayor Renca (3min)<br>3. Energy policy for reduction of GHG emission of Toyama City (20min)<br>4. Activities implemented/planned for reduction of local government footprints/ promotion of private sector to reduce its CO2 emission reduction of Renca city and expected/ facing issues in Renca Municipality (20 min)<br>5. Discussion to embody good practice/ lessons to be shared from Toyama City with Renca Municipality (25min)<br>6. Proposal on the regular meeting between Renca Municipality and Toyama City (3min)<br>7. Closing remark: Toyama City (2min) |
| 2nd | 16 November 2021 | 1.Introduction: Nippon Koei (5min)<br>2. Follow-up for 1st Technical Meeting<br>Methodology for setting and evaluation of Key Performance Indicators of the policies relevant to Energy Vision: Toyama City (10min)<br>3.Questions (5min)<br>4 Discussions on Race to Zero/ Zero Carbon City Seminar (30min)<br>5. Progress of formulation of a JCM project (15min)<br>6. Next technical meeting (10min) |
| 3rd | 10 February 2022 | 1.Purpose of the meeting: Nippon Koei (5min)<br>2. Steps for self-evaluation of SDGs-relevant activities with a tool "Tsumugi" / Image of the self- evaluation result and expected use of the result / Outline of the questionnaire for self-evaluation<br>Proposal of the next meeting for feedback of the self-evaluation result: Nippon Koei (35min)<br>3. Questions (10 min)<br>4. Sharing and discussing the progress of JCM project formation: Nippon Koei (20min)<br>5. Future schedule: Nippon Koei (5min) |

Source: Nippon Koei

# CHAPTER 5. PROJECT MANAGEMENT UNDER THE IMPACTS OF COVID-19

## 5.1 IMPACTS OF COVID-19

The project has been affected in various ways by the pandemic of COVID-19. The major impacts are listed below.

1) Unable to travel: Although this is the 2nd year of the City to City collaboration project, due to the change of some personnel in Renca Municipality, both Toyama City and Nippon Koei started the project without meeting face-to-face.

2) Restrictions on the government budget: In Renca Municipality, health and education are in the same department, and the budget and manpower were affected by COVID-19, so it was not possible to budget for the introduction of solar power in schools.

## 5.2 MEASURES TO MITIGATE THE ADVERSE IMPACTS OF COVID-19

The impact of COVID-19 described above was mitigated by the following measures.

**Table 5-1 Measures to mitigate the impacts of COVID-19 on the project**

| # | Impacts | Measures |
|---|---|---|
| 1 | Unable to travel | ・ Monthly online meeting was held with Renca Municipality and Toyama City to facilitate their communication. Active discussions at the meetings were promoted by facilitation.<br>・ Simultaneous interpretation between Japanese and Spanish was employed at the major seminars to promote mutual understanding.<br>・ In order to materialise the project with both the Renca Municipality and the private sector, two subcontract agreement was made to local institutions to strengthen the coordination and information collection from the local entities. In addition, close communication with the subcontractors and Renca municipalities by e-mail and online meeting was made to facilitate information sharing.<br>・ Since it was not possible to visit the target sites, information was gathered by video recording of the candidate sites by a local contractor. |
| 2 | Restrictions placed on the government budget | ・ Study on installation of PV system in schools was postponed to the next year.<br>・ Due to the limitations in the number of target facilities mentioned above, the scale of the project proposed by Renca municipality, installation of solar power generation systems in public facilities, was too small to apply for JCM model project as one independent project. Integration of the Renca proposed project with another PV system project proposed by a private company, for application as one JCM model project was proposed and agreed by them. |

Source: Nippon Koei

# CHAPTER 6. FUTURE PLAN

## 6.1 PROPOSALS FOR JCM MODEL PROJECTS AND FINANCING PROGRAMME FOR CO-INNOVATION

As mentioned in the three-year plan in 1.4, the target is to develop feasible project in this second year of the City-to-City Collaboration. The activities have been restricted under COVID-19 pandemic, and Toyama City and companies in Toyama have not been able to travel to Renca so far since the start of the project in 2020.

In parallel with the continuation of the city-to-city collaboration in the next fiscal year, applications for JCM Model Project and Financing Programme to Demonstrate Decarbonization Technology for Realizing Co-Innovation are planned. The proposal strategies for these projects are as follows.

### 6.1.1 JCM model projects

Based on last year's conclusions that the formation of photovoltaic projects under the ESCO scheme is promising, this year's study was carried out. As explained in 2.2, it was confirmed that there is high potential to apply for JCM model project of roof-top solar panels on public buildings related to Renca Municipality and private factories in Renca Municipality through the ESCO scheme.

Although there is a remaining issue to finalize the representative participant, Renca Municipality has high expectations for this project. The negotiation with the candidate representative participant will continue to apply for JCM model project in the next fiscal year.

### 6.1.2 Financing Programme to Demonstrate Decarbonization Technology for Realizing Co-Innovation

A proposal for the introduction of hydrogen mobility described in 2.3 will be prepared for Financing Programme to Demonstrate Decarbonization Technology for Realizing Co-Innovation, as it is not suitable for the JCM model project scheme from a cost-efficiency point of view.

Considering that this programme will end in the fiscal year of 2023, it is essential to apply the planned project in the next fiscal year. In addition, it is favorable to promote the project since the Chilean company needs to take some decarbonization action as soon as possible, and the Mayor of Renca is very supportive for this idea. One of the remaining challenges is that commercial fuel cell vehicles have not yet entered the Chilean market, so the business decisions of vehicle manufacturers and distributors are crucial.

## 6.2 FINANCING PROGRAMME TO DEMONSTRATE DECARBONIZATION TECHNOLOGY FOR REALIZING CO-INNOVATION

A technical meeting with Lenca Municipality and Toyama City will be held in March to discuss strategies for continuing to propose the City-to-city Collaboration Project next year. Based on the contents discussed at the previous technical meetings and seminar, the current strategies are as follows.

### 6.2.1 Strategy for next fiscal year (JCM Model project)

(1) With the participation in Race-to-Zero, Renca Municipality needs to take visible actions towards decarbonization and report them. The above two candidate projects (6.2 and 6.3) will be implemented, aiming to contribute to Race-to-Zero through this city-to-city collaboration project. Since it is expected that these projects will continue to be difficult to implement in a remote environment to a certain extent, it is thought to be important to back up these projects through the city-to-city collaboration project so that the support of Renca Municipality can be provided when necessary.

(2) If the commercialization of the ESCO solar installation scheme (6.2) is achieved as a JCM model project, it is expected that there will be many companies that will be interested for future horizontal extension. Activities for horizontal development will be carried out as soon as applications can be submitted next fiscal year.

(3) Through this year's study, it was identified that there is a need for CO2 capture and fixation in the region and that there are Japanese companies that would like to provide technology in this field. In the next fiscal year, a new study on the possibility of CCUS project will be planned.

### 6.2.1 Strategy for next fiscal year (policy level cooperation)

Continuing from the previous year, the information sharing on SDGs future city plan and decarbonization-related plans by Toyama City through regular technical meetings and seminars was effective and highly evaluated by Renca Municipality. This year, the SDG initiative of Renca Municipality was visualized in 3.7, and the discussion on how Renca Municipality would like to proceed with the SDG initiative will be held in coming March, and the result of the discussion will be incorporated into the application for the next year as a concrete activity item. It is important not only to overcome the weaknesses, but also to make the most of the strengths, and this could benefit from the advice of Toyama City.