FY2017 Project for Ministry of the Environment Japan

FY2017
City-to-City Collaboration Programme for Low-Carbon Society

Project to Accelerate Low Carbonization in Hai Phong City (Kitakyushu-Hai Phong Cooperation Project)

Report

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NTT Data Institute of Management Consulting, Inc.

Table of Contents

Appendix

Appendix a：Material for Kick-Off Meeting for Ministry of the Environment Japan

Appendix b：Material for Progress Reporting Meeting in Aug for Ministry of the Environment Japan

Appendix c：Material for Progress Reporting Meeting in Dec for Ministry of the Environment Japan

Appendix d：Material for Final Reporting Meeting for Ministry of the Environment Japan

Appendix e：Material for City-to-City Collaboration Seminar in Kawasaki

Appendix f：Material for City-to-City Collaboration Seminar in Tokyo

Chapter 1: Background and Objectives of the Project

Chapter 1 Table of Contents

1.1 Overview of Hai Phong City

Hai Phong City is a centrally-controlled city (Municipalities of Vietnam) with a population of about 1.9 million, and is the third largest city in Vietnam, ranked just behind Hanoi and Ho Chi Minh. Located in a coastal area, about 100 km east of the capital, Hanoi. Hai Phong City is the largest marine logistics base in northern Vietnam, where many large industrial parks exist. It is connected to the capital Hanoi by National Route 5. In addition, an expressway was opened on December 2015 from Hanoi to Hai Phong City, connecting the belt highway 3 to the Dinh Vu port in the Red River delta region of Hai Phong City.

The Hai Phong Port is the largest container port in northern Vietnam, and has a capacity of accepting up to 40,000 DWT (dead-weight tonnage). Lack Huyen port, which is under construction off the shore of Hai Phong Port, and the land space of the port is 1,200 ha. Two large 100,000 DWT class ships alongside each other are able to enter the birth of Lach Huyen port at the same time. Hai Phong City, as the largest harbor logistics base in northern Vietnam, aims to be an environmentally friendly, green port city.

The economy of Hai Phong City is growing at a rate of about 7.5% per year, and the per capita GDP has reached 2,500 USD (in 2013). There are 11 industrial parks in the city, and more than 50 Japanese companies have entered the market. It is expected that more companies will enter for its smoother economic growth and the importance as a logistics base. In particular, Hai Phong City is also known as the area with a 100 year plus history of having many foundries located in itself. Currently approximately 140 foundries are based in the area.

In addition, approximately 60 km southeast of Hai Phong City's mainland, an island called Cat Ba exists. Cat Ba belongs to the administrative units of Cat Hi prefecture in Hai Phong City. Cat Ba Island is the largest island in Halong Bay, which is famous for its World Heritage Sites. About 1.4 million visitors, far more than Cat Ba's population of about 17,000 people, come for tourism each year and enjoy the nature and rich ecosystem of the island.

1.2 Policy on the Reduction of Greenhouse Gas Emissions by the Vietnamese Government

（1） Basic Plan on Climate Change in Vietnam

Basic plans on climate change such as the Sustainable Development Strategy in Vietnam (153/2004 / QDTTg 2004/8/17), the National Target Program for Climate Change (158/2008 / QD-TTg 2008/12/2), the National Climate Change Strategy (2139 / QD-TTg 2011/12/5), the green growth strategy (1393 / QD-TTg 2012/9/25), the Management of GHG Emissions and Carbon Credits (1775 / QD-TTg 2012/11/21), the National Target Program for Climate Change (NTC-RCC) in 2012-2015 (1183 / QD-TTg 2012/8/30), the Resource Management system for Climate Change by Supporters (Ministry of Natural Resources, Ministry of Finance, Ministry of Planning and Investment)(03/2013 /TTLT-BTNMT-BCT-BKHDT), Ministry of Commerce and Industry's Action Plan on Climate Change (4103 / QD - BCT 2010/8/3). In The Green Growth Strategy, GHG emissions target and GHG concentration reduction targets are set.

Figure1.2-1 GHG emissions and concentration reduction targets of Green growth strategy

Term	Amount of GHG emission reduction	Reduction ratio	Reduction of energy consumption to GDP	Domestic efforts	International Support
2011 ～2020	BAU 10～20%	8～10%	1～1.5% year	10%	10%
～2030	BAU 20～30%			10%	20%
～2050	1.5～2% year				

（2） Economic Overview

Vietnam has been promoting its transition toward market economy since the late 1980s, through ways of joining ASEAN and the WTO and others. In the 2000s, Vietnam achieved an economic growth of more than 7% on average, with a per capita income of 1,550 USD. It became one of the lower middle income countries. Since the possibility of economic growth in Vietnam is high in the future as a country adding to the economic growth of the world, the importance of Vietnam is increasing. However, such economic growth in Vietnam brings issues, such as the inadequate development of social infrastructure and the deterioration of environmental problems.

Figure1.2-2 Major economic indicators and others in Vietnam (1990, 2011, 2012)

index	1990	2011	2012
population	6.602 million	8,784million	8,877milion
Gross national income	6,595 million USD	117,758 million USD	148,961 million USD
Gross national income(per person)	130USD	1,270USD	1,550USD

Source: Ministry of Foreign Affairs, "Official Development Assistance (ODA) Country Specific Data Book"

Vietnam has environmental problems, mainly air pollution caused by exhaust gas come from factories and the transportation sector, dust pollution coming from the construction sector, water pollution resulting from poor drainage systems of both industries and households, strong odors due to inappropriate disposal and management of waste methods, loud noise as a result of the transportation sector, and soil contamination due to high concentrations of harmful substances. However, in recent years, an increase in energy consumption has also begun to be recognized as another environmental problem.

Comparing the annual energy consumption in Vietnam with the growth rate of their GDP (2000-2007), it is clear that energy consumption is increasing in with economic growth in Vietnam and it is expected that energy consumption in Vietnam will also keep increasing alongside economic growth in the future too.

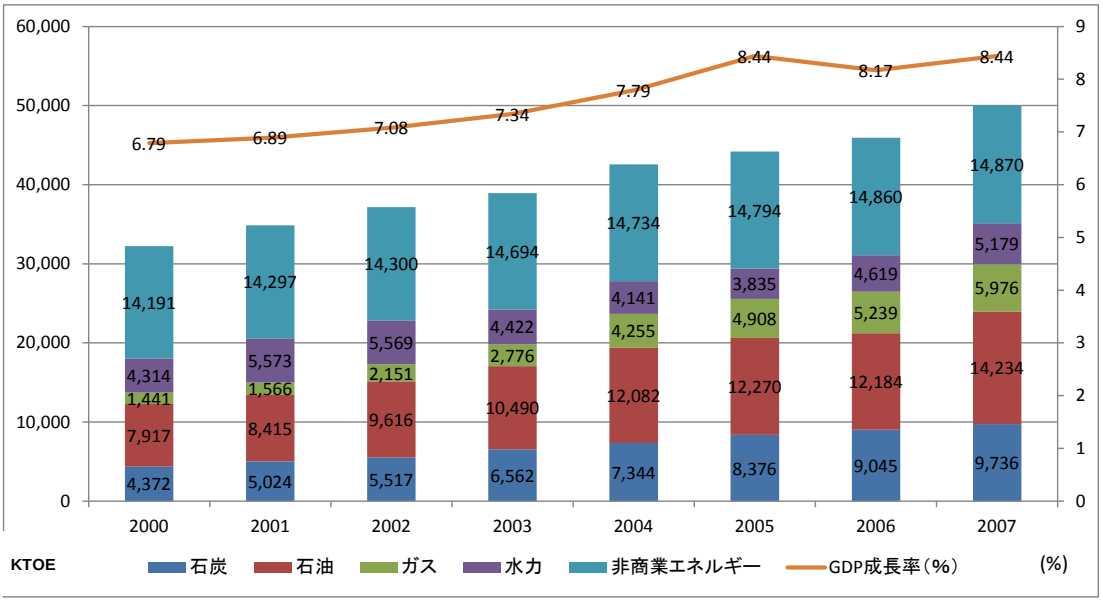


Figure 1.2-3　Primary energy consumption and GDP growth rate by resource in Vietnam (2000 - 2007)

出所：Ministry of Natural Resources and Environment “Viet Nam’s Second National Communication to the United Nations Framework Convention on Climate Change”より作成

Figure 2 shows the annual CO2 emissions in Vietnam and annual electric power consumption per capita. Although the annual CO2 emissions have repeatedly increased and decreased from the 1960s to 1990, the annual per-capita electric power consumption and annual CO2 emissions have grown remarkably since 1990. Implementing measures to reduce electric power consumption in Vietnam (where economic growth is expected in the future), would be an effective measure to not only secure a stable electric power supply, but to also reduce CO2 emissions.

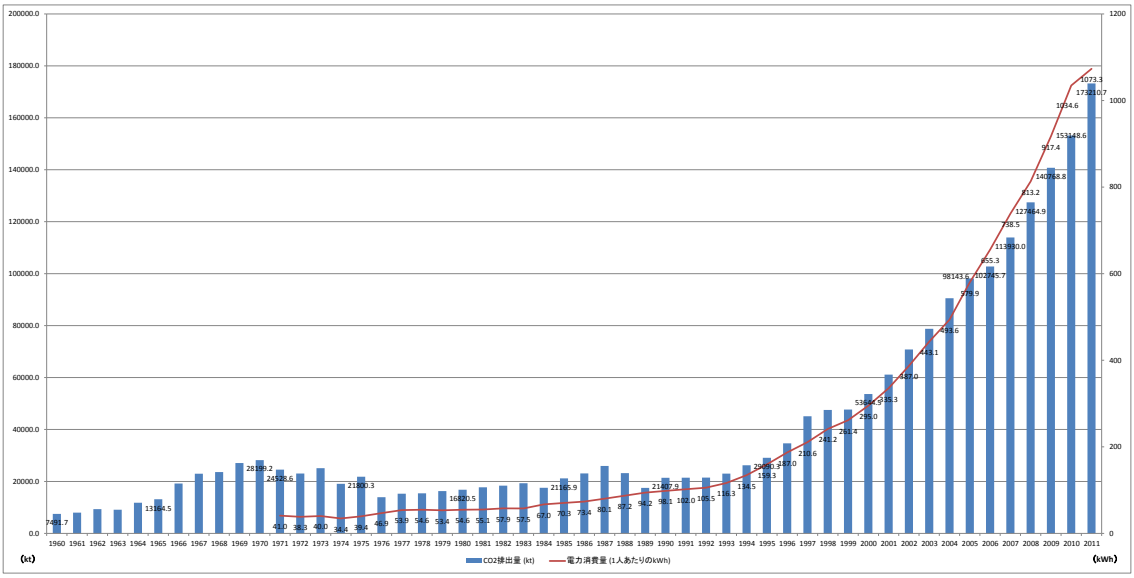


Figure 1.2-4 CO2 emissions (kt) and electricity consumption per capita (kWh) in each sector of Vietnam[1]

[1] (Note) Data of the amount of CO_2 emission and those of the per-capita electric power consumption have been released since 1960 and 1971, respectively. Therefore, no data for the 1960s are presented in Figure 2. Created on the basis of the World Bank. World Data Bank.

1.3 Hai Phong City's efforts and issues to reduce greenhouse gas emissions

Efforts of Hai Phong City

The efforts of Hai Phong City until present to reduce greenhouse gas emissions are described below.

① Formulation of the Green Growth Strategy Action Plan

② Formulation of a green growth promotion plan in Hai Phong City (supported by Kitakyushu City)

③ Public relations activities with citizens on waste sorting and energy saving

Regarding private-sector initiatives, the introduction of energy-saving equipment has begun mainly in companies that are financially prosperous, such as the introduction of exhaust heat recovery systems at Chinfon cement factories, and the introduction of LED lighting to commercial facilities, hotels, etc.

① Formulation of the Green Growth Strategy Action Plan

Hai Phong City has established the Green Growth Strategy Action Plan (1463 / QD-UBND, hereinafter referred to as the HPGGSAP) at the same time as a sustainable economic development plan, with the aim of preserving the environment and reducing greenhouse gas emissions.

In the HPGGSAP, the rough policies for promoting green growth and the role of each department of Hai Phong City are described clearly. Furthermore, it is required that each department set up concrete projects, and that they are obliged to provide a status update on their progress to the Hai Phong People's Committee every year. The main role of each major department specified by HPGGSAP is shown below.

HPGGSAP was established in accordance with the following top three plans, prepared by the central government, and based on the prime minister’s decisions, and therefore has legal grounds.

- "Green Growth Strategy (1393 / QD-TTg, decided by Prime Minister in September 2012)"
- "Green Growth Action Plan (403 / QD - TTg, decided by Prime Minister in March 2014)"
- "Development of Hai Phong city at the time of industrialization and modernization of the state <Green Port City> (72-KL / TW, Communist Party Politburo)"

Figure 1.3-1 Main roles of major departments (Hai Phong City Green Growth Strategy Action Plan)

department	Main role
Common to all departments	· Thorough knowledge of HPGGSAP · Human resources development in the administration, civic awareness reform · Concrete the content of HPGGSAP as a project and report on its progress to the city People's Committee on November 10 every year.
Department of Planned Investment	・Establish target evaluation indicators for the whole city (indicators on energy consumption, green production, greening of lifestyle). · Attracting project implementers (domestic and foreign organizations) and examining its management system · Participation in international events / seminars on green growth and international cooperation · Review of the award system for institutions, companies and individuals practicing green growth.
Department of Commerce & Industry	・Establish and oversee indicators on energy consumption and green production in the industrial and commercial fields. We will also promote the spread of green production technology. · To list energy-intensive enterprises, to check the energy usage situation of energy-consuming enterprises, and to support efficiency improvement. · Thoroughly familiarize about energy saving and efficient energy use. Encourage enterprises to introduce energy saving systems. · Conduct inspections of companies that produce and import products such as electric appliances, whether energy saving / labeling system is properly operated or not.
Department of Agricultural rural development	・Lifestyle greening in rural areas · Proper treatment of waste in traditional village village and support for green production · Encourage the use of recycled energy in rural areas · Introduction of technology to reduce greenhouse gas emissions in agriculture, forestry and fishery industry, improvement of production management capacity · Afforestation, maintenance and quality improvement of forest resources (especially forest conservation in biosphere protected areas of Katba Island) · For the fishery industry, promote the energy saving of fishing boat lighting and the introduction of energy conservation technology at aquaculture and fishery processing plants. · Promote circulation agriculture such as the use of organic fertilizer.
Department of Science and Technology	・revitalize existing technology and equipment exchanges and try to disseminate energy saving technologies.
Department of Transportation	・Promote the use of public transportation such as buses. · From the truck transportation, try to convert to mass transit using railway and feeder ship (modal shift).
Department of Mineral Recourse	・Increase the urban green space and waterfront space, to secure the per capita green space area. · Human resource development and database creation to periodically check greenhouse gas emissions
Department of Construction	・Promotion of energy conservation of construction activities and public lighting · Introduction of construction technology with less environmental impact · Reduce the amount of final disposal by intermediate treatment of waste and recycling.

HPGGSAP comprehensively defines the main plans of Hai Phong City, including a sustainable development strategy, various programs such as sightseeing, medical care, as well as a master plan. (in 2011-2020).

② Formulation of Green Growth Promotion Plan in Hai Phong City (Supported by Kitakyushu City)

(A) Relationship with HPHHSAP

In 2014, with the support of Kitakyushu City, "Green Growth Promotion Plan in Hai Phong City" was formulated as a practical edition that clearly shows the concrete action plan of HPGGSAP. The relationship between the plan and HPGGSAP is shown in Figure 1.3.1. The plan was formulated after a discussion between Hai phong City and Kitakyushu City, and has been legally permitted by the Hai Phong People's Committee.

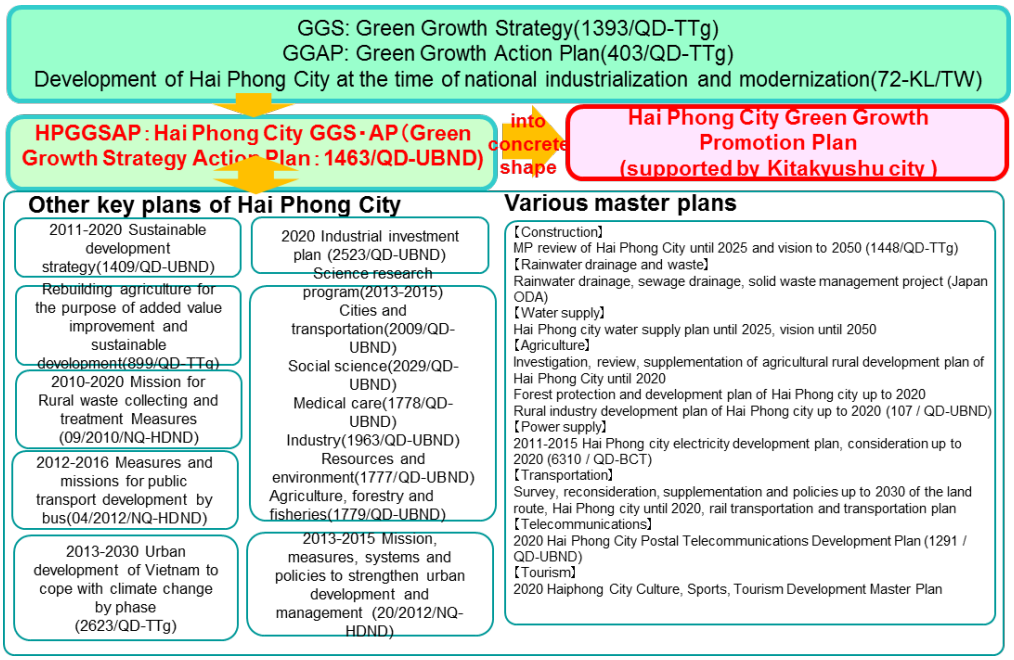


Figure1.3-2Relationship between legal position of HPGGSAP and green growth promotion plan

(B) Outline of the plan

The fields covered by the plan are classified into seven categories of waste, energy, transportation, Cat Ba Island, water supply and sewage / rainwater drainage, environmental conservation and green production. Among them, waste, energy, transportation, and Cat Ba Island, which are closely related to the emission of greenhouse gases, were positioned as the main fields and the rest as other fields. According to these categories, the Green Growth Promotion Plan in Hai Phong City was formulated by the following procedure.

①Understanding of current status （Understanding current situation and future plans, extracting tasks）
↓
②Strategy formulation （Setting vision and sectoral targets and numerical targets）
↓
③Concrete measures （considering measure by field, Pilot project making）
↓
④Method of verifying strategy and measure
（Feasibility and validity of measures, Study on effect verification method after operation, etc.）
↓
⑤Ordering and fund raising （Fund raising method, Project implementation scheduling and others）
↓
⑥ Schedule managing

Figure 4　Flow of Hai Phong City Green Growth Plan Formulation

Flow of plan development support flow ③ In the concrete measures, the details of specific measures implemented by Hai Phong City, its implementing body, implementation time, and evaluation index were clarified. For reference, specific concrete measures in the energy field are shown as an example in Figure1.3-5.

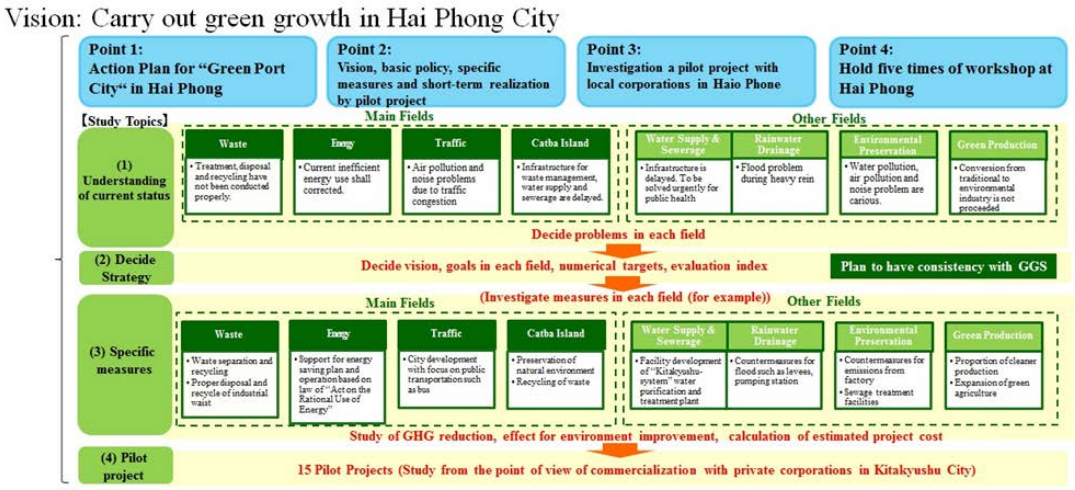


Figure 1.3-5　Flow of Hai Phong City Green Growth Promotion Plan Formulation Support

Figure 1,3-5 Specific measures in the energy field

Business classification	Contents	Main Actor	Project term	KPI
1. Efficient use of energy at factories	・To promote energy conservation efforts in energy consuming enterprises, conduct energy-saving diagnosis by utilizing energy conservation center etc. and propose methods of efficient use of energy.	Company, DOIT	Short	Energy saving amount GHG reduction amount
	・Propose concrete measures such as energy saving and energy reuse that can be applied to small and medium enterprises, and aim for more efficient use of energy.		Medium	
2. Efficient use of energy in commercial facilities, office buildings, etc.	・promoting energy conservation diagnosis in large commercial facilities and office buildings with an annual energy consumption of over 500 TOE, which is the object of the Energy Conservation Law, energy conservation such as lighting and air conditioning equipment with large electricity consumption, introduction of distributed power sources such as renewable energy etc. , We propose a method of efficient use of energy.	Company, DOIT	short	Energy saving amount GHG reduction amount
	・Specific examples of energy conservation and introduction of renewable energy such as newly constructed and remodeled buildings with a floor space of over 2,500 m 2, which is subject to the building energy saving standard (QCVN 09: 2013 / BXD) We propose measures to make energy use more efficient.		Medium	
3. Introduction of cleaner production in factories	・Promote energy conservation by reviewing the production process (cleaner production) that can realize efficient use of raw materials and energy at each factory including supporting industries (casting, metal processing etc).	Company, DOIT	Short	Energy saving amount GHG reduction amount
4. Promotion of introduction of renewable energy	・In order to cope with the shortage of basic electric power, as part of the introduction of distributed type power supply, promote the introduction of renewable energy such as solar power generation, solar heat, small scale wind power generation, geothermal energy use.	Company citizen	Short	Energy saving amount GHG reduction amount
5. Energy saving of public facilities	・Hai Phong Municipalities will promote energy saving and energy efficient use of the facilities related to the city, People's Committee, etc.	Administrative agency	Short	Energy saving amount GHG reduction amount
	・Promote energy saving lighting such as LEDs for existing and new road lights and street lights.	DOT		
6. Promotion of energy management	・Introduce a system of energy management utilizing smart meters etc. in factories, office buildings, commercial facilities, and homes to promote optimization of energy use such as peak cut response.	Company citizen	Medium	Energy saving amount GHG reduction amount
	・For stable operation in industrial estates and the like, we introduce a system that collectively receives power and perform voltage control, and aim to stabilize the voltage in the main power.	company		
7. Enhancement of energy conservation promotion system	・In order to promote efficient use of energy, we will examine and evaluate energy use situation of priority energy use agencies and support improvement of usage efficiency.	Company, DOIT	Short	Energy saving amount GHG reduction amount
	・In order to introduce and disseminate green production methods in the industrial field, we set indicators (greening indicators) to evaluate energy conservation and environmental load reduction.			
	・Regarding energy conservation and efficient use of energy, we conduct educational activities for corporations and citizens, while building energy-saving models in each household, disseminate energy conservation.	Company citizen DOIT		

③ Public relations activities for citizens on waste sorting and energy saving

In Hai Phong City, citizens are called out to by outdoor speakers to separate garbage and save energy in the morning and evening.

In addition, the Energy Conservation Center of the Bureau of Commerce and Industry creates and distributes brochures aimed at promoting energy conservation to households. In addition, they hold elaborately planned contests, in which they compete with knowledge on energy conservation and efficient energy saving methods, together with electric power companies, schools, etc., every year.

Figure 1.3-6 Brochure of promoting energy saving at home

A. 2011年度の電気の節約・有効的利用のコンテスト

「2011年の節約的・効果的な電気利用」コンテスト開催に関するハイフォン市給電運営指導委員会の2011/4/9日付276/KH-BCD号計画を実施し、節約的・効果的・安全な電気利用に関する人民の意識を高めるために、工商局の省エネセンターは、ハイフォン電力一人メンバー有限責任会社とLeChan区青年団と共同して上記のコンテストを開催した。

I. 参加者

・ハイフォン市LeChan区のDuHangWardチーム、TraiCauWardチーム、HangKenhWardチーム、DuHangKenhWardチーム。

・1つのチームは5人のメンバーを含む。

II. 招待者

・市給電運営指導委員会、工商局、関連部局、関連区町、コンテストのスポンサー、記者

・約350人

III. コンテストの目的

・節約的・効果的な電気利用に関する基本知識を家庭およびコミュニティに宣伝する。

・宣伝者、協力者の宣伝能力を確認する。

・節約的・効果的な電気利用モデル・発想を紹介する。

IV. コンテストの内容

4.1. 挨拶

形式：ステージでのドラマのように、チーム全体の紹介

時間：5分

点数：10点

4.2. 節約的・効果的な電気利用に関する知識のコンペ

形式：各チームから2人の代表者が節約的・効果的な電気利用に関する10つの質問を答える。

時間：5分

点数：10点

4.3. 芸コンペ

形式：各チームは、節約的・効果的な電気利用に関する内容の歌・ダンス・ドラマなどを演奏する

時間：10～20分

点数：20点

4.4. スピーチコンペ

形式：各チームから1人の代表者がチームの節約的・効果的な電気利用に関する発想について発表する

合計で最も高い点数を取ったチームは優勝。

B. 2014年度の「グリーン世界のため」の黄金鐘鳴らしコンテスト

2014 年度ハイフォン市持続可能発展ハイフォン市人民委員会の 2014/1/16 日付 391/KH-UBND 号計画および 2014 年度事業プログラムの任務を展開するため、省エネセンターは LeChan 中学校と共同して「グリーン世界のため」のコンテストを開催する。

I. 参加者

ハイフォン市の LeChan 中学校の学生と教員

II. 招待者

工商局、教育局、区町の教育部、ハイフォン電力一人メンバー有限責任会社、その他の学校の代表者、記者

III. コンテストの目的

・省エネと環境保全意識を学校の生徒に身に着けさせる。

・節約的・効果的・安全なエネルギー利用を促進するために必要な情報・知識を生徒に提供する。

・日常生活における節約的・効果的・安全なエネルギー利用と環境保全の知識・スキルを持つ青年宣伝者を育成する。

IV. コンテストの内容

時間	内容	実施	備考
7:30~8:00 8:00~8:20	- 客歓迎 - 歌演奏	LeChan 中学校	生徒に電気省エネ宣伝パンフレットを配布
8:20~8:25	- 代表者紹介	司会者	
8:25~8:30	- 開催スピーチ	省エネセンター	
8:30~8:45	- グリーン環境の紹介	司会者	
8:45~9:35 15'	- 黄金鐘鳴らしゲーム ドラマ	LeChan 中学校の生徒 LeChan 中学校の生徒	
9:50~10:05	環境保全テーマのファッションショー	LeChan 中学校の生徒	
10:05~10:15	表彰	省エネセンター& LeChan 中学校	
10:30	閉幕	司会者	

V. 資金：省エネセンターの資金

Figure 1.3-7 Energy saving contest Program overview

(3) Issues

In addition to describing the administrative issues in advancing the efforts of the previous section, the issues regarding “waste”, “energy”, and “traffic”, which are closely related to the emission of greenhouse gases, are presented below.

① Administrative Issues

(A) It takes time before the law/plan is actually implemented.

In Vietnam, ordinances incorporating new ideas of developed countries, such as the Environmental Protection Act (formulated in 1993, the first revision in 2003, the second revision in 2014 (effective on January 1st in 2015)), the Energy Saving Act (Established in 2010), and the law on waste disposal and recycling Laws which are being developed.

In addition, as mentioned above, the Green Growth Strategy (GGS) was formulated in 2012 and the GGS Action Plan was formulated in 2014, and measures necessary to promote greenhouse gas reduction and clean energy use were laid out.

Even if laws and policies are set at the national level as described above, it takes time for proper implementation at the local level in many cases. In Hai Phong City, the planning and execution of energy conservation plans by designated businesses, based on the Energy Conservation Law enacted in 2010, has just started.

(B) Hai Phong City’s Inefficient Law Operation and Plan Implementation

The system of legal management and plan implementation lack certainty for the reason that the authority of each department has not been organized yet. In addition, there may be a lack of responsibility. Particularly in the waste field, the department in charge is different depending on whether it is urban or rural and depending on the type of waste. Thus, it is difficult to accurately know the true situation regarding waste in the city and also efforts for properly managing (separation of garbage, 3R, etc.) are inefficient.

(C) There are a shortage of funds, personnel, and data for environmental conservation (such as greenhouse gas reduction).

Development that directly relates to economic development is prioritized, budget for environmental conservation such as greenhouse gas reduction is not enough, and the effectiveness of environmental conservation measures is low (the administration is satisfied with only making plans).

Also, since there is a low budget, there is a lack of human resources and monitoring data on greenhouse gas reduction, and thus it is difficult for each city itself to estimate how much each city is emitting greenhouse gases as a whole, as well as to implement

effective countermeasures on the basis of the estimate.

As described above, support from the Japanese Government and Kitakyushu City for making a system of legal operation and a plan of implementation overseen by a human resources department, as well as providing financial support, are still necessary.

② Issues in the waste field

(A) Inappropriate sorting and recycling of household waste

Waste is landfilled as is, without being sorted and recycled, so there is a concern that the landfill site will become tight. On the other hand, due to the opposition of residents, it is difficult to establish new landfill disposal sites.

There is a composting facility at the Trang Cat Landfill site, but because waste is not properly sorted, it can't produce high-quality compost, which is only used to for covering a landfill.

Figure 1-3.8 Trang Cat repository Current status of composting facility

(B) Improper treatment of waste produced in daily life

Incineration treatment for waste produced in daily life is still rare, and thus it is necessary to promote the reduction of waste as well as composting using incineration facilities or biogas facilities.

While a small incinerator (20t/day) developed by the Hanoi University of Technology is operating in rural areas, but because garbage collection sites are not maintained, incinerators are not properly controlled, and there is scattered garbage around the incinerators, which might be the cause of environmental pollution in the surrounding fields.

In many cases, hazardous waste is landfilled together with general waste, which can cause health problems and pollution of the environment.

Figure 1.3-9 Incineration facility in Kien Thuy Province

(C) Traceability of industrial/medical/harbor waste

Regarding industrial/medical/harbor waste, it is a rule that such kinds of waste should be processed by a city designated company in a predetermined fashion. In practice, however, it is not sufficiently known to what extent waste is appropriately treated, so it is necessary to understand the actual condition and ensure traceability.

For companies that illegally dump, it is necessary to take strict measures based on government ordinances on Penalties for Violating Laws and Regulations in the Field of Environmental Protection (Decree No. 1/2006 / ND-CP)".

Figure 1.3-10 Illegal dumping

(D) Actual situation of recycling business

Although the household appliance recycling law is being improved, environmental pollution is now caused by inappropriate recycling of various waste such as inappropriately recycled home appliances in the handicraft villages.

(E) Waste generation volume

The amount of waste generated in 2025 is expected to be more than four times the current amount. It is urgent to develop waste disposal systems and build disposal facilities.

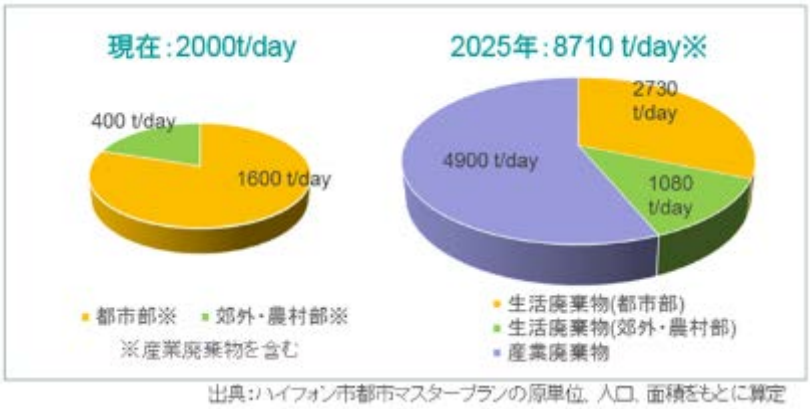


Figure 1.3-11 Amount of current and future waste generation

(F) Waste incineration capacity

The incineration capacity is overwhelmingly insufficient (now: 33.9 t / day).

Figure1.3-12 Ability of incineration facilities in Hai Phong city and others

Manager of the facility	Place	Capacity	Objects to be incinerated
URENCO	Trang Cat waste disposal field	1.6 t/day(200kg/h)※	Medical, hazardous waste
URENCO	Trang Cat waste disposal field	0.5t/day(60kg/h)※	
Kien Thuy province	Inside Haiphong City	20t/day	Municipal waste
Company A	Inside company A	10t/day	Hazardous waste
Company B	Inside Company B	1.8t/day	Medical, hazardous waste

(G) Waste circumstances of Hai Phong City

In Hai Phong city (urban area), 1,600t of waste a day is created by homes and business establishments, and only 200 tons of that is brought to the compost facility in the Trang Cat disposal site. Most of the rest is landfilled at a final disposal site.

③ Issues in the energy field

(A) High dependence on fossil fuels

As the population increases, factories and service facilities are being remarkably developed, which creates a concern that in the future that large amounts of energy will be consumed, and an issue that GHG emissions will increase. Hai Phong City has four coal-fired power plants (Pha Lai, Wong Bi, Hai Phong 1, Hai Phong2) as power supply

sources, which are highly dependent on fossil fuels. A distribution of energy sources, such as the use of renewable energy, is necessary from the viewpoint of global warming prevention and energy security.

(B) Electric power problems

There is a power outage about twice a month, and a single power outage lasts for several hours to half a day. Therefore, many factories are equipped with private power generation facilities. Voltage in Hai Phong City is unstable, and electric power is in low quality, so it may hamper the operational stability and sophistication of industry. The power transmission loss is large, and it is necessary to take action to ensure efficiency of transmission and distribution systems.

(C) Promotion of energy saving measures

Full-scale operation promotion of energy saving measures, such as the formulation and execution of energy conservation plans of specified business operators based on the Energy Conservation Act, have just started, and are necessary to promote the efficient use of energy through the means including the introduction of energy saving equipment to companies.

	
Haiphong 1 coal thermal power plant	Hospital's coal-fired boiler

Figure1.3-13 Ability of incineration facilities in Hai Phong city and others

- In factories and hospitals with steam needs, coal-fired boilers are mainly used and cause environmental pollution.
- The efficient utilization of energy, such as the utilization of waste heat, is rarely carried out.
- In office buildings and commercial facilities, energy conservation measures are not taken regarding lighting and air conditioning equipment which consume high power.
- Many companies lack funds to implement energy conservation systems.
- Although energy conservation labeling system have been established, the implementation system of energy saving performance tests of products has not yet been fully implemented.

・Comprehensive energy management is not available at factories, offices, commercial facilities, etc.

(D) Use of renewable energy

・The promotion of the use of renewable energy such as sunlight, wind power, and biomass is not in progress.

(E) Electric power consumption

・ On the other hand, power consumption has increased greatly, and it is expected that the trend will be stronger in the future.

・Figure 1.3-14 shows a comparison of the energy consumption per GDP (in 2013) for Hai Phong City and Japan as a whole. Since Hai Phong City has lower energy efficiency than Japan, it is important to promote efficient energy use.

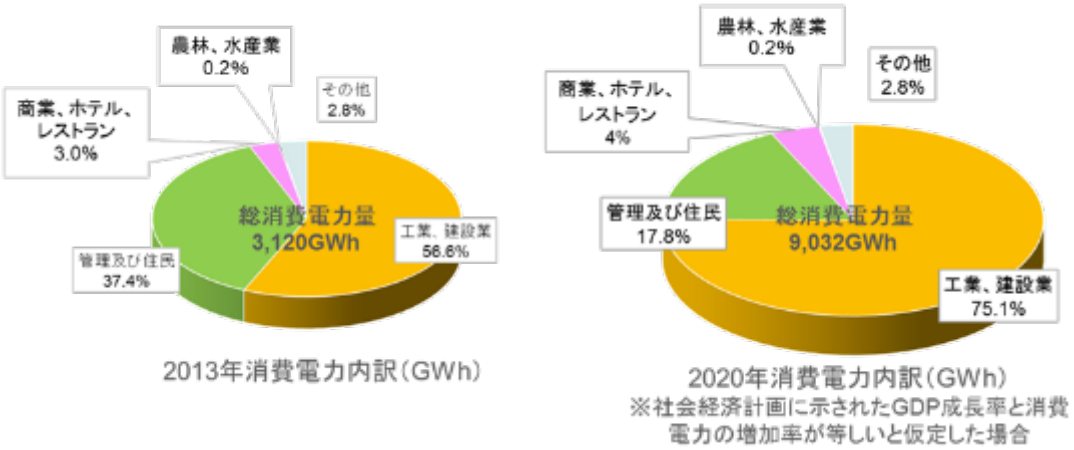


Figure 1.3-14 Breakdown of current and future power consumption

Figure1.3-15 Energy consumption per GDP (2013)

	kWh	GDP(USD)	kWh/GDP
ハイフォン市	31.2×10^8	2.73×10^{9}※1	1.14
日本	$9{,}236 \times 10^{8}$※2	$4{,}902 \times 10^{9}$	0.19

日本のエネルギー効率は6倍

※1 2010年 1USD＝21,000VNDで換算、※2 2012年度

④ Issues in transportation

(A) A development plan for highways, ports, airports, and railways

Figure1.3-16 Development plan of highway, port, airport and railway (external traffic)

(B) Elimination of traffic congestion

Although Hai Phong City has functioned as just a gateway in northern Vietnam, the traffic volume of cars will increase, after construction of the Lach Huyen Port as a deep-water port, due to the economic ripple effect of the port. That will cause a concern for further traffic congestion and environmental deterioration.

The national highway, No. 5, which is the main road to Hanoi, passes through the urban district, but the city is crowded, and therefore rapid construction of the Hanoi - Haiphong expressway is urgently needed. The railroad connecting Hanoi with Hai Phong and the city's roads intersect in 12 places, which is a cause of traffic congestion.

	
Trafficjam on arterial road	Congestion of National Highway No. 5 [2]

Figure 1.3-172 Traffic situation around Hai Phong

(C) Modal shift to mass transit

Regarding the logistics from the Lach Huyen Port, in order to change from truck transport to inland water transport utilizing railway and feeder ships, the transport infrastructure for mass transit, such as the extension of the railroad to the Lach Huyen Port, must be developed as quickly as possible.

The Cat Bi International Airport, is promoting internationalization through ways such as improving new runways is necessary to attract not only passengers but also international cargo flights, aiming for land, sea and air transportation bases.

[2] http://anhp.vn/an-toan-giao-thong/

(D) Maintenance and development of public buses

Today, citizen's public bus utilization rate remains at 1% (Hai Phong city's goal: 30%), and therefore increasing the convenience and comfort of public buses will increase the number of users of public buses. It is necessary to reduce the amount of cars and motorbikes to suppress the occurrence of traffic congestion in urban areas. In order to improve the convenience of the public bus, it is important to secure punctuality and to arrange a bus stop in a convenient place. For now, there are many ports and factories on the right bank (on the south side) of the Cam River, and each company has its own shuttle bus. It is inefficient commuter traffic.

	
Bus used in Haiphong city	Electric motorcycle

Figure .3-18 Transportation network in Hai Phong city

(E) Promotion of gas exhaust regulation and low carbon type vehicles

It is necessary to promote the regulation of exhaust gas of motorbike and automobiles and the diffusion of low-carbon vehicles (hybrids, electric vehicles, electric motorbikes, etc.) in order to eliminate air pollution, as well as upgrade current exhaust gas standards Euro II to Euro IV.

(F) Town planning and transport policy

The viewpoint of enlightenment activities to promote the transfer from automobiles and motorbikes to public buses, and mobility management such as the distribution of timetables and route maps of public buses, installation of lanes dedicated to buses, the introduction of IC cards, etc., are lacking in traffic policy.

It is necessary to consider traffic policies, in integration with town planning, to increase the use of public buses in the future with the introduction of mass transit agencies, such as monorail and subway systems, and make commercial facilities and apartments built mainly around stations.

1.4 Cooperative relationship between Hai Phong city and Kitakyushu city

（1） Overview

Kitakyushu city signed a friendship and cooperation agreement with Hai Phong city in 2009, and the two cities began exchanges. After that, Kitakyushu city continued to exchange and cooperate with Hai Phong city in various fields such as the water supply field and civic cultural exchanges. The Sister city Agreement between Kitakyushu city and Hai Phong city was established in April 2014, when the friendship and cooperation agreement reached a deadline of five years.

In addition, in 2014 Kitakyushu city supported Hai Phong city to establish the ”Hai Phong city Green Growth Promotion Plan,” which revealed a concrete action plan to promote the green growth of Hai Phong city, by taking advantage of the experience of overcoming environmental pollution in Kitakyushu city utilizing environmental technology and know-how. In the following year, 2015, Kitakyushu city also focused on discovering and realizing a pilot project regarding the Hai Phong city Green Growth Promotion Plan.

Figure1.4-1　Mutual visit contents of Kitakyushu city - Hai Phong city

Term	Mutual visit contents
April, 2009	Mayor Kitahashi visited Hai Phong City and signed a "friendship cooperation agreement" (Contents of Friendship and Cooperation Agreement) Training acceptance of Hai Phong city staff Distribution of Vietnamese business information centering on Haiphong City Dispatch of economic mission team International cooperation such as environment · water supply and sewerage
September,2009	Hai Phong Municipal People's Committee Du Chun · Toi Vice Chairman visited Kitakyushu City
May, 2010	Mayor Kitahashi · President of Sasaki city council representative visited Hai Phong city (Hai Phong city liberation 55th anniversary commemorative ceremony participation)
July, 2010	Hashimoto deputy mayor led an economic mission team to visit Hai Phong city (holding an economic exchange seminar)
August, 2010	Hai Phong Municipal People's Council Chairman Nguyen Bang Tsuang visits Kitakyushu City (holding an economic exchange seminar)
Nobemver,2010	Deputy Mayor Shiga led Kitakyushu Overseas Water Business Promotion Council to visit Hai Phong City (Hai Phong city water supply exhibition participation) Citizen Orchestra held concert at Hai Phong Opera House
October,2011	Hai Phong Municipal People's Committee Vice Chairman Dan Zuc Hiep visited Kitakyushu City (100th Anniversary Event of the Kitakyushu Water Supply)
May,2013	Deputy Mayor Umemoto visited Hai Phong City, City Federation Hita Hayasaki Ai Kai "Hibiki" performed in Hai Phong City (Vietnam Tourism Year · Hong Hong Festival Opening Ceremony)
April, 2014	Chairman of the Hai Phong People's Committee Zhon Ain Dien (Mayor) visited Kitakyushu City and signed a "sister city agreement"
September,2014	Secretary General Secretary Gwen van Tyne of Haiphong visits Kitakyushu
April, 2015	Deputy Mayor of Haiphong City Du Chun · Toi visited Kitakyushu City
May, 2015	A visit team representing Mayor Kitabashi and Chairman of Tomachi City Council visited Hai Phong City (participate in the ceremony for the 60th anniversary of Hai Phong Liberation)

Figure1.4-2　Hai Phong Green Growth Plan

（2） Technical cooperation in the water field of Kitakyushu city

Kitakyushu city is now engaged in disseminate Upward Flow Bio Contact Filtration (U-BCF) (which Kitakyushu city owns the patent ownership of), which is effective for improving the safety of tap water quality and can work with a low operating cost, mainly in Hai Phong city. Joint enterprises, including the member companies of the Kitakyushu Municipal Water Business Promotion Council, are commissioned from JICA to conduct a preliminary investigation (July 2014 - March 2015) for the Plan to improve the Anzuon Water Purification Plant.

Based on the findings of this investigation, Kitakyushu city will equip U-BCF for the main water purification plant in the Hai Phong, Anzuon Water Purification Plant (Designed Daily Volume 100,000 m 3) by FY 2017 with JICA''s grant aid.

With the full-fledged U-BCF of the Anzuon Water Purification Plant as a showcase, Hai Phong Water Corporation and Kitakyushu city collaborate to promote the spread of U-BCF not only in Hai Phong city but also throughout Vietnam.

Figure 1.4-3 Cooperation history of Kitakyushu city water service

Chapter 2: Purpose and Implementation Structure of Project Formation Potential Study

Chapter 2　Table of Contents

2.1 Project Outline

All countries participate in the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP 21) held in Paris, France in December, 2017, and the Paris Agreement, a legal framework for equitable and effective climate change after 2020, was adopted.

In the Paris agreement, the temperature rise of the earth is kept sufficiently lower than 2 ° C compared to before the industrial revolution, furthermore, it was stated that pursuing efforts to keep it below 1.5 ° C, promotion of efforts towards decarbonization is required. At COP 21 decided to recognize the actions of non-state actors including cities and decided to welcome the efforts of all non-governmental organizations (such as the city and other local governments) and was decided to invite the scale up.

Also in the "Declaration of Marrakesh Action for Climate and Sustainable Development" adopted at COP 22nd held in Morocco / Marrakech in November 2015, the climate is warming at an unprecedented rate, so urgent It was emphasized that there is an obligation to respond and it was recognized that global actions including not only the government but local governments, as well as economic transformation, are active opportunities for further prosperity and sustainable development.

Cities are the site of activities to support the development of socioeconomic, many people live. About 50% of the world's population live in cities with less than 2% of the total area of the world, the proportion is expected to increase to 70% by 2050. As of 2006, it is estimated that more than 70% of the world's CO2 emissions are emitted from cities, the role of cities to mitigate climate change is significant, steady implementation of climate change countermeasures in peripheral urban areas , Reduction of greenhouse gas emissions is important to achieve the goal of the Paris Convention

Based on the above points, in this survey project, based on the collaboration with Kitakyushu City, which has the know-how of forming a low-carbon society, with Hai Phong, a partnership to realize a low-carbon society, activities for acquiring JCM credits for energy fields with a large margin for reducing emissions of energy-derived CO 2 will be carried out. Through conducting the survey activities, we also aim to develop capacity for a low-carbon society in Hai Phong

2.2 Target Field and Applied Technology

(1) Target Field

Based on the results of the survey in FY2016, the following two activities were taken as main activities.

① Waste-to-Energy of Mixed Combustion of Municipal Solid Waste and Industrial Wastes emitted from Industrial Park

Taking measures to enhance profitability by combining the mixed combustion of industrial wastes, steam selling, etc., mainly the waste disposal at a disposal site adjacent to an industrial park.

Figure 2.2-1 Waste Disposal Site

② Discovery of Businesses for Large CO2 Emission Reduction such as Waste Heat Recovery Power Generation at a Cement Plant

Considering introduction of waste heat recovery power generation system in a cement plant which will be build in Hai Phong city.

Figure 2.2-2 Image of Cement Plant

③ Low Carbonization Project in a Remote Island combined with Unique Funding Mechanisms

Continuing the discussion for introducing an environmental fee system to strive for building a model of low carbonization of a remote island using a mechanism of the fee.

Figure 2.2-3 Cat Ba Island

(2) Applied Technology

The technology to be applied in this survey project was selected from the results of the survey in FY2016. Techniques selected as introduction candidates are as shown in the table below.

Figure2.2-4 Target facilities and Technology applied

Category	Target facility	Technology applied
Activity 1	Waste-to-Energy of Mixed Combustion of Municipal Solid Waste and Industrial Wastes emitted from Industrial Park	Waste to Energy Power Generation
Activity 2	Discovery of Businesses for Large CO2 Emission Reduction such as Waste Heat Recovery Power Generation at a Cement Plant	Waste Heat Recovery Unit
Activity 3	Low Carbonization Project in a Remote Island combined with Unique Funding Mechanisms	EV Bus

2.3 Implementation Organization

The survey implementation organization of this project is shown below.

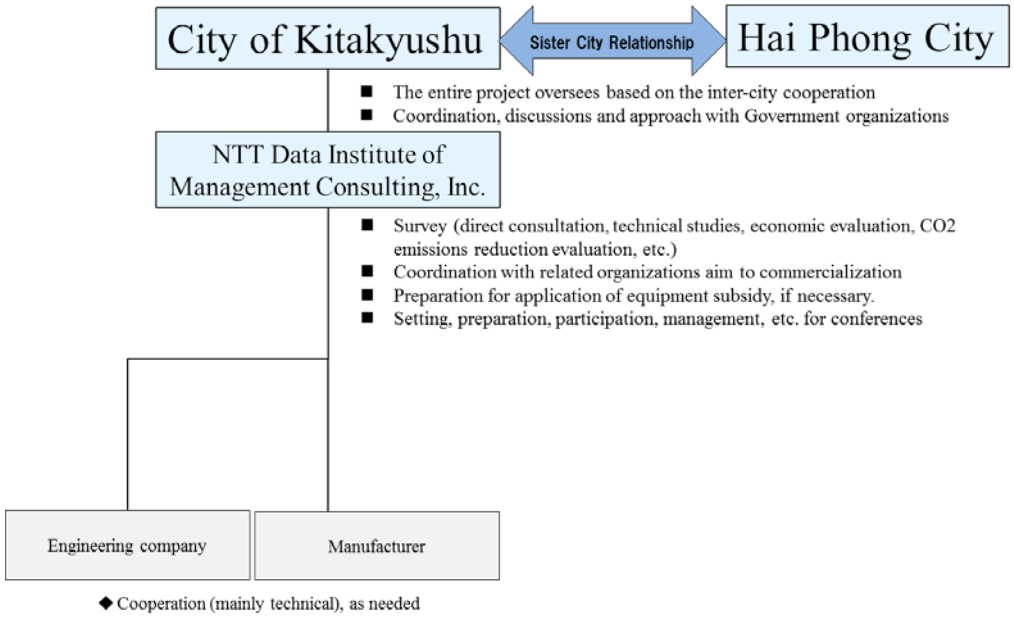


Figure2.3-1 Implementation Organization

In this survey project, we will conduct a feasibility study of JCM equipment financing projects under the inter-city collaboration between Hai Phong City in Cambodia, which has a partnership to realize a low-carbon society, and Kitakyushu City, which holds know-how to form a low-carbon society.

Kitakyushu City and Hai Phong City have conducted overall supervision based on intercity collaboration, and encouragement for coordination, collaboration and introduction with administrative organizations such as related departments in Hai Phong city and Administrative agencies such as relevant ministries and agencies in Cambodia.

NTT Data Institute of Management Consulting, Inc. will conduct direct consultation with the survey subjects for each activity, technical examination, economic consideration examination, assessment of CO 2 emission reduction, etc., and proposals and hearings etc. to the survey subjects. If necessary, the company will also conduct consultation of detailed examination of technology with some of various manufacturers, and support for JCM equipment financing project application, etc.

2.4 Survey Plan and Schedule

(1) Survey Plan

The survey in this project was conducted in the following 4 steps

Figure2.4-1 Survey Step

1) We searched candidates companies, enterprises or organization, by introduction of Water Supply Authority utilizing sister city relationship between City of Kitakyushu and Hai Phong City, introduction of candidates from the companies who related in last year, and direct appointments by independent survey. etc. We focused on candidates who may have high possibility of CO2 emission reduction.

2) The current diagnosis was conducted to extract the tasks and needs faced by each target facility through direct hearing by utilizing the visits etc. during the field survey.

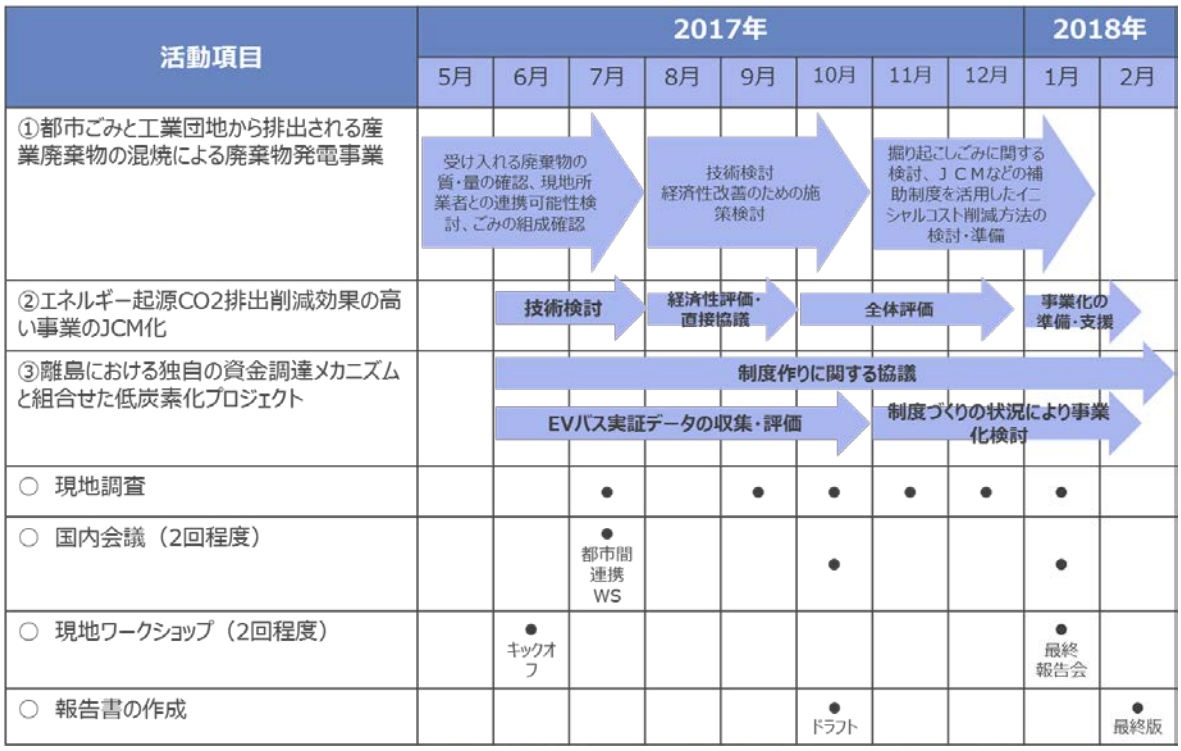
3) In considering countermeasures, based on the hearing results of 2), energy conservation measures, introduction of energy conservation facilities, economic consideration, and CO 2 emission reduction effect, etc., which are considered to be feasible, were examined. Partly, a practical study was conducted through the cooperation from experts on photovoltaic panel construction,

4) In the proposal and discussion, the results of the examination with the staff in charge of each facility were shared, and further hearing of opinions and issues, and how to proceed in the future were examined.

(2) Schedule

The implementation schedule of this survey project is as shown in Figure 2.4-2.

Figure2.4-2 Survey Schedule



Chapter 3 Results of Project Formation Potential Study

Chapter 3 Table of Contents

3.1 Summary of Field Survey

In this section, we will organize the visit schedule of the first to sixrth field surveys, and summarize the main agenda and activity contents. For detailed discussion etc. at each visiting destination, each activities are summarized as Section 3.2 (Activity 1: Waste-to-Energy of Mixed Combustion of Municipal Solid Waste and Industrial Wastes emitted from Industrial Park), Section 3.3 (Activity 2: Discovery of Businesses for Large CO2 Emission Reduction such as Waste Heat Recovery Power Generation at a Cement Plant) and Section 3.4 (Activity 3: Low Carbonization Project in a Remote Island combined with Unique Funding Mechanisms)..

3. 1. 1 The First Field Survey

Schedule; 31-Jul to 5-Aug, 2017

Appointment

- ✓ Hai Phong Related Ministry
- ✓ Factory and Company
- ✓ Cement Plant
- ✓ Shipping Company etc

Summary

- ✓ Kick off Meeting with Hai Phong
- ✓ Hearing for Waste disposal
- ✓ Discussion with Cement Plant for JCM

3. 1. 2 The Second Field Survey

Schedule; 4-Sep to 7-Sep, 2017

Appointment

- ✓ Hai Phong Related Ministry
- ✓ Factory and Company
- ✓ Cement Plant
- ✓ Shipping Company etc

Summary

- ✓ Hearing for Factory and company
- ✓ Study for Waste disposal
- ✓ Discussion with Cement Plant for JCM
- ✓ Study for Biomass

3. 1. 3 The Third Field Survey

Schedule; 1-Oct to 7-Oct, 2017

Appointment

- ✓ Hai Phong Related Ministry
- ✓ Factory and Company
- ✓ Developer
- ✓ Manufacture etc

Summary

- ✓ Hearing for Factory and company
- ✓ Discussion with Cement Plant for JCM
- ✓ Study with developer
- ✓ Study for Biomass

3. 1. 4 The Fourth Field Survey

Schedule; 12-Nov to 17-Nov, 2017

Appointment

- ✓ Hai Phong Related Ministry
- ✓ Factory and Company
- ✓ Developer
- ✓ Manufacture etc

Summary

- ✓ Hearing for Factory and company
- ✓ Discussion with Cement Plant for JCM
- ✓ Study with developer

3. 1. 5 The Fourth Field Survey

Schedule; 16-Dec to 20-Dec, 2017

Appointment

- ✓ MRI
- ✓ Factory and Company
- ✓ Shipping Company
- ✓ Manufacture etc

Summary

- ✓ Discussion for waste disposal
- ✓ Discussion for eco town

- ✓ Follow-up for Cement Plant for JCM
- ✓ Follow-up for EV bus project

3. 1. 6 The Sixth Field Survey

Schedule; 5-Feb to 8-Feb, 2018

Appointment

- ✓ MRI
- ✓ Factory and Company
- ✓ Shipping Company
- ✓ Manufacture etc

Summary

- ✓ Discussion for waste to energy
- ✓ Discussion for eco town
- ✓ Follow-up for Cement Plant for JCM
- ✓ Follow-up for EV bus project

3.2 Activity 2: Waste-to-Energy of Mixed Combustion of Municipal Solid Waste and Industrial Wastes emitted from Industrial Park

3.2.1 Overview of Survey

・Taking measures to enhance profitability by combining the mixed combustion of industrial wastes, steam selling, etc., mainly the waste disposal at a disposal site adjacent to an industrial park.

・In the vicinity of the industrial estate, there is a landfill disposal site of living garbage, concerned about the health damage caused by the management company of the industrial estate, the management company of the industrial estate, the tenant company and the Hai Phong city related department, the waste is not properly treated and it is piled up , An example in which a worker retired for health reasons, and a voice worried about the drop in value as an industrial park and eventually the city.

・ Information on the amount of industrial waste generated and its processing cost, although limited, through interviews and questionnaire surveys. On the other hand, enterprises entering housing estates are on an increasing trend, and confirmed that the amount of industrial waste generated will increase, including expansion plans for future housing complexes.

Figure 3.2.1-1 Dinh Vu disposal site

Figure 3.2.1-1 Activity items and contents of activities

	Activity item	Content of activity
①	Confirmation of quantity and quality of industrial waste received from factory in neighboring industrial complex	Confirm the amount of recoverable waste materials by volume of interviews with companies in Dinh Vu Industrial Park and industrial parks in Hai Phong City (Nomura Hai Phong Industrial Park etc).
②	Study possibility of cooperation with local processing company with license concerning industrial waste disposal	Through direct consultation, consider possibility of cooperation with a local processing company having a license necessary for accepting industrial waste.
③	Confirmation of composition of municipal waste and industrial waste to be treated	The introduction of a stalker furnace is a basic concept and we confirm the properties of waste to be treated this time.
④	Basic examination of waste power generation facility capable of processing waste confirmed in 3	Based on the amount and properties of general and industrial waste confirmed, we will conduct basic examination of waste power generation facilities.
⑤	Possibility of selling steam to neighboring industrial estates, and checking sales volume / price	We study the possibility of steam supply utilizing heat generated from the waste power generation facility to be introduced. Through the interview survey, we check the existence of companies that can become customers in the industrial estate, and in some cases check the selling price.
⑥	Possibility of supplying electricity to neighboring industrial parks, confirmation of supply volume and price	In addition to selling the electricity generated at the plant to EVN, it is possible to sell directly to companies moving to an industrial estate, and confirm the legal system. If it is possible, confirm the supply amount and price as well.
⑦	Investigation on dug out garbage	Appropriate treatment method (such as simple incineration, RDF conversion, etc.) of landfill landfilled in Dinh Vu repository. Consider measures to recover the availability of land after disposal of buried waste and expenses related to digging up garbage disposal.
⑧	Reduction of initial cost by utilizing auxiliary system such as JCM	In order to enhance the business potential, we consider possibility of reducing initial cost such as JCM equipment subsidies.
⑨	Confirm ordering / contract method	Confirm whether contract for introduction of equipment is required for bidding or if voluntary contract is possible

3.2.2 Assumed Technology to be introduced

・Assumed Technology to be introduced is Stoker-type Incineration Plant

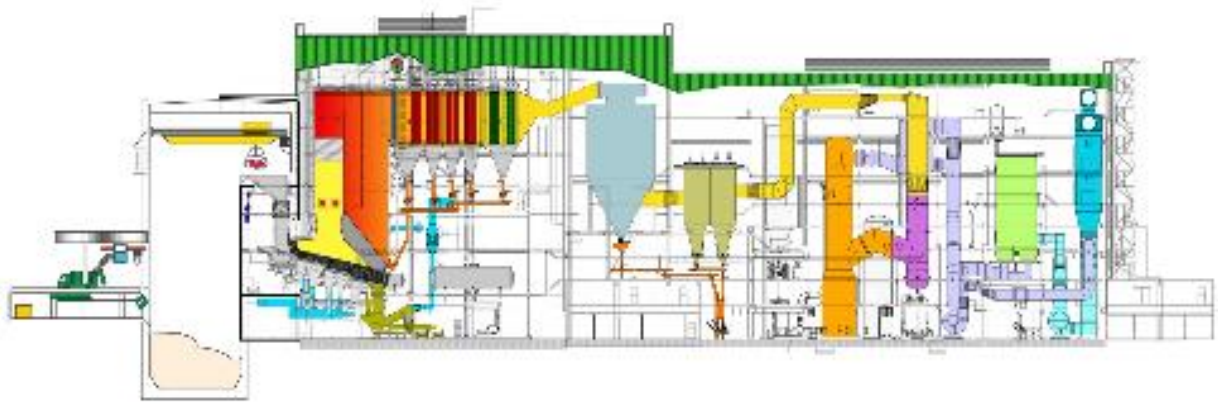


Figure 3.2.2-1 Stoker-type Incineration Plant

The followings are summary of Stoker-type Incineration Plant

- ✓ Enough Experience: above 500 including overseas subsidy
- ✓ Flexibility: Treat various type of wastes（Stable incineration LHV 1,200 ～5,000 kcal/kg）
- ✓ Scalability: Maximum 1,200 t/d per 1 line
- ✓ Power Generation efficiency: Maximum30%
- ✓ Operational Time: 8,000 hours / year

3.2.3 Study for Industrial Waste

As mentioned above, information on the amount of industrial waste generated and its processing cost was collected, although limited, through interviews and questionnaire surveys. Based on the results of the survey, the amounts and properties of industrial waste to be treated in the stoker furnace are summarized in the table below.

Since the target waste that can be processed in the stoker furnace has certain restrictions, it is decided to limit to target waste oil and waste plastics as shown in shaded part in the table below.

Based on the results of interviews and questionnaire surveys, estimation of the amount of industrial waste to be treated and treatment cost was carried out.

Figure 3.2.3-1 Analysis of Industrial Waste

連番	ポテンシャル	排出者	品目	数量	数量単位	処理費	処理費単位
1	×	①Anpha Petrol Joint Stock Company	廃材(グローブ、バルブ、布、ホース等)	–	–	12,000,000	VND/年
2	○	②出光ルブベトナム	廃ドラム	13	t/月	1,000,000	VND/月
3	○		廃油	6	t/月	1,000,000	VND/月
4	○		廃プラスチック缶	2	t/月	2,000,000	VND/月
5	○	③信越 マグネティック マテリアルズベトナム	廃油	0.1	t/月	5,000	VND/kg
6	○	ベトナム日通エンジニアリング	domestic	76.66	m3/年	390,000	VND/m3
7	○		Hazardous(蛍光管など)	1532	kg/年	6,000	VND/kg
8	○	④IML TECHNOLOGY VIETNAM	一般廃棄物(食堂ごみ、事務室からの紙など)	5	m3/月	2,000,000	VND/月
9	○		プラスチック	3.08	t/月	10,000,000	VND/kg?→VND/t
10	○		ダンボール	0.91	t/月	10,000,000	VND/kg?→VND/t
11	○		有害廃棄物(廃油･インク)	0.617	t/月	10,000,000	VND/kg?
12	×	⑤JXエネルギーベトナム	廃油	–		逆有償	
13	×		ウエス	少ない			
14	×		ダンボール	–		逆有償	
15	×		プラスチック	–		逆有償	
16	○	⑥ブリジストン	タイヤ製造材料	1.2	t/day	5,000,000	JPY/年
17	○		ドラム缶	0.5	t/day		
18	○		廃油				
19	×	日通ロジスティクスベトナム	なし				
20	○	⑦タマダ	鉄スクラップ			1,000,000	JPY/年
21	○		廃ドラム				
22	○		一般ごみ				
23	○		Hazardous				

連番	ポテンシャル	排出者	処理費年額(VND)	年間処理費(USD)	処理業者	備考	処理量		単価(US$/t)
1	×	①Anpha Petrol Joint Stock Company	12,000,000	600	Dai Thang TNHH Phat Trien	業務都合上、関係を密にする必要がある消防署の勧めで業者選定をしている。入札はしていない。			
2	○	②出光ルブベトナム	156,000,000	7,800	Hoa Binh Industrial Aaste	価格、サービスで業者選定の上随意契約			
3	○		72,000,000	3,600	Recycling and Treatment JST		72	t/年	50
4	○		48,000,000	2,400	Toan Thang Trading & Service		24	t/年	100
5	○	③信越 マグネティック マテリアルズベトナム		0	回答不可	価格と法令順守したサービスが提供されるかどうか。入札			
6	○	ベトナム日通エンジニアリング	29,897,400	1,495					
7	○		9,192,000	460					
8	○	④IML TECHNOLOGY VIETNAM	24,000,000	1,200	DVIZ				
9	○		30,800,000	1,540	安生環境技術合資会社		47.88	t/年	42
10	○		9,100,000	455	安生環境技術合資会社				
11	○			0	安生環境技術合資会社				
12	×	⑤JXエネルギーベトナム		0					
13	×			0					
14	×			0					
15	×			0					
16	○	⑥ブリジストン		50,000	アンスンエンバイロメントJSC	今後タイヤ増産に伴いごみも増える見込み	396	t/年	89
17	○								
18	○						165	t/年	
19	×	日通ロジスティクスベトナム						平均単価	70
20	○	⑦タマダ							
21	○			10,000					
22	○								
23	○								

・Urban garbage and buried waste

Subsequently, we analyzed properties related to municipal waste and buried waste to be treated.

As for the municipal solid waste, the results of the sample analysis conducted in the past and the analysis results carried out by the company holding the industrial estate are available, we set the property of municipal solid waste by taking the average value using this data.

Figure 3.2.3-2 Analysis of Urban garbage and buried waste

Municipal Waste		Analysis Data					
						Simple Average	
Item	Unit	Sample 1 Market waste	Sample 2 An Duong	Sample 3 Hong Bang	Sample 4 Hai An		
Moisture	%	62.5	64.1	64.5	62.3		
Non-combustibles	%	15.2	8.7	9.2	9.1		
Combustibles	%	22.4	27.2	26.3	28.6		
Kitchen waste	%	12.1	11.8	9.6	11		
Plastics	%	5.5	8.1	8.5	8.2		
Fibers	%	0.7	1.8	3.5	1.9		
Paper	%	1.1	2.1	2.4	2.1		
Others	%	3	3.4	2.3	5.4		
LHV	Kcal/kg	808	1,184	1,246	1,192	1,108	
Density	ton/m3	0.32	0.27	0.31	0.27		
LHV of municipal waste will increase due to the increase of Standard of living							
			Estimated value by DEEP C			1,800	
			Estimated Value of this research			1,454	1,450

As for the buried waste, as shown in the table below, analysis data by the industrial estate management company existed. According to the same analysis value, the average calorific value of the burial waste is 2,900 kcal / kg. Ordinarily, municipal solid waste is decomposed while organic matter is being buried, moisture decreases while it is assumed that the average calorie decreases as covering is added. Therefore, the analysis data by the industrial estate management company was judged to be a value that was somewhat higher than the calorie. Therefore, we decided to set the calorie of buried waste based on the results of sample analysis excluding market waste, which contains a large amount of moisture, among the municipal waste shown in the above table, and set it to 1,100 kcal / kg.

Figure 3.2.3-3 Analysis Date by DEEP C

Buried Waste		Analysis Data (by DEEP C)										
												Simple Average
LHV	kcal/kg	988	3,880	3,309	2,309	4,184	3,271	2,848	3,512	3,064	1,685	**2,905**

3.2.4 Economic Consideration for Installation Facilities

When municipality construct a new incineration plant for its municipal wastes, Japanese government (MOEJ) prepares a supporting subsidy.

The ratio of the subsidy is larger (1/2 of the initial cost) when the energy recovery ratio is above 21.5 %. The ratio of the subsidy is 1/3 of the initial cost when the ratio is above 17.5 %.

※ Energy recovery ratio =

(used heat + generated electricity) / (energy of the target waste + input energy)

Thus, we would like to introduce 2 options 21.5% and 17.5 % as energy recovery ratio.

Also, Japanese government sets the level of high efficient electricity generation ratio is above 20 %.

Based on the above, we set the energy recovery ratio and electricity generation ratio as below.

Figure 3.2.4-1 Efficiency of Electricity Generation and Energy Recovery Ratio

Efficiency of Electricity Generation	16%	20%
	(prorated)	(High efficient generation standard)
Energy Recovery Ratio	17.5%	21.5%
	(1/3 subsidy)	(1/2 subsidy)

・Case Study

There are 2 types of scenario, base case and expanded case for Industrial waste. Thus, we would like to set the 2 case as below.

Figure3.2.4-2 Waste : Base Case and Max Case

			(t/day)	Calory	(kcal/kg)	TF(US$/t)
Industrial Waste	37	150		8,300		70
Municipal Waste	408	295		1,450		10
Buried Waste	55	55		1,100		10
Average Calory(kcal/kg)	1,918	3,467				
	Waste base case	IW max case				

In addition, there are a 2 types of scenario, energy base case and energy high efficient case for energy efficiency. Thus, we would like to set the 2 case as below.

Figure3.2.4-3 Energy recovery ratio: Base Case and High Efficiency Case

Electricity Generation Ratio	16%	20%
	(prorated)	(high efficient W2E)
Energy recovery ratio	17.5%	21.5%
	(1/3 subsidy)	(1/2 subsidy)
	Energy base case	**Energy high efficiency case**

Considering the previous scenario, we set the 4 case scenario as below.

Figure 3.2.4-4 Four Case Scenarios

case 1	Energy base ＋ Waste base
case 2	energy base ＋ IW max
case 3	Energy high ＋ IW base
case 4	Energy high ＋ IW max

Results of simulation of IRR etc. for the above four cases are shown below.

Case 1

Figure 3.2.4-5 Case 1: Energy base and Waste base

	10Year	15Year	20Year
Project IRR	**-7%**	0%	3%
Equity IRR	#NUM!	-11%	1%

Case 2

Figure 3.2.4-6 Case 2: Energy base and Waste Max

	10Year	15Year	20Year
Project IRR	11%	16%	17%
Equity IRR	27%	30%	31%

Case 3

Figure 3.2.4-7 Case 3: Energy high and Waste base

	10Year	15Year	20Year
Project IRR	-2%	4%	7%
Equity IRR	-11%	1%	7%

Case 4

Figure 3.2.4-8 Case 4: Energy high and Waste base

	10Year	15Year	20Year
Project IRR	17%	20%	21%
Equity IRR	40%	41%	42%

We calculated IRR for the above 4 scenario as attached sheet.

As for Case 2 and Case 4, IRR is large enough and Project seems to be very fruitful. Tipping fee of Industrial waste is high enough and expanded volume of the industrial waste to be treated contributes to the profitability of the project.

While, the profitability of Case 1 is very low and it seems impossible to realize the project. As for Case 3, Project IRR & Equity IRR is both 7%, which is low to make investment. However, if we increase the volume of industrial waste, decrease the initial cost of the plant or include the selling of steam, there may be a possibility to make the project more attractive.

3.2.5 Expected Scheme

・The basic scheme for implementing this project including waste generation is assumed as follows.

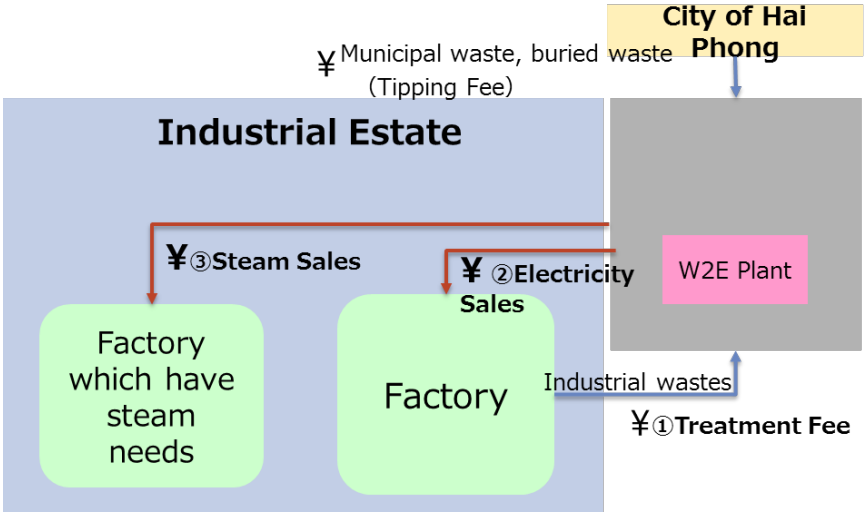


Figure 3.2.5-1 Expected Scheme of Project

・Unlike the municipal garbage disposal business, which usually uses only the chipping fee from the administration and electricity sales as the revenue, this project has considered the following in order to realize diversification of revenue sources.

① Industrial Waste Treatment

- Conducted a questionnaire survey on the state of occurrence of industrial waste and disposal cost, mainly for Japanese-affiliated enterprises residing in Dinh Vu industrial park.

② (Electricity Sales)

- With consultation with the industrial estate management company, within the housing complex, since the equipment for collecting electricity from the grid collectively and for distribution to each tenant company is in place, the electricity generated by the waste generation is sold to the management company Make sure that it is possible. There is a need for peak cutting.

③ Steam Sales

- Direct hearings were conducted for companies that are expected to have large steam demand. In the future, steam demand is expected to increase with the expansion of factories, and boiler investment plans according to demand are in place

3.2.6 Exploring possibility of collaboration with Vietnamese Eco-Town

・Ministry of Planning and Investment in Vietnam (MPI) started model projects to realize Eco-town in Vietnam and selected several areas（Support by UNIDO）

Inventory of industrial wastes are prepared, waste re-utilization and circular utilization will be tried in the above model projects.

There is a possibility that an industrial estate in Hai Phong will be selected as one of the field.

In eco-town in Vietnam, generated industrial wastes will be re-used or recycled as much as possible and wasted material will be reduced.

City of Kitakyushu which has enough experience to realize Eco-town is requested to support MPI and model project. In the model project, various wastes from an industrial estate will be used as fuel or raw material for other factory.

Waste to energy project will be considered as one of the element of Eco-town.

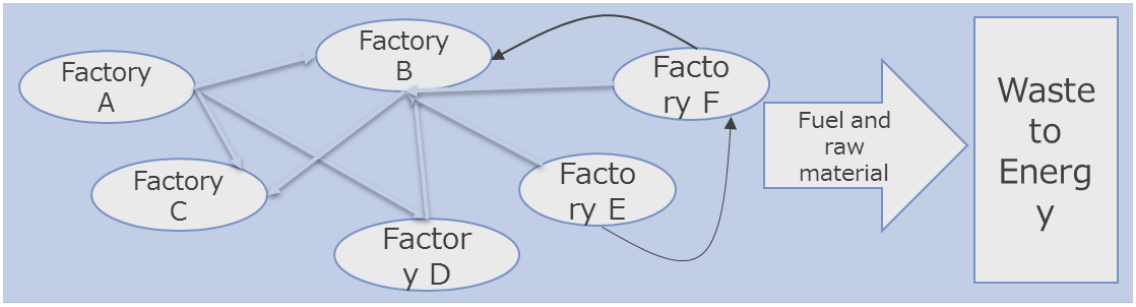


Figure 3.2.6-1 Exploring possibility of collaboration with Vietnamese Eco-Town

3.2.7 Consideration for Implementation of JCM

・The assumed Organization for JCM is as follows

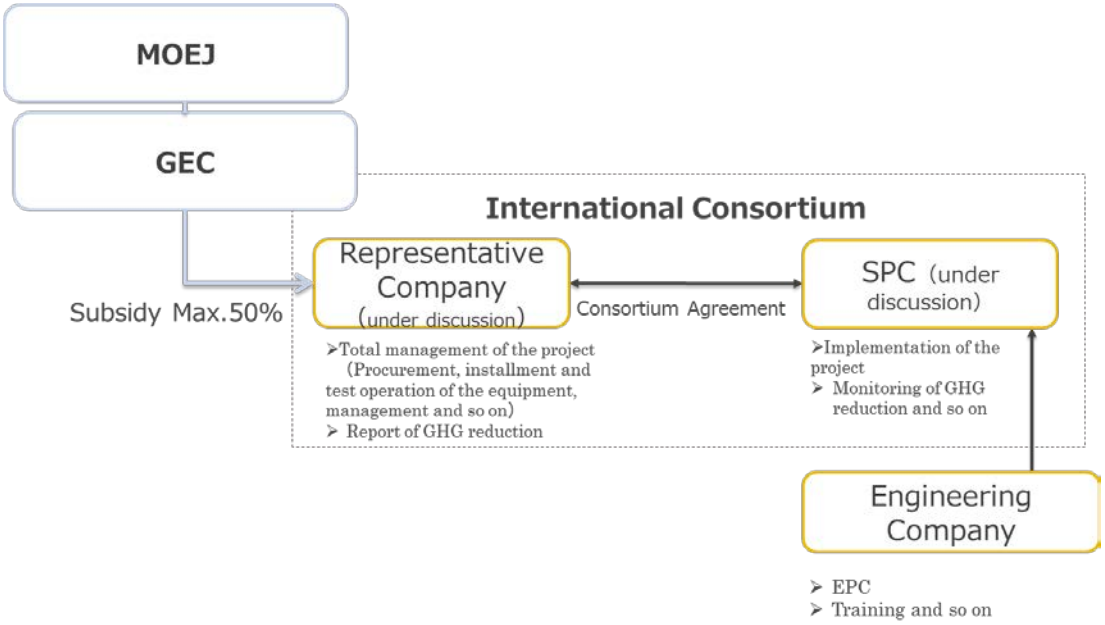


Figure 3.2.7-1 Implementation Organization for JCM

3.3 Discovery of Businesses for Large CO2 Emission Reduction such as Waste Heat Recovery Power Generation at a Cement Plant

3.3.1 Overview of Survey

Conduct a research of waste heat recovery & electricity generation on the cement factory which was introduced by people's committee in Hai Phong

Cement factory has a plan to construct a new cement production line by the end of 2019 and would like to install waste heat recovery system at the beginning

In addition, cement company owned by the government which has been collaborating with us through city to city relationship have an interest in BOT type of waste heat recovery project.

Besides, we will continue a research from last year on introducing co-generation system or high efficiency boiler into a factory in the industrial estate.

The activity items and contents of activities of activity 2 are summarized in Figure 3.3.1-1.

Figure3.3.1-1 Activities Items and Contends of Activities

	Activity item	Content of activity
①	Get detailed data on the local cement factory through direct consultation	Obtain data to calculate the amount of waste heat that can be recovered, such as the size of the cement kiln and the operation plan.
②	Engineering study in collaboration with engineering company etc.	Design the outline such as the size of the waste heat recovery power generation facility and the expected power generation amount.
③	Economic evaluation based on the result of 2	Confirm the compatibility of local companies with internal investment standards, etc. after clarifying the investment amount · investment recovery years and internal rate of return. Reexamine the technology as necessary.
④	Evaluation of CO2 emission reduction amount based on the result of examination 3	Calculate the CO2 emission reduction effect by installing facilities.
⑤	Support for decision making based on evaluation results	When applying for JCM equipment assistance, prepare for it.
⑥	Confirm ordering / contract method	Confirm whether contract for introduction of equipment is required for bidding or if voluntary contract is possible

3.3.2 Assumed Technology to be introduced

・Waste heat recovery & generation system is considered

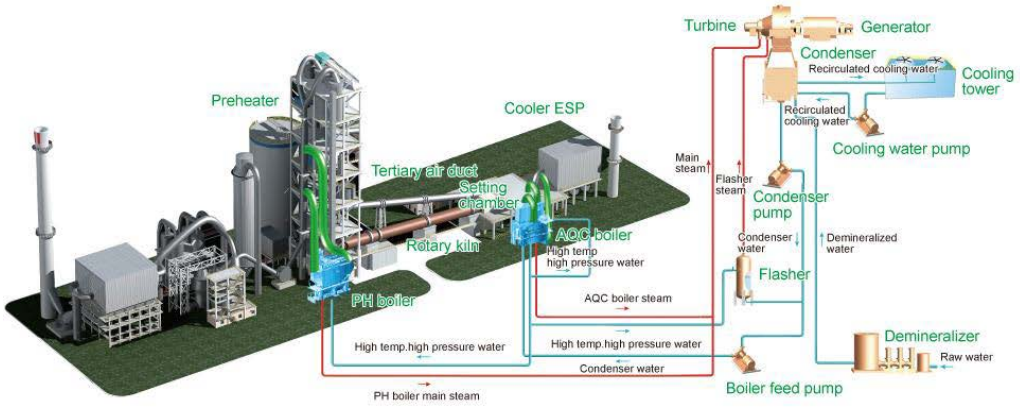


Figure3.3.2-1 Waste heat recovery generation system

・Enough Experience：Over 240 in the world

Electricity from the grid will be replaced by waste heat recovery and electricity generation. As a result, CO2 emission through the electricity from the grid will be reduced.

・2 projects as a JCM

2013: Indonesia JFE engineering

2016: Thailand NTT Data Institute of management Consulting Inc.

3.3.3 Progress status of Discussion with cement company

Continuing the discussion with 2 cement companies on introducing waste heat recovery & electricity generation system. We are planning to submit JCM subsidy program in 2018.

① Discussion with A Cement Company

・Planning to introduce 4.75 MW WHR & electricity generation plant in Hai Phong factory of national cement company.

Keeping the discussion on the conditions for BOT type of project such as investor.

We have already found out an investor.

・Expected Project Implementation Structure is as follows:

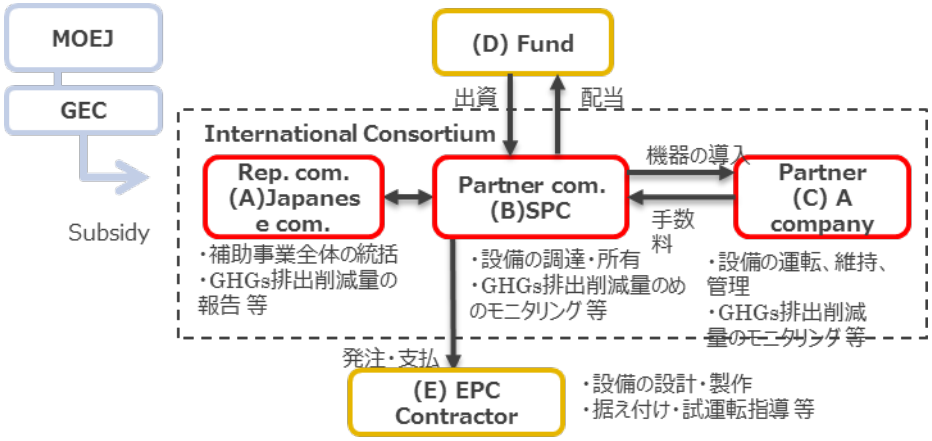


Figure 3.3.3-1 Project Implementation Structure for A Cement Company

② Discussion with B Cement Company

・Large company group which conducts business in Construction and Transportation started the construction of cement factory in Hai Phong.

They are planning to install WHR & electricity generation system starting the operation around April, 2019

Continuing the discussion on project structure and members.

・Expected Project Implementation Structure is as follows:

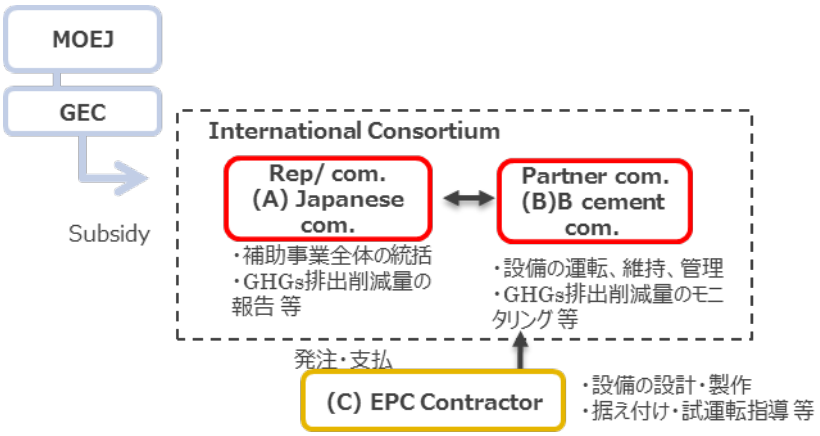


Figure 3.3.3-2 Project Implementation Structure for B Cement Company

3.4 Activity 3: Low Carbonization Project in a Remote Island combined with Unique Funding Mechanisms

3.4.1 Overview of Survey

・As a mechanism to establish environmentally conscious activities in remote islands as a project, we collected environmental conservation fees for tourists who visit remote islands, and encouraged them to establish environmentally-friendly activities on remote islands as projects using the funds I have been doing.

Although the hurdles to the institutionalization are still high in the activity of the past four years, the awareness about the environmental conservation fee is steadily increasing. In the near future, as Haiphong City, we are prohibiting diesel buses to catch the Island of Katba in order to protect nature inside the island. In line with that, we plan to introduce an EV bus etc. which does not emit exhaust gas as a means of transportation inside the island.

This fiscal year we will continue to implement activities to realize the system of environmental conservation fees until last year and to realize the introduction of a rechargeable EV bus as a use destination of funds using this mechanism and realize a funding mechanism We did activities towards.

Figure3.4.1-1 Activities Items and Contends of Activities

	Activity item	Content of activity
①	Discussions for the introduction of tourism fee system	Toward the introduction of the tourism fee system, we will hold regular consultations with relevant departments of Hai Phong city to support consensus building among stakeholders in the city.
②	Confirmation of policy trend toward commercialization of EV bus	In order to commercialize the EV bus, confirm the status of consideration of measures to promote utilization / dissemination within Katba island (prohibition of taking a diesel bus in Cat Ba Island etc).

3. 4. 2 Background of considering the system

(1) Business environment in Cat Ba Island

① Main industry of Cat Ba Island

Since a main industry of Cat Ba Island is tourism, a lot of tourists are expected to visit the island. On the other hand, a number of rare ecosystems remain in the island, and therefore, the tourism industry should be revitalized while conserving the ecosystems. As it is now, the tourists are concentrated in the summer period. Past researches show that it could be difficult to recoup investment costs for energy conservation measures in various tourist facilities, because occupancy rate of tourist facilities in the island, such as hotels and restaurants, largely fluctuates by season.

② Natural environment in Cat Ba Island

Cat Ba Island is a tourism island, which has rich natures and ecosystems and is designated as one of UNESCO Biosphere Reserves. Currently, however, development progress and insufficient environmental conservation have caused environmental problems including garbage problem and marine pollution. Therefore, for sustainable development in the future, it is urgent to implement an effective project for environmental conservation measures by using large-scale and advanced environmental technology.

③ Policy trend relating to Cat Ba Island

In 2014, Hai Phong City formulated “Cat Ba Island Sustainable Tourism Development Master Plan: until 2025 and toward 2050” and “Hai Phong Green Growth Promotion Plan” in association with Kitakyushu City. The city also plans to promote environmentally conscious development and projects in the future. Especially, a project for recycling of waste and introduction of environment-friendly transportation, which are included in “Hai Phong Green Growth Promotion Plan,” are also planned as comparatively large-scale projects for facility introduction, early realization of the projects are expected.

The construction of Tan Vu Bridge connecting Hai Phong City and Cat Hai Island will complete in 2017. The number of tourists who visit Cat Ba Island after Cat Hai Island is expected to increase. Furthermore, there is some restriction plan for car traffic into Cat Ba Island by ferry.

④ Past activities

Based on the above situation, while realizing new financial mechanisms (new financial resources of Hai Phong City) called remote island model since 2014, research institutes

have carried out surveys and consultation in an effort to create JCM project along with the financial mechanisms.

In addition, zero-emission EV bus introduction project has been promoted in conjunction with solar panels since FY2015.

(2) Current condition of Cat Ba Biosphere Reserve Sustainable Development Fund

Cat Ba Biosphere Reserve Sustainable Development Fund was established in 2009 with financial support from Vietnam National Committee for Man and Biosphere Program (MAB), Hai Phong City, Cat Ba Biosphere Reserve Management Board, and Vietnam-Japan Steel. The fund has been used for environmental education activities, researches for a sustainable development system, etc. However, since the fund relies on charitable contributions from companies and other organizations, the fund does not function effectively due to poor finances under economic depression over the past few years. It is unclear whether there is a chance to actively utilize the fund in the future. As for an environmental education project, educational activities are carried out every year for primary school students, senior high school students, and fishing people in the island, and these activities are financially supported by international organizations including World Wide Fund for Nature (WWF).

(3) Improvement in tourism commission collection system

Now, tourists to Cat Ba Island pay

Currently, tourists visiting Cat Ba Island pay Cat Ba National Park tourist fee and Cat Ba Bay tourism commission at the entrance. Annual revenue from the commission based on 2013 result is that the former is 1.5 billion VND and the latter is 3.8 billion VND. It has been used as a fund for environmental conservation activities, such as salaries for cleaning staff and educational activities in Cat Ba Island.

However, the current collected amount is not enough to provide sufficient environmental conservation measures and new environmental conservation projects. We also found that only one person is allocated at the ticket booth to collect Cat Ba Bay tourism commission. It is not able to collect all commission. Therefore, we proposed increasing the collection rate through the mechanization of ticket sales, which improves Cat Ba Bay tourism commission collection system, to Hai Phong City and Cat Hai District People's Committee.

3. 4. 3 Outline of system under consideration

(1) Overview of Cat Ba Island entree fee

The entry fee to Cat Ba Island, which is provided by this proposal, will be charged to the tourists visiting the island, and this aims at continued support for new projects to protect, preserve, and maintain the natural environment, the public health infrastructure as well as tourist attractions on Cat Ba Island as a whole. The outline of Cat Ba Island entry fee (draft) is shown as below.

Figure 3.4.3-1 Outline of Cat Ba Island entry fee (draft)

課金主体	ハイフォン市
手数料目名	カットバ島の環境保全と観光ブランド向上のための環境保全手数料
課金客体	旅客船等によりカットバ島に入域する行為
手数料収入の使途	島の持続可能な成長発展に資する新規の環境保全事業、環境配慮型事業
課金標準	旅客船等によりカットバ島に入域する回数
支払い義務者	旅客船等によりカットバ島に入域する者
徴収額	1 回の入域につき 20,000 VND (1USD、120 円)
徴収方法	ハイフォン市の委託による特別徴収
収入見込額	年間 200 億 VND（100 万 USD、1 億 2 千万円）
非課金事項	カットバ島に住所を有する者 カットバ島に職を有する者 未成年
委託費見込額	年間 3 億 VND（15,000 USD、180 万円）
徴収を行う期間	条例施行後、必要に応じて見直しを行うこととする規定あり。

However, residents and business operators on the island as well as commuters to the island will not be subject to the fee because a passenger ship is the only transportation to the island and one of the basic infrastructures for livelihoods for them. Hence, only tourists are subject to the fee.

A function of the fee is different from the current other systems as described below. Tourists

visiting Cat Ba Island will pay a part of the operating cost to preserve the whole environment as well as to control and maintain rich natural environment and tourist attractions on Cat Ba Island because they will become beneficiaries through their experiences. Therefore, it is evaluated that introduction of the fee system will not cause a double charging problem.

(2) Way and system of collecting admission fee

The operation which includes charging fee to enter the area, or the entry fee to the island, on a passage ticket of speed boat or ferryboat and paying it to the Hai Phong City will be entrusted to companies operating speed boats and ferryboats to collect the entry fee. The operation will be entrusted to the companies operating boats because this way will make the fee collection efficient, considering that tourists have only a sea route to visit Cat Ba Island.

The collected entry fee will be managed by Hai Phong City. Environmental preservation projects eligible for subsidy, including multiyear projects, will be selected from among the public, and the projects will be supported by subsidy every year. The fee collection operation and the projects eligible for subsidy will be managed by Cat Hai District.

The subsidy rate to operating cost will be determined by Hai Phong City through consultation with Cat Hai District.

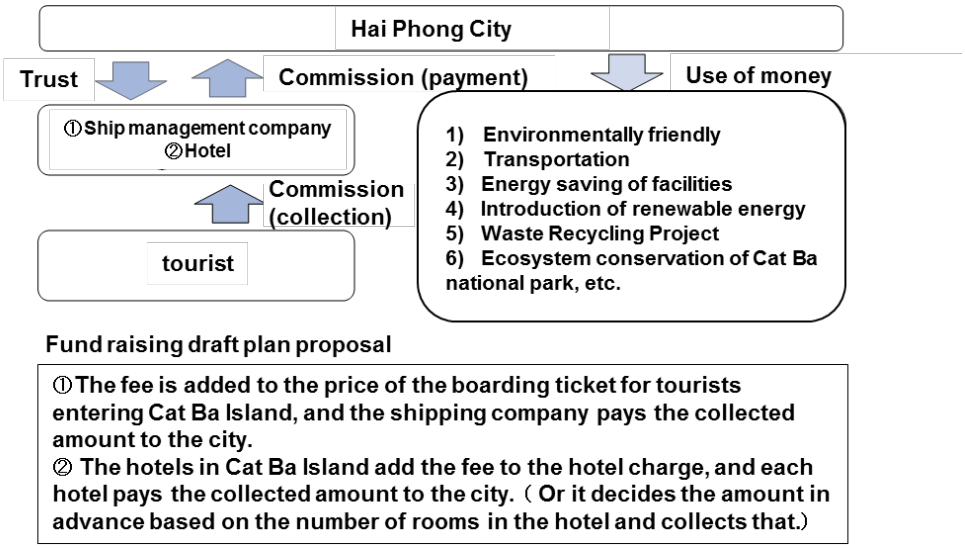


Figure 3.4.3-2 Cat Ba Island entry fee system

Roles of each entity in the above system are defined as follows:

- Hai Phong City： A main entity receiving the entry fee, Selecting projects eligible for subsidy
- Cat Hai District： Managing the fee collection operation,

Managing projects eligible for subsidy

- Companies operating boats：Consignees for the fee collection operation
- Tourists： Paying the entry fee
- Private companies and public corporations, etc.：Implementing subsidized projects for environmental preservation

-

（3） Collected amount

The entry fee of 20,000 VND (about 1 USD or 120 yen) per person is a reasonable amount based on the results of questionnaire investigations performed among tourists in September 2015, and annual revenue is estimated to be 20 billion VND (1 million USD or 120 million yen).

（4） Ensuring fairness and transparency in use of entry fee

Subsidized projects conducted by using the entry fee revenue as the financial resource should support new environmental preservation projects in Cat Ba Island. Subsidized projects should be selected from among private business operators basically through an annual public nomination process via review of their proposals by the third-party committee appointed by Hai Phong City. The subsidy rate to operating cost will be determined by Hai Phong City through consultation with Cat Hai District.

（5） Checking similar systems

① Environmental Protection Tax：Environmental Protection Tax (EPT) is a tax system prescribed in Environmental Protection Tax Law enforced on January 1st, 2012 in Vietnam. It is an indirect tax imposed against products which is likely to have a harmful influence on the environment. Only products prescribed in the law (gasoline, oil, fat, coal, and others) are subject to taxation, and tax rates should be determined by the unit of each taxable product.

Figure 3.4.3-3 Tax rate table of environmental protection tax target products
(prescribed by the 8th Environmental Protection Tax Law)

No.	内容	単位あたり	税額（ドン）
Ⅰ	**ガソリン、油、油脂**		
1	ガソリン（エタノールを含まない）	lit	1,000-4,000
2	飛行機燃料	lit	1,000-3,000
3	ディーゼルオイル	lit	500-2,000
4	石油	lit	300-2,000
5	燃料油	lit	300-2,000
6	潤滑油	lit	300-2,000
7	油脂	kg	300-2,000
Ⅱ	**石炭**		
1	亜炭	ton	10,000-30,000
2	無煙炭	ton	20,000-30,000
3	脂肪炭	ton	10,000-30,000
4	その他石炭	ton	10,000-30,000
Ⅲ	**液体水素・フロン（HCFC）**	kg	1,000-5,000
Ⅳ	**課税対象のビニール袋**	kg	30,000-50,000
Ⅴ	**使用が規制されている除草剤**	kg	500-2,000
Ⅵ	**使用が規制されている殺虫剤および農薬**	kg	1,000-3,000
Ⅶ	**使用が規制されている林産物に係る防腐剤**	kg	1,000-3,000
Ⅷ	**使用が規制されている倉庫用消毒剤**	kg	1,000-3,000

（source：JETRO）

② Environmental Hygiene Fee：Cat Hai District imposes the refuse collection charge as the environmental hygiene fee on resident and business operators such as hotels and restaurants. Total amount of the environmental hygiene fee that public facility administrators and the incorporated association for city services received was 770 million VND (actual result in 2014). 36.54% of whole expenses for the services (such as refuse collecting, managing disposal site, sewage disposal, managing road infrastructure, etc.) of the incorporated association were financed by the Environmental Hygiene Fee, but the remaining 63.46% were financed by Hai Phong City. The Environmental Hygiene Fee is currently calculated based on 7 unit prices and the details are described below.

①30,000 VND per month for ordinary households

②15,000 VND per month for small households and inns operated in private houses

③80,000 VND per month for small-scale businesses at home and merchants

④120,000 VND per month for larger businesses at home and merchants

⑤180,000 VND per month for administrative organizations with garbage amount of less than 1 cubic meter per month

⑥180,000 VND per cubic meter for administrative organizations with garbage amount of more than 1 cubic meter per month

⑦280,000 VND per cubic meter for private businesses (restaurants, hotels, and companies)

③ Sightseeing fee：This is a system of Hai Phong City that collects fees from tourists when they enter specific tourist spots, including the national park on Cat Ba Island and Cat Ba Bay, to be used for salary for cleaners on the island, activity funds of the Cat Ba Bay management society and Department of Agriculture and Rural Development. The received amount had been insufficient for them, and therefore, Hai Phong City decided to raise the entry fees in 2014. The current entry fees are as follows:

- Cat Ba Bay：30,000 VND per visit
- Forest in the national park：40,000 VND per visit
- Ocean in the national park：30,000 VND per visit

The annual revenue from the admission fees for sightseeing consisted of 3.8 billion VND from the one for Cat Ba Bay and 1.5 billion VND from the one for the nation park (actual result in 2013).

(6) Acceptability of the proposal system

Regarding tourists' acceptability of new entry fee system, it is considered that tourists agree to pay the entry fee for the environmental preservation and that they judge that the amount is acceptable as long as it is a reasonable amount, based on the results of questionnaire survey performed on Cat Ba Island in September 2015. In this survey, although around 60% of 160 Vietnamese tourists randomly selected were frequent visitors to Cat Ba Island who had visited more than once a year, the low percentage, around 3%, of the tourists answered that the introduction of the entry fee would lead to reduce their visit frequency. Rather than the negative side, such as financial burden, they expected that favorable effect on tourism would be obtained by executing the environmental preservation projects certainly and continuously with the introduction of the entry fee and by preserving the environment of Cat Ba Island. About half of them answered that the introduction of the entry fee would lead to increase their visit frequency to Cat Ba Island, and the rest of them answered that it would not make any difference to their visit frequency.

In other words, the introduction of the entree fee would promote the development of the tourism industry which is the largest industry on Cat Ba Island and would have a positive impact on both of environment and finance by enabling the large-scale and effective environmental preservation projects to be executed with the introduction; thus, it can be said that significance of introduction of the entry fee is extremely high.

(7) Implementation of eco-friendly traffic system using financing schemes

Eco-friendly traffic systems on Cat Ba Island, especially introduction of electric vehicles (EVs) with low environmental load, will be promoted, and EV conversion will be conducted for 2 routes (Route 13 and 14), which are dealing with the demand of transportation mainly for tourists, of the fixed-route buses on Cat B Island. Companies in Kitakyushu City will cooperate with the bus operating companies on the island concerning the EV bus technology. The electric power for buses will be supplied by bus butteries charged by solar power after installing solar power generator system at the sites of the bus operating companies.

Introduction of 10 EV buses is scheduled for 2017 before opening of Tan Vu Bridge, after arrangements were made by actual operation with a bus for safe operation of EV fixed-route buses which are suitable for Cat Ba Island in 2016.

To promote spreading of eco-friendly traffic systems on Cat Ba Island, it is required to prohibit using current diesel-powered transportation, including buses and passenger cars, to meet transportation demand which is expected to increase along with opening of Tan Vu Bridge, and to implement measures such as using eco-friendly traffic systems, including

electric buses; therefore, it is required to implement the following effective measures:

- Prohibiting passenger vehicles from entering via ferries from Cat Hai Island to Cat Ba Island
- Prohibiting introduction of new diesel-powered buses on the island

Figure3.4.3-4 EV bus

Income estimation model in the first year is shown below.

EVバス・太陽光発電導入：	59,000千円（総額） （10,030 mil VND） ⇒10,000千円／年×6カ年 （1,700 mil VND）	（10円／人・年）(＊1) ×6カ年 （1,700 VND）

Figure3.4.3-5 Required amount of admission fee for proposal project and the fee per tourist

(＊1) Calculation was carried out assuming JCM equipment subsidy (50%) for EV bus introduction.

収入：	グリーン手数料徴収　120,000千円 (20,000 mil VND) 120円 (20,000 VND) ／人・年×100万人(＊2) ／年＝120,000千円 (20,000 mil VND) ／年	
支出：	バイオガス化事業	28,000千円 (4,760 mil VND)
	固形燃料化事業	22,000千円 (3,740 mil VND)
	EVバス導入費用	10,000千円 (1,700 mil VND)・・・6カ年で終了
	その他の環境保全事業	58,200千円 (9,500 mil VND)・・・海洋汚染対策等
	その他（徴収委託料等）	1,800千円 (300 mil VND)

Figure3.4.3-6　Entire balance of entrance fee business

(＊2) The total number of tourists is approximately 1.4 million people, but we do not collect from less than 18 years old, and we assumed that about 1 million people are subject to collection

3.4.4 Applicable Technologies

Technologies, which are considered for application after introduction of the system, are shown as below.

（1） Electric vehicle (EV)

Electric vehicles (EVs) are classified by performance and practical stage into three generations: 1970's - the middle of 1990's (the first generation), the latter half of 1990's – the middle of 2000's (the second generation), and after the middle of 2000's (the third generation). The third generation's EVs, mass-produced model, were sold initially to domestic corporations, and have been introduced probatively as rental cars and taxi with a central focus on professional and official uses and demonstration experiment/model project. EVs have been sold to individuals since 2010, and the estimated number of EV sales is about 55,000 as of 2013. Based on the trend forecasting until 2030, car lines of EVs are estimated to be all out around 2018 - 2020, and the EVs are anticipated to spread in a larger scale from 2025. Efforts on technology development including modularization, weight reducing, electrically motorizing, IT, and automated driving are addressed on a full scale.

As for EV buses to be introduced in the project, we will apply the technology of Soft Energy Controls Inc., a company based in Kitakyushu City. EV buses of Soft Energy Controls have the following seven features:

1) Utilization of a lithium-ion battery by using the company-owned technologies
2) Realization of the world lightest EV buses by aluminum-alloy semi-monocoque bodies
3) Realization of 0.8Wh/km, the world smallest level of electricity consumption among full-size buses
4) Introduction of the latest real-time battery management system
5) Installation of ceiling soft solar panels
6) Efforts on power peak cut by using electrical storage system
7) Solar power storage

In addition, because of realization of cost-cutting, the cumulative driving distance surpassed 50 million km in China. AS initially commercializing of low carbon technologies for developing countries just ended, we are in the next stage where we spread EV buses into various developing countries in Asia. The lightweight EV buses are loaded with large-capacity batteries, which realize the lowest price along with longer-distance running ability compared to that of other companies.

Figure3.4.4-1 Examples of actual EV bus travel experience

2014年現在、SDL6120を中心に公道走行中のEVバスは500台以上、累積走行距離は5,000万kmを超える実績を誇る。

No	TYPE	仕様	ユーザー	台数	開始年月日	累積走行距離（km）
1	SDL6120EVG SDL6105EVG	1.航続距離（km） 360 2.車両重量（kg） 12,000 3.最高車速（km/h） 70 4.乗車定員（人） 92	臨沂市公共交通	30 30 40 40 5	2010年10月20日 2010年12月24日 2010年12月30日 2012年 2月20日 2013年 3月20日	17,000,000
2	SDL6120EVG SDL6105EVG	1.航続距離（km） 360 2.車両重量（kg） 12,000 3.最高車速（km/h） 70 4.乗車定員（人） 92	許昌交通	21	2011年 1月 1日	2,700,000
3	SDL6120EVG	1.航続距離（km） 360 2.車両重量（kg） 12,000 3.最高車速（km/h） 70 4.乗車定員（人） 92	青島バス	50 10	2012年10月19日	250,000
4	SDL6120EVG	1.航続距離（km） 360 2.車両重量（kg） 12,000 3.最高車速（km/h） 70 4.乗車定員（人） 92	国利新エネルギー	13	2011年11月17日	110,000
5	SDL6120EVG	1.航続距離（km） 360 2.車両重量（kg） 12,000 3.最高車速（km/h） 70 4.乗車定員（人） 92	日照市交通局	16	2012年 7月26日	650,000
6	SDL6120EVG	1.航続距離（km） 360 2.車両重量（kg） 12,000 3.最高車速（km/h） 70 4.乗車定員（人） 92	河南環宇新エネルギー	20	2012年 6月14日	未集計
7	HC-150-120 HC-150-105	1.航続距離（km） 300 2.車両重量（kg） 14,200 3.最高車速（km/h） 70 4.乗車定員（人） 51	香港華夏神龍 Hong Kong Great Dragon	1 2	2012年 9月21日 2012年 9月27日	150,000
8	SDL6120EVG	1.航続距離（km） 360 2.車両重量（kg） 12,000 3.最高車速（km/h） 70 4.乗車定員（人） 92	東莞新エネルギー	2	2011年 6月27日	60,000
合計				281台	合計	20,920,000

(Source: Soft energy control)

Figure3.4.4-2 Comparison of full size EV bus in Japan

ユーザー名		岩手県北自動車	日の丸自動車興業	北九州市	川内市	JR東日本
目的	路線バス・EV-BRT	観光地における路線バス	東京駅周辺地区の循環シャトルバス	ゼロエミッション交通システム		観光型BRTシステム
メーカー名	フィリピン日野／SECI	東京R&D	東京R&D	三菱重工	三菱重工	
トピックス	アルミフレーム、世界最軽量			再生可能エネルギーで営業運行		大きな側窓と天窓
	BRT(バス高速輸送システム)			7.5MWソーラーで発電		BRT(バス高速輸送システム)
運行開始年月	BRT:Bus Rapid Transit			2014年3月26日運行開始		BRT:Bus Rapid Transit
外形写真						
参考データ	累計走行実績：5000万km ソーラー＆蓄電システムにより、30台のEVバスが同時に充電可能な大型充電ステーションの実現	改造車両 ディーゼル→EV バス本体は価格に含まない。	改造車両(2台) ガスタービン→PHEV バス本体は価格に含まない。	7.5MWソーラーシステムとの組合せにて必要な電力は全て発電。 大容量蓄電システムにて夜間電力もサポートできるスマートシステムとして運行。		大量輸送バス、PTPS(公共車両優先システム)、バスレーン等を組み合わせることで、速達性・定時性の確保や輸送能力の増大が可能となる高次の機能を備えたバスシステム
車両価格	4,200万円	5,230万円(改造費のみ)	9,100万円(改造費のみ)	27億円(7.5MWソーラー含む)		
充電ステーション価格	500万円	上記に含む	上記に含む	急速充電システム含む		
補助金		1/2	1/2			
		中古バスの改造	改造バス			
走行距離	MAX 430km(実負荷時)	11.1km×4往復/日		9km、10km×2往復		
バス仕様	ノンステップバス	ノンステップバス	ノンステップバス	ノンステップバス	ノンステップバス	ノンステップバス
バスサイズ	12m×2.5m×3.25m	8.99m×2.3m×2.89m		11.065m×2.495m×3.475m	11m×2.5m×3.48m	8.99m×2.295m×3.005m
乗車定員	90名	54名		72名	72名	49名
バッテリー容量	200kwh	43kwh		93.23kwh	93.23kwh	65.12kwh
1充電走行距離	360km(無負荷時)	40km		80km(エアコンオフ)	40km(エアコンオン)	
最高速度	80km	70km/h		85km/h	85km/h	
車両重量	11.4ton			11.25ton	11.25ton	
モーター出力	120kw			240kw	240kw	

(Source: Soft energy control)

As for penetration of EVs in Vietnam, a very few EVs are in practical use mainly for sightseeing in resorts, although its use is limited to partial areas of the public roads. The main type of EVs is open-air and shared-use. Many of the EVs are low-cost vehicles made in China or

Vietnam, which use short-life lead batteries. The same situation is seen in Cat Ba Island, and other transport service company than QH introduced about ten EVs in the last year. QH also has an EV on a trial basis.

EV buses have not been introduced because law systems relating to public operation of EV buses have not been consolidated yet. (However, we confirmed that Hai Phong City's traffic bureau has a policy to allow experimental running of EV buses only in the tourist destination of Cat Ba Island.)

As a policy, Nationally Appropriate Mitigation Actions (NAMAs) have set a goal of introduction of 30,000 eco cars in 2020. If we assume 10% of the eco cars are EVs, we are supposed to aim for introduction of around 3,000 EVs. However, the current condition shows there are huge cost constraints.

（2） Solar power

As resources for battery charge of EV buses described in the last section, we considered introduction of CIGS thin film flexible solar system.

CIGS has the highest conversion efficiency among thin film solar panels, and the crystal type is expected to generate electricity under the circumstances where solar power does not work (time periods of little sunshine including cloudy weather, early morning, and dusk). Among several merits, the first merit of CIGS solar cells is resistance to heat, which is effective especially in Vietnam. Compared to crystalline silicon solar cells, CIGS solar cells are said to have higher "temperature coefficient." Temperature coefficient is a number that indicates degree of resistance of a material to get warmed. CIGS solar cells hardly heat in the broiling sun, and therefore, the conversion efficiency is less likely to decrease. The second merit is its structure by which the generating capacity hardly decreases even in shadow. Since crystalline silicon solar cells are placed in series, if one of solar cells is in shadow, the current degrades in the whole solar cell module. As for CIGS solar cells, only a cell in shadow hardly generates electricity, and the other cells can generate electricity. Therefore, CIGS solar cells are less affected by the installation environment.

In addition, since CIGS solar cells have a feature of high absorption of light, thickness of CIGS compound layer can be reduced up to 2-3μm. Compared with 200-300μm of thickness of silicon solar module, the thickness is notionally reduced to about 1/100. The weight is one-sixth of existing solar panels, which realizes 2.5kg/m^2 of weight reduction. Therefore, there is no need of strong mount.

Furthermore, CIGS solar cells excel in high material stability. Since the product is vacuum-coated with resin, it is suitable for use along the coast, where damages by seawater and plentiful moisture can be considered. This feature is also suitable for use in the climate of Cat Ba

Island.

On the other hand, the demerit of CIGS solar cells is that the conversion efficiency is lower compared to that of household solar power system. However, a recent study shows CIGS solar cells have achieved high conversion efficiency: 29% of the theoretical value and 17.2% of the result value. Improvement in products is expected in the future.

Also, the feature that the solar panels are less affected by cloudy weather (electricity can be generated with about half of the solar radiation of crystal panels) gives another advantage to use in Cat Ba Island, located in the northern part of Vietnam with a lot of cloudy days. In addition, zf power generation efficiency of the panels hardly decrease even by oblique incident light, resin parts of the panel can be flexibly bended so that the panel can be folded up into concertinas, and thus, the panels are suitable for the condition of the island which has limited-site area.

（3） EV bus adopting zero emission - battery exchange type in cooperation with solar power generation

Zero-emission EV buses are considered to introduce by utilizing solar power generation and battery exchange system in which battery charging is controlled by the battery management technology of Soft Energy Controls Inc. Battery exchange system enables the buses to travel a long distance irrespective of charging time.

Figure3.4.4-3　Image of zero emission - battery exchange type EV bus

3. 4. 5 Relevant policies and legal systems

（1） Preferential treatment policies for EVs and public buses by Vietnam government

In Vietnam, currently EVs have been allowed to run in limited areas, especially tourist destination. EVs mainly used for tourists may benefit from applications of reduction of import duties (notification on December 8, 2011, 133/2011/ND-CP) and simplification of inspection, etc. at vehicle registration (notification on December 31, 2014, 86/2014/TT-BGTVT).

Vietnam government also holds up a policy for promoting public buses (decision on May 5, 2015, 2015/13/QD-TTg). According to systems and policies that encourage development of public transportation by bus, the followings are supposed to introduce for public transportation bus system: preferentially granting a subsidy (article 4), tariff exemption to imported parts (article 5 par. 1), free of registered fee for owners of renewable energy-powered buses (article 5 par. 2), installation of operation management bases (article 6, article 9 par. 1), and consideration of fare discounting for preschoolers, disabled people and students (article 7 par. 1). Hereafter, laws and rules are estimated to be established based on the decision.

（2） Status of discussions with Hai Phong City’s traffic bureau

In order to promote eco-friendly public transportation, Hai Phong City’s traffic bureau shows an attitude to proactively support EV bus project of the proposal.

In the future, legal systems for EVs to run a public road are expected to be consolidated, and Hai Phong City has a policy to promote public EV buses on a full scale.

Chapter 4:　Attending Workshop

Chapter 4　Table of Contents

4.1 City-to-City Collaboration Project Workshop

(1) Overview

"City to City Collaboration Project Workshop" was held for domestic municipalities that have entrusted City-to-City Collaboration Programme for Low-Carbon Society in FY2017, and staff and related companies of Asian municipalities. Organized by the Ministry of the Environment, the workshop was held in Kawasaki City and Tokyo a total of twice in a year

(2) Date and time held

In Kawasaki city: 27- July to 28-July, 2017
In Tokyo City: 30-January, 2018

(3) Contents

Each seminar was held in the following program.

① In Kawasaki city

＜Day 1＞

- Session 1: Outline of City-to-City Collaboration Project and its Expected Outputs
- Session 2: The activities and issues for creating the low carbon society
- Session 3: Introduction of the activities for low carbon society by foreign cities
- Site Visit : Life science environment research center
- Site Visit : Ukishima-waste treatment plant, Rycling plant, Solar PV plant
- ＜Day 2＞
- Session 4: Strategy for good outcome by promoting city to city collaboration
- Session 5: Introduction of the activities for low carbon society by foreign cities
- Site Visit : corelex
- Site Visit : petrefinetechnology

② In Tokyo metropolitan area

(Morning section) Private seminar

- Greeting from the organizer
- Project case briefing session
- Overview of fund scheme

(Afternoon section) Open seminar

- Greeting from the organizer
- Introduction of financial support schemes and examples to promote low carbonization in Asian cities
- Examples of actions taken by participating cities of Intercity Collaboration projects
- Panel Discussion
- Closing remarks

(4) Reference materials

Minutes from participating in the seminar on the day and materials used by our company for presentation are attached as reference materials.

（memo 1）

City to City Collaboration Project Workshop in Kawasaki
Minutes of Meeting

27 and 28-Jul, 2017
At Nikko Hotel Kawasaki

Minutes:

＜DAY1_27-Jul, 2017＞

I. 【Session 1: Outline of City-to-City Collaboration Project and its Expected Outputs】

1. Explanation (IGES Kataoka)

The number of visitors to cooperating cities increases year by year, and the expectation for each city action against climate change is increasing. Among the 17 goals of SDGs, it is said that the functions of cities are important as "goal 11. sustainable inter-city collaboration".

This intercity cooperation effort is important for promoting low carbon society, urban toughness and sustainable development, and can also contribute to the achievement of SDGs goal.

2. Overview of City-to-City Collaboration Projects and its Expected Outputs (MOE Mr. Sai)

It is the purpose of this WS to reaffirm the final goal and what to do this year.

① The role of the city on climate change。

- Two points were reconfirmed at COP 21: 1) recognizing activities of non-government actors, 2) cooperation between central government and local governments is important.
- · Also at the Environment Ministers Meeting held in Toyama in 2016, the importance of urban roles was reaffirmed. We unanimously agreed to encourage activities of the city.

② About the scheme of cooperation between cities

Formation among Private enterprises, Cities in Japan (municipalities) and Cities in overseas cities. As a role of cities in Japan, sharing, supporting and guiding the environmental technologies and know-how that each city possesses to overseas cities, supporting plan formulation, establishing environmental standards, creating a foundation for building a low-carbon city, operating them It is to support such as skill up to do.

③ Flow of excavation of project

The flow of excavation of projects is as follows.

Phase 1: Plan formulation (prioritization) → Phase 2: Survey of local needs → Phase 3: Detailed examination, selection of candidate sites, confirmation of legal system → Phase 4: Project realization

We are expecting support and cooperation such as support for project finding from local cities at each phase and provision of information such as local legal system.

④ Main milestones until project implementation

The main milestones are as follows.

Basic study → Technical study → Economic consideration → Preparation of initial investment cost → Adjustment with stakeholders → preparation for JCM financing programme

In particular, procurement of initial investment cost is important for project formulation, and we are expecting to coordinate with representative company and partner companies.

I would like you to discuss directly through activities in intercity collaboration and form projects with more feasibility.

Also, we plan to hold seminars similar to this seminar at the beginning of 2018, so please do a feedback again and check the shortcomings etc. in each group.

⑤ Explanation of JCM

A brief introduction was given about the background of JCM, the signatory countries, financial support schemes, etc.

⑥ Results of last fiscal year

It was introduced as the main achievement that information on tours and workshops in Kitakyushu and intercity collaboration projects at COP 22 was disseminated.

II. 【Session 2: The activities and issues for creating the low carbon society】

1. Low carbonization in Kawasaki city (Kawasaki)

Kawasaki city works in collaboration with Yangon and JCM projects are being implemented. Introduction about low carbon initiatives in Kawasaki city, especially low carbon initiatives at the coastal area where you are visiting.

· Kawasaki Environmental Research Institute Environmental Monitoring

· Ukishima processing center, resource recycling facility, → a case example of collaboration between companies.
· Mega solar, example of reenergization
· Iriyasaki Water Treatment Center Re-Energy Case
· Corex San-Ei PET to PET → a case example of corporate collaboration

○Explanation of the coastal area

Explanation about the use of residents' beach at the Kawasaki coastal area of the past. Although it was originally a natural and rich area, landfill progresses gradually, and many industries have gathered (1960 - 1970). After that, it gets annoyed by pollution problems. Considering the economic growth rate, is not it similar to the city of the former Kawasaki and guests' cities? What situation did Kawasaki once fell into? The living environment of citizens is polluted, industrial waste water to the Tama river, illegal dumping of a large amount of garbage. Air pollution. Introducing photos of the coastal area. Air is cloudy due to air pollution. As the environment improvement (administration + citizen + local company's efforts) from this situation progressed, it is now beautiful, the coastal area · Tama river is a leisure spot. Ayu was also confirmed in the Tama River.

○Three cases of low-carbon initiatives in Kawasaki city

①Kawasaki Eco Town

First certification when the Ministry of the Environment and the Ministry of Economy and Trade began projects about 10 years ago (as in Kitakyushu city)
· Manufacture of ammonia as a plastic raw material at Showa Denko
· Eco cement. Waste used as cement raw material
· Corex Sanei. We use wastewater treated water for making toilet paper.

② Renewable energy equipment (highly efficient power plant using PV, biomass, natural gas)

Hydrogen strategy

We are devising three strategies with the aim of utilizing hydrogen discharged from the petrochemical complex as energy. 1. Supply system, 2. Introduction of utilization technology as energy, 3) To promote society utilizing hydrogen. As a project to realize these, the following three points were introduced.

A) FCV. Kawasaki is also owned by a public vehicle (Toyota's Mirai). In addition, a hydrogen station is installed as a hydrogen supply source.
B) (A) As an effort towards supply, take out hydrogen from the plastic of Showa Denko (Kawasaki KPR) in the process of ammonia formation.
C) (B) We also have BCP in cooperation with Toshiba. Fuel cell

container. H2 ONE unit. Generate hydrogen from the electricity generated by the solar panel and store it. It is possible to supply electricity for 300 people, hot water supply, and it is possible to operate continuously for one week.

2. Japan Environment Sanitation Center

Tender process and system for the suitable technology installation

① raised the issue of infrastructure export

I would like to spread Japan's excellent environmental technology to Asia, but there are many problems in each country in terms of institution. I am thinking about various support, but when exporting public works, there are parts that Japanese do not understand, I would like to organize and raise problems. In Japan, I have made sophisticated things, but I can not export to Asia as it is. For example, garbage disposal in Asia. Some cities are doing good modernization of garbage disposal flow, others are not so, and as a result there are problems in terms of environmental hygiene.

There, the use of private vitality is increasing. In Japan, municipalities plan themselves, EPC, O & M are also outsourced to the private sector, so it is characterized by high expertise in local government planning. The challenges in doing this approach are the formulation of a business model, the FS to respond to the problem, and the proposal of a scheme.

The Japanese government also supports this FS and hopes that Japanese companies will efficiently enter Asian cities.

About the scheme of BOT. There is not only a chipping fee, but a viewpoint of electricity sales income is necessary. It is difficult to secure profitability alone with a chipping fee.

The case in Bandung city was also explained.

② About the bidding process

Facility Plan formulation → Site selection · Environmental Impact Assessment · Consensus formation with local citizen → PPP FS → bid → contract

There is a method called "voluntary contract after comparative examination of proposal" rather than comprehensive evaluation method bidding.

Bidding in Asia is being conducted, but some do not progress after bidding. Succeeded in Thailand, but not in Jakarta or Bandung. I get a bidding process and go to O & M, but I can see a case of bidding and stopping. There are also cases where the bid itself does not advance, and this can not raise a hand from the viewpoint of risk. For this reason, it is necessary to clarify the risk with FS, but there is a problem that the flow from FS to bidding expires.

In recent Japan, PPP has come in and not only construction but also private sector is in charge of operation. Feasibility Plan, Site selection + EIA (Resident agreement in Japan is troublesome, it takes about 5 years, taking time to look at Japan) Consideration of business scope. In the case of Japan, there are few issues of initial funding. The central ministries have great financial support.

③ Case Study in Asia

In Malaysia, Malaysia tender process by KPI comprehensive evaluation method is made. We maintain bidding quality through screening.

In Indonesia, it is a procedure that evaluates the hardship of the first proposer. It is very important to negotiate how much electricity sale income can be bought, but this process is not transparent, it is unclear because there are multiple procedures and moreover it is difficult to create a business.

The Swiss challenge method is interesting in the Philippines. Is not it the way of giving privilege to those who first performed FS in popularization in Asia.

④ Summary

It is important to create a bidding process together with the site. Capacity building is necessary, and it is necessary to take advantage of the use of the Swiss challenge method.

Improvement of the bidding process is necessary, such as a one - stop system when giving permission, a persistent system on residents' consensus.

3. Supporting the establishment of a low-carbon action plan (JCM / AIM's initiative)

- Support for the establishment of a low-carbon action plan (JCM / AIM initiatives) was introduced.
- We have created a system to simulate and evaluate the environmental impact of projects and support them using this system. It is aimed to quantify the impact, to make it visible, to grasp the current situation, to utilize it for future planning and so on.
- Each city has a potential that is close to 10 times the amount of CO2 reduction of projects studied through collaboration among cities. It is important to advance the scale-up.
- Therefore, I would like you to formulate an action plan for each city and promote activities.

III. 【Session 3: Introduction of the activities for low carbon society by foreign cities】

1. Myanmar Yangon / Mr. Zaw Win Naing （YCDC : Yangon City Development Committee）

Main explanation of cooperation with Kawasaki city is main. Utilizing the scheme of JCM, we will try to improve and normalize the atmosphere and water environment. Particularly by making garbage compost and recycling, educational dissemination in this field, we aim to establish Eco Town.

There was explanation about waste management, solar power generation, water supply and sewage management.

2. Thailand Ms. Mayuree Deeroop （Port Authority of Thailand＝PAT）

Introduction of Thailand's port managed by PAT. We have set up a framework for reducing GHG emissions and sustainable development at ports.

"PAT's environmental master plan and estimation emission baseline." We aim to reduce 10% in the six years from 2013 to 2019.

3. Vietnam Hai Phong Mr. Mai Quang Tho （Hai Phong City）

Introduction of sister city relations with Kitakyushu city, OECD Green City Program, city low carbonization activities from Hai Phong City Foreign Affairs Bureau.

3 items on JCM projects.

- Pilot project introduction of EV bus in Katoba Island
- Waste heat recovery power generation business of industrial waste.
- Takakura compost example Planned amount of 50 tons / day in the future.

As future challenges and challenges by introducing JCM, it is necessary to formulate policies, establish laws and regulations, formulate a management scheme of the city, make Hai Phong city unique based on examples with Kitakyushu city, technical and personnel There was a shortage.

We point out that the problem of enterprises is the lack of such technology and the lack of long-term strategy.

As a proposal to Kitakyushu City, training on PPP, waste management / environmental technology field, creation of new project was presented.

4. Myanmar Ayabwadi Division Mr. Ye Tun （The Government of the Ayeyawaddy Resion）

It is a province in the southern part of Myanmar and has a population of about 300,000. Fukushima city, Fujita, MRI in cooperation with JCM to commercialize. We are examining JCM for solar power generation.

Economically it is in the development stage, there are many policies to set the foundation as the industrial policy of the province. As urgent issues of the country, it is necessary to relax the barriers to the creation of new business, promote the flow of investment, develop human resources education, develop business tutor service (BDS), create innovation, secure accessibility to the market, information utilizing the Web Transmission, access to energy sources and waste disposal. Also, the central government and municipalities have great interest in JCM.

We will promote waste management, including rice husk power generation in rural areas, and micro-grid in local communities in the Aiyadi district.

5. Cambodia Phnom Penh Mr. Keat Reinsey (Phnom Penh Department of Environment)

Introduction on waste management in Phnom Penh. Municipal waste, industrial waste, medical waste is divided into three. Municipal waste is handled by the ward, and Sintury is processing it. The Ministry of the Environment is responsible for industrial waste, and the Red Cross is in charge of medical waste. 1700 tons in one year. 69% are garbage.

Stung Meanchey treatment plant (closed) Dangkor treatment plant

Until 2009-2016, 40 million tons of city garbage are being processed. As a daily dose, 1.1 ton / day medical waste is treated, and 3.6 ton / day industrial waste is treated.

Challenges and challenges: There is a limit to fostering the awareness of residents, 3R measures by the government. Sorting collection is not done at the time of waste collection. As the most important point, the amount of hazardous waste has increased rapidly, and furthermore, it is not separated from general household waste.

At present, there is not enough funded capital investors to build a waste treatment plant with a consistent treatment process. As a result, landfill processing will increase.

6. Q&A

Moderator) About Thai PAT, what is the point of cooperation with Yokohama City?

Thailand) Consulting in energy calculation etc. The database is calculated and updated automatically every day

Japan Ministry of the Environment) About Vietnam. I would like to ask about the priority of this year.

Yangon) We will prepare a master plan for 2040 with local governments.

Hai Phong) We will specialize in waste management to realize a low-carbon society. Also, in terms of transportation, as I recommend in Cappado City, I will also promote clean transportation in Haiphong.

Japan Ministry of the Environment) Since we are promoting capacity building in foreign countries in Japan, we hope that we will push forward even in Hai Phong City and report the output in the next January.

Moderator) JCM expects not only the development of cities but also the development of policy and plan formulation on the environment. It was included in the announcement of each city. So, what kind of projects are given priority and how do you secure funds in the action plan?

Nguyan Trun Viet) Explain about Ho Chi Minh City. Push forward G to G first. Since it takes time in C to C, we will speed up the process with the private sector. Haiphong city is implementing it with Osaka city. We are also promoting City to Company, B to B.

The private intention in the city is Biogas or a small-scale renewable project. In addition, some companies efficiently utilize rainfall. Because water consumption is remarkable in the city and costs are costly, cost reduction is aimed at by efficient use of rainfall. In case

According to the result of rainfall analysis in Ho Chi Minh City concerning air pollution, the city has a very low pollution degree. (On the other hand, there are many cars in Bangkok, so the degree of pollution of rain is large.)

The issue in PV thinks that investment and government policy are the subjects.

Japan 's Ministry of the Environment) Ask questions to local governments in

Japan. In terms of implementation positioned in the action plan, as to how to do with the overseas counterparts, how is the part described in the action plan implemented

Kawasaki City) We are trying to make low carbon action plan in cooperation with Yangon City. Kawasaki City also has a plan as a municipality, but since it is difficult to apply it to the site as it is, it is assessing it by drafting what is applicable to the locale while grasping the needs of the locality. Japanese municipalities have taken the flow of securing budget and implementing based on the plan, but since overseas does not always have such a recognition, how to recognize the meaning of the plan Is a problem. We will carry out such activities according to the action plan. I would like to promote using limited resources not limited to JCM

	
Workshop	Explanation

＜Day 1. 27-Jul Afternoon Site Visit＞

1. Life science environment research center

・Greeting

・History of pollution control in Kawasaki city

・Q&A

Yangon City) What is the use of drainage standard management as a parameter? And how do you manage it?

Director) For aqueous matter, harmful substances are concentration standards. When we inspected with drainage ditch, we gather water and analyze it. And we are seeking regular reports. Regarding living environment items, there are two types of concentration control and total amount control. Kawasaki City faces the Tokyo Bay, Tokyo Bay is a closed watershed, so it is low to be inspected. Three items of COD, nitrogen and phosphorus were verified.

For areas with high emissions, automatic measurement is carried out, and management is always done by the source telemeter. I have my information sent over the telephone line and check it. This telemeter is unique to Kawasaki. Regulation of continuous measurement is in the law, but checking it with a telemeter is the initiative of Kawasaki City and business operators.

Oriental Consultant) About exhaust gas etc of car. About the measurement of exhaust gas, does the city invest as the city of Kawasaki and measuring it?

Director) There are nine measuring stations in Kawasaki city. It is installed in an area where 144 square kilometers are divided almost by 9. Kawasaki city has seven districts of administrative districts and one place in each district, but the coastal area has added two places to the industrial area. Automobile exhaust gas detection. Regarding PM 2.5, there is a provision of the country for the installation place, there are conditions of the surrounding environment, and several places are set up in the place meeting it.

Collected data is gathered in this laboratory and it is now being able to be seen in terrestrial digital broadcasting in real time.

Oriental Consultant) How do you think the reasons for not meeting standards?

Director) Although measures against PM 2.5 are not taken, measures for particulate matter have been set in 2000 and countermeasures have been taken, SPM measures are effective for PM 2.5, and it is on a downward trend.

2. <u>Ukishima-waste treatment plant, Rycling plant, Solar PV plant</u>

Explained the facilities by office staff.。

3. <u>reception</u>

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Life science environment research center</td><td>Ukishima-waste treatment plant</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Solar PV plant</td><td>Recycling plant</td></tr>
</table>

＜DAY2_28-Jul＞

IV. 【Session 4: Strategy for good outcome by promoting city to city collaboration】

1. Joint Crediting Mechanism (JCM) and JCM Financing Program

・Explain the outline and current status of JCM projects

○Q&A

Ho Chi Minh City) How do you select target companies? There is a demonstration experiment of 5 million biogas power generation, but after two years the local organization can not raise funds, and four years pass without being an entrepreneur.

GEC) In JCM financing programme, it is important to locate the local company and it is necessary to select a firm. At the JCM financing programme, it is a mechanism that it is impossible to subsidize that the country itself introduces facilities. However, it is possible to utilize assistance for local governments and public corporations.

Ho Chi Minh City) In the Hitachi Zosen ship project, we are implementing a private project, but we must obtain permission from the local government. The asset belongs to the local government, and how should we pay the tax? How is the Japanese government conducting tax calculations? How about taxes on equipment, subsidies for environmental, global warming countermeasures projects?

Ministry of the Environment) Which taxes do you cover for taxes? MOE will pay subsidies for equipment.

Ho Chi Minh City) It is a story about how to do 50% of equipment assistance. Regarding policy, JCM belongs to the government, but the JCM scheme is a limited company. The JCM case belongs to the government, but what about the conflict around it. Who owns facilities / facilities?

Ministry of the Environment) In Yangon's example of waste heat recovery power generation, the city of Yangon owns the equipment, and Yangon City, the owner, pays tax. In the case of Ho Chi Minh, as the ownership of the biogas power generation facilities after the verification test was not clearly decided, it seems that they are also paying taxes. Thank you for sharing it as Lesson & Learnt.

2. ADB　JFJCM Fund

Explanation of ADB and JFJCM Fund

Exporting low-carbon technology by ADB's financial support, and aim for Japan's credit acquisition.

The budget for 2017 is 1 billion yen, and it supports two kinds of projects. One is sovereign assistance, one is nonsovereign, that is, funding for the private sector, and the subsidiary limits are different.

· Introduction of case examples (introduction of EMS incidental equipment in Maldives)

3. Energy cost reduction technology

It is energy saving data for enterprises. It has a technology of IOT and AI, has 12 places in Japan, and overseas has a station in Jakarta. We have reduced equipment energy costs by replacing facilities and improving operations for more than 2,000 companies in Japan. Evaluated and received awards. The domestic share of real-time monitoring and operational improvement is 28%, top share. Cost reduction contributed 10% reduction. Reduce costs by reducing the chore of human work.

It is pointed out that not only installing facilities but also consulting to the operation after introduction will not lead to actual reduction.

Moderator) What specific areas do you consider energy saving overseas?

Hirokawa) Energy conservation related to air conditioning is a strength. In the case of Japan, we may not use air conditioning, but we think that there is a potential for air conditioning management in Asia.

Ministry of the Environment) To what extent is the collection period of facilities assumed

Hirokawa) Regarding collection of equipment auxiliary projects, it is not an introduction of expensive equipment but operation improvement. In the case of airport projects in Indonesia, we are thinking about investing about 3 years.

V. 【Session 5: Introduction of the activities for low carbon society by foreign cities】

1. Chiang Mai Ms.Pakawan Sangree (Chiang Mai Provincial Office)

Introduction on waste management. Kitakyushu is referred to as a role model.

W to E, explanation of the project of biogas power generation

○ Q & A

Kataoka) What are the standards for selecting local companies?

Chiang Mai) case was introduced in the city, and companies were recruited.

2. Ho Chi Minh City

Climate change action plan 2017-2020, toward 2030

Regarding transportation, construction, waste, agriculture, citizen's perception.

3. Quezon City

Biogas, PV, EV bus and other energy saving strategies introduced.

In the future we are thinking about W to E.

4. Phnom Penh Mr. Dek Vimeanreaksmey (MOE) & Sajith Edirisuriya (Chip mong)

4-1. MOE Waste :

The overlapping part of the presentation of Cambodia of the other day is omitted.

Landfill garbage problem

There is a problem that 2020 is full of processing plants.

We are doing campaign activities on garbage disposal along the road.

We plan to make ordinances concerning plastic back.

4-2. Chip Mong Insee Cement :

Produce an amount that accounts for one-third of Cambodia's cement production.

As a strategy to lower CO2, three initiatives ① Electric power use ② Use of alternative raw materials ③ Development of sustainable products.

We plan to introduce 6.5 MW class WHR and lower 25% of electricity. Estimated CO2 reduction is 30000 CO2 / year

5. Mandalay Mr.Sou Lin (MCDC)

Introduction of rural electrification using biomass power generation

6. Q&A

Kataoka) There are various activities about Quezon, but about future prospects

Quezon) In cooperation with Osaka, I would like to create a GHG reduction road map. Among the mid- and long-term targets, specific projects are necessary, and I expect the Osaka city technical support (especially in the priority order). We place importance on the energy sector in the reduction of GHG and emphasize reduction of energy efficiency in industry.

Kataoka) Although I mentioned the initiative of the state in the slide, what is the private incentive? Benefits of participating in the initiative.

We are under coordination with the private sector and we are considering incentives for them to participate.

VI. Closing Remark

Closing by Mr. Sai from the Ministry of Environment.

I would like to set a clear goal for the closing of the project at the end of February.

I want to continually recommend this program next year, and create clear output.

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Chiang Mai</td><td>Chip Mong Insee Cement</td></tr>
<tr><td>  </td><td> 
</td></tr>
<tr><td>MCDC</td><td>Phnom Penh MOE</td></tr>
</table>

＜Day 2. 28-Jul Afternoon Site visit＞

1. corelex 13:45

○Company description at training room

It is a factory made 15 years ago, making toilet paper.

Features are found in the raw materials making toilet paper. Usually, we make paper from wood, but this factory uses only used paper. Waste paper is also wide, but this factory finished using documents. Fifty percent of the current situation is placed in a file and is put in a cardboard box with each file and arrives at the factory. I handle this mix of metal and paper without emptying the contents of the box. For each box, take it without opening it and put it in the water. The process is divided into three stages.

In the first stage all the machinery is bracketed. The one with the most number is a stapler. The separated metal is put out for sale from the factory.

The second stage, plastics which are not heavy, but shape remains. Since plastic can not be sold, it is incinerated and recovered to be used as heat of a dryer that dries paper. It burns in a large incinerator, but a large amount of ash remains. The ash should be used in neighboring cement factories. There is no waste at all.

Third stage, ink. Collect and collect ink using foam. Because it is not worth the utility, it burns in an incinerator.

I get these three steps in a day and a half and become toilet paper.

The flow to see today is the above process.

Customers own highly confidential documents such as tax offices and the Metropolitan Police Department.

The remaining half of the materials are paper waste from the house of Kawasaki city. Other than that, there is raw material to collect money. It is a milk carton. In Japan, milk cartons are treated with great care. The reason is that the fibers used are soft and beautiful fibers are used. Even if you withdraw money, mixing the milk carton with the waste paper such as documents will increase the quality of the toilet paper.

How many milk cartons are needed when making toilet paper with milk carton alone?

It can be made from 5 sheets.

Paper is traded by weight. The weight of one roll is 125 g. One milk carton is 25 g.

Other targets for train tickets. The white paper is inside the ticket, even if you collect it you can make toilet paper. In the past it was all abandoned.
It is most important to reuse things we have thrown away without discarding them.

Finally, about the water used in the factory. A large amount of water is used in factories that make paper. Therefore, whether there is a big river, or whether there are a lot of cheap and clean water. But this place does not fill it. There is seawater, but it can not be used at the factory. Therefore, we use a large amount of sewage discharged from home. There is dirt, but it is reused.

I also have a factory in Hanoi, Vietnam.
The factory in Hanoi is also exactly the same system as Kawasaki. However, waste paper is not gathered as much as in Japan.
Coreless toilet paper is used in public toilets and the like. Can we compete with general products at factories in Vietnam? → Because toilet paper is not mainstream in Vietnam, it is still to come.

○Q&A

Oriental Consultant) What is the color of the paper?
Officials) 95% have received orders, but products that are in the conference room are our original. There are many products in Japan, but I think that it is not necessary to have such a kind.
NDK) Do materials are separated by quality?
Staff) I have not divided. I make dozens of kinds while using the same product. We change the thinness etc., aroma, etc.
Mr. Tho) After seeing the picture of Vietnam, I understand that there is a good relationship, but what is the brand name in Hanoi?
Staff) Vietnamese people are 25 of 110 employees. Besides, people from the Philippines, Brazil, Iran and Ghana come.

○Factory tour

2. <u>petrefinetechnology　15:30-17:00</u>

○Company description at training room

It is the only resin recycling law manufacturer in Japan. Introduction of recycling cycle process of PET bottle.

○Factory tour

	
corelex	petrefinetechnology
	
Factory Tour 1	Factory Tour 2

以上、

（Memo 2）

City to City Collaboration Project Workshop in Tokyo
Minutes of Meeting

30-Jan-2018
At Kaiun Club

Minutes of Open seminar

30-Jan-2018
At Kaiun Club

(1) Opening Remarks: Mr. Yasuo Takahashi, Vice Minister for Global Environmental Affairs, MOEJ

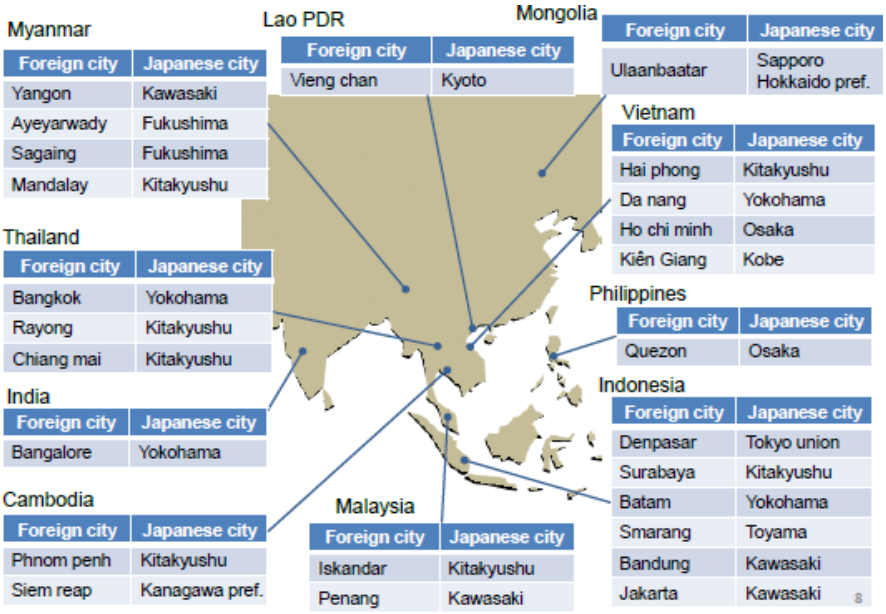
- Urban population concentration 70%. Two thirds of the world's energy resources are consumed in urban areas. Environmental measures in urban areas are important.
- Efforts on decarbonization in urban areas are progressing. We will strive to disseminate Japan's excellent low-carbon technology and support overseas cities.
- To achieve the goal as a Japanese government, it is important that different players collaborate to demonstrate Japan's comprehensive strength. In that sense, collaboration between cities that cooperate with each other is important.

(2) Support for creating low carbon society in Asia

- Increasing role of cities.
  - Paris COP 21 in 2015. We will recognize the activities of non-government actors. Collaboration between the central government and local governments.
  - Toyama G7 Environment Ministers Meeting.
  - SDD11
- City to City Collaboration Project
  - Relocate the low-carbon know-how owned by Japanese municipalities overseas. At that time, private and local governments will work

together to form a consortium.

- Participating cities since 2013 are as follows:



- Flow of composition of low-carbon project
  - Phase 1) Support for making master plan / action plan → Phase 2) Field survey → Phase 3) Investigation of specific project → Phase 4) Implementation stage
  - Fifteen projects were formed through collaboration among cities.
- JCM scheme
  - Appropriate evaluation of introduction of low-carbon technologies and GHG emission reductions, contributing to reduction of GHG emissions in Japan and local country.
  - 17 JCM signatory countries. The JCM auxiliary project is cumulative 112 projects.
- Introduction of city to city cooperation projects
  - Yokohama City and Da Nang City
  - Kitakyushu city and Phnom Penh city
  - Kawasaki City and Yangon City

(3) Recent development of strengthening city-to-city collaboration by Japanese cities

① Yokohama City

- We are pursuing the Y-Port project.
  - We have established Y-Port Center three years ago. Composition centering on city enterprises.
  - Opened a citizen partnership office with Minatomirai. We reside experts to support expertise.
  - YUSA: Yokohama Urban Solution Alliance was launched. I believe that by working in a corporate group, not administrative, we can provide solutions that emerging countries are looking for in packages. By having a juridical personality, YUSA can proceed by concluding a contract to carry out overseas business directly.

    I would like to promote collaboration with emerging cities and support small and medium-sized enterprises' overseas expansion in the future.

② City of Kitakyusyu

- Establishment of Asia Low carbonization Center based on Green Frontier Plan
  - Utilizing administrative know-how, we are promoting low carbonization in the Asian region.
  - We have done 154 projects. Cooperate with 106 companies in the city. 57 cities
  - We have been conducting inspections of many important people in various countries, and environmental education for trainees. I recently joined the MOU with the World Bank on the theme of green growth and waste management. The Kitakyushu model called know-how is being made, and it is entering and developing from planning in the Asian region. In the MOU with the World Bank, we are trying to collaborate in the field of flood control measures newly.

(4) Panel Discussion

① IGES (coordinator)

② Mizuho Information Research Institute (panelist)

③ Malaysia ·Iskandar Regional Development Agency (panelist)

④ Tokyo Metropolitan Environment Bureau (panelist)

⑤ Tokyo Metropolitan Environment Bureau (panelist)

- Asia-Pacific Integrated Model (AIM) Activities: We are not only planning but also supporting institution building.
- Malaysia ·Iskandar Regional Development Agency is a region where growth is very advanced. I have cooperated with Japan to make Blueprint. 12 actions. Building Energy Monitoring & Reporting System (BEMRS) was developed
- Tokyo has been engaged in international cooperation in the field of climate change, waste management, air pollution.
- Tokyo BEEP Model: Building Energy Efficiency Policy. ① It covers existing / new construction, large and small, various buildings. ② three stages of Hop, Step & Jump ③ It cooperates with various support measures, there are three features. We are carrying out a project to relocate this know-how to Malaysia.
- Energy efficiency in buildings is a big challenge, so I think that the approach of developing things like this case in various regions will become more important in each region, so let's pick up this time.

(5) Summary of Climate Change Policy and Intercity Collaboration Needs in Asian Cities

- Publication of country contribution towards achievement of Paris Agreement 2 ℃ target. The same applies to Asian countries.
- 70% of GHG emissions are generated from cities. The susceptibility to environmental damage is also concentrated in cities. Therefore, it is important to deal with urban areas.

(6) Asian cities' low carbon policy and implementation trend：

① Phnom Penh

- After Pol Pot regime, I have continued reconstruction. In Phnom Penh city, various countermeasures are taken against problems such as drainage, transportation, waste management. The amount of waste is increased by about 20% every year. We have enacted laws and regulations and are trying to solve them. Under the support of Kitakyushu city, we have formulated a climate change action plan. I plan to conduct a pilot project.

② Batam City

- We are collaborating with BIFZA (Batam Indonesia Free Zone Authority) and Yokohama City for the project. There is a plan of LRT as green traffic. As the green waste, the first phase of the sewage facility project is in progress. Dam maintenance plan is ongoing. I am developing a new hospital as a green building.

③ Jakarta City

- In Jakarta, emission of 34.67 miliion tonCO 2 in 2005. We have prepared various action plans to reduce GHG emissions by 2030. There is also plan of Transit Oriented Development (TOD). We are also planning an intermediate treatment facility for waste. We are promoting energy conservation and energy conservation such as LED and solar panel.

④ Yangon City

- Work on waste disposal. The amount of waste per person is 0.41 kg. Since methane gas is generated from the waste and released to the atmosphere, we plan to recover and generate electricity.

⑤ Quezon City

- The largest city in the Philippines. I am pursuing a clean and clean environment in a religious city, green. Participate in ICLEI, C40 and CITYNET. In collaboration with Osaka city, we are promoting the project. We are developing a climate change action plan. We also conducted biogas plant project and solar project.

⑥ Bangkok Port ・Laem Chabang Port (PAT)

- Introduction of Green Port development by PAT (Port Authority of Thailand). Thailand aims to reduce GHG emissions by 20% by 2030. Contribute to this reduction goal. We incorporate wind power generation and are doing various development. The amount of emissions has been made visible on the tablet, and it is updated daily.

⑦ Chiang Mai Province

- As for waste management, we have been doing various efforts with

Kitakyushu city which builds cooperative relations since 2000. We are developing policies to create environmentally friendly areas, utilize bioresources for sustainable development, and capacity building for citizens.

⑧ Hai Phong City

- Up to now, we have prepared four environmental legal systems and 17 action plans. I learned from the experience of Kitakyushu city and have worked on environmental measures. In April 2014 Kitakyushu city and Haiphong city partnered with sister cities. Since then, Kitakyushu City has been supporting the Green City Plan. There are 15 pilot projects. One of the success stories is composting household waste. Another demonstration of the electric bus at Katba Island.

⑨ Ho Chi Minh City

- Greatly affected by climate change, average humidity is 78-82%. During the rainy season, flooding occurs. As a legal framework, HCMC established the Climate Change Committee in 2009. Under the support of Osaka city, we made an activity plan for 2015 in 2015. We are planning a project in 10 fields. As a countermeasure to the transportation sector, we are progressing construction of Metro and BRT.

(7) Closing remarks

- It was nice to hear the announcement of various projects. I will present three comments on the summary. The first point, stable progress can be seen, not only the plan but also real projects are progressing. Secondly, concrete activities such as diversity, transportation, buildings, waste, etc are becoming extremely diverse. The third point, the effectiveness of JCM inter-city cooperation, the results of the inter-city collaboration so far have yielded very successful results.

Minutes of Closed Seminar

2018/1/30

At Kaiun Club

(1) Opening remarks:

- In the morning, discussions focused on low carbonization by cities, but in the afternoon we would like to have a lively discussion on the efforts of each group.
- It is an environment infrastructure that is lower in carbon and promotes environmental infrastructure for environmental preservation. It is important for intercity collaboration projects not only to simply formulate projects but also how to spread to society through it and how to develop horizontally.
- Since Prime Minister Abe and the ASEAN countries are also asking for a call for these initiatives, the efforts of city-to-city collaboration is an important project. We will exchange effective opinion opinions and expect to be a developmental discussion.

(2) Progress report of city-to-city collaboration projects for low-carbon society

① Chiang Mai Project

(Background / Overview)

- Chiang Mai is the main water source in Thailand. The project is managed with sufficient consideration of the surrounding environment.
- Through consultations between Chiang Mai prefecture and Kitakyushu city, we set integrated waste management in Chiang Mai province as a cooperative field. We grasped the current situation in each area and examined the action from the gap with target setting. Specifically, support for the formulation of the master plan is the primary movement.
- Authority in Thailand is owned by individual municipalities in the prefecture, so it is necessary to cooperate with individual local governments. Efforts are being made according to the characteristics of 210 local governments in the prefecture. As many municipalities showed interest, we decided to introduce W to E and Bio Digester.

（Biomass Digester）

- As for Biomass Digester, we are considering the utilization of Japanese price management technology, and are considering the introduction and examination concretely

（Waste power generation）

- Waste generation is under consideration in the southern part of Hort. We are

investigating the quality and quantity of garbage and the surrounding infrastructure situation.

- Introduction technology is planned to introduce technology of Nippon Steel Sumikin Engineering

② Hai Phong city

- Haiphong city has a sister city relationship with Kitakyushu City, and with the support of Kitakyushu city, he has formulated a master plan and is supporting pilot projects. Until now, we have implemented three JCM equipment auxiliary projects. Based on these outcomes, we conducted three activities this fiscal year.
- ① W to E, ② waste heat recovery from the cement plant, ③ institutional proposal of the EV bus.

（W to E）

- We are considering a stoker type high efficiency incinerator. Although it is common to monetize with a set with a chipping fee, this project is blessed with location, so we are planning to diversify our revenue sources including steam sales

（Waste heat recovery power generation）

- Vietnam is experiencing rapid progress in economic development and construction of cement factories is also prosperous. It is a case focused on such a background. We are talking about two cases. One is establishing the SPC and thinking of a BOT type scheme where private equipment owns equipment. One is conventional. Hopefully it will lead to an assistance application for next year.

（EV bus）

- Support for environmental promotion activities on remote islands. As Vietnam, we are also considering registration of World Heritage sites.
- It is an EV bus and the power supply is also considering utilization of PV, assumed to be from soft energy Control Company in Kitakyushu city. It was introduced in the absence of local regulations.
- Because it is a city famous for sightseeing, it is considering whether it can be used as business funds by collecting money from tourists. Because it is institutional improvement, it takes time. I am planning to proceed with a set of institutional aspects and projects.

③ Phnom Penh City

- Phnom Penh is in collaboration with Kitakyushu City in the field of water supply and has been a sister city relationship since 2016.

- They are working on two activities. One is energy waste heat recovery to cement plants as a reduction in energy costs. The other is considering the introduction of ESCO type business model with solar power generation facilities.
- We are conducting a three-way travel survey so far.

（W to E）

- Working with a cement factory in Cambodia to uncover the project. I applied for this year's secondary public invitation.
- An annual CO2 reduction of 20,000 tons was expected, but a Chinese company awarded in WHR bid.

（ESCO type business model with solar power generation）

- We are considering introducing lightweight panels in cooperation with local hospitals. As the scale is small, we are searching for other projects and are working with Phnom Penh Water Supply Authority.

（Status of follow-up of strategic plan）

- A ceremony to hand out the action plan for the previous fiscal year was implemented.
- Separation support at home, composting, and optimization of final disposal site.

④ Mandalay City

- Kitakyushu city and NTT Data Management Institute are implementing it at three companies.
- □Mandalay is the second city located in the north of Yangon. It has a population of 1.3 million people.
- Since 2009, Kitakyushu City has provided support to the city in the waste field, and it is a project that has been formed under collaboration relations.
- This project is a two-part study on energy conservation field and biomass utilization field.

（Renewable energy and energy saving field）

- We conduct multiple project investigation. Among them, we are discussing with each other aiming to formulate projects on energy conservation at international airports.

（Biomass Utilization Field）

- While conducting investigations repeatedly, difficulties in raising funds, the rise of Indian companies, and declining electricity charges are hurdles.
- In this trend, we focus on water treatment facilities and are investigating projects.
- Specifically, we are considering introducing an anaerobic membrane methane fermentation system. We plan to improve water quality by improving methane recovery efficiency and introducing MBR.

- We are also considering the possibility of using BDF for restaurants.

⑤ Semarang City

（Outline of Toyama City）

- Introduction of Toyama City. This is the first JCM project. Located in the north is a sea and the mountain in the south is similar to the city of Semarang.
- The city aims to make it compact city, and it carries out aggregation of the expanded suburbs. Since the city is an environmental future city, it is an area that is popular with small hydroelectric power generation, so we also operate an agricultural facility training center that makes use of it.
- Both Toyama City and Semarang City are included in 100 Resilient Cities. We met with Semarang city at the Resilient City meeting and we have repeated cooperation agreements in the transportation field.

（about JCM）

- ① Re-energy such as small hydraulic power, solar power, biomass, ② Public transport: Study of natural gasification of BRT ③ Study of energy conservation.
- Projects that are likely to be realized are small hydropower projects. There is a large-scale dam, and introduction possibility is high. Electric power of about 80 kW can be generated.
- PV has a case to be installed on the rooftop of the university.
- Public transportation has not yet been developed for BRT lanes, but passengers are extending, so there is a plan to expand the route. There is a plan for hybridization of diesel and natural gas.

⑥ Ayawadi Project ･Zagaine Project

- Knowing Fukushima when Ayahawadi district director came to Japan in 2015 and sending cooperation request to Fukushima city is the beginning. After repeated consultations over and over again this year we are aiming to materialize the project.
- Regional cooperation is also taken into consideration, and Zagaine Division is also in addition to discussions.
- In the Zagain district, we are seeking possibilities such as rice hull power generation. We are seeking a mega solar project in Ayahawadi district.
- We also conducted inspections between cities, and we invited them to Fukushima and conducted inspections on biomass power generation facilities and solar power generation facilities that utilized wastewater from the food factory

⑦ Bangkok Port ・Laem Chabang Project:

- About the partnership between Yokohama City and the port director of Thailand. Thailand is an important shipping destination for Yokohama Port. We have been working together such as seminars and personnel exchanges.
- There is a history that PAT and Yokohama port whale have respectively implemented environmental promotion.
- We are investigating the possibility of low carbonization by replacing the fuel of the gantry crane with a hybrid from diesel.
- Energy saving by installing LED lighting, high efficiency air conditioning equipment etc. at the car loading and unloading terminal.

⑧ Batam Project

- About intercity cooperation between Batam City and Yokohama City. Batam Island is an hour from Singapore by ferry. I would like to solve the urban problem of the island in its entirety in Yokohama. MOU signed three years ago.
- Batam city is not entering from the master plan. What is entering from JCM is characteristic in the Yokohama municipal project.
- As a feature, it is to introduce Yokohama city experience and technology in a way that suits Batam. Beginning cooperation between cities since 2015, it has been organized into six pillars. This year we are implementing F / S on 2 green buildings and green traffic.
- We are conscious of agreeing individual projects and green plans so that we can broaden the project actually made in plan.
- As a result, consideration is being made by installing Smart LED street lights in the industrial park together with PV.
- As for green building, we are discussing with JCM at shopping mall.

⑨ Ho Chi Minmin Project ・Quezon Project

（Ho Chi Minh）

- Cooperation between Osaka and Ho Chi Minh has been in effect 3 or 4 years ago. We have been supporting the formulation of an action plan for climate change.
- We have implemented plans to introduce heat exchangers and boiler facilities to fiber factories.

（Quezon）

- Quezon City has continued collaboration between cities, but there is still room for energy conservation and energy conservation.

- Itroduction of mega solar and examination of energy conservation of factory as well as Ho Chi Minh

⑩ Yangon Project

- Kawasaki city is implementing four inter-city collaborations. Three of them are implemented in Yangon and one in Jakarta.
- Beginning JCM city-to-city collaboration in 2015 was the start of relations between cities. There are three main pillars of MOU: (1) cooperating with each other to achieve low carbon, (2) supporting low carbonization in Yangon City, and (3) creating a new environmental business.
- As individual projects, introduction of high efficiency pumps to the water treatment plant and waste power generation facilities. Regarding the pump business, it is a project to replace the old pump of the 1980s with a high-efficiency pump made in Japan, and the project implementation players are almost decided and discussions are under way.
- Regarding W to E, we will consider further investigating whether the introduction of past waste power generation facilities can be further expanded. It aims at solving simultaneous solution of garbage problem solving and energy problem solving. It is a case leading to multi benefits.

⑪ Jakarta Project

- It is a project adopted in the secondary public invitation. The goal is to promote green innovation in Jakarta Special State. (1) to formulate JCM projects, and (2) to form green innovation projects. Also, we will promote the part of urban problems not directly related to JCM.
- We will focus on three areas of green building, waste, and energy conservation. This fiscal year, I will focus on green building and will formulate projects.

⑫ Phnom Penh Project

- This is the first project related to the Ministry of the Environment.
- By performing methane fermentation using raw garbage, it is possible to reduce the amount of garbage collected at the disposal site in Phnom Penh, and also to suppress methane fermentation in the garbage disposal site.
- In this project, waste treatment from the market of 50 ton / day is assumed.
- We plan to investigate in a dry methane fermentation plant.

(3) Summary of Comments from partner cities

- We conducted a preliminary questionnaire. There are two question contents, learning by participating in one project. 2 What is the problem of each city?
- The answers on 1. are as follows. Understanding of significance and know-how of international cooperation projects, understanding of Japanese technology, etc.

- There were various answers about 2. The major classifications include issues such as legal regulation, policy, technology, budget, human resources, cooperation with stakeholders, and awareness raising, as described below. Among them, many answered that they felt the problem in the transportation field. There was also a voice that the proposal of Japan is separate from the actual situation of the site, and there was an answer that filling up the gap is an issue.

(4) Financial support for city to city collaborative projects

- IGES is investigating what type of domestic funds can be used for inter-city collaboration.
- Those that Japanese municipalities can apply directly.
  - Local Authority Internationalization Association CLAIR: "Local Government Official Cooperation Exchange Project" "Local Government International Cooperation Expert Dispatch Project" "Local Government International Cooperation Promotion Project (Model Project)" "Overseas Sales Channel Development Support Project"
  - □JICA: "Grassroots Technical Cooperation Project (Regional Revitalization Special Framework)" "(Grant Assistance for Local Authorities) Grant Aid"

- Municipalities in Japan can not apply directly, but can apply in cooperation with other organizations.
  - JICA: "SDGs business survey" "Small and medium enterprise overseas development support project (basic → FS → demonstration)" "overseas investment loan" "technical cooperation project"
  - Ministry of the Environment: "Asia Water Environment Improvement Model Project"
  - NEDO: "International Demonstration Project of Japanese Technology that contributes to Energy Efficiency Increase, etc."
    And so many.
- It is thought that it is possible to procure fund length by combining them。

(5) Closing Remark

- This time we received more than 150 participants from the general public. We are expecting the effect of spreading out in plan in the future, expecting the effect of deriving from city-to-city collaboration such as institutional design and capacity building in local governments.
- There are two points to keep in mind. One thing is that "cooperation" is important. Among the many stakeholders, it is demand for cooperation to be successful. Secondly, I would like you to clearly share the strategy and goals.
- Please do your best for the rest of the term and let us know the results that will lead to the future.

環境省　国際協力室　御中

NTT DATA
Global IT Innovator

平成29年度　低炭素社会実現のための都市間連携事業「ハイフォン市・低炭素化促進事業(北九州市－ハイフォン市連携事業)」キックオフミーティング用資料

2017年5月16日

NTTデータ経営研究所
社会・環境戦略コンサルティングユニット

1．都市間連携の概要と本年度の目標

2．想定しているプロジェクト概要
- 2-1．都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業
- 2-2．セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘
- 2-3．離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト

3．年間活動スケジュール

NTT DATA

1.都市間連携の概要と本年度の目標

北九州市とハイフォン市の関係

- **北九州市とハイフォン市は2014年に姉妹都市協定を締結した。**
- **同年に、北九州市の支援のもと「ハイフォン市グリーン成長推進計画」が策定された。この計画はハイフォン市人民委員会からも正式に承認されたもので、廃棄物、エネルギー、交通、カットバ島、上下水道・雨水排水、環境保全、グリーン生産の7分野を対象としている。中でも、温室効果ガスの排出と関係の深い、廃棄物、エネルギー、交通、カットバ島は主要分野として位置づけられている。**

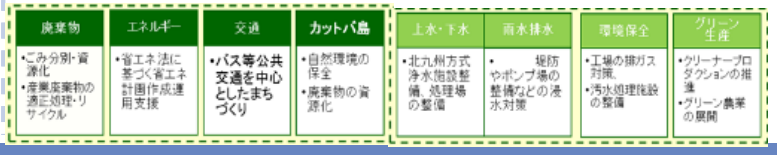
これまでの取り組み

1. 衛生陶器生産工場への高効率な省エネ設備導入による工場省エネ化事業
   - JCM設備補助事業（2015年度第2次公募で採択）
   - CO2排出削減見込み：**1,400tCO$_2$/年**
   - 事業体制
     - 代表事業者：TOTO
     - 共同事業者：TOTOベトナム
     - EPC企業：日本碍子(日本ｶﾞｲｼ)

2. ショッピングモールにおける太陽光発電の導入
   - JCM設備補助事業（2015年度第2次公募で採択）
   - CO2排出削減見込 **274CO$_2$/年**
   - 事業体制
     - 代表事業者：イオンリテール
     - 共同事業者：イオンベトナム
     - EPC企業：ネクストエナジー

3. ホテルへの高効率インバータエアコンの導入事業
   - JCM設備補助事業（2015年度第2次公募で採択）
   - CO2排出削減見込み：**826tCO$_2$/年**
   - 事業体制
     - 代表事業者：NTTデータ経営研究所
     - 共同事業者：Peace Real Estate Investment Company Limited

4. GEC途上国イノベーション事業（2015年度に採択）
   - 事業体制
     - 代表事業者：ソフトエナジーコントロールズ
     - 共同事業者：NTTデータ経営研究所、Quoc Hung Company Limited



2.想定しているプロジェクト概要

本事業では、ベトナム国ハイフォン市と北九州市の協力関係のもと、3つのタイプのプロジェクトに関して調査を実施する。

想定事業	①都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業	②セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘	③離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト
プロジェクト内容	DinhVu工業団地に隣接する処分場のごみ処理を中心に、産業廃棄物の混焼、蒸気売りなどを組み合わせて収益性を高める方策を検討する。	ハイフォン市内に新しく建設予定のセメント工場に対して、廃熱回収発電システムの導入を検討する。	観光手数料の仕組みを用いた離島の低炭素化のモデル構築を目指し、環境手数料制度導入に向けた協議を継続する。
導入技術	廃棄物発電システム	廃熱回収発電システム	EVバス等
実施スキーム	別表参照		
想定している契約方式事業形式	随意契約を想定		
補助金見込額、費用対効果	調査結果を踏まえ検討		
要調整事項	プロジェクト実施に向けた事業採算性の確保	設備に	制度導入に際し利害関係の発生する行政機関との折衝

2-1.
都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業

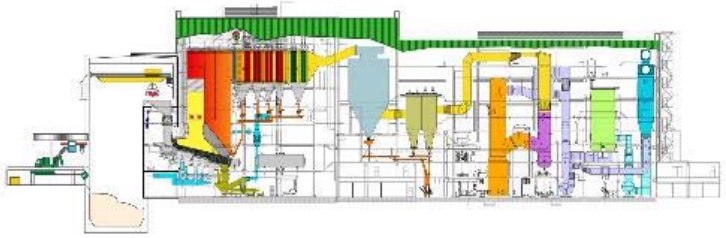
2-1.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業 プロジェクト概要・導入を想定している技術の実績

プロジェクトの概要

- ハイフォン市内にあるDinh Vu処分場に埋め立てられている都市ごみ処理のため、発電設備つき焼却炉の導入を検討する。
- ハイフォン市では過去の都市間連携事業で同様のFSを実施しており、その際にはハイフォン市の支払うチッピングフィーの価格が高額になることからプロジェクトの実施は困難であるとの結果であった。
- 今回のFSでは、廃棄物処理の収益源として以下を想定し、収益性を高めることにより事業の実現を目指す。
  - ・チッピングフィー
  - ・売電
  - ・産業廃棄物の処理
  - ・近隣の工業団地内企業への蒸気販売
- Dinh Vu処分場は既に満杯となりつつあり、隣接する施設の中には養殖場等も存在することから、Dinh Vu処分場の埋設廃棄物を掘り起こし、廃棄物発電施設で処理を行うとともに、跡地を焼却灰の処分等で活用しつつ、最終的には工業団地の一部として取込む等のオプションも含めた検討を行うことを想定している。

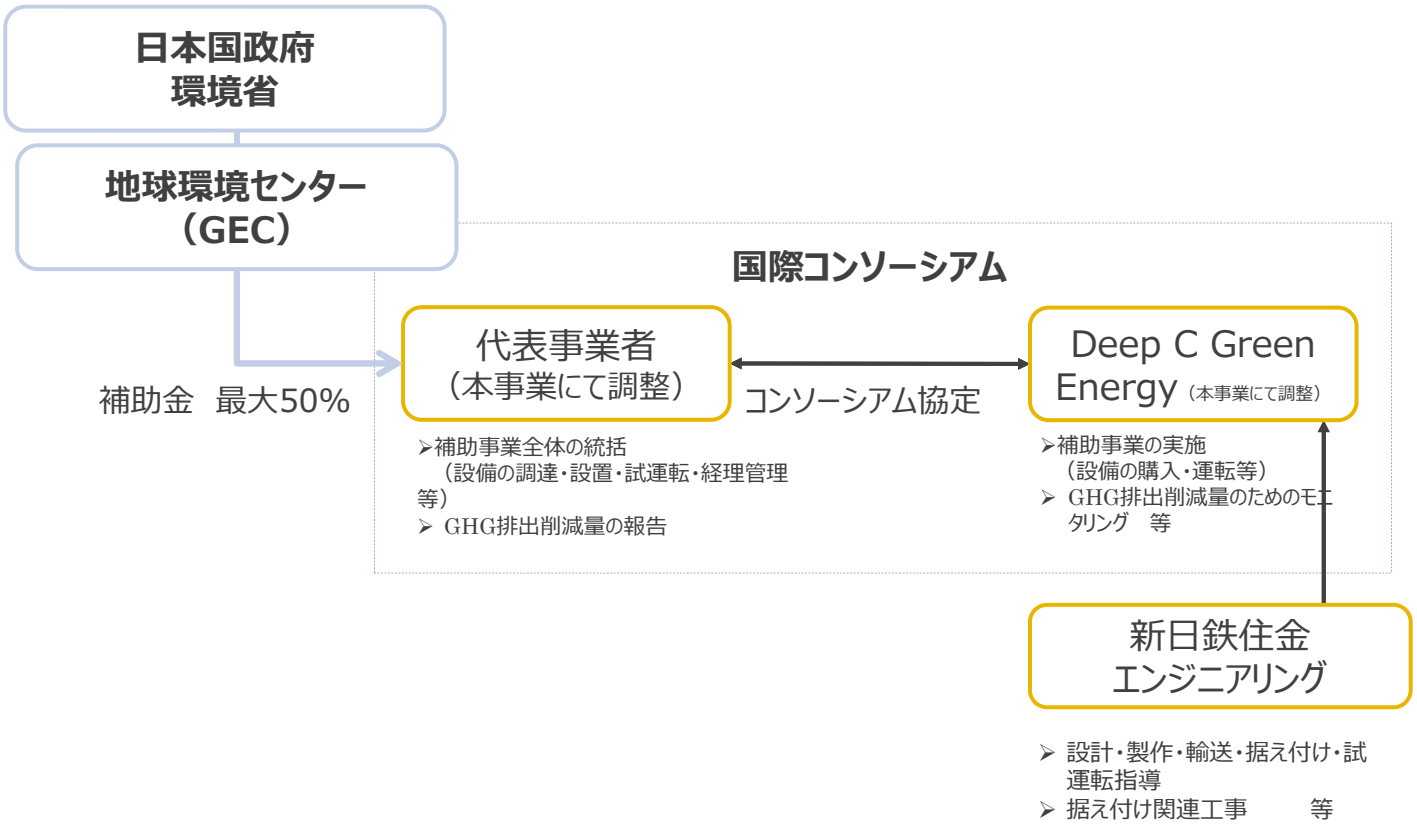
導入を想定している技術

- 新日鉄住金エンジニアリング社製の焼却炉



- ✓ 海外子会社が設備を納入しているサイトも含めると全世界で500以上の実績
- ✓ 多様なごみ質への対応（低位発熱量 1,200 ～5,000 kcal/kgまで安定燃焼可能）
- ✓ 1系列あたり最大 1,200 t/d まで処理可能
- ✓ 発電効率 最大30%まで達成可能
- ✓ 年間稼働時間 8,000 時間超を達成

2-1.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業 想定している事業実施スキーム等



2-1.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業 プロジェクト実現に向けた課題

No.	調査で解決したい課題	獲得目標	担当	相手方
1	近隣工業団地内工場から受け入れる産業廃棄物の量・質の確認	Dinh Vu工業団地や、ハイフォン市内の工業団地（野村ハイフォン工業団地等）内に入居する企業へのヒアリングにより、回収可能な廃棄物質・量を確認する。	北九州市 NDK	Dinh Vu工業団地他
2	産業廃棄物処理に関するライセンスを有する現地処理業者との連携可能性検討	直接協議により、産業廃棄物を受け入れるに当たり必要となるライセンスを有する現地処理業者との連携可能性を検討する。	北九州市 NDK	現地処理業者
3	処理対象となる都市ごみと産業廃棄物の組成の確認	ストーカー炉の導入を基本的なコンセプトとし、今回処理対象とする廃棄物の性状を確認する。	NDK	ハイフォン市
4	3で確認した廃棄物を処理することが可能な廃棄物発電設備の基本検討	確認した一般・産業廃棄物の量や性状を元に、より廃棄物発電設備の基本検討を行う。	NSENGI	-
5	近隣工業団地への蒸気販売の可能性、ならびに販売量・価格の確認	導入予定の廃棄物発電設備から発生する熱を利用した蒸気供給の可能性について検討を行う。ヒアリング調査により、工業団地内に需要家となりうる企業の有無の確認、ある場合には販売価格の確認を行う。	NDK TG	Dinh Vu工業団地
6	近隣工業団地への電力供給の可能性、ならびに供給量・価格の確認	プラントで発電した電力をEVNに販売するだけでなく、工業団地に入居する企業に対して直接販売することが可能か、法制度を確認する。可能である場合、供給量や価格についても確認を行う。	北九州市 NDK	ハイフォン市、Dinh Vu工業団地、EVN
7	掘り起こしごみに関する検討	Dinh Vu処分場内に埋め立てられたごみの適切な処理方法（単純焼却、RDF化等）。埋設廃棄物を処理した後の土地の利用可能性、掘り起こしごみ処理にかかる費用を回収する方策について検討する。	北九州市 NDK	ハイフォン市
8	JCM等の補助制度を活用したイニシャルコストの削減	事業性を高めるため、JCM設備補助等のイニシャルコスト削減可能性を検討する。	NDK	-
9	発注・契約方式の確認	設備導入の契約に当たり入札が必要か、随意契約が可能か確認	NDK	Dinh Vu工業団地

2-1. 都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業排出削減総量および補助金の見込み額

CO2排出削減量の算出方法

- 廃棄物発電は、従来、埋立処分されていた廃棄物からエネルギーを回収するもので、系統電力の消費量削減を通じてCO2排出量の大幅な削減効果を期待することができる。
- 副次的効果として、埋立処分場において発生しているメタンガスの発生抑制効果も期待できる。
- リファレンス排出量としては、“廃棄物発電が行われない場合（＝単純焼却）に排出されるCO2排出量、廃棄物の焼却プロセスからのメタンと亜酸化窒素の排出及び化石燃料等を利用した電力供給により排出されるCO2排出量”を想定することができる。
- プロジェクト排出量としては、“化石資源由来の炭素を含む廃棄物の焼却によるCO2の排出”、“廃棄物の焼却プロセスからのメタンと亜酸化窒素の排出”及び“焼却処理とエネルギー回収のために消費される電力及び燃料の消費によるCO2の排出の合計値を想定することができる。

CO2排出削減量の算出パラメータ

現時点で想定しているCO2排出削減量算出用パラメータは以下のとおり。

項目	数値
廃棄物発電施設　処理能力	500t/day
発電用燃料の低位発熱量	1,500kcal/kg
年間稼働時間	7,920時間
廃棄物発電による発電量（発電端）	11,200kW
発電施設内に用いる電力量	1,530kW
系統電力の排出係数	0.5408 t -CO2/MWh

2-2.
セメント工場の廃熱回収発電等の CO2排出削減量の大きいプロジェクトの発掘

2-2.セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘
プロジェクト概要・導入を想定している技術の実績

プロジェクトの概要

- ハイフォン市人民委員会から、JCM事業化のポテンシャルのあるターゲットとして紹介を受けたセメント工場（Bach Dang Cement）における排熱回収発電システムの導入事業の実現に向けた調査を実施する。
- Bach Dang セメントは、2019年に新しい工場の稼動を目指して準備を進めているところであり、設計段階からJCMを活用した設備導入の提案を行うことで、スムーズなJCM事業化の実現を狙う。
- 加えて、都市間連携の枠組みのもと、これまでの活動によって可能性を検討してきたVICEMグループのセメント工場の排熱回収発電事業についても、BOT型のモデルを活用した提案を続けることで、ベトナム国内他地域のセメント工場への横展開を視野に入れた活動を行う。
- 昨年度までの活動で検討を進めてきた、工業団地内企業への高効率ボイラあるいはコジェネレーションシステムの導入についても継続検討を進め、JCM適用事業としての実現を目指す。

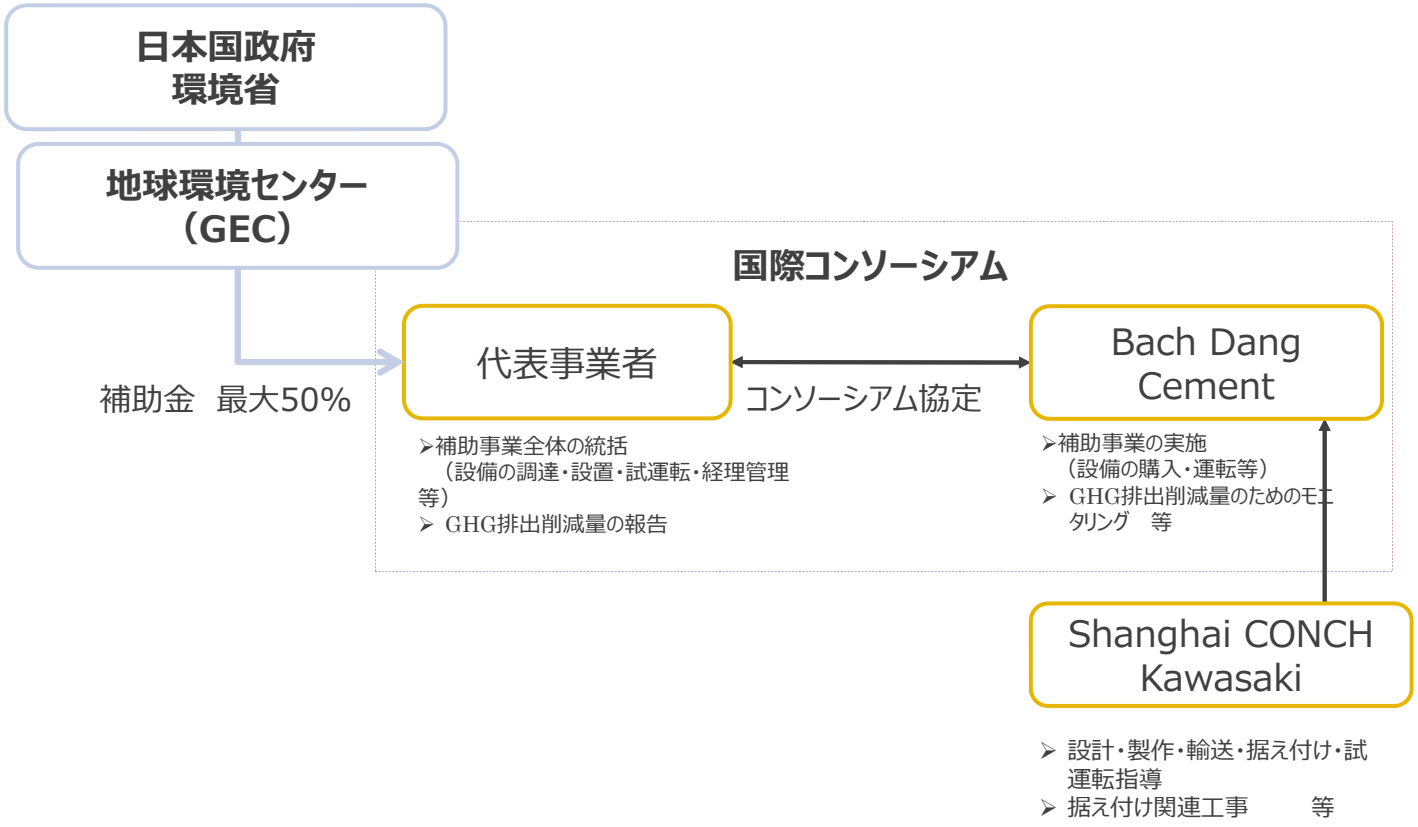
導入を想定している技術

- Shanghai CONCH Kawasaki社製の廃熱回収発電システム

- ✓ 全世界で240件以上の導入実績を有している
- ✓ これまで利用されず捨てられていた熱を回収し発電を行うことで、系統電力からの電力利用量を削減することが可能となる。その結果、系統電力を通じて排出されていたCO2量を削減することが可能となる。

JCM事業としては2件の導入実績あり。
1. 2013年　インドネシア　セメント工場への廃熱回収発電システムの導入(JFEエンジニアリング)
2. 2016年　タイ　セメント工場への廃熱回収発電システムの導入（NTTデータ経営研究所）

2-2.セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘
想定している事業実施スキーム等



2-2.セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘
プロジェクト実現に向けた課題

No.	調査で解決したい課題	獲得目標	担当	相手方
1	直接協議による、現地セメント工場の詳細データ入手	セメントキルンのサイズや稼動計画等、回収可能な廃熱の量を算出するためのデータを入手する。	北九州市 NDK	Bach Dang Cement
2	エンジニアリング会社等と連携した技術検討	廃熱回収発電設備の規模、発電見込み量等の概要を設計する。	NDK	Shanghai CONCH Kawasaki
3	2の結果を踏まえた経済性評価	投資額・投資回収年数、内部収益率等を明らかにした上で、現地企業の内部投資基準への適合性等を確認する。必要に応じて技術の再検討を実施する。	NDK	Bach Dang Cement
4	３の検討結果を踏まえたCO2排出削減量評価	設備導入によるCO２排出削減効果の試算を行う。	NDK	-
5	評価結果を踏まえた意思決定の支援	JCM設備補助への応募を行う場合は、その準備を行う。	NDK	Bach Dang Cement
6	発注・契約方式の確認	設備導入の契約に当たり入札が必要か、随意契約が可能か確認	NDK	Bach Dang Cement

2-2. セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘
排出削減総量および補助金の見込み額

CO2排出削減量の算出方法

- 廃熱回収発電を行った後の発電電力を系統から調達した場合のCO2排出量をリファレンス排出量とする。
- 廃熱回収発電を行った場合の発電電力は、廃熱回収発電システムそのものの消費電力を除いて、全てセメント工場において自己消費することとなり、プロジェクト排出量は0とする。
- リファレンス排出量からプロジェクト排出量を引き算して、CO2排出削減量とする。

○**Ery = Rey – Pey**
Ery : プロジェクト期間yにおけるCO2排出削減量[tCO_2/y]
REy: リファレンス排出量 [tCO_2/y]
PEy: プロジェクト排出量 [tCO_2/y]
○**REy = EGy * EFgrid**
EGy: 購入系統電力を代替する廃熱回収システムによる正味発電量
EFgrid: プロジェクトにより代替されるタイの系統電源のCO2 排出係数
EGyの決定
EGy=EGGEN – EGAUX
EGGEN: 廃熱回収システムによる総発電量
EGAUX: 廃熱回収システムによる電力消費量
EGAUXの決定
EGAUX=EGCAP * 24 * 365
EGCAP: 電力を消費する廃熱回収システムの機器の定格容量最大値の合計
○**PEy= 0**

CO2排出削減量（想定）

現時点で想定しているCO2排出削減量ならびに、投資額とのCO2削減費用対効果は以下のとおり。

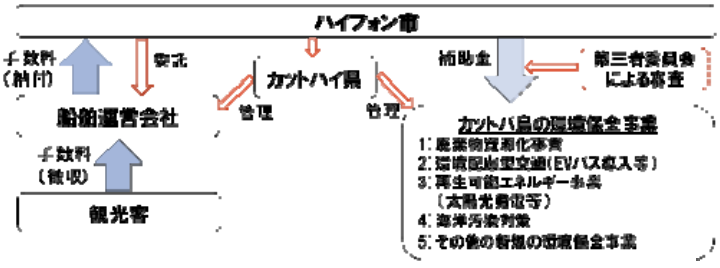
年度	平29(2017)	平30(2018)	平31(2019)	平32(2020)	平33(2021)	累計	法定耐用年数	費用対効果
補助申請予定額(百万円/年)	250	250				①500	④9	
GHG削減量(t-CO2/年)	18,820	18,820	18,820	18,820	18,820	②94,100		①/(②/稼働年数)/④)×1,000,000(単位：円) 2,951円
エネルギー起源二酸化炭素削減量(t-CO2/年)	18,820	18,820	18,820	18,820	18,820	③94,100		①/(③/稼働年数)/④)×1,000,000(単位：円) 2,951円

2-3.
離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト

2-3.離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト
プロジェクト概要・導入を想定している技術の実績

プロジェクトの概要

- 離島における環境配慮型活動を事業として成立させる仕組みとして、離島を訪問する観光客を対象に観光手数料を徴収し、同資金を活用して離島における環境配慮型活動を事業として成立させるための働きかけを行ってきている。
- 過去3年間の活動で、まだまだ制度化までのハードルは高いものの、観光手数料に関する認知度は着実に高まっている。2017年には島内の自然を保護するため、ハイフォン市としては、ディーゼルバスのカットバ島への乗り入れが禁止となる。それにあわせて、島内の交通手段として、排気ガスを排出しないEVバス等の導入を計画している。
- 観光手数料の仕組みづくり、同仕組みを利用した資金の利用先としての再エネ充電型のEVバスの導入の実現に向けた活動を実施する。



導入を想定している技術

- ソフトエナジーコントロールズ社製　EVバス

- ✓ 中国において2010年より累計5000万kmを超える走行実績
- ✓ アルミ合金セミモノコックボディによる世界最軽量のEVバスの実現
- ✓ フルサイズバスとして、世界最小レベルの電力消費（0.8Wh/km）
- ✓ 最新のリアルタイムバッテリー管理システム
- ✓ 蓄電システムを利用した充電による電力のピークカット
- ✓ 太陽光発電からの充電

※上記EVバスは、平成27年から28年度にかけて、GECの途上国イノベーション事業にて、実証を実施している。

2-3.離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト プロジェクト実現に向けた課題

No.	調査で解決したい課題	獲得目標	担当	相手方	調査の内容
1	観光手数料制度の導入	観光手数料制度の導入を実現する。	北九州市 NDK	ハイフォン市（カットハイ県人民委員会、交通局、財務局、天然資源環境局、ハイフォン市人民委員会等）	ハイフォン市（カットハイ県人民委員会、交通局、財務局、天然資源環境局、ハイフォン市人民委員会等）との直接協議を行う。
2	EVバスの商用化	EVバスを商用化し、カットバ島内での利用普及を促進する。	北九州市 NDK	現地バス会社（Quoc Hung社等）、現地デベロッパ（SUN Group等）	実証データの蓄積を図りつつ、上記協議の進捗状況にあわせて、商用化の準備を進める。

3.年間活動スケジュール

活動項目	2017年 5月	6月	7月	8月	9月	10月	11月	12月	2018年 1月	2月
①都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業		受け入れる廃棄物の質・量の確認、現地所業者との連携可能性検討、ごみの組成確認			技術検討 経済性改善のための施策検討			掘り起こしごみに関する検討、ＪＣＭなどの補助制度を活用したイニシャルコスト削減方法の検討・準備		
②エネルギー起源CO2排出削減効果の高い事業のJCM化			技術検討		経済性評価・直接協議		全体評価		事業化の準備・支援	
③離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト			制度作りに関する協議							
			EVバス実証データの収集・評価						制度づくりの状況により事業化検討	
○ 現地調査		●			●		●		●	
○ 国内会議（2回程度）						●			●	
○ 現地ワークショップ（2回程度）		● キックオフ							● 最終報告会	
○ 報告書の作成					● ドラフト					● 最終版

NTT DATA
Global IT Innovator

環境省　国際協力室　御中

NTT DATA
Global IT Innovator

平成29年度　低炭素社会実現のための都市間連携事業「ハイフォン市・低炭素化促進事業(北九州市－ハイフォン市連携事業)」第1回進捗報告用資料

2017年8月31日
NTTデータ経営研究所
社会・環境戦略コンサルティングユニット

1．都市間連携の概要と本年度の目標
2．想定しているプロジェクト概要
3．８月末までの活動報告（概要）
4．都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業
5．セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘
6．離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト
7．年間活動スケジュール

NTT DATA

1.都市間連携の概要と本年度の目標

北九州市とハイフォン市の関係

- **北九州市とハイフォン市は2014年に姉妹都市協定を締結した。**
- **同年に、北九州市の支援のもと「ハイフォン市グリーン成長推進計画」が策定された。この計画はハイフォン市人民委員会からも正式に承認されたもので、廃棄物、エネルギー、交通、カットバ島、上下水道・雨水排水、環境保全、グリーン生産の7分野を対象としている。中でも、温室効果ガスの排出と関係の深い、廃棄物、エネルギー、交通、カットバ島は主要分野として位置づけられている。**

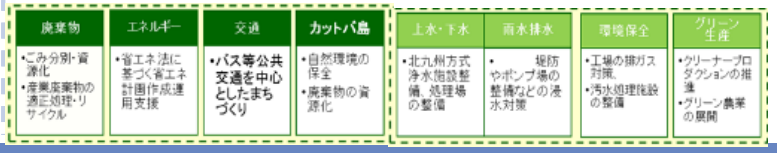
これまでの取り組み

1. 衛生陶器生産工場への高効率な省エネ設備導入による工場省エネ化事業
   - JCM設備補助事業（2015年度第2次公募で採択）
   - CO2排出削減見込み：**1,400tCO_2/年**
   - 事業体制
     - 代表事業者：TOTO
     - 共同事業者：TOTOベトナム
     - EPC企業：日本碍子(日本ｶﾞｲｼ)

2. ショッピングモールにおける太陽光発電の導入
   - JCM設備補助事業（2015年度第2次公募で採択）
   - CO2排出削減見込 **274tCO_2/年**
   - 事業体制
     - 代表事業者：イオンリテール
     - 共同事業者：イオンベトナム
     - EPC企業：ネクストエナジー

3. ホテルへの高効率インバータエアコンの導入事業
   - JCM設備補助事業（2015年度第2次公募で採択）
   - CO2排出削減見込み：**826tCO_2/年**
   - 事業体制
     - 代表事業者：NTTデータ経営研究所
     - 共同事業者：Peace Real Estate Investment Company Limited

4. GEC途上国イノベーション事業（2015年度に採択）
   - 事業体制
     - 代表事業者：ソフトエナジーコントロールズ
     - 共同事業者：NTTデータ経営研究所、Quoc Hung Company Limited



2.想定しているプロジェクト概要

本事業では、ベトナム国ハイフォン市と北九州市の協力関係のもと、3つのタイプのプロジェクトに関して調査を実施する。

想定事業	①都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業	②セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘	③離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト
プロジェクト内容	DinhVu工業団地に隣接する処分場のごみ処理を中心に、産業廃棄物の混焼、蒸気売りなどを組み合わせて収益性を高める方策を検討する。	ハイフォン市内に新しく建設予定のセメント工場に対して、廃熱回収発電システムの導入を検討する。	観光手数料の仕組みを用いた離島の低炭素化のモデル構築を目指し、環境手数料制度導入に向けた協議を継続する。
導入技術	廃棄物発電システム	廃熱回収発電システム	EVバス等
実施スキーム	別表参照		
想定している契約方式事業形式	随意契約を想定		
補助金見込額、費用対効果	調査結果を踏まえ検討		
要調整事項	プロジェクト実施に向けた事業採算性の確保	設備に	制度導入に際し利害関係の発生する行政機関との折衝

3.8月末までの活動報告

- ◆ 8月末までの活動として、回の現地調査を実施いたしました。各プロジェクトに関する協議内容については、次ページ以降でご報告いたします。
- ◆ 都市間連携ワークショップにて、北九州市内の設備を見学していただきました。

期間	活動内容	活動内容サマリー	訪問先等
7/31 ｜ 8/5	第一回現地調査	✓ ハイフォン市外務局への、本年度の全体活動計画の共有 ✓ 都市間連携セミナーへの出席者の調整 ✓ 廃棄物発電事FS実施に関する協力依頼 ✓ 都市ごみ、産業廃棄物発生量に関するヒアリング ✓ JCMを活用したセメント工場への廃熱回収発電システム導入に向けた関係者協議	✓ ハイフォン市外務局 ✓ URENCO ✓ Dinh Vu工業団地 ✓ 工業団地入居企業 ✓ VICEMハイフォン ✓ Quoc Hung社 ✓ Bach Dang セメント ✓ ハイフォン市建設局
7/25 ｜ 7/28	都市間連携ワークショップ （北九州市、川崎市）	✓ ハイフォン市外務局・交通局からの参加者とともに北九州市内の環境教育施設、廃棄物処理・リサイクル施設、EVバス、太陽光発電システム等の視察を実施。 ✓ 川崎市でのワークショップに参加。	✓ エコタウンセンター ✓ 環境ミュージアム ✓ 廃棄物発電工場 ✓ EVバス試乗 ✓ セメント工場　など

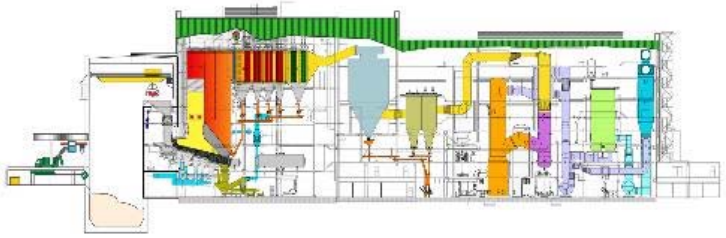
4.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業 プロジェクト概要・導入を想定している技術の実績

プロジェクトの概要

- ➢ ハイフォン市内にあるDinh Vu処分場に埋め立てられている都市ごみ処理のため、発電設備つき焼却炉の導入を検討する。
- ➢ ハイフォン市では過去の都市間連携事業で同様のFSを実施しており、その際にはハイフォン市の支払うチッピングフィーの価格が高額になることからプロジェクトの実施は困難であるとの結果であった。
- ➢ 今回のFSでは、廃棄物処理の収益源として以下を想定し、収益性を高めることにより事業の実現を目指す。
  - ・チッピングフィー
  - ・売電
  - ・産業廃棄物の処理
  - ・近隣の工業団地内企業への蒸気販売
- ➢ Dinh Vu処分場は既に満杯となりつつあり、隣接する施設の中には養殖場等も存在することから、Dinh Vu処分場の埋設廃棄物を掘り起こし、廃棄物発電施設で処理を行うとともに、跡地を焼却灰の処分等で活用しつつ、最終的には工業団地の一部として取込む等のオプションも含めた検討を行うことを想定している。

導入を想定している技術

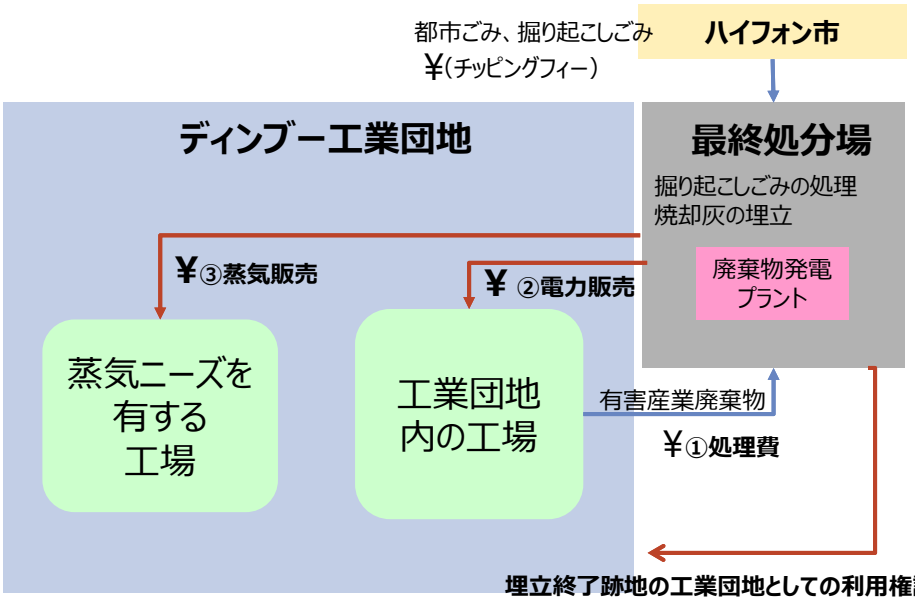
- ➢ 新日鉄住金エンジニアリング社製の焼却炉



- ✓ 海外子会社が設備を納入しているサイトも含めると全世界で500以上の実績
- ✓ 多様なごみ質への対応（低位発熱量 1,200 ～5,000 kcal/kgまで安定燃焼可能）
- ✓ 1系列あたり最大 1,200 t/d まで処理可能
- ✓ 発電効率 最大30%まで達成可能
- ✓ 年間稼働時間 8,000 時間超を達成

4.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業 調査進捗状況

- 廃棄物発電事業実施に向けて、第一回現地調査では、ハイフォン市ならびにURENCO（ハイフォン市都市廃棄物公社）、Dinh Vu工業団地管理会社との協議、入居企業へのアンケート実施等、収益源多様化の可能性について情報収集を行った。
- Dinh Vu工業団地管理会社ならびに入居企業、ハイフォン市外務局からは、廃棄物が適正処理されず、山積みされていることによる健康被害への懸念や、実際に健康上の理由でワーカーが退職した例、また、工業団地、ひいては市としての価値の低下を懸念する声が聞かれた。



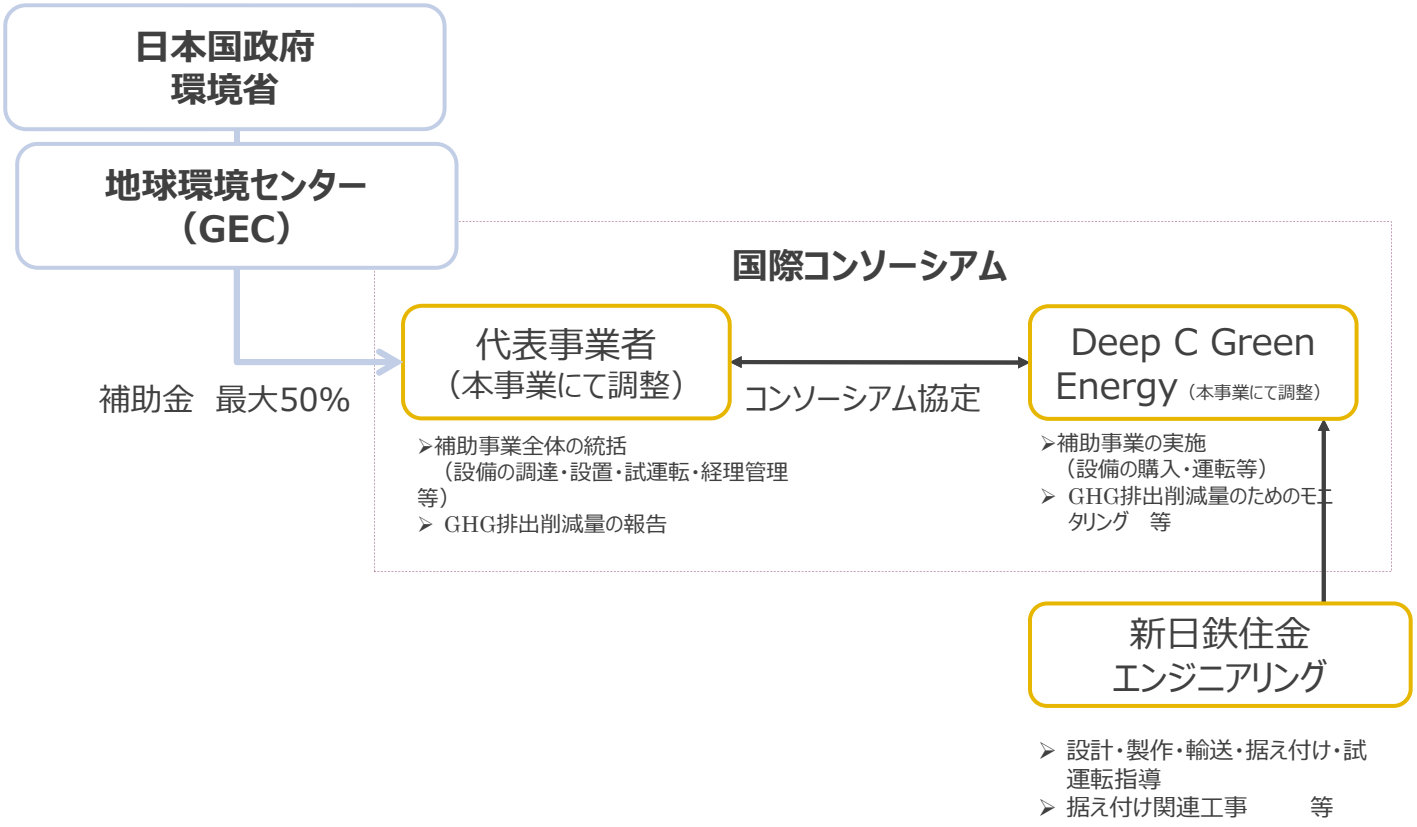
収益源多様化につながる情報

① 産業廃棄物処理
- Dinh Vu工業団地に入居している日系企業を中心に、産業廃棄物の発生状況、処理費に関するアンケート調査を実施。回答の集計中である。

② 電力販売
- Dinh Vu工業団地管理会社の社長との協議により、団地内においては、電気を系統から一括受電して、各入居企業に配電する設備が整っていることから、廃棄物発電によって発電した電力をDVIZに販売することが可能であることを確認。ピークカットのニーズがある。

③ 蒸気販売
- 蒸気の大口需要が見込まれる企業に対して直接ヒアリングを実施した。今後、工場拡張に伴い蒸気需要が増加する見込みで、需要に応じたボイラの投資計画が整っている。

4.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業 想定している事業実施スキーム等



4.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業プロジェクト実現に向けた課題

No.	調査で解決したい課題	獲得目標	担当	相手方
1	近隣工業団地内工場から受け入れる産業廃棄物の量・質の確認 **→ヒアリング調査を実施済**	Dinh Vu工業団地や、ハイフォン市内の工業団地（野村ハイフォン工業団地等）内に入居する企業へのヒアリングにより、回収可能な廃棄物質・量を確認する。	北九州市 NDK	Dinh Vu工業団地他
2	産業廃棄物処理に関するライセンスを有する現地処理業者との連携可能性検討	直接協議により、産業廃棄物を受け入れるに当たり必要となるライセンスを有する現地処理業者との連携可能性を検討する。	北九州市 NDK	現地処理業者
3	処理対象となる都市ごみと産業廃棄物の組成の確認 **→ヒアリング調査を実施済**	ストーカー炉の導入を基本的なコンセプトとし、今回処理対象とする廃棄物の性状を確認する。	NDK	ハイフォン市
4	3で確認した廃棄物を処理することが可能な廃棄物発電設備の基本検討	確認した一般・産業廃棄物の量や性状を元に、より廃棄物発電設備の基本検討を行う。	NSENGI	-
5	近隣工業団地への蒸気販売の可能性、ならびに販売量・価格の確認	導入予定の廃棄物発電設備から発生する熱を利用した蒸気供給の可能性について検討を行う。ヒアリング調査により、工業団地内に需要家となりうる企業の有無の確認、ある場合には販売価格の確認を行う。	NDK TG	Dinh Vu工業団地
6	近隣工業団地への電力供給の可能性、ならびに供給量・価格の確認	プラントで発電した電力をEVNに販売するだけでなく、工業団地に入居する企業に対して直接販売することが可能か、法制度を確認する。可能である場合、供給量や価格についても確認を行う。	北九州市 NDK	ハイフォン市、Dinh Vu工業団地、EVN
7	掘り起こしごみに関する検討	Dinh Vu処分場内に埋め立てられたごみの適切な処理方法（単純焼却、RDF化等）。埋設廃棄物を処理した後の土地の利用可能性、掘り起こしごみ処理にかかる費用を回収する方策について検討する。	北九州市 NDK	ハイフォン市
8	JCM等の補助制度を活用したイニシャルコストの削減	事業性を高めるため、JCM設備補助等のイニシャルコスト削減可能性を検討する。	NDK	-
9	発注・契約方式の確認	設備導入の契約に当たり入札が必要か、随意契約が可能か確認	NDK	Dinh Vu工業団地

4. 都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業 排出削減総量および補助金の見込み額

CO2排出削減量の算出方法

- 廃棄物発電は、従来、埋立処分されていた廃棄物からエネルギーを回収するもので、系統電力の消費量削減を通じてCO2排出量の大幅な削減効果を期待することができる。
- 副次的効果として、埋立処分場において発生しているメタンガスの発生抑制効果も期待できる。
- リファレンス排出量としては、“廃棄物発電が行われない場合（＝単純焼却）に排出されるCO2排出量、廃棄物の焼却プロセスからのメタンと亜酸化窒素の排出及び化石燃料等を利用した電力供給により排出されるCO2排出量”を想定することができる。
- プロジェクト排出量としては、“化石資源由来の炭素を含む廃棄物の焼却によるCO2の排出”、“廃棄物の焼却プロセスからのメタンと亜酸化窒素の排出”及び“焼却処理とエネルギー回収のために消費される電力及び燃料の消費によるCO2の排出の合計値を想定することができる。

CO2排出削減量の算出パラメータ

現時点で想定しているCO2排出削減量算出用パラメータは以下のとおり。

項目	数値
廃棄物発電施設　処理能力	500t/day
発電用燃料の低位発熱量	1,500kcal/kg
年間稼働時間	7,920時間
廃棄物発電による発電量（発電端）	11,200kW
発電施設内に用いる電力量	1,530kW
系統電力の排出係数	0.5408 t -CO2/MWh

4．新たなJCM事業化が見込まれるプロジェクト

- ◆ 産業廃棄物の発生量のヒアリングを実施した際、あわせてJCM設備補助制度の紹介を実施したところ、直近で蒸気供給のためのボイラを増設する計画を有する企業を発掘した。
- ◆ ボイラの燃料は、近隣で季節ごとに得られるバイオマスとすることで、CO2排出削減に寄与することができる。
- ◆ 現在、2017年９月のJCM設備補助二次公募応募に向けて、書類の準備を進めている。

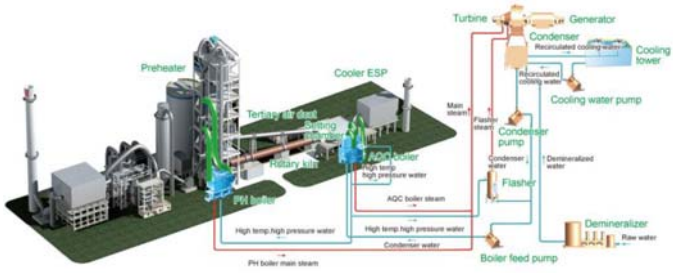
5.セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘 プロジェクト概要・導入を想定している技術の実績

プロジェクトの概要

- ➢ ハイフォン市人民委員会から、JCM事業化のポテンシャルのあるターゲットとして紹介を受けたセメント工場（Bach Dang Cement）における排熱回収発電システムの導入事業の実現に向けた調査を実施する。
- ➢ Bach Dang セメントは、2019年に新しい工場の稼動を目指して準備を進めているところであり、設計段階からJCMを活用した設備導入の提案を行うことで、スムーズなJCM事業化の実現を狙う。
- ➢ 加えて、都市間連携の枠組みのもと、これまでの活動によって可能性を検討してきたVICEMグループのセメント工場の排熱回収発電事業についても、BOT型のモデルを活用した提案を続けることで、ベトナム国内他地域のセメント工場への横展開を視野に入れた活動を行う。
- ➢ 昨年度までの活動で検討を進めてきた、工業団地内企業への高効率ボイラあるいはコジェネレーションシステムの導入についても継続検討を進め、JCM適用事業としての実現を目指す。

導入を想定している技術

- ➢ Shanghai CONCH Kawasaki社製の廃熱回収発電システム



- ✓ 全世界で240件以上の導入実績を有している
- ✓ これまで利用されず捨てられていた熱を回収し発電を行うことで、系統電力からの電力利用量を削減することが可能となる。その結果、系統電力を通じて排出されていたCO2量を削減することが可能となる。

JCM事業としては2件の導入実績あり。
1. 2013年　インドネシア　セメント工場への廃熱回収発電システムの導入(JFEエンジニアリング)
2. 2016年　タイ　セメント工場への廃熱回収発電システムの導入（NTTデータ経営研究所）

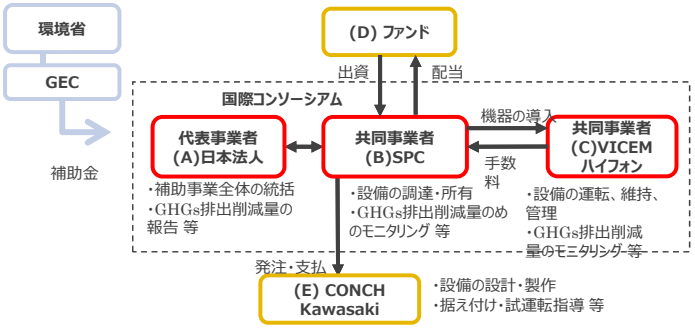
5.セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘
VICEMハイフォン、Bach Dangセメントとの協議進捗状況

◆ 昨年度までの活動で協議を進めてきたVICEMハイフォン、ならびにBach Dangセメントへの廃熱回収発電設備の導入については、いずれも2018年４月の設備補助申請を目指して協議を進めてきている。

VICEMハイフォンとの協議状況

- ベトナム国営のセメント製造会社であるVICEMグループのハイフォン工場に4.75MWの廃熱回収発電システムを導入する。
- 現在、BOT型での事業実施スキームにより2018年４月の設備補助申請に向けて、SPCへの出資の座組みなどについて、関係者との協議を行っている。

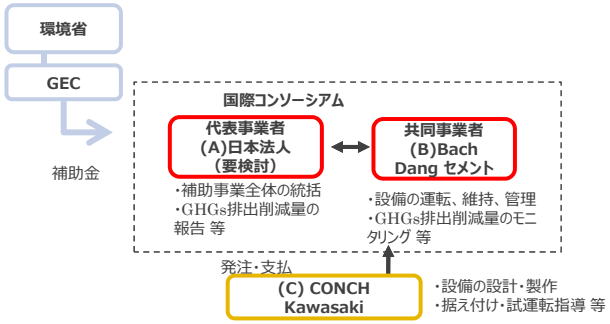
事業体制



Bach Dangセメントとの協議状況

- ベトナム国内で建設、交通、運輸を主たる事業としていたBach Dangグループが、ハイフォン市にセメント工場を設立する計画を有している。
- 2019年４月の稼動に向け、廃熱回収発電システムも合わせて設計検討を行う。
- 2018年４月の設備補助申請に向けて、国際コンソーシアムの体制等について、関係者との協議を行っている。
- 現在の計画では、4MW規模の発電容量を見込んでいる。

事業体制



5.セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘
プロジェクト実現に向けた課題

No.	調査で解決したい課題	獲得目標	担当	相手方
1	直接協議による、現地セメント工場の詳細データ入手 →進行中	セメントキルンのサイズや稼動計画等、回収可能な廃熱の量を算出するためのデータを入手する。	北九州市 NDK	Bach Dang Cement
2	エンジニアリング会社等と連携した技術検討 →進行中	廃熱回収発電設備の規模、発電見込み量等の概要を設計する。	NDK	Shanghai CONCH Kawasaki
3	2の結果を踏まえた経済性評価 →進行中	投資額・投資回収年数、内部収益率等を明らかにした上で、現地企業の内部投資基準への適合性等を確認する。必要に応じて技術の再検討を実施する。	NDK	Bach Dang Cement
4	３の検討結果を踏まえたCO2排出削減量評価→進行中	設備導入によるCO２排出削減効果の試算を行う。	NDK	-
5	評価結果を踏まえた意思決定の支援 →進行中	JCM設備補助への応募を行う場合は、その準備を行う。	NDK	Bach Dang Cement
6	発注・契約方式の確認 →進行中	設備導入の契約に当たり入札が必要か、随意契約が可能か確認	NDK	Bach Dang Cement

5. セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘
排出削減総量および補助金の見込み額

CO2排出削減量の算出方法

- 廃熱回収発電を行った後の発電電力を系統から調達した場合のCO2排出量をリファレンス排出量とする。
- 廃熱回収発電を行った場合の発電電力は、廃熱回収発電システムそのものの消費電力を除いて、全てセメント工場において自己消費することとなり、プロジェクト排出量は0とする。
- リファレンス排出量からプロジェクト排出量を引き算して、CO2排出削減量とする。

○**Ery = Rey − Pey**
Ery： プロジェクト期間yにおけるCO2排出削減量[tCO_2/y]
REy: リファレンス排出量 [tCO_2/y]
PEy: プロジェクト排出量 [tCO_2/y]
○**REy = EGy * EFgrid**
EGy: 購入系統電力を代替する廃熱回収システムによる正味発電量
EFgrid: プロジェクトにより代替されるタイの系統電源のCO2 排出係数
EGyの決定
EGy=EGGEN − EGAUX
EGGEN: 廃熱回収システムによる総発電量
EGAUX: 廃熱回収システムによる電力消費量
EGAUXの決定
EGAUX=EGCAP * 24 * 365
EGCAP: 電力を消費する廃熱回収システムの機器の定格容量最大値の合計
○**PEy= 0**

CO2排出削減量（想定）

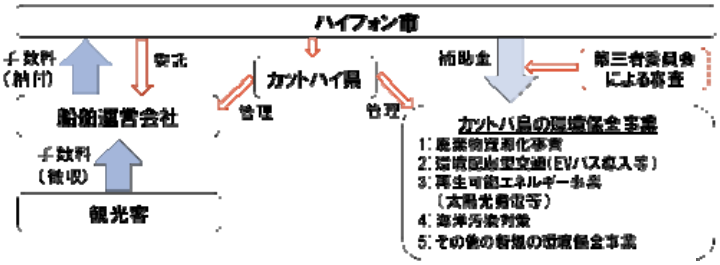
現時点で想定しているCO2排出削減量ならびに、投資額とのCO2削減費用対効果は以下のとおり。

年度	平29(2017)	平30(2018)	平31(2019)	平32(2020)	平33(2021)	累計	法定耐用年数	費用対効果
補助申請予定額(百万円/年)	250	250				①500	④9	
GHG削減量(t-CO2/年)	18,820	18,820	18,820	18,820	18,820	②94,100		①/(②/稼働年数)/④)×1,000,000(単位：円) 2,951円
エネルギー起源二酸化炭素削減量(t-CO2/年)	18,820	18,820	18,820	18,820	18,820	③94,100		①/(③/稼働年数)/④)×1,000,000(単位：円) 2,951円

6.離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト
プロジェクト概要・導入を想定している技術の実績

プロジェクトの概要

- 離島における環境配慮型活動を事業として成立させる仕組みとして、離島を訪問する観光客を対象に観光手数料を徴収し、同資金を活用して離島における環境配慮型活動を事業として成立させるための働きかけを行ってきている。
- 過去3年間の活動で、まだまだ制度化までのハードルは高いものの、観光手数料に関する認知度は着実に高まっている。2017年には島内の自然を保護するため、ハイフォン市としては、ディーゼルバスのカットバ島への乗り入れが禁止となる。それにあわせて、島内の交通手段として、排気ガスを排出しないEVバス等の導入を計画している。
- 観光手数料の仕組みづくり、同仕組みを利用した資金の利用先としての再エネ充電型のEVバスの導入の実現に向けた活動を実施する。



導入を想定している技術

- ソフトエナジーコントロールズ社製　EVバス

- ✓ 中国において2010年より累計5000万kmを超える走行実績
- ✓ アルミ合金セミモノコックボディによる世界最軽量のEVバスの実現
- ✓ フルサイズバスとして、世界最小レベルの電力消費（0.8Wh/km）
- ✓ 最新のリアルタイムバッテリー管理システム
- ✓ 蓄電システムを利用した充電による電力のピークカット
- ✓ 太陽光発電からの充電

※上記EVバスは、平成27年から28年度にかけて、GECの途上国イノベーション事業にて、実証を実施している。

2-3.離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト 調査進捗状況・プロジェクト実現に向けた課題

- ◆ カットバ島においては、現在ベトナム大手デベロッパーのSun groupが大規模開発計画を進めているという情報を得ている。一方で、ハイフォン市としてはカットバ島の自然遺産登録を狙いに、グリーンな観光産業開発を強く求めている。
- ◆ 過去に実施してきたとおり、都市間連携による制度設計支援を推し進めるとともに、デベロッパーともうまく連携しながらJCMスキームを活用した低炭素プロジェクトを実現することで、グリーンなカットバ島開発の実現に貢献できるよう、協議を進める予定である。

No.	調査で解決したい課題	獲得目標	担当	相手方	調査の内容
1	観光手数料制度の導入	観光手数料制度の導入を実現する。	北九州市 NDK	ハイフォン市（カットハイ県人民委員会、交通局、財務局、天然資源環境局、ハイフォン市人民委員会等）	ハイフォン市（カットハイ県人民委員会、交通局、財務局、天然資源環境局、ハイフォン市人民委員会等）との直接協議を行う。
2	EVバスの商用化	EVバスを商用化し、カットバ島内での利用普及を促進する。	北九州市 NDK	現地バス会社（Quoc Hung社等）、現地デベロッパ（SUN Group等）	実証データの蓄積を図りつつ、上記協議の進捗状況にあわせて、商用化の準備を進める。

7.年間活動スケジュール

活動項目	2017年 5月	6月	7月	8月	9月	10月	11月	12月	2018年 1月	2月
①都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業		受け入れる廃棄物の質・量の確認、現地所業者との連携可能性検討、ごみの組成確認		技術検討 経済性改善のための施策検討			掘り起こしごみに関する検討、ＪＣＭなどの補助制度を活用したイニシャルコスト削減方法の検討・準備			
②エネルギー起源CO2排出削減効果の高い事業のJCM化		技術検討		経済性評価・直接協議		全体評価			事業化の準備・支援	
③離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト		制度作りに関する協議								
		EVバス実証データの収集・評価					制度づくりの状況により事業化検討			
○ 現地調査			●		●		●		●	
○ 国内会議（2回程度）			● 都市間連携WS			●			●	
○ 現地ワークショップ（2回程度）		● キックオフ							● 最終報告会	
○ 報告書の作成						● ドラフト				● 最終版

NTT DATA
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環境省　国際協力室　御中

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平成29年度　低炭素社会実現のための都市間連携事業「ハイフォン市・低炭素化促進事業(北九州市－ハイフォン市連携事業)」12月進捗報告用資料

2017年12月21日
NTTデータ経営研究所
社会・環境戦略コンサルティングユニット

1．都市間連携の概要と本年度の目標
2．想定しているプロジェクト概要
3．12月末までの活動報告（概要）
4．都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業
5．セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘
6．離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト
7．年間活動スケジュール

NTT DATA

1.都市間連携の概要と本年度の目標

北九州市とハイフォン市の関係

- **北九州市とハイフォン市は2014年に姉妹都市協定を締結した。**
- **同年に、北九州市の支援のもと「ハイフォン市グリーン成長推進計画」が策定された。この計画はハイフォン市人民委員会からも正式に承認されたもので、廃棄物、エネルギー、交通、カットバ島、上下水道・雨水排水、環境保全、グリーン生産の7分野を対象としている。中でも、温室効果ガスの排出と関係の深い、廃棄物、エネルギー、交通、カットバ島は主要分野として位置づけられている。**

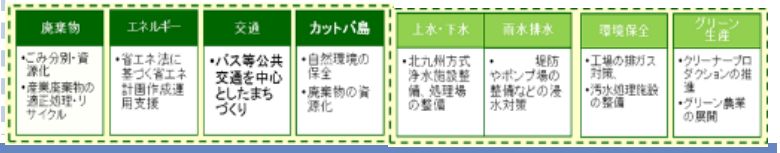
これまでの取り組み

1. 衛生陶器生産工場への高効率な省エネ設備導入による工場省エネ化事業
   - JCM設備補助事業（2015年度第2次公募で採択）
   - CO2排出削減見込み：**1,400tCO$_2$/年**
   - 事業体制
     - 代表事業者：TOTO
     - 共同事業者：TOTOベトナム
     - EPC企業：日本碍子(日本ｶﾞｲｼ)

2. ショッピングモールにおける太陽光発電の導入
   - JCM設備補助事業（2015年度第2次公募で採択）
   - CO2排出削減見込 **274CO$_2$/年**
   - 事業体制
     - 代表事業者：イオンリテール
     - 共同事業者：イオンベトナム
     - EPC企業：ネクストエナジー

3. ホテルへの高効率インバータエアコンの導入事業
   - JCM設備補助事業（2015年度第2次公募で採択）
   - CO2排出削減見込み：**826tCO$_2$/年**
   - 事業体制
     - 代表事業者：NTTデータ経営研究所
     - 共同事業者：Peace Real Estate Investment Company Limited

4. GEC途上国イノベーション事業（2015年度に採択）
   - 事業体制
     - 代表事業者：ソフトエナジーコントロールズ
     - 共同事業者：NTTデータ経営研究所、Quoc Hung Company Limited



2.想定しているプロジェクト概要

本事業では、ベトナム国ハイフォン市と北九州市の協力関係のもと、3つのタイプのプロジェクトに関して調査を実施する。

想定事業	①都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業	②セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘	③離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト
プロジェクト内容	DinhVu工業団地に隣接する処分場のごみ処理を中心に、産業廃棄物の混焼、蒸気売りなどを組み合わせて収益性を高める方策を検討する。	ハイフォン市内に新しく建設予定のセメント工場に対して、廃熱回収発電システムの導入を検討する。	観光手数料の仕組みを用いた離島の低炭素化のモデル構築を目指し、環境手数料制度導入に向けた協議を継続する。
導入技術	廃棄物発電システム	廃熱回収発電システム	EVバス等
実施スキーム	別表参照		
想定している契約方式事業形式	随意契約を想定		
補助金見込額、費用対効果	調査結果を踏まえ検討		
要調整事項	プロジェクト実施に向けた事業採算性の確保	セメント工場本体と廃熱回収発電部分の分離、他社との競合	制度導入に際し利害関係の発生する行政機関との折衝

3.12月末までの活動報告 ①

- ◆ これまでの現地調査等は以下のとおりです。各活動結果等については、次ページ以降でご報告いたします。
- ◆ 都市間連携ワークショップにて、北九州市内の設備を見学していただきました。

期間	活動内容	活動内容サマリー	訪問先等
7/31 ｜ 8/5	第一回現地調査	✓ ハイフォン市外務局への、本年度の全体活動計画の共有 ✓ 都市間連携セミナーへの出席者の調整 ✓ 廃棄物発電事FS実施に関する協力依頼 ✓ 都市ごみ、産業廃棄物発生量に関するヒアリング ✓ JCMを活用したセメント工場への廃熱回収発電システム導入に向けた関係者協議	✓ ハイフォン市外務局 ✓ URENCO ✓ Dinh Vu工業団地 ✓ 工業団地入居企業 ✓ VICEMハイフォン ✓ Quoc Hung社 ✓ Bach Dang セメント ✓ ハイフォン市建設局
7/25 ｜ 7/28	都市間連携ワークショップ （北九州市、川崎市）	✓ ハイフォン市外務局・交通局からの参加者とともに北九州市内の環境教育施設、廃棄物処理・リサイクル施設、EVバス、太陽光発電システム等の視察を実施。 ✓ 川崎市でのワークショップに参加。	✓ エコタウンセンター ✓ 環境ミュージアム ✓ 廃棄物発電工場 ✓ EVバス試乗 ✓ セメント工場　など

3.12月末までの活動報告 ②

期間	活動内容	活動内容サマリー	訪問先等
9/4 ｜ 9/7	第二回現地調査	✓ Dinh Vu工業団地入居企業に対して実施した、産廃発生状況のヒアリング結果の整理・集計を実施 ✓ 処分場で発生している悪臭の問題について、焼却炉を導入して焼却処理するまでの間の短期対応策について、福岡大学との協議を実施 ✓ ﾌﾟﾛｼﾞｪｸﾄ実行体制の調整(ｾﾒﾝﾄ工場廃熱回収発電) ✓ バイオマス利用熱供給事業の設備補助準備	✓ ハイフォン市外務局 ✓ URENCO ✓ Dinh Vu工業団地 ✓ 工業団地入居企業 ✓ Quoc Hung社 ✓ Bach Dang セメント 等
10/1 ｜ 10/7	第三回現地調査	✓ Dinh Vu団地内で発生する産業廃棄物に関するヒアリングの継続。 ✓ VICEM Haiphong向けの廃熱回収発電システムのビジネスモデル調整。 ✓ 大手ディベロッパーとの離島開発PJの協議 ✓ バイオマスボイラーの設備補助準備	✓ ハイフォン市外務局 ✓ URENCO ✓ Dinh Vu工業団地 ✓ 工業団地入居企業 ✓ サングループ ✓ 大手タイヤメーカ 等
11/12 ｜ 11/17	第四回現地調査	✓ Dinh Vu団地内で発生する産業廃棄物に関するヒアリングの継続及びアンケートの実施。 ✓ Bach Dangセメントとの導入プラント協議。 ✓ ベトナム大手ディベロッパーとの協議の継続。	✓ ハイフォン市外務局 ✓ Dinh Vu工業団地 ✓ サングループ ✓ 大手タイヤメーカ 等
12/16 ｜ 12/20	第五回現地調査	✓ 団地運営会社と短期対策及び中長期対策について協議。 ✓ 環境配慮型団地（ベトナム版エコタウン）に関する計画投資省との協議。 ✓ セメント工場の廃熱回収発電事業のフォローアップ ✓ EVバス導入に向けたフォローアップ。	✓ MPI ✓ Dinh Vu工業団地 ✓ ハイフォン市外務局 ✓ ハイフォン市建設局 ✓ URENCO　等

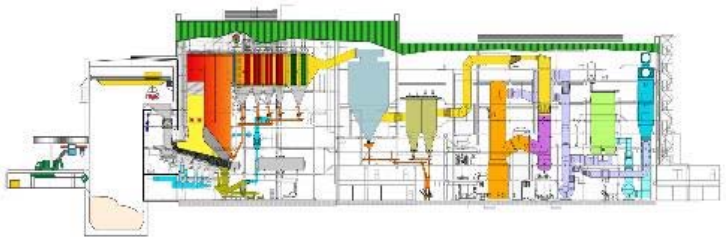
4.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業 プロジェクト概要・導入を想定している技術の実績

プロジェクトの概要

- ハイフォン市内にあるDinh Vu処分場に埋め立てられている都市ごみ処理のため、発電設備つき焼却炉の導入を検討する。
- ハイフォン市では過去の都市間連携事業で同様のFSを実施しており、その際にはハイフォン市の支払うチッピングフィーの価格が高額になることからプロジェクトの実施は困難であるとの結果であった。
- 今回のFSでは、廃棄物処理の収益源として以下を想定し、収益性を高めることにより事業の実現を目指す。
  - ・チッピングフィー
  - ・売電
  - ・産業廃棄物の処理
  - ・近隣の工業団地内企業への蒸気販売
- Dinh Vu処分場は既に満杯となりつつあり、隣接する施設の中には養殖場等も存在することから、Dinh Vu処分場の埋設廃棄物を掘り起こし、廃棄物発電施設で処理を行うとともに、跡地を焼却灰の処分等で活用しつつ、最終的には工業団地の一部として取込む等のオプションも含めた検討を行うことを想定している。

導入を想定している技術

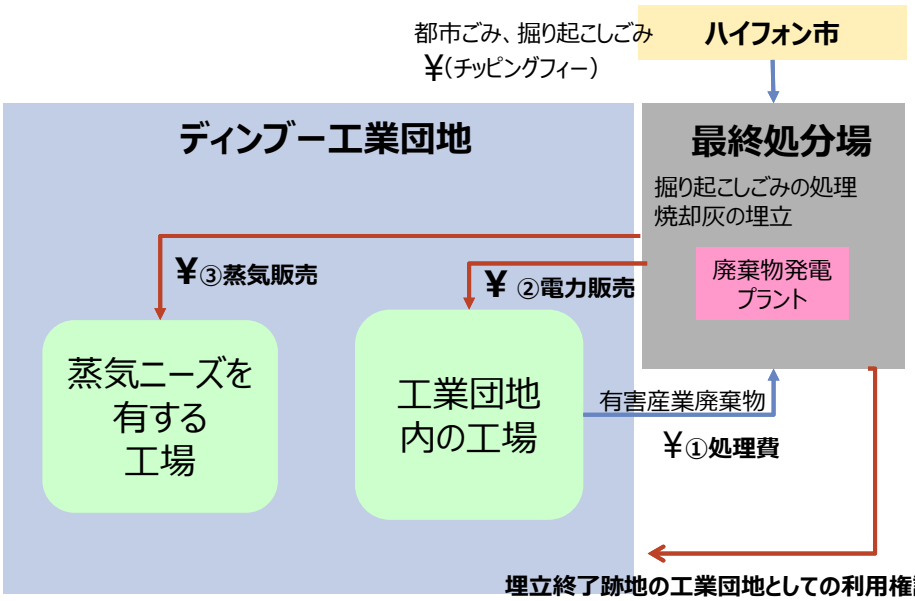
- 新日鉄住金エンジニアリング社製の焼却炉



- ✓ 海外子会社が設備を納入しているサイトも含めると全世界で500以上の実績
- ✓ 多様なごみ質への対応（低位発熱量 1,200 ～5,000 kcal/kgまで安定燃焼可能）
- ✓ 1系列あたり最大 1,200 t/d まで処理可能
- ✓ 発電効率 最大30%まで達成可能
- ✓ 年間稼働時間 8,000 時間超を達成

4.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業 調査進捗状況 ①

- ◆ 廃棄物発電事業実施に向けて、第一回現地調査では、ハイフォン市ならびにURENCO（ハイフォン市都市廃棄物公社）、Dinh Vu工業団地管理会社との協議、入居企業へのアンケート実施等、収益源多様化の可能性について情報収集を行った。
- ◆ Dinh Vu工業団地管理会社ならびに入居企業、ハイフォン市外務局からは、廃棄物が適正処理されず、山積みされていることによる健康被害への懸念や、実際に健康上の理由でワーカーが退職した例、また、工業団地、ひいては市としての価値の低下を懸念する声が聞かれた。



収益源多様化につながる情報

① 産業廃棄物処理

- Dinh Vu工業団地に入居している日系企業を中心に、産業廃棄物の発生状況、処理費に関するアンケート調査を実施。回答の集計中である。

② 電力販売

- Dinh Vu工業団地管理会社の社長との協議により、団地内においては、電気を系統から一括受電して、各入居企業に配電する設備が整っていることから、廃棄物発電によって発電した電力をDVIZに販売することが可能であることを確認。ピークカットのニーズがある。

③ 蒸気販売

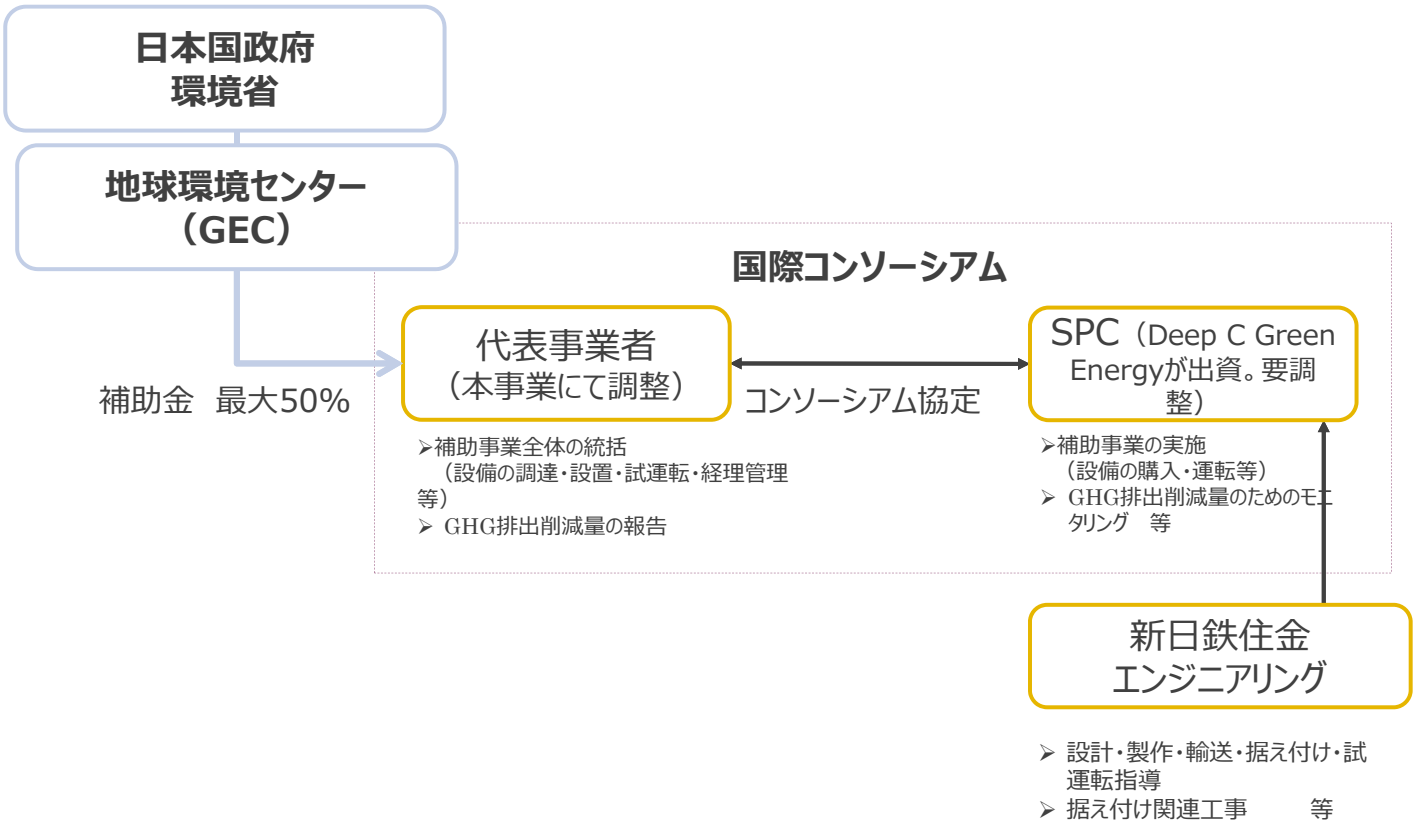
- 蒸気の大口需要が見込まれる企業に対して直接ヒアリングを実施した。今後、工場拡張に伴い蒸気需要が増加する見込みで、需要に応じたボイラの投資計画が整っている。

4.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業 調査進捗状況 ②

- ヒアリング及びアンケート調査を実施するも回答率が悪く、団地内に存する企業からの産業廃棄物発生量及びその処理コストについては、限定的な情報が得られたのみの状況。一方で、団地への入居企業は増加する一方であり、産業廃棄物発生量も増加することが予想される。
- 調査結果では、発生する産業廃棄物のうち、ストーカー炉で処理可能なものもあるが、処理が困難なものも含まれている。また、処理コストは500円/tのレベルから50,000円/tのレベルまで様々である。
- また、一般廃棄物の性状については、添付のものと変化がないとの意見が得られている。
- Dinh Vu工業団地管理会社の本事業に対する姿勢は前向きであり、現地にSPCを設立した場合、同事業が一定の収益性を確保できる場合、自ら出資したり、他の出資者を募る等の活動を行う可能性は大きい。同管理会社の期待する一定の収益は equity IRR で13%（20年）が目安といわれており、必ずしも達成できない数値目標ではない。また、SPCを設立した場合、同SPCがプラントを整備する敷地については、工業団地内に設置するものの、土地利用料は免除される可能性がある。
- 収益源の多様化の一つの柱であった蒸気販売について、期待していた大手タイヤメーカでは独自にバイオマスボイラーを導入する計画を進めており、当面、蒸気の販売先として想定することは難しい状況。

（ごみ質分析結果）

4.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業 想定している事業実施スキーム等



4.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業 プロジェクト実現に向けた課題

No.	調査で解決したい課題	獲得目標	担当	相手方
1	近隣工業団地内工場から受け入れる産業廃棄物の量・質の確認 **→ヒアリング調査を実施済**	Dinh Vu工業団地や、ハイフォン市内の工業団地（野村ハイフォン工業団地等）内に入居する企業へのヒアリングにより、回収可能な廃棄物質・量を確認する。	北九州市 NDK	Dinh Vu工業団地他
2	産業廃棄物処理に関するライセンスを有する現地処理業者との連携可能性検討 **→優先順位を下げるべきとのアドバイス**	直接協議により、産業廃棄物を受け入れるに当たり必要となるライセンスを有する現地処理業者との連携可能性を検討する。	北九州市 NDK	現地処理業者
3	処理対象となる都市ごみと産業廃棄物の組成の確認 **→ヒアリング調査を実施済**	ストーカー炉の導入を基本的なコンセプトとし、今回処理対象とする廃棄物の性状を確認する。	NDK	ハイフォン市
4	3で確認した廃棄物を処理することが可能な廃棄物発電設備の基本検討 **→現在、実施中**	確認した一般・産業廃棄物の量や性状を元に、より廃棄物発電設備の基本検討を行う。	NSENGI	-
5	近隣工業団地への蒸気販売の可能性、ならびに販売量・価格の確認 **→確認済**	導入予定の廃棄物発電設備から発生する熱を利用した蒸気供給の可能性について検討を行う。ヒアリング調査により、工業団地内に需要家となりうる企業の有無の確認、ある場合には販売価格の確認を行う。	NDK TG	Dinh Vu工業団地
6	近隣工業団地への電力供給の可能性、ならびに供給量・価格の確認 →EVN販売と団地管理会社販売の2つのケースで試算実施中	プラントで発電した電力をEVNに販売するだけでなく、工業団地に入居する企業に対して直接販売することが可能か、法制度を確認する。可能である場合、供給量や価格についても確認を行う。	北九州市 NDK	ハイフォン市、Dinh Vu工業団地、EVN
7	掘り起こしごみに関する検討 →まずは、短期的対策を実施したいとの意向が強く、対策を検討中	Dinh Vu処分場内に埋め立てられたごみの適切な処理方法（単純焼却、RDF化等）。埋設廃棄物を処理した後の土地の利用可能性、掘り起こしごみ処理にかかる費用を回収する方策について検討する。	北九州市 NDK	ハイフォン市
8	JCM等の補助制度を活用したイニシャルコストの削減→適用予定	事業性を高めるため、JCM設備補助等のイニシャルコスト削減可能性を検討する。	NDK	-
9	発注・契約方式の確認 →概ねのスキームを確認済み	設備導入の契約に当たり入札が必要か、随意契約が可能か確認	NDK	Dinh Vu工業団地

4．都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業排出削減総量および補助金の見込み額

CO2排出削減量の算出方法

- 廃棄物発電は、従来、埋立処分されていた廃棄物からエネルギーを回収するもので、系統電力の消費量削減を通じてCO2排出量の大幅な削減効果を期待することができる。
- 副次的効果として、埋立処分場において発生しているメタンガスの発生抑制効果も期待できる。
- リファレンス排出量としては、“廃棄物発電が行われない場合（＝単純焼却）に排出されるCO2排出量、廃棄物の焼却プロセスからのメタンと亜酸化窒素の排出及び化石燃料等を利用した電力供給により排出されるCO2排出量”を想定することができる。
- プロジェクト排出量としては、“化石資源由来の炭素を含む廃棄物の焼却によるCO2の排出”、“廃棄物の焼却プロセスからのメタンと亜酸化窒素の排出”及び“焼却処理とエネルギー回収のために消費される電力及び燃料の消費によるCO2の排出の合計値を想定することができる。

CO2排出削減量の算出パラメータ

現時点で想定しているCO2排出削減量算出用パラメータは以下のとおり。

項目	数値
廃棄物発電施設　処理能力	500t/day
発電用燃料の低位発熱量	1,500kcal/kg
年間稼働時間	7,920時間
廃棄物発電による発電量（発電端）	11,200kW
発電施設内に用いる電力量	1,530kW
系統電力の排出係数	0.5408 t -CO2/MWh

4．新たなJCM事業化が見込まれるプロジェクトの進捗状況

- 産業廃棄物の発生量のヒアリングを実施した際、あわせてJCM設備補助制度の紹介を実施したところ、直近で蒸気供給のためのボイラを増設する計画を有する企業を発掘した。
- ボイラの燃料は、近隣で季節ごとに得られるバイオマスとすることで、CO2排出削減に寄与することができる。
- 現在、2017年９月のJCM設備補助二次公募応募に向けて、書類の準備を進めている。
- 申請書をほぼ完成させたものの、工場の拡張計画が延期となったことに伴い、バイオマスボイラの導入そのものも延期となった

5.セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘
プロジェクト概要・導入を想定している技術の実績

プロジェクトの概要

- ハイフォン市人民委員会から、JCM事業化のポテンシャルのあるターゲットとして紹介を受けたセメント工場（Bach Dang Cement）における排熱回収発電システムの導入事業の実現に向けた調査を実施する。
- Bach Dang セメントは、2019年に新しい工場の稼動を目指して準備を進めているところであり、設計段階からJCMを活用した設備導入の提案を行うことで、スムーズなJCM事業化の実現を狙う。
- 加えて、都市間連携の枠組みのもと、これまでの活動によって可能性を検討してきたVICEMグループのセメント工場の排熱回収発電事業についても、BOT型のモデルを活用した提案を続けることで、ベトナム国内他地域のセメント工場への横展開を視野に入れた活動を行う。
- 昨年度までの活動で検討を進めてきた、工業団地内企業への高効率ボイラあるいはコジェネレーションシステムの導入についても継続検討を進め、JCM適用事業としての実現を目指す。

導入を想定している技術

- Shanghai CONCH Kawasaki社製の廃熱回収発電システム

- ✓ 全世界で240件以上の導入実績を有している
- ✓ これまで利用されず捨てられていた熱を回収し発電を行うことで、系統電力からの電力利用量を削減することが可能となる。その結果、系統電力を通じて排出されていたCO2量を削減することが可能となる。

JCM事業としては2件の導入実績あり。
1. 2013年　インドネシア　セメント工場への廃熱回収発電システムの導入(JFEエンジニアリング)
2. 2016年　タイ　セメント工場への廃熱回収発電システムの導入（NTTデータ経営研究所）

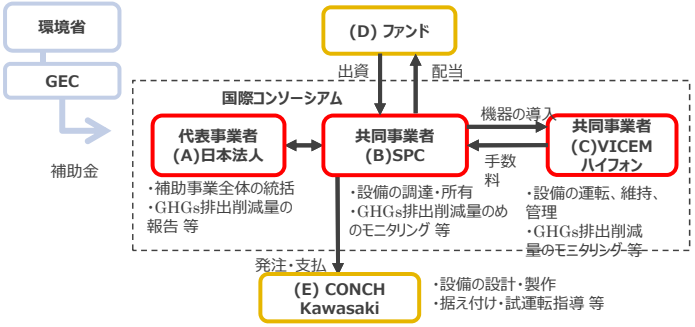
5.セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘
VICEMハイフォン、Bach Dangセメントとの協議進捗状況

◆ 昨年度までの活動で協議を進めてきたVICEMハイフォン、ならびにBach Dangセメントへの廃熱回収発電設備の導入については、いずれも2018年４月の設備補助申請を目指して協議を進めてきている。

VICEMハイフォンとの協議状況

- ベトナム国営のセメント製造会社であるVICEMグループのハイフォン工場に4.75MWの廃熱回収発電システムを導入する。
- 現在、BOT型での事業実施スキームにより2018年４月の設備補助申請に向けて、SPCへの出資の座組みなどについて、関係者との協議を継続中。
- 投資家候補も見出し、BOT条件等を調整中。

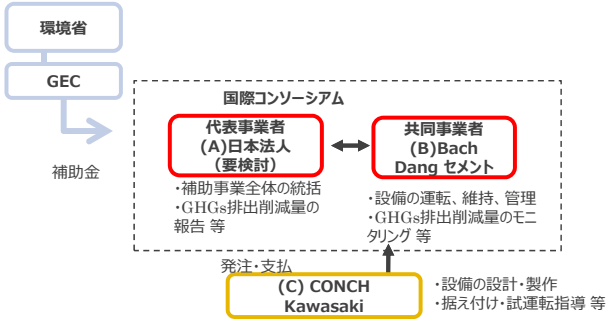
事業体制



Bach Dangセメントとの協議状況

- ベトナム国内で建設、交通、運輸を主たる事業としていたBach Dangグループが、ハイフォン市にセメント工場を設立する計画を有している。
- 2019年４月の稼動に向け、廃熱回収発電システムも合わせて設計検討を行う。
- 2018年４月の設備補助申請に向けて、国際コンソーシアムの体制等について、関係者との協議を行っている。
- セメント工場の整備を行った企業との競合に陥っている。

事業体制



5.セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘
プロジェクト実現に向けた課題

No.	調査で解決したい課題	獲得目標	担当	相手方
1	直接協議による、現地セメント工場の詳細データ入手 →進行中	セメントキルンのサイズや稼動計画等、回収可能な廃熱の量を算出するためのデータを入手する。	北九州市 NDK	Bach Dang Cement
2	エンジニアリング会社等と連携した技術検討 →進行中	廃熱回収発電設備の規模、発電見込み量等の概要を設計する。	NDK	Shanghai CONCH Kawasaki
3	2の結果を踏まえた経済性評価 →進行中	投資額・投資回収年数、内部収益率等を明らかにした上で、現地企業の内部投資基準への適合性等を確認する。必要に応じて技術の再検討を実施する。	NDK	Bach Dang Cement
4	3の検討結果を踏まえたCO2排出削減量評価→進行中	設備導入によるCO２排出削減効果の試算を行う。	NDK	-
5	評価結果を踏まえた意思決定の支援 →進行中	JCM設備補助への応募を行う場合は、その準備を行う。	NDK	Bach Dang Cement
6	発注・契約方式の確認 →進行中	設備導入の契約に当たり入札が必要か、随意契約が可能か確認	NDK	Bach Dang Cement

5. セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘
排出削減総量および補助金の見込み額

CO2排出削減量の算出方法

- 廃熱回収発電を行った後の発電電力を系統から調達した場合のCO2排出量をリファレンス排出量とする。
- 廃熱回収発電を行った場合の発電電力は、廃熱回収発電システムそのものの消費電力を除いて、全てセメント工場において自己消費することとなり、プロジェクト排出量は0とする。
- リファレンス排出量からプロジェクト排出量を引き算して、CO2排出削減量とする。

○**Ery = Rey – Pey**
Ery : プロジェクト期間yにおけるCO2排出削減量[tCO_2/y]
REy: リファレンス排出量 [tCO_2/y]
PEy: プロジェクト排出量 [tCO_2/y]
○**REy = EGy * EFgrid**
EGy: 購入系統電力を代替する廃熱回収システムによる正味発電量
EFgrid: プロジェクトにより代替されるタイの系統電源のCO2 排出係数
EGyの決定
EGy=EGGEN – EGAUX
EGGEN: 廃熱回収システムによる総発電量
EGAUX: 廃熱回収システムによる電力消費量
EGAUXの決定
EGAUX=EGCAP * 24 * 365
EGCAP: 電力を消費する廃熱回収システムの機器の定格容量最大値の合計
○**PEy= 0**

CO2排出削減量（想定）

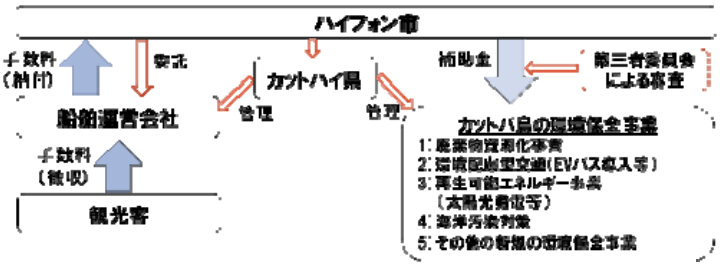
現時点で想定しているCO2排出削減量ならびに、投資額とのCO2削減費用対効果は以下のとおり。

年度	平29(2017)	平30(2018)	平31(2019)	平32(2020)	平33(2021)	累計	法定耐用年数	費用対効果
補助申請予定額(百万円/年)	250	250				①500	④9	
GHG削減量(t-CO2/年)	18,820	18,820	18,820	18,820	18,820	②94,100		①/(②/稼働年数)/④)×1,000,000(単位：円) 2,951円
エネルギー起源二酸化炭素削減量(t-CO2/年)	18,820	18,820	18,820	18,820	18,820	③94,100		①/(③/稼働年数)/④)×1,000,000(単位：円) 2,951円

6.離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト
プロジェクト概要・導入を想定している技術の実績

プロジェクトの概要

- 離島における環境配慮型活動を事業として成立させる仕組みとして、離島を訪問する観光客を対象に観光手数料を徴収し、同資金を活用して離島における環境配慮型活動を事業として成立させるための働きかけを行ってきている。
- 過去3年間の活動で、まだまだ制度化までのハードルは高いものの、観光手数料に関する認知度は着実に高まっている。2017年には島内の自然を保護するため、ハイフォン市としては、ディーゼルバスのカットバ島への乗り入れが禁止となる。それにあわせて、島内の交通手段として、排気ガスを排出しないEVバス等の導入を計画している。
- 観光手数料の仕組みづくり、同仕組みを利用した資金の利用先としての再エネ充電型のEVバスの導入の実現に向けた活動を実施する。



導入を想定している技術

- ソフトエナジーコントロールズ社製　EVバス

- ✓ 中国において2010年より累計5000万kmを超える走行実績
- ✓ アルミ合金セミモノコックボディによる世界最軽量のEVバスの実現
- ✓ フルサイズバスとして、世界最小レベルの電力消費（0.8Wh/km）
- ✓ 最新のリアルタイムバッテリー管理システム
- ✓ 蓄電システムを利用した充電による電力のピークカット
- ✓ 太陽光発電からの充電

※上記EVバスは、平成27年から28年度にかけて、GECの途上国イノベーション事業にて、実証を実施している。

6.離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト
調査進捗状況・プロジェクト実現に向けた課題

- ◆ カットバ島においては、現在ベトナム大手デベロッパーのSun groupが大規模開発計画を進めているという情報を得ている。一方で、ハイフォン市としてはカットバ島の自然遺産登録を狙いに、グリーンな観光産業開発を強く求めている。
- ◆ 過去に実施してきたとおり、都市間連携による制度設計支援を推し進めるとともに、デベロッパーともうまく連携しながらJCMスキームを活用した低炭素プロジェクトを実現することで、グリーンなカットバ島開発の実現に貢献できるよう、協議を推進中。既に２回の打合せを実施し、EVバスを含めた交通分野や下水道分野での連携可能性を協議中。
- ◆ 観光手数料については、ハイフォン市への働きかけを継続しているものの、時間を要している状況。

No.	調査で解決したい課題	獲得目標	担当	相手方	調査の内容
1	観光手数料制度の導入 →フォローアップ実施中	観光手数料制度の導入を実現する。	北九州市 NDK	ハイフォン市（カットハイ県人民委員会、交通局、財務局、天然資源環境局、ハイフォン市人民委員会等）	ハイフォン市（カットハイ県人民委員会、交通局、財務局、天然資源環境局、ハイフォン市人民委員会等）との直接協議を行う。
2	EVバスの商用化 →難航しつつも実証活動を実施中	EVバスを商用化し、カットバ島内での利用普及を促進する。	北九州市 NDK	現地バス会社（Quoc Hung社等）、現地デベロッパ（SUN Group等）	実証データの蓄積を図りつつ、上記協議の進捗状況にあわせて、商用化の準備を進める。

7.年間活動スケジュール

活動項目	2017年 5月	6月	7月	8月	9月	10月	11月	12月	2018年 1月	2月
①都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業	受け入れる廃棄物の質・量の確認、現地所業者との連携可能性検討、ごみの組成確認			技術検討 経済性改善のための施策検討			掘り起こしごみに関する検討、ＪＣＭなどの補助制度を活用したイニシャルコスト削減方法の検討・準備			
②エネルギー起源CO2排出削減効果の高い事業のJCM化		技術検討		経済性評価・直接協議		全体評価			事業化の準備・支援	
③離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト		制度作りに関する協議								
		EVバス実証データの収集・評価					制度づくりの状況により事業化検討			
○ 現地調査			●		●	●	●	●	●	
○ 国内会議（2回程度）			● 都市間連携WS			●			●	
○ 現地ワークショップ（2回程度）		● キックオフ							● 最終報告会	
○ 報告書の作成						● ドラフト				● 最終版

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平成29年度　低炭素社会実現のための都市間連携事業「ハイフォン市・低炭素化促進事業　エネルギー分野（北九州市－ハイフォン市連携事業)」最終報告資料

2018年2月20日
北九州市　アジア低炭素化センター
（株）NTTデータ経営研究所

NTT DATA

1.都市間連携の概要と本年度の目標

北九州市とハイフォン市の関係

- **北九州市とハイフォン市は2014年に姉妹都市協定を締結した。**
- **同年に、北九州市の支援のもと「ハイフォン市グリーン成長推進計画」が策定された。この計画はハイフォン市人民委員会からも正式に承認されたもので、廃棄物、エネルギー、交通、カットバ島、上下水道・雨水排水、環境保全、グリーン生産の7分野を対象としている。中でも、温室効果ガスの排出と関係の深い、廃棄物、エネルギー、交通、カットバ島は主要分野として位置づけられている。**

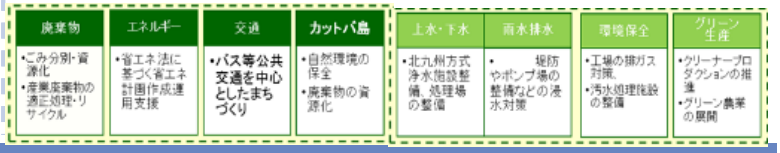
これまでの取り組み

1. 衛生陶器生産工場への高効率な省エネ設備導入による工場省エネ化事業
   - JCM設備補助事業（2015年度第2次公募で採択）
   - CO2排出削減見込み：**1,400tCO$_2$/年**
   - 事業体制
     - 代表事業者：TOTO
     - 共同事業者：TOTOベトナム
     - EPC企業：日本碍子(日本ｶﾞｲｼ)

2. ショッピングモールにおける太陽光発電の導入
   - JCM設備補助事業（2015年度第2次公募で採択）
   - CO2排出削減見込 **274CO$_2$/年**
   - 事業体制
     - 代表事業者：イオンリテール
     - 共同事業者：イオンベトナム
     - EPC企業：ネクストエナジー

3. ホテルへの高効率インバータエアコンの導入事業
   - JCM設備補助事業（2015年度第2次公募で採択）
   - CO2排出削減見込み：**826tCO$_2$/年**
   - 事業体制
     - 代表事業者：NTTデータ経営研究所
     - 共同事業者：Peace Real Estate Investment Company Limited

4. GEC途上国イノベーション事業（2015年度に採択）
   - 事業体制
     - 代表事業者：ソフトエナジーコントロールズ
     - 共同事業者：NTTデータ経営研究所、Quoc Hung Company Limited



2.想定しているプロジェクト概要

本事業では、ベトナム国ハイフォン市と北九州市の協力関係のもと、3つのタイプのプロジェクトに関して調査を実施する。

想定事業	①都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業	②セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘	③離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト
プロジェクト内容	工業団地に隣接する処分場のごみ処理を中心に、産業廃棄物の混焼、蒸気売りなどを組み合わせて収益性を高める方策を検討する。	ハイフォン市内に新しく建設予定のセメント工場に対して、廃熱回収発電システムの導入を検討する。	環境保全手数料の仕組みを用いた離島の低炭素化のモデル構築を目指し、環境手数料制度導入に向けた協議を継続する。
導入技術	廃棄物発電システム	廃熱回収発電システム	EVバス等
実施スキーム	別表参照		
想定している契約方式事業形式	随意契約を想定		
補助金見込額、費用対効果	調査結果を踏まえ検討		
要調整事項	プロジェクト実施に向けた事業採算性の確保	セメント工場本体と廃熱回収発電部分の分離、他社との競合	制度導入に際し利害関係の発生する行政機関との折衝

3.これまでの主な活動 ①

◆ **現地調査を６回実施。**

期間	活動内容	活動内容サマリー	訪問先等
7/31 ｜ 8/5	第一回現地調査	✓ ハイフォン市とキックオフ ✓ 都市ごみ、産業廃棄物発生量に関するヒアリング ✓ JCMを活用したセメント工場への廃熱回収発電システム導入に向けた関係者協議	✓ ハイフォン市関係局 ✓ 工業団地・入居企業 ✓ セメント会社 ✓ 輸送会社　など
7/25 ｜ 7/28	都市間連携ワークショップ （北九州市、川崎市）		
9/4 ｜ 9/7	第二回現地調査	✓ 工業団地入居企業へのヒアリング ✓ 団地近傍の処分場で発生している悪臭対策検討 ✓ ﾌﾟﾛｼﾞｪｸﾄ実行体制の調整(ｾﾒﾝﾄ工場廃熱回収発電) ✓ バイオマス利用熱供給事業の設備補助準備	✓ ハイフォン市関係局 ✓ 工業団地・入居企業 ✓ 輸送会社 ✓ セメント会社　など
10/1 ｜ 10/7	第三回現地調査	✓ 団地内で発生産廃に関するヒアリング（継続） ✓ セメント工場向けの廃熱回収発電ビジネスモデル調整 ✓ 大手ディベロッパーとの離島開発PJの協議 ✓ バイオマスボイラーの設備補助準備	✓ ハイフォン市関係局 ✓ 工業団地・入居企業 ✓ 大手ディベロッパー ✓ 大手メーカ　など
11/12 ｜ 11/17	第四回現地調査	✓ 団地内で発生する産廃に関するヒアリングの継続及びアンケートの実施。 ✓ セメント会社との導入プラント協議。 ✓ ベトナム大手ディベロッパーとの協議の継続。	✓ ハイフォン市関連局 ✓ 工業団地・入居企業 ✓ 大手ディベロッパー ✓ 大手メーカ　など
12/16 ｜ 12/20	第五回現地調査	✓ 団地運営会社と短期対策及び中長期対策について協議。 ✓ 環境配慮型団地（ベトナム版エコタウン）に関する計画投資省との協議。 ✓ セメント工場の廃熱回収発電事業のフォローアップ ✓ EVバス導入に向けたフォローアップ。	✓ MPI ✓ 工業団地・入居企業 ✓ 輸送会社 ✓ 現地メーカ　など

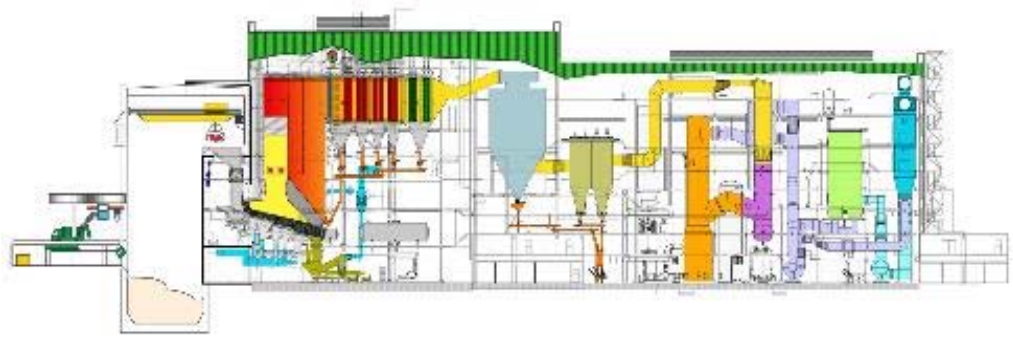
3.これまでの主な活動 ②

期間	活動内容	活動内容サマリー	訪問先等
2/5 ｜ 2/8	第六回現地調査	✓ 団地運営会社と中長期対策としてW2Eについて協議。 ✓ 環境配慮型団地（ベトナム版エコタウン）に関する計画投資省との協議。 ✓ セメント工場の廃熱回収発電事業のフォローアップ ✓ EVバス導入に向けたフォローアップ。	✓ MPI ✓ 工業団地・入居企業 ✓ 輸送会社 ✓ 現地メーカ　など

4.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業導入を想定している技術の実績

導入を想定している技術

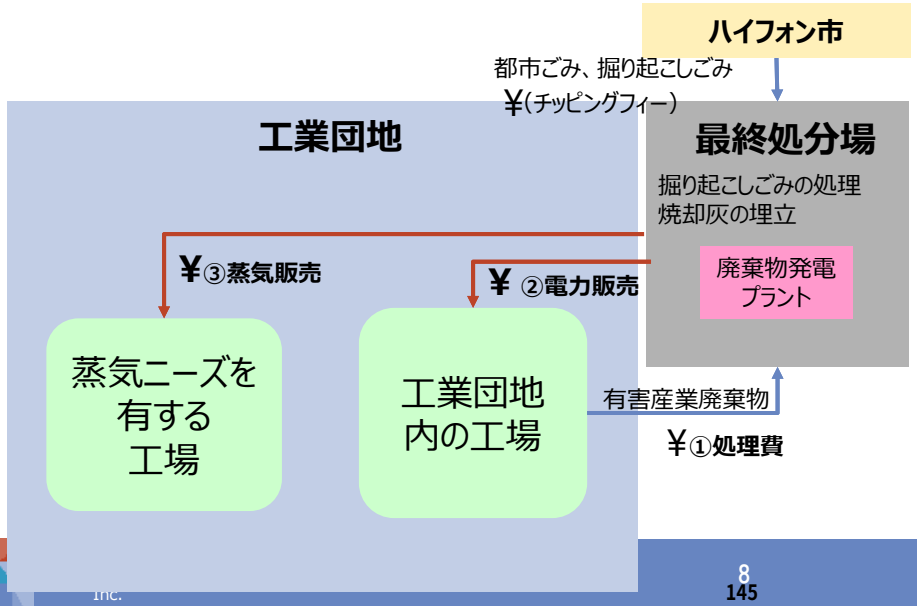
- ストーカ型の焼却炉



- ✓ 海外子会社が設備を納入しているサイトも含めると全世界で500以上の実績
- ✓ 多様なごみ質への対応（低位発熱量 1,200 ～5,000 kcal/kgまで安定燃焼可能）
- ✓ 1系列あたり最大 1,200 t/d まで処理可能
- ✓ 発電効率 最大30%まで達成可能
- ✓ 年間稼働時間 8,000 時間超を達成

4.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業調査進捗状況

- ◆ 下図に示したとおり、廃棄物発電事業を中心に収益源の多様化を図るため、関連調査を実施中。
- ◆ なお、工業団地近傍には、生活ごみの埋め立て処分場があり、工業団地の管理会社ならびに入居企業、ハイフォン市関連部局からは、廃棄物が適正処理されず、山積みされていることによる健康被害への懸念や、実際に健康上の理由でワーカーが退職した例、また、工業団地、ひいては市としての価値の低下を懸念する声が聞かれた。
- ◆ ヒアリング及びアンケート調査により、限定的ではあるものの産業廃棄物発生量及びその処理コストに関する情報を収集。一方、団地への入居企業は増加傾向にあり、今後の団地の拡張計画を含め、産業廃棄物発生量は増加することを想定。
- ◆ 一般廃棄物の性状についても確認。
- ◆ 複数のシナリオを作成し、収益性シミュレーション等を実施（次ページ以降）



収益源多様化につながる情報

① 産業廃棄物処理
- Dinh Vu工業団地に入居している日系企業を中心に、産業廃棄物の発生状況、処理費に関するアンケート調査を実施。

② 電力販売
- 工業団地管理会社との協議により、団地内においては、電気を系統から一括受電して、各入居企業に配電する設備が整っていることから、廃棄物発電によって発電した電力を管理会社に販売することが可能であることを確認。ピークカットのニーズあり。

③ 蒸気販売
- 蒸気の大口需要が見込まれる企業に対して直接ヒアリングを実施。今後、工場拡張に伴い蒸気需要が増加する見込みで、需要に応じたボイラの投資計画が整っている。

5. Target material to be treated

(1) 産業廃棄物

調査結果を基に、ターゲットとなる産業廃棄物の量および性状について下表の通りまとめた。
(別添「sheet 1」参照)

産業廃棄物発生量について

連番	ポテンシャル	排出者	品目	数量	数量単位	処理費	処理費単位	処理費年額(VND)	年間処理費(USD)	処理業者	備考	処理量		単価(US$/t)				
1	x	①Anpha Petrol Joint Stock Company	廃材(グローブ、バルブ、布、ホース等)	-	-	12,000,000	VND/年	12,000,000	600	Dai Thang TNHH Phat Trien	業務都合上、関係を密にする必要がある消防署の勧めで業者選定をしている。入札はしていない。							
2	○	②出光ルブベトナム	廃ドラム	13	t/月	1,000,000	VND/月	156,000,000	7,800	Hoa Binh Industrial Asste	価格、サービスで業者選定の上随意契約							
3	○		廃油	6	t/月	1,000,000	VND/月	72,000,000	3,600	Recycling and Treatment JST		72	t/年	50				
4	○		廃プラスチック缶	2	t/月	2,000,000	VND/月	48,000,000	2,400	Toan Thang Trading & Service		24	t/年	100				
5	○	③信越 マグネティック マテリアルズベトナム	廃油	0.1	t/月	5,000	VND/kg	0	0	回答不可	価格と法令順守したサービスが提供されるかどうか。入札							
6	○	ベトナム日通エンジニアリング	domestic	76.66	m3/年	390,000	VND/m3	29,897,400	1,495									
7	○		Hazardous(蛍光管など)	1532	kg/年	6,000	VND/kg	9,192,000	460									
8	○	④IML TECHNOLOGY VIETNAM	一般廃棄物(食堂ごみ、事務室からの紙など)	5	m3/月	2,000,000	VND/月	24,000,000	1,200	DVIZ								
9	○		プラスチック	3.08	t/月	10,000,000	VND/kg?→VND/t	30,800,000	1,540	安生環境技術合資会社		47.88	t/年	42				
10	○		ダンボール	0.91	t/月	10,000,000	VND/kg?→VND/t	9,100,000	455	安生環境技術合資会社								
11	○		有害廃棄物(廃油・インク)	0.617	t/月	10,000,000	VND/kg?		0	安生環境技術合資会社								
12	x	⑤JXエネルギーベトナム	廃油	-		逆有償			0									
13	x		ウエス	少ない					0									
14	x		ダンボール	-		逆有償			0									
15	x		プラスチック	-		逆有償			0									
16	○	⑥ブリジストン	タイヤ製造材料	1.2	t/day	5,000,000	JPY/年		50,000	アンスンエンバイロメントJSC	今後タイヤ増産に伴いごみも増える見込み	396	t/年	89	330日稼動/年と想定	1,940	工場の規模拡大(4.9倍)	
17	○		ドラム缶	0.5	t/day													
18	○		廃油									165	t/年		330日稼動/年と想定	809		
19	x	日通ロジスティクスベトナム	なし										平均単価	70				
20	○	⑦タマダ	鉄スクラップ			1,000,000	JPY/年											
21	○		廃ドラム						10,000									
22	○		一般ごみ															
23	○		Hazardous															
24									79,549									
25												705	t/年			2,893	t/年	
26												2	t/日		330日稼動/年と想定	9	t/日	
27											入居企業56社のうち、製造業と想定される企業数は30社							
28											上記のアンケート回答企業のうち7社が製造業と想定	9	t/日			38	t/日	
29											今後、団地の拡張に伴い入居企業が拡大し、約4倍になると想定	37	t/日			150	t/日	
											プラスチック、ゴム、廃油等の熱量	8,300	kcal/kg					

5. Target material to be treated

(2) 都市ゴミおよび埋設廃棄物

調査結果による都市ゴミの性状は下表の通り。

一般廃棄物		分析データ					
						単純平均	
項目	単位	サンプル1 市場廃棄物	サンプル2 An Duong	サンプル3 Hong Bang	サンプル4 Hai An		
水分	%	62.5	64.1	64.5	62.3		
不燃分	%	15.2	8.7	9.2	9.1		
可燃分	%	22.4	27.2	26.3	28.6		
ちゅう芥類	%	12.1	11.8	9.6	11		
プラスチック類	%	5.5	8.1	8.5	8.2		
繊維類	%	0.7	1.8	3.5	1.9		
紙類	%	1.1	2.1	2.4	2.1		
その他	%	3	3.4	2.3	5.4		
低位発熱量	Kcal/kg	808	1,184	1,246	1,192	1,108	
比重	ton/m3	0.32	0.27	0.31	0.27		
生活水準の向上とともに、低位発熱量は増加							
			DEEP Cによる推定値			1,800	
			本事業における推定値			1,454	1,450

5. Target material to be treated

埋設廃棄物については下表の通り、DEEP C による分析データと比較した。

埋設廃棄物		DEEP Cによる分析データ										
												単純平均
低位発熱量	kcal/kg	988	3,880	3,309	2,309	4,184	3,271	2,848	3,512	3,064	1,685	2,905

DEEP Cの過去の分析値によると、埋設ごみのカロリーは単純平均で2,900kcal/kgとなる。
埋設されている間に有機分は分解され、水分が減少する一方で、覆土が加わるため平均カロリーは低下するものと想定。
ここでは、分析値（前ページ参照）のうち、市場ごみを除いて、低いデータを活用することとする。

Estimated Value of this research 1,100

6. Energy recovery and Electricity generation

自治体が都市ゴミ用の焼却施設を新設する場合、日本政府（環境省）は補助金を用意する。
エネルギー回収比率が17.5%を超える場合、補助金の割合は初期費用の1/3となり、回収比率が21.5%を超える場合は補助金の割合が大きくなる（初期費用の1/2）。

※ エネルギー回収比率 =
(使用した熱量 + 発電量) / (対象ゴミのエネルギー + 投入エネルギー)

上記により、エネルギー回収比率として、2種の選択肢を提案する。

また、日本政府は高効率発電のレベルを設定しており、その発電効率は20%以上である。.

以上をもとに、エネルギー回収率及び発電効率として、下表を設定した。

発電効率	16%	20%
	比例配分	高効率ごみ発基準
エネルギー回収率	17.5%	21.5%
	1/3補助	1/2補助

7. Setting the simulation pattern (Scenario)

(1)に記載のとおり、産業廃棄物については下表に示したとおり、基本ケースと拡大ケースの２つのシナリオが存在する。

	基本	産廃最大	(t/日)	カロリー	(kcal/kg)	処理費(US$/t)
産業廃棄物	37	150		8,300		70
一般ごみ	408	295		1,450		10
埋設ごみ	55	55		1,100		10
平均熱量(kcal/kg)	1,918	3,467				
	廃棄物基本ケース	**産廃最大ケース**				

また、前項に示したとおり、エネルギー回収率及び発電効率についても、下表に示した２つのシナリオが存在する。

発電効率	16%	20%
	比例配分	高効率ごみ発基準
エネルギー回収率	17.5%	21.5%
	1/3補助	1/2補助
	エネルギー基本ケース	**エネルギー高効率ケース**

7. Setting the simulation pattern (Scenario)

前項のシナリオを踏まえ、以下の４つのケースを設定した。

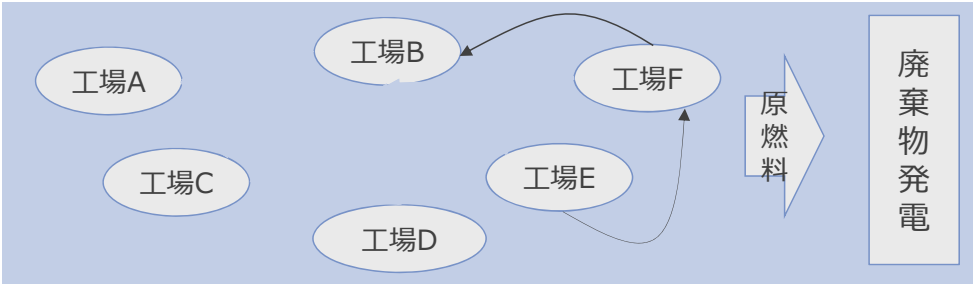
ケース１	エネルギー基本＋産廃基本
ケース２	エネルギー基本＋産廃最大
ケース３	エネルギー高効率＋産廃基本
ケース４	エネルギー高効率＋産廃最大

上記の４つのケースにすいてIRR等のシミュレーションを実施した結果を添付資料に示す。
ケース２及びケース４については、IRRが比較的大きく、プロジェクト採算性は良い結果となった。産業廃棄物のティッピングフィーが十分に大きく、産業廃棄物処理量を拡大すると採算性が向上する。

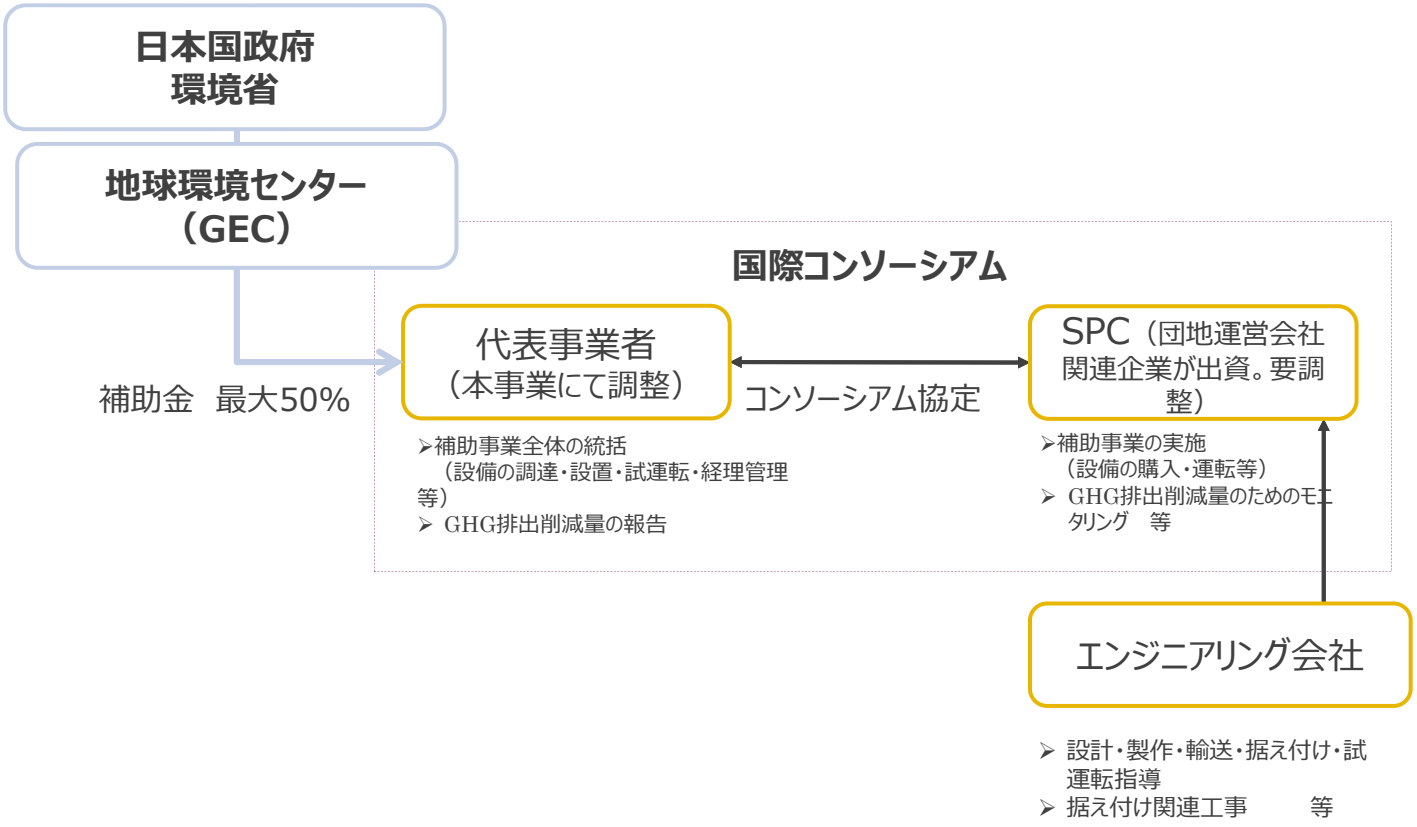
一方、ケース１の採算性は非常に悪く、プロジェクトを実現することが困難と想定される。ケース３については、プロジェクトIRR、エクイティIRRがともに7%程度であり、投資を行うには小さすぎるものと考えられる。しかしながら、産業廃棄物処理量を増加させる、設備の初期投資を削減する、あるいは、蒸気販売を行う等の条件を整えることができれば、プロジェクトの採算性を向上させることができる。

8.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業 ベトナム版エコタウンとの連携可能性の模索

- ベトナム計画投資省（MPI)においては、ベトナム国内で複数のモデル地域を選定し、ベトナム版エコタウンの実現にむけた活動を展開中（UNIDO支援）
- 同モデル事業では、工業団地内で発生する産業廃棄物等のインベントリーを作成し、可能な限り団地内で有効利用するためのモデル活動を展開中
- このベトナム版エコタウン実現に向けた活動のフィールドの一つとして、ハイフォン市内の工業団地が選定される可能性あり
- ベトナム版エコタウンが実現されると団地内で発生する産業廃棄物の可能な限りの団地内利用が促進され、これまで産業廃棄物として処理処分されていたものが、循環資源として団地内で有効活用される可能性が高まる
- エコタウン経験豊富な北九州市は、MPIを支援するとともに、モデル事業の一つとして、工業団地から発生する各種廃棄物を原燃料として利用するための仕組みづくりにも貢献する予定
- 今後、廃棄物発電事業については、ベトナム版エコタウンの枠組みの中の一要素として位置づけていくことも可能性あり



9.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業 想定している事業実施スキーム等



4.都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業プロジェクト実現に向けた課題

No.	調査で解決したい課題	獲得目標	担当	相手方
1	近隣工業団地内工場から受け入れる産業廃棄物の量・質の確認 **→ヒアリング調査を実施済**	Dinh Vu工業団地や、ハイフォン市内の工業団地（野村ハイフォン工業団地等）内に入居する企業へのヒアリングにより、回収可能な廃棄物質・量を確認する。	北九州市 NDK	Dinh Vu工業団地他
2	産業廃棄物処理に関するライセンスを有する現地処理業者との連携可能性検討 **→優先順位を下げるべきとのアドバイス**	直接協議により、産業廃棄物を受け入れるに当たり必要となるライセンスを有する現地処理業者との連携可能性を検討する。	北九州市 NDK	現地処理業者
3	処理対象となる都市ごみと産業廃棄物の組成の確認 **→ヒアリング調査を実施済**	ストーカー炉の導入を基本的なコンセプトとし、今回処理対象とする廃棄物の性状を確認する。	NDK	ハイフォン市
4	3で確認した廃棄物を処理することが可能な廃棄物発電設備の基本検討 **→実施済**	確認した一般・産業廃棄物の量や性状を元に、より廃棄物発電設備の基本検討を行う。	NSENGI	-
5	近隣工業団地への蒸気販売の可能性、ならびに販売量・価格の確認 **→確認済**	導入予定の廃棄物発電設備から発生する熱を利用した蒸気供給の可能性について検討を行う。ヒアリング調査により、工業団地内に需要家となりうる企業の有無の確認、ある場合には販売価格の確認を行う。	NDK TG	Dinh Vu工業団地
6	近隣工業団地への電力供給の可能性、ならびに供給量・価格の確認 →4つのケースについて実施済	プラントで発電した電力をEVNに販売するだけでなく、工業団地に入居する企業に対して直接販売することが可能か、法制度を確認する。可能である場合、供給量や価格についても確認を行う。	北九州市 NDK	ハイフォン市、Dinh Vu工業団地、EVN
7	掘り起こしごみに関する検討 →短期的対策と中長期的対策に分けて検討を実施済	Dinh Vu処分場内に埋め立てられたごみの適切な処理方法（単純焼却、RDF化等）。埋設廃棄物を処理した後の土地の利用可能性、掘り起こしごみ処理にかかる費用を回収する方策について検討する。	北九州市 NDK	ハイフォン市
8	JCM等の補助制度を活用したイニシャルコストの削減→適用予定	事業性を高めるため、JCM設備補助等のイニシャルコスト削減可能性を検討する。	NDK	-
9	発注・契約方式の確認 →概ねのスキームを確認済み	設備導入の契約に当たり入札が必要か、随意契約が可能か確認	NDK	Dinh Vu工業団地

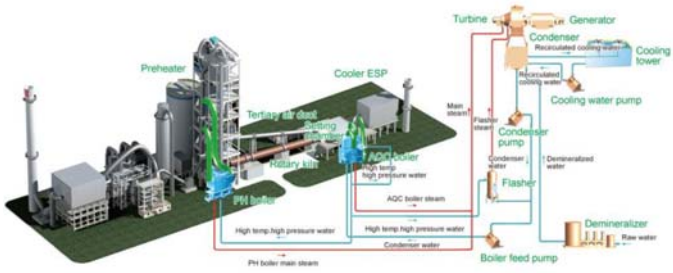
10.セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘 プロジェクト概要・導入を想定している技術の実績

プロジェクトの概要

- ハイフォン市人民委員会から、JCM事業化のポテンシャルのあるターゲットとして紹介を受けたセメント工場における排熱回収発電システムの導入事業の実現に向けた調査を実施する。
- 同社は、2019年に新しい工場の稼動を目指して準備を進めているところであり、設計段階からJCMを活用した設備導入の提案を行うことで、スムーズなJCM事業化の実現を狙う。
- 加えて、都市間連携の枠組みのもと、これまでの活動によって可能性を検討してきた国営のセメント工場の排熱回収発電事業についても、BOT型のモデルを活用した提案を続けることで、ベトナム国内他地域のセメント工場への横展開を視野に入れた活動を行う。
- その他、昨年度までの活動で検討を進めてきた、工業団地内企業への高効率ボイラあるいはコジェネレーションシステムの導入についても継続検討を進め、JCM適用事業としての実現を目指す。

導入を想定している技術

- 廃熱回収発電システム



- ✓ 全世界で240件以上の導入実績あり
- ✓ これまで利用されず捨てられていた熱を回収し発電を行うことで、系統電力からの電力利用量を削減することが可能となる。その結果、系統電力を通じて排出されていたCO2量を削減することが可能となる。

JCM事業としては2件の導入実績あり。
1. 2013年　インドネシア　セメント工場への廃熱回収発電システムの導入(JFEエンジニアリング)
2. 2016年　タイ　セメント工場への廃熱回収発電システムの導入（NTTデータ経営研究所）

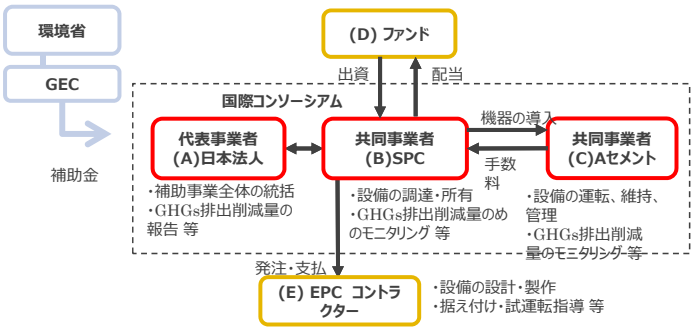
10.セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘 セメント会社との協議進捗状況

◆ セメント会社2社と廃熱回収発電設備の導入について、協議を実施中。いずれも2018年４月の設備補助申請を目指して活動中。

Aセメントとの協議状況

- 国営セメント製造会社である企業グループのハイフォン工場に4.75MWの廃熱回収発電システムを導入する計画。
- 現在、BOT型での事業実施スキームにより2018年４月の設備補助申請に向けて、SPCへの出資者を含めた体制などについて、関係者との協議を継続中。
- 投資家候補も見出し、BOT条件等を調整。
- 発電規模は4.75MW、初期投資は約10MUS＄。

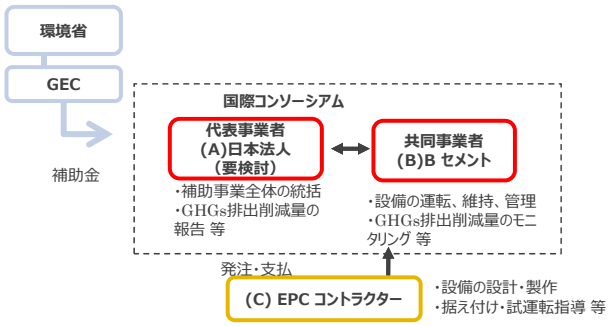
事業体制



Bセメントとの協議状況

- ベトナム国内で建設、交通、運輸を主たる事業としていた大手グループ企業が、ハイフォン市にセメント工場を整備中。
- 2019年４月の稼動に向け、廃熱回収発電システムも合わせて設計検討を行う。
- 2018年４月の設備補助申請に向けて、国際コンソーシアムの体制等について、関係者と協議中。

事業体制



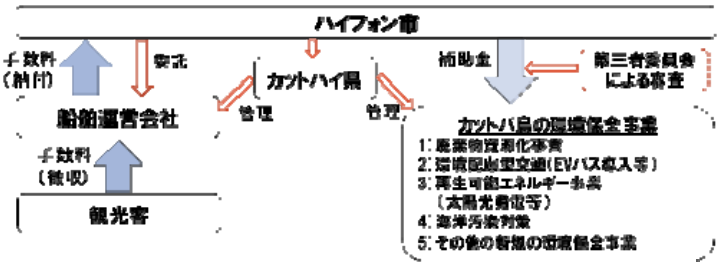
5.セメント工場の廃熱回収発電等のCO2排出削減量の大きいプロジェクトの発掘 プロジェクト実現に向けた課題

No.	調査で解決したい課題	獲得目標	担当	相手方
1	直接協議による、現地セメント工場の詳細データ入手 →実施済	セメントキルンのサイズや稼動計画等、回収可能な廃熱の量を算出するためのデータを入手する。	北九州市 NDK	Bach Dang Cement
2	エンジニアリング会社等と連携した技術検討 →実施済	廃熱回収発電設備の規模、発電見込み量等の概要を設計する。	NDK	Shanghai CONCH Kawasaki
3	2の結果を踏まえた経済性評価 →実施済	投資額・投資回収年数、内部収益率等を明らかにした上で、現地企業の内部投資基準への適合性等を確認する。必要に応じて技術の再検討を実施する。	NDK	Bach Dang Cement
4	３の検討結果を踏まえたCO2排出削減量評価→実施済	設備導入によるCO２排出削減効果の試算を行う。	NDK	-
5	評価結果を踏まえた意思決定の支援 →実施済	JCM設備補助への応募を行う場合は、その準備を行う。	NDK	Bach Dang Cement
6	発注・契約方式の確認 →実施済	設備導入の契約に当たり入札が必要か、随意契約が可能か確認	NDK	Bach Dang Cement

11.離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト プロジェクト概要・導入を想定している技術の実績

プロジェクトの概要

- 離島における環境配慮型活動を事業として成立させる仕組みとして、離島を訪問する観光客を対象に観光手数料を徴収し、同資金を活用して離島における環境配慮型活動を事業として成立させるための働きかけを行ってきている。
- 過去3年間の活動で、まだまだ制度化までのハードルは高いものの、観光手数料に関する認知度は着実に高まっている。2017年には島内の自然を保護するため、ハイフォン市としては、ディーゼルバスのカットバ島への乗り入れが禁止となる。それにあわせて、島内の交通手段として、排気ガスを排出しないEVバス等の導入を計画している。
- 環境保全手数料の仕組みづくり、同仕組みを利用した資金の利用先としての再エネ充電型のEVバスの導入の実現に向けた活動を実施する。



導入を想定している技術

- 日系企業製　EVバス

- ✓ 中国において2010年より累計5000万kmを超える走行実績
- ✓ アルミ合金セミモノコックボディによる世界最軽量のEVバスの実現
- ✓ フルサイズバスとして、世界最小レベルの電力消費（0.8Wh/km）
- ✓ 最新のリアルタイムバッテリー管理システム
- ✓ 蓄電システムを利用した充電による電力のピークカット
- ✓ 太陽光発電からの充電

※上記EVバスは、平成27年から28年度にかけて、GECの途上国イノベーション事業にて、実証を実施。

11.離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト 調査進捗状況・プロジェクト実現に向けた課題

- ◆ カットバ島においては、現在ベトナム大手デベロッパーが大規模開発計画を推進中。
- ◆ ハイフォン市としてはカットバ島の自然遺産登録も視野に、グリーンな観光産業開発を強く要請中。
- ◆ 過去に実施してきたとおり、都市間連携による制度設計支援を推し進めるとともに、デベロッパーともうまく連携しながらJCMスキームを活用した低炭素プロジェクトを実現することで、グリーンなカットバ島開発の実現に貢献できるよう、協議を推進中。既に２回の打合せを実施し、EVバスを含めた交通分野や下水道分野での連携可能性を協議中。
- ◆ 環境保全手数料については、ハイフォン市への働きかけを継続しているものの、時間を要している状況。

No.	調査で解決したい課題	獲得目標	担当	相手方	調査の内容
1	観光手数料制度の導入 →フォローアップ活動継続中	観光手数料制度の導入を実現する。	北九州市 NDK	ハイフォン市（カットハイ県人民委員会、交通局、財務局、天然資源環境局、ハイフォン市人民委員会等）	ハイフォン市（カットハイ県人民委員会、交通局、財務局、天然資源環境局、ハイフォン市人民委員会等）との直接協議を行う。
2	EVバスの商用化 →実証活動を実施中	EVバスを商用化し、カットバ島内での利用普及を促進する。	北九州市 NDK	現地バス会社（Quoc Hung社等）、現地デベロッパ（SUN Group等）	実証データの蓄積を図りつつ、上記協議の進捗状況にあわせて、商用化の準備を進める。

12.年間スケジュール（当初予定）

活動項目	2017年 5月	6月	7月	8月	9月	10月	11月	12月	2018年 1月	2月
①都市ごみと工業団地から排出される産業廃棄物の混焼による廃棄物発電事業		受け入れる廃棄物の質・量の確認、現地所業者との連携可能性検討、ごみの組成確認		技術検討 経済性改善のための施策検討			掘り起こしごみに関する検討、ＪＣＭなどの補助制度を活用したイニシャルコスト削減方法の検討・準備			
②エネルギー起源CO2排出削減効果の高い事業のJCM化		技術検討		経済性評価・直接協議		全体評価			事業化の準備・支援	
③離島における独自の資金調達メカニズムと組合せた低炭素化プロジェクト		制度作りに関する協議								
		EVバス実証データの収集・評価					制度づくりの状況により事業化検討			
○ 現地調査			●		●	●	●	●	●	
○ 国内会議（2回程度）			● 都市間連携WS			●			●	
○ 現地ワークショップ（2回程度）		● キックオフ							● 最終報告会	
○ 報告書の作成						● ドラフト				● 最終版

12.2018年度の活動に向けて

ベトナム版エコタウンの実現を通じた案件形成

- ◆ ハイフォン市の大規模工業団地である、ディンブー工業団地は、ベトナム政府（MPI:計画投資省）が進めるベトナム版エコタウンのパイロットモデルとして選定される見込み。
- ◆ ベトナム版エコタウンでは、団地内で発生する各種廃棄物の可能な限りのリユース・材料リサイクルなどの有効利用を図り、有効利用が難しい場合、サーマルリサイクルとして廃棄物発電等のエネルギー回収が行われる可能性がある。
- ◆ また、ディンブー工業団地では、港湾地区という特性を生かし、風力発電をはじめとする再生可能エネルギーの導入も推進していく予定。
- ◆ わが国のエコタウン第一号の実績を誇る北九州市は、MPIを支援しベトナム版エコタウン実現を支援していく予定。

廃棄物の原燃料化・廃棄物発電・再エネ省エネ機器の導入などエコタウンを通じて、低炭素プロジェクトを形成

フォローアップ活動による案件発掘と多様なビジネスモデルの実現

これまでの活動で発掘・形成してきた事業機会

- ◆通常のEPCに加えBOT型でのセメント工場における廃熱回収発電設備の導入。
- ◆比較的、CO2排出削減規模の大きなプロジェクトの形成。
- ◆BOT型モデルによる化石燃料による熱供給を代替するバイオマス熱利用事業。
- ◆熱需要を有する工場への横展開モデルの形成。
- ◆観光客等を対象とした環境保全のための手数料収入構造を確保した離島型の低炭素化事業。
- ◆離島型ビジネスモデルの形成。

フォローアップ活動を継続することにより、様々なビジネスモデルの低炭素プロジェクトを形成

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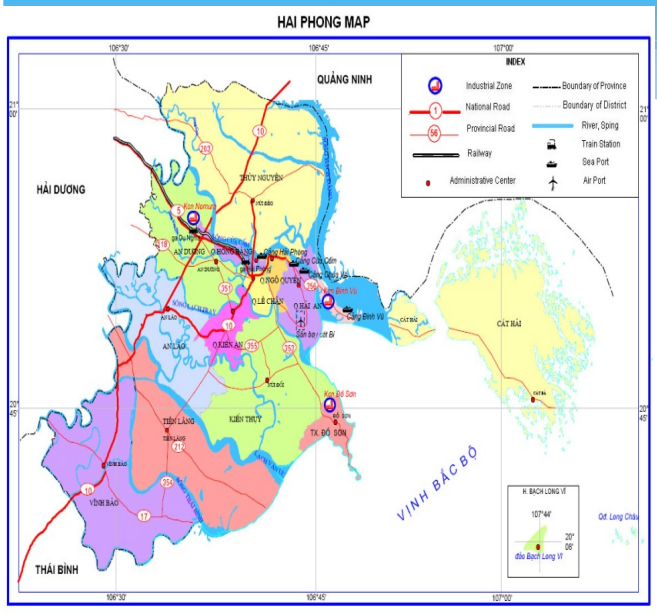
Low Carbon Activities in Hai Phong City based on City-to-City Collaboration

Warm Greetings from Haiphong City
July 2017

General information of Haiphong City



- A big port and coastal city in the North of Vietnam, facing Gulf of Tonkin
- One of the central development of the northern key economic region and Vietnam (Decision 1448/QD-TTg dated 16th Sep 2009 of PM of Vietnam)
- A growth pole in the Northern economic triangle (Hanoi – Haiphong – Quang Ninh)
- The third largest city with a traffic hub (roads, waterway, seaway, railway, airway) -> Center of trade, tourism, services, the main gateway of Vietnam Northern provinces to the sea and the world
- Area: 1,527.4 km2 (589.7 sq mi)
- Population: 1,946,000 (2014)
- Density of population: 1,274 persons/km2 (3,300 persons/sq mi)

Haiphong – Kitakyushu "sister cities"

Visit of Kitakyushu Delegation led by Mayor of Kitakyushu to Hai Phong City in May 2015

* Strengthening delegations exchange between two sister cities in different fields since April 2014
* Strict cooperation in organizing conferences, workshops: 03 Workshops on Green Growth Promotion Plan of Haiphong City (in 2014, 2015); 02 Workshops on pilot projects in the framework of Green Growth Promotion Plan of Haiphong City (04th Aug and 17th Nov 2015); Seminar on Water Supply technology and Management (09th Oct 2015); etc.

2

Formulation of Green Growth Promotion Plan of Haiphong City

Based on Haiphong – Kitakyushu official sister-city agreement signed in April 2014

⟶ Kitakyushu's assistance in formulating the Green Growth Promotion Plan of Haiphong City (2014 – 2015)

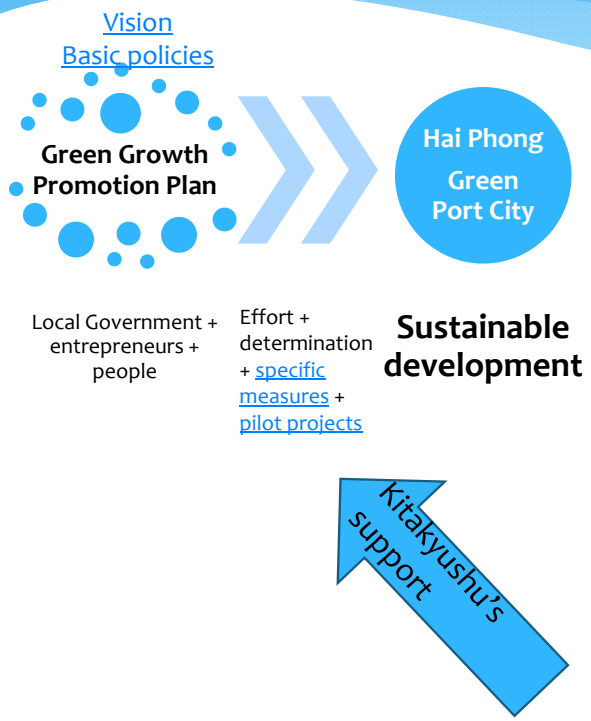
July 2014

October 2014

January 2015

3

Green Growth Promotion Plan of Haiphong City



* Purpose: A Green Port City, sustainable development
* Basic policies to formulate the Plan
* Strengthening inner power of Haiphong & learning experience and know-how of Kitakyushu to implement the Plan

4

Pilot Projects in "Green Growth Promotion Plan" to Haiphong proposed by Kitakyushu

Involving to GHGs	Waste	①Separation and composting of household waste
		②Waste Heat Recovery Power Generation & Utilization of Industrial Waste
		③Recycling of E-Waste
	Energy	④Energy savings and introduction decentralized energy systems in factories & buildings
	transportation	⑤Introduction of low-emission buses
		⑥Promotion use of public transportation
	Cat Ba Island	⑦Development of comprehensive resource recycling system
		⑧Energy saving and introduction of renewable energy &EV buses in Cat Ba Island
	Water & Sewage, Rainwater Drainage	⑨U-BCF expansion project
		⑩Handicraft village wastewater measures
		⑪Introduction of sewerage registry system
	Environmental Protection	⑫Restoration of Tay Nam canal
		⑬Development of air and noise monitoring systems
	Green Production	⑭Installation of high-efficiency furnaces in foundries
		⑮Promotion of green agriculture

5

②Waste Heat Recovery Power Generation & Utilization of Industrial Waste

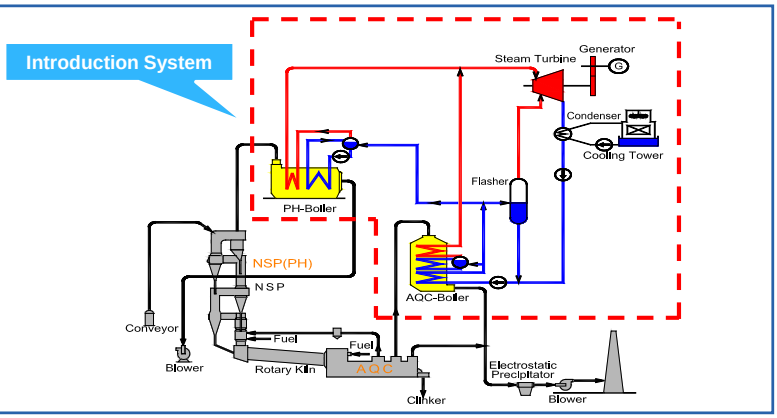
FY2017 JCM City to City corroboration project

In order to accelerate the implementation of Low Carbonization Projects under the framework of the cooperative agreement between City of Kitakyushu and City of Hai Phong. This projects aims to incubate the project with possibility to reduce large CO2 emission mainly in the field of energy-saving such as introduction of power generation system by Waste Heat Recovery in cement plant

Outline of GHG Mitigation Activity

This project is planned to introduce a waste heat recovery (WHR) boiler steam turbine generator system to produce power at cement production plant located in Haiphong City, Vietnam. The generated electricity is used in the cement plant.

WHR system contributes to the reduction of GHG emission to substitute the electricity from the power grid.



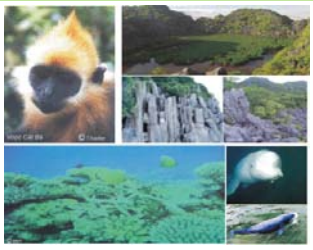
Project member for this study

Sites of JCM Model Project

6

⑧Energy saving and introduction of renewable energy &EV buses in Cat Ba Island

Demonstration run of EV bus in conjunction with solar power in Viet Nam



Energy savings and introduction of renewable energy and EV buses in Cat Ba Island where Hai Phong City Is trying to register as World Heritage .

Low-carbon technical innovation creation project for developing countries

(Period: Feb.2017 to Feb 2020)

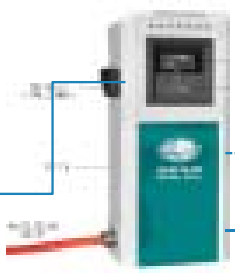
- Joint development by local company, Soft Energy Controls, with a Chinese company (provider of technologies to control storage batteries)
- Introduction of first EV bus in Viet Nam Temporary import measures→Approved by prime minister
- Demonstration run→Development of guidelines by the Ministry of Transport

Achieving CO2 Zero Emission Transportation !!

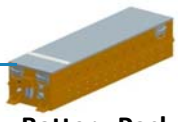
PV Power Generation (Roof-Top) in Bus Port 51KW

Directly Charging (In case still remain)

PV Power Generation PCS 51KW(DC/AC)



Battery Pack Charging 576V250A（AC/DC）



Battery Pack

Exchanging

7

Thanks for your attention

Welcome to Haiphong City

NTT DATA
Global IT Innovator

FY 2017 JCM Project by City to City Collaboration "Project to Accelerate Low Carbonization in Hai Phong City (Energy Sector) / Kitakyushu-Hai Phong Cooperation Project

January 30, 2018

City of Kitakyushu, Kitakyushu Asian Center for Low Carbon Society
NTT Data Institute of Management Consulting, Inc.

[Contents]

NTT DATA

1. Background and Objectives of the Project

Cooperative Relationship between Hai Phong city and Kitakyushu city

- Kitakyushu and Hai Phong city established a sister city relationship in 2014.
- In the same year, Kitakyushu city supported Hai Phong city to establish the "Hai Phong city Green Growth Promotion Plan", which is officially approved by Hai Phong People's Committee and targets at 7 sectors, Waste, Energy, Transportation, Cat Ba Island, Water & Sewerage and Rainwater Drainage, Environmental Protection, and Green Production. Especially, the first 4 sectors that have a deep connection with GHG emissions are the main targets.

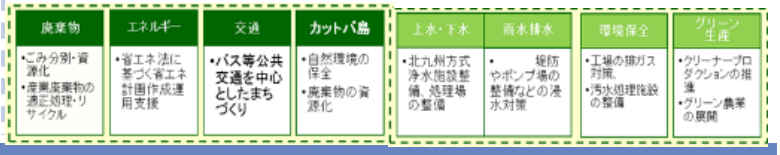
Past Activities

1. Installation of High Efficiency Kiln in Sanitary Ware Manufacturing Factory
   - JCM Model Project (adopted at 2nd public offering in FY 2015)
   - Expected CO2 Emissions Reduction: **1,400tCO_2/y**
   - Implementation Structure
     - Representative: TOTO
     - Partner: TOTO VietNam
     - EPC: NGK Insulators

2. Introduction of Solar PV System at shopping
   - JCM Model Project (adopted at 2nd public offering in FY 2015)
   - Expected CO2 Emissions Reduction: **274tCO_2/y**
   - Implementation Structure
     - Representative: AEON Retail
     - Partner: AEON VietNam
     - EPC: Next Energy & Resources

3. Introduction of High Efficiency Air-conditioning in Hotel
   - JCM Model Project (adopted at 2nd public offering in FY 2015)
   - Expected CO2 Emissions Reduction: **826tCO_2/y**
   - Implementation Structure
     - Representative: NTTD IMC
     - Partner: Peace Real Estate Investment Company Limited

4. GEC Innovation Project for Developing Countries (adopted in FY 2015)
   - Implementation Structure
     - Representative: Soft Energy Controls
     - Partner: NTTD IMC, Quoc Hung Company Limited



2. Assumed Outline of Project

The investigation of 3 kinds of projects will be conducted through cooperation between Hai Phong city and Kitakyushu city.

Expected Businesses	① Waste-to-Energy of Mixed Combustion of Municipal Solid Waste and Industrial Wastes emitted from Industrial Park	② Discovery of Businesses for Large CO2 Emission Reduction such as Waste Heat Recovery Power Generation at a Cement Plant	③ Low Carbonization Project in a Remote Island combined with Unique Funding Mechanisms
Outline	Taking measures to enhance profitability by combining the mixed combustion of industrial wastes, steam selling, etc., mainly the waste disposal at a disposal site adjacent to an industrial park.	Considering introduction of waste heat recovery power generation system in a cement plant which will be build in Hai Phong city.	Continuing the discussion for introducing an environmental fee system to strive for building a model of low carbonization of a remote island using a mechanism of the fee.
Technology to be installed	Waste-to-Energy System	Waste Heat Recovery Power Generation System	EV Bus, etc.
Scheme	As per the appendix		
Contract Method	Assuming Negotiated Contracts		
Subsidy & Cost-effectiveness	To be considered depending on the survey results		
Issues to be solved	Securement of profitability to implement the project	• Detachment of Waste Heat Recovery Power Generation System from Cement Plant • Competitors	Negotiation with interested administrative bodies to adopt the system

3. Main Activities so far

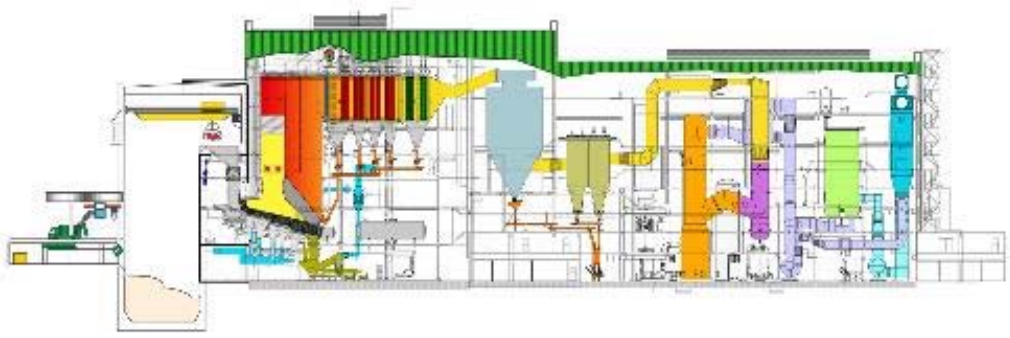
◆ 5 Field Investigations

Period	Activity	Summary	Visit
7/31 – 8/5	1st Field Investigation	✓ Kickoff meeting with Hai Phong city ✓ Interview about generation of municipal solid and industrial wastes ✓ Discussions with related parties about the introduction of waste heat recovery power generation system in a cement plant using JCM	✓ Hai Phong city authorities ✓ Industrial Park and its tenants ✓ Cement companies ✓ Shipping companies, etc.
7/25 – 7/28	City to City Collaboration Workshop (Kitakyushu city, Kawasaki city)		
9/4 – 9/7	2nd Field Investigation	✓ Interviews with tenants in Industrial Park ✓ Consideration of countermeasures against bad odors from the disposal site adjacent to the industrial park ✓ Adjustment of the implementation structure of the cement plant project ✓ Preparation for the equipment subsidy of heat supply business using biomass	✓ Hai Phong city authorities ✓ Industrial Park and its tenants ✓ Shipping companies ✓ Cement companies, etc.
10/1 – 10/7	3rd Field Investigation	✓ Interviews about industrial wastes originated from the industrial park (continued) ✓ Adjustment of the business model for cement plants ✓ Discussions with major developers about a remote island development project ✓ Preparation for the equipment subsidy of a biomass boiler	✓ Hai Phong city authorities ✓ Industrial Park and its tenants ✓ Major developers ✓ Major suppliers, etc.
11/12 – 11/17	4th Field Investigation	✓ Continued interviews about industrial wastes originated from the industrial park and questionnaire ✓ Discussion with a cement company about their intended plant ✓ Continued Discussions with major developers	✓ Hai Phong city authorities ✓ Industrial Park and its tenants ✓ Major developers ✓ Major suppliers, etc.
12/16 – 12/20	5th Field Investigation	✓ Discussions with industrial park operators about a short-term and a mid-long term strategies ✓ Discussion with Ministry of Planning and Investment about an environment-friendly industrial park (Vietnamese eco-town) ✓ Follow-ups for the cement plant project ✓ Follow-ups for the EV bus introduction	✓ MPI ✓ Industrial Park and its tenants ✓ Shipping companies ✓ Local suppliers, etc.

4. Waste-to-Energy of Mixed Combustion of Municipal Solid Waste and Industrial Wastes emitted from Industrial Park
Assumed Technology to be introduced

Assumed Technology to be introduced

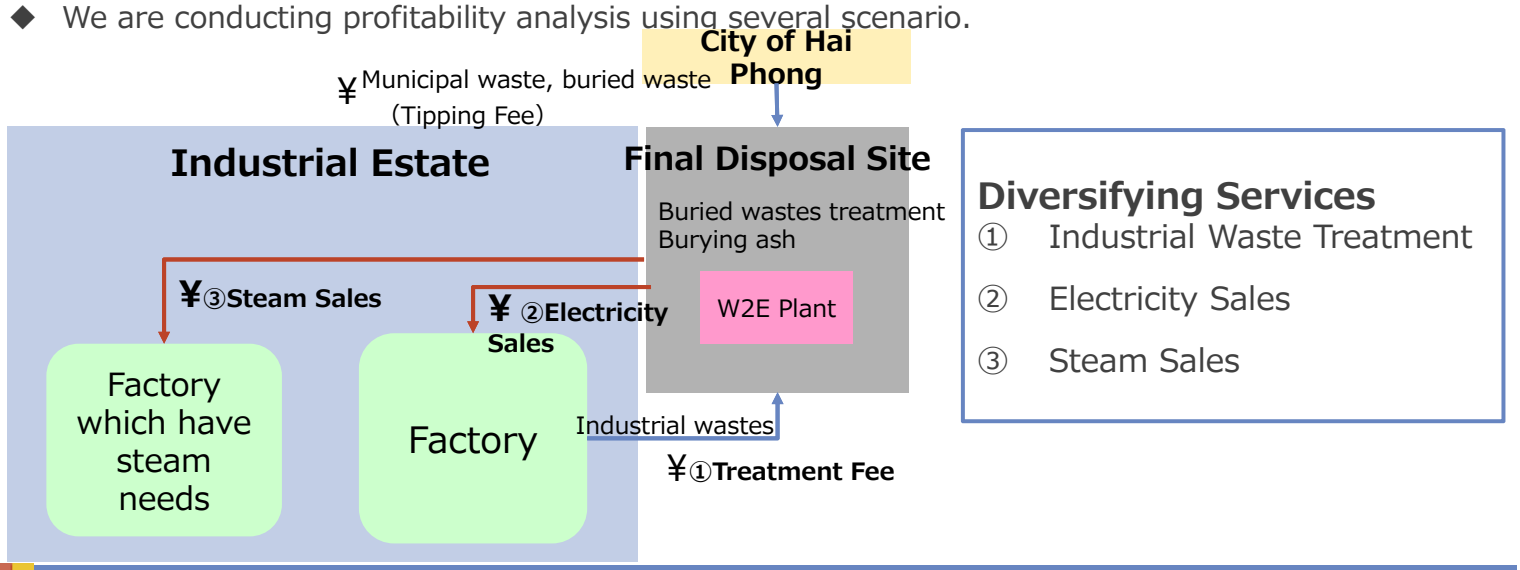
➢ Stoker-type Incineration Plant



- ✓ Enough Experience: above 500 including overseas subsidy
- ✓ Flexibility: Treat various type of wastes (Stable incineration LHV 1,200 ～5,000 kcal/kg)
- ✓ Scalability: Maximum 1,200 t/d per 1 line
- ✓ Power Generation efficiency: Maximum30%
- ✓ Operational Time: 8,000 hours / year

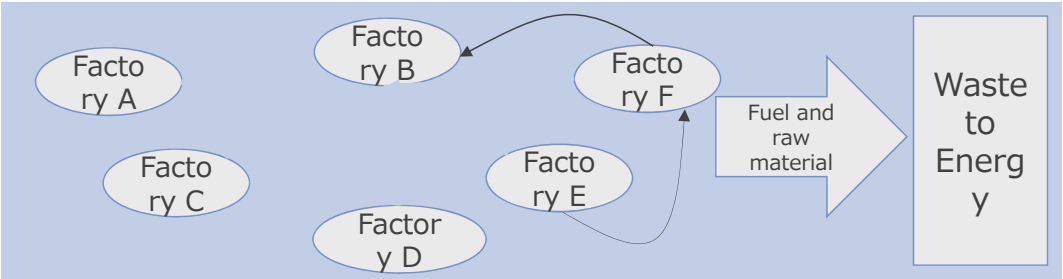
4. Waste-to-Energy of Mixed Combustion of Municipal Solid Waste and Industrial Wastes emitted from Industrial Park
Progress Status

- Continuing related research to realize waste to energy project by diversifying services as below.
- Municipal waste final disposal site exists near the industrial estate. Management company of industrial estate, factory owner and Hai Phong city expressed concerns of the decrease of the value of the industrial estate, health problems of the workers due to improper treatment of the wastes and
- Quantity and the cost for the treatment of the industrial waste were collected through interviews and questionnaire research. Since the number the company in the estate increases, quantity of the industrial wastes to be treated will increase.
- Checked the quality of municipal wastes
- We are conducting profitability analysis using several scenario.

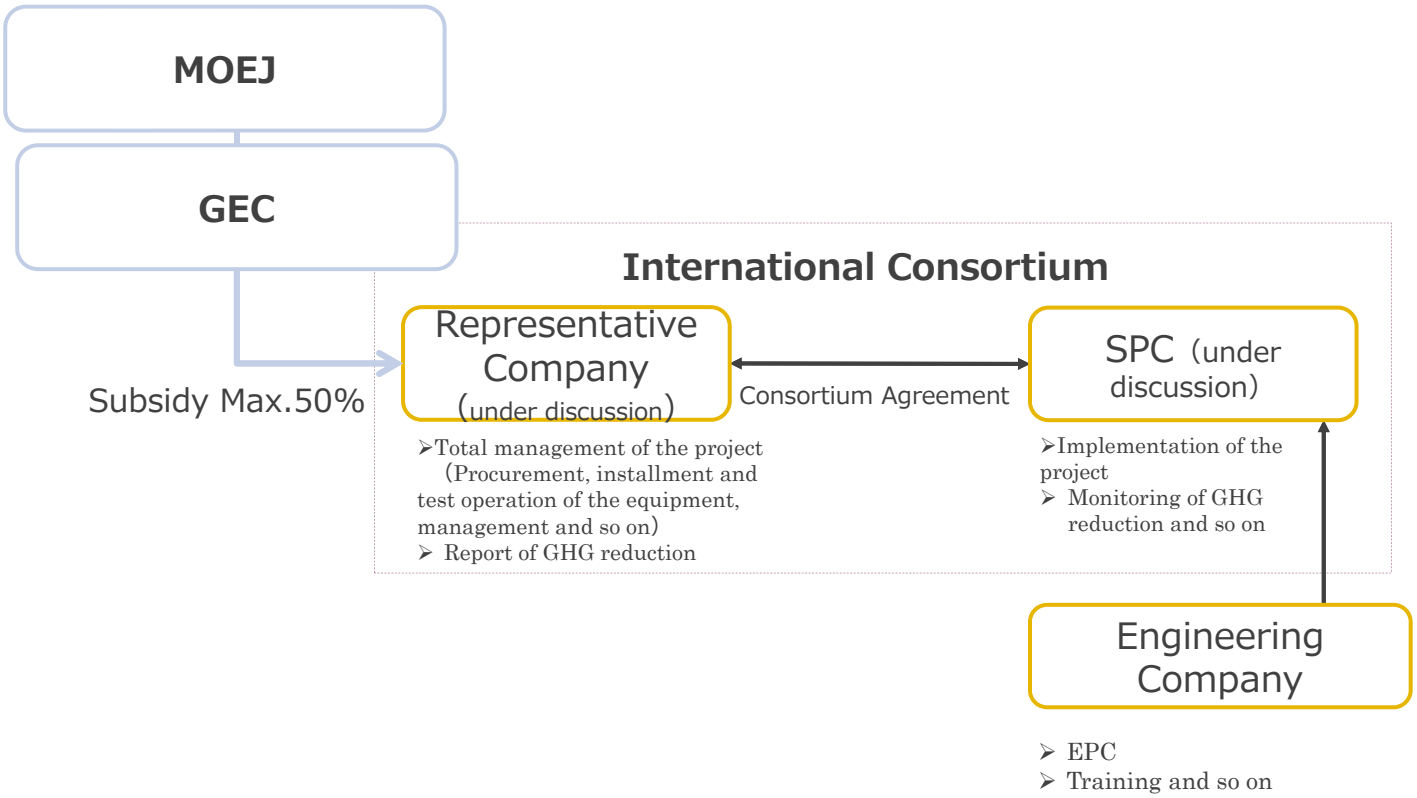


4. Waste-to-Energy of Mixed Combustion of Municipal Solid Waste and Industrial Wastes emitted from Industrial Park
Possibility of Eco-town in Vietnam

- Ministry of Planning and Investment in Vietnam (MPI) started model projects to realize Eco-town in Vietnam and selected several areas (Support by UNIDO)
- Inventory of industrial wastes are prepared, waste re-utilization and circular utilization will be tried in the above model projects.
- There is a possibility that an industrial estate in Hai Phong will be selected as one of the field.
- In eco-town in Vietnam, generated industrial wastes will be re-used or recycled as much as possible and wasted material will be reduced.
- City of Kitakyushu which has enough experience to realize Eco-town is requested to support MPI and model project. In the model project, various wastes from an industrial estate will be used as fuel or raw material for other factory.
- Waste to energy project will be considered as one of the element of Eco-town.



4. Waste-to-Energy of Mixed Combustion of Municipal Solid Waste and Industrial Wastes emitted from Industrial Park
Assumed Project Implementation Structure



5. Discovery of Businesses for Large CO2 Emission Reduction such as Waste Heat Recovery Power Generation at a Cement Plant
Outline of Project / Assumed Technology to be introduced

Outline of Project

- Conduct a research of waste heat recovery & electricity generation on the cement factory which was introduced by people's committee in Hai Phong
- Cement factory has a plan to construct a new cement production line by the end of 2019 and would like to install waste heat recovery system at the beginning
- In addition, cement company owned by the government which has been collaborating with us through city to city relationship have an interest in BOT type of waste heat recovery project.
- Besides, we will continue a research from last year on introducing co-generation system or high efficiency boiler into a factory in the industrial estate.

Assumed Technology to be introduced

- Waste heat recovery & generation system

- ✓ Enough Experience : Over 240 in the world
- ✓ Electricity from the grid will be replaced by waste heat recovery and electricity generation. As a result, CO2 emission through the electricity from the grid will be reduced.

2 projects as a JCM
1. 2013, Indonesia JFE engineering
2. 2016, Thailand NTT Data Institute of management Consulting Inc.

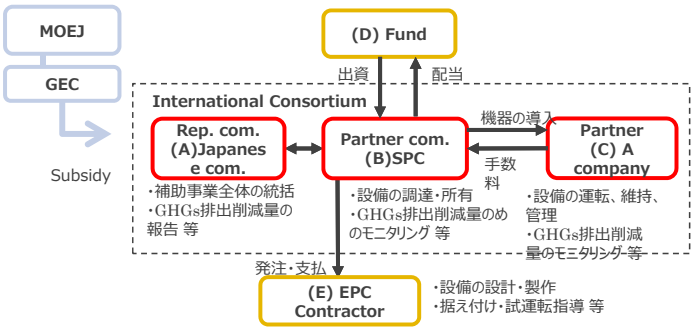
5. Discovery of Businesses for Large CO2 Emission Reduction such as Waste Heat Recovery Power Generation at a Cement Plant
Progress Status

◆ Continuing the discussion with 2 cement companies on introducing waste heat recovery & electricity generation system. We are planning to submit JCM subsidy program in 2018.

A cement company

- Planning to introduce 4.75 MW WHR & electricity generation plant in Hai Phong factory of national cement company.
- Keeping the discussion on the conditions for BOT type of project such as investor.
- We have already found out an investor.

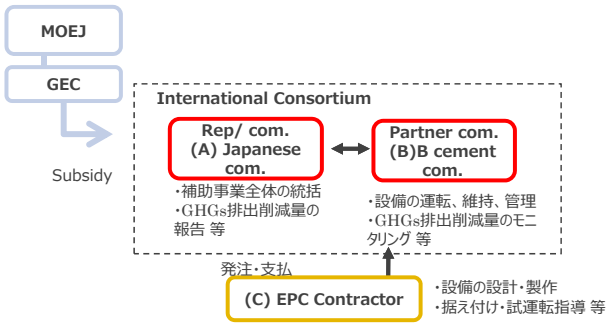
Project Implementation Structure



B cement company

- Large company group which conducts business in Construction and Transportation started the construction of cement factory in Hai Phong.
- They are planning to install WHR & electricity generation system starting the operation around April, 2019
- Continuing the discussion on project structure and members.

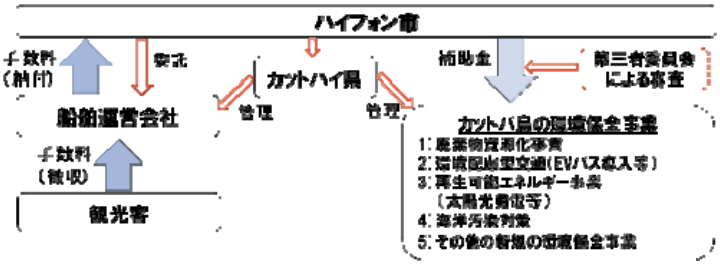
Project Implementation Structure



6. Low Carbonization Project in Remote Islands combined with Unique Funding Mechanisms
Outline of Project / Assumed Technology to be introduced

Outline of Project

- We have been proposing a scheme to collect a commission from tourists visiting a remote island and use it as an environment protection activity in the island.
- The awareness of new scheme have been increasing through past 3 years activity. However, it takes more time to realize the scheme. Diesel bus will not be allowed in the island and EV bus will be used as a transportation method in the island.
- Continuing the proposing activity to Hai Phong city to introduce a new scheme.



Assumed Technology to be introduced

- EV bus by Japanese company

- ✓ Enough experience: above 50 million km from 2010 in China
- ✓ Light weight: lightest body using aluminum alloy
- ✓ High energy efficiency: highest energy efficiency as a full size bus (0.8Wh/km)
- ✓ Advanced real time management battery system
- ✓ Peak-cut by using electricity storage system

※Demonstration project was conducted in 2016 and 2017 under the support of GEC

6. Low Carbonization Project in Remote Islands combined with Unique Funding Mechanisms Progress Status

- Large developer in Vietnam has a plan to construct resort facilities in the Island.
- City of Hai Phong request green development since the island is considered as a candidate for world heritage.
- We conducted the meeting twice with the developer and check the possibility to introduce low-carbon technologies. Transportation system using EV bus and waste-water treatment were the major topics of the discussion.
- Keeping the proposing activity to introduce a commission from tourists for environmental prevention.

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