FY 2017 INTERCITY CONSIGNMENT BUSINESS COLLABORATION TO REALIZE A LOW-CARBON SOCIETY

PROJECT TO DEVELOP COMPACT CITY TYPE TRANSPORTATION SYSTEM AND RESEARCH PROJECT TO SUPPORT LOW CARBONIZATION RESILIENT CITY CONSTRUCTION OF SEMARANG CITY, INDONESIA WITH COOPERATION OF TOYAMA CITY, JAPAN

REPORT

9 March 2018

Pacific Consultants Co., Ltd.

Toyama City

Institute for Global Environmental Strategies

Contents

Glossary

Abbreviation	Indonesian /English notation
ADB	Asian Development Bank
APFSD	Asia-Pacific Forum on Sustainable Development
ASEAN	Association of South-East Asian Nations
BAPPEDA	Badan Pengendalian Dampak Lingkungan Badan (Regional for Planning and Development Agency)
BAU	Business as Usual
BBG	Bahan Bakar Gas
BRT	Bus Rapid Transit
BSB	Taman Industri BSB City
BtoB	Business to Business
CIS	Cu(Copper), In(Indium), Se(Selenium)
CNG	Compressed Natural Gas
COP	Conference of Parties
CO2	Carbon Dioxide
CRO	City Resilience Officer
CRS	City Resistance Strategy
CTY	The City Taskforce
ECU	Electric Control Unit
EPC	Engineering Procurement Construction
ESDM	Ministry of Energy and Mineral Resources
FS	Feasibility Study
GEC	Global Environment Center Foundation
GHG	Green House Gas
G7	Group of Seven
HLPF	High-Level Political Forum on Sustainable Development
HLS/ESC	High Level Seminar on environmentally Sustainable Cities
IC	Integrated Circuit
ICT	Information and Communication Technology
IDR	Indonesia Rupiah
IGES	Institute for Global Environmental Strategies
IPP	Independent Power Producer
IRDA	Iskandar Regional Development Authority
IRR	Internal Rate of Return
ISAP	International Forum for Sustainable Asia and the Pacific
ITB	Institut Teknologi Bandung
ITDP	The Institute for Transportation and Development Policy
JCM	Joint Crediting Mechanism

JFJCM	Japan Fund for the Joint Crediting Mechanism
JICA	Japan international Cooperation Agency
KIW	Kawasan Industri Wijayakusuma
LED	Light Emitting Diode
LoCARNet	Low Carbon Asia Research Network
LNG	Liquefied Natural Gas
LOI	Letter of Intent
LPG	Liquefied Petroleum Gas
LRT	Light Rail Transit
MOU	Memorandum of Understanding
MPW	Ministry of Public Works
MRT	Mass Rapid Transit
MRU	Mobile Refueling Unit
MRV	Measurement, Reporting, Verification
OECD	Organization for Economic Co-operation and Development
PCKK	Pacific Consultants CO., Ltd.
PGN	PT. Perusahaan Gas Negara
PU	Ministry of Public Works
UNDIP	Diponegoro University
RSND	Rumah Sakit Nasional Diponegoro
RUEN	Rencana Umum Energi Nasional (National Energy Plan)
RUPTL	Rencana Umum Penyediaan Tenaga Listrik (Electrical Power Supply Plan)
SDGs	Sustainable Development Goals
SGC	Sustainability Governance Centre
SPBG	Stasiun Bahan Bakar Gas
SPC	Special Purpose Company
SV	Supervisor
WUF	The World Urban Forum
100RC	100 Resilient Cities

Summary

We conducted surveys in transportation and renewable energy fields to resolve urban problems, based on city t city cooperation projects between Semarang city and Toyama city.

In the transportation field, we conducted a survey on business feasibility of the projects and carbon dioxide (CO2) reduction effects after implementing a “Modal Shift” by improving the current Bus Rapid Transit (BRT) transportation operation system and introducing a shift from diesel to CNG fuel for bus vehicles.

Additionally, we conducted a survey in the renewable energy field, especially on project feasibilities, including technological transfer and applications for environmental education through small hydroelectric power, biomass power and solar power generation projects. We also investigated feasibility of CO2 reduction and possibility of human resources development in the renewable energy field through the projects, together with a screening survey on energy saving methods in industrial fields of the Indonesian industrial district.

Firstly, we concluded that for BRT operator Trans Semarang, business profitability and project feasibility would be low for the BRT operational improvement program in the transportation field, as they already implemented an IC card system and a bus-location system on the internet. Though the penetration ratio can still be improved, feasibility will be low for BRT improvement.

However, regarding the project to shift the current BRT system to CNG, both Semarang city and Trans Semarang showed strong interest in the project to introduce CNG bus vehicles and CNG supply by using Mobile Refueling Unit (MRU) vehicles. As Semarang city has three gas stations constructed, but not in operation, using MRU vehicles to supply CNG remains attractive for Semarang city.

Secondly, in the renewable energy field, at Diponegoro University that aims for a sustainable campus, we conducted a feasibility survey on business profitability and introduction methods for small hydroelectric power, biomass power, and solar power generation projects.

Additionally, we investigated the possibility to introduce hydroelectric power generation in an agricultural channel and flood control dams. We paid special attention to prompt implementation of Diponegoro University's projects and the solar power generation introduction project at primary schools and junior high schools in Semarang city.

In parallel with the survey, both Semarang city and Toyama city agreed to reconfirm that "Compact City" policies, based on Light Rail Transit (LRT) and the know-how and expertise of Toyama city in utilizing its technological capacity for low carbon society were effective for problem solving and realizing a low carbon society in Semarang city. In December 2017, both cities concluded a cooperation agreement after confirming the above-mentioned perspectives.

From now on, both cities will cooperate under the city to city agreement to contribute to resolve urban issues and realize a low carbon society. Demonstrating this contribution to problem solving will have a positive influence for ASEAN countries and other cities for further applications.

1. Project outline

1.1 Project name

Project to develop compact city type transportation system and research project to support low carbonation resilient city construction in Semrang city, Indonesia with cooperation of Toyama city, Japan

1.2 Project duration

From August 18, 2017 to March 9, 2018

1.3 Objectives of the project

The COP21 climate change summit reached the Paris Agreement in 2017. Nearly 200 countries participated and adopted the decision called the Paris Agreement that commits all countries to cut emissions that will come into being in 2020. The Paris Agreement concluded in COP21 to keep the temperature increase to 2 degrees C compared with the pre-industrial revolution era and pursue efforts to limit it to 1.5 degrees C.

The enforcement of non-carbon implementations are encouraged to stop global warming. In addition to these implementations, decisions were made to acknowledge the actions of NGOs (including cities), and to encourage the efforts of all NGOs and local governments to accelerate their dedication and commitment by providing support to extend their activities.

COP22, held in November 2016 in Marrakesh, Morocco, adopted the "Marrakesh Action Proclamation for our Climate and Sustainable Development". This proclamation emphasized the acute need for actions to prevent global warming that has accelerated at an unprecedented rapid pace, and acknowledged the urgent need to promote civil society engagement to take actions to prevent climate change on a global basis.

Additionally, these were recognized as positive chances to pursue sustainable development as well as to shift the economic system to prosper further

globally. In cities where many of people reside, i.e. urban areas, 50% of global population is concentrated on the less than 2% of the world's area. This urban population concentration rate is expected to increase dramatically up to 70% by 2050.

By 2006, 70% of CO2 emission was from urban areas. The role of cities in reducing the impacts of climate change is significant and implementation of countermeasures for climate change is crucial for achieving the Paris Agreement objectives.

In our project, Japanese research institutes and private companies will provide support for establishing a low carbon society in cities of developing countries, based on city to city cooperation with Japanese local governments that have knowledge and experience in creating a low carbon society. Additionally, this project will help cities in developing countries increase their capability to create a low carbon society through partnership with Japanese local governments.

1.4 Project overview/contacts

Our project is operated under a scheme based on a bilateral agreement between Toyama and Semarang city. Our survey includes the following projects, "Compact city type transportation system implementation, Problem solving renewable energy introduction, a Business operation scheme, International consortium building, a Funding composition scheme, as well as studies of Business profitability and problems and their solutions. Following is our project outline.

Our project includes the feasibility survey of the followings:

1.4.1 Feasibility study for compact city-type transportation system development

（1） Feasibility to improve technologies of existing Bus Rapid Transit (BRT) service efficiency

To prompt a modal shift from automobile and motorcycle, we surveyed feasibility to improve the technology and service efficiency of the existing BRT that provides public transportation in Semarang city.

・Feasibility of IC card system

・Consideration of modification

・Consideration of bus system location

・Consideration of information distribution service

(2)Conversion from existing BRT (diesel fuel) to CNG bus

In converting from existing BRT (diesel fuel) to CNG bus, surveyed the possibility of reducing CO2 by fuel conversion from diesel to CNG.

・Study of routes subject to consideration for CNG bus conversion

・Study of vehicles for converting to CNG bus

・Study of CNG stations

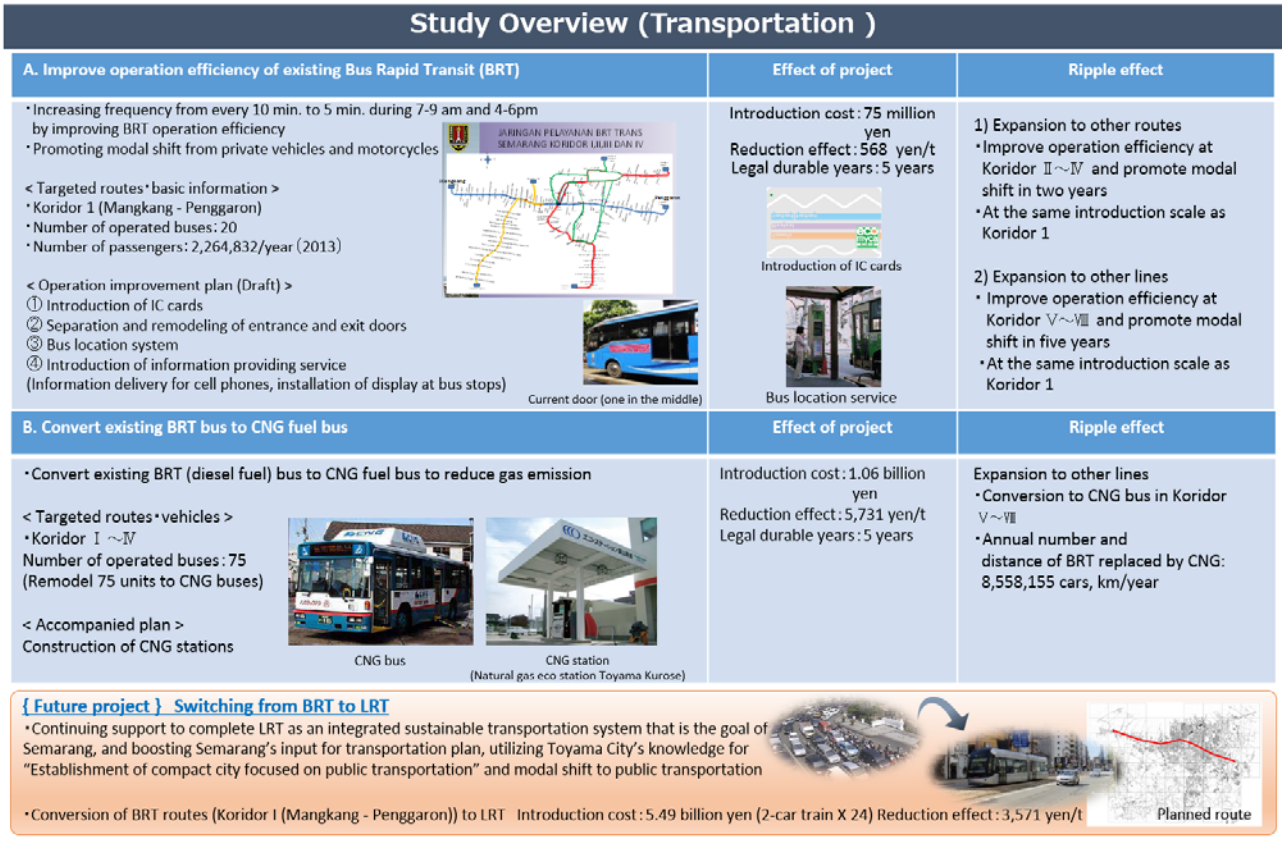


Figure 1-1 Overview of the study (Transportation)

1.4.2 Feasibility study of renewable energy and energy saving equipments

(1) Feasibility of Renewable energy introduction on Diponegoro Univ. campus

We conducted a feasibility study for small power generation, biomass power and solar power generation on Diponegoro University campus.

- Feasibility for an on-campus educational dam alteration to small power generation dam.
- Feasibility of on-campus biomass power generation at the university waste treatment facility.
- Feasibility of solar power generation on university hospital roofs.

(2) Feasibility of hydroelectric power generation in Jatibaran dam

Conducted a feasibility study on hydroelectric power generation in MPW flood

control dam.

(3) Screening of facilities conducting energy saving projects in industry field

Conducted a screening survey with Japanese companies operating in KIW and BSB industrial districts in Semarang city.

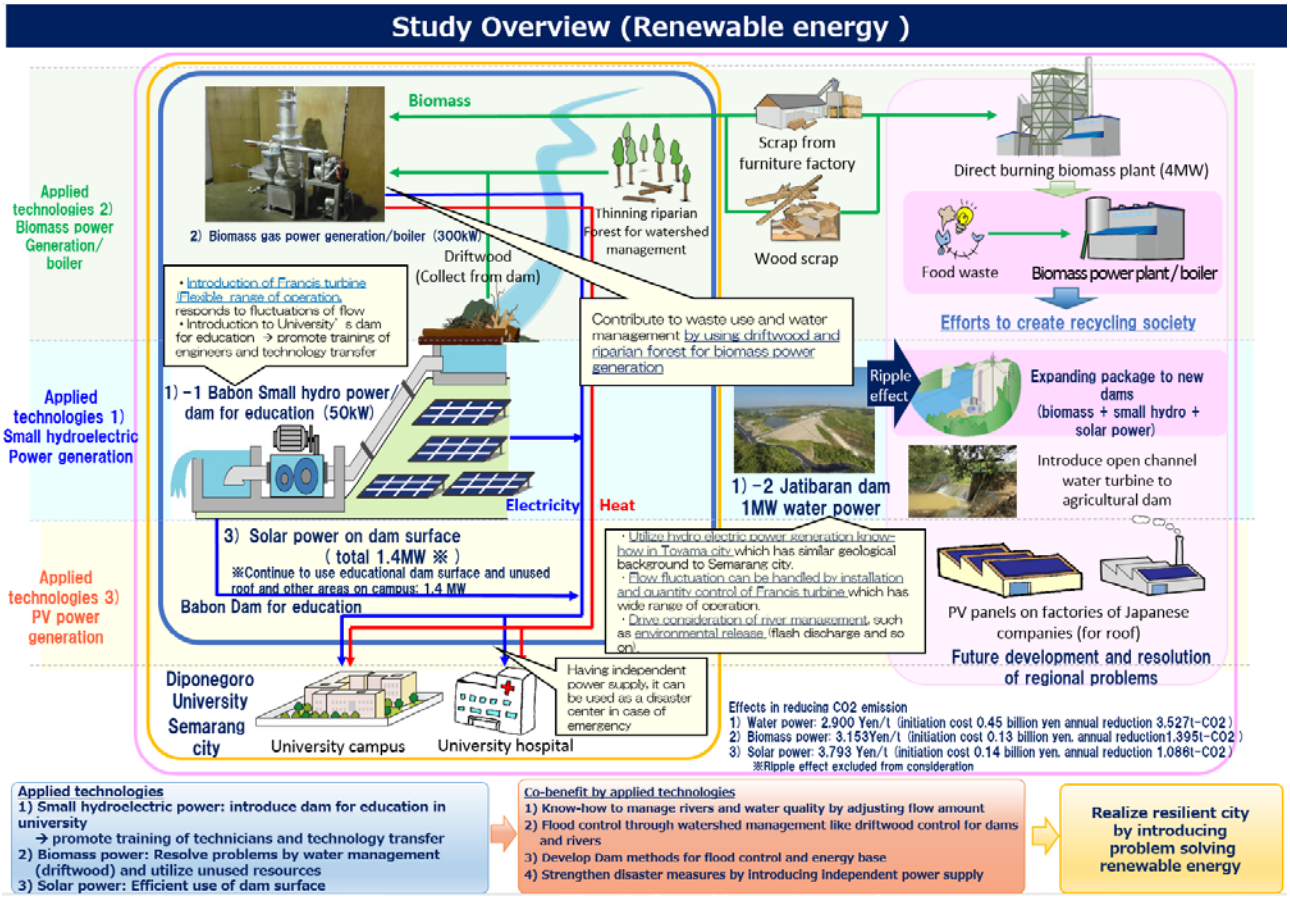


Figure 1-2 Overview of the Study (Renewable Energy)

1.5 Project system

1.5.1 Transportation

Followings are the operation system of our project.

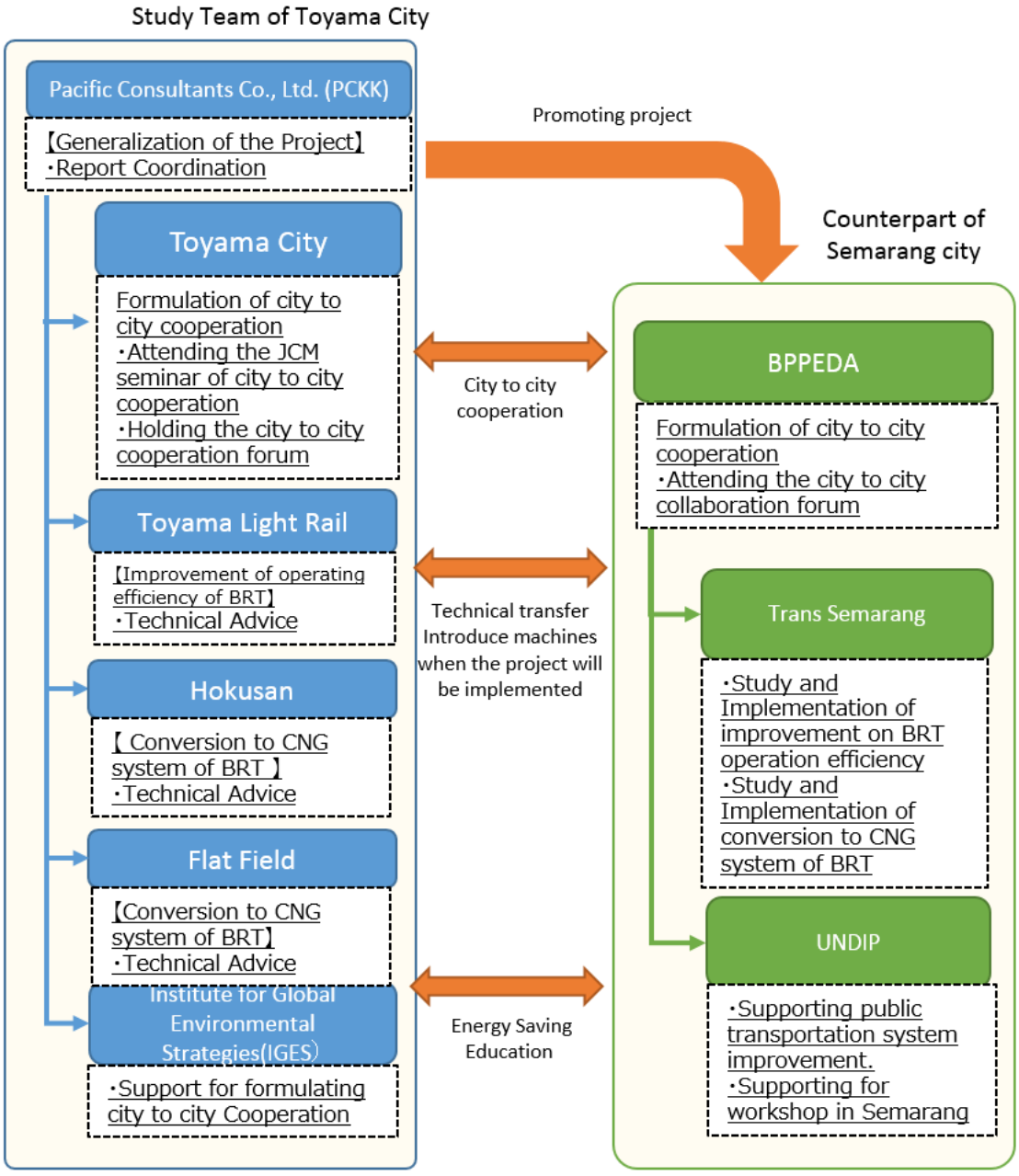


Figure 1-3 Conduction system of the study (Transportation)

1.5.2 Renewable Energy and Saving Energy

Followings are the operation system of our project.

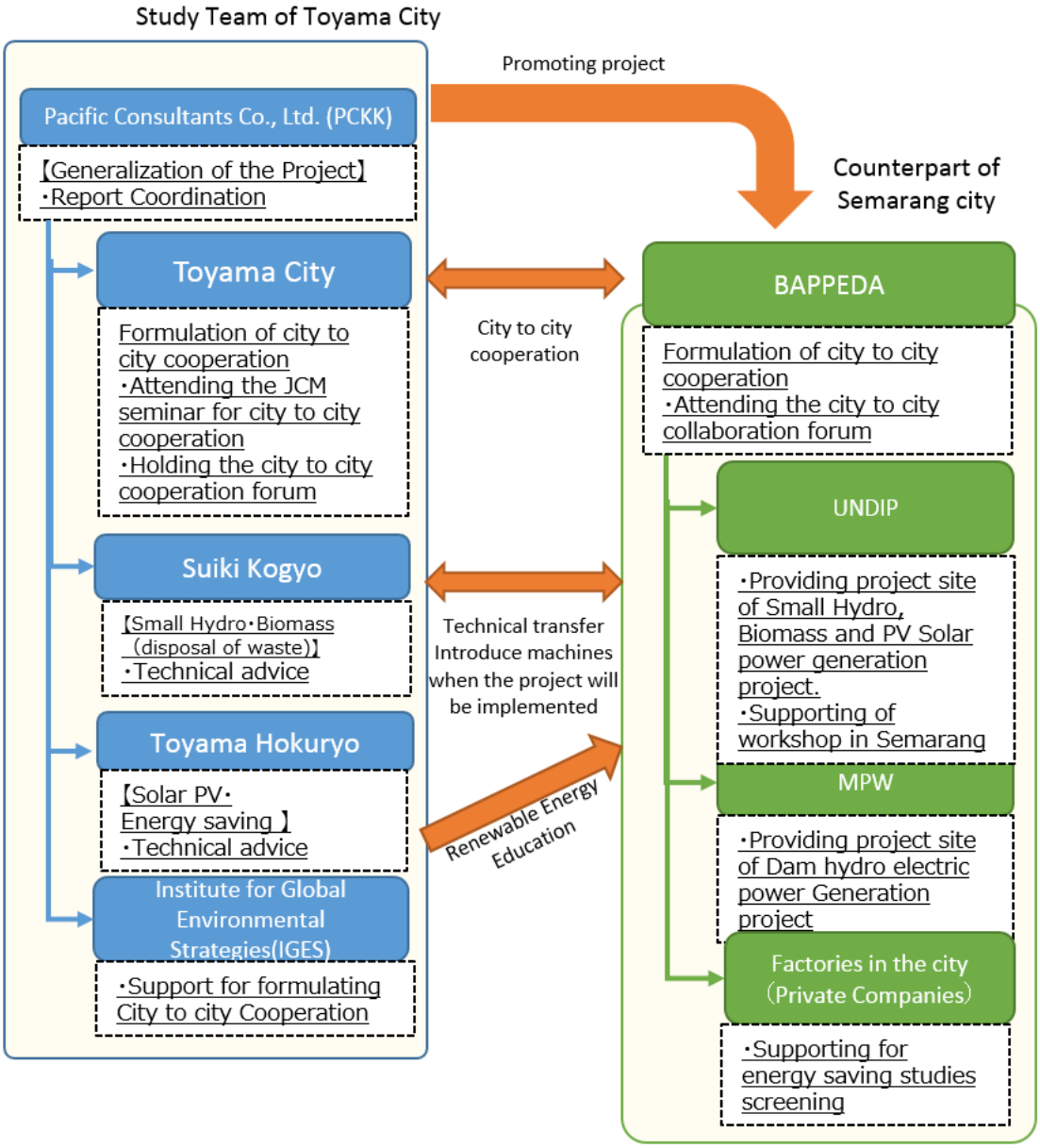


Figure 1-4 Conduction system of the study (Renewable Energy・Energy Saving)

1.6 Progress

Followings are the progress of our project.

Table 1-1　Progress

Topics/Items		Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	References/Notes
Compact city type transportation system introduction feasibility survey	Feasibility of present BRT operation efficiency refoming technology									
	Present BRT will be changing to ONG Bus system									
Renewable energy and energy saving facility introduction feasibility survey	Feasibility of Diponegoro University campus renewable energy introduction.									
	Introduction of small hydropower power generation in Jatibaran Dam									
	Screening of the facilities that implement the energy-saving projects in industrial field									
Progress Reports for Ministry of Environment				①			②	③		①First Progress Report ②Second Progress Report ③Third Progress Report
Pre discussion meeting for workshops that local government organizes, etc.,in the survey city.		①					②			
Workshops in survey city				①			②			①First workshop(Local) ②Second workshop(Local)
Presentations of city to city collaboration overseas and inside of Japan projects.(Seminor hosted by metropolitan Tokyo for city to city collaboration)							●			
Japanese local government city to city collaboration forum Toyama city, city to city collaboration Forum						●				
Finalization of the Report										
Local Survey			①	②			③		④	

2. Background of business operation

2.1 City to city cooperation background knowledge.

The Republic of Indonesia is a country with high vulnerability to climate change. It is, however, the top Green House Gas (GHG) emitting country in the world, and has set a target to reduce 26% of GHG compared with Business As Usual (BAU). In addition, Indonesia set the target to increase its percentage of renewable and returnable new energy to 25% by 2025. To achieve these targets, it implemented the Grand National Energy Plan 2015-2050 (RUEN) to promote use of renewable energy such as small hydraulic power, biomass, solar power generation and so forth.

The Indonesian Federal Power Agency has also decided on the National Electric Power Plan 2017-2016 (RUPTL) that goes along with National Integrated Energy Plan to strengthen domestic power generation capacity by 80.5GW in ten years.

Indonesia decided on positive promotion plans concerning renewable energy in the RUPTL, and the target was set to expand the percentage of renewable energy up to 23% by 2015. The government also set the target to strengthen hydropower generation capacity with Independent Power Producers (IPP) to facilitate the country's needs. The country decided a 5,000MW increase of power generation capability by 2025 as the goal for solar power generation.

Our business will be operated in the middle of Java State in Semarang city, located 450km east of Jakarta city at the center of Java island. Semarang city has the fifth largest population in Indonesia with a population of 1,550,000 in 2010.

Figure 2-1 Location of Semarang city in Indonesia

(Reference: Resilient Semarang)

Semarang city is located in an area with vulnerability to disasters, as its geological background has mountains in the south, and lowland and coast area in the north. Currently with effects of global warming, Semarang city has faced serious impacts from heavy rains, droughts and sea level rise and has had significant economic development problems.

Urgent countermeasures to reduce the main component of GHG, CO2, must be taken to cut down overall GHG emissions that lead to global warming.

In December 2013 Semarang city decided to participate in the 100 Resilient Cities of Urban Resilience (100RC) Reinforcement Program hosted by Rockefeller Foundation to resolve urban issues through collaboration with other cities and utilizing city-to-city networks at the international level.

With 100RC's support, City Resilience Strategies (CRS) was decided in June 2016. One of the strategies to implement 100RC objectives stipulated in CRS was "Sustainable water resources and energy".

The CRS also stipulated Energy sector strategies for both (a) Energy reduction through demand control and management, and (b) additional energy supply variations through promotion of renewable energy use in the city.

In addition to (a) and (b), there was interest in introducing renewable energy strategies such as reusing waste and biomass and others to expand the use of

waste energy. The CRS also started initiatives to accelerate the use of renewable energy as well as resolve issues of waste. However, in central Java area where Semarang city is located to fossil fuel consumption for grid power generation has increased in accordance with increased demand of electricity, and the impacts of renewable energy promotion measures are not too positive at this moment.

2.2 Present conditions of city to city cooperation

This survey was designed to achieve the goal to create a low carbon society in Semarang city while accelerating introduction of renewable energy to resolve environmental issues. The survey depends on collaboration with private sector and other related personnel, together with active utilization of city to city cooperation through the 100RC scheme both Toyama city and Semarang city adopted.

With the 100RC program, a variety of support will be provided to assist the investigation and advice will be given to members to actively implement measures to reach CRS goals in an integrated manner and resolve multiple global issues including climate change. Additionally, 100RC will introduce progressive cases to resolve global issues, with Platform Partners consisting of research institutes and private enterprises. The Japanese government and Kanagawa prefecture established Institute for Global Environmental Strategies (IGES) has been a 100RC Platform Partner member for three years from May 2016. In June 2016 IGES and Semarang city signed a declaration letter of interest for co-benefit projects in the transportation field.

Toyama, however, has gained global recognition and reputation; as the first local government in Japan to join 100RC in December 2014, selected as the Environmental Model City in Japan by the national government in 2008, Environmental Future City in 2011, OECD Compact City Report Case Study

City in 2012, and UN Energy Effectiveness, Reform City in 2014.

In May 2016, the G7 Toyama Environmental Ministers' Meeting was held in Toyama city. There IGES co-organized the "Role of the City" parallel session together with the Ministry of Environment of Japan, Toyama city, and the G7 Environment Ministers' Meeting Promotion Cooperation Committee.

In this parallel session, each representative and mayor presented speeches and shared perspectives that cities will play an important role for collaborative application of measures to share tasks, and discussed needs for collaboration with various stakeholders by introducing specific previous cases.

Especially against environmental issues in Asian cities, which IGES has major concerns to resolve, IGES and other participating cities agreed to tackle these issues concretely in cooperation with international institutions and cities that participated the meeting.

Against this background, IGES joined the 100RC platform with Toyama city as intermediary, and with IGES mediation, Semarang city, between Toyama city and the 100RC network, concluded a joint partnership and (LOI Letter of Intension) on co-benefits in the field of transportation and so forth. Then, discussion for collaboration among these three parties developed actively.

Additionally, in Toyama in November 2016 the "Resilient city Summit" was held (co-hosted by Toyama city, the World Bank and100RC). Semarang city participated to exchange opinions with Toyama and conducted local site visit studies.

Semarang city strongly hoped to facilitate CRS implementation through collaboration with Japanese local governments, thus, the request for cooperation was proposed to Semarang city to improve its resilience and problem solving ability for urban issues.

Based on this request, in February 2017 Toyama city visited city of Semarang with the private company Suiki Kogyo Co., Ltd. to exchange opinions and conducted a local investigation tour. In March 2017, the Mayor of Semarang

city sent the cooperation request to the Mayor of Toyama to promote further discussion for the possibility of prospective conclusion of a cooperation agreement (MOU) regarding the formation of low carbon society in the future.

3. Compact city type transportation system introduction feasibility survey.

3.1 Feasibility of technology introduction to improve the present Bus Rapid Transit (BRT) operational efficiency

Toyama city has an advanced transportation system, including Light Rail Transit (LRT) and various bus routes developed. Semarang city, however, has not yet reached the level of having an advanced public transportation system, and is still in the early stage of transportation development. At the present stage, one of the major public transportation means is Trans Semarang Bus Rapid Transit (BRT), but recently traffic congestion has started in the city due to population increase and citizens are suffering from increasing time loss from traffic jams.

From mid-term to long-term perspectives, it makes more sense to develop or renovate the present transportation system to make it work better than to introduce a brand-new LRT system modeled on the Toyama city transportation system. LRT can be an option; however, due to budgetary constraints, introduction of LRT is not realistic and renovating the current BRT system would be more down to earth. For this reason, we mainly conducted the survey on how to make the current transportation system close to the level matching a “Compact City” and we surveyed technological aspects to approach a “Compact City System.”

3.1.1 Current bus systems

For the main bus system in Semarang city, the main routes cover the following four corridors (Koridors):

Table 3-1　Main bus system in Semarang city

No.	Kode trayek	Rute trayek
1	BRT I	Terminal Mangkang - Jalan Jrakah - Jalan Siliwangi - Jalan Jend. Sudirman - Tugu Muda - Jalan Pemuda - Jalan Pandanaran - Simpanglima - Jalan Ahmad Yani - Jalan Brigjend. Sudiarto - Terminal Pengaron - PP
2	BRT II	Terminal Sisemut Ungaran - Jalan Setiabudi - Jalan Sultan Agung - Jalan Letjen. S. Parman - Jalan Dr. Sutomo - Tugu Muda - Jalan Pemuda - Pasar Johar - Terminal Terboyo - PP
3	BRT III	Pelabuhan Tanjung Emas - Jalan Ronggowarsito - Jalan Pengapon - Jalan Raden Patah - Bubakan - Jalan Pattimura - Jalan Dr. Cipto - Jalan Peterongan - Jalan Tanah Putih - Kaliwiru - Akademi Kepolisian - Bundaran Taman Diponegoro - (RS Elizabeth) - Jalan Diponegoro - Jalan Siranda - Jalan Pahlawan - SMA 1 - Simpanglima - Jalan Gajah Mada - Jalan Pemuda - Tugu Muda - Jalan Imam Bonjol - Stasiun Tawang - Jalan Ronggowarsito - Pelabuhan Tanjung Emas
4	BRT IV	Terminal Cangkiran - Jalan Ngaliyan - Jalan Jrakah - Jalan Krapyak - Kalibanteng - Bandara A. Yani - Jalan Jend. Sudirman - PP

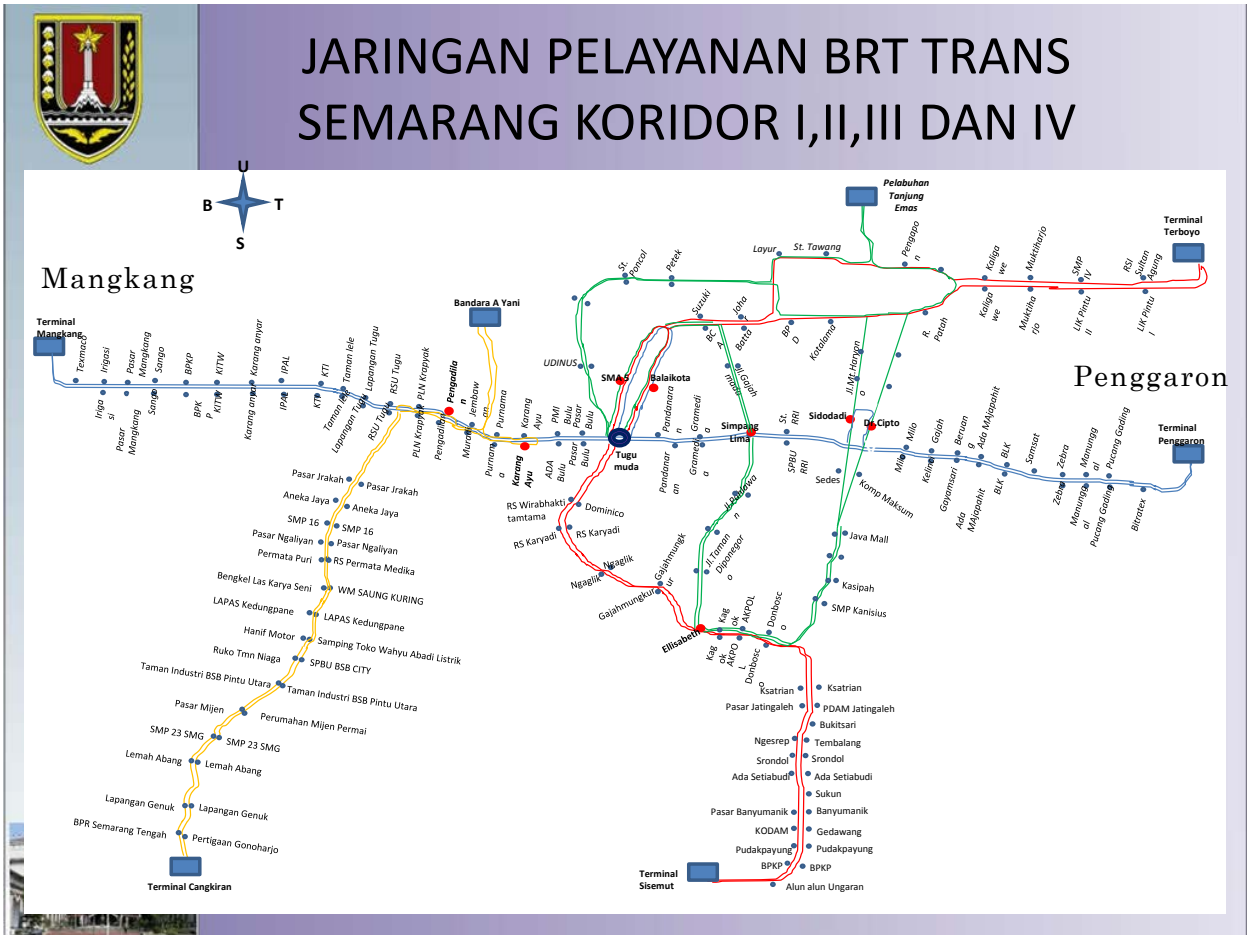


Figure 3-1　Main bus system in Semarang city

As the BRT improved, by January 2018 the number of corridors increased to seven in Semarang city, and will continue to increase to eight corridors by the end of 2019.

IDENTIFIKASI KORIDOR

Koridor V: Meteseh (Perumahan Dinar Mas) - Pemuda

Panjang rute total kurang lebih 56,7 km

Rute berangkat:

- Jl. Puri Dinar Mas Raya - Prof. Suharso - Jl. Ketileng Raya - Jl. Kedungmundu Raya - Jl. Tentara Pelajar (Mrican) - Jl. MT Haryono - Jl. Sriwijaya - Jl. Dr Sutomo - Jl. Pemuda - Sutomo - Jl. Kaligarang - Jl. Pamularsih - Bundaran Kalibanteng - Jl. Jenderal Sudirman - Jl. Puri Anjasmoro - PRPP.

Rute pulang:

- PRPP - Jl. Puri Anjasmara - Jl. Jenderal Sudirman - Bundaran Adipura - Jl. Jenderal Sudirman - Bundaran Kalibanteng - Jl. Pamularsih - Jl. Kaligarang - Jl. Veteran - Jl. Sriwijaya - Jl. MT. Haryono - Jl. Tentara Pelajar (Mrican) - Jl Kedungmundu Raya - Jl. Ketileng Raya - Jl. Prof Suharso - Jl. Puri Dinar Mas Raya.

IDENTIFIKASI KORIDOR

Koridor VI: Terboyo (Kaligawe) - Pemuda

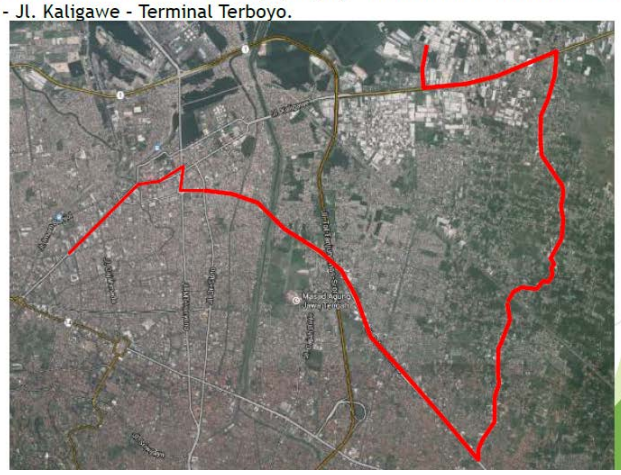
Panjang rute total kurang lebih 19,2 km untuk rute berangkat (Kaligawe - Pemuda) dan total kurang lebih 19,2 km untuk rute pulang (Pemuda - Kaligawe).

a. Rute berangkat:

- Terminal Terboyo - Jl. Kaligawe - Jl. Wolter Monginsidi - Jl. Arteri Soekarno-Hatta - Jl. Citarum - Jl. Patimura - Jl. Cendrawasih - Jl. Letjen Suprapto - Jl. Pemuda.

b. Rute pulang:

- Jl. Pemuda - Jl. Letjen Suprapto - Jl. MT Haryono (Sayangan) - Jl. Patimura - Jl. Citarum - Jl. Arteri Soekarno-Hatta - Jl. Wolter Monginsidi - Jl. Kaligawe - Terminal Terboyo.



IDENTIFIKASI KORIDOR

Koridor VII: Goa Kreo - Pemuda

Panjang total koridor ini kurang lebih 36,4 kilometer.

a.Rute berangkat:

- Pertigaan Gunungpati, Cangkiran, Ungaran (Jl. Raya Magersari) - Goa Kreo - Jl. Warsito Sugiarto - Jl. Untung Suropati - Jl. Abdulrahman Saleh - Bundaran Kalibanteng - Jl. Jend Sudirman - Bundaran Tugu Adipura - Jl. Indraprasta - Jl. Kapt. Pierre Tendean - Jl. Pemuda.

b.Rute pulang:

- Jl. Pemuda - Jl. Mgr. Soegijapranata - Bundaran Tugu Adipura -Jl. Jend. Sudirman - Bundaran Kalibanteng - Jl. Abdulrahman Saleh - Jl. Untung Suropati - Jl. Warsito Sugiarto - Goa Kreo - Pertigaan Gunungpati, Cangkiran, Ungaran (Jl. Raya Magersari).

IDENTIFIKASI KORIDOR

Koridor VIII: Sisemut - Pemuda (via Sekaran, Universitas Negeri Semarang)

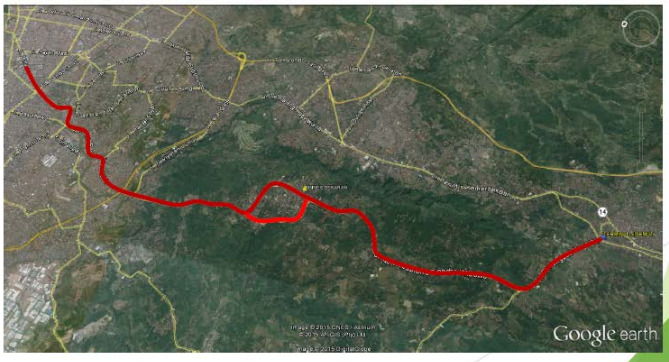
Panjang rute total kurang lebih 42,9 km.

a. Rute berangkat:

- Jl. Pattimura (Sisemut) - Jl. Mr. Wuryanto - Jl. Raya Muntal Gunungpati - Jl. Patemon - Jl. Taman Siswa (kawasan UNNES) - Jl. Kol. Hadiyanto - Jl. Dewi Sartika - Jl. Menoreh Raya - Jl. Kelud Raya - Jl. Kaligarang - Jl. Dr. Sutomo - Jl. Pemuda.

b. Rute pulang:

- Jl. Pemuda - Jl. Dr. Sutomo - Jl. Kaligarang - Jl. Kelud Raya - Jl. Menoreh Raya - Jl. Dewi Sartika - Jl. Kol. Hadiyanto - Jl. Taman Siswa (kawasan UNNES) - Jl. Patemon - Jl. Raya Muntal Gunungpati - Jl. Mr. Wuryanto - Jl. Pattimura (Sisemut).



＊As of January 2018,Corridor Ⅰ～Ⅶ is operating

Currently buses are running every ten minutes on average, and the numerical target for daily users is set in the tables that follow:

Table 3-2　SEMARANG BRT Summary of each corridor (bus route)

	No. of Buses	Capacity	Route distance	Daily driving distance per one bus	Total driving distance ※
Koridor Ⅰ	20	80	26.00 km	—	4,056 buses・km/day
Koridor Ⅱ	25	42	26.60 km	—	4,150・km/day
Koridor Ⅲ	10	42	26.30 km	—	4,103・km/day
Koridor Ⅳ	20	42	28.80 km	—	4,493・km/day
Koridor Ⅴ	32	(42)	28.35 km	238 km/day・car	7,616・km/day
Koridor Ⅵ	21	(42)	19.20 km	242 km/day・car	5,082・km/day
Koridor Ⅶ	21	(42)	18.20 km	229 km/day・car	4,809・km/day
Koridor Ⅷ	22	(42)	21.45 km	270 km/day・car	5,940・km/day

※Koridor Ⅰ~Ⅳ　numbers are calculated based on timetables
Koridor Ⅴ~Ⅷ　are planned numerical targets
Ref.: Koridor Ⅰ~Ⅳ: http://pamboedifiles.blogspot.jp/2013/07/informasi-brt-trans-semarang.html
Koridor Ⅴ~Ⅷ: Cost Component for Future BRT Corridor 5 to 8

Table 3-3　Numerical target for annual passengers (riderships)

NO	KOR	Targeted passengers in 2018			Comparison rate	
		General citizens	Students	Total	General citizens	Students
1	Ⅰ	1,605,286	1,285,500	2,890,786	56%	44%
2	Ⅱ	1,681,190	1,051,950	2,733,140	62%	38%
3	Ⅲ	934,400	560,640	1,495,040	63%	38%
4	Ⅳ	1,401,300	841,260	2,242,560	62%	38%
5	Ⅴ	572,320	572,320	1,144,640	50%	50%
6	Ⅵ	572,320	1,029,850	1,602,170	36%	64%
7	Ⅶ	264,000	475,200	739,200	36%	64%
8	Ⅷ	—	—	—	—	—
Total		7,030,816	5,816,720	12,847,536	55%	45%

Reference: Trans Semarang materials

3.1.2 Concept of bus operation reform/improvement method.

(1) Method of bus operation service reform/improvement

[Context of bus operation improvement]

Frequency reform: We will have more frequent bus operation services from 7-9 am (Morning) and 4-6 pm (Afternoon) for a total of four hours,. Current ten minute intervals will be shifted to five minutes. Then, we will encourage automobile and motorcycle users to shift to bus service.

- Area: Koridor I (Mangkang - Penggaron) Target Area: Blue area
- Number of bus stops: From Mangkang 31 stops, From Penggaron: 32stops
- Number of bus vehicles: 20 Busses
- Numerical target of bus passengers

  for Route 1 BRT, 2018: 2,890,768 riderships/ year

  (References: Trans Semarang Materials)

[Prerequisites for operational reform formulas, how to calculate as follows]

1) Concept of Modal shift

- Since the occupancy rate per car exceeds 100%, we estimate there is a prospective demand for additional bus service. Therefore, we estimate that after reform the rate will drop to 75% (Large size bus of 60 passengers/per car and medium size bus of 32 passengers/per car). These numbers are estimates derived from expected demand of 150% in above mentioned peak hours (in the morning and evening total of four hours).
- We estimated that during the morning and evening peak hours, many passengers are students and people going to work and the demand percentage was set as 25% for each, with 50% in total as the evening repeats the same pattern(Reference: Demand Survey in 2016, IGES paper).
- We estimated that after reform, prospective BRT passengers will be 36% in total which includes former bicycle/car-users (drivers of his/her own car 2.3%,

picked up/dropped off by someone 7.0% or motorcyclists 26.3%).(Ref: Demand Survey in 2016, IGES).

Ratio of Car to Motorcycle 1:3

The average occupancy rate for cars and motorcycles in Semarang city is unknown.

And there was no applicable data, alternatively we used the number for Jakarta BRT introduction prospective passengers as follows,

Average occupancy rate of car set as = 1.2 passengers/car

(Reference: 2012 MRV modeling survey materials: Modal Shift from MRT improvements)

・The following materials are basis for estimating the numbers. Previous driving distances are set at 30 km/day before the conversion demand, for automobile: 32 km/day on average and motorcycle average driving distance: 34.1 km/day

(Reference: Emission inventory by IVE)

2) Annual driving distance after increased frequency: car/km and automobiles and motorcycles subject to conversion car km/day

・Annual driving distance after increased frequency:

car/km: 1,248 km/day × 365 day = 455,520 km/year

・Annual driving distance subject to conversion:

car/km: 35,840 km/day × 365 day = 13,081,300 km/year

・Annual driving distance of an automobile that is subject to conversion:

car/km: 16,368 km/day × 365 day = 5,974,320 km/year

[Concepts for introductory costs]

We will install IC card readers inside of the buses to minimize time loss for incoming and outgoing passengers. We will improve frequency of bus service as well. At first, we were considering renovation to two door buses, but most bus stops are not combertible for two doors, so we gave up this idea. However, we will install display monitors at major bus stops to display a bus GPS location system to improve service.

In addition, we found that mobile phone information providing service is already there and we will not provide the same service. Additionally, a purchasing fee for bus vehicles is not applicable for this survey, as in Indonesia, the government purchases bus vehicles.

2)-1 Reducing Time loss for incoming and outgoing passengers at entrance of vehicles (Fee payment system improvement)

・Expected cost for IC card system: approx. 1 million JPY per vehicle

(Present 20 vehicles ＋additional 20 vehicles) = 4,000,000JPY

2)-2 Bus location system

・Installing display monitors at bus stops: approx. 1.5 million JPY per/unit × 20 units

(Only for the city center) = 30,000,000 JPY

Total estimated introduction costs is 70,000,000 JPY

Table 3-4 Previous transportation types for BRT users

NO	Previous Transportation Types		BRT Users Before
1	Jalan kaki	Walking	6.3%
2	Sepeda	Bicycle	1.0%
3	Sepeda motor	motorcycle	26.3%
4	Ojek (termasuk ojek online)	Bike taxi	3.3%
5	Becak	RICKSHAW	0.7%
6	Angkot	Mini-bus	28.7%
7	Bus	Bus	22.0%
8	Diantar/dijemput	Pick up-drop off by family or friend	7.0%
9	Mobil Pribadi	Cars (Driving her/his own car)	2.3%
10	Taksi (termasuk taksi online)	taxi	0.7%
11	Lainnya	Others	1.7%

Reference: Demand Survey in 2016, IGES

Table 3-5 Purpose of trips

No	Trip Purposes	%
1	Commuting	16.7%
2	Going home	42.3%
3	Business trip	6.0%
4	Going to School	10.3%
5	Leisure	13.7%
6	Shopping	5.0%
7	Others	4.7%

Ref. Demand Survey in 2016, IGES materials

Typical bus stop in Semarang (not a major bus stop)

（2） Expected impacts after operational improvements

[Impacts from the reform on Koridor 1.]

Current operation of Koridor 1 will be improved and the frequency of the bus services for the morning and evening peak hours will be increased. We estimate the impact as follows:

(Traffic volume conversion)

Expected ridership in the morning and evening perk hours, number of passengers : 2,890,786 passengers/365 days × 25% × 2 = 3,960 passengers/day

Converted demand from cars and motorcycle : 3,960 / 2 × 0.36 = 713 passengers/day

Converted demand from cars 178 passengers/day, form motorcycles 535 passengers/day

MSpc-bus: converted from cars to BRT, average number of passengers and distance in km (5,340 passengers・km/day) =178 passengers x 30 km/day

MSmc-bus: Converted from motorcycle to BRT average number of passengers and distance in km (16,050 passengers・km/day) =535 passengers x 30 km/day

(Calculation method for CO2 reduction)

ERy = REy – PEy

ERy : Annual CO2 reduction volume (t-CO2/year)

REy : Annual reference emission volume (t-CO2/year)

PEy : Annual project emission volume (t-CO2/year)

REy = MSpc-bus x 365 x 0.9 / PSpc x EFpc /1000

+ MSmc-bus x 365 x 0.9 / PSmc x EFmc /1000

= 435 + 962 = 1,397

(Reference:) Co-Benefit Study 2017 - Kick-Off 21 April 2017（P.15）

PSpc: Average car occupancy rate (average number of passengers in car)

(1.2 passengers/per vehicle)

EFpc: Net reduction included automobile average CO2 volume of emission per one vehicle

(0.298kg-CO2/one vehicle・km)

(Reference:) IPCC 1996 Revised reference manual (Early Three-way Catalyst: 8.0km/liter)

PSmc: Average number of the passengers on a motorcycle (1.2 person/per vehicle)

EFmc: Net reduction included motorcycle average CO2 volume of emission per one vehicle

(0.219kg-CO2/car・km)

(Reference:) IPCC 1996 Revised reference manual (Non-catalytic control: 10.8km/liter)

(CO2 increase from the increased frequency of bus services)

PEy = EF bus x D bus＝1,262 kg-CO2/day

EF bus: Net reduction included bus average CO2 volume of emission per one vehicle (1.011kg-CO2/car・km)

(Reference:) IPCC 1996 Revised reference manual (Moderate Control Heavy Duty Diesel: 2.4km/liter)

D bus: Additional BRT bus route distance Driving distance of BRT increased bus service (1,248 buses・km/day

=24 buses operational services/times x 52 km/round trip

[Impacts from the reform/improvement on Koridor Ⅱ ~Ⅷ]

We estimated the impacts on Koridor Ⅱ~Ⅷ after operational improvements and increasing the bus services in the peak hours as follows. When we set the Koridor Ⅷ numerical target, we referred to the sample data of Koridor Ⅶ that had similar geological characteristics for estimating the expected number of passengers and adjusted with route distance and day (CorridorⅧ = 872,000 passengers/year)

(Converted Traffic volume)

Peak hours ridership: 10,829,014 passenger/365day×25%×2=14,834 passengers/day

Converted demand from car and motorcycle : 14,834/2×0.36=2670 passengers/day

Converted demand from car: 668=670 passengers/day

Motorcycle: 2,002=2,000pg/day

MSpc-bus: converted from car to BRT, average converted passengers volume・Km

(20,100 passengers・km/day) = 670 passengers x 30 km/day

MSmc-bus: Converted from motorcycle to BRT average converted passengers volume・Km

(60,000 persons・km/day) = 2,000 persons x 30 km/day

（Calculation method for CO2 reduction)

ERy = REy – PEy

ERy : Annual CO2 reduction volume (tCO2/year)

REy : Annual reference emission volume (tCO2/year)

PEy : Annual project emission volume (tCO2/year)

REy = MSpc-bus x 365 x 0.9 / PSpc x EFpc /1000

+ MSmc-bus x 365 x 0.9 / PSmc x EFmc /1000

=1,639+3,579=5,236

(Reference:) Co-Benefit Study 2017 – Kick-Off 21 April 2017 (P.15)

PSpc: Average occupancy rate of the car (average number of the passengers on a car)

(1.2 passengers/per vehicle)

EFpc: Net reduction included automobile average CO2 volume of emission per one vehicle

(0.298kg-CO2/one vehicle・km)

(Reference:) IPCC 1996 Revised reference manual (Early Three-way Catalyst: 8.0km/liter)

PSmc: motorcycle average occupancy (1.2 passengers/car)

EFmc: Average CO2 emission volume per one motorcycle vehicle after net reduction

(0.219kg-CO2/car・km)

(Reference:) IPCC 1996 Revised reference manual (Non-catalytic control: 10.8km/liter)

(Increased volume of CO2 from more frequent operation)

PEｙ = EFbus x Dbus＝8,196 kg-CO2/day

EFbus: Net reduction included BRT Bus average CO2 volume of emission per one vehicle

(1.011kg-CO2/car・km)

(Reference:) IPCC 1996 Revised reference manual (Moderate Control Heavy

Duty Diesel:

2.4km/liter)

Dbus: Driving distance of additional BRT bus services (8,107car・km/day)

=24 bus trips x (53.2+52.6+57.6+56.7+38.4+36.4+42.9)km/round trip

[Overall impacts on the Koridor I ～Ⅷ]

REy = MSpc-bus x 365 x 0.9 / PSpc x EFpc /1000

+ MSmc-bus x 365 x 0.9 / PSmc x EFmc /1000

=6,633 kg-CO2/day

PEｙ = EFbus x Dbus＝9,458 kg-CO2/day

3.2 Feasibility of commercialization

The chances of making our Japanese proposal into their specification is low, as Trans Semarang already has its own IC card and internet bus location systems. The CO2 reduction impact derived from the Modal shift will bring positive outcome to form the public transportation mainstreaming movement in Semarang. Though in the med-term to long-term perspectives, “Modal shift” impacts are expected to continue, there are some concerns for its introduction.

3.3 Present BRT system (Diesel Fuel) shift to CNG bus system

3.3.1 Background knowledge for Trans Semarang Bus vehicle conversion for CNG system

The Indonesian government is positively promoting the use of Natural Gas in the public transportation sector in order to achieve the “Oil to Gas program” objective by shifting to multiple fuel energy and reducing pollution.

Trans Jakarta has already converted its bus fuel supply to BBG (In Indonesian language) i.e. CNG (Compressed Natural Gas)

At present, because of political incentives, CNG price is fixed as more cost efficient compared to diesel in Jakarta. As shown in the following table, we compared the costs of various fuels for bus vehicles with application of JCM subsidy. As compared to diesel, natural gas (CNG) has a lower emission coefficient and it brings positive impact to reduce both greenhouse effect and costs that can kill two birds with one stone. The survey results are shown below.

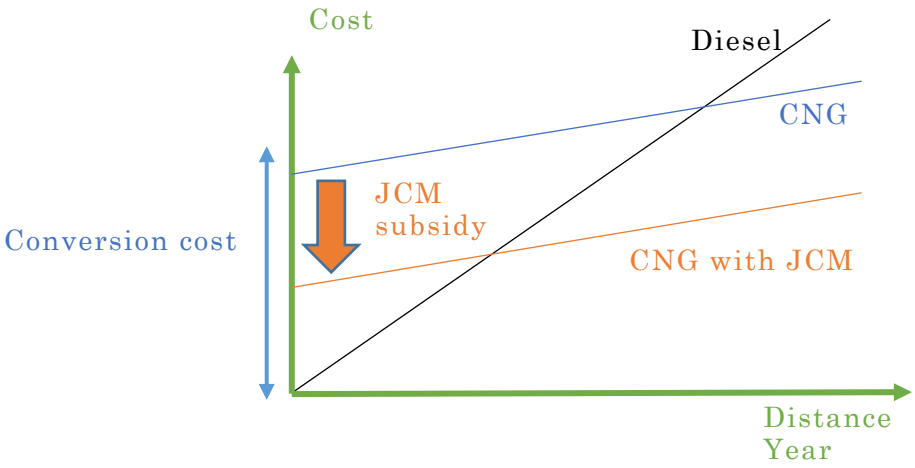
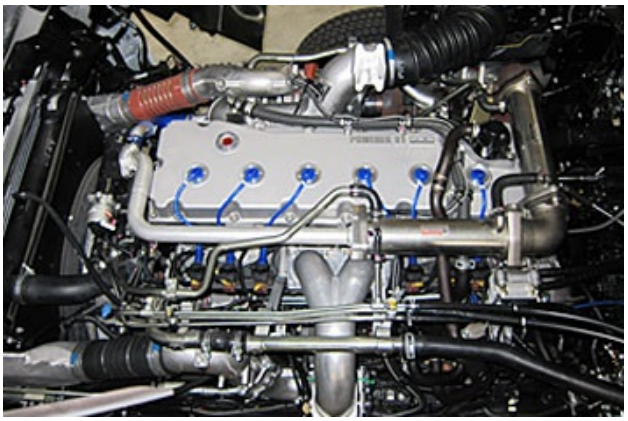


Figure 3-2 Images of cost reduction from conversion from diesel fuel supply to CNG with JCM applications – Costs comparisons

Ref: AAPG UGM

Mobile Refueling Unit (MRU)
Ref.: AAPG UGM

Station Bahan Bakar Gas
(SPBG)



Machinery for improvement
Ref.: HKS

Machinery for improvement
Ref.: Japanese Government

3.3.2 Gas Supply Facility in Jakarta and Semarang cities

(1) Gas Supply Facility in Jakarta

The Natural Gas supply price in Jakarta is fixed as 3,100IDR/L.

※Diesel Price （BIO SOLAR : IDR5150、SOLAR Premium IDR6550、Pertamina Dex IDR8900）

Pertamina gas supply station

The followings are Natural Gas supply stations in Jakarta city and normal gas stations providing natural gas (called SPBG) and natural gas tank trucks that provide natural gas in the city that are called MRU. Two types exist in Jakarta.

Table 3-6　Natural gas supply facilities in Jakarta

Type	Station No.	Supplier	Address	Purposes
SPBG	A. 34.02.02	PERTAMINA（PT）	Jl. Raya Pesing (Pool PPD), Jakarta Barat	Trans Jakarta・private automobile Taxi・Tricycle taxi（Bajaj）・mini public bus（Angkut）
SPBG	A. 31.03.01	PERTANIMA(PT)	Jl. Pemuda, Jakarta Timur	Trans Jakarta・private automobile・Taxi・Tricycle taxi（Bajaj）・mini public bus（Angkut）
SPBG	A.31.114.01	PERTANIMA(PT)	Jl. Raya Daan Mogot, Jakarta Barat	Trans Jakarta・private automobile・Taxi・Tricycle taxi（Bajaj）・mini public bus（Angkut）
SPBG	A.34.04.01	PERTANIM(PT)	J2l. Kapten Tendean, Jakarta Selatan	Same as above
MRU	-	PGN	Jl. Medan Merdeka Sel. No.14, T.5/RW.2	Private automobile・taxi・tricycle taxi（Bajaj）
MRU	-	PGN	Jl. Dr. Susilo Raya No.22C/D, RT.5/RW.5	Same as above
MRU	-	PGN	Jl. I Gusti Ngurah Rai No.15 AB, RT.1/RW.15	Same as above

CNG Supply stand

Pressure level set as

Inside of Mobile Refueling

MRU Truck

Natural Gas pipeline and entry of compression pipe

(2) Gas supply facilities in Semarang city

In Semarang city, there are three gas supply stations for Bahan Bakar Gas (BBG: Compressed Natural Gas・CNG) provided by governmental operation (PERTAMINA PT). These are located near bus terminals.

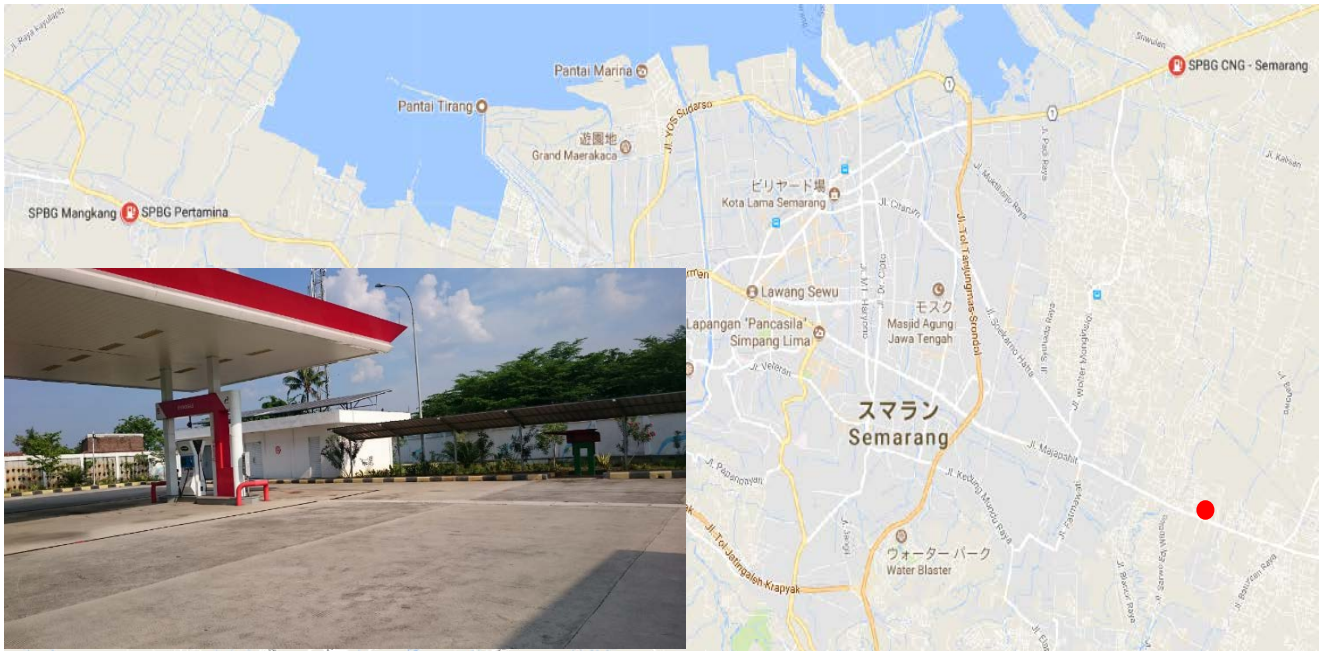


Figure 3-3 Bahan Bakar Gas (BBG:Compressed Natural Gas・CNG)supply facilities in Semarang

CNG Supply facility in Semarang, which is not in operation

Solar powergeneration is applied, but the battery hasnot sufficient power tohave lighting at

Natural Gas Dispenser (Made in

3.3.3 Gas containers for CNG supply

The structure is combatible for diesel when a CNG unit breaks down; this model change will be a shift to a Dual-Fuel structure type and it can provide both CNG and diesel. Additionally, most core parts will be assembled with Japanese products. Therefore, basically, incentives for using CNG will be maintained.

Pressure regulator
(KEIHIN product)

ECU（Electric Control Unit）

CNG Tank（Type Ⅰ）

Lightweight CNG tank

CNG tank（Type Ⅱ）

3.3.4 Trans Semarang Bus vehicle CNG introduction feasibility

(1)Pre-conditions

Table 3-7　Survey for Preconditions for introduction feasibility

Unit original elements	Preconditions
Driving distance of Bus per day	240 km/day
Annual operational days for buses	320 days/year
Project period	5 years

- It is uncertain if either PGN or PT (Pertamina) will provide immediate services.
- A Joint Venture (JV) of Hokusan and Gazindo Raya will provide CNG supply.

The above-mentioned JV for CNG supply requires the following preconditions,

- CNG demand must be secured at least at the level of 2,000kNm3
- Min. sales price for CNG per liter must be higher than 1,000Nm3/5,000USD

(2)Tentative plans

Trans Semarang is currently considering the conversion for CNG of 72 bus vehicles (Property of Trans Semarang includes 25 large size bus vehicles and 47 medium size bus vehicles). Eventually, 59 medium size bus vehicles from a private consortium will be shifted to CNG. Therefore, a total of 131 vehicles will be converted to CNG according to the plan.

We suggest three tentative plans to look at the prospective conditions as follows.

Table 3-8 Tentative plans

Plans	Conditions
A	25 cars (Large size bus: Fuel costs 2.6km/ L. Diesel)
B	72 cars (Large size bus: 25 vehicles: Fuel costs 2.6km/ L. Diesel) (Medium size bus: 47 vehicles: Fuel costs 3.5km/ L. Diesel)
C	131 cars (Large size bus: 25 vehicles: Fuel costs 2.6km/L. Diesel) (Medium size bus: 106 vehicles: Fuel costs 3.5km/ L. Diesel)

(3) Operational costs and subsidies

a) Size of facilities to commercialize the JCM project.

Table 3-9 Size of facilities for the JCM project

Plan	Total operational costs (1,000JPY)	Investment return rate IRR (%)
A	43,500	18.0%
B	91,440	22.9%
C	151,620	33.9%

b) Costs Semarang city will bear in comparison

Table 3-10 Comparison chart

Plan	Total operational costs (1,000JPY)	Subsidy (1,000JPY)	CO2 reduction (t-CO2/year)	Costs the city bears (1,000JPY)
A	43,500	5,450	272	38,050
B	91,440	12,750	638	78,690
C	151,620	25,600	1,280	121,020

3.3.5 JCM Subsidy project schemes plan ~ Trans Semarang bus for CNG option

The Following shows the tentative project scheme of JCM subsidiary project

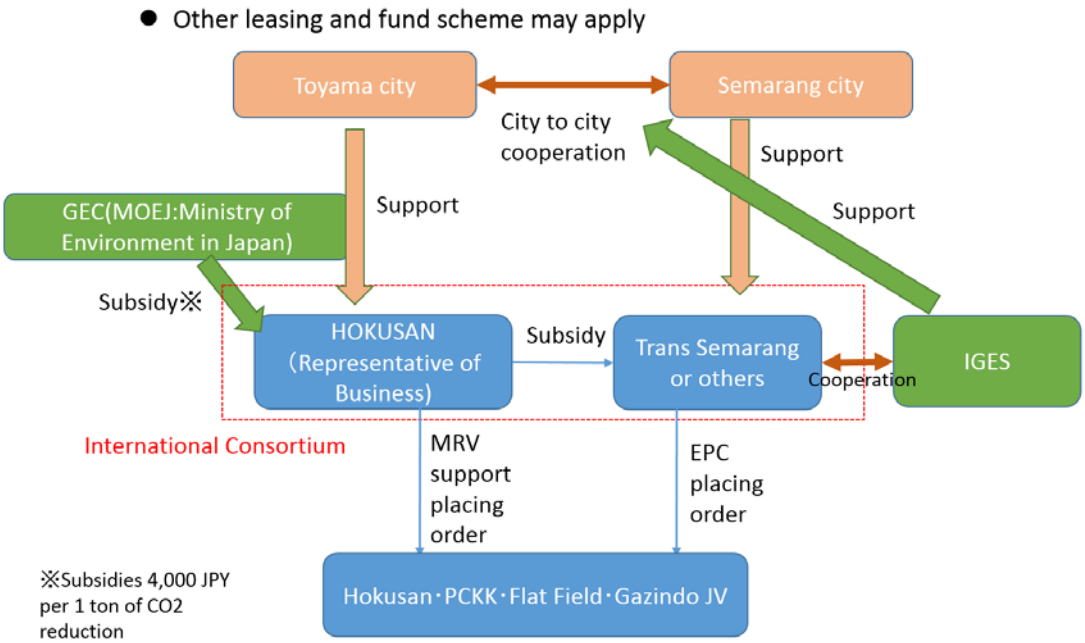


Figure 3-4　Tentative Project Scheme

3.3.6 Method of reducing the initial costs

(1)Using the lease packages

・Five years leasing

・Total payment divided into 60 times and costs are allotted for annual costs for five years. Inclusion in expenses

・For Plan B (72 bus vehicles):　Trans Semarang federal agency will bear the cost of 54,666,000 JPY and calculated by annual leasing amount, annual payment will be 18,279,000 JPY.

(2) Using Infrastructure Fund

・The foundation needs not only rental fee, but also annual profit from conversion gain.

・Internal profit rate should exceed 30% as minimum.

3.3.7 Possibility of Commercialization

In order to realize this project, it is essential to secure the project budget by Semarang city and Trans Semarang. However, it is not budgeted yet at this moment and a supplementary budget study will be carried out in August. We will continue to monitor whether budget will be realized in Semarang city and Trans Semarang by continuous encouragement through city-to-city collaboration.

4. Investigation possibility study on renewable energy and energy saving equipment

4.1 Feasibility of introducing renewable energy equipment to Diponegoro University campus

4.1.1 Feasibility of introducing small hydoelectric power generation to educational dam in the Diponegoro University

(1)Facilities to be surveyed

Following shows the location of the educational dam in the Diponegoro University facility

Figure 4-1　Location of educational dam in Diponegoro University

(2)Facility overview

In this survey, we found that small hydroelectric power generation was introduced in 2014 to the educational dam owned by Diponegoro University. It

was introduced as a demonstration (for educational purposes) to students, not for the purpose of power reduction and so forth.

Hydropower does not supply electricity to school facilities, but it can supply electricity to about two streetlights near the education dams. In fact, however, it is not used at all after completion.

In addition, the ownership of the hydroelectric power generation and the responsibility for maintenance belongs to the Ministry of Public Works (PU), but assignment to Diponegoro University is scheduled to occur by 2020.

Intake tower in dam lake

Inside power plant building

Outside power plant building

Drainage canal outside power plant building

(3)Power generation plan

This educational dam is designed mainly for demonstration purposes for students, but the small hydroelectric power station is barely in operation. It has some technical and mechanical problems such as a Sluice valve that has power loss problem, etc. Regardless of high potentials, this hydroelectric power station has small power output and is expected to generate several times more power output, with abundant volume of water flow and sufficient size of reservoir. Therefore, we propose a hydroelectric power system that will reduce the electric costs on campus and provide power to facilities by maximizing the potentials of the dam. This project will serve not only for an educational purpose for students but also for an ecological purpose. The hydroelectric power station performs a function as "Electric Storage" for a power station with rapid output fluctuation such as photovoltaic power (PV) generation.

Table 4-1　Power generation plan of educational dam in Diponegoro University

Items	Value
Hydroelectric power generation output	80kW
Max. discharge	500L/s(0.6m3/s)
Effective head	18m
Diameter of pipe	φ250
Annual power generation※1	433MWh/year
Annual CO2 reduction※2	255t-CO2/year

※1 Calculation formula of annual power generation
Power generation output×24(hours)×365(days)×Facility utilization rate ×Occupancy rate=80(kW)×24(hours)×365(days)×65(%)×95(%)
≒433MWh/year

※2 Calculation formula of annual CO2 reduction
432MWh/year×0.590t-CO2/MWh
≒ 255t-CO2 /year

(4)Facility plan

Renovate only the hydroelectric turbine and power generator, and use or apply the existing water intake facility, penstock, buildings and drainage canal to build a low cost hydroelectric power station.

Hydroelectric turbine: Due to limited space, constructing additional hydroelectric turbine is difficult. Therefore, we would like to introduce a "renewal plan" i.e. we will remove the old one and introduce a new one that serves better with the potentials of the dam. A suitable turbine type is a "Pump Reversal Turbine" which is simple and inexpensive. The sluice valve has to be renovated with a normal butterfly valve or other.

We only renovate the followings: Hydroelectric turbine, Inflow valve, Electric facilities(power generator, board and power line)

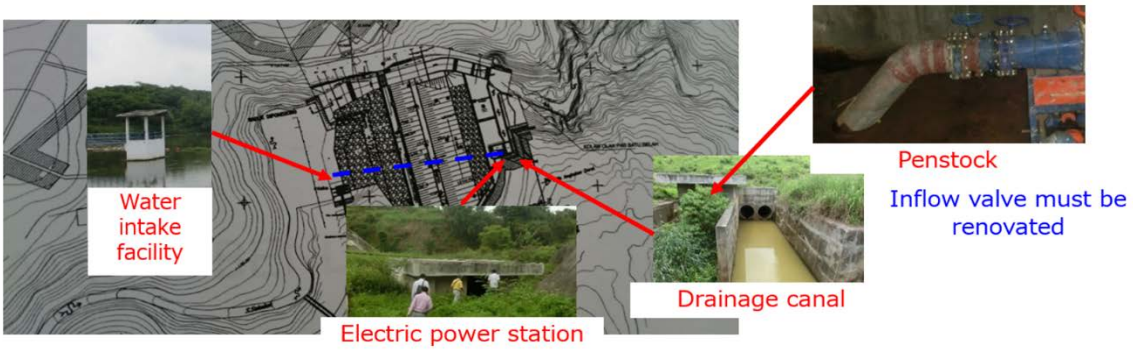


Figure 4-2 Facility plan of educational dam in Diponegoro University

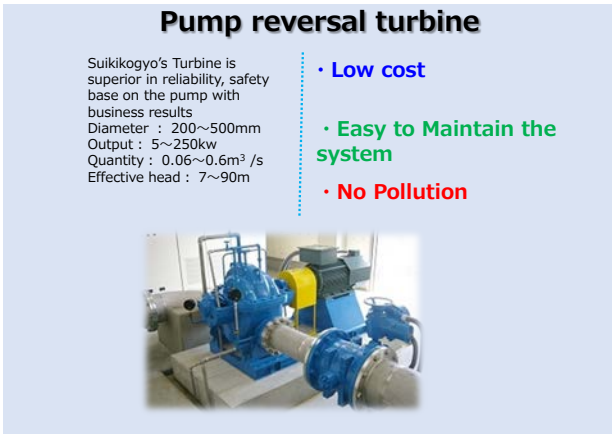


Figure 4-3 Example of pump reveral turbine (Ref.: Suiki kogyo)

(5)Operational Costs of small hydroelectric power generation dam

The summary of operational costs is shown as follows:

Table 4-2 Operational Costs

Operational Costs	Direct construction costs (1,000JPY)	Direct costs (1,000JPY)	SV costs (1,000JPY)	Total OC (1,000JPY)
Small hydroelectric power generation	37,416	3,984	25,028	66,427

(6)Effect of energy cost reduction

The electric costs of unit recondition and results of energy costs reduction of the small hydroelectric power generation educational dam are as follows:

Table 4-3 Effect of Energy cost reduction

	Annual power generation amount (kWh/year)	Energy costs reduction effect (IDR/year)
Small hydroelectric power generation	432,774	400,315,950

※University has three different types of contracted electric units of (IDR735/kWh, IDR925/kWh,IDR1102.2/kWh) Therefore, we estimated with the medium/intermediate value of IDR925/kWh.

※1:IDR 1 = JPY 0.0084

(7)Study on business profitability

a) Payback period

Depending on the applicable scheme of the project, SV costs will vary, so we estimated according to the Table 4-2 opertional costs. We estimated with two patterns.

Followings are the payback years of the project. We estimated with the patterns of 100% and 50% of Management fee and Construction work fee.

When we set the Management fee and Construction work fee as 100%, the payback year will be 18 years and if 50%, it will be 14 years.

Table 4-4　Payback Period

		Payback Period (year)
Small hydroelectric power generation	SV cost 100%	18
	SV costs 50%	14

※Subsidy rate of the JCM is set as 40% and 60% will be covered by the project operator.

b) IRR: Internal Rate of Return

The table below is the result of IRR calculation, IRR will be 1.2% when the Management fee and Construction work fee is set as 100%, and 4.3% when the fee is set as 50%

Table 4-5　IRR calculation results

		Internal rate of return (IRR)
Small hydroelectric power generation	SV cost 100%	1.2
	SV costs 50%	4.3

(8)CO2 reduction costs are as follows

Annual reduction volume is 255t-CO2, and cost in Yen was estimated as 2,592JPY/t-CO2, which was lower than the JCM precondition of 4,000JPY/t-CO2.

Table 4-6　Annual CO2 reduction

	Annual CO2 reduction (t-CO2/year) ※1, 2	Costs of CO2 reduction ※3 (×1,000IDR/t-CO2)
Small hydroelectric power generation	255	350,993 (JPY2,952)

※1 0.59t-CO2/MWh
※2　22 years of useful life designated by law
※3 Rate of subsidy set as 40%, Costs here means the JCM subsidy

(9)Benefits of introducing small hydraulic power generation

Following are the benefits of the small hydraulic power generation facility at

the educational dam on campus

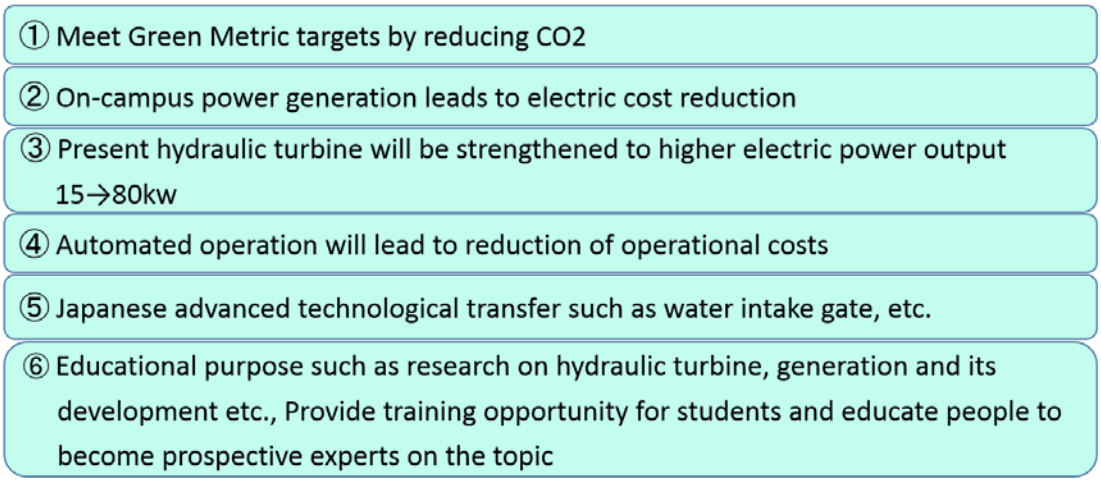


Fig4-5 Benefits of Small hydro electric power generation implementation at the Educational Dam on campus

(10) Summary of Diponegoro University's on campus Dam for hydraulic power generation program

Currently the university has not been operating the hydraulic power plant, and even if it can operate the plant, places to supply the electric power are limited, thus the operational feasibility is not high. However, as we reported in the survey, we can utilize the present water intake pipes etc., and renovate the water mill and power generator for larger output, and then we can cut down the costs of the project.

According to the estimate, the investment return will be completed within approximately 14 years and CO2 reduction cost fits within the range of JCM project precondition of 4,000JPY/t- CO2. Therefore, it has certain business feasibility as a JCM facility subsidy project. The property rights of the present hydraulic power plant belongs to PU and so as well the management responsibility, but these will be transferred to Diponegoro University in the future, thus project should start when the transfer will be completed. However, the timing is not yet decided.

4.1.2 Feasibility study of biomass power generation in disposal site on campus

(1) Facility for survey

Followings are the survey target facilities at Diponegoro University.

Locations of the disposal site on campus is indicated as follows,

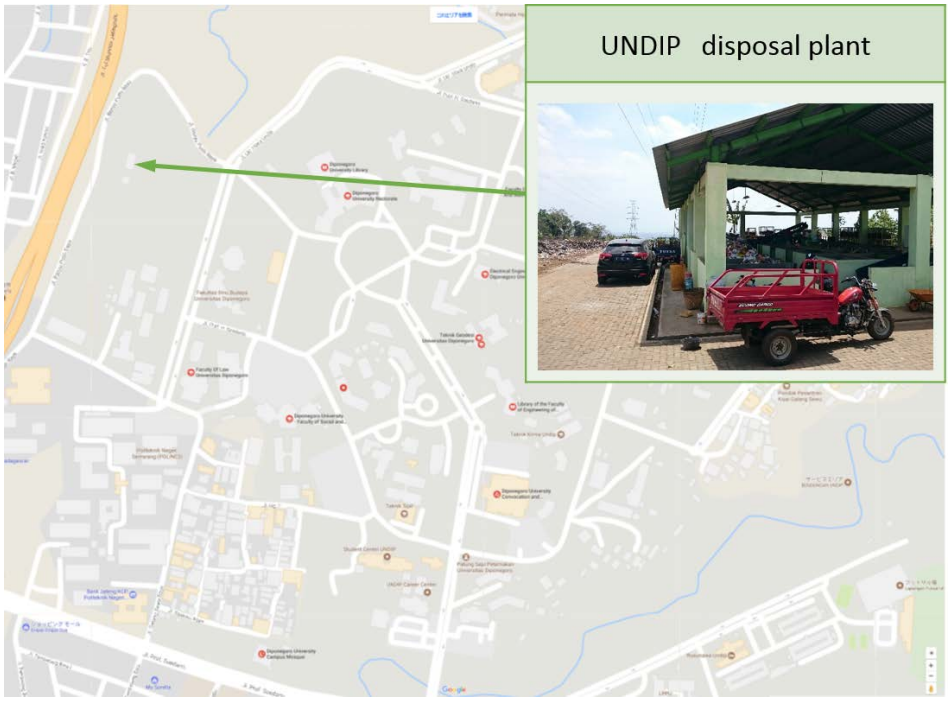
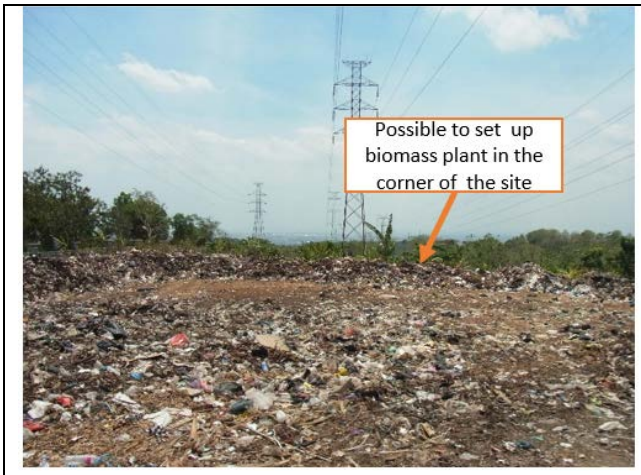
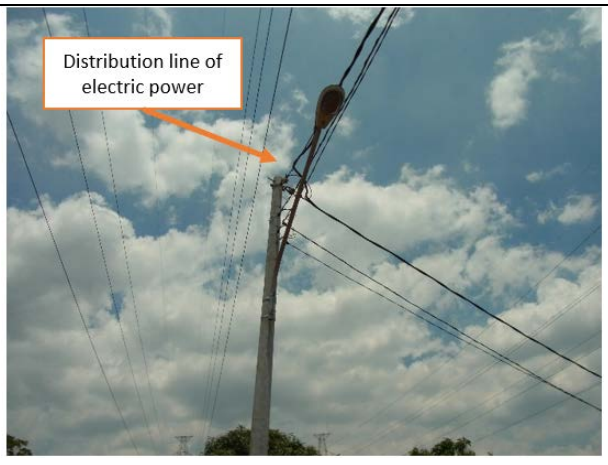


Figure 4-4 On-campus facility location

(2)Summary of the facility

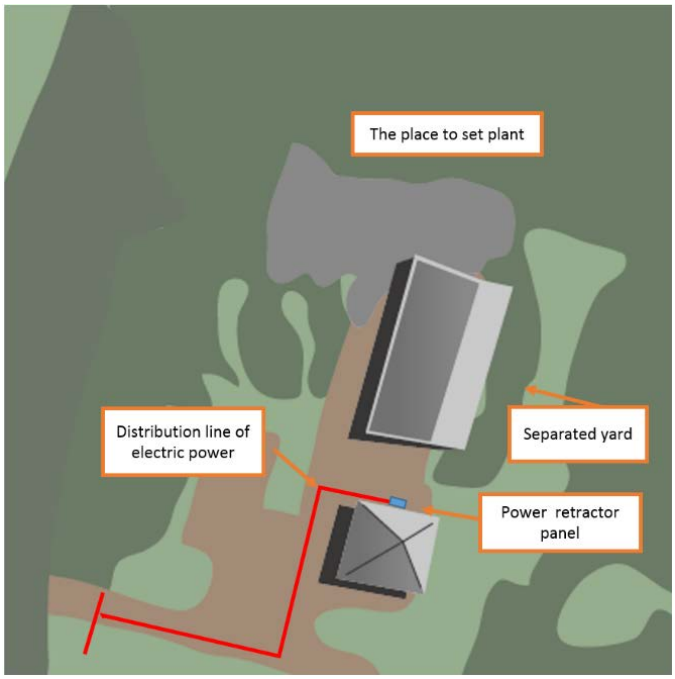
The summary of the Garbage disposal site is as follows,





(3)Disposal site facility arrangement plan

The biomass plant will be located in the garbage disposal site to connect with the power plant of the management building to supply the electric power to on campus electrical load. Followings are the biomass plant arrangement plan and estimated size and specifications.



Example of spec	
Power generation output	200kW
Power generation efficiency	15%～30%
Heat output	300～400kWth
Annual operation hours	8,000 hours/year
Amount of necessary wood chips (depends on the quality of materials)	1,000～1500t/year (recommended 15% or less of moisture content)
Space required for arrangement	100～150㎡

■ Configuration Conditions

- ✓ Biomass plant will be implemented in disposal site accumulation space
- ✓ Power generated by the plant will be connected with the power intake board at the managerial building to supply on campus electric load.
- ✓ The heat created by operation will be reused for compost.

Figure 4-5　Biomass plant arrangement and specification examples

(4)Biomass generation conditions

Followings are the UNDIP generated estimated biomass waste water amount.

Table 4-7　Each facility’ s waste water amount per year in 2015

Teacher/Facility	Average amount		Average price	
	kg/day	L/day	kg/person/day	L/person/day
FH	26,234	75,000	0,008	0,156
FEB	34,366	706,406	0,009	0,276
FTS1	52,058	592,236	0,009	0,140
FTD3	15,970	391,236	0,010	0,295
FK	106,255	191,093	0,040	0,055
FPP	134,709	1,518,948	0,026	0,674
FIB	32,824	784,783	0,007	0,168
FISIP	33,997	75,000	0,008	0,133
FSM	281,273	277,931	0,022	0,479
FKM	49,309	491,959	0,037	0,344
FPIK	56,261	686,603	0,010	0,116
FPSi	38,760	456,885	0,008	0,102
Rektprat	23,346	461,853	0,100	1,820
Undip Press	1,063	12,333	0,080	1,270
UPT Perpus	29,303	89,546	0,120	2,890
LPPM	8,788	99,827	0,160	4,680
LP2MP	4,944	90,450	0,100	1,520
ICT	10,551	289,500	0,167	5,000
Lab Terpadu	580	91,059	0,050	1,400
PKM	5,940	94,963	0,014	0,200
Rusunawa	32,824	568,826	0,010	0,881
Total	978,775	8,046,436	-	-

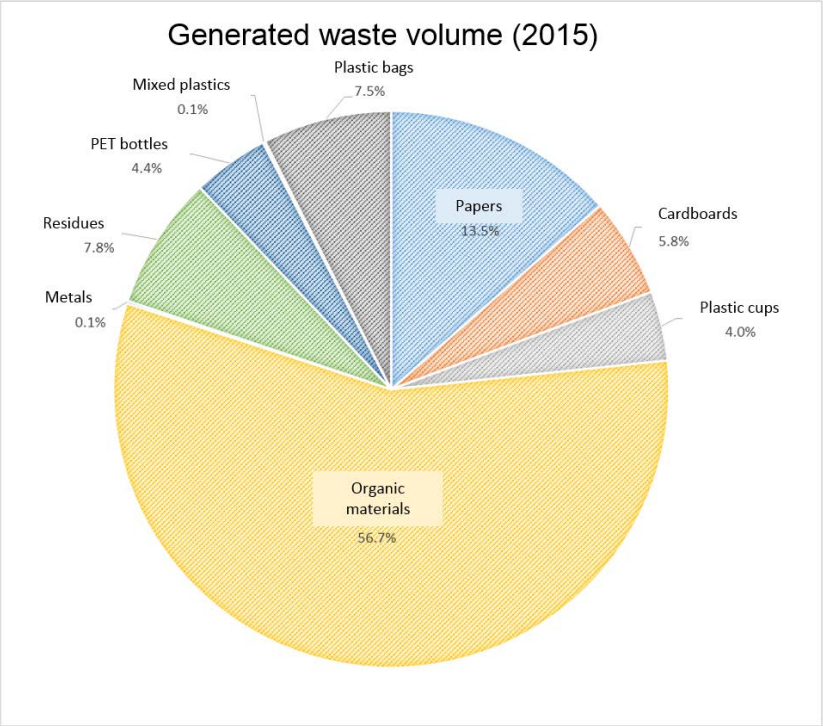


Figure 4-6　Waste ratio on campus in 2015

Interview Content	・The Disposal site is 1ha and started its operation after April 2016 ・The precise amount of biomass is not yet known, however, it is estimated that at least 300t/year will be created and wood biomass will be 300t/year, which will be 60-70% of the total biomass. Thus, the expected amount of general waste will be 200t/year and a total of 500t/year of waste will be created. ・The size of the university will be expanding to double its size in 7-10 years. At first, we will use the internal resources to operate the project due to carry-in restrictions. At a later stage, we can start using the external resources such as waste from a lumber factory. Initially we will operate the project as a pilot program with internal resources. ・If we implement the biomass plant on campus, we can use it for educational purposes such as experiments and research, however, some University programs must change. ・At first the University was looking for a prompt resolution to reduce waste, so it was not necessary to make power generation. The university tried composting but it did not work.   Survey visit

(5)Feasibility of the project

We do not know the exact amount of the wood biomass on campus, however, according to the interview survey; the annual amount will be 300t. We would assume the required amount is about 1,000t ~ 1,500t to make it profitable enough. Since, we need to maintain the quality of the wood chips, the feasibility for industrialization of the project is low.

4.1.3 Feasibility of solar power generator on roofs of the ICT center and university.

(1) Facilities for survey

Followings are the locations of ICT center and University Hospital.

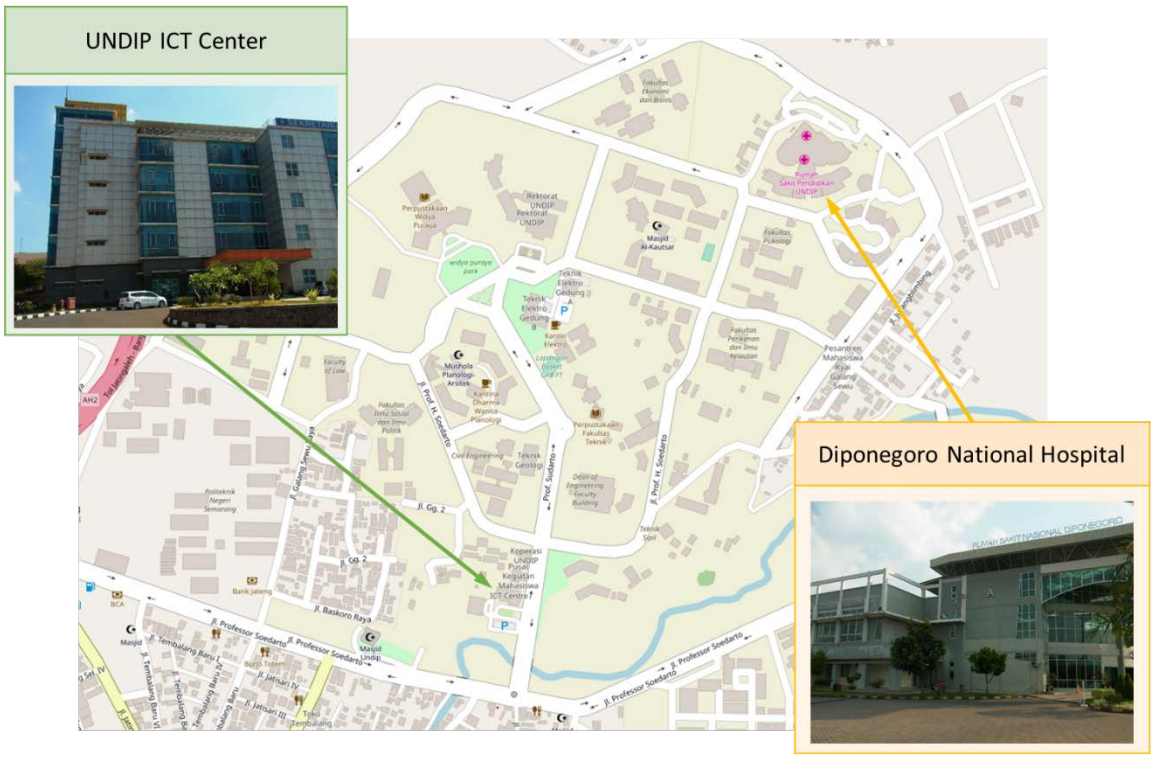


Figure 4-7　Diponegoro University facilities locations on the map

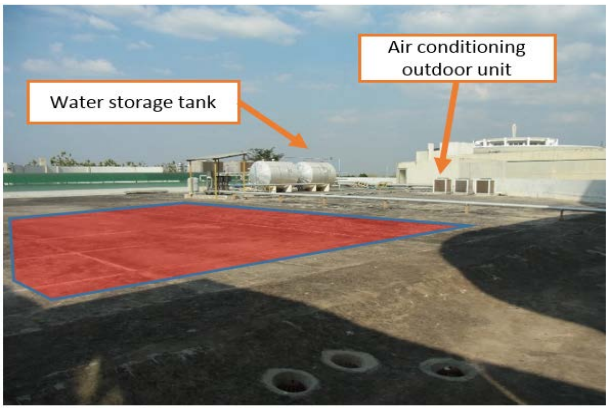
(2) Summary of facilities

a) ICT center

Followings are the summary of the facility. The red areas are the space to install the arrays for the solar panels after considering the shade from the fence and tower.

b) Diponegoro University's Hospital

Followings are the outline map of the university's hospital roof. The red areas are the space for installing the arrays of solar panels.



(3) Climate conditions

Followings are the comparison of climates of Tokyo and Semarang cities, and the winter solstice solar altitude in Semarang city.

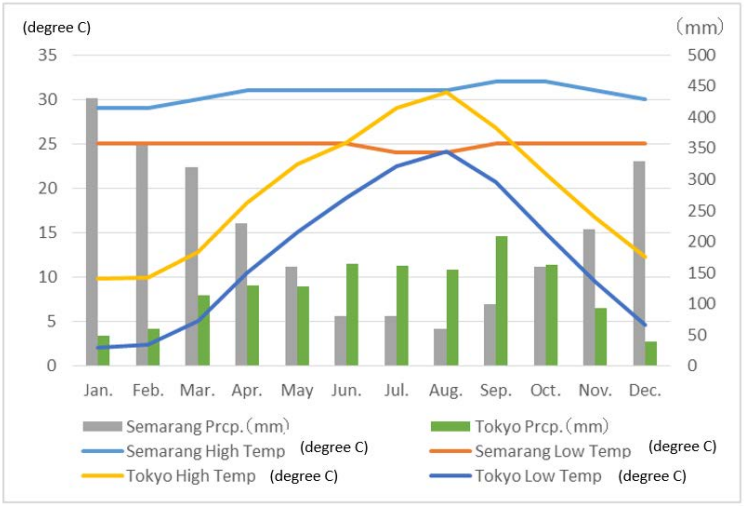


Figure 4-8 Comparison of climates in Tokyo and Semarang cities

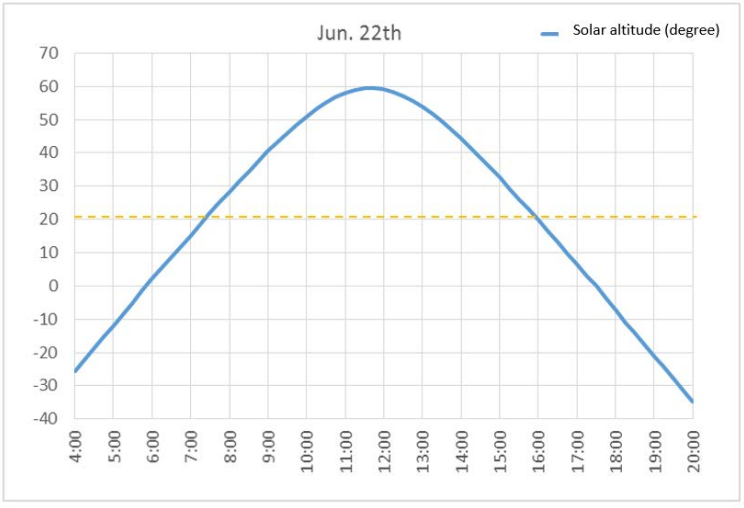


Figure 4-9 Solar altitude of Semarang city in winter solstice

(4) Arrangement plan

a) ICT Center

Followings are the estimate results for the two ICT center buildings that we concluded to generate 58kW with the solar power generation system. The conditions are set as follows to study the feasibility of arrangement plan for the solar cell modules

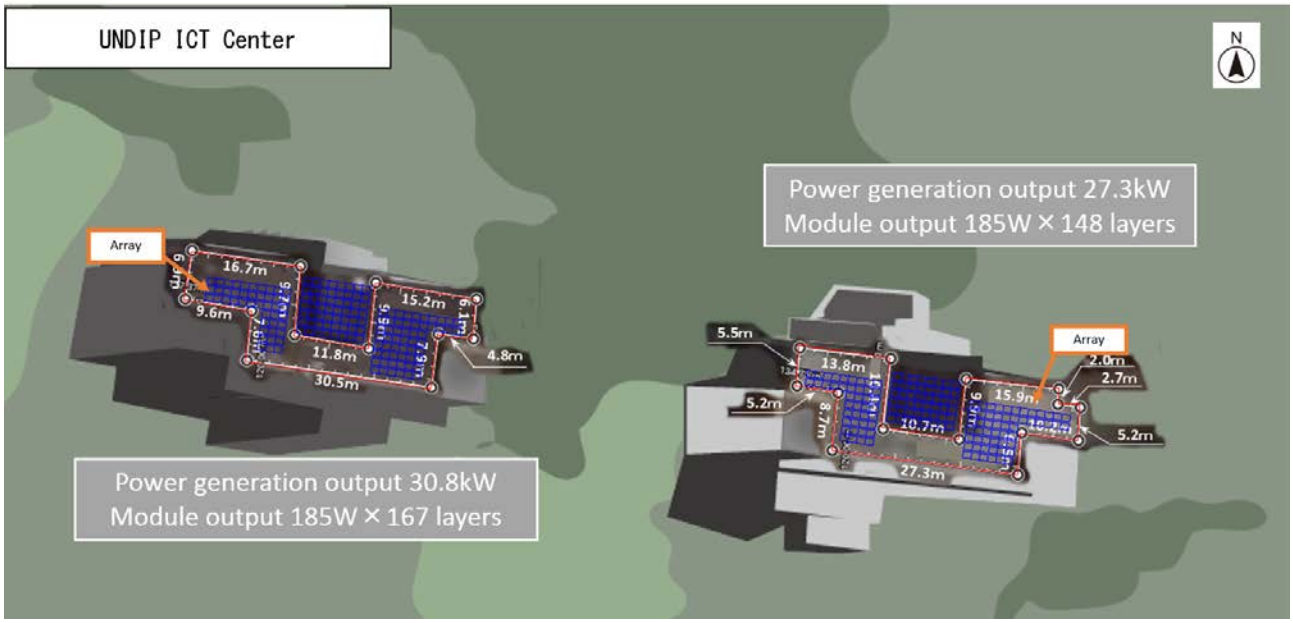


Figure 4-10 Layout of ICT center array arrangement

Table 4-8 Study on photovoltaic array arrangement

Facility Name	Array configuration (number of layers)	Azimuth angle (degree)	Angle of inclination (degree)	Array separation (mm)	Module (number of layers)	Power generation output (kW)	Total Power generation output (kW)
Left Bldg.	1 layer	Approx. 9	5	265	167	30.8	58.1
Right Bldg.	1 layer	Approx. 9	5	265	148	27.3	

b) Diponegoro National Hospital

Followings are the estimated results for the national hospital solar power genertion feasibility. Solar power generation there can produce approximately 153kW of electricity. The conditions of solar cell modules arrangement are as follows:

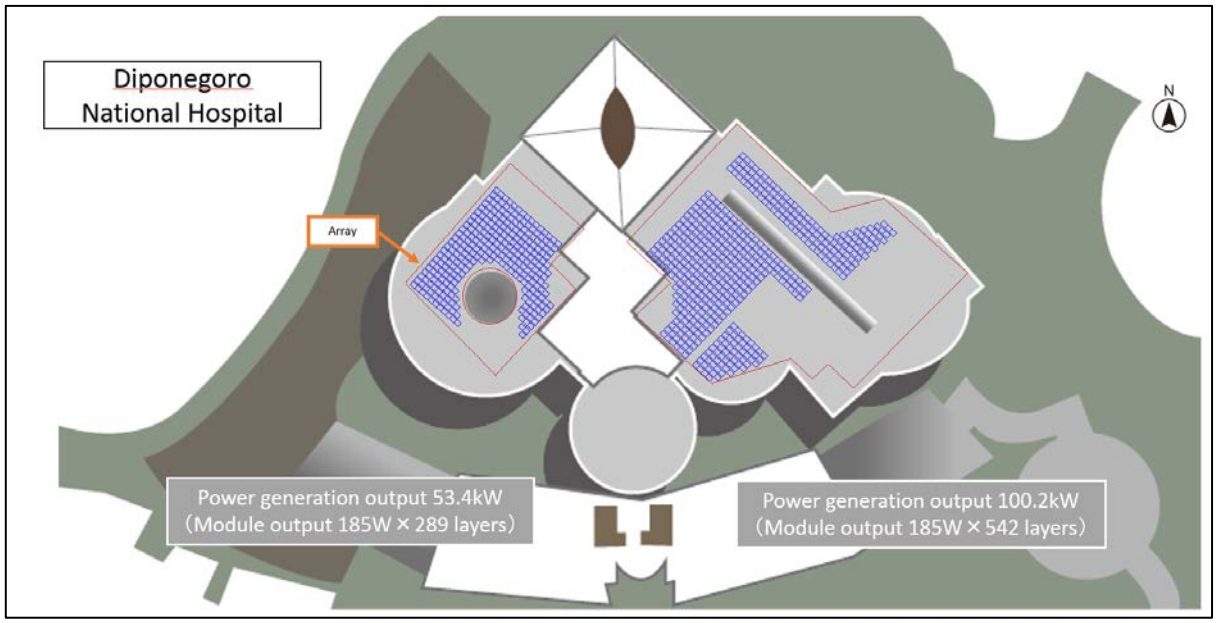


Figure 4-11 Tentative arrangement plan in the Diponegoro National Hospital

Table 4-9 Condition of photovoltaic array arrangement

Facility Name	Array configuration (number of layers)	Azimuth angle (degree)	Angle of inclination (degree)	Array separation (mm)	Module (number of layers)	Power generation output (kW)	Total Power generation output (kW)
Left Bldg.	1 layer	Approx. 9	5	265	542	100.2	153.6
Right Bldg.	1 layer	Approx.9	5	265	289	53.4	

■ Common arrangement conditions

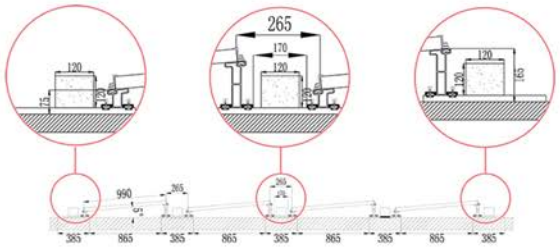
✓ The solar cell modules will be aligned on top of the roof.

✓ After taking the climate of Semarang into consideration, we adopted a CIS solar cell modules that has least power generation loss when temperature is high.

(Ref.) CIS Solar Cell Module 185W
(SOLAR FRONTIER)

✓ As we need to maximize space, angle of inclination was set as 5 degrees to align as many solar panels as possible. Stands are specially designed for flat roofs. The frame is for flat roof mounting; the inclination angle was set to 5 degrees in order to maximize the number of installed pieces.

(Ref.) Leapton Energy Co. Ltd Flat Roof Stand.



(Ref.) Leapton Energy Co. Ltd Flat Roof Stand.

✓ We arranged the array after considering the shade created by buildings.

✓ We set the range of shade in June 22, and the day of the winter solstice solar altitude of 20 degrees as standard.

(5)Power generation plan

We estimated the CO2 reduction effect and annual volume of power generation as follows.

Annual power generation volume is 327,812 kWh and CO2 reduction effect is 193t-CO2 / year.

Followings are the estimated monthly electric power generation and yearly monthly electric power generation of Diponegoro University ICT center and Diponegoro University National Hospital.

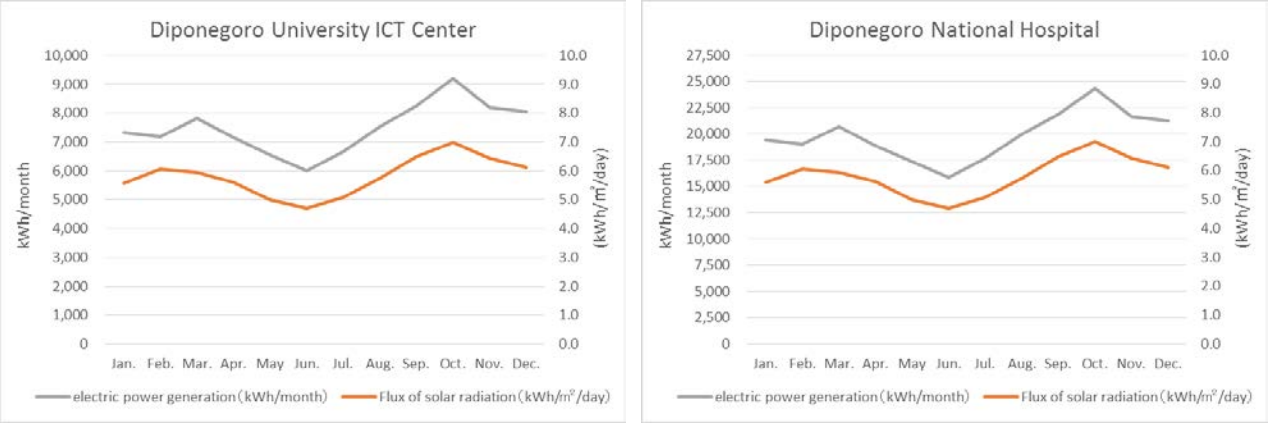


Figure 4-12　Estimated monthly power generation amount

Table 4-10　Estimated annual power generation amount CO2 reduction effect

Facility name	Total power output [kW]	Annual power generation amount [kWh/ year]	CO2 reduction effect [t-CO2/year]
UNDIP ICT Center	58.1	89,922	53
Diponegoro National Hospital	153.6	237,890	140
Total	211.7	327,812	193

(6)Project costs

Diponegoro ICT Center and Diponegoro University Hospital total project costs were estimated as 42,270,000 JPY. Followings are the details,

Table 4-11　Total project costs

	Direct construction costs [1,000JPY]	Direct Costs [1,000JPY]	SV costs [1,000JPY]	Total project costs [1,000JPY]
221kW	28,930	4,340	9,000	42,270

(7)Energy cost reduction effects

Based on the annual power generation amount, we estimated the effects of energy cost reduction as follows. The total energy cost reduction of Diponegoro ICT center and Diponegoro University National Hospital was estimated as IDR 303,226,100/year. Please see the following details.

Table 4-12　Energy cost reduction effect(IDR/kWh)

Facility Name	Annual power generation amount（kWh/year)	Energy reduction cost (IDR/year) ※2
UNDIP ICT Center	89,922	83,177,000
Diponegoro National Hospital	237,890	220,048,000
Total	327,812	303,226,100

※University has three different types of contracted electric units of（IDR735/kWh, DR925/kWh,IDR1102.2/kWh) Therefore, we estimated with the medium value of IDR925/kWh.

(8)Business profitability

According to the result of study on business profitability, when the JCM subsidy rate is higher than 20%, payback of investment is feasible within the expected life designated by law. However, considering the SV costs on Japanese

side, there will be no incentives for UNDIP to apply for the JCM. Thus, we concluded that introducing the project with approximately 30% of subsidy rate was necessary to commercialize the project. On the contrary, if leasing method will be applied, after Japanese SV costs are taken into consideration, appropriate subsidy rate should be higher than 30%, and even with the 30% it will not be feasible to achieve the investment return within the expected life designated by law.

Table 4-13　Payback year and IRR

Project scheme/Subsidy rate・		Payback period [year]※1	IRR [%]※1
PV211kW	Subsidy rate 20%	17	1.3
	Subsidy rate 30%	16	2.3
	Leasing method・Subsidy rate 30%※2	22	-0.6

※1 We estimated with the medium value of IDR 925/kWh.
※2 Leasing fee payback period is 5 years.

(9)CO2 reduction unit price

We estimated the CO2 reduction unit price for both 20% and 30% of the subsidy rate. For both cases the cost was below the 4000JPY/t-CO2. The followings are the details of the estimated costs.

Table 4-14　CO2 reduction unit price

Project scheme		Power generation annual amount [kWh/Year]	Annual CO2 reduction amount [t-CO2/Year]	CO2 reduction unit price [JPY/t-CO2]
PV211kW	Subsidy rate 20%	327,812	193	2,023
	Subsidy rate 30%			3,035

(10) Business Scheme Plan

c) Purchase method

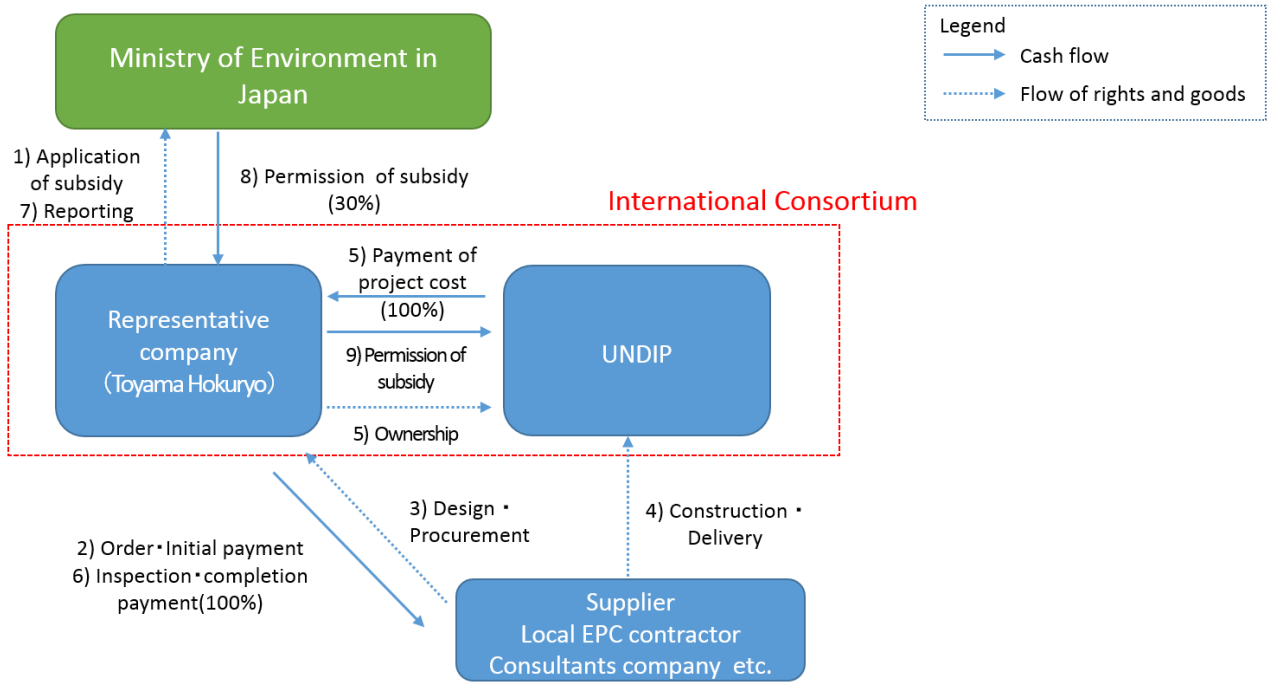


Figure 4-13 Business Scheme Plan (Purchase)

d) Leasing method

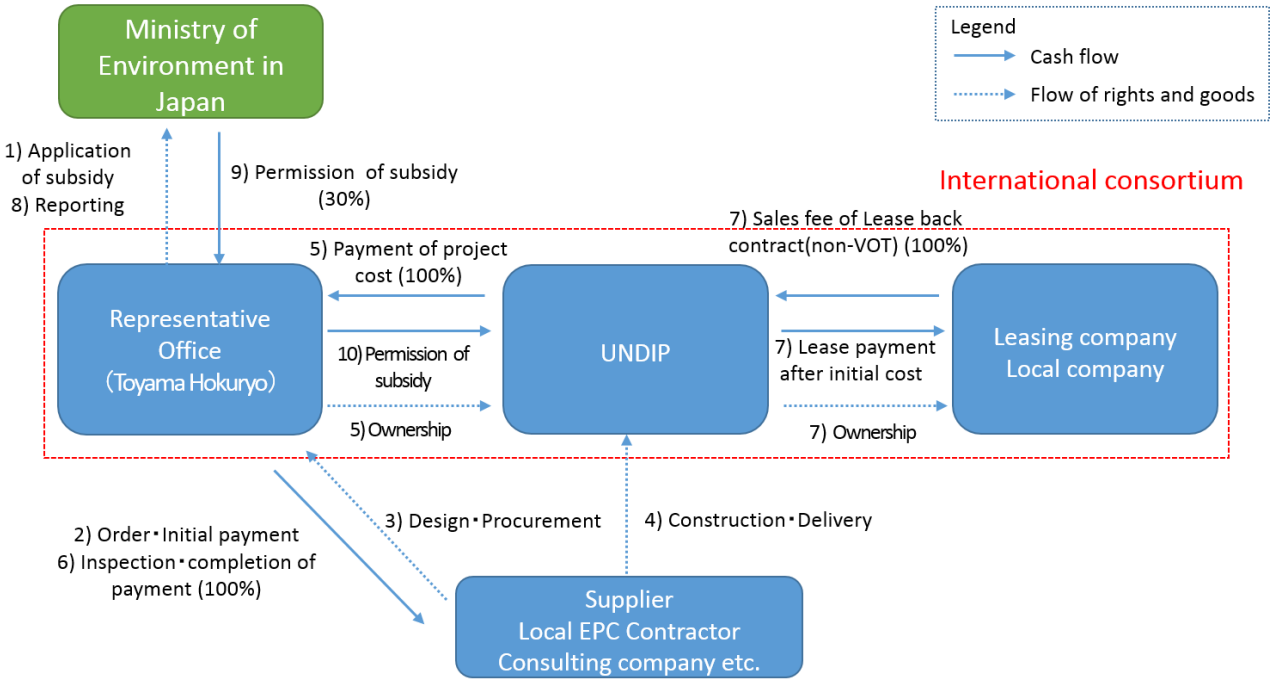


Figure 4-14 Business Scheme Plan (Leasing)

(11) The benefits of solar power generation implementation

This project can integrate with the University's objective to realize a "Sustainable smart campus". Followings are the benefits of implementing the solar power generation project.

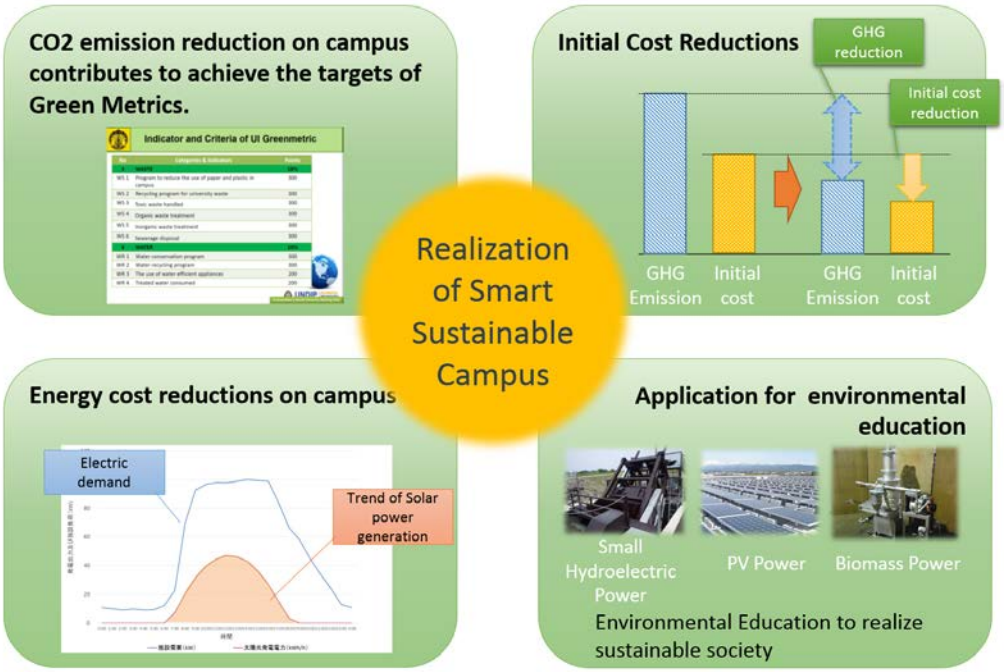


Figure 4-15 Benefit of the project implementation

(12) Feasibility of commercialization/industrialization

As indicated with the above-mentioned (8) business profitability, if the JCM facility subsidy rate is higher than 20%, the investment return is feasible within the useful life designated by law. However, when we consider the SV costs and the subsidy rate remaining at the level of 20%, there will be no incentives for UNDIP to apply for JCM. Thus, the project feasibility is low. With 30% of subsidy rate there will be a feasibility of industrialization.

On the contrary, if a leasing scheme is applied, investment return will be difficult with the current size of business within the useful life designated by

law due to the interest of leasing cost. So, if we industrialized with the leasing scheme we would need to expand the size of business, for example as when we have 400kw power generation size, even when the leasing scheme was applied, remaining within the useful life designated by law is feasible. Thus, 400kW size of power generation will be sufficient for industrialization/commercialization. However, at the moment UNDIP has no budget especially designed for this project. Looking at the current university budgetary constraints, it will be difficult to allocate a large size budget and we need to consider other project schemes or current size of the budget to industrialize the project.

4.2 Feasibility of introducing hydroelectric power generation to Jatibaran dam

4.2.1 Facility for investigation

Following shows the location of the facility being investigated, the Jatibaran dam.

Figure 4-16　Location of Jatibaran dam

4.2.2 Interview survey

(1) The objective of interview survey

While conducting this survey, we found that Jatibaran Dam is in the state of public offering by hydroelectric power plant construction companies. Therefore, a hearing was conducted on Jatibaran Dam office staff about the status of public offering, room for entry and the possibility of hydroelectric power generation near the Jatibaran dam.

Table 4-15　Interview survey

Date	Venue	Objectives
1)2017.10.30 2)2017.11.2	Jatibaran dam office Century Park Hotel	To study feasibility of entering the project operation market of the Jatibaran dam

(2)Interview survey

After the survey, we found that the Jatibaran hydroelectric power generation plant construction project had decided a successful bidder and already selected a hydro turbine company. Thus going into the project market is very difficult.

Summary	Date: Oct.30, 2017, (Mon.) 15:00-16:00 Venue: Jatibaran dam office Participants: Local Jatibaran dam staff members, Ministry of Public works, PU) [Study group from Japan] Toyama city, Suiki kogyo, PCKK
Agendas	We confirmed that PT Daya Mulia Turangg was the successful bidder. ➢ Jatibaran dam has not much difference in height downstream. However, in the Simongan canal area where there is no difference in height, an open channel type hydro turbine by Suiki Kogyo can fit. ➢ Jatibaran dam upstream area has another dam construction plan, but not in the near future  

Summary	Date: Nov. 2, 2017, (Thu.) 17:30 - 18:45 Venue: Century Park Hotel Participants: Locals PT Daya Mulia Turangga [Study group from Japan], Toyama city, Suiki Kogyo Co. Ltd., PCKK
Agendas	➢ No rules set for bidding. Our company has internal rules/policy when selecting bidder. Hydro turbine maker should have the following characteristics: Trustful in a technological manner for damages. The company should have a branch in Indonesia for prompt repair work when the turbine gets broken. Hydroelectric power operation will last next 25years and if the company has no branch in Indonesia, they cannot handle the damage promptly, thus this is important. We selected two manufacturers Golal (Australian) and VOITH (German) for bidding and when they submitted the application form, we already decided to select VOITH. This is because VOITH conducted various feasibility studies and was the most cost efficient. ➢ Prospective chances for Japanese companies to enter our markets are rather small but not zero, however, mutual understanding from both investors of the project and VOITH must be obtained. ➢ PT Daya Mulia Turangga has another successful bidding with the Serayu river hydroelectric power generation project. For this project they selected VOITH for the hydro tubine. ➢ This river is located outside of Semarang city and the size of the river is 100m width and 250m^3/s flow at the river. 8 hydro turbines will be constructed and each produces 0.6MW. ➢ Indonesia has two project types. One is " Investors' matter" and the other is " Government's matter" ➢ "Investors' matter" requires consent and evaluation from designated local private sector and it seems difficult for a Japanese company to enter. On the contrary, a "government matter" is comparatively easy, as the government will provide assistance for obtaining the water rights and adjustment; additionally PLN will purchase the power generated by the dam. ESDM is the former example. ➢ PT Daya Mulia Turangga conducts operations and management of the projects but also invests. Technological instruction will be provided for 1-2 years. The Public project proposal is conducted outside of Semarang city as well, and we can ask the government of Indonesia to provide information. Maybe, they will be able to introduce to us some projects in Semarang.

4.3 Feasibility of introduction hydroelectric power generation to agricultural water channel in Semarang city

4.3.1 Facilities for survey

Following show location of investigated facilities, Pucanggeding dam and Simongan dam.

Figure 4-17　Location of Pucanggeding dam

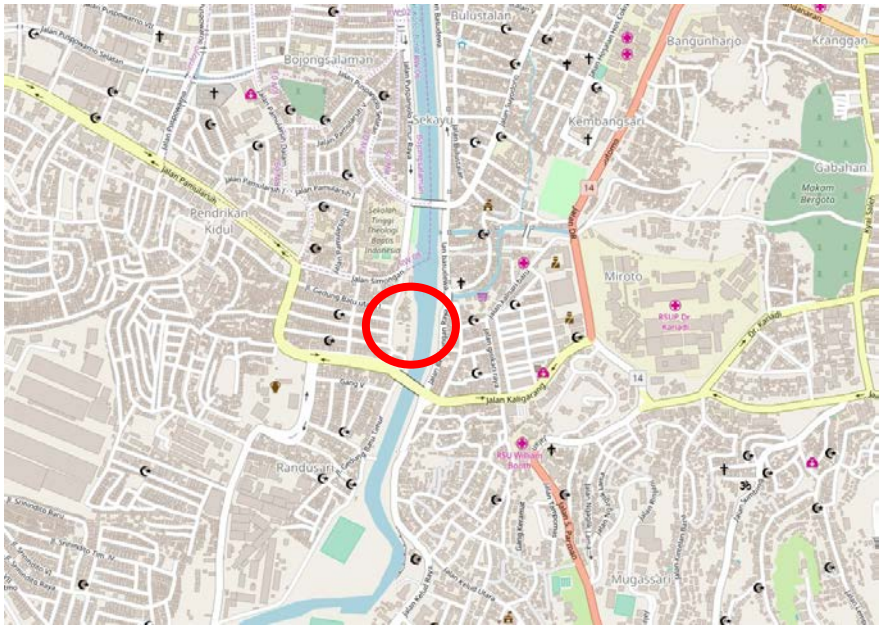


Figure 4-18　Location of Simongan canal

4.3.2 Pucanggeding Dam

The area near the Pucanggeding dam, an agricultural canal connecting with the River Babon, has height difference at the sand drainage canal. Therefore, an open channel hydro turbine can be installed. A 10 kW open channel hydro turbine can be introduced. However, this sand drainage canal has no water and we need to convert its function to receive water constantly. It may not be feasible and can be problematic.

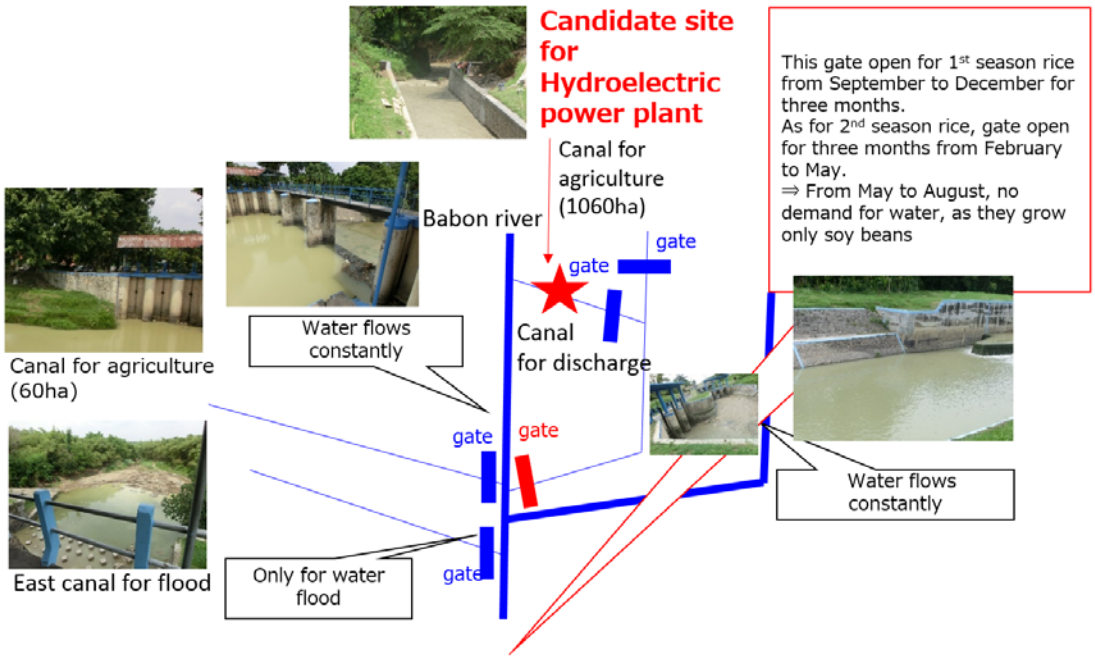


Figure 4-19 Study of small hydroelectric power generation at Pucanggeding dam

4.3.3 Simongan canal

Simongan agricultural canal is located along the sand drainage gate, which is used after flooding on both of the riverbanks. The sand drainage gate opens only when the shed sand flushes after flood. For example, it opens when the water level drops from 60 cm to 30 cm after a flood. We are considering installing hydropower equipment that will operate in integration with the sand drainage gate. Hydro turbine of 30kW output could be installed, according to the current water volume and difference in height.

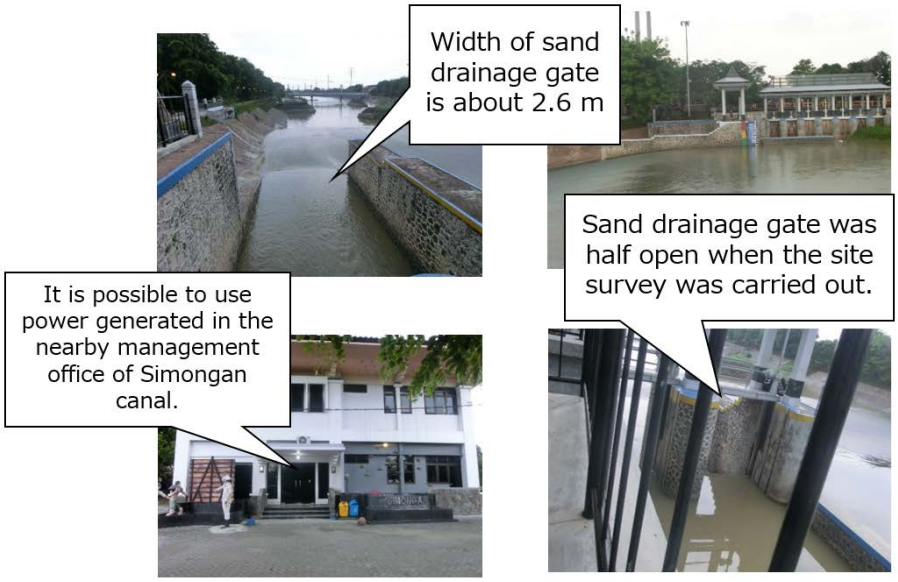


Figure 4-20　Example of the pump gate

4.3.4 Feasibility of commercialization/industrialization

Followings are the summary of survey results on hydroelectric power generation feasibility at the Semarang agricultural water channel. Each of the surveys is conducted on the estimate that the dam will be constructed at the sand drainage channel; thus in order to continue generation of the power in a consistent way, the sand drainage channel must be operated with an unusual method. Therefore, this is only applicable if such unusual operation is feasible. Additionally we would like to note that power generation amount of the hydro turbine is not as large and compared with the cost efficiency of the educational

dam, the agricultural channel hydroelectric power generation is less efficient/profitable.

Table 4-16 Results of Agricultural channel hydroelectric power generation feasibility study in Semarang (1)

	Power generation output	Hydro turbine
Pucanggeding Dam	10kW	Open water Channel 
Simongan canal	30kW	Pump and gate in one unit 

Table 4-17 Agricultural channel hydraulic power generation feasibility study in Semarang city (2)

	Annual power generation	Annual CO2 reduction	Concerns
Pucanggeding Dam	54,093 kWh/year	32t-CO2/year	・ Possibility of changing the operation ・ Introduction cost (Open water channel)
Simongan canal	162,279 kWh/year	96t-CO2/year	・ Possibility of changing the operation ・ Introduction cost (Pumping and intake gate in one unit)

4.4 Feasiblity of introducing the solar power generation on Semarang city primary and junior high school campuses

4.4.1 Survey location and facilities

We conducted the feasibility studies for a solar photo volatic generation project at Primary schools and junior high schools in Semarang city.

Table 4-18　Surveyed facilities

	Facility names
1)	State Primary School Sendangmulyo 4 Semarang
2)	Junior High School 39 Semarang

4.4.2 Suggested arrangement of solar cell modules (tentative)

(1)State Primary School

Solar cell modules are aligned on top of the roof of the passageway. They will generate total of 60kW electricity (Estimated). However, we confirmed that enforcement work was necessary, particularly on the roof structure.

Figure 4-21　Solar cell modules are installed in the locations shown in the table above

Table 4-19　Power generation output

Facility name	Module output [W]	Number of Modules	Power generation output [kW]
State Primary School	330	184	60.7

(2) Junior High School

We selected the building structure that was resistant to weight from the roof top solar cell array. As we estimated the number of array we can install on the rooftop, we reached the conclusion that we could produce 29kW of electricity.

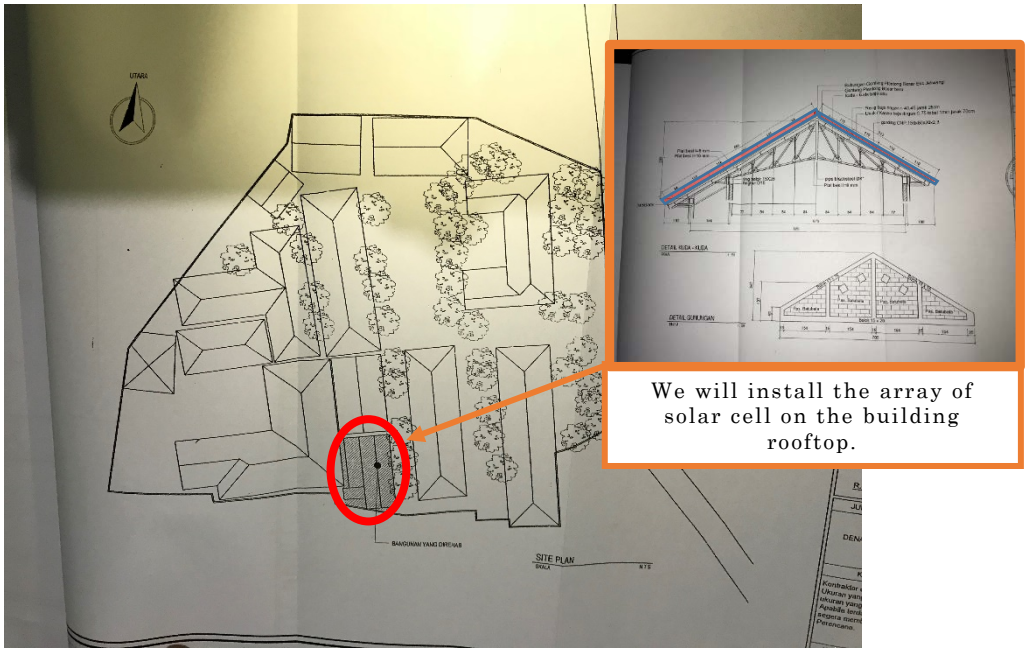


Figure 4-22　Solar cell array in the venue

Table 4-20　Electricity output

Facility name	Module output [W]	Number of Modules	Power generation output [kW]
Junior High School 39 Semarang	330	90	29.7

4.4.3 Power generation plan

We estimated the annual power generation amount and effect of CO2 reduction as follows. The annual total power generation amount will be 139,735 kWh/year and CO2 reduction amount will be 82t-CO2/year.

The results will be shown as follows for each facility.

Table 4-21 Annual power generation amount and CO2 reduction effects

Facility name	Total output [kW]	Annual power generation amount [kWh/year]	Annual CO2 reduction effect [t-CO2/year]※
State Primary School Sendangmulyo 4 Semarang	60.7	93,837	55
Junior High School 39 Semarang	29.7	45,898	27
Total	90.4	139,735	82

※ CO2 Discharge rate: 0.59 t-CO2/MWh

4.4.4 Operational costs

Total operational costs were estimated as 24,800,000 JPY for schools in Semarang city.

Table 4-22 Operation Costs

Operation costs	Direct construction costs [1,000 JPY]	Direct Costs [1,000 JPY]	SV costs Roof reinforcement work costs [1,000 JPY]	Total operation costs [1,000JPY]
90kW	13,147	1,973	9,680	24,800

4.4.5 Effect of energy cost reduction

We estimated the costs as follows at the schools in Semarang city, Annual total costs were estimated as IDR 132,189,310/year.

Table 4-23 Estimate of energy cost reduction

Facility name	Annual power generation amount (kWh/year)	Energy reduction costs (IDR/year) ※1
State Primary School Sendangmulyo 4 Semarang	93,837	88,769,802
Junior High School 39 Semarang	45,898	43,419,508
Total	139,735	132,189,310

※1 Electricity unit price: IDR946/kWh

4.4.6 Business profitability

As a result of the business profitability study, we found that even with the rate of JCM facility subsidy higher than 30%, the payback of investment cannot be achieved within the expected life designated by law.

Table 4-24 IRR payback year and IRR

Project scheme		Payback period (year)	IRR (%)
90kW	Subsidy rate 20%	26	-2.1
	Subsidy rate 30%	24	-1.5

4.4.7 Feasibility of commercialization or industrialization of the project.

We need to expand the size of the project to make it feasible for commercialization. As the current size of 90kW power generation will not meet the precondition for the JCM projects' payback (investment return) and in order to increase the profit, (to reduce the initial cost to maintain the business

profitability) the size has to be larger. If we can generate 290kW electricity with 30% of subsidy rate, we can maintain certain degree of business profitability, however, we need to secure an additional 1,200 ㎡ space (approximately) to install the equipments and a supplementary budget of 30,000,000 JPY.

Looking at these situations, the business profitability is low at the moment.

4.5 Energy saving projects implementation facilities' screening in industrial sector

4.5.1 Interview survey conducted with the managerial company in the industrial district

(1) Objective of the interview survey

To study the interests of Japanese companies in the JCM facility subsidy programs regarding the energy saving projects.

Table 4-25 Interview survey

Dates	Place of visits	Objectives
1) 2017.9.18	BSB Industrial district	We conducted interview surveys with Japanese companies to understand if they have interests in the JCM facility subsidy for energy saving projects.
2) 2017.9.29	KIW Industrial district	

(2)Interview survey

Summary	Date: Sep. 18, 2017（Mon.）13：00～15:00 Venue: BSB Industrial district Participants: [Locals] Company A and B [Survey group form Japan] Toyama city, IGES, PCKK
Agendas	[Summary] ・Survey group from Japan explained the outline of the survey and confirmed if they still have interests on the JCM subsidy, negotiation can continue. ・We requested the participation for prospective workshop for Japanese companies taking place in Oct, 2017. [Survey group form Japan] Explained the objectives of the survey and summary of the JCM project proposal survey, together with the significance of city to city agreement of Semarang and Toyama cities. [Locals] Followings are the opinions from the locals: ・It is difficult to operate the energy saving and renewable energy projects with the current tight facility investment budget.（Company A） ・There is not much capital investment budget for energy conservation and energy renewal, so it is difficult to implement energy conservation project at present. (Company A) ・Since the electric power cost of the factory is an issue and there is interest in the JCM project, it is possible to provide information on what equipment is possessed. (Company B) 

Summary	Time:　Sep. 19, 2017 (Tue.)　10:00～11:30 Venue: KIW Industrial districts Participants : [Locals] Company C [Survey group from Japan] Toyama city, IGES, PCKK
Agendas	[Summary] ・Survey group form Japan explained the summary of the survey and projects to conduct energy saving diagnosis in October. ・The group also confirmed that they would cooperate to ask for anactive participation of Japanese companies in the neighborhood for workshop for Japanese companies in October. [Survey group from Japan] Purpose of visit, significance of city to city cooperation between Toyama and Semarang cities, and outline of the JCM project formulation survey. [Locals] Following are the opinions from the locals, ・We are interested in the JCM facility subsidy project as we have been looking for energy saving measures such as photobolatic, shifting to LED lighting in our factory, etc., and Japanese headquarters office strongly encouraged us to promote eco-friendly measures to reduce environmental load. We can accept the energy saving diagnosis. 

4.5.2 Explanatory meeting for Japanese companies

(1) Objectives of the Japanese companies

We held the explanatory meeting for neighboring Japanese companies in the industrial district to inform them the purpose of JCM city to city cooperation and to help understanding the JCM facility subsidy projects.

(2) Summary of the meeting

Summary	Date : Sept. 31, 2017 (Tue.) 14:00～16:00 Place : Novotel Hotel Semarang Participants :【Locals】 6 Japanese companies within KIW · BSB Industrial Park, JCM Indonesia Secretariat 【Study Team】 Toyama city, Toyama Hokuryo, Aqueduct Industry, Toyama Light Rail, Flat Field, IGES, PCKK
Agendas	・Summary of the JCM system and JCM projects in Indonesia(JCM Indonesian office) ・Toyama and Semarang cities, city to city cooperation projects introduction ・Energy saving equipment and renewable energy facility introduced by the scheme were presented in the meeting. Ex. CNG bus, projects commercialization examples, and etc. ・Q&A regarding the energy saving equipment introduction with the JCM schemes [Questions] ・Can you give us the examples of the JCM schemes applicable equipment such as LED and solar? Would it be covered by the JCM scheme if introducing the new machinery instead of renovating the old machine? ・Would it be covered if the non-Japanese company applied for the equipment? ・Do we need the Japanese assistance to apply for the JCM subsidy in local office; can the local office apply alone without the assistance of Japanese headquarters? ・Can we discuss the feasibility of business before officially applying for the JCM subsidy? ・What would happen if we could not reduce the CO2 during the

	monitoring period? Is there any penalty for not fulfilling the requirements? ・ Would it be possible to shift to more productive/efficient machinery in the middle of the JCM project period? ・  

4.5.3 Local survey in the facility

We conducted the local survey with KIW (Semarang city industrial district) Japanese companies to confirm if they are interested in JCM facility subsidy when to renovate the energy saving facilities. Natural Gas is supplied in the KIW where Japanese companies are concentrated. Thus, the feasibility of make the air-conditioning and boiler facilities more efficient was found.

Then, we conducted the local survey on the operation of air-conditioning, boilers, lighting equipment, and management of these facilities and equipment in the area.

<Air-conditioning>

Air-conditioning was not operated with central heating source type, but corresponding to the invertor package individual air-conditioning, so there was no feasibility of renovation for much better efficiency. Additionally, the temperature set for air-conditioning facilities are 26 degrees C～28 degrees C and moderately air-conditioned. Thus there was no need for improvement.

Outdoor air conditioner corresponding to invertor

<Lighting>

They have more than 5,000 lighting, at the high ceiling mercury lamps, and other parts, FL lighting was used. They were changing the mercury lamps to fluorescent lamps in some areas.

There was a plan to change the whole lighting to LED but, the period of facility renovation is planned to be completed before March, 2018 the JCM facility subsidy does not match this period.

Mercury lamp at the high ceiling

<Other facilities>

They had emergency power generators, and compressors as well, the power generator can generate 30-40h of electricity for emergency per year, but it was not designed for energy saving. They had eight compressors (37 kW × 5 units, 75 kW × 3 units) and one of them is the inverter type. We suggested that

when they purchase new compressors in the future, changing to invertor types will increase the energy reduction effect.

5. Progress report meeting for Ministry of Environment of Japan.

Followings are the details of the meeting regarding the survey result and progress report.

Table 5-1　Progress report meeting agendas

No.	Time	Agendas
1)	2017.10.6 15：00～17：00	Progress report of first local survey ・Summary of local survey from September 13 to September 21, 2017 ・Prospective schedules and study/survey methods
2)	2018.1.5 13：30～15：00	Progress report from the second local survey ・Summary of local survey from Oct. 29 to Nov. 4, 2017 ・Prospective schedules and study/survey methods
3)	2018.2.26 13：00～	Final report of final result of the survey ・Final research report

6. Preliminary meeting of workshops etc. at the research site held at the local municipality

Preliminary meetings such as workshops in the survey site were carried out as follows:

Table 6-1　Pre-meeting for the workshops etc.

No.	Date	Agendas	Participants
1)	2017.8.28 10:00　～ 15:00	・Negotiation for the first (kick off work shop) in the survey city ・Schedule of the first local survey and locations of the survey, places to visit ・Date of workshop and programs etc.	Toyama city PCKK Toyama light rail Suiki Kogyou Toyama Hokuryou Nihonkai Gas
2)	2018.1.5 13:00　～ 15:00	Negotiation for the second workshop(Wrap up workshop) in the survey city ・Schedule of the 3rd local survey and locations of the survey, and places to visit. ・Date of workshop and programs etc.	Toyama city PCKK

7. Workshop in the survey city

We held two workshops in the survey city, Semarang. Invited related personnel from the local government in the city to introduce the city to city cooperation agreement projects and JCM city to city cooperation projects in other Indonesian cities. The followings are the details of the two workshops.

7.1 The First Kick-off Workshop

7.1.1 Date and Place of Workshop

- Date: October 31, 2017
- Time: 09.00-12.00 WIB (Indonesia Western Time)
- Venue: Merbabu Room, Novotel Hotel Semarang

7.1.2 Objective of Workshop

Semarang city and Toyama city are part of the 100 Resilient Cities Network. The City Resilience Officers (CRO) of both cities met at the Resilient Cities Summit Toyama in 2016 and agreed to work together on resilience development programs in Semarang city. One focus of resilience programs in Semarang city is to reduce CO2 emission from urban activities.

To maximize further the scope and impact of cooperation, the governments of Semarang city and Toyama city are now working on an agreement - “Joint Crediting Mechanism (JCM) Scheme for City-to-City Cooperation”. Through this JCM scheme, the government of Toyama city will support the government of Semarang city in implementing low carbon development activities.

In this workshop, cooperation will include in its scope works such as transportation, renewable energy and energy efficiency to introduce the Joint Crediting Mechanism (JCM) scheme for emission reduction cooperation projects between Semarang city and Toyama city.

7.1.3 Program

Following is the workshop timetable.

Table 7-1 Program of 1st Workshop

Time	Agendas	Speakers
08.30-09.00	Reception	
09.00-09.10	Opening Speech	Semarang city
09.10-09.20	Introduction of city to city cooperation of Toyama and Semarang cities	Toyama city
09.20-09.30	Showing the video of Toyama city	Toyama city
09.30-09.50	Recent Development of the JCM Project in Indonesia	JCM Indonesia Office
09.50-10.05	Overview introduction of FS study of JCM city-to-city cooperation project between Toyama and Semarang FY 2017	PCKK
10.05-10.20	Introduction of Suiki Kogyo Renewable Energy Small hydro power generation	Suiki Kougyo
10.20-10.40	Introduction of Toyama Hokuryo	Toyama Hokuryo
10.40-10.55	Toyama's Experience on Developing LRT	Toyama LRT
10.55-11.10	Green Metrics Program/ Diponegoro University's implementation examples	UNDIP
11.10-11.25	IGES activities in Semarang city	IGES
11.25-11.55	Discussion	
11.55-12.00	Closing Remarks	

7.1.4 Discussion

(1) Opening Speech – Assistant of Regional Secretary for Economic Administrative, Development, and Welfare of Semarang city on behalf of The Regional Secretary of Semarang city

Since 2013, Semarang city has joined the 100 RC network and committed to build Semarang as a resilient city.

Joining the 100 RC network brings many benefits through the multiple of collaborations and supports from parties of the network in order to find solutions to various problems caused by urban shocks and stresses.

Semarang city Resilience Strategy (CRS) focuses on 6 targets, while 36 initiatives from the total of 53 initiatives under those targets are already included in the city development plan.

The CRO of Toyama city and Semarang city have met and agreed to cooperate in resilience development programs in Semarang city.

Today we will further learn about the JCM scheme that will be shared by colleagues from Toyama city and JCM Indonesia Secretariat to understand what can be done in the future.

Through the JCM program, it is expected that the private sector will engage in emission reduction development programs with the coordination of the Coordinating Ministry for the Economic Affairs of Indonesia.

(2) Short Speech – Head of Cooperation Division from Coordinating Ministry for the Economic Affairs of Indonesia

The JCM scheme is a bilateral cooperation between Indonesia and Japan that started in August, 2013 in order to achieve low carbon society in Indonesia.

Emission reduction programs under the JCM scheme are focused on three sectors: renewable energy, energy efficiency, as well as industry and manufacturing.

The main players for the scheme are the private sectors of both Indonesia and Japan.

This cooperation between Toyama and Semarang is a chance to learn from each other and we hope the cooperation established will be in line with the development plan of Semarang city

（3） Recent Development of JCM Project in Indonesia – JCM Indonesia Secretariat

The core purpose of the JCM is how Japan as a developed country helps Indonesia in reducing emission.

Activities under the JCM scheme should be able to be calculated based on the amount of emission for reduction, so it is not a loan but partly a grant (can be up to 30%).

There are 3 activity models under the JCM scheme:

a.) Model project (the participants have to pass the bidding process),

b.) Demonstration project (the first 3 years of management is run by the Japanese partner and it is given to the local government after fourth year),

c.) ADB Trust Fund – JFJCM if the project budget needs over 100 million rupiahs.

Some city-to-city cooperation under the JCM scheme in Indonesia: Surabaya and Kitakyushu for energy management in building and waste management; Batam

and Yokohama for energy efficiency and biomass energy; and Bandung and Kawasaki for energy management in building, waste management, and street lamps.

Upcoming city-to-city cooperation under the JCM scheme is between Semarang and Toyama as well as between Jakarta and Kawasaki.

(4)Introduction of JCM Feasibility Study (FS) in Toyama – Toyama city

On December 14, 2017, there will be a signing of LOI between Toyama city and Semarang city. This cooperation will be a good opportunity for Toyama city, as a fellow member of 100 RC network, to further build cooperation works in the future.

If the cooperation work can be implemented next year, it would be very good for both Japanese and Indonesian governments, as in 2018 we are going to celebrate the 60th anniversary of bilateral cooperation.

Playing video of Toyama city.

The video was showing the profile of the city and how development should be made to increase city resilience and the quality of its citizens' lives by adopting more environmentally friendly and sustainable technologies.

(5)JCM FS under the city to city cooperation project between Toyama and Semarang cities FY 2017 – PCKK

There will be at least two targets of cooperation projects under the JCM scheme with Semarang city: a transportation project and an energy project.

The role of PCKK is to investigate conditions in Semarang city alongside the government of Toyama city to support project implementation by providing technical assistance.

Projects implemented by consultants to be handed over to governments of both cities.

Benefits for Semarang city by utilizing the JCM scheme: GHG emission reduction, initial cost reduction, realization of the government plans, and technology transfer. All of these will support the realization of resilient Semarang.

Stakeholders involved in city to city cooperation between Toyama and Semarang cities:

Sector	Project	Main Stakeholders
Transportation	LRT	Toyama Light Rail and PCKK
	Trans Semarang CNG	Study is continued by PCKK
	Bus Management	Study has been almost finished
Energy	Hydroelectric Power Generation Biomass Power	Suiki Kogyo and PCKK
	PV Generation	Toyama Hokuryo and PCKK
	Energy efficiency in Industrial Estate	Study is continued by PCKK

Each Japanese stakeholder that would be involved in JCM scheme projects in Semarang introduced their profiles and scope of works related to their respective projects.

(6)GreenMetrics Program of Diponegoro University-UNDIP

GreenMetrics provide the result of an online survey regarding the current condition and policies related to Green Campus and Sustainability of universities all over the world.

There are six categories that make up the assessment: Setting and Infrastructure (15%); Energy and Climate Change (21%); Waste (18%); Water (10%); Transportation (18%); and Education (18%).

Common environmental problems faced by universities in Indonesia related to green metrics assessment are infrastructure, waste/pollutants, energy and water utilization, as well as transportation.

Green Metrics assessment indicators placed UNDIP fourth as the green university in Indonesia.

UNDIP already implemented programs to support Green Metrics and there are several future plans.

The opportunity of UNDIP to cooperate in the JCM project is very important not only to achieve a more environmentally friendly campus but also as important means of learning for universities and students.

(7)IGES activities in Semarang city -IGES

Collaboration works between Semarang city and IGES officially started after signing of the letter of intent on May 24, 2016. A Memorandum of agreement on academic partnership with IGES has also been signed in November 2016.

Co-benefits study has been conducted since 2016 and this year there are ongoing activities for the development of BRT and low carbon city in Semarang.

Agendas	Relevant activities and remarks	Collaborative Organizations
Co-Benefit (SGC)	Follow-up co benefit studies on improvement of BRT system to increase the ridership	100 RC, UNDIP: Urban Planning Group, ITDP New York (Jakarta Office) – Advisory Team, and Save The Children
Low Carbon City (Mitigation) (CTY)	Study on developing low carbon city scenario in Semarang city	UNDIP: School of Environmental Studies, Mizuho, and ITB (Advisory group)

Future directions of collaboration works between IGES and Semarang city:

1) Action Research and Implementation

- JCM FS survey -> Installation of PV in UNDIP, next FS. workshop
- Co-benefit study in transportation -> City Resilient Strategy 2.0
- Low Carbon Scenario -> Climate Change Action Plan

2) Connection and Networking

- Share Semarang SHOWCASE with stakeholders
- Opportunities
  LoCARNet, COP23, WUF, HLS/ESC, APFSD, HLPF, ISAP, COP24, etc.)
- SDGs

(8)Follow Ups

There will be a signing of LOI between Toyama city and Semarang city on December 14, 2017.

After this kickoff workshop, the team from Japan will continue to do feasibility studies on proposed projects until early next year.

The result of the feasibility studies will be reported/shared to stakeholders involved in Semarang city through a workshop in mid-January, 2018.


JCM
IGES
KICK-OFF JOINT CREDIT MECHANISM (JCM) FEASIBILITY STUDY WORKSHOP

7.2 The Second Workshop

7.2.1 Date and Place of Workshop

- Dates: January 19, 2018
- Time: 08.00-11.00 WIB (Indonesia Western Time)
- Venue: Meeting Room 1 & 2, Crowne Plaza Hotel Semarang 7F

7.2.2 Objective of Workshop

To report the progress and results on the feasibility study of some possible projects that will be done under the Joint Crediting Mechanism (JCM) scheme for emission reduction cooperation work between Semarang city and Toyama city.

7.2.3 Participants:

Participants were representatives of some Semarang city governmental agencies, universities, surrounding regions' governments, and possible collaborating corporations.

7.2.4 Program

Following is the timetable of the workshop.

Table 7-2 Program of the Second Workshop

Time	Agendas	Remarks
07.45-	Reception	
08.00-	Opening Remarks 1. Toyama city	Toyama city
08.20-	Photo	
08.30-	Introduction of Hokusan (Toyama	Hokusan
08.50-	Report on progress of project in	UNDIP
09.00- 09.10	Introduction of IGES activity-IGES	IGES
09.10- 10.10	Reports on Survey Results 1. Overview of JCM Survey Report 2. Survey Report-Small Hydroelectric	 PCKK PCKK PCKK
10.10- 10.50	Discussions 1. By invited discussion participants 2. By JCM Jakarta Office 3. Open discussion	100RC Asia Pacific JCM JKT Office
10.50- 11.00	Closing Remarks 1.Toyama city 2. Semarang city	

7.2.5 Discussion

(1)Opening Remarks – Toyama city

In 2017, Semarang city and Toyama city kicked off collaboration works between the cities and the two Mayors have signed an LOI on December 14, 2017. Feasibility studies have been conducted since September 2017 and the results will be presented and discussed today.
Hopefully the cooperation works could be implemented this year, as it would be a very good opportunity for both of the governments of Semarang and Toyama cities.

(2) Opening Speech – Bappeda Kota Semarang on behalf of the Head of Bappeda of Semarang city

Firstly, I would like to apologize that the Head of Bappeda of Semarang city could not be present today to deliver his remarks as he is currently out of town. Please allow me to deliver the opening remarks on his behalf.
Since 2016 Semarang city, as a member of the 100 RC network, has closely cooperated with IGES Japan for co-benefits study. In addition to working under the 100 RC program, IGES also connects Semarang city government with various partners to cooperate in city development agendas.

On December 14, 2017, the Mayors of Semarang city and Toyama city have signed a letter of intent for city-to-city cooperation in sustainable city development as well as building city resilience.

There are several projects planned under the JCM scheme: first is small hydro power generation development – with UNDIP and Gunung Pati areas as proposed locations, second is solar power plants – at UNDIP and this is sought to be proposed at some public schools, and the third is conversion of diesel-powered BRT buses to CNG buses.

There is also cooperation to develop a more environmentally friendly area in Wijaya Kusuma Industrial Area. A campany has joined the JCM scheme for its future implementation of low carbon practices in the factory.

Assistance from JCM Indonesia is also needed as we still find some unsettled things regarding the financial calculation for some proposed projects.

Today is a good opportunity for people from surrounding regional areas as well as Kadin (Chamber of Commerce and industry) to communicate directly with Toyama city team or partners from Japan if there is any possible collaboration work that can be proposed under the JCM B2B scheme.

We hope that all programs will work well and give wide impacts not only for involved partners but also for the general public in Semarang city.

(3)Introduction of Hokusan (Toyama Company) – Hokusan Company

Hokusan was established 80 years ago and is specialized in providing gas service for industry as well as selling LNG and LPG. It has branches in Tokyo and Niigata beside the one in Toyama. The industrial area in Toyama is well developed. We have several business divisions: industrial gas division (selling industrial high pressure gas/ liquefied gas/ and medical gas), LP gas division, industrial materials-chemical division, and medical division.

We have 30% share of the hydrogen market in Japan.

We have some environmental friendly programs, such as promotion of a new energy business and a government – industry – university cooperation project on smart community/ underground water heat utilization.

(4)Report on the progress project in UNDIP – Engineering Faculty, UNDIP

There are two aspects that will be implemented at UNDIP under the JCM scheme; cooperation in small hydroelectric and solar PV.

UNDIP holds the third position nationally according to the Green Metrics indicator and is working towards more environmentally friendly aspects for its management and operation.

Progress shows a positive atmosphere as the plan is in line with UNDIP's commitment to implement the Green Metrics program.

UNDIP wants to be the advanced one to implement this green technology and hopefully it can encourage students to study this technology further.

For the financial aspect the proposals still need to be discussed with the university committee and now we are working on finalizing these two proposals.

On the other hand, I think the technical aspect shows no problems.

We think that UNDIP could develop this cooperation, perhaps with Toyama

University and enable education joint programs.

Hopefully these programs can be implemented as soon as possible.

(5)Introduction of IGES activity – IGES

JCM cooperation supported by IGES is not only done with UNDIP. Feasibility studies are also conducted on a city scope that focuses on reducing carbon emissions. We support the development and acceleration of the climate change action plan in Semarang. We also help with capacity building and knowledge transfer of Low Carbon Society (LCS) scenario development and implementation.

Surveys are conducted by looking at the current condition of Semarang city, but we also try to see the possibilities until the year 2030.

For starters, in August 2017 a kickoff meeting on low carbon society was held in Semarang.

Data collection results show fuel consumption, and as the economy progresses rapidly, so do energy needs. We also try to compare carbon emissions production to the amount of energy consumption. Then we surveyed how we can actually reduce our carbon emissions. Among these questions is how to reduce use of fossil fuels in the transport sector.

In the process of cooperation between Semarang city and Toyama city, in addition to reduction of energy consumption, there are also some other things. We have already presented the study results in Bonn at COP 23 on November 2017. The JCM parties, both Semarang city and Toyama city governments also attended the event.

On January 17 2018 we held a lecture on SDGs at UNDIP.

As for a co-benefits study in the transportation sector, we started this activity in 2016. We have done emission inventory and prioritized local actions on public transport.
After we map the impacts of priority policies on public transport and BRT Trans Semarang, together with stakeholders in the transportation sector in Semarang city we built follow-up actions.
In 2017, the follow up activity focused on the improvement of intermodality and BRT ridership. We collaborated with UNDIP and ITDP to develop a better BRT system. Campaigns to raise the awareness on the modal shift from motorcycle to BRT have also been conducted among middle school students.
IGES hopes to establish sustainable cooperation with Semarang city.

(6) Reports on Surveys Results –Presentations on Feasibility Study Results from PCKK Team, moderated by UNDIP

a) Overview of the Feasibility Studies (FS)

Background of FS survey: Semarang city has a geographical similarity with Toyama city besides being the fellow member of 100RC. On December 14, 2017 both governments have already signed an LOI for JCM cooperation.
The survey was conducted based on how we apply environmentally friendly technology: low carbon, micro hydro, and such as LRT development - whether these can be implemented in Semarang city.
Overview about JCM: it is bilateral cooperation between Japan and Indonesia and this time we have city-to-city cooperation. This JCM scheme is also followed by companies from Japan and Indonesia.
These JCM participants will form an international consortium which will be subsidized by Japan up to 50% of the project value. Then the credits for CO2 reduction will be divided in half between Japan and Indonesia.

Hopefully this cooperation will benefit Semarang city in reducing carbon emissions and also reducing financial expense in the early phase of low emission technology adoption in infrastructure and energy saving. We can also provide technical assistance for the technology that has been applied in Toyama city.

The FS has begun in September 2017 and its final report will be completed in February 2018.

Cooperation in transportation sector: conversion to CNG bus usage for BRT. In UNDIP we have surveyed for solar panel and micro hydro implementation. From discussions with the Mayor of Semarang city, it is also expected that we can install solar panels at some public schools in the city. This input will be discussed further with some Japan companies.

b) FS Result on Small Hydroelectric -PCKK

Surveys were done for three objects: Diponegoro University (UNDIP) educational dam, Pucang Gading dam, and Simongan channel.

Educational dam in UNDIP: there is already a 15 kWh small electric hydro power plant. The facility already exists but the micro hydro is for educational purpose and is not operated at the moment.

The existing facility could be re-operated but the operation could only be done manually and there is a risk of energy leak.

Suiki Kogyo company would be the institution that helps with development of small hydro power plants in UNDIP.

Result from the FS: looking at the current and environment conditions, it is possible to reactivate the micro hydro installation, not only for educational purposes, but also to provide electrical needs of the campus and its

surrounding area. Electricity capacity can be increased to 80 kWh.
Available facilities can still be used: impact water, powerhouse, drainage, and penstock. However, we will update the tool kit, generator, and also the part that connects the penstock.
There are two options: we can continue to use the existing turbine or change it to a new one (with capacity of 80 kWh).
There is a plan to replace the machine, but with the limited available space, it is likely to change only the turbine and keep the engine.
Pucang Gading dam: this dam functions for irrigation and if the water flows smoothly, it can be used for power generation.
Simongan channel: this channel is located around a large river where there are a channel and water gate that can be utilized. It is possible to install a 30 kWh turbine with a propeller type that fits.

c) FS Result on Solar Panel PCKK

The FS has been done by conducting basic survey, system review, study on commercialization possibilities, and business evaluation.
Some things need to be highlighted: the first object for solar PV installation is the ICT center of UNDIP and the second is Diponegoro National Hospital (RSND).
Conditions for system review: the solar cell module installation range is placed with consideration for areas not impacted by shadows, such as rooftops.
Approximately 58 kWh can be produced by solar panels installed on the roof of the ICT center and about 153 kWh from the one on the RSND.
The total annual power generation amount from both installations is 327,812 kWh/year and there are three scenarios for energy reduction cost.
Benefits of the business operation: realization of smart sustainable campus because carbon emission reduction on campus contributes to achieve the Green Metric targets; initial cost reductions; energy cost reductions; and application

for environmental education.

d) FS Result on Transportation (CNG Bus) – PCKK

The Indonesian government is actively promoting the use of natural gas in order to achieve their “oil-to-gas program” goal to reduce pollution and increase diversify of fuel in the public transportation sector.

Trans Jakarta has switched to CNG and compared it with diesel, it is cheaper per distance.

Several measures to be considered for converting to CNG bus: mobile refueling unit, CNG station, and conversion equipment.

For CNG supply facilities in Semarang city, three stations were built by Pertamina in 2014 near the bus terminal.

Hokusan, as representative participant for this transport project under the JCM, will subsidize Trans Semarang in providing CNG buses as well as giving MRV support.

There is no certainty of CNG supply from Pertamina so we from Hokusan Toyama and Gazindo Indonesia can supply the gas for BRT.

We calculate that it would be three plans. For plan A there will be 25 buses, 72 buses for plan B, and 131 buses for plan C. Plan A has 16.7% of subsidy rate, plan B has 23.5% subsidy rate, and Plan C has 25.9% subsidy rate.

(7)Discussion Session

a) 100 Resilient Cities Asia Pacific

Cooperation such as the JCM is an inspiration for additional resilient partner for Semarang as a member of 100 RC network.

Very quick intro for 100 RC network: we help cities to build up their capacity to respond to their environmental, economic, and social challenges in the century.

A city is a very complex system and it relies on institutions, infrastructure, and information in order to operate. Urban resilience as we define is the ability to respond to any shocks in the future.

There are 4 ways that we support cities:
Providing city resilient officers (CRO) as institutional support;
Working on city resilience strategy (CRS). Semarang is the first city in Asia to publish its resilience strategy and project with IGES is part of CRS;
Connecting our cities to a platform of services. IGES is one of our platform partners;
Provide networking between our members. Semarang and Toyama are eager to share knowledge and are working together to advance their resilience priorities.
We have seen Semarang and Toyama reched the process of implementing a strategic process. They both have looked at what was the important project for advancing their agendas. Considering the work they have done; they have built a resilient team, worked on their strategy, connected with partners in their own business community as well as with outside to work on resilience.
The JCM is a concrete example of developing that strategy; it connects multiple institutions, businesses as well as people. This kind of collaboration gives multiple benefits and it is only possible because of people like you who come together to achieve a more resilient Semarang.

b) JCM Indonesia Secretariat

The JCM scheme is a bilateral cooperation between Indonesia and Japan that has started since August 2013 in order to achieve low carbon emission Indonesia.
Many parties have been involved with JCM and JCM Indonesia will be happy to help you to understand this scheme.
There are already 115 city studies conducted under the city to city cooperation scheme as well as the business-to-business scheme.
It involves many technologies of which some have been implemented in Indonesia.
Activities under the JCM scheme should be calculated based on the amount of emission for reduction, so it is not a loan but a grant (it can be up to 30%).

There are 3 activity models under JCM scheme: a. model project (the participants have to pass a bidding process), b. demonstration project (first 3 years of management is operted by the Japanese partner and it is given to the local government after the fourth year), and c. ADB Trust Fund – JFJCM if the project budget needs over 100 million rupiahs.
The core of city-to-city cooperation is not only work between city governments but also between communities, institutions, and business entities from both cities.
JCM support can be either technical assistance or feasibility studies.
Up to now, some city to city cooperations under the JCM scheme in Indonesia are Surabaya and Kitakyushu; Batam and Yokohama; Bandung and Kawasaki; Semarang and Toyama. Jakarta is now preparing cooperation under the JCM scheme.

c) Open discussion:

Question from Byappeda of Semarang city

Semarang finds difficulties when the project is going to be implemented in a public building/area. We do not have an assigned institution that can manage administrative needs for this JCM scheme. This problem happens for the installation plan of solar PV in public school as well as for dam utilization. What can the city government do about it? As for the conversion to CNG bus, we do not find such issues as we already have with BLU Trans Semarang that manages the operation of BRT. We would also want to know if colleagues from other regencies around Semarang are interested to join the JCM, and what they should do.

Answer from JCM Jakarta Office

Maybe Semarang could do smilr to Surabaya. Plans or projects that are indicated suitable for the JCM scheme could be proposed for other type of grants from Japanese side, government of Toyama city. As for other regencies, I

think a business-to-business scheme can be used in order to join the JCM cooperation.

Comment from100RC Asia Pacific
There would be more benefits generated from business community in the surrounding area (regional) of Semarang city so that it can expand the scheme to support realization of resilience.

Comment from UNDIP
UNDIP is interested in this program because the benefits can be extended to develop the students' knowledge. In the long term we would like to work on the possibility of cooperation between UNDIP and the university in Toyama city.

Comment from IGES
Japan responds well to the concerns of resilient cities. There were already JCM workshops and many participants are from the industry sector. We also invited Semarang city and surrounding areas and many of them showed interests. As former speaker said, to expand the impact of this cooperation and realize it, first we must do the projects in Semarang successfully so we can take these as models applicable for other cities or regions. Cooperation from all parties will be very much needed.

(8)Closing Remarks by PCKK
Thank you very much for your warm welcome. I would like to extend our grtitude to the speakers and participations in the discussion.Thank you very much, herewith I'd like to close today's event.


環境省
JCM
Pacific Consultants
IGES
WRAP UP JCM FS WORKSHOP

8. Presentation on initiatives for cooperation between cities in Japan and overseas

The Ministry of the Environment of Japan announced the initiative of this survey at "City to city coopertion seminar for realizing low carbon society in Asia" on January 30, 2018. The outline is as follows:

Presentation by Toyama city

8.1 Summary of the presentation/meeting

・Date: January 30, 2018. (Tue.) 9:30~12:30

・Venue: Kaiun Club

・Participants: Toyama city, PCKK.

8.2 Presentation Agendas

Toyama city made a presentation about city to city cooperation projects between Toyama and Semarang cities.

・Outline of Toyama-city

・Policy of Compact city based on the Public Transportation System

・Introduction of the implementation cases of renewable energy

・City to city cooperation and results of implementation

・Summary of the survey

9. Forum for Collaboration among cities at local governmental level

Following is the outline of the previous forum that was hosted by Toyama city.

9.1 Summary

・Date: December 14, 2017.

・Venue: City of Toyama international conference hall

・Participants: 150

9.2 Objectives of the forum

After adoption of “Paris agreement” in 2015, the agreement has been universally recognized to develop measures to achieve a low carbon society in order to attain its long-term objectives.

Simultaneously, initiatives are already taken globally to tackle with international issues to achieve the 17 SDGs (in 2015 the UN General Assembly adopted 17 Sustainable Development Goals) such as climate change and energy issues related to 2030 agendas for Sustainable development.

For the above-mentioned measures, the role of cities and collaborations between cities are very important for development and implementation. When the G7 Toyama Environmental Minister’s Meeting took place, they discussed sharing advanced examples of each city and accelerating city to city collaboration. In addition, the contents of the conference were stipulated in the Communique.

Toyama city has been taking actions to implement city-to-city collaboration programs with South East Asian cities and stakeholders such as the World Bank, JICA, IGES, and general corporate judicial person IKUREI Japan, and so forth.

The objectives of the forum were as follows: to strengthen mutual understanding of each city to achieve collective goals, to enhance relationships to strengthen international cooperation and to further understand the significant roles of cities for achieving these goals through studying the

examples of “100RC” selected Semarang city in Indonesia and Toyama city, as well as projects related to “Energy effectiveness targeted city” Malaysian Iskandal Local Developmental Ministry and Toyama city.

9.3 Programs

Key note speech” The role of city for sustainable development”
We have lectures on what roles local government, cities, and national government (Japan) should play while more global attention is paid to the environment, such as the “2030 Sustainable Development Agendas” including the 2015 Paris Agreement and SDGs stipulated in the UN developmental Objectives.

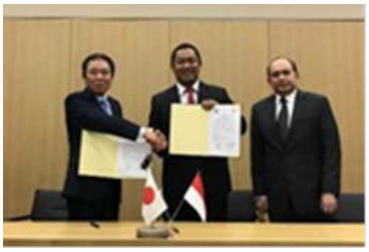
“International cooperation and multi stakeholders” - Panel discussion
While Toyama city is making a great effort to implement measures to achieve global goals to meet “Paris Agreement and SDGs”, we will further discuss and exchange opinions regarding the role Toyama, as “100RC and energy effectiveness reform targeted city” and an ecologically developed city, should play and also regarding prospective stakeholders to collaborate. Additionally, discussed were the international cooperation between the Malaysian Iskandar Regional Development Ministry (Energy effectiveness reform targeted city) and Toyama city as the first Asian case, as well as the other first case example of “100RC” cities of Toyama and Semarang for their prospective cooperation and their spill-off effects.

Ceremony of cooperation agreement conclusion between city of Toyama and Semarang cities in Indonesia.
Both cities are member of 100RC cities and the agreement is concluded to share mutual assignments and progressive implementation measures for facilitating the conclusion of the policy-making ceremony of cooperation agreement between Toyama city and IGES. We will release information inside and outside Japan to

introduce the progressive implementation cases of Toyama city as models, and IGES and Toyama city conclude a cooperation agreement to support and facilitate specific introduction and applications.

9.4 Summary of program

Time	Program and summary
09:00-9:10	Opening speech of city of Toyama Mayor
09:10-09:25	Keynote speech: Lecturer: MOE Deputy Vice - Minister " The role of the city towards sustainable development"  Mr. Takahashi, introduced the previous example of Ministry of Environment and city of Toyama and talked about the importance of city to city collaboration. Specifically, he mentioned how important it was to maintain cooperation among cities to pursue objectives set for achieving collective goals in accordance with Paris Agreement, and international relations such as upcoming COP23, SDGs etc.,. He also introduced some cases of implementation with the JCM projects ofthe Ministry of Environment of Japan as well as ASEAN cases. He concluded the speech with expectations and hope for Toyama city to accelerate further its global commitment.
09:30-09:55	Introductions of implementation for each cities  Toyama, Semarang, Iskandar and Kotakinabalu cities presented environmental projects in each city. ・Toyama city introduced the compact city policy and city to city cooperation projects for energy saving. ・Semarang city introduced transportation and energy policies. ・Iskandar Regional Authority presented a project to develop a low carbon society and its implementations.

	・Kotakinabalu City presented environmental policy and private sector public sector cooperation projects from the perspective of sightseeing, ecology and nature.
10:00-11:00	Panel discussion: “International cooperation and multi-stakeholders” [Panelists] ・Semarang city mayor ・Chief executive of Islander Regional Development Authority ・Mayor of the Kotakinabalu city in Malaysia. ・Senior counselor MOFA: Ambassador ・MOE Deputy vice minister. ・Mayor of Toyama  Coordinator: ・President of IGES. In the panel discussion, the need for international cooperation was emphasized in the speeches of Indonesia, Malaysia and Toyama city. They confirmed the necessity of learning with each other and mutual cooperation to reduce greenhouse gas emission. Additionally, specific examples and needs for city to city cooperation were presented and shared by Ambassador, and Deputy Vice Minister Takahashi by introducing the previous cases of COP and G7. The Mayor of Toyama city emphasized the benefit of intercity cooperation, necessity of extending business chances for municipal enterprises, acquisition of new expertise and fulfilling the role of an ecologically advanced district by contributing to international society and collaborating with global partners.
11:05-11:15	Ceremony of cooperation agreement conclusion Toyama city and Semarang city concluded the cooperation agreement. The objectives of the agreement was to accelerate establishment of low carbon society and city to city cooperation in the environmental field. 

11:15- 11:25	Ceremony for conclusion of agreement between Toyama city and IGES Toyama city and IGES concluded the cooperation agreement to accelerate city to city cooperation and establishment of a low carbon society.