FY2018 Project for Ministry of the Environment Japan

FY2018
City-to-City Collaboration Programme for Low-carbon Society

Support on Tourism Future City of Bali Province through City-to-City Collaboration

Report

February 2019

Nippon Koei Co., Ltd.
Toyama City

FY2018
City-to-City Collaboration Programme for Low-carbon Society
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Report

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Abbreviations

Items	Description
AHU	Air Handling Unit
BAPPEDA	Badan Perencanaan Pembangunan Daerah
BAU	Business as usual
CNG	Compressed Natural Gas
COP	Conference of Parties
DDF	Diesel Dual Fuel
EIA	Environmental Impact Assessment
EPC	Engineering, Procurement and Construction
ESDM	Ministry of Energy and Mineral Resource
EV	Electric vehicle
GHG	Greenhouse Gases
GPS	Global Positioning System
IGES	Institute for Global Environmental Strategies
IPP	Independent Power Producer
I-RECs	International renewable energy certificates
KEN	Kebijakan Energi Nasional
NDC	Nationally Determined Contribution
JCM	Joint Crediting Mechanism
MFO	Marine Fuel Oil
MHP	Mini Hydropower generation (PLTM)
MOE	Ministry of the Environment
MRV	Measurement, Reporting and Verification
PLN	State Electricity Company (Perusahaan Listrik Negara)
PPA	Power Purchase Agreement
PV	Photovoltaics
RAD-GRK	Regional Action Plan for Greenhouse Gas Emission Reduction
RAN-GRK	National Action Plan for Greenhouse Gas Emission Reduction
RUEN	Grand National Energy Plan 2015-2050
UNFCCC	United Nations Framework Convention on Climate Change
SE4ALL	Sustainable Energy for All
SDGs	Sustainable Development Goals
SDIP	Sustainable Development Implementation Plan
100RC	100 Resilient Cities

CHAPTER 1 OUTLINE OF THE PROJECT

1.1 BACKGROUND

1.1.1 Activities for Low Carbon Society in Indonesia

Under Indonesian national energy policy (Kebijakan Energi Nasional : KEN), Indonesia government has proposed to enhance Oil to Gas, in particular, in order to reduce dependence on fossil fuels goals until 2025 the goals has set such as the rate of petroleum from 49％ to 22％, natural gas from 20％to22％.

As for the nationally determined contribution (NDC), the government committed to reduce 29% of GHG emissions under business-as-usual (BAU) by 2030 and to reduce 41% of GHG emissions with international support such as Joint Crediting Mechanism (JCM). Additionally, based on the Indonesian RAN-GRK, each municipality also promoted RAD-GRK. In January 2017, “Grand National Energy Plan 2015-2050” (RUEN) which promotes energy saving and utilization of natural gas as main purpose has been enacted. Indonesian government is expecting for implementation of JCM scheme agreed between Indonesia and Japan toward achievement of NDC.

1.1.2 Activities of Bali province for Low Carbon Society

The Bali province, where is in the eastern part of Java island, consists of Bali island with surrounding small islands. The capital of Bali is Denpasar, and the population is around 4.2 million people in 2016. The population density is 745 people/km^2, and total area of island is around 5,600 ㎢ which is 0.29% of Indonesia. Total distance of coastline is 610 km. Bali is one of the most famous tourism cities in the world and received 5.7 million foreign/domestic visitors in 2017.

RAD-GRK (2012), governor’s degree No.49, is one of the policies of climate change in Bali was developed based on national policy RAN-GRK. The GHG inventory team for RAD-GRK was formulated under the RUEN and Governor’s order (529/03-X / HK / 2018) regarding structure of the member had been issued in 2018.

1.1.3 Activities of Toyama City for Low Carbon Society

Recently, Toyama city, located on the coast of the Japan Sea, has had many activities for development of sustainable society and has appealed the activities both domestically and overseas.

Table 1-1 Activities of Toyama city for sustainable city and City-to-city collaboration between Bali and Toyama

Year	Activity	Descriptions
2008	ECO Model City	Toyama city was evaluated by activities regarding to advanced low carbon society and CO2 emission reduction plan for developing compact city.
2011	Future City	The strategy of compact city was evaluated as a solution model of the problems of local governments. The Toyama has been expected to promote of its knowledge and experiences of activities to other cities.
2014	Sustainable Energy for All	Toward goal proposed by the United Nations SE4ALL, Toyama city formulated own plan that can expect improvement of energy efficiency in the future.
2014	100Resilient City	Toyama city was selected as one of the 100 resilient cities by Rockefeller Foundation. The definition of RC100 has resilience to the risks and challenges of cities such as natural disasters.
2014	Technical cooperation between Tabanan prefecture and Toyama city	Under the cooperation between Tabanan prefecture of Bali province and Toyama city, four micro hydropower facilities were installed by private companies of Toyama in November 2017.
2016	G7 Environment Ministerial Meeting in Toyama	To promote resilient city through city collaboration for achieving a best balance on the quality of life, economic growth and the environment, Toyama city mayor summarized the discussion about roles of city in the session.
2017	FY2018 City-to-City Collaboration Programme for Low-carbon Society	The project aims to share knowledges of Toyama as Future city with Bali province and to introduce JCM model project using low carbon technologies (such as energy saving, renewable energy and fuel switch) provided by Toyama private companies.
2018	“SDGs Future City” & “Municipalities’ SDGs Model project”	Toyama city was selected as a municipality that integrates efforts on a wide range of subjects related to social and environmental fields by Japanese government.

Source: Toyama city edited by Nippon Koei

In addition, Toyama city has promoted a package of city cooperation and UN future city based on future city plan.

A part of cooperation with overseas municipalities, Toyama city signed an agreement with Bali province for technical cooperation on environmental management in November 2017. As a reference, before the agreement with Bali, Toyama city also made another agreement for sustainable energy supply with Tabanan prefecture of Bali province. The rice terrace “*Jatiluwih*” in Tabanan has been registered as a world heritage term.

November 2017
Technical cooperation on environmental management between Bali and Toyama

March 2015
Technical cooperation on sustainable energy supply between Tabanan and Toyama

1.2 PURPOSE OF THE PROJECT

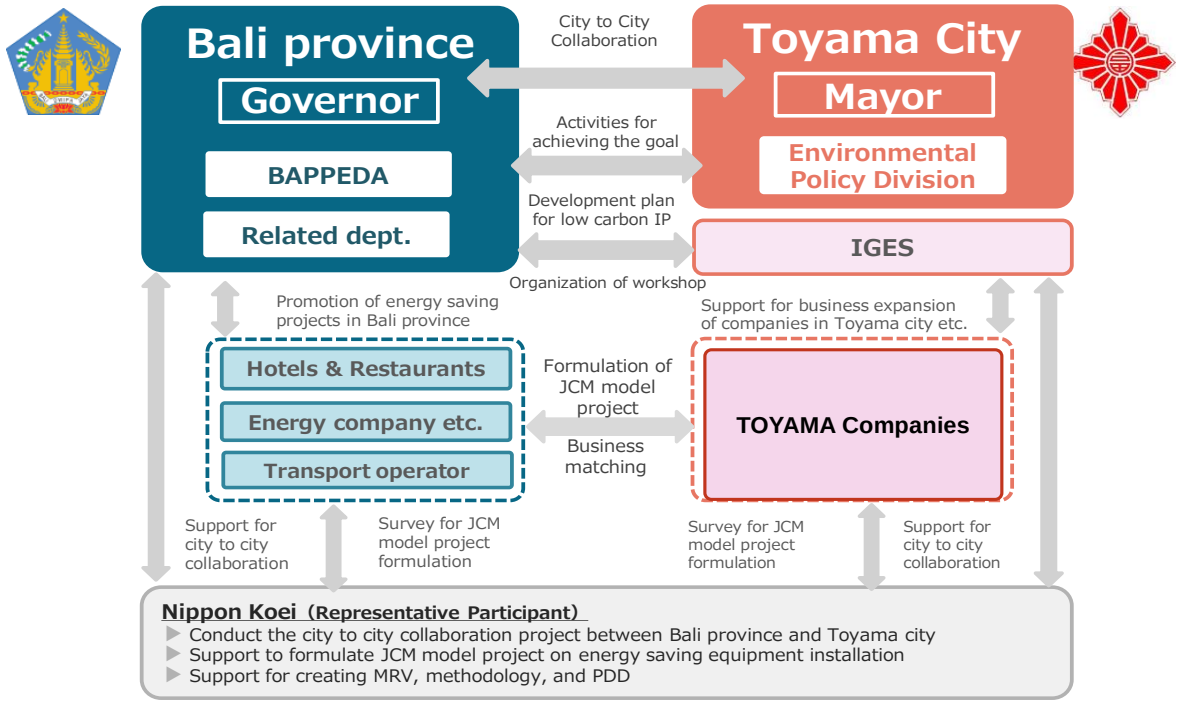
This project aims to support promotion of activities related to low carbon society as “Tourism Future city” in core industry of Bali. The feasibility study was conducted to utilize Toyama’s knowledge and experience, and to introduce advanced technology of private entities and institutes development, both efficiently and effectively.

1.3 STRUCTURE OF CITY-TO-CITY COLLABORATION

Main partner in Bali province is Badan Perencanaan Pembangunan Daerah (BAPPEDA) which is responsible for planning, approval and implementation of various development activities in Bali. On the other hand, Environmental Policy Division of Toyama city is in charge of this project to discuss related topics of City-to-city collaboration, and to share information / request support for private entities of Toyama city. Additionally, Toyama city made also another MoU with Tabanan of Bali for the transportation sector.

Private entities of Toyama city will provide environmental technology to solve the social issues and develop JCM model project in this project. Nippon Koei is in charge of supporting field survey, formulating JCM model project to introduce energy saving technology under the City-to-city collaboration and considering MRV plan.

Institute for Global Environmental Strategies (IGES） supports the project for formulation of systems and plans. The structure of the project and roles of each stakeholders is shown below.



Source: Nippon Koei

Figure 1-1 Structure of City-to-City Collaboration between Bali and Toyama

1.4 SCHEDULE

The schedule of the project is shown below.

Items		2018									2019	
		Apl.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.
Formulation of JCM model project												
1)	Cosideration and Selection of target facilityes for JCM											
2)	Discussion for formulation of international consoutium											
3)	Confirmation of EIA and SDIP											
4)	Business matching for saving energy in Toyama				☆							
5)	Preparing program for promote energy saving technology											
6)	Visit to Japan							☆				
Other activities												
1)	Monthly report			☆	☆	☆	☆	☆	☆	☆	☆	☆
2)	Progress report to MOE		☆			☆			☆			☆
3)	Seminar in Bali											☆
4)	Presentation of the project in City to City Seminar							☆				
Site visite, meeting and report												
1)	Site visit			★		★		★			★	
2)	Meeting in Japan		☆	☆	☆	☆			☆	☆		☆
3)	Final report											☆

★ : Activity in Bali(plan) ☆ : Activity in Japan (plan)
★ : Activity in Bali(achieved) ☆ : Activity in Japan (achieved)

plan achievement

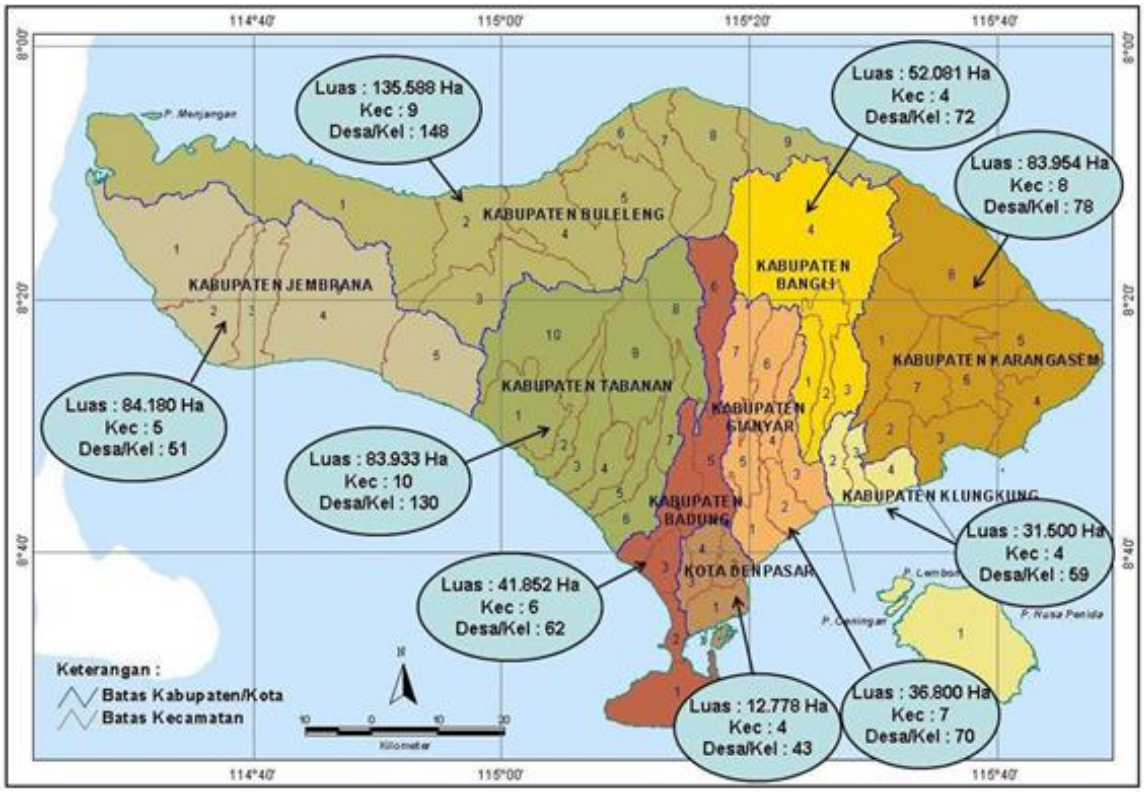
Source: Nippon Koei

Figure 1-2 Schedule of the schedule

CHAPTER 2 OUTLINE OF BALI PROVINCE

2.1 BASIC INFORMATION

Bali province, located in eastern Indonesia, consists of Bali island and neighboring islands. Originally it was mainly an agricultural land, but since the opening of Denpasar International Airport in 1949, the tourism industry became popular using Bali's rich natural resources. Recently, Bali has become the largest tourist destination in Indonesia.



Source: Environmental Department of Bali province

Figure 2-1 Map of Bali

Bali province consists of the Capital Denpasar and eight municipalities. Bandung prefecture earns a lot of income and tax revenue from tourism because of a lot of luxury resort areas compared with other municipalities. The economic disparity with other prefectures has become a social issue in Bali.

The geographic and social basic information of Bali province is as follows.

Table 2-1 Basic information of Bali province

Area	5,638 [km2]
Population	4.4million (Projection in 2016)
Religion	Hindu (83%), Muslim (13%), Catholic (2%), Protestant (1%), Buddhist (1%)
Capital of province	Denpasar
Municipality	Jembrana, Tabanan, Badung, Gianyar, Klungkung, Bangli, Karangasem, Buleleng
Major business sector	Tourism sector (Hotel and restaurant etc.), service, Agriculture, Fishery

Source: BPS-Statistics Bali, 2017

Table 2-2 Statistics information of Municipalities in Bali

Municipality	Area (km2)	Population (Census of 2010)	Annual precipitation (㎜)
Jembrana	842	261,638	2,867
Tabanan	839	420,913	3,292
Badung	419	543,332	2,248
Gianyar	368	469,777	2,397
Klungkung	315	170,543	2,081
Bangli	521	215,353	3,322
Karangasem	840	396,487	2,153
Buleleng	1,366	624,125	1,119
Denpasar	128	788,589	2,323
Total (Bali Province)	5,638	3,890,757	(Average) 2,867

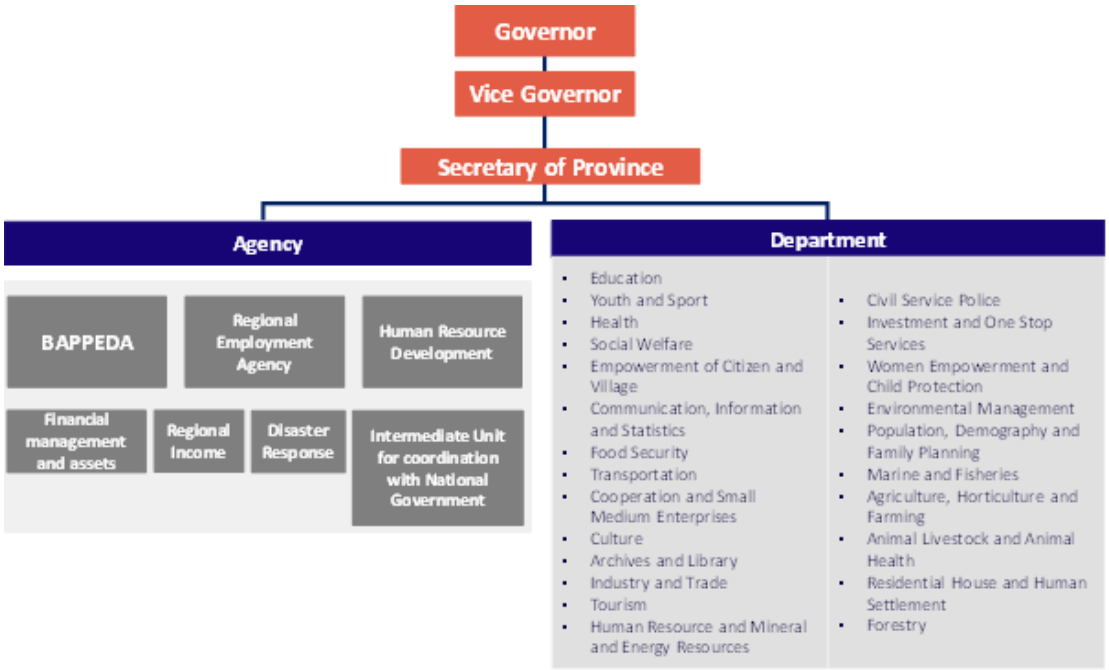
Source: BPS-Statistics Bali, 2017, Appropriately population is 4.4million in 2016

2.2 BALI PROVINCE

2.2.1 Organization Structure of Bali Province

The current organization structure of Bali province is presented below. It consists of Governor, vice governor, secretaries, 7 agencies and 24 departments. BAPPEDA is in charge of this project.

In FY 2018, unfortunately the collected information was limited because of few opportunities for discussion with transportation and tourism sector. Thus, it is expected that there will be promotion of specific collaboration with target sectors through BAPPEDA in the future.



Source: IGES based on the documents provided Bali province

Figure 2-2 Organization structure of Bali province

2.2.2 Main Policy of Bali Province

The effect of the Indonesian government policy of "Oil to Gas" will increase the price of diesel oil and stabilize the price of the natural gas.

On 29 June 2018, Mr. I Wayan Koster from Singaraja became the 10th governor of Bali province. He announced through media his plan for active promotion of both Oil to gas in hotel sector and Electric vehicle (EV). Therefore, it is expected that the governor will promote several policies and regulations related to low carbon society in tourism sector with the same purpose as the city to city collaboration project.

2.2.3 Environmental Issues and Measurements in Bali Province

According to Environmental department of Bali province, there are issues of GHG emissions in each industrial sector as follows:

1) Agriculture: NO2 emissions from chemical fertilizer, CO2 emissions from agricultural waste incineration
2) Animal husbandry: Methane emissions from livestock waste
3) Forestry : Deforestation by illegal logging, CO2 emissions from slash-and-burn and forest fires
4) Energy : Exhaust gas and air pollution from power plant
5) Transportation : CO2 emissions, noise in city area, air pollution and dust(PM10) due to congestion
6) Waste : No properly management of methane emissions from waste and waste water
7) Tourism : Increase number of hotels and tourists

Because there are many industrial activities in not only tourism, but also other sectors mentioned above, new themes of City-to-city collaboration will be considered in 2019 based on the requirements and opinions from Bali province.

2.3 CHARACTERISTICS OF INDUSTRY IN EACH MUNICIPALITY

Because tourism is the core industry in Bali, this causes a difference in industrial structure between Municipalities and so economic disparity has become a social issue. The characteristics of agriculture, Animal husbandry and construction of municipalities of Bali are summarized in table below. It is Agriculture is main industry in n Tabanan, Gianyar and Buleleng and It is recognized that Animal husbandry is a popular in Bangli, Karangasem and Buleleng which have mountains and highlands area in northern and eastern part of Bali. On the other hand, construction of commercial facilities and hotels are concentrated in capital Denpasar and Badung because there are around 100 construction companies.

Table 2-3 Characteristics of Industries in each Municipalities

Municipality	Annual production of several sector（High ranking municipality in bold）		
	Agriculture (Rice production(ton）in 2015)	Animal husbandry (No. of cow and buffalo in 2013)	Construction (No. of construction company in 2017）
Jembrana	65 295	37,202	9
Tabanan	**194 134**	48,251	21
Badung	105 951	36,668	**91**
Gianyar	**192 518**	40,426	19
Klungkung	38 070	33,974	3
Bangli	28 718	**74,435**	8
Karangasem	71 078	**109,581**	6
Buleleng	**128 209**	**93,135**	12
Denpasar	29 926	6,454	**116**
Total (Bali Province)	853 899	480,126	285

Source: BPS-Statistics Bali edited by Nippon Koei

2.4 TOURISM SECTOR IN BALI PROVINCE

Bali is one of southeast Asia's leading tourism cities and is internationally recognized for its beach resorts. The tourism industry occupies two-thirds of the whole provincial income according to national statics. Number of tourists from overseas has been increasing to more than 6 million visitors in 2018 which was 6% increase over the previous year. That number corresponded to 40% of the total (15.80 million in Indonesia).

There are 551 hotels in 2017 and 80% of hotels located in Badung because of large beach resort area. Considering the province, the luxury hotel of 4 stars or 5 stars occupies 40% of the total, so Bali has become a high-class resort.

Table 2-4 Number of Hotels by Stars (ranking) in 2017

Municipality	Number of Hotel by Stars (5 stars: the highest rank)					Total
	5	4	3	2	1	
Jembrana	0	1	3	1	0	5
Tabanan	2	1	2	0	0	5
Badung	58	123	190	57	15	443
Gianyar	6	4	7	3	4	24
Klungkung	0	0	0	0	3	3
Bangli	0	0	0	0	0	0
Karangasem	1	4	2	1	0	8
Buleleng	2	4	9	2	0	17
Denpasar	4	7	16	15	4	46
Total (Bali province)	73	144	229	79	26	551

Source: BPS-Statistics Bali, 2017

In the formulation of JCM model project, other sectors were given priority in FY 2018, and the hotel sector was not considered sufficiently. Based on the information above, high-energy consumption facilities mainly for luxury hotels will be considered to introduce into the JCM scheme from FY 2019.

2.5 POTENTIAL OF RENEWABLE ENERGY IN BALI

The potential of GHG emission reduction until 2020 was tentatively calculated by Environment department of Bali province as follows. Since the items of the calculation aiming at both stability of energy supply and CO2 emission reduction, they are consistent with JCM concept.

Table 2-5 Potential of GHG emission reduction in Bali province

#	Items	Potential of CO2emission reduction [tCO2]
1	Premium fuel and solar PV	38,970,000
2	Reduction of electricity consumption	37,250,000
3	Reduction by using LPG for fuel and cooking	5,260,000
4	Reduction of methane gas emissions caused by livestock	169

Source: Nippon Koei based on the documents provided by DLH of Bali

Additionally, the following items are listed as energy saving measures that will be considered by Bali province in the future.

Table 2-6 Considered Measurements of Energy saving in Bali

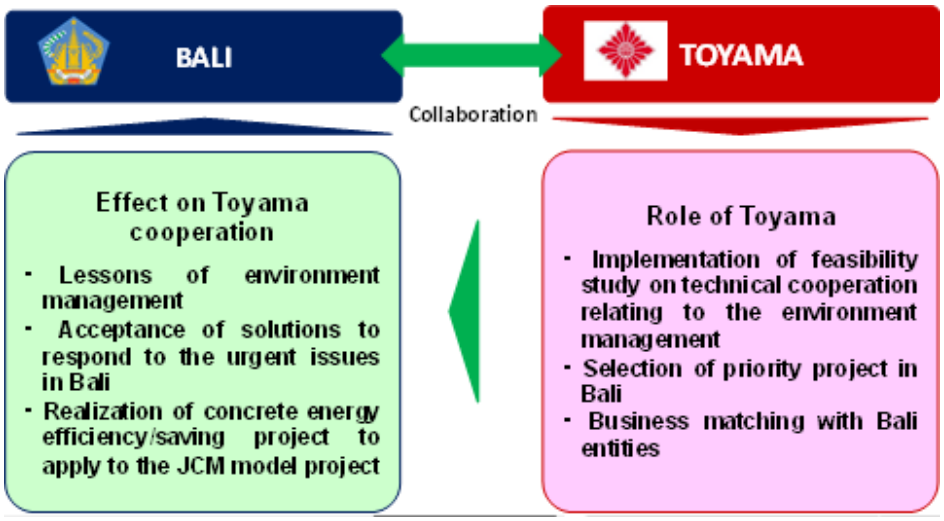
#	Items
1	Fuel saving
2	Management of use of premium fuel for certain types of vehicles
3	Promoting Oil to gas (CO2emission reduction by2020：1.6million tCO2)
4	Saving electric energy
5	Formulation a power saving cluster team
6	Electric energy management in industry
7	Introduce LED widely（CO2emission reduction by2020：1.5million tCO2）
8	Renewable energy development (CO2emission reduction by2020：0.47million tCO2)
9	Micro hydropower
10	Solar PV
11	Wind power
12	Biogas production

Source: Nippon Koei based on the documents provided by DLH of Bali

The items in above are proposed by Bali province after reviewing own issues and problems. Therefore, it is good reference information to consider activities of City-to-city collaboration through discussion with stakeholders of Bali province from FY 2019.

2.6 COLLABORATION WITH TOYAMA CITY

In November 2017, Bali province and Toyama city has made additional cooperation from the previous agreement for environmental management. In the cooperation, there is not only the collaboration at local government level, but private entities of Toyama have shared their experience and knowledge of installation, operation and management of micro hydropower generation in Tabanan through a demonstration project.



Source: Nippon Koei

Figure 2-3 Roles of Toyama city and expected effects of City-to-city collaboration

From 2014, Toyama city has mainly promoted technical cooperation with Tabanan through JICA study as follows.

Table 2-7 Current contributions of Toyama City for Bali province

#	Year/Month	Descriptions
1	March 2014	Agreement of technical cooperation between Tabanan and Toyama for promote agriculture industry using renewable energy generation
2	July 2015	Applied JICA study for micro hydropower project in Tabanan
3	January 2017	Applied JICA implementation project for micro hydropower project in Tabanan
4	January 2017	Project for promoting agriculture industry using renewable energy generation renewable energy
5	November 2017	Completion ceremony for micro hydropower facilities (4 sets)
6	November 2017	Agreement of promotion of Environmental technology between Bali and Toyama
7	November 2017	Agreement of collaboration between Udayana Uni. and Toyama
8	May 2018	Start City-to-city collaboration between Bali and Toyama

Source: Nippon Koei

As one of contributions of Toyama City to Tabanan, four micro hydropower generators were installed in Jatiluwih, Tabanan through JICA project in November 2017. Photos of three generators are shown below. These power generation facilities are equipped with small

storage batteries mainly for nighttime street lights in the area. Different types of facilities were introduced not for limited to supply of nighttime electricity but to showcase sustainable renewable energy in this area.

Photos of micro hydropower plant in Tabanan

This achievement was through JICA project scheme, but when similar technology is introduced by JCM scheme or activities of City-to-city collaboration, it will be the result of a series of continuous collaborative support activities from Toyama to Bali.

CHAPTER 3 JCM FEASIBILITY STUDY

FY2018 is the first year for Bali and Toyama city-to-city collaboration. Bali province is famous for international tourism and has abundant natural resources to utilize for generation of additional power to reinforce the PLN grids. JCM feasibility study were conducted in three sectors.

1) Energy efficiency of tourism facilities
2) Energy efficiency of public transportation system
3) Renewable energy

3.1 ENERGY EFFICIENCY OF TOURISM FACILITIES

There is a regulation in Bali that buildings are not allowed to be constructed that block the scenic landscape. Also, Bali traditional buildings are constructed with eco-friendly design. Therefore, it seems that traditional/cultural building is not suitable for energy efficiency. In this context, high-class hotel and large-scale shopping malls are good candidates for JCM model project which has big potential of GHG emission reduction.

The above points are considered in the city-to-city collaboration between Toyama and Bali. Hence, the following local entities were contacted to identify the prospective JCM model projects.

- Bali hotel association
- Bali hotel and restaurant association
- Shopping mall association, Bali

3.1.1 Selection of the Candidate Shopping Mall

Currently Bali province has 21 large scale shopping malls, which are located mainly in the Kura area. Through the discussions with the association, the following three malls were checked as the JCM candidate buildings.

As for the hotel industry, there was not enough time to discuss with the association concerned, so it will be considered as a JCM model project with local stakeholders in FY 2019.

Table 3-1 Candidates shopping malls in Bali

#	Name	Outlines
1	Discovery shopping mall	This mall is one of the oldest facilities, and the main building is more than ten years. Management of the mall is interested in application of energy efficiency facilities and installation of renewable energy equipment.
2	Beachwalk shopping mall	Age of the main building is around seven years, and its air-conditioning facilities are slightly early to replace. However, management of the mall is interested in application of energy efficiency facilities and installation of renewable energy equipment's.
3	Lippo mall	Age of the main building is around four years, and its air-conditioning facilities are slightly early to replace. And the management of the mall is currently not interested in application of energy efficiency and installation of renewable energy equipment.

Source : Nippon Koei

3.1.2 Discussions with Shopping Malls

In October 2018, discussions with the shopping mall staff were made and some potentials for JCM mode project were confirmed. Outlines of the discussions are presented below.

Table 3-2 Results of the discussions on JCM application in the Bali shopping malls

<table>
<tr><td colspan="3">1 : Discovery shopping mall</td></tr>
<tr><td>Potential</td><td colspan="2">Discovery shopping mall has opened a business since 2004 and plans to install solar PV system after October 2019. Air Handling Unit (AHU) has also been installed 48 units and operated since 2004, they will be replaced after October 2019. Monthly utility cost is approximately 1.5 billion IDR per month.</td></tr>
<tr><td>Photo</td><td> 
Meeting in Discovery shopping mall</td><td> 
Outside of the mall</td></tr>
<tr><td colspan="3">2 : Beachwalk shopping mall</td></tr>
<tr><td>Potential</td><td colspan="2">Beachwalk shopping mall has opened a business since 2011 and has parallelly operated resort hotel. Six chillers and one heat pump unit has been operated for the air-conditioning function. These are also operated ON/OFF mode by manual. Monthly utility cost is approximately 2 billion IDR per month. However, they do not have any improvement plan, so it will be discussed in the next fiscal year.</td></tr>
</table>

Photo	 **Meeting in Beachwalk**	 **Existing turbo chiller, Trane**
3 : Lippo mall		
Potential	Lippo mall has opened a business since 2015 and their equipment is not timing of the replacement. Also, this mall does not have any energy saving/efficiency policy confirmed so far. It will be therefore discussed with the mall staff in the next fiscal year.	

3.1.3 Selection of JCM Model Project

In 2018, Discovery shopping mall, one of the large-scale shopping malls in Kuta area, was selected as candidate of the JCM model project because this mall had a renovation plan to install solar PV system and replace AHU.

The mall is 5 stories and has 95 tenants in the ground floor area (38,000 m2).

Photos of outside of Discovery shopping mall


Photos of inside of Discovery shopping mall

Currently, Discovery shopping mall plans to renovate the main building from October 2019, which will consist of replacement of the roof material (from steel material to permeability one) to get a lot of sunlight and air. However, the mall is considering additional renovation, such as installation of renewable energy equipment and improvement of the air-conditioning system.

Hence, the Project proposed the following items with JCM subsidy.

1) Installation of solar PV system
2) Replacement of AHU

To respond to their request, Toyama company "Nippon Air-conditioning Hokuriku (NAH)", that has a lot of knowledge and experience of the solar PV system installation and air-conditioning improvement in Toyama city, participated in JCM feasibility study due to their interest.

株式会社日本空調北陸

NAH is established in October 1977 as a subsidiary company of Nippon Air-conditioning Service in Hokuriku region as total facility engineering company. NAH has 200 employees and its service is study, planning, design, construction and operation and maintenance of the air-conditioning facilities and solar PV system. NAH has four business departments:: RAC Dept, Maintenance Dept, Operation management Dept, and Eco Dept Details of each department are summarized below.

Reform and construction (RAC) Dept	Service of this department is construction of the air-conditioning and the water supply facilities and improvement/renovation of aging building.
Maintenance Dept	Service of this department is maintenance of air-conditioning/electrical facilities.
Operation management Dept	Service of this department is operation management by the active monitoring to operate building facilities effectively.
Ecology Dept	Service of this department is overall management of the solar PV system from design, construct and operation.

NAH has discussed with Discovery shopping mall three times since October 2018 so far and visited the project site.

3.1.4 Consideration of JCM Project Formulation

NAH plays an active role in total facility engineering company with solar PV system and air-conditioning system in Toyama city mainly. NAH has made a study on new field (see below) in Bali, like procurement of solar PV system, supervision in local project site etc.

- Implementation the field survey on the roof-top solar PV system, study of the PV module layout and preparation of the cost estimate.
- Implementation of the field survey on AHU, study of the AHU replacement, and preparation of the cost estimate.
- Study of construction supervision on the above activities

Snaps of the field survey were attached below.

Discussions and site survey

Current roof condition of Discovery shopping mall

1) Consideration of solar PV system, newly installation

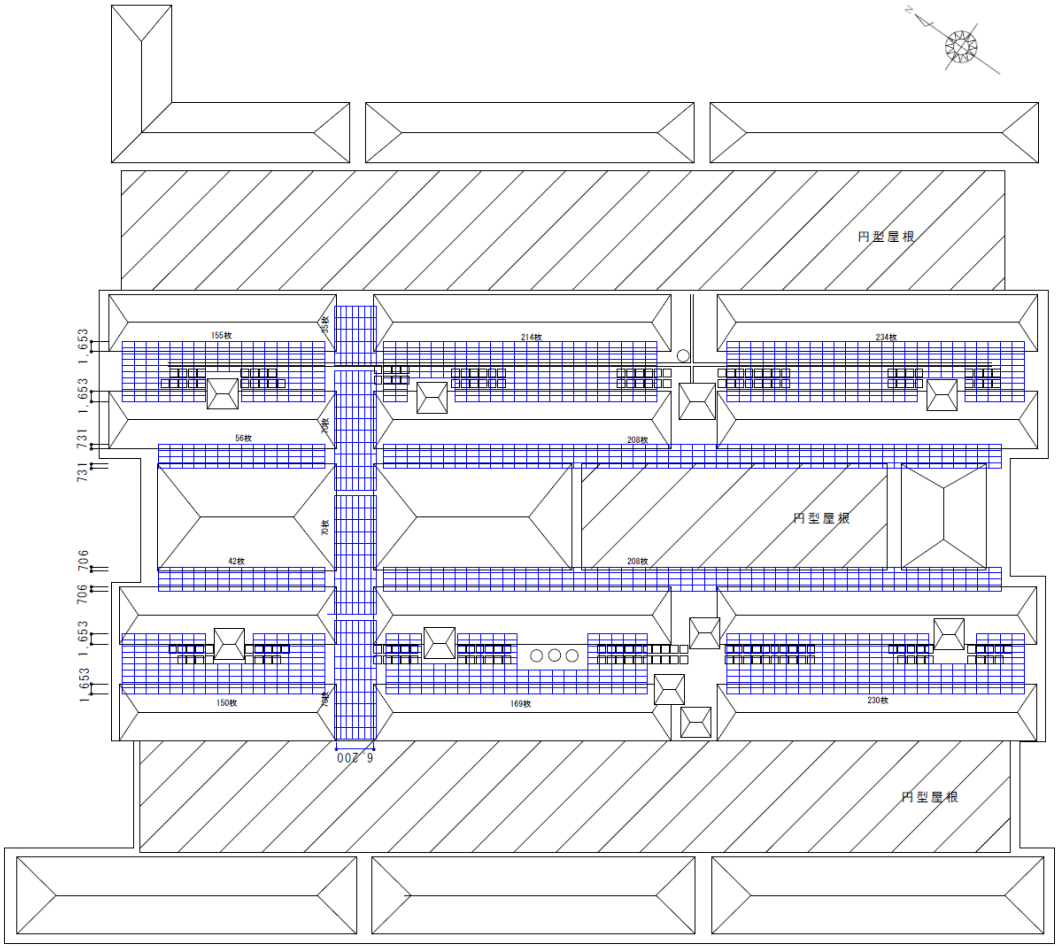
Currently, Discovery shopping mall as a normal user purchases electricity from Perusahaan Listrik Negara (PLN), who is an Indonesian state-owned company tasked with supplying the electricity.

Average Temperature in Bali is more than 25 degrees Celsius all through the year and daily duration of bright sunshine is approximately 12 hours throughout the year. To take advantage of this, the mall will install solar PV system on the roof-top of the main building after the renovation. The purpose of this system to reduce power consumption from the grid, not to supply to the grid. Therefore, the mall does not have any Power Purchase Agreement (PPA).

Aerial photo of the Discovery shopping mall

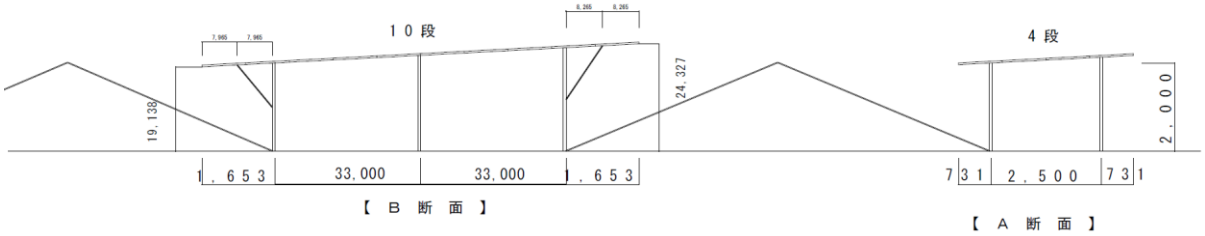
Currently outdoor equipment of AHU is installed on the roof-top. Shapes of the roof are triangle type and elliptic type. It seems that the supporting structures are light weight material and do not have enough strength. At the renovation, the roof of the elliptic type will replace its material from steel one to a permeable one.

Accordingly, it is decided that installation of the elliptic roof is not easy and so it is excluded from the scope of the panel installation. It is proposed that PV panels will be installed with the following layout from the NAH. Layout of the PV panel is planned to be installed in the intermediate space of the roof excluding the existing roofs.



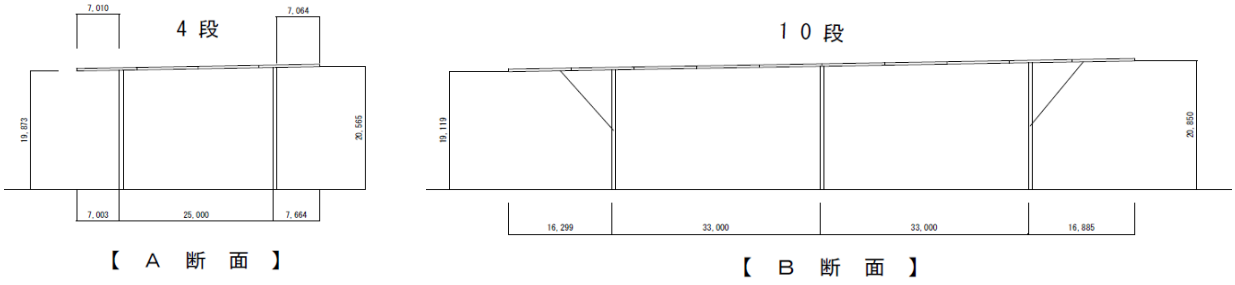
Source : Nippon Airconditioning Hokuriku

Figure 3-1 Plan drawing of Solar PV system



Source : Nippon Airconditioning Hokuriku

Figure 3-2 Profile drawing of solar PV system



Source : Nippon Airconditioning Hokuriku

Figure 3-3 Profile drawing of solar PV system, details

To utilize horizontal space of the roof as much as possible, length of the supporting structures is designed approximately 2,000 mm, to avoid operation and maintenance of the outdoor equipment (See the Figure 3-3).

Also, the latitude in Bali province is approximately south 8 degrees and so the sun is shining from directly overhead. Therefore, layout of the panel can be installed almost flat (1 degree due to drainage function as shown in the following drawing).

Accordingly, Discovery shopping mall was designed by NAH to has the panel layout 635.25 kW (total 1,925 panels) with total annual power generation time (1,825 hours). Calculation result of the GHG emission reduction based on the tentative conditions is shown below.

$$\begin{aligned} \textit{Emission reduction} &= \textit{Reference emission} - \textit{Project emission} \\ &= 635.25\ [kW] \times 1{,}825\ [h/y] \times 0.616\ [tCO2/MWh] - 0 \\ &= \underline{\textbf{\textit{714.14 [tCO2/y]}}} \end{aligned}$$

2) Consideration of AHU replacement

Air conditioning system in Discovery shopping mall is applied to air handling unit (AHU). This system is considered to be replaced after renovation of the main building in the same exclusive space (i.e. AHU room). Also, some auxiliaries such as duct, pipe etc. will be utilized in the same manner before the renovation.

Also, the mall will replace 8 units of AHU last year which are manufactured by Daikin McQuay Singapore. Through discussions with the mall, AHU of the Daikin McQuay decided it is preferable as replacement machine through JCM scheme.

Note : Upper photos are indoor equipment and lower photos are outdoor equipment.

Photos of AHU newly installed in 2018

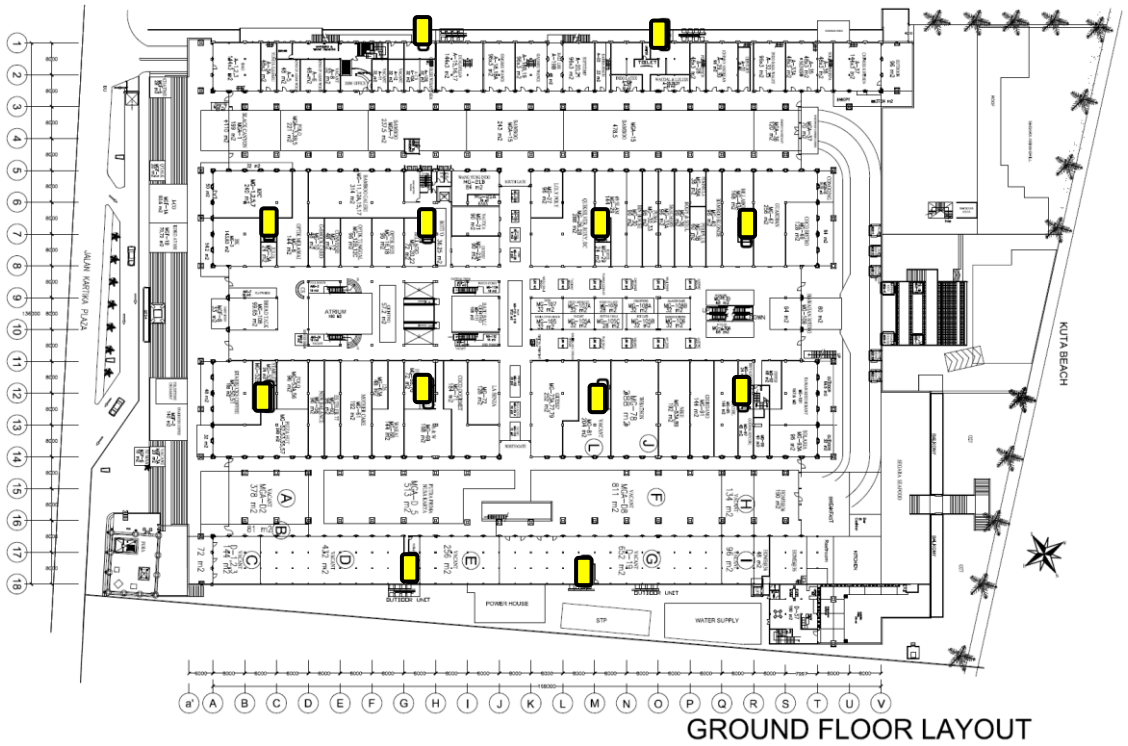
The following table shows specifications of the existing AHU in the mall. All indoor equipment are products of Daikin McQuay.

Table 3-3 List of existing AHUs, partially

NO	DESCRIPTION				
	INDOOR		OUTDOOR		LOCATION
	AHU	TYPE	NO BODY	TYPE	
1	AHU 1 GF	MDB 350 B			BURGER KING
			7	YVC 125 A35C6	roof
			8	YVC 125 A35C6	roof
			9	YVC 100 A35C6	roof
2	AHU 2 GF	MDB 350 B			BURGER KING
			10	YVC 125 A35C6	roof
			11	YVC 100 A35C6	roof
			12	YVC 125 A35C6	roof
3	AHU 3 GF	MDB 500 B			ROTI O
			26	YVC 125 A35C6	roof
			27	YVC 125 A35C6	roof
			28	YVC 125 A35C6	roof
			29	YVC 125 A35C6	roof
4	AHU 4 GF	MDB 500 B			ROTI O
			30	YVC 125 A35C6	roof
			31	YVC 125 A35C6	roof
			32	YVC 125 A35C6	roof
			33	YVC 125 A35C6	roof
5	AHU 5 GF	MDB 500 B			QUICKSILVER
			48	YVC 125 A35C6	roof
			49	YVC 125 A35C6	roof
			50	YVC 125 A35C6	roof
			51	YVC 125 A35C6	roof

Source : Discovery shopping mall

For reference, ground floor layout of the AHU rooms is presented in the following figure. In this floor, there are 12 AHU rooms located in intermediate space of the tenants (See the yellow boxes).



Source : Discovery shopping mall

Figure 3-4 Location of AHU rooms, Ground floor

3) Consideration of project finance

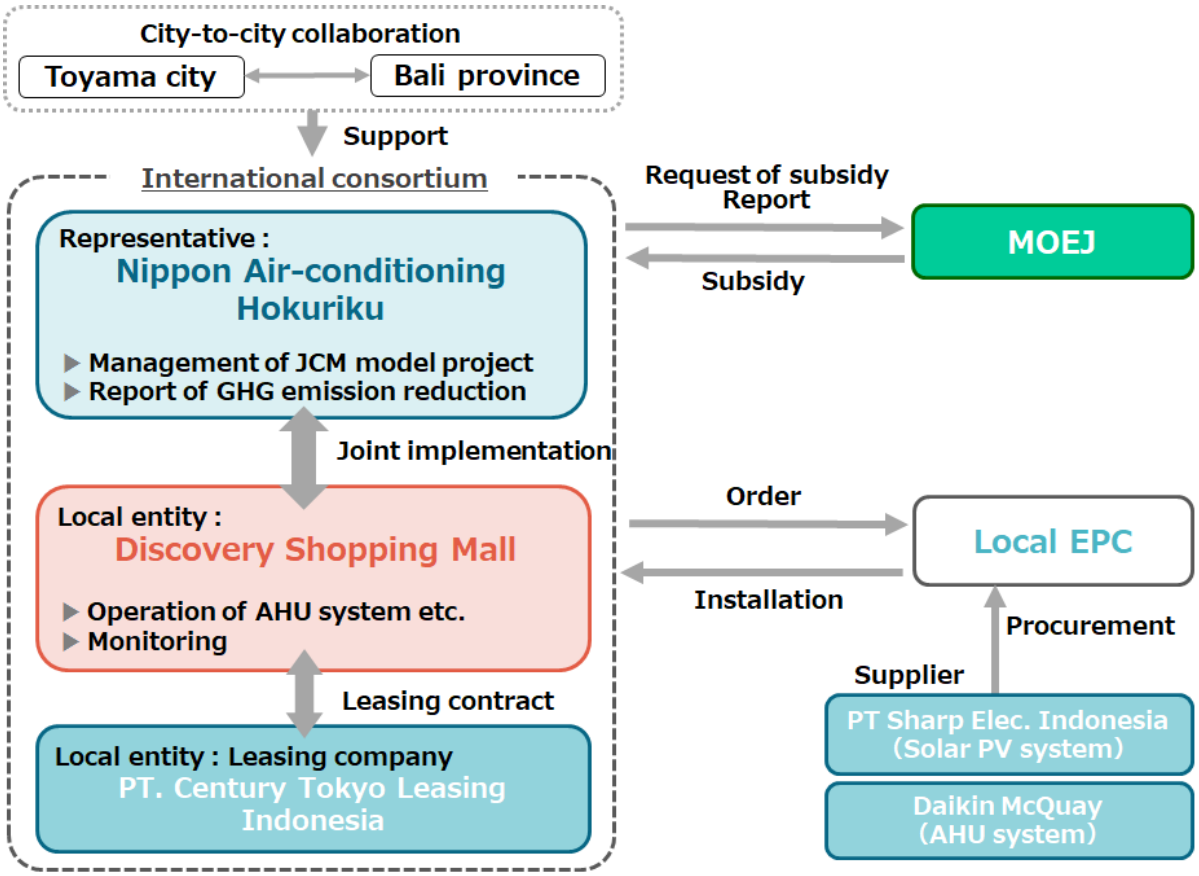
Discovery shopping mall is planning to renovate the main building etc. from October 2019, and its cost has been budgeted. However, JCM application has been considered since September 2018 and is not involved in their current budget.

To apply to JCM, the mall needs to apply the leasing contract on this purchase.

Taking the above structure into consideration, international consortium will involve the leasing company. Currently, PT. Century Tokyo Leasing Indonesia is considered to join this project.

4) Consideration of JCM application

Discovery shopping mall is a private company and therefore it is not necessary to conduct tender process on their procurement. To apply to JCM subsidy, it is necessary to build an international consortium which consists of Japanese and Indonesian entities. Representative of the consortium is currently considering a Toyama private company, and this will be finalized before the JCM application.



Source : Nippon Koei

Figure3-5 International consortium, Discovery shopping mall

Also, project owner of the mall is thinking about leasing contract to purchase the solar PV and AHU systems. To do this, the project will involve the leasing company "PT Century Tokyo Leasing Indonesia" that has experience of the JCM model project not only in Indonesia but other partner countries.

5) Consideration of Indonesian regulations/laws

The prospective project is to install solar PV system on the roof top of the main building and to replace AHU inside/outside of the whole building. Therefore, it is not so big impact for the circumference environment of the building, and so it seems that environmental impact assessment is not required according to their experience.

Before the JCM registration, these construction activities should be checked based on the Indonesia environmental impact assessment (AMDAL) etc. properly. Because JCM scheme is required to follow the national laws and regulations. In addition, Sustainable Development Implementation Plan (SDIP) should also checked based on the requirement from Indonesian JCM secretariat

Table 3-4 Confirmation items of SDIP in Discovery shopping mall

Items	#	Questions	Y/N	If answer is Yes, please describe the action plans.
EIA	1	Does the proposed project require official/legal process of EIA?	No	
Pollution Control (No need to answer if EIA is required)	2	Does the proposed project emit air pollutants?	No	
	3	Does the proposed project discharge water pollutants or substances which influence BOD, COD or pH, etc.?	No	
	.4	Does the proposed project generate waste?	No	
	5	Does the proposed project increase noise and/or vibration from the current level?	No	
	6	Does the proposed project cause ground subsidence?	No	
	7	Does the proposed project cause odor?	No	
Safety and health	8	Does the proposed project create dangerous condition for local communities as well as individuals involved in the project, during either its construction or its operation?	No	
Natural Environment and biodiversity	9	Is the proposed project site located in protected areas designated by national laws or international treaties and conventions?	No	
	10	Does the proposed project change land use of the community and protected habitats for endangered species designated by national laws or international treaties and conventions?	No	
	11	Does the proposed project bring foreign species?	No	
	12	Does the proposed project include construction activities considered to affect natural environment and biodiversity (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	No	
	13	Does the proposed project use surface water, ground water and/or deep ground water?	No	
Economy	14	Does the proposed project have negative impact on local workforce capacity?	No	
	15	Does the proposed project have negative impact on local community's welfare?	No	
Social Environment and	16	Does the proposed project cause any resettlement or other types of conflict?	No	
	17	Does the proposed project fail to involve activities to	No	

Items	#	Questions	Y/N	If answer is Yes, please describe the action plans.
Community Participation		respond to, and follow up, comments and complaints that have been received from local communities, particularly from the public consultation?		
	18	Do the project participants violate any laws and/or ordinances associated with the working conditions of local communities which the project participants should observe in the project?	No	
Technology	19	Does the proposed project fail to involve activities to build capacity of human resources through technology transfer and technical assistance?	No	
	20	Does the proposed project fail to describe information of technology specification that consists of manual book and ways to overcome the problems that may occur when being operated on the site, at least in English and in Bahasa Indonesia as applicable?	No	

Source : JCM Sustainable Development Implementation Plan Form

According to the above table, there are no issues on SDIP indicators currently for the Discovery shopping mall. After application of JCM scheme, the details will be confirmed with the owner of the mall.

3.2 LOW CARBON TRANSPORTATION SYSTEM

3.2.1 Selection of Candidate Project

Hokusan is a gas engineering company based in Toyama city It has JCM experience for Introduction of CNG-diesel hybrid equipment to public bus in Semarang. This company is considering horizontal expansion of the Semanrg project.

Hokusan is considering vehicle replacement in Tabanan prefecture due to aging public transportation vehicle (small bus : Bemo) with JCM subsidy.

Tabanan prefecture is located in the southern part of Bali island and has Jatiluwit village which is registered as the World Heritage site. Tabanan prefecture does not have enough budget for maintenance of the public transportation system due to insufficient annual revenue. Old Bemos over 30 years old have therefore taken of the function of public transport.

Toyama city has received a request from Tabanan prefecture on replacement of the old Bemos with fuel shift from oil to CNG.

3.2.2 Discussions with Prospective Players

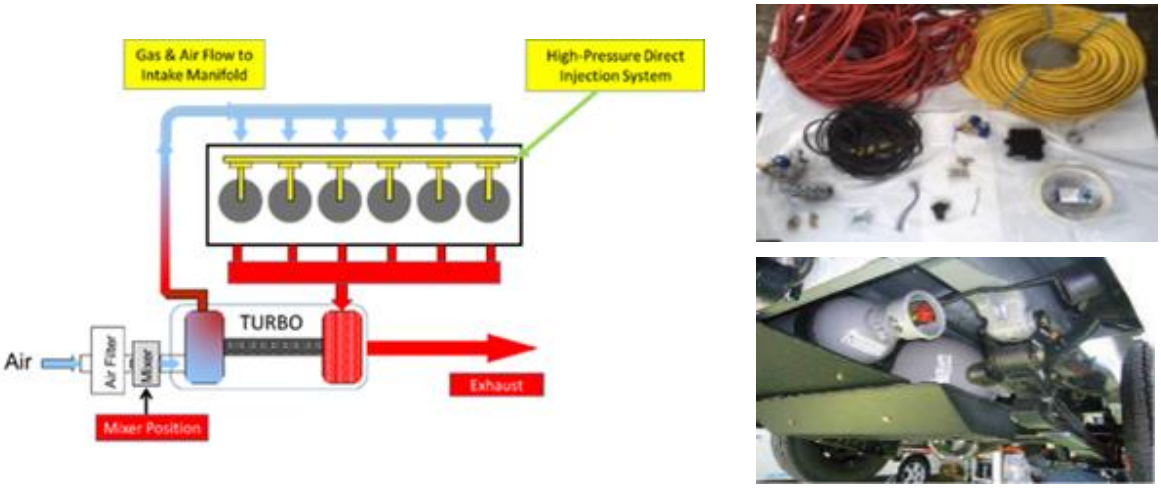
Ttransportation department of Tabanan prefecture and Hokusan have discussed several times on Bemo replacement. It concluded that the project is appropriate in terms of technology applied, project size etc. Hokusan, Koperasi, Indonesian supplier (GAZINDO) etc. have discussed about JCM application.

Photos of discussions with Tabanan officers

3.2.3 Selection of JCM Model Project

As JCM model project, CNG hybrid engine was considered to apply to Diesel Dual Fuel (DDF) unit that blends diesel oil with CNG.

In addition to the DDF unit, regulator, Engine Control Unit (ECU), safety bulb, CNG fuel injection unit etc. are equipped. DDF unit applied to JCM model project can be equipped with basically any vehicle.



Source : Hokusan

Figure 3-6 CNG fuel injection unit

In Bali, there are no CNG vehicles introduced/operated on public roads. It is reported that DDF unit can convert diesel oil into gas more than 70% to 80% compared to that of normal fuel shift unit (less than 50%). Accordingly, DDF unit can save 20% to 30% by its application.

3.2.4 Consideration of JCM Model Project

1) Confirmation of Bemo specification

Through discussions, it was identified that 203 vehicles (Bemos) will be replaced based on the requirement from Tabanan Bemo drivers. Total cost for Bemo replacement will be estimated by Indonesian DDF supplier (GAZINDO) later in detail. It will be estimated before the application of JCM subsidy.

Table 3-5 Features of vehicle type and technology applied

#	Vhiecle type	Fuel type	No.	Schedule	Technology
1	9 persons	Gasoline	80	1st year	CNG gasification
2	13 persons	Diesel	98	2nd year	DDF application
3	13 persons	Diesel	27	2nd year or later	DDF application

Source : Nippon Koei

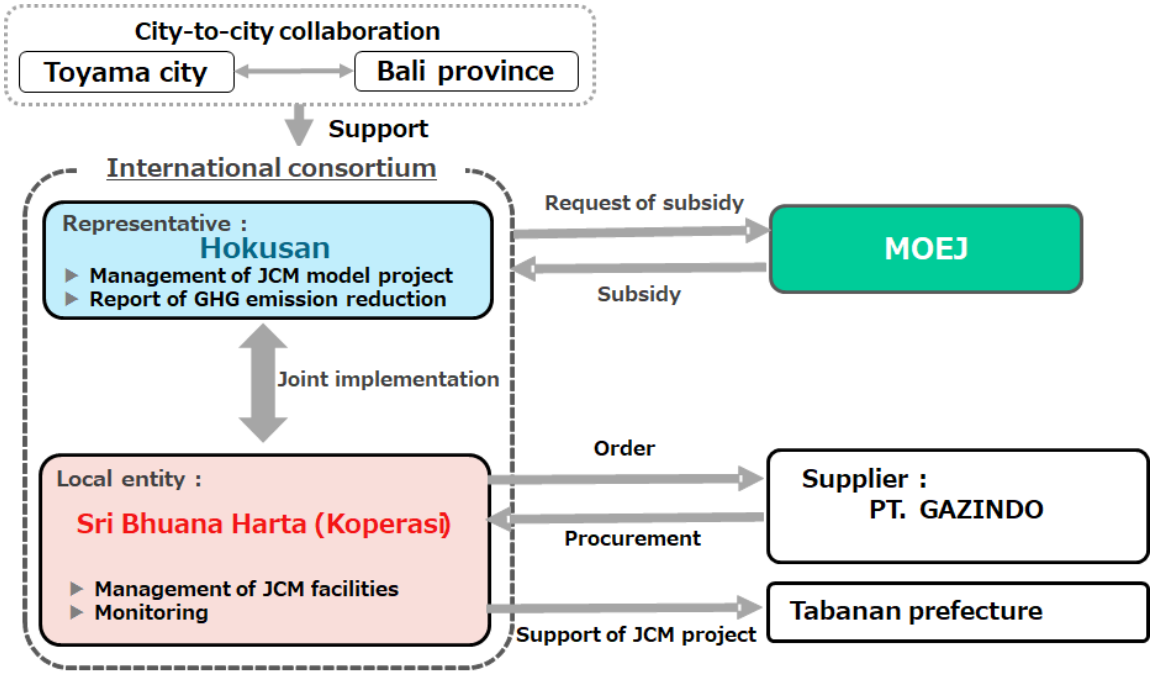
2) Consideration of project finance

Koperasi, that is a union of drivers, controls daily Bemo operation. As for the project finance, Koperasi will support the drivers to cover part of the cost. The remaining payment will be covered by Indonesian local bank. The deal has been already confirmed between Koperasi and the bank.

3) Consideration of international consortium

All Bemos are basically owned by the individual drivers. They will therefore be owned during their legal durable lifetime. So an international consortium will be organized with Hokusan as representative and Koperasi as the local entity.

International consortium of JCM application is tentatively estimated in the figure below.



Source : Nippon Koei

Figure 3-7 International consortium

4) Study on travel distance and fuel consumption

Driving travel distance, fuel consumption, GPS data etc. These are used for the performance of DDF unit in Tabanan prefecture.

5) Consideration of the Indonesian regulations/laws

Fuel shift by DDF unit is legally permissible under Indonesian regulations/laws. Also, the JCM model project will be supported by EPC member (PT. GAZINDO RAYA) that has a

license of the vehicle conversion and JCM experience in Semarang city. PT GAZINDO RAYA does not have any problem regarding this activity so far.

6) Consideration of the CNG fuel

Bali province and Tabanan prefecture currently do not have any CNG infrastructure, such as gas station, pipeline, lorry etc. To secure stable fuel procurement, Bali province is considering CNG supply plan, especially in Tabanan prefecture. They will also discuss with Ministry of Energy and Mineral Resources, Indonesia (ESDM) and PT Pertamina.Another option being considered is to provide fuel by lorry by Mobile Refueling Unit.

7) Monitoring of Bemo operation and maintenance

[Operation and maintenance]

Operation and maintenance (O&M) to the DDF unit will be done by the Koperasi as a part of daily check or by the technical expert who is appointed to at do periodic checking.

[Monitoring and reporting]

Monitoring data will be collected by the data logger equipped Bemo when the driver refuels at a gas station. The data will be stored in the data server of Koperasi. Then, once a month or more, it will be reported to the representative of the international consortium “Hokusan”. Hokusan will properly report it to Ministry of the Environment (MOE) Japan once a year.

8) Consideration of environmental/social aspects

By the replacement/improvement of the CNG hybrid engine, in addition to GHG emission reduction, it is expected that NOx, SPM and HC pollutants will not be released to the air.

This JCM model project will act as a stimulus for promotion of fuel shift from oil to CNG that contributes to mitigation of the environmental burden.

Indonesian government plans to alter the mix of energy consumption, oil (49% to 22%) and natural gas (20% to 22%), with national energy policy (Kebijakan Energi Nasional : KEN) by 2025. This project meets with and contributes to the Indonesian national energy policy.

3.2.5 Details of GHG Emission Reduction Calculation

GHG emission reduction calculates the difference between CO2 emission of gasoline/diesel oil vehicle (reference scenario) and CO2 emission of DDF unit vehicle (project scenario). By JCM project implementation, it is expected to reduce CO2 emission from diesel fuel which has high level of CO2 emission.

According to the Japanese regulation, it is expected that the legal durable lifetime of this project is five years.

CO2 emission reduction = Reference CO2 emission − Project CO2 emission

Reference CO2 emission [tCO2] = Reference fuel consumption [tCO2/km]
× Total travel distance, monitored [km]

Project CO2 emission [tCO2] = Project fuel consumption [tCO2/km]
× Total travel distance, monitored [km]

Currently, cost of the vehicle (Bemo), driving inspection and fuel data is being acquired for JCM model project application.

3.3 RENEWABLE ENERGY ACTIVITIES

3.3.1 Selection of Project Site and Local Player on the Renewable Energy Project

Bali province is famous for international tourism and has also abundant natural resources for renewable energy project, such as solar power, geothermal power, hydropower, etc. Electrification of Bali island is 92.20% and is slightly higher than Indonesian average (91.6%). However, some off-grid areas exist.

Approximately 70% of the total power supply (790 MW) in Bali province is produced inside the island by thermal power plant, and balance is supplied from Java island by submerged cables. Generated power by thermal plant in Bali island consists of light diesel oil, C class heavy oil, marine fuel oil and natural gas. In addition, there were some wind power plants in isolated island. However, they are not used due to malfunction. Therefore, renewable energy plants in Bali province are limited.

As for the hydropower, there are some ongoing projects in Bali. One of the projects is PLTM Muara project located in Singaraja on the northern part of Bali island. This project has been operated by PT Basara.

PLTM Muara project has generated the hydropower since 2017 with installation capacity of 2.3 MW. PT Basara has been invested in by Indonesian entities since 2011 and acts PLTM Muara project as their main project currently.

The following table shows the total amount of power generation by PLTM Muara project during the last two years.

Table 3-6 Power Generation of PLTM Muara

Year	Power generation [kWh/year]
2017	10.250 million
2018	10.0 million

Source : PT Basara Hydropower

This project has already made a Power Purchase Agreement (PPA) with PLN and has some remaining additional power generation capacity based on the previous results. To make up for insufficient power generation, PT Basara is considering to install additional power plant, such as solar PV system and mini hydropower, in their project site.

Currently, Singaraja town has total power demand of 32.0 million kWh annually; however it is not enough power except for PLTM Muara project. Also, production cost of PLTM Muara is approximately 8.8 JPY/kWh in comparison with that of PLN is approximately 12 JPY/kWh. Accordingly, it is attractive to add some more power generation by PT Basara in Singaraja town.

3.3.2 Discussions of Local Participants

The Project has discussed with PT Basara once every two months on JCM model project application since June 2018. Summary of the meetings with PT Basara is presented below.

Photos of PLTM Muara project site and the meetings

The Project has received some requests (see items below) for JCM model project application from PT Basara.

1) Installation of solar PV system nearby PLTM Muara site
2) Installation of additional hydropower plant which will be located downstream of the main plant of PLTM Muara project

For this request, the Project is cooperating with Nippon Air-conditioning Hokuriku and Suiki Kogyo and has studied its feasibility.

Suiki Kogyo was established in 1967 in Toyama city it has designed, products and supervises steel structures, such as water gate, rubber dam, various bridges, water pipe bridge, etc. Also, Suiki Kogyo has implemented small hydro project in Jutiluwit village which was registered as a World Heritage site for its famous for rice terraces. This project produces electricity and supplies it to agriculture facilities such as irrigation pumps, street lights, etc.

Photos of small hydropower system produced by Suiki Kogyo in Jatiluwit

3.3.3 Selection of JCM Model Project

Currently, PT Basara supplies the power to the neighboring area that contribute to servicing power demand, and they are considering additional power generation systems, such as solar PV system and small hydropower system.

1) Consideration of solar PV system installation

PLTM Muara project is located in the rice terraces of Singaraja town. Additional solar PV system will be installed in the roof top of the powerhouse and surrounding area of the power plant.

Source : PT Basara Indonesia

Figure 3-8 Layout of the existing hydropower plant

Reservoir (Location A) is in the upstream area and the powerhouse (Location B) is in the downstream area. The guest house is located in the middle of PLTM Muara project facilities. Details of installation idea are presented in the table below.

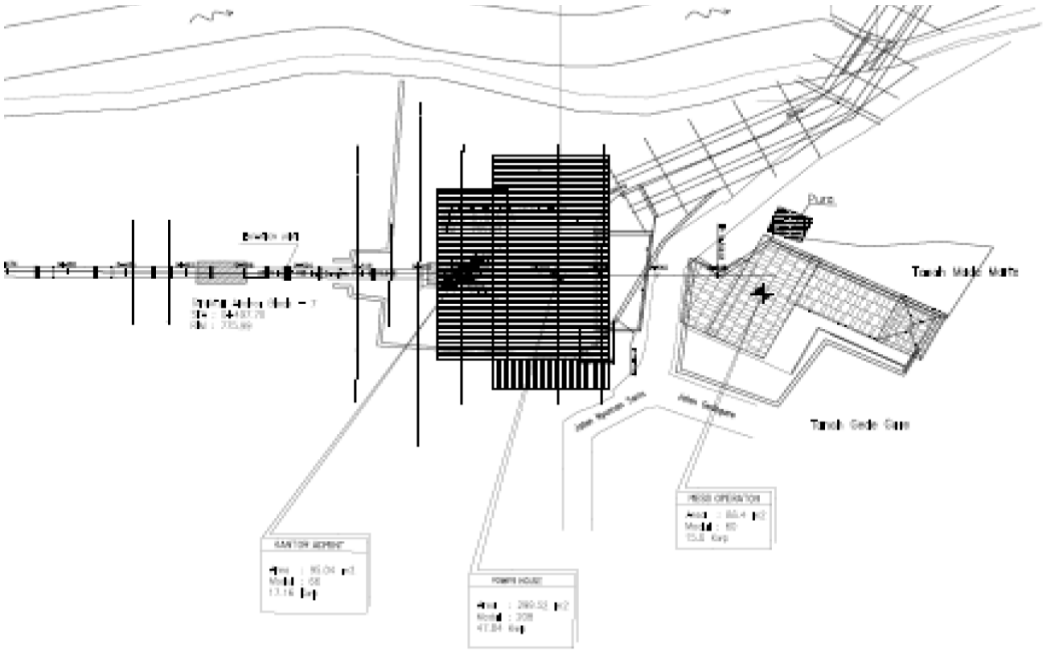
Table 3-7 Installation area of solar PV system in PLTM Muara site

Location		Installation
A	Reservoir	Above the reservoir
B	Powerhouse	On the roof top
C	Guest house	On the roof top and on the ground

Source : Nippon Koei

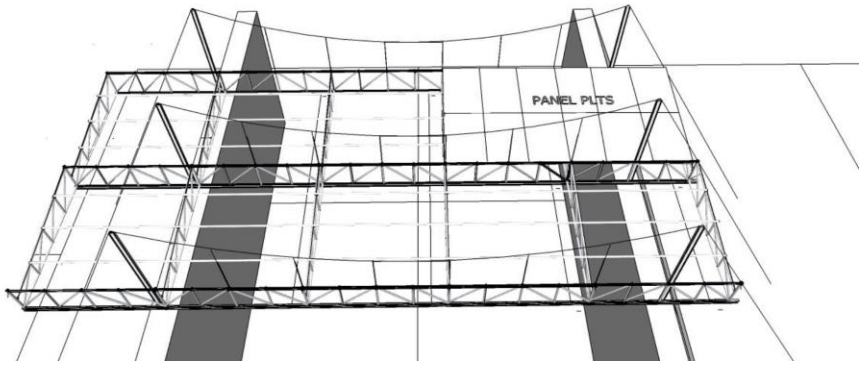
Photos of current situation of PLTM Muara in Singaraja

The following drawings were prepared by PT Basara. Basically, PT Basara can manage everything for the construction of solar PV system and hydropower systems from planning to supervision. They also have experience for renewable energy operation to sell to the national grid (PLN grid).



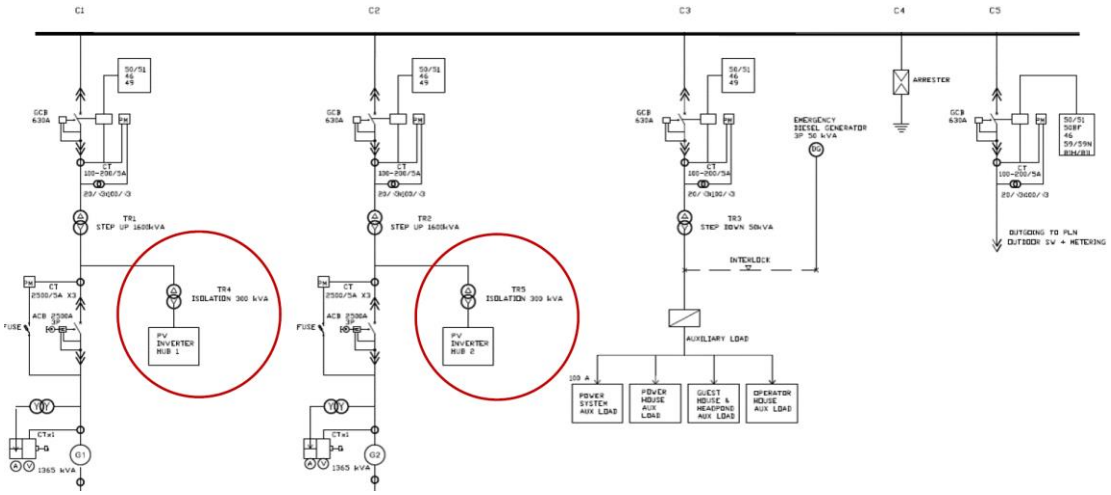
Source : PT Basara Hydropower

Figure 3-9 Installation plan of solar PV system nearby powerhouse



Source : PT Basara Hydropower

Figure 3-10 Image of supporting structure over the reservoir



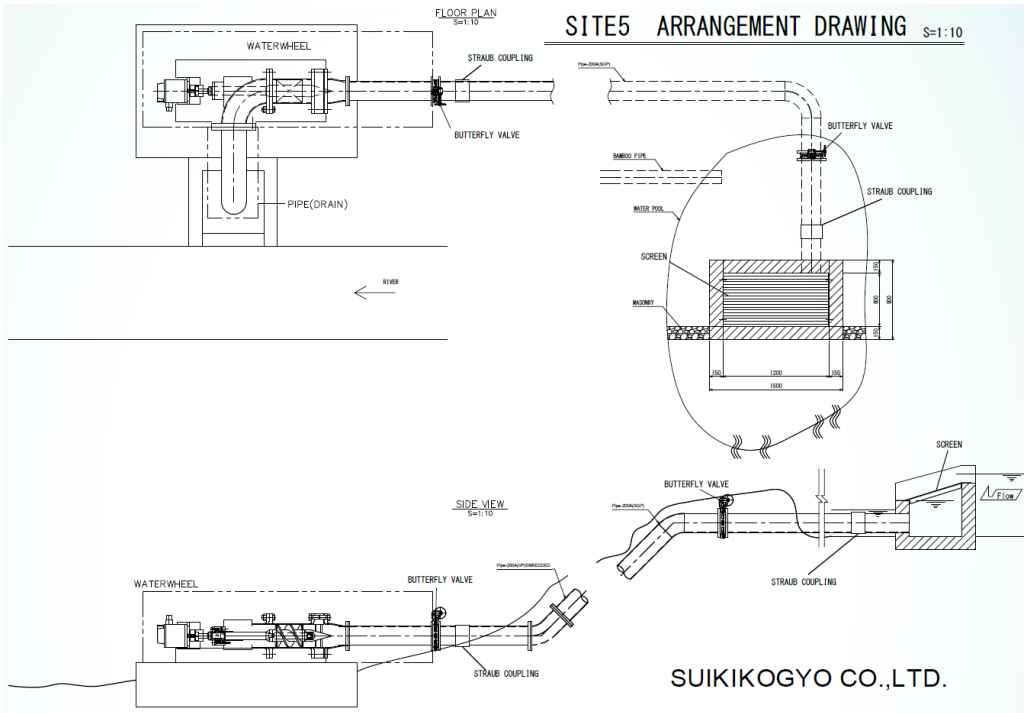
Source : PT Basara Hydropower

Figure 3-11 System diagram of solar PV system

2) Consideration of small hydropower system

Water utilized for the power generation by PLTM Muara project is discharge to a small river and the agricultural zone. Its flow volume is approximately 0.8 [m3/sec].

Suiki Kogyo has studied a project of the small hydropower plant and wants to design an efficient hydropower plant. Sample drawing prepared by Suiki Kogyo is presented below.



Source : Suiki Kogyo

Figure 3-12 Site arrangement drawings of small hydropower plant

Based on the requirement from PT Basara, Suiki Kogyo will plan and design small hydropower system as JCM model project, located at the downstream of the powerhouse of PLTM Muara project site.

There are still some points remaining to be settled on the design of the additional hydropower system. Discussions are continuing.

3.3.4 Consideration of JCM Application

1) Consideration of the solar PV system

PT Basara is considering to install a solar PV system (500 kW) by themselves. For after the implementation of solar PV system, the GHG emission reduction is calculated below.

[Conditions] Installation capacity : 500 kW, Annual operation hours : 1,460 hours / day

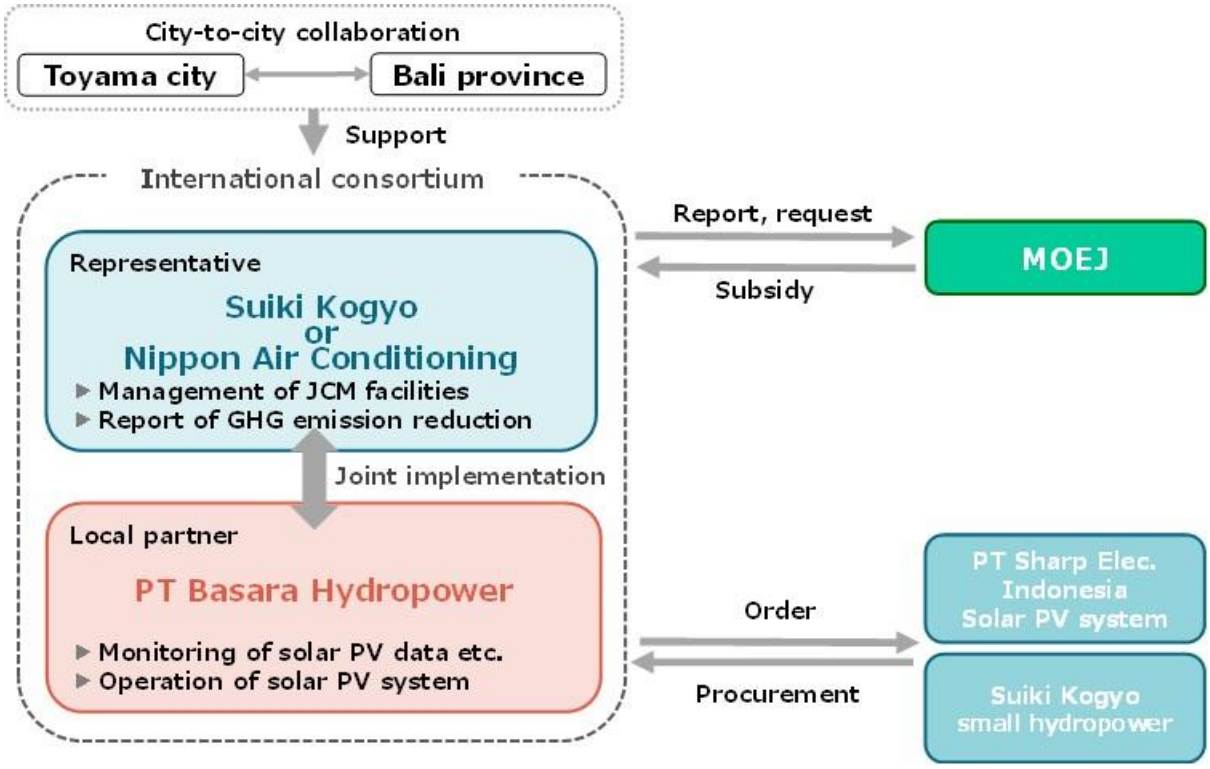
Emission reduction = Reference emission － Project emission

= (500.00 [kW] × 1,460 [h/y] × 0.616 [tCO2/MWh]) － 0

= 449.68 ≒ 500.00 [tCO2/y]

2) Consideration of the JCM application

PT Basara is a private company and so it is not necessary to conduct tender process for their procurement. To apply to JCM subsidy, it is necessary to build an international consortium which consists of Japanese and Indonesian entities. Representative of the consortium is currently considering a Toyama private company, and this will be finalized before the JCM application.



Source : Nippon Koei

Figure 3-13 International Consortium, PT Basara

3) Consideration of the Indonesian law

JCM model project will install solar PV system on the roof-top of the powerhouse and nearby the power plant of the small hydropower system downstream of the powerhouse.

Before the JCM registration, construction activities should be properly checked based on the Indonesia environmental impact assessment (AMDAL) etc. because JCM scheme is required to follow national laws and regulations. In addition, Sustainable Development Implementation Plan (SDIP) will also be checked based on the requirements from Indonesian JCM secretariat.

Table 3-8 Confirmation items of SDIP in PT Basara project

Items	#	Questions	Y/N	If answer is Yes, please describe the action plans.
EIA	1	Does the proposed project require official/legal process of EIA?	Yes or No	Check the project details when the overall design is completed. Then, EIA or similar investigation will be done in case of necessary.
Pollution Control (No need to answer if EIA is required)	2	Does the proposed project emit air pollutants?	No	
	3	Does the proposed project discharge water pollutants or substances which influence BOD, COD or pH, etc.?	No	
	.4	Does the proposed project generate waste?	Yes	
	5	Does the proposed project increase noise and/or vibration from the current level?	No	
	6	Does the proposed project cause ground subsidence?	No	
	7	Does the proposed project cause odor?	No	
Safety and health	8	Does the proposed project create dangerous condition for local communities as well as individuals involved in the project, during either its construction or its operation?	No	
Natural Environment and biodiversity	9	Is the proposed project site located in protected areas designated by national laws or international treaties and conventions?	Yes or No	Check the project site and its surrounded area whether they are designated by national laws etc.
	10	Does the proposed project change land use of the community and protected habitats for endangered species designated by national laws or international treaties and conventions?	Yes or No	Check the project site and its surrounded area whether they are designated by national laws etc.
	11	Does the proposed project bring foreign species?	No	
	12	Does the proposed project include construction activities considered to affect natural environment and biodiversity (e.g., noise, vibrations, turbid water, dust, exhaust gases, and wastes)?	No	
	13	Does the proposed project use surface water, ground water and/or deep ground water?	Yes	
Economy	14	Does the proposed project have negative impact on local workforce capacity?	No	
	15	Does the proposed project have negative impact on local community's welfare?	No	
Social Environment and Community Participation	16	Does the proposed project cause any resettlement or other types of conflict?	No	
	17	Does the proposed project fail to involve activities to respond to, and follow up, comments and complaints that have been received from local communities, particularly from the public consultation?	Yes or No	Check the project site and its surrounded area whether they are designated by national laws etc.
	18	Do the project participants violate any laws and/or ordinances associated with the working conditions of local communities which the project participants should observe in the project?	No	
Technology	19	Does the proposed project fail to involve activities to build capacity of human resources through technology transfer and technical assistance?	No	
	20	Does the proposed project fail to describe information of technology specification that consists of manual book and ways to overcome the problems that may occur when being operated on the site, at least in English and in Bahasa Indonesia as applicable?	No	

Source : JCM Sustainable Development Implementation Plan Form

CHAPTER 4 JCM CITY-TO-CITY COLLABORATION

4.1 OUTLINES OF CITY-TO-CITY COLLABORATION

As the 1st city-to-city collaboration activity, the Project has conducted information/data collection of energy saving demand and issues in Bali province in association with BAPPEDA. Also, through the discussions with BAPPEDA, the following items were identified.

1) Introduction of renewable energy project, such as solar PV system, small hydropower etc.
2) Installation/replacement of energy efficiency, air-conditioning system etc.
3) Implementation of fuel shift in transportation sector

Major activities in the city-to-city collaboration are described in the table below.

Table 4-1 Major activities in the city-to-city collaboration

Activities	Time	Outlines
Kickoff meeting, Tokyo	May 31, 2018	- Discussions on overall schedule, technology applied, project, prospective JCM model project etc.
1st field survey	Jun. 17 - 21, 2018	- Discussion with BAPPEDA Bali province etc. - Discussion with small hydropower developer (PT. BASARA)
2nd field survey	Jul. 16 - 20, 2018	- Discussions with shopping mall association - Bali hotel & restaurant association
JCM seminar, JKT	Jul. 24, 2018	- Outlines of JCM scheme, presentation of Bali province and Toyama city etc.
Indonesia-Japan 60th anniversary	Jul. 29, 2018	- Participation of the Indonesia-Japan 60th anniversary - Discussions on JCM city-to-city collaboration
Business matching, Toyama	Jul. 30, 2018	- Business matching in Toyama city
3rd field survey	Sep. 8 - 14, 2018	- Discussion with Hotel association - Discussion with Tabanan prefecture on JCM application
4th field survey	Oct. 9 - 14, 2018	- Meeting with shopping malls in Bali - Site survey of small hydropower in Singaraja town - Meeting with BAPPEDA - Meeting with Tabanan prefecture
City-to-city seminar and etc., Yokohama	Oct. 25 - 30, 2018	- Participation of JCM seminar in Yokohama - Courtesy call to Toyama city
5th field survey	Nov. 11 - 15, 2018	- Discussion of shopping mall on JCM application - Discussion of transportation sector with Tabanan
6th field survey	Jan. 22 - 24, 2019	- Discussion of shopping mall on JCM application - Discussion of transportation sector with Tabanan - Participation of ASEAN high-level seminar
7th field survey	Feb. 4 - 9, 2019	- Holding of wrap-up meeting with BAPPEDA Bali - Discussion on next fiscal year's activities

Source : Nippon Koei

4.2 BUSINESS MATCHING IN TOYAMA CITY

Business matching in Toyama was held on July 30, 2018 when Semarang city delegations that came to Japan to attend the Indonesia-Japan 60th anniversary in Tokyo. The participants from Indonesia were basically not from Bali province; however, it was a good opportunity for Toyama companies to understand Indonesian culture, customs and business opportunities.

During the business matching, information and local needs in Bali province were provided to Toyama participants. Outlines of the business matching is presented below.

Date : July 30, 2018, Monday 13:30 to 17:00
Venue : Oaks Canal Park Hotel Toyama, 4th floor
Participants : Semarang city : 7 persons, Toyama city : 10 persons, IGES : 2 persons, Toyama companies : more than 10 persons from 6 companies, Nippon Koei : 3 persons, Total 33 persons

Through this business matching, it was confirmed that Nippon Air-conditioning Hokuriku (NAH) was interested in not only JCM scheme application but also overseas business expansion in Bali province. Also, NAH took part in the JCM feasibility study.

Photo of discussion in business matching, Nippon Air-conditioning Hokuriku

Photo of Business matching

4.3 JCM SEMINAR IN YOKOHAMA

From October 24 to 30, 2018, the JCM seminar in FY2018 was held in Yokohama city. From Bali province, the following two persons attended the seminar.

1) Mr. Jayadi Jaya (Director of Regional Government Bureau, Bali province)
2) Ms. Luh Ayu Aryani (Environment Bureau, Bali province)

In the seminar, Bali province delegations made presentation on JCM city-to-city collaboration between Bali and Toyama. Then, they made courtesy call to Environmental Policy Division of Toyama city and exchanged opinions including ideas for further collaboration.

Photo of presentation of Bali at JCM seminar

Photo of courtesy visit in Toyama city office

4.4 WRAP-UP MEETING IN BALI PROVINCE

As a final report to Bali province in FY2018, the wrap-up was held in the meeting space of BAPPEDA Bali province.

Date : February 7, 2019, 13:00 to 15:30
Venue : BAPPEDA office in Denpasar city Bali province
Participants : Total 35 persons including 9 persons from Toyama city concerned

In the meeting, the results of JCM feasibility study and city-to-city collaboration were reported to the Bali participants. Also, Toyama companies joined the meeting to explain their experiences. To enlarge scope of the next fiscal year's project, people from other prefectures in Bali province were invited to the meeting.

Through discussions among the participants, it was pointed out that the JCM project sustainability is uncertainly. To this point, Toyama city replied that city-to-city collaboration will be functional for such issues, precisely in order to support project sustainability.

Also, participants wanted to hear about the practicability of the fuel shift technology. To this point, it was explained that preparation of fuel shift infrastructures such as CNG gas station, transportation tool is under consideration between cities to reinforce materialization of the idea. It was mentioned that fuel shift has already been implemented with public buses and taxies in Jakarta and Semarang cities.

Table 4-2 Agenda of wrap-up meeting in Bali province

#	Program	Person
1	Opening remarks	Toyama city Bali province
2	Introduction of the participants	All attendance
3	Outline of Joint Crediting Mechanism	Nippon Koei
4	Free discussion	All
5	Report on feasibility study for JCM model project in Bali province ➢ Energy saving project ➢ Renewable energy project ➢ Fuel conversion project	Toyama companies Nippon Koei
6	Report on City-to-city collaboration activities ➢ Kick off meeting in Bali ➢ JCM city-to-city seminar in Japan ➢ High level seminar in Bali	Nippon Koei
7	Further collaboration in FY 2019	Nippon Koei
8	Closing remarks	Toyama city Bali province

Source : Nippon Koei

Snap of wrap-up meeting

Snap of wrap-up meeting

JCM outline and report on JCM FS, Nippon Koei

Presentation, by Mr. Murotani

Presentation by Mr. Nomura

Presentation material, Suiki Kogyo

Photos of wrap-up meeting

4.5 FURTHER CITY-TO-CITY COLLABORATION

At the end of the meeting, it was confirmed that further collaboration between Bali and Toyama would be implemented based on the experiences of Toyama's environment future city which contributes to regional government formulation with utilization of regional characteristics and industries.

With this process, Bali province can enhance the value of international eco-friendly tourism city. The menus are considered based on the Toyama's experimental properties such as Compact city, Environmental future city, 100RC, SE4ALL etc.

In addition, private company involvement is another factor to reinforce the collaboration. Bali province is expected to utilize its own tourism/natural resources to lead to tourism future city with JCM subsidy scheme.

CHAPTER 5 RESULTS AND PROPOSALS

5.1 RESULTS OF JCM FEASIBILITY STUDY

In FY 2018, the Project has identified (i) JCM potentials in Bali and (ii) feasibility of Toyama private entity's involvement in JCM model project through the city-to-city collaboration, in association with BAPPEDA Bali province, Tabanan prefecture, Bali Hotel association, Bali Shopping Mall Association.

Especially the Project has intensively discussed with a large-scale shopping mall, regional governments, private companies, as the potential JCM model project participants.

5.1.1 JCM Model Project in the Next Fiscal Year

From this city-to-city collaboration, the following three projects are identified as candidate JCM model projects in FY 2019.

Table 5-1 JCM model project in the next fiscal year

PROJECTS	Members of international consortium	Specification	GHG emission reduction [tCO2/y]
Installation of solar PV system and replacement of AHU systems in shopping mall	Nippon Airconditioning Hokuriku, Discovery Shopping Mall, PT Tokyo Century Leasing	Details of solar PV system and AHU system will be fixed later on.	Solar PV system : 700 AHU system : --- *Details of cost effectiveness on AHU unit will be calculated later on.
Procurement of CNG vehicle for public school transportation in Tabanan prefecture	Hokusan, Koperasi in Tabanan	Bemo 9 pax. : 80 Bemo 13 pax. : 98 + 2 Total : 205 * Cost estimate etc. will be confirmed later on.	Cost effectiveness : Less than 4,000 JPY//tCO2
Installation of solar PV system and additional mini hydropower system in existing hydropower plant	Suiki Kogyo, Nippon Airconditioning Hokuriku, PT Basara Indonesia	Sola PV system : 500kW Hydropower : ---	Solar PV : 500 Hydropower : --- *Details of cost effectiveness will be calculated later on.

Source : Nippon Koei

5.1.2 JCM City-to-city Collaboration

In FY 2018, the Project has conducted discussions aiming to low carbon tourism city with JCM model projects formulation below (bottom-up approach).

(i) High efficiency air-conditioning system in shopping mall

(ii) Solar PV system in rural area

(iii) Fuel shift in public transportation system with Bali potential players

Due to the limited time, the collaboration was not implemented. So, it shall be done in a positive manner in the next fiscal years. Details are described in the next sections.

5.2 PROPOSAL FOR NEXT YEARS

5.2.1 Feasibility Study on JCM Model Project in FY2019

By the result of JCM feasibility study in FY 2018, it was confirmed that JCM model project of the large tourism facilities and the transportation activity contributes to environmental policy in Bali and can get across with regional government and private companies.

In the wrap-up meeting in February 2019, the Project was required to implement further feasibility study that contacts with other prefectures in Bali province in the next fiscal year.

In this context, it is preferable that the following activities are recommended to implement in the next fiscal year.

1) Project finding in the energy efficiency/saving activities in large-scale hotel

2) Project finding in the public transportation except Tabanan prefecture, in order to expand fuel shift project (oil to gas)

Also, Bali province has interest in introduction of electric vehicle (EV) as a public transportation tool. It will be considered to be included in the scope of JCM feasibility study in FY 2019.

The following table shows the candidates of JCM model project.

Sector	Target	Stakeholders	Plan for FY2019
	**Promotion of Energy saving technology in Hotel&Tourism sector in Bali**	**Japan side : Nippon Air conditioning, Hokusan Bali side : Bali Hotels Association, Bali hotels & Restaurant Association (Bali shopping mall association)**	**Establish a cooperative relationship with Hotel sector for developing JCM model project through the discussion with the related associations in the Wrap up meeting.**
	**Introduction of Low carbon Transportation in Bali**	**Japan side :Hokusan Bali side : Municipalities in Bali province Sri Bhuana Harta (Koperasi) in Tabanan, Related associations etc.**	**Promotion of energy saving technology (fuel conversion) in transportation sector such as School bus and Tourist bus by JCM model project.**

5.2.2 Activities on JCM City-to-city Collaboration in FY2019

Through the city-to-city collaboration in FY 2018, JCM seminar in Japan, business matching in Toyama and activities of Toyama private companies were conducted. Collaboration between Bali and Toyama have just started from FY 2018 and the following items will be implemented in the next fiscal year.

1) Knowledge sharing of compact city concept by Toyama city in terms of city planning

2) Discussions on future city contributing to low carbon society

The following table shows the candidates of JCM model project.

Sector	Target	Stakeholders	Plan for FY2019
	**Support for development "Tourism Future city" as a low carbon society in Bali**	**Japan side :Toyama City Nippon Koei Bali Province (BAPPEDA etc.) Municipalities in Bali province**	**Information sharing of profitable know-how & ideas of international activity through the collaboration between Bali province and Toyama city. (Ex. Compact city, Future city、100RC, SE4ALL etc.)**

Concretely speaking, it is recommended that the following activities would be implemented as JCM city-to-city collaboration in association with Toyama city in the next fiscal year.

1) Support on CNG infrastructure development such as construction of gas station etc. in association with Toyama city/entity.
2) Support on equalization of tourism resources and raise of the tourism value whole Bali province.

5.2.3 Proposals on JCM City-to-city Collaboration

Scheme of JCM city-to-city collaboration was proposed by the Government of Japan to disseminate JCM benefits effectively and gives trigger an overseas challenge to Japanese regional government/private companies, like Toyama city/company.

This year is the first year of JCM collaboration with Toyama city, its local companies and Bali province. Based on the findings through the activities, the following items are proposed for the further collaboration between Toyama city and Bali province.

1) Effective support on small scale JCM project formulation

One of the conditions of JCM model project application is the minimum amount of subsidy (i.e. more than 50 million JPY). In case the rate of JCM subsidy is 40%, the project initial cost should be at least 125 million JPY. Through the experience of seed finding and project formulation, some projects are sometimes identified that are small investment cost but high cost effectiveness (high performance).

Taking the above into consideration, it is proposed that simplified schemes are necessary for small scale JCM model project, in order to disseminate the JCM model project and expand the small-scale project formulation.

2) Bundling small scale project to contribute to horizontal development

To enlarge the small JCM model project, one of the critical factors is whether the international consortium is developed properly or not. If it is done properly, the bundling of small ones is not so difficult. On the other hand, it means that the task of the representative of the international consortium will increase.

Under the city-to-city collaboration, such situations are sometimes confirmed, and they are not easy to solve.

Hence, second or later projects will be designed based on the first project in the same country, in the same manner as the program CDM. If such approach is accepted, it should contribute to the horizontal development of JCM model project.

3) Utilization of city-to-city collaboration on JCM model project implementation

In the city-to-city collaboration, both cities formulate the partnership which contributes to low carbon society development. Such relationship is effective not only for project formulation but also project implementation. It is essential to join the city-to-city collaboration for the Japanese local company that does not have any experience in the overseas market. Accordingly, the city-to-city collaboration contributes to JCM model project development and its implementation.

Concretely speaking, it seems to be encouraging for local companies and regional governments, i.e. Toyama city and Bali province, to support them to develop or participate in the international consortium. In case the project participant faces issues that seems to be difficult to solve by the private company by themselves, utilization of the collaboration between cities is effective.