Large scale JCM feasibility study in FY2015

(JCM Project Formulation Study through City-to-City Collaboration in Yangon)

Final Report

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Nippon Koei Co., Ltd Kawasaki City

Large scale JCM feasibility study in FY2015 JCM Project Formulation Study through City-to-City Collaboration in Yangon

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ABBREVIATION

#	Abbreviation	Meanings		
1	CCFL	Cold Cathode Fluorescent Lamp		
2	CPLA	City Planning and Land Administration Department		
3	GHG	Greenhouse Gases		
4	INDC	Intended Nationally Determinaed Contributions		
5	JCM	Joint Crediting Mechanism		
6	MIC	Myanmar Investment Committee		
7	MOECAF	Ministry of Environment Conservation and Forestry		
8	MOU	Minitues of Undestanding		
9	NAPA	National Adaptation Programmes of Action		
10	PCCD	Pollution Control and Cleansing Department		
11 UMFCCI The Republic of the Union Commerce and Industry		The Republic of the Union of Myanmar Federation of Chambers of		
		Commerce and Industry		
12	YCDC	Yangon City Development Committee		

CHAPTER 1 BACKGROUND OF THE STUDY

1.1 BACKGROUND

Yangon City, the former capital of the Republic of the Union of Myanmar, is one of the largest commercial cities in the country which population is 5 million. In response to the democratization in recent years, rapid urbanization of Yangon city is on-going through the inflow of foreign capital and development by private companies. However, the city faces the difficulties such as deterioration of infrastructure due to the limited investment, technical assistance and social development from foreign countries against the military government. More specifically, there are some problems to be considered, for example, the demand far exceeds the supply of electricity power with the urban development and infrastructure development, traffic congestion is caused by the poor road condition or lack of facilities, including signal, and the lower capacity of water supply and sewerage facilities by their aging. In addition, energy saving of buildings by private investment would be a point to be considered for the increasing power demand in the future.



Figure 1-1 Map of the Yangon City

Japanese local government has been addressed and managed the issue of pollution and other related issues caused by economic development during the post-war economic recovery so that it is expected to contribute to mitigate such negative impacts in Yangon city which is currently facing the similar issues. To this situation, Kawasaki city in Kanagawa prefecture where function as the core city of the neighboring Keihin industrial area, has a variety of experiences and knowledge such as pollution measures or industrial development. And, in

recent years, the city has been actively involved in the activities toward low-carbon society inside and outside of the countries.

1.2 PURPOSE

This study is aimed to find and form the candidate projects of Joint Crediting Mechanism (JCM) in Yangon city, where rapidly developing, through city-to-city collaboration with Kawasaki city which has the useful knowledge for low-carbon emission society, and contributes to the Yangon city's problem-solving.

1.3 PROJECT IMPLEMENTATION SCHEME

Nippon Koei Co., Ltd., implements the study as the proponent in this project in cooperation with Kawasaki city as co-proponent and Yangon City Development Committee (YCDC) as counterpart.



Figure 1-2 Implementation Structure of the Project

This project proposed four (4) low-carbon theme (JCM candidate projects) and the technology in each theme was introduced by the following companies as a co-proponent; Ebara Refrigeration Equipment & Systems Co., Ltd. (introduction of high-efficiency air conditioning systems), Ebara Corporation (introduction of high-efficiency pump), NANOFUEL Co., Ltd. (introduction of nano-emulsion fuel), Cool Japan Co., Ltd.

(introduction of the CCFL¹). Also Kawasaki green innovation clusters, association companies are approximately 100 companies, joined the project as cooperation corporate entity to examine the theme. The result of examination for JCM project formulation is described in chapter 5.

Also, Mingaladon industrial park, located in the northern part of Yangon City, showed their intentions to cooperate/participate in the proposed low-carbon industrial park, and cooperated with the study as a co-proponent of this proposed project. In addition, Myanmar Koei International Ltd., one of group companies of Nippon Koei and also local subsidiary in Myanmar, had the main responsibilities for information collection and the consultation coordination as contact place for the Yangon city and related ministries and agencies.

¹ CCFL stands for Cold Cathode Fluorescent Lamp

CHAPTER 2 OVERVIEW OF YANGON CITY

2.1 OVERVIEW

2.1.1 Basic Information

Yangon city, formerly known as Rangoon, has been the capital of Republic of the Union of Myanmar until 2006. The current capital is Naypyidaw which lies to the North of Yangon. Yangon city belongs to Yangon region, an administrative area. The region has the north and east boarder with Bago region, west border with Ayeyarwady, and Mottama bay in the south. Yangon region including Yangon city is one of the most industrialized area in Myanmar, and most of the major industry is concentrated in this region.

The following table shows the basic information of Yangon city comparing to that of the Japanese counterpart of this Project, namely Kawasaki city.

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Item	Yangon city	Kawasaki city
Area [km ²]	598.8	143.0
Population [person]	521 million (2014)	147 million (2015)
Average daily temperature [degree Celsius]	27.5	16.6

Source: Study Team based on the references

According to the recent rapid urbanization, the population had been increased about threefold from 1998 to 2014.



Development Programme in the Greater Yangon (2011), and tentative result of Population census (2014)

Figure 2-1 Change of the Population of Yangon City

The budget of Yangon City Development Committee (YCDC) is shown in the table below. The budget had been increased about 1.5 times for five (5) years from 2007 to 2012, and the expenditure also increased accordingly. The budget scale is expanding according to the economic growth of Myanmar.

					Unit:	MMK Million
#	Item	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012
1	General income	33,672.80	33,857.18	40,097.32	46,429.09	49,972.62
2	Income from investment	370.10	1,168.40	5,505.82	30,745.30	5,794.85
	Sub-total	34,042.90	35,025.58	45,603.14	77,174.39	55,767.47
3	General expenditure	20,585.61	26,450.70	27,048.18	49,533.65	37,225.23
4	Expenditure for investment	13,440.00	24,119.50	21,894.50	37,381.50	16,740.00
	Sub-total	34,025.61	50,570.20	48,942.68	86,915.15	53,965.23

Table 2-2Annual budget of YCDC

Source: YCDC

2.1.2 Yangon City Development Committee (YCDC)

Myanmar has the seven (7) regions and seven (7) states composed of district/township, and each of region/state has a local administrative organization stipulated as the Constitution. However, YCDC, which is not stipulated in the Constitution, is in charge of administrative service in Yangon city according to the Low on Development of Yangon City. The administrative mandate of central and region/ state is defined in the Constitution².

YCDC constituting with 27 departments, is responsible for administrative service to the 33 townships in Yangon city, such as operation and maintenance of public facility (road, market etc.), administrative control (issuance of construction permission, sanitary control of restaurant business etc.), and others (water supply operation etc.). Major task of YCDC is operation and maintenance of the existing facilities, and YCDC has little intervention in establishment of new projects and preparation of development plan.

The counterpart of this study is a joint team of two (2) departments of YCDC. One of them is the Department of City planning & Land Administration (CPLA), a newly established department under Secretary. The other is the Pollution control & Cleansing Department (PCCD), which is in charge of planning and implementation of waste management and cleansing. The organizational structure of YCDC and the roles of each sub-group are shown in the table below.

² Although a document clearly defining the mandate of the central, local government and YCDC does not exist, their mandate is conventionally defined and understood mutually.



Source: YCDC

Note : Departments colored GREEN and YELLOW shows the counterparts of the Project

2.2 CURRENT SITUATION OF YANGON CITY

2.2.1 Major Industry

YCDC had contributed to develop Myanmar as the leading city, and currently YCDC is expected to lead Myanmar to convert its major industry from agriculture to commerce.

Industry	Summary			
Manufacture	In industrial zone of Yangon city, more than 2,800 factories are under operation. The			
	most of the factories are categorized into food/metal/timber process, rubber/plastic			
	manufacture, fix/installation of equipments, and sewing. As the Ministry of			
	Commerce of the central government leads to construct and manage the factories,			
	YCDC has less intervention in them.			
Commerce	Yangon city has various markets categorized into the followings: (i) Traditional market (ii) Modern commercial facilities (shopping center, super market, convenience store etc.) (iii) Private shop (iv) Street stall. Yangon city has more than			
	150 traditional markets, and more than 50 modern commercial facilities.			
Service	In Yangon city, there are more than 200 of hotels and restaurants, and amusement			
	facilities such as movie theater, and the number of those facilities is increasing.			

Table 2-3Major Industry of Yangon City

Source: Study Team based on Report of JICA Preparatory Study for Urban Development Programme in the Greater Yangon (2011) Note : Traditional market means public market where sells various products such as rice, oil, oil seeds, beans, other foods

Note : Traditional market means public market where sells various products such as rice, oil, oil seeds, beans, other foods and snacks, plastic and plastic products, hemp sack, mat, waterproof sheet, etc.

Figure 2-2 Organizational Structure of YCDC

Industry of Myanmar relies on agriculture likewise the neighbor Asian countries, while that of Yangon city depends on manufacture and commerce. Current industrial structure of Myanmar constitutes with 36 % Agriculture/Livestock/Fishery/Forestry, 20% manufacture, 20% commerce, 18% service, while that of Yangon city is 37% manufacture, 25% commerce, 24% service. The table above shows the summary of the industry of Yangon city.

2.2.2 Business Expansion of Japanese Companies to Myanmar

- 1) In Yangon city, the number of construction of transportation infrastructure such as elevated bridge, hotel, shopping mall, buildings has been drastically increased.
- 2) It is not actively promoted to save energy of the existing facilities in Yangon city compared with the other Asian nations because the managers put priority to operate the existing infrastructure rather than renovation of private buildings, energy saving as it has not passed long time since economic closure.
- 3) In Myanmar, foreign companies started to expand their business in Myanmar after lifting the economic blockage. However, the foreign companies has limitations, such as (i) retail/ service (ii) difficulty in obtaining a export license except companies which import all the materials, process in Myanmar, and export all the products. These limitations are revised frequently, and the companies are forced to follow the circulars and bylaws on investment issued by Myanmar Investment Committee (MIC).
- 4) Most of the equipment for daily life in Yangon were brought from the foreign countries as second-hand products or imported from China. Most of the private vehicles, and buses were used-ones brought from Japan, and many of the home electronics such as air conditioner and generator are imported from China.

2.2.3 Strategy against Climate Change in Myanmar

The study target, Yangon city, has not yet developed organizations and institutions against climate change. Therefore, the following sections show the collected information on the national strategy against climate change.

(1) Emission of Green House Gas (GHG) in Myanmar

Myanmar submitted the first national communication in 2000. According to it, the major source of GHG emission is land use and forest sector (36.5%), following agriculture (17.1%), and waste (4%). Land use and forest sector shares much in both absorption and reduction amount.

		v		
Sector		Share		
Sector	Absorption	Gross reduction	Net reduction	Gross reduction
Energy	0	786	786	1.2
Industry	0	463	463	0.3
Agriculture	0	22,843	22,843	17.1
Land Use and Forest	142,221	40,405	-101,816	36.5
Waste	0	2,826	2,826	4.0
Total	142,221	67,323	-74,898	100.0

Table 2-4GHG emission in Myanmar in 2000

Source: The 11th workshop on GHG inventories in Asia

Potential reduction amount of CO_2 emission was estimated by UNEP RISO CENTER based on its past data as shown in the table below.

Sector	Potential reduction amount of CO ₂ emission [tCO ₂ /year]
REDD+/Avoid deforestation	133,883,430
Afforestation/ plantation	419,363,560
Charcoal manufacture	127,920
Power generation from waste	589,400
Convert from fossil fuel	1,706,353
Water power generation	47,900
Wind power generation	655,750
Popularization of compact fluorescent lamp	150,000
Improvement of efficiency of equipments for heat	6,500,000
generation	
Improvement of process of brick manufacture	500,000
Utilization of biodiesel in transportation sector	500,000
Utilization of Ethanol fuel	100,000
Introduction of express bus transportation system	25,000

Table 2-5Potential reduction amount of CO2 emission by sector

Source: EMISSIONS REDUCTION PROFILE Myanmar (UNEP RISO, June 2013)

(2) Organizational Structure and National Strategy against Climate Change

The organizational structure for climate control in Myanmar is composed of the Ministry of Environmental Conservation and Forestry (MOECAF³), established in 2012, and the following six (6) divisions/ organizations: Department of survey, Department of forestry, Department of environment conservation, Department of afforestation of dry zone, and Forestry University. The agreement on JCM on 16th September 2015 was signed by the Deputy Minister of MOECAF, Dr. Thet Thet Zin.

³ As of February 2016

Myanmar ratified UNFCCC on 25th November 1994, and Kyoto Protocol on 13th August 2003. National counter measurement against climate change is shown the table below.

Policy	Year	Content
Myanmar National Environment	1994	Conservation and prevention from deterioration of
Policy		environment, promotion of economic development,
		achievement of sustainable development which puts
		priority to environment protection, development in
		harmony with environment
Myanmar • Agenda 21	1997	Sustainable natural resources utilization, social
		development, economic development, organization
		development
National Sustainable Development	2009	Strategy to achieve sustainable development in the three
Strategy		fields: Society/ Economy/ Environment
Law on Environment Protection	2012	Control/ prevention from loss/ sustainable utilization of
		natural resources, improvement of public awareness, and
		cooperation for environment program
National Adaptation Programmes	2012	Implementation of the 32 prior activities from the eight (8)
of Action (NAPA)		target sectors for adaptation
JCM	2015	Bi-lateral agreement on JCM

 Table 2-6
 National Action against Climate Change

Source : Study Team based on Handbook of national market mechanism, IGES, January 2013, and 11th workshop on GHG inventories in Asia and the published information by the UN prepared by the JICA study team

Myanmar has developed NAPA in 2012, which shows the 32 prior activities from the eight (8) target sectors (agriculture, disaster prevention, forest, public sanitation, water resource, coast protection) for adaptation. Based on it, Myanmar has implemented the prior activities.

CHAPTER3 OVERVIEW OF KAWASAKI CITY

3.1 BASIC INFORMATION

Kawasaki City is located in the North-eastern area of Kanagawa Prefecture. The city has the north boarder along Tamagawa River with Tokyo Prefecture, and the south boarder with Yokohama City. The city has Tama hill in the west and Tokyo bay in the south. The population is about 1.4 million, and the number of the households is 687,000. The city has the highest population growth rate among the big cities in Japan, and lower average age. The history of Kawasaki city is originated from "Kawasaki jyuku" which is an old guest house at EDO era in the Tokaido road. After starting the modern industrialization starting in the end of Meiji era, the city has been grown leading the technology improvement of Japan. The agricultural area has become an urban agricultural area which produces agricultural crops to be shipped to Edo and Tokyo, and the coastal area has become an industrial city with harbor facilities. However, the city has faced the pollution from industry and traffic sector, and social issue caused by the overdevelopment. Therefore the city had changed its policy from industry-first to environment-first, and became an environmentally-friendly city.

3.2 CURRENT SITUATION OF KAWASAKI CITY

3.2.1 History of Kawasaki City on Environment Problems

In the period of rapid economic growth (1960s-1970s), since Kawasaki city played a leading role for industrialization of Keihin Industrial area, the city faced various environmental problems such as air and water pollution etc. However, the efforts made by all of the relevant companies, local people and the city government contributed to recover the environment with clear sky and clean river. As a result, the city accumulated (i) the world - class environmental technology on air pollution control, waste disposal, and recycle and, (ii) know-how such as technology development by the companies, pollution control regulation, and public awareness improvement.



Kawasaki Oceanfront Industrial Area in 1960s



Current Overview of Kawasaki City

3.2.2 Actions against Environmental Problems

Kawasaki city has promoted the industrial growth with high environmental consideration such as pollution control and recycle, based on the environmental technology and know-how accumulated in the course of solving the environmental problems. Kawasaki Eco-town, the first eco-town approved in 1997, coordinates with the facilities in/around the town for circulation of the resources through the various recycling facilities. Kawasaki Eco-town, about 2,800 hectare of Kawasaki coast front, developed a system of waste resource circulation among the companies in the city, recycling the waste produced from the Eco-town and Kawasaki city. This Eco-town is highly appreciated not only from domestic area but also from foreign countries.



Figure 3-1 Framework of Kawasaki Eco-town

In the next pages, major low-carbon facilities in the city are introduced.



<u>Mega Solar Power Plant in Kawasaki</u>

Operation of about 100,000 of solar panels started in 2011 before the other areas.

- ✓ Output power:2MW
 - •Ougi island 1.3MW
 - •Uki island 0.7kW
- ✓ Operating body:

Tokyo Electric Power Company and Kawasaki city

✓ The plant is constructed in the post- final disposal site

Wind Power Plant in Ougi island

Large scale wind power plant, whose annual power-generating capacity is 300 MWh.

- ✓ Output power:0.199MW
- ✓ Operating body: JX Nikko Nisseki Energy

Biomass Power Plant in Kawasaki

The largest plant generating power only from biomass fuel. The first biomass power plant for a city.

- ✓ Output power:3.3MW
- ✓ Operating body:

Kawasaki biomass power generation Co.,Ltd.(Japan Bioenergy holding, Sumitomo Forestry Co., ltd, Furuhashi EPO Co., ltd, Sumitomo Joint Electric Power Co., ltd)

✓ Power generation from wood biomass such as construction waste etc.

<u>Natural Gas Power Plant in Kawasaki</u>

Highest operation rate with a few operators. The characteristics of the plant is environmentally friendly, high efficient, and stable power supply.

- ✓ Output power:84.7Mw
- ✓ Operating body: JX Nikko Nisseki Energy, Tokyo gas
- ✓ High efficient power generation by combined cycle of gas and steam turbine

Besides, Kawasaki city supports business matching of the companies in Kawasaki with superior environmental technology and the areas which has needs for those technologies. As shown in the figure below, Kawasaki city has assisted the companies in the city to extend their environmental technology in China, Saudi Arabia, Mozambique, Thailand, and Laos in order to support the countries to solve the environmental problems.



Figure 3-2 Environment technology extended from Kawasaki city to the world

3.2.3 Kawasaki Green Innovation Cluster

Kawasaki Green Innovation Cluster is a network aiming at industrial development and international contribution through coordination among the three organizations: related companies, university and government. The cluster supports to create a business based on the accumulated environmental technology and know-how.

The member of the cluster is over 100 companies from and outside of Kawasaki city. The network has been working on the three major tasks coordinating with the cluster members and local governments: "inquiry counter for effective implementation of the policy of Kawasaki-city and the supporting organizations", "public relations, information sharing", and "Creation of business based on the accumulated environmental technology, experience of the local government and know-how".



Figure 3-3 Image of Kawasaki Green Innovation Cluster

Function of the Cluster

1. Inquiry counter for effective implementation of the policy of Kawasaki-city and the supporting organizations

The secretary of the cluster opens an direct inquiry counter to have consultation with those who has interest on the assistance from Kawasaki city and other supporting organizations.

2. Public relations, and information sharing

The cluster shares the information on the cluster to the public to support create a new business.

- Public relations on the environmental technology and service accumulated in the Kawasaki city
- Information sharing of the needs for environmental technology home/abroad
- Information sharing related to the project by the supporting organizations (e.g. public invitation)
- Information sharing on the public invitation/ seminars/ consultation organized by the related organizations
- 3. Creation of new business opportunity based on the accumulated environmental technology, experience of the local government and know-how The cluster supports the cluster members to expand their business in order to create new business through cooperation with Kawasaki city
- Support research and development, and demonstration in Kawasaki city

• Support business expansion of the cluster members through the intercity cooperation

Packaging of the environmental technology, products, service accumulated in Kawasaki city, and business expansion to the domestic and international market

3.2.4 Chamber of Commerce in Kawasaki City

Chamber of Commerce in Kawasaki city, aiming at development of small and medium-sized business, local revitalization, promotion of the international activities, plays a role of promotion of economic exchange of the private sector in the other countries coordinating with the chambers of commerce in the world.

Chamber of Commerce in Kawasaki city has signed a memorandum with association of chambers of commerce in Myanmar on 29th June 2015 to strengthen the relation for the mutual economic development and promotion of small and medium-sized business. The background of the memorandum is that the small and medium-sized business in Kawasaki city tries to make connections with the chambers of the commerce in Myanmar so as to start business in the market in Mekong region, and Myanmar expects Kawasaki with manufacturing business to assist Myanmar to develop its industry. In 2014 before the memorandum was signed, Kawasaki city has dispatched a mission composed of the companies from/outside of the city, to Yangon, Naypyidaw, and Mandalay for business matching, and organized business seminar to the companies in the city to promote business expansion to Myanmar.

CHAPTER 4 PROMOTION OF LOW-CARBON CITY-TO-CITY COLLABORATION

4.1 **OVERVIEW**

In this project, the challenges which Yangon city faces currently or in the future are assumed (e.g. various environmental issues due to the rapid economic growth), and then Kawasaki city was selected as a Japanese local government which has knowledge and experiences in those fields.

Kawasaki city consists of the core of the Keihin industrial region and they are working on environmental problems such as pollution measures for many years. And recently, Kawasaki city becomes the one of the cities that owns a lot of environmental technologies and industries related to low-carbon/ resource recycling/ energy, etc. In addition, in Kawasaki city, citizens, companies, and government have cooperated together to address environmental issues from long time ago, and there are many companies with high environmental awareness.

From the above, it is clear that Kawasaki city has supported the economic development of Keihin industrial region and developed the broad network in the field of environmental technologies and the industry. Thus, participation of Kawasaki city in the city-to-city collaboration is expected to contribute to the sustainable development of Yangon city, and also JCM candidate projects were examined from the Kawasaki green innovation cluster companies.

This project investigated and examined the possibilities of "city-to-city collaboration" between Kawasaki city and Yangon city, and the JCM project formulation from the following four sectors to solve the problems Yangon city faces.

- Development of low-carbon industrial park
- Introduction of low-carbon building management system
- Introduction of low-carbon water supply and sewerage facilities
- Finding the candidate project of renewable energy/ new energy

The main participants of this project and their correlation charts are shown in the figure below.



Figure 4-1 Main participants and their correlation in the project

4.2 DISCUSSION ON CITY TO CITY COLLABORATION

At the beginning of this project, as described above, it had been focused on the cooperation with International Economic Promotion Office of Economic Labor Bureau in Kawasaki city for the JCM projects formulation in Yangon city. However, some plans were modified compared with the original one through the discussion and exchange opinions with Yangon city regarding the city-to-city collaboration (mainly two departments in YCDC: City planning & Land Administration Department, and Pollution control & Cleansing Department).

Considering the above situations, the topics which currently the two cities have consultation regarding city-to-city collaboration are categorized into three points as followings; 1) Implementation Structure of Kawasaki city, 2) Implementation Structure of both Yangon and Kawasaki cities, and 3) Basic Policies.

4.2.1 Implementation Structure of Kawasaki City

In this project, International Economic Promotion Office of Economic Labor Bureau in Kawasaki city became the entity in charge of the low-carbon city-to-city collaboration and examined the possibilities of its collaboration with Yangon city. International Economic Promotion Office is responsible for the promotion of industrial exchanges with other countries, the promotion of environmental industry, etc. as their main tasks, and providing support to the members of Kawasaki green innovation cluster companies to support the expansion of their overseas businesses.

After the commencement of this project, the study team discussed with the Kawasaki Chamber of Commerce and Industry (KCCI), having the support from Kawasaki city, and had the consultation meeting for further business expansion of companies of Kawasaki city into Yangon city. This reason is that, "KCCI", the representative of the business community of Kawasaki city, has signed MOU for economic cooperation agreement with the Myanmar Chamber of Commerce and Industry (MCCI) in June, 2015. Thus, the further cooperative

relationships were examined among the companies in both cities. The following figure below shows the image of collaboration with Kawasaki city and KCCI.



Source: Study team

Figure 4-2 Implementation Structure of Kawasaki City for City-to-City Collaboration

As the related above activities, "Kawasaki green innovation cluster overseas development seminar" was held on 13th November, 2015 within Kawasaki city. Information of JCM project formulation which contributes to city-to-city collaboration by both Kawasaki and Yangon cities was provided to the participation from not only the cluster member companies, but also the stakeholders of KCCI.

4.2.2 Draft Implementation Structure of both Yangon and Kawasaki cities

Initially, City Planning and Land Administration Dept (CPLA) of Yangon city was supposed to be the counter part of this project. However, according to Yangon city, the Pollution Control and Cleansing Dept (PCCD) is also appropriate counterpart as well as CPLA, which was in charge of JCM model project "Waste Power Generation Business in Yangon city" that has been already undertaken in the country. Based on the advice from Yangon city, the structure of the counterpart in Yangon city was revised as below.

On the other hand, International Economic Promotion Office of Economic Labor Bureau in Kawasaki city, which had the main responsibility of Kawasaki city for this project, became the coordinator within the city to promote the city-to-city collaboration and attempt the cooperation of the related departments to the city-to-city collaboration. Each department will work together by examination of the idea for concrete assistance menu of city-to-city collaboration, or technology exchanges with the Yangon city staff. In particular, for JCM project formulation, it is assumed to cooperate with Kawasaki green innovation cluster companies which consist of the companies mainly located in Kawasaki city.

In addition to KCCI signed the MOU with Myanmar Economic Federation in June 2015, the head and the officers of KCCI showed the positive attitudes for the cooperation with the project. Thus, KCCI was also included in the implementation structure.



Figure 4-3 Draft Implementation Structure of City-to-City Collaboration

4.2.3 Basic Policy for City-to-City Collaboration

At the initial stage of this project, it was focused to promote the JCM project formulation. However, there were requests of the Yangon city side and the project examined widener range of cooperation, which is not limited to project formation, into a variety of support and cooperation to the Yangon city through sharing the knowledge of Kawasaki city.

And, to sign by both cities mayors on the MOU for city-to-city collaboration was set as a goal, utilizing the consultation results of both cities for its foundation. At the beginning of the project, it was started from the understanding the issues faced by Yangon city and needs for the city-to-city collaboration with Kawasaki city, etc. And then, Kawasaki city has discussed, explored and examined with Yangon city about how to utilize the experiences, technologies and the network of Kawasaki city which have been piled up until now to meet the expectation of Yangon city.

Basic policy of city-to-city collaboration, considering the challenges faced by Yangon city and possible support can be offered by Kawasaki city are summarized below.

The main challenges and needs of the Yangon city were categorized into three; low-carbon development, waste disposal, and environmental monitoring. As responds to those sectors from Kawasaki city, technical support, support by personnel exchanges, support for preparation of plan, etc. have been proposed widely. Both parties confirmed their needs and possible sector to be supported and then, examined basic policy of the future city-to-city collaboration. Based on this basic policy, the draft of MOU is going to be prepared and signed by March 2016.



Figure 4-4 Basic Policy of City-to-City Collaboration of both Yangon and Kawasaki cities

4.2.4 Implementation menu for City-to-City Collaboration

The following table summarizes the examined content of the implementation menu for city-to-city collaboration from next fiscal year.

Fiscal year		Topics	Summary		
2015	1)	To grasp and share the current situation for city-to-city collaboration	It was focused to build the deeper understanding of each other through the understanding of the current situation and information sharing by having several consultation meetings in Myanmar and Japan.		
	2)	To examine the menu for city-to-city collaboration	It was examined the menu for city-to-city collaboration by having the consultation of the issues and needs of Yangon city and possible supports to be offered from Kawasaki city.		
	3)	To examine the draft MOU	It was examined and prepared the draft MOU based on the above discussion for future city-to-city collaboration		
2016	1)	To prepare the low-carbon	To prepare low-carbon development action plan from		

Table 4-1	Draft Imple	mentation	menu for	Citv-to-	Citv	Collaboratior
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2016	1)	To prepare the low-carbon development action plan	To prepare low-carbon development action plan from middle and long term point of view based on the low-carbon development vision stated in Master Plan of the development of Yangon metropolitan area prepared in 2013
	2)	To conduct regular WG meetings (including the meetings in Japan)	To implement regular WG meetings to promote the preparation of low-carbon action plan and implementation of the city-to-city collaboration. WG will be hold in Myanmar and Japan.
	3)	To prepare the draft menu for technical training	To prepare the technical training menu based on the possible support from Kawasaki city toward the technical assistance requested by Yangon city
	4)	To prepare the draft pilot project	To select the sites for pilot projects which are feasible in the short term and prepare implementation plans in lo-carbon development action plan.

2017	1)	To implement the pilot project	To support pilot project implementation based on the
		based on the low-carbon	pilot project implementation plan prepared in 2016
	development action plan		fiscal year.
	2)	To implement the technical	To implement the technical training in Myanmar and
		training (including training in	Japan based on the technical training menu prepared
		Japan)	in 2016 fiscal year.
	3)	To implement regular WG	To attempt close cooperation through the
		meeting (including meeting in	implementation of regular WG meetings.
		Japan)	

4.3 RESULTS OF ACTIVITIES REGARDING CITY-TO-CITY COLLABORATION

4.3.1 Overview

In this fiscal year, after reviewing the challenges and countermeasures (including the study of JCM project formulation) for low-carbon society in Yangon city (YCDC), building the relationship between Kawasaki city and Yangon city was conducted, together with providing the information of various activities of Kawasaki city from the experiences of pollution problems to low-carbon society and their movements established or operated by the city in recent years, which based on the environmental technologies/ industries that Kawasaki city has developed as the core city of Keihin industrial zone.

City-to-city collaboration between Yangon city and Kawasaki City has not been addressed before. Thus, as first step, understanding of the current situations of the two cities was attempted, then, needs of Yangon city for city-to-city collaboration were shared, and proposal of supports by Kawasaki city was discussed in a phased manner and examined the framework of the future city-to-city collaboration. Activities regarding city-to-city collaboration in this project are summarized in the table below.

Contents of the	Implementation	Summary
Study	period	
Kick-off	25th August, 2015	Kick-off meeting was held among Ministry of Environment,
meeting(Tokyo)		Kawasaki city, and Nippon Koei and the study policy, schedule
		of the study, contents of study are discussed
1 st Field Study	8 th -12 th September,	Summary of the study and its schedule was explained to YCDC
(Yangon)	2015	and asked YCDC to participate the JCM workshop for
		city-to-city collaboration in Yokohama on 19 th October. One
		person was assigned from City Planning & Land
		Administration Dept and Pollution control & Cleansing Dept
		respectively as the participants ^{± 1}
2 nd Field Study	11 th -16 th October,	2 nd field Study was conducted by Nippon Koei and the person
(Yangon)	2015	in charge of Kawasaki city. The summary of the field Study
		was showed as below.
		- Meeting with YCDC (City Planning & Land Administration
		Dept and Pollution control & Cleansing Dept) as the
		counterpart and discussion regarding the cooperation system
		with Kawasaki city, signatures on agreement documents of
		city-to-city collaboration was conducted.
		- It was confirmed that mayor of Yangon city became the
		signer on the agreement documents regarding the cooperation.
		so that the cooperation of public relations Depts were required
		to promote the city-to-city collaboration.
JCM Workshop	19 th -22 nd October,	19 th October: Participation of JCM workshop for
(Yokohama)	2015	city-to-city collaboration (hosted by Yokohama city and
		Ministry of Environment)
		Director of Mingaladon industrial park management company;
		Mr. Min Thu was invited.
		20 th – 22 nd October: Field trip on low-carbon facilities in

 Table 4-2
 Activities regarding City-to-City Collaboration

Contents of the	Implementation	Summary
Study	period	Vorrogelti eity
		Kawasaki city As applicable technology owned by companies or facilities in Kawasaki city into Mingaladon industrial park, recycling plant, biomass power generation facility, Environmental Research Institute, and the energy-saving-related facilities were guided and question-and-answer session was conducted about the low-carbon technologies in Kawasaki city. * See the attachment for the summary of the field trips of low-carbon related facilities in Kawasaki city
3 rd Field Study (Yangon)	15 th -26 th November, 2015	- Meeting with YCDC (City Planning & Land Administration Dept and Pollution control & Cleansing Dept) and discussion about the invitation to Japan supposed to be help on January and its participants or programme were conducted. The workshop was going to be arranged, putting in mind the participation of the director of each dept.
		- Regarding MOU of city-to-city collaboration between Kawasaki city and Yangon city, its contents, procedures, and schedule up to signature were discussed and confirmed. The draft MOU was prepared by the study team, and then detail descriptions were decided based on the draft. The signing schedule was set by the end of February, as much as possible, considering the possibility of change of Yangon mayor due to the change of government since March
4 th Field Study (Yangon)	27 th – 29 th December, 2015	 4th field Study was conducted by Nippon Koei and the person in charge of Kawasaki city. The summary of the study was described as below. Meeting with YCDC (City Planning & Land Administration Dept and Pollution control & Cleansing Dept) and secretary of Public Relation, and discussion about signing on the MOU for city-to-city collaboration and invitation to Japan, scheduled to be implemented last month were discussed. After the preparation of draft MOU, it was agreed that review was conducted within YCDC and proceed to the signature from the mayor via Public Relation Dept. The contents of city-to-city collaboration were decided to be examined from three key-words; Air-pollution monitoring, Waste management, Low-carbon eco-town development
Invitation to Japan (Kawasaki)	11 th – 16 th January, 2016	 The following officers were invited to Kawasaki city and field trip to see environmental technologies of the companies in Kawasaki city and discussion regarding the draft MOU were conducted. 1) Director of Pollution control & Cleansing Dept: Mr.Cho Tun Aung2) Director of City Planning & Land Administration Dept : Mr.Than Lwin Oo, 3) Secretariat Division: Mr. Thike Soe *See the attachment for the summary of the invitation to Japan
Workshop (Yangon)	29 th January, 2016	A workshop on city-to-city collaboration was carried out in Yangon City Hall. The mayor of Yangon performed the opening and the deputy mayor of YCDC gave the closing remark, and 70 people from each department from YCDC, University officers in Yangon city, and companies in the city participated. From Japanese side, study team, Kawasaki city, and the Japanese companies in Yangon city attended. In the workshop, the study team announced regarding the city-to-city collaboration by YCDC and Kawasaki City, the activities and

Contents of the StudyImplementation period		Summary
		the future prospects of this project.
		*See the attachment for the summary of the workshop
5 th Field Study	$22^{nd} - 26^{th}$	The result of the study for city-to-city collaboration in this year
	February, 2016	was explained to YCDC and discussed on next step for next
	-	fiscal year.

Source: the study team

*1 : Regarding the invitation of YCDC officers to JCM city-to-city collaboration workshop, due to the influence of Myanmar general election as it had been scheduled, the persons concerned are not allowed to travel to Japan. Initially, it was informed that national elections did not affect YCDC, but the elections brought a situation in which the possible changes of mayor was considered, so that the above determination was made in the YCDC.

4.3.2 The third field study

At the third field study, the study team discussed with CPLA and PCCD on basic concept of city-to-city collaboration and MOU between Kawasaki city and Yangon city which is planned to conclude within this fiscal year. The MOU is finalized based on discussion both cities.



Discussion between Kawasaki city and YCDC

4.3.3 The forth field study

It was discussed having YCDC's secretary on corporation of city-to-city collaboration between Kawasaki city and YCDC. Also the needs of YCDC on city-to-city collaboration and the menu which Kawasaki city can provide for the collaboration were shared at the meeting.

4.3.4 Inviting YCDC staff to Kawasaki city and discussion at Kawasaki

YCDC's staff who are directors of CPLA and PCCDYCDC visited Kawasaki city and discussed with Kawasaki economic labor department on city-to-city collaboration and visited several low-carbon facilities in Kawasaki city in order to get images of future city-to-city collaboration.



Visiting Kawasaki Chamber of Commerce



Visiting Kawasaki Environment Research Center

4.3.5 City-to- city collaboration Workshop at Yangon

The workshop for city-to-city collaboration was held at Yangon city and more than 80 persons participated from Yangon city, Kawasaki city, universities, and private companies. At the workshop, Mayor of Yangon city gave a opening speech and both cities presented for introduction of the cities and basic concept of city-to-city collaboration.



Opening speech was given by Mayor of Yangon city



Workshop presentation

4.3.6 Kawasaki International Eco-Tech Fair

The Kawasaki International Eco-Tech Fair was held on 18th and 19th of February 2016 hosted by Kawasaki city. At the Eco-tech fair, the activities of city-to-city collaboration between Yangon city and Kawasaki city and Kawasaki innovation cluster were introduced. Also, it was promoted to join the business in Yangon city as JCM project to private companies which have low-carbon technologies.



Kawasaki Eco-tech fair

CHAPTER5 JCM PROJECT FORMULATION ACTIVITIES

5.1 OVERVIEW

In Yangon (YCDC), since the economic blockade released in 2011, the city has been rapidly urbanized, causing the chronic traffic congestion and energy shortages, or deterioration of sanitary environment. In this situation, the government of Myanmar agreed to build JCM on 16^{th} September, 2015, and bilateral documents regarding its operational system with Japan. And this agreement is expected to be the first step to solve the various problems which the country faces.

The speed of the YCDC development is outstanding among rapidly developing Asian countries so that the interest of Japanese companies which would like to start their businesses into the new markets is high. Therefore, by carrying out this project, it is expected to promote Japanese companies into Yangon city by JCM scheme as a trigger, and especially to become a familiar presence of Yangon city for the Kawasaki companies through the project.

Also, it should be understood that the project needs to build the foundation to find and form the JCM project for medium and long-term stably, rather than to simply understand the project for JCM project formulation in a single year. In this regard, information dissemination to the Kawasaki green innovation cluster member companies was conducted, and building one function of sending the cluster-related information to Yangon city was attempted.

In this project, while respecting the implementation of the "city-to-city collaboration" by Kawasaki city and Yangon city, in order to solve the problem of Yangon city, JCM project formulation was examined from four sectors ("low-carbon industrial park", "low-carbon building management system", "low-carbon water supply and sewerage systems", and "renewable energy/ new energy"), considering to meet the two main purposes of this project. The main participants of this project and its correlation are shown in the figure below.



Figure 5-1 Main Participants and Their Correlation in the Project

In this project, JCM project formulation was conducted together with Japanese companies, having the interests of doing their businesses in Yangon city or JCM experiences. In addition to this, it is going to be invited to join "Kawasaki green innovation cluster" member companies managed by Kawasaki city. The cluster is a network of the cooperation among industry, academia and government related to Kawasaki city and aimed to improve the environment and achieve the industrial development and international contributions. Therefore, the support of business incubation is provided by utilizing accumulated environmental technology and know-how of Kawasaki city.

5.2 STUDY POLICY FOR PROJECT FORMULATION

JCM Project formulation study was implemented based on the following study policies.

Issues	Policy at the beginning of the study
1. Funding situation by	The project implementation will be depended on the company (business
companies, business plan,	owner). In particular, financing conditions or business plan of the
confirmation of financial	company greatly affects the JCM projects implementation. In addition,
health, etc.	since the financial condition of the company is considered as one of the
	indicator to measure the stable project implementation, it is required to
	make sure that point.
2. Study of strategies,	In order to implement the energy saving and new business, they are often
utilizing existing policy,	affected by the related policies and institutions. Particularly, the existence
for the JCM candidate	of the funds support for energy saving project implementation boosts
projects implementation,	significantly its implementation. Considering the situation above, the
in particular energy	points of JCM implementation were confirmed and examined.
saving measures, etc.	
3. Current situation of	Distributed situation of the target product or equipment will significantly
market share regarding	affect the implementation of similar projects. Particularly, it is important
targeted products or	to check the products from the countries other than Japan and their
facility	market share to set reference scenario, etc.
4. Situation of electricity	To confirm whether electricity prices become a burden to make users
price or price for fuel	consider the necessary of energy-saving, and, whether the situation could
	be a reason to induce energy-saving.
5. Confirmation of Grid	For the calculation of GHG emission reductions related to energy-saving
emission factor	and renewable energy, the grid emission factor is essential. As Nippon
	Koel has collected sufficient information related to "grid emission
	factor, which has not been made public in Myanmar, it becomes possible
C Empression of Doll and	to do the deep examination with respect to the calculation.
6. Examination of BaU and	Reference emissions has been assumed to be set lower level compared to
reference scenario	Business-as-usual (BaU), and firstly, BaU is examined quantitatively,
	taking into account the status of the products and equipment, estimation
7 Situation of installation	In the ICM project, it is necessary to conduct MDV without any delayer
7. Situation of instanation	along with the proper installation of the monitoring instrument. In
of the monitoring	along with the proper installation of the monitoring institutient. In
of MPV	and acuinment to MPV are adopted
8 Confirmation of	As the environment surrounding the subject facilities the Study
equipment conditions	recognizes that confirmation of equipment or systems frequency of use
surrounding the subject	and usage status is an important point in the development of MRV
facility and frequency of	methodology Thus target facility's environment etc is to make sure in
	detail
use	uotuni.

 Table 5-1
 Study Policy regarding JCM Project Formulation

The project suggested examining the JCM candidate project from four sectors. The following table summarizes the related stakeholder and their interests of the project at the moment, etc. by each sector.

Suggested	Stakeholder	Interests of the project, degree of interests, etc.
project		
1) Low-carbon industrial park	Mingaradon Industrial park	Mingaladon industrial park shows their willingness to low-carbonization (JCM project) of its equipment in the park. Already the needs for low-carbonization of the park have been confirmed, so that consultations were conducted with the technologies and companies to meet their needs, and attempt for the project formulation in the next fiscal year.
2) Building	Private	In "Yangon urban area development program Study (JICA)"
Management	shopping	implemented by Nippon Koei, hearing to existing commercial
system	center	facility was carried out and grasped the issues and needs of
	(existing)	them. In a subsequent follow-up investigation in the country, the
		intention of the energy-saving has been confirmed, and meeting with several facilities will be conducted regarding the introduction of energy-saving technologies, towards the project formulation in the next fiscal year
3) Low-carbon	Water and	Almost water and sewage facilities in Vangon city has been
water and	sewage facility	aging and they has not been able to achieve safe and secure
sewage	(existing),	water supply. Also, non-revenue water rate is high as 67% so
facilities	Industrial park, commercial facility	that there is an urgent need to review the system in general. In addition, adequate treatment has not been made in the sewage treatment plant, resulting in the low level of water quality compared with other countries in Asia.
4) Renewable	Local	Currently, Yangon city faces the chronic power shortage, the
energy/ new	company, etc.	introduction of renewable energy and new energy, which does
energy		not rely on power from the grid, is expected by local companies.
		So far, Nippon Koei has confirmed from local companies about
		the potential of the introduction of renewable and new energy.
		Thus, based on the information, the needs of JCM project
		identification are confirmed.

 Table 5-2
 Degree of Interests among Stakeholders

For JCM project formulation, results of the consultation with variety of industry organizations, etc. are organized in the table below. In Kawasaki city, KCCI signed cooperation agreement (MOU) with Myanmar Industry Association in June, 2015 fr the business development at the private level.

#	Name of the Organization	Reason to be Selected			
1	JETRO, Yangon Office	-To grasp the situation of Japanese companies as for			
		doing their businesses in Yangon, and to collect			
		information on the business development in Yangon,			
		etc.			
		-To confirm additional information after the meeting at			
		JETRO Yangon office to the person who stayed in the			
		Yangon office before, etc.			
2	JETRO, Tokyo Office	-To confirm additional information after the meeting at			
		JETRO Yangon office to the person who stayed in the			
		Yangon office before, etc.			
3	KCCI	-To have the meeting to exchange opinions regarding			
		the expansion to Yangon city from Kawasaki green			
		innovation cluster companies, and the situation of the			
		signed MOU with Yangon Industry Association in			
		2015			
4	Myanmar Japanese Chamber of	-To have a consultation meeting to provide information			
	Commerce and Industry	for JCM project formulation			
	(Former Yangon Japanese Chamber				
	of Commerce and Industry)				
5	Others	-To grasp the Japanese companies, doing their			
	(Japanese organizations in Yangon	businesses in Yangon, etc.			
	city)				

Table 5-3	Results of the Consultation with Variety of Industry Organizations for JCM
	Project Formulation

In addition, having the support of the International Economic Promotion Office, Economic Labor Bureau in Kawasaki city, the project has implemented with the assumption that the support for the overseas businesses expansion in the city is attempted and blueprint for active participation in the JCM is drawn, taking full advantage of the function of the "Kawasaki green innovation clusters", established and operated by the city. Some companies in the cluster are indicated in the table below.

Table 5-4	List of Kawasaki	Green Inn	ovation Cluster	r Member	Companies	(excerpt)
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E-Square Inc.	Toshiba Co., Inc. (Community Solution Group, Business Development Center)
Elly Power Co., Ltd.	NANOFUEL Co., Ltd.
Kawasaki Shinkin Bank	Nihon Genryo Co., Ltd.
Kureha Ecology Management Co., Ltd.	Japan Future Eco-Systems Co., Ltd.
JFE Kankyo Co., Ltd.	Nippon Basic Co., Ltd.
JFE Plastic Resource Co., Ltd.	Fujitsu Co., Ltd. Kawasaki Branch
Sowshow Co., Ltd	Hokkai Spring MFG. Co., Ltd.
Softem Co., Ltd	Takasago Co., Ltd
Tokyo Rectifier Co., Ltd.	

As indicated, it is expected to contribute to the present and future of the Yangon city by the various elements which Kawasaki city industrial sector has, technologies for the industrial complex formation, environmental friendly products/technology/services. Therefore, together with the "city-to-city collaboration" as mentioned above, the Study was conducted, considering the continuous discussions with the listed companies in the table above, and to support the companies in Kawasaki city for their businesses in Yangon city.
5.3 DEVELOPMENT OF LOW CARBON INDUSTRIAL PARK

5.3.1 Overview

Considering the possibility of introduction of Japanese technology and products for industrial park (existing industrial park: Mingaladon), where intensive energy consumption is expected in Myanmar, JCM project formulation was examined.



Figure 5-2 The Image of JCM Project Formulation for Low-carbon Industrial Park

Mingaladon Industrial Park was established in 1998, and it is a medium-scale industrial park where many tenants have been occupied by the Japanese companies. It passed already 17 years since its establishment and the park faces the aging of infrastructure and the necessity to renovate. Also, similar to Yangon city, due to the unstable power supply, ensuring the power for backup power source becomes a major challenge. Based on these circumstances, the effort for low-carbon industrial park can be expected to achieve stable factory operation in terms of its operation or economic perspectives.

"Introduction of high-efficiency air conditioning" and "introduction of energy-saving fluorescent lamps" were raised as technologies that seem to be high feasibility for the introduction at the moment for low-carbonization of Mingaladon industrial park. Also, similar opinions were confirmed through the hearings to the industrial park management staff. In addition to this, the following technologies were examined their feasibilities, having the supports of Kawasaki green innovation cluster companies; "introduction of thermal barrier coatings and films", "introduction of the heat-insulating glass", "introduction of solar power generation facilities", "introduction of high-efficiency distributed power", etc.

5.3.2 Current Situation of Industrial Park Development

Yangon city (YCDC) has not prepared the clear policy, institutions or plans for low-carbon industrial park development yet. Therefore, Mingaladon industrial park or other parks established various criteria (for power, water supply and sewerage sectors, etc.), referring to the standard of industrial park in neighboring countries or regulations of YCDC. Therefore, in this project, the city has referred the outputs regarding the policy or planning, which the city will refer from "Program Formulation Preparatory Study for Development of Urban Area Yangon city in Myanmar" implemented by the Japan International Cooperation Agency (JICA). The followings summarizes the information related to low-carbon industrial development in YCDC.

1) Thilawa SEZ⁴ Development Projects

This is a project to develop the industrial park or commercial facilities, etc. in special economic zone which are located at 23 kilometer to south from Yangon city center. 400ha (zone A) out of total development area: The area of 2,400 is currently in progress for development. The development project, was agreed between the government of Myanmar and the government of Japan in December 2012, and Myanmar Japan Thilawa Development Ltd., comprised of Japanese trading companies, have been in charge of development. The development also includes the industrial park area, so that low-carbon industrial park development in the region is expected.

2) Current Situation of Industrial Park around Yangon City and Future Trend of Construction

In Yangon, industrial park (or a single factory) can be confirmed through the entire city. In current situation, although there is no particular constraint, new industrial park (or plants) have been constructed along the main road in suburbs. This trend would remain and be remarkable in the future, and industrial parks are likely to be transferred in a good suburban area (and along the main road) which has good access to distribution centers such as airports or ports, due to avoid problems of the traffic congestion by heavy vehicles and neighboring residents problems.

⁴ SEZ: Special Economic Zone

5.4 INTRODUCTION OF LOW-CARBON BUILDING MANAGEMENT SYSTEM

5.4.1 Overview

One of the challenges of the Yangon City (YCDC), ordinary blackout, planned power outage and unstable power supply can be raised. Therefore, spare power supply (generator, etc.) has been prepared as a measure for power failure in a normal commercial facilities, office buildings, etc., and the fuel costs become a major burden on the employer. On the other hand, urban development is proceeding rapidly in the city by private sectors such as shopping malls or hotels, and there is a tendency of further urban development in the future. Therefore, the introduction of low-carbon building management system is attempted through the introduction of low-carbon technologies, such as energy-saving or alternative energy to the existing private commercial facilities, or hotels.

In the future, in commercial facilities and offices in the YCDC, low-carbon technologies widely spread in Asia region, that show the effect (high-efficiency air conditioning or high-efficiency lighting, renewable energy and various types of energy-saving equipment) are expected to be introduced. In addition, having the support of Japanese companies, it was examined the following technologies during the project period; "the adoption of thermal barrier paint", "introduction of the insulating glass", "introduction of solar power generation facilities", "introduction of high-efficiency distributed power", etc. as well as the demand in the industrial park.



Figure 5-3 Image of JCM Project Formulation Regarding Low-Carbon Building Management System

5.4.2 Situation of Development of Commercial Building

Regarding low-carbon building management system, Yangon city (YCDC) has not prepared the clear policy, institutions or plans for low-carbon industrial park development yet. Also, the city has not showed any policies towards the achievement of low-carbon society. Therefore, this project referred the outcome of the "Program Formulation Preparatory Study for Development of Urban Area Yangon city in Myanmar" implemented by JICA because it can be considered the best plan at the moment and it is likely to be carried out the plans.

1) Urban Development Project in Yangon City

YCDC has addressed various urban development projects by the public and private sectors since economic blockade was released in 2011. Especially, the projects which YCDC has been involved are indicated as below.

#	Project Name	Summary	Project Implementing Body	Implementati on Year (plan)
1	Mindama Project	Movie theater, Multi-purpose commercial facilities, including hotels, Development area: 13.3 ha	YCDC	Pending
2	Mayangon Junction Project	Movie theater, Multi-purpose commercial facilities, including hotels, Development area: 8.1 ha	YCDC	Pending
3	Garnamar Project	Movie theater, Multi-purpose commercial facilities, including hotels, Development area: 13.3 ha	YCDC	Pending
4	Kyaukyaetwin Project	Commercial facilities, Housing Development Area: 20.4 ha	YCDC	Pending
5	Babahtoo Housing Development Project		YCDC	Pending
6	Bo Min Yong Low Cost Housing Development Project	 Development area: 3.8 ha	YCDC	Pending
7	Duplex for South Dagon Project	Multi-purpose facilities, Development area: 7.6 ha	YCDC	Pending
8	Middle Level Housing Development Project	 Development area: 7.6 ha	YCDC	Pending

 Table 5-5
 Urban Development Project in Yangon City

Source: Program Formulation Preparatory Study for Development of Urban Area of Yangon city in Myanmar (JICA)

2) Others

In YCDC, in recent years, multiple-dwelling houses has been built as high rise of housing, and many of them often was built since 2000. And with respect to commercial facilities, complex shopping center, supermarket, convenience stores, etc. which had not existed in the YCDC before has rapidly increased as well as the market of traditional commercial facility. Then, these facilities (buildings) is forced to provide power failure measures, stable air conditioning facilities, and water and sewage facilities in stably and safely as part of their good services and that makes additional burdens for the employers.

5.5 INTRODUCTION OF LOW-CARBON WATER AND SEWERAGE FACILITY

5.5.1 Overview

Water supply population of the Yangon City (YCDC) is 6.8 million, water supply diffusion rate is 38% (2011), and sewer diffusion rate is less than 5% so that 60% of the citizens can not enjoy the benefits of water supply and they take the water from groundwater, rivers, and lakes. In addition, non-revenue water rate is 67 and it indicates the issue of water leakage due to aging pipes, illegal connections to the water pipe.



Figure 5-4 Image of JCM Project Formulation regarding Low-carbon Water and Sewerage Facility

In addition, the water quality provided from tap water cannot be said good, general bacteria have been detected from most of tap water. Thus, the low-carbon in the water supply field is promoted to introduce low-carbon water purification facility through the improvement of current situation and the supply of safe and secure water. From the fact that a number of water and sewerage facilities in the YCDC are aging, update of the system, renovation, and the construction of new infrastructure has become an urgent task. Therefore, the introduction of energy-saving equipment related to the water and sewerage has been widely required, and it is expected to reduce the GHG emission from water pump, etc. of which power consumption is high in the sector.

While water supply and sewerage project is considered as mainly public works due to its characteristic, it is already confirmed that some of private companies also intervene in some of projects.

On the other hand, as described above, it is a clear fact that the aging of water supply and sewerage facility becomes an urgent issue to be solved in YCDC. From the above, this project was implemented with the participation of Kawasaki green innovation cluster member companies, etc. for the contribution of low-carbon of the water and sewerage project, taking the approach indicated in the figure below.

In addition, application of JCM model project by MOJ to the project with high public characteristics could be raise some considerations points regarding the implementation of public bidding. In that case, since it was confirm the demand of Yangon city side, application of a related scheme of JCM; "Leapfrog Development" was examined.

5.5.2 Current Situation of Yangon City

Regarding low-carbon water and sewerage, Yangon city (YCDC) has not prepared clear policies, institutions or plans for the improvement of water and sewerage services, but because it is an urgent problem in the city, they have been actively promoting the acceptance of study funded by JICA.

Currently, a study, focusing on water and sewerage is being carried out by JICA, and in order to grasp the overall picture, the target (see table below) in water and sewerage sector, which was identified in "Program Formulation Preparatory Study for Development of Urban Area of Yangon city in Myanmar" (JICA) was referred as the Study results which should be a reference as of now.

1) Development Goal and Indicators of Water Facilities

[Vision] Realization of independent and sustainable water projects and the provision of drinkable water at the appropriate water amount, pressure and price to more citizens

No.	Development Indicator	Impact Indicator
1	Water supplied population	Yangon city : 6,800,000人
		Yangon urban area :8,100,000人
2	Coverage rate of the water supply	Yangon city :80% (38% : as of 2011)
	system	Yangon urban area: 69% (35%: as of 2011)
3	Daily maximum water supply	Yangon city :2,500,000 m3/day
		Yangon urban area :2,900,000 m3/day
4	Non-revenue water	To production water amount: 15% (67%: as of 2011)
5	Facility utilization rate	More than 80%
6	24-hour water supply rate	To water supplied population: 100%
7	Chlorine injection rate	To water supplied population: 100%
8	Water quality	All items show under the indicators in the guideline of

Table 5-6Development Indicator of water facility

No.	Development Indicator	Impact Indicator
		WHO

Source: Program Formulation Preparatory Study for Development of Urban Area of Yangon city in Myanmar (JICA)

2) Development Goal and Indicators of Sewerage and Rainwater Drainage

[Vision] The creation of good water environment and safe city with no flood

No.	Development Indicator	Impact Indicator	
1	Sewer diffusion rate	Yangon city : 36% ()	
		Yangon urban area: 49% (4% : as of 2011)	
2	Sewage treatment rate	Yangon urban area : 40%	
3	Water regeneration rate	To sewage treatment amount: 6%	
4	Water quality of sewage treatment	BOD : 20 mg/liter	
		SS : 30mg/liter	
5	Goal of Improvement for flood (qualitative)	Elimination of flood damage in the YCDC city center	

 Table 5-7
 Development Indicator for Sewerage and rainwator drainage

Source: Program Formulation Preparatory Study for Development of Urban Area of Yangon city in Myanmar (JICA)

5.6 PROJECT FINDING ON RENEWABLE ENERGY AND NEW ENERGY

5.6.1 Overview

Electricity supply is not always stable in Yangon city due to damage of transmission lines by strong wind and planned outage in the last half of the dry season. Although the power demand in Yangon city is increasing with the recent rapid economic growth, stable power supply has not been realized yet. Therefore, the private sector shows its interest in renewable energy and new energy because they are rather easier to install than other power generation system.

In this connection, the Study team conducted two things in order to understand the basic information to formulate JCM projects of renewable energy and new energy as below: (i) a needs study in Yangon city (ii) Study on the Japanese technology which has potential to be applied in Yangon to satisfy the needs identified in study (i).



Figure 5-5 Image of the study for Project Finding

- (i) Needs survey: In order to understand the needs of Yangon city, interview survey with the following organizations was conducted: various local companies, the government, and the chamber of the commerce.
- (ii) Study on the Japanese technology: Interview survey for information collection from the companies, which are interested in business expansion to Yangon, was conducted. The potential companies' list were made by hearing to Kawasaki Green Innovation Cluster, JETRO Yangon office, and Energy saving center etc.

5.6.2 Current Power Condition of Yangon City

Power shortage has become one of the most serious problems not only in Yangon city, but also in entire $Myanmar_{\circ}$

1) Lack of Power Generation

In the end of dry season and drought period, output power from hydraulic power plant declines, and the existing plant and power distribution station are old enough to have maintenance or renewal. In many of the facilities, backup generators were installed to address this power shortage and the budget for this backup system has to be supplemented.

2) Loss in Power Transmission

The major technical causes of the loss in power transmission in Myanmar are (i) aging of the transmission lines, and (ii) little capacity of power distribution station. Non-technical cause is unofficial power use.

5.7 POTENTIAL PROJECTS OF JCM MODEL PROJECT

The result of the project finding is summarized in the following table.

#	Study target	Summary of the Study result	Further action for project formulation
Int	erview Study with th	e Potential Companies to apply for JCM Model Pr	oject
1	I•BS Co., Ltd.	 The company will open Yangon office in April 2016, and Japanese staff will be dispatched from October. The major service of the company is cleaning. The company has technology to improve cooling 	-to examine needs for heat shield film in Yangon
		and heating system by heat shield paint.	
2	Nanofuel Co., Ltd.	 It is expected to improve efficiency of generator and boiler by 10 % with nano emulsion fuel. The boiler using heavy oil with high operation rate has high potential of GHG emission reduction. It is possible to propose application for JCM project if any factories or commercial facilities are interested in the technology. 	 -to study the needs for efficiency improvement of power plants and self power generation system of factories in Yangon. - to study the feasibility of the proposed project.
3	Fuji Furukawa E&C Co., Ltd.	The study team obtained the data to study the feasibility of the project of renewal of the sewerage system of Mingaladon industrial park. The obtained data is operation hour of the pumps, list of the facilities, operation hour of the independent diesel generator, rate of operation of blower, the specifications of the facilities and system diagram of the industrial park. The company plans to replace three sets of pump and blower. The approval for application for JCM project is planned in the management board on May. After the approval, the detail plan is to be developed and approved on August. The information sharing on JCM is planed after the approval from the management board.	 -to obtain a quotation of pump and blower for sewerage system and estimate cost of the project to study the feasibility. -to confirm the possibility of application for the 2nd public invitation to the JCM model project on May after the approval from the management board of the company.
4	Nomura Trading Company	This company has closed off its Yangon office in 1996 due to the economic blockage, but it re-opened a branch of its Thai local company in Yangon in 2012. This company imports LED lamps and refueling tanker planes in Myanmar. The imported LED lamps are used as highway lightning.	-to study on potential and feasibility of introduction of LED lamp in Myanmar

 Table 5-8
 Project for City Development un Yangon City

In the table on the next page, the projects which were studied as the JCM model project are listed with the judgment of potential as next fiscal year's JCM model project.

Name of company		Overviews	Further actions	Feasibility
1	I Company	 It was explained the JCM scheme to the company. The company shared its needs for backup power generator of its factory in Mingaladon industrial park. 	• To study the potential of JCM by introducing backup power generator, and follow up the company if the potential is high.	
2	Yangon Japanese school	The number of the students is expected to increase according to the Japanese business expansion to Myanmar. The study team confirmed the plan of facility expansion and potential of a JCM project.	• The scale is too small to apply for JCM model project.	×
3	Mingaladon industrial park	The study team obtained the data to study the feasibility of the project of renewal of the sewerage system of Mingaladon industrial park. The obtained data is operation hour of the pumps, list of the facilities, operation hour of the independent diesel generator, rate of operation of blower, the specifications of the facilities and system diagram of the industrial park. The company plans to replace three sets of pump and blower. The approval for application for JCM project is planned in the management board on May. After the approval, the detail plan is to be developed and approved on August. The information sharing on JCM is planed after the approval from the management board.	 To obtain a quotation of pump and blower for sewerage system and estimate cost of the project to study the feasibility. To confirm the possibility of application for the 2nd public invitation to the JCM model project on May after the approval from the management board of the company. 	
4	M company	The study team explained the JCM scheme to the company with qualification of IPP to discuss about the potential of JCM project for the plan of power plant with heavy fuel oil (HFO).	 To obtain the data on the planed amount of power generation, fuel consumption, fuel price, initial cost, cost for operation and maintenance, from a maker of fuel reformulating equipment. To study on the feasibility of the project based on the obtained data 	
5	P company	It distributes electricity in Minagaladon township including Mingaladon industrial park, Yangon and Mandalay as requested by Yangon Electricity Supply Board (YESB). The study team had discussion about the potential of the application of the JCM scheme for the equipment	 To obtain a list of the equipments which need to be renewed or introduced. Based on the list, discuss with a maker about the possibility of introduction of high efficiency equipments. 	×

 Table 5-9
 The result of finding for JCM model project

	Name of company	Overviews	Further actions	Feasibility
		renewal / investment in the new high efficiency equipments. It shows its interest in the JCM scheme if the initial investment is almost as same as that of Chinese products.		
6	A company	• A Company, which took over a local food company, plans to establish a new production line with high efficiency equipments such as steam recovery system, chillers, through flow boiler. This company shows its interest in JCM scheme to introduce those new equipments.	 To obtain information on the equipments from Mayekawa and Miura boiler which are to introduce the equipments. To continue support for application for JCM model project. 	0
7	B company	• This company plans to introduce through flow boiler in its new factory, which plans to start its operation in April 2017.	 It is planned to have approval from the management board in the end of January. After the approval, start to support application from February. 	
8	C company	• C Company established a joint venture, called I&H, with the Ministry of Construction of Myanmar. It plans to introduce several energy saving equipments such as boiler in a cement factory.	• Support application after confirmation of the approval from the head quarter of C Company.	

Source: Study Team

Feasibility:

 \bigcirc High. Possible to apply for the 1^{st} public invitation for JCM model project next year

 \triangle Medium. Though it seems to be difficult to apply for the 1st public invitation for JCM model project due to project schedule and scale, it has potential to apply in the following years.

 \times Low. Not feasible for JCM model project.

The outlines of the potential projects for JCM model project formulated based on the study result are summarized in the following section.

5.8 FORMULATION OF PROJECT FOR DEVELOPMENT OF LOW-CARBON INDUSTRIAL PARK

The potential projects for development of low-carbon industrial park are summarized below.

1) Project for energy saving of Mingaladon Industrial Park by introduction of solar panels

Proponent company	Locally incorporated company of I Company		
Summary of the project	I Company has newly established a factory in Mingaladon Industrial Park in Yangon city. The new factory for manufacture of electronic parts will start its operation in the beginning of 2016. Since blackout happens frequently, the factory aims at operate even during blackout period with solar power generation system.		
Technology to be introduced	Solar power generation system on roof (600 panels of 260W =171.6kWp, and 6 inverters of 25 kW, and 150 kW of AC output power) will enable to generate 238,763kWh per year. This is an independent power system without power sales. Storage battery is not included.		
Business plan	Locally corporate company of I Company invests in 100% of initial cost.		
Implementation scheme	International Consortium Project owner: I Company Anagement of JCM Model Project Submission of monitoring report to MoEJ Acceptance of subsidy and distribution to project participants Information Sharing, reporting and coordination Project Participant Local I Company Procurement of equipment Maker Procurement of equipment Maker Procurement of equipment Maker		
Estimated reductionamount of emission	94 tCO2/year Xannual mean of total reduction for 17 years (legal life year)		
Cost-effectiveness	JPY 10,093/tCO2		

2) Project for energy saving of food factory by introduction of high efficiency chiller and boiler

Prominent company	Locally incorporated company of A Company	
Summary of the project	A Company took over the largest beer factory and plans to set up a new production line in its Yangon factory with high efficiency equipments such as steam recovery, chiller, through flow boiler. The company considers applying for JCM model project to receive financial support for the investment.	
Technology to be introduced	 High efficiency chiller Ejector system High efficiency through flow boiler 	
Implementation scheme	International Consortium Project owner: A Company Anagement of JCM Model Project Submission of monitoring report to MoEJ Acceptance of subsidy and distribution to project participants Information Sharing, reporting and coordination Project Participant Local Factory Procurement of equipment Maker B Supply and installation of product	
Estimated reduction amount of emission	 1) 668 tCO2/year 2) 1,000 tCO2/year 3) 1,086 tCO2/year Total 2,754 tCO2 * Annual mean of total reduction for 10 years (legal life year) 	
Cost-effectiveness	1) JPY 8,996/tCO2 2) JPY 13,456/tCO2 3) JPY 4,604/tCO2 Total JPY 8,347/tCO2	

5.9 FORMULATION OF PROJECT FOR INTRODCTION OF LOW-CARBON BUILDING MANAGEMENT

The study team studied the potential of the project for introduction of low-carbon building management in the Japanese school and commercial facility such as shopping mall. The studied energy saving technology/ products which have potential to be introduced is solar panel, high efficiency chiller, and LED lamp. As the scheme of JCM model project does not match with the needs and business schedule of the study target, no potential project for next year was confirmed. However, one company which has a chain of shopping mall is still discussing with the study team to apply for JCM model project in the near future.

5.10 FORMULATION OF PROJECT FOR INTRODUCTION OF LOW-CABON FACILITY FOR WATER SUPPLY AND SEWERAGE SYSTEM

The summary of the potential JCM model projects for introduction of the low-carbon facility for water supply/distribution and sewerage system is shown below.

Proponent company	Operation company of the industrial park	
Summary of the project	Replacement of the existing pump and blower of the common sewerage	
	system of the tenant factories of the industrial park with high efficiency	
	pump and blower.	
Technology to be introduced	1) High efficiency pump	
	2) High efficiency blower	
Business plan	Project owner will invest at 100%	
Estimated reduction amount	To be calculated after selection of the equipments	
of emission		
Cost-effectiveness	To be calculated	
Further work for project	- Approval for renewal of the equipments from the management board of	
formulation	the prominent company	
	- Collection of quotation of pump and blower, and estimate the initial	
	cost and cost-effectiveness	

1) Introduction of high efficiency pump blower in Mingaladon

5.11 PROJECT FINDING OF RENEWABLE ENERGY AND NEW ENERGY

The summary of the potential JCM model projects on renewable energy and new energy is shown below.

1) Improvement of fuel quality for power generation with Heavy Fuel Oil (HFO)

Proponent company	Private company with qualification of Myanmar IPP	
Summary of the	IPP company will establish four (4) HFO thermal power plants (total 12.5 MW) in	
project	Kyaukpyu. One of the plant will introduce emulsion fuel which has higher	
	efficiency by 5-10 % than the traditional HFO.	
Technology to be	Production of emulsion fuel by mixing water into liquid fuel and make nano-size	
introduced	water scattered in the liquid oil. This emulsion fuel improves combustion	
	efficiency, and reduce emission of air pollutant such as PM and NOx.	
Business plan	Myanmar IPP company invests and covers the full cost	
Implementation scheme	International Consortium Project owner: (To be determined) -Management of JCM Model Project - Submission of monitoring report to MoEJ - Acceptance of subsidy and distribution to project participants Information sharing, reporting and coordination Project Participant Local Company -Procurement of equipment - Monitoring and reporting	
Estimated reduction	1,695 tCO2/year	
amount of emission	(Reduction efficiency: 5% under the condition of HFO emission factor 3.0	
	t-CO2/t)	
Cost- effectiveness	To be calculated	
Further work	- Cost estimate	
	- Confirmation of the implementation schedule	
	- Data collection for calculation of the reduction efficiency	
	- Selection of the representing company and formation of a Joint Venture for	
	project implementation	

CHAPTER6 FUTURE PLAN

6.1 CITY TO CITY COLLABOLATION

6.1.1 Current situation and future plan

As for city to city collaboration between Yangon city and Kawasaki city, the draft MOU was prepared based on discussions by both cities. The draft MOU is under finalization and authorization by both cities and it is planned to conclude by the end of March this year. In the MOU, basic policies for city to city collaboration are mentioned and both cities agree with conducting city to city collaboration between Yangon city and Kawasaki city based on the MOU from the next fiscal year. The three basic policies for city to city collaboration which YCDC expects to Kawasaki city are **1**) Excavating and supporting of low-carbon projects utilizing Joint crediting mechanism (JCM) scheme, **2**) Technical cooperation and information exchange for realizing low-carbon society of Yangon, **3**) Supporting a certain of new business in a field of environment. Based on those policies, it is planned to conduct city to city collaboration next year.

As for framework of implementation of the city to city collaboration, in the Kawasaki city, the economic labor department plans to take a leading role in order to corporate with relevant departments in the city for preparing city to city collaboration menu, implementation of technical assistance, and assistance of preparation of low carbon action plan.

In the next fiscal year, it is planned to conduct regular working group meeting at Yangon and Kawasaki city and precede city to city collaboration between both cities. In the third year, it aims to implement pilot project which is selected from low carbon action plan prepared in the second year.

6.2 JCM MODEL PROJECT

6.2.1 Current situation and future plan

As for four theme for JCM project development which are "Project for low carbon industrial park", 'Project for low-carbon building management system', 'Project for low-carbon facility for water supply and sewerage system', and 'Project finding of renewable energy and new energy', it was studied to formulate JCM model project at site and in Japan. Among projects found in Yangon city, two projects were selected as JCM model project which prepares for next JCM model project offering from the points of views such as implementation scheme, effect of GHG emission reduction, and cost benefit etc.

One of the candidate projects is selected from theme of low-carbon industrial park, and a saving energy project by introducing high efficiency chiller and boiler in existing food factory.

Another candidate is selected from the same theme and a project of introducing solar panels on top of the factory located in Mingaludon industrial park. Those two projects are under preparation to apply for next JCM model project.

Also, in the following table, the projects which are not prepared for next JCM model project in the viewpoint of project schedule and other unfixed matters are listed. Those projects are to follow aiming for application of JCM model projects within this year and in 2017.

Project	Theme	Policies for follow-up
Project for introduction of	Project for low-carbon	The board of meeting of project owner will
high efficiency pump and	facility for water supply and	be held in March and to be determined for
blour in Minguladon	sewerage system	project implementation. After it is
industrial park		authorized to implement the project in the
		board meeting, it is prepared for
		application of JCM model project.
Project for fuel	Project finding of renewable	The cost estimate of the project is
reformulation by HFO	energy and new energy	submitted to the project owner and now
		under consideration to implement the
		project.
		After the project owner decides to apply
		for JCM model project, it is prepared for
		application of JCM model project.

Appendix

- 1) Presentation material for JCM seminar hosted by MOEJ
- 2) Presentation materials for Workshop in Yangon
- 3) Discussion materials with YCDC
- 4) Study tour in Kawasaki city
- 5) JCM model project related materials

Appendix : Presentation material for JCM seminar hosted by MOEJ

JCM Project Formulation Study through City-to-City Collaboration in Yangon



Profile of Yangon city

Yangon city is the largest city and the former capital of the Republic of the Union of Myanmar (Burma), and consists of 33 townships.

Area :	: 1,036 [km²]						
Population :	pulation : 7.36 [million] (2013)						
	(= 14.3% of Myanmar)						
Temperature :	32 degree Celsius (max)						
	22 degree Celsius (min)						

Yangon city is not only commercial heart but also industrial center of the of Myanmar.

Administrative body of Yangon city is Yangon City Development Committee (YCDC). The committee's chairman therefore acts as the mayor of the city.



Background and Objective of the Project

[Background]

Yangon city is one of the rapid growth cities in the world, however, the city has faced several issues, such as energy supply, transportation, water supply/sewerage etc. Also, the private investment has been facilitated from not only domestic entities but also foreign entities, so the city has big commercial potential.

[Objectives]

To contribute to sustainable development and realize low carbon society in Yangon, the study aims to formulate prospective JCM projects collaborate with Kawasaki city and Japanese private entities, which have high-efficiency and low carbon technologies.



Outlines of City-to-City Collaboration between Yangon and Kawasaki



Objectives of the City-to-City Collaboration

- It aims to support establishment of Low Carbon Society in Yangon in order to mitigate GHG emissions.
- Also, it aims to scrutinize mid-and-long term city-to-city collaboration between Yangon and Kawasaki.
- Under the process of JCM project formulation, it aims not only "diffusion of advanced low carbon technologies" but also "share of knowledge and know-how" between Kawasaki city and YCDC in the JCM scheme.

Advanced low carbon products /technologies from Japanese entities

Shared Kawasaki city's experience , knowledge and know-how

- Overcome of pollution and establishment of low carbon society
- Operation experiences of institutions and infrastructures

Establishment of low carbon societies in Yangon , in order to solve its current/urgent issues

Merits of the Project

YCDC (Yangon city)'s Merits

- Establish the low carbon society with utilization of Japanese advanced products/technologies and saving YCDC's effort including administrative cost etc. by JCM scheme.
- Share the mid-and-long term support with Kawasaki city.
- Enjoy private support from not only domestic but also Japanese entities.
- **Raise the quality of life** by enjoying the co-benefits that the improvement of energy supply, air and water pollution, waste management etc.

City to city collaboration with Kawasaki city

Myanmar local entity's Merits

- Available to acquire/install the advanced products/technologies with reasonable cost with JCM financial support programme.
- Can contribute to low energy consumption activities.
- Can save operating and maintenance costs.
- Feel the security for the introduction of new low carbon products /technologies by expectation of assistance and support.

Schedule of City-to-City Collaboration





Examples of focusing sector, Low carbon industrial park (2/2)



Examples of focusing sector, others

Low carbon building management system

- High efficiency air conditioning system
- High efficiency lighting system
- Solid waste energy system
- Back-up power supply system
- Heat shield film/panel
- Solar power system etc.

Low carbon building management system

- High efficiency water pump system
- High efficiency waste water pump system
- Solid waste energy system etc.

Project identification of Renewable energy/New energy

- Solar power system
- Biomass power generation system
- Biogas power generation system
- Back-up power supply system
- Application of natural gas etc.



Appendix : Presentation materials for Workshop in Yangon





Workshop on JCM Project Formulation Study through City-to-City Collaboration Between Yangon City Development Committee and Kawasaki City in Yangon

Coordinated by NIPPON KOEI

Date : 29th January 2016

Time : 10:00 AM to 12:00 PM

Venue : Meeting Room, City Hall, Yangon City Development Committee, Kyauktada Township, Yangon, Myanmar

Language : Myanmar, Japanese

No	Item	Speaker	Time	
0	Registration			09:45 - 10:00
1	Opening remarks	YCDC	10	10:00 - 10:10
2	Presentation 1:	Kawasaki city	15	10:10 - 10:25
	Introduction of Kawasaki city			
3	Presentation 2:	Nippon Koei	15	10:25 - 10:40
	Outlines of JCM formulation study			
4	Tea break		20	10:40 - 11:00
5	Presentation 3:	YCDC	20	11:00 - 11:20
	Expectation/Idea of city-to-city collaboration			
6	Presentation 4:	Kawasaki city	20	11:20-11:40
	Draft menu/idea of city-to-city collaboration			
7	Discussions		15	11:40-11:55
8	Closing remarks	YCDC	5	11:55-12:00





Low Carbon Society Sector

- Yangon City Development Committee Pollution Control and Cleansing Department (YCDC – PCCD) is trying to implement (CDM) including clean air, clean land and clean water.
- At present, there are 1690 tons/day of waste generated
- Carbon credit can be got and so 169 CERs from waste.
- PCCD would like to know how to connect and implement, and how Kawasaki City can support to YCDC.
- To obtain carbon credit, PCCD would like to ask to share knowledge to YCDC how to start the activities.



Existing Used Main (2) Final Disposal Sites & (4) Temporary Small FDS									
N O	Location of FDS site	Constructed Year	Planned Capacity	Site (Plant) Area	Dispose Ton Per Day (Current)	Remark			
1	HtainBin	2002	-	<u>150- Acre</u> Used- 70 Ac	847	Open Dumping			
2	Htwei Chaung	2001	-	<u>104.7 – Acre</u> <mark>Used-50 Ac</mark>	612	Open Dumping			
3	Dala	2003	-	2.47- Acre	10	Low Landfill Temporary site			
4	Seikkyi Khanaung To	2003	-	0.25 - Acre	5	Low Landfill Temporary site			
5	Mingalardon	2003	-	0.91 - Acre	25	Low Landfill Temporary site			
6	Shwe Pyi Thar	2005	-	9 - Acre ²⁴	-Feb-16 50	Low Landfil Temporary site			

Proposed SSIP site in Tawkyaungkalay for 60 tons per day of the waste in Shwe Pyi Thar Township



Note: (1) Total capital investment about (16) million US \$, (2)YCDC allocated (8) which fixed (1.4) at 2015-2016, (6.6) at 2016-2017
(3) Leap Frog program about (8) million, 2-year program from MoEJ.
(4) Joint Crediting Mechanism about from MoFAJ,

Solid Waste Management Sector

- To establish waste to energy plant between 60 tons/day to 200 tons/day of solid waste according to JCM project.

-Further Requirements from Kawasaki

- To plan and implement advanced solid waste collection system.
- To get knowledge sharing of industrial waste management.
- To plan and implement waste separation program.
- To establish solid waste database.
- To plan and implement compost promotion program.



Air Quality Monitoring (in front of City Hall)





AQM - Junction of Htaukyant (Northern part of Yangon)








Overall Discussion

We are so interested in low carbon society sector.

- Our PCCD collects and disposes 1600 tons per day of , So I want to ask you to help us to get carbon credit from the waste.
- I also would like to collaborate with you if there are other activities of low carbon.
- HAZ-SCANNER Modern EPAs and chosen 67 places to monitor.
 We have installed 3 sets of device as station
 other device is used as mobile station

-The 11 kinds of parameters we used for air quality monitoring are CO2, CO, CH4, NO2, SO2, PM2.5, PM10, Relative Humidity, Wind Speed, Wind Direction and Temperature.

Monitoring Sector

-At present, HAZ-SCANNER Modern EPAs, The 11 kinds of parameters,

-Further Requirements from Kawasaki City

- We would like to get Mobile Station (Vehicle) to carry out more effective air quality monitoring activities.)
- Mobile Air Quality Monitoring Device and Portable Air Quality Monitoring Device
- Sound Pollution Monitoring Device

Industrial Zones In Yangon City

Industrial Zones in City	= 24 No
>Total Factories	= 3474
≻Garments	= 126
≻Foodstuff	= 334
≻Chemical	= 56
Firon and Melting	= 519
Cold Storage and Fish Processin	g = 45
Paper and Cardboard	= 105
≻Distillery	= 9
≻Forest Product	= 148
≻Public Use Goods	= 661
>Others	2/24/2016 = 1511



WASTE WATER ANALYSIS RESULT OF ALCOHOL DISTILLERIES - 2014 AFTER PHYSICAL TREATMENT (ppm)									
S R	ITEM	PMG	TAWIN	SMT	SHANHE L	TOP ONE	YD	THEIN TOEAG	Myanm ar
1	рН	5.6	4.92	<i>4.99</i>	5.00	5.12	5	5.35	7
2	TOTA L SOLID	1595	2980	2181	2095	2983	6505	7750	1000
3	SS	235	600	<i>391</i>	515	658	1915	300	500
4	BOD	2023	2490	2023	562	2156	1484	2490	20- 60
5	COD	648	3711	2089	396	684	2053	1225	200
							2/24/2016 5:	18:56 PM	19

- At present, our PCCD has implemented inspection activities to the factories in the industrial zones in order to inspect waste water treatment yearly.

- The 5 kinds of parameters we have used for waste water quality monitoring are pH, B.O.D, C.O.D, T.S (Total Solid) and S.S (Suspended Solid).

However, there is no mobile device, we need its.
We would like to get Mobile Device to monitor waste water quality and to carry out more effective waste

water monitoring activities.

Monitoring Sector, supporting by Kawasaki

-To get the support on system development on air pollution.

- Devices

- JCM (50 % Both of Kawasaki and YCDC)
- To get the support on system development on water quality.

- Devices

- JCM (50 % Both of Kawasaki and YCDC)
- To get the support on system development on soil condition.
 - Devices
 - JCM (50 % Both of Kawasaki and YCDC)
- To get the support on system development on car exhaust.

- Devices

- JCM (50 % Both of Kawasaki and YCDC)

Joint Crediting Mechanism

The "**Yangon Waste to Energy Plant Project**" will be subsidized under the Joint Crediting Mechanism (JCM) Program. Approximately Up to 50% of total construction cost of the plant will be subsidized by the Japanese Government under the JCM Program. In order to reduce the generation of greenhouse gases such as methane from Open dumping Site, Yangon City Development Committee and JFE Engineering Corporation will establish an "International Consortium" which will aim to achieve a greenhouse gases emission reduction target. It is expected that the Republic of Myanmar and Japan will soon sign the bilateral document to start the JCM.





Good for collecting data needed for mandatory reduction program

Towards low-carbon and environmentally sustainable Yangon cities,

Please, Yangon wishes to share experiences from Kawasaki City

ALL!

- Potential for City-to-City Collaboration -Utilizing Kawasaki's Experience for better future of Yangon City (part-1)

> Economic and Labor Affairs Bureau Kawasaki-city

General Information about Kawasaki

Location



City Profile

- > Population:
- ➤ Area:
- City budget:
- ➤ 7 wards:

APPROX 1.47 million population (2014) 144.35 Km2 APPROX 10 billion US\$ (2015) Kawasaki, Saiwai, Nakahara, Takatsu, Miyamae, Tama, Asao





Major Corporations in Kawasaki



Overview of Kawasaki's Experience

Background

~ History of Industrialization and Environmental Deterioration ~

Chronological viewpoint about environmental issue change in Kawasaki

I 1940-1960	Development as "Industrial-city" Economic Development > Environment
II 1960-1975	Environmental Deterioration caused by industries
Ⅲ 1975-1990	Environmental Deterioration caused by household
№ 1990-	Issue of "Sustainability" (Earth Summit in Rio, Brazil): Search for the way to balance between economic and environment

Formation of Kawasaki Waterfront Area

Expansion of Reclaimed Land in Kawasaki Waterfront Area







Kawasaki Waterfront Area (1950s-60s)







Rapid Economic Growth and Serious Environmental Deterioration (1960s-70s)





(注)年度ベース。93SNA連鎖方式推計。平均は各年度数値の単純平均。1980年度以前は「平成12年版国民経 済計算年報」(63SNAベース)、1981~94年度は年報(平成21年度確報)による。それ以降は、2015年7-9月 期 2次速報値 〈2015年12月8日公表〉

(資料)内閣府SNAサイト











"Sharing of roles" & "Cooperative action"

Business

- Investment for pollution control
- Development of pollution control technologies
- Civil action against pollution
- Development of pollution control Public awareness for environment

Citizen



Public Authority

- Pollution control agreement with local industries
- Regulation for pollution control
- Pollution monitoring system



Improvement of environmental situation

Accumulation of Pollution control technologies & Know-how

Current Environmental Situation in Kawasaki (2010)







~ Potential for City-to-City Collaboration ~ Utilizing Kawasaki's Experience for better future of Yangon City part-2

> Economic and Labor Affairs Bureau Kawasaki-city

Efforts for Environmental Improvement in Kawasaki ①

"Environmental Monitoring "

Environmental Monitoring System in Kawasaki



Environmental Monitoring Data Analysis





Trend of NO_2 Concentration in air from 1973 to 2014





Efforts for Environmental Improvement in Kawasaki ②

"Solid Waste Management"

Basic Flow of Municipal Solid Waste Management









Municipal Solid Waste Management <Waste Incineration Plant>





Ukishima Final Disposal Site for Incineration Ash

Ukishima Final Disposal Site No.1

- Ukishima Final Disposal Site No.1 Operation period 1978~2006
- Ukishima Final Disposal Site No.2
 2000 ~(Under operation)

Ukishima Final Disposal Site No.2

After Incineration, Volume of Solid Waste would Reduce up to 1/50.



Menu for Waste Separation at household

menu	collection	Detail
General waste	2/week	Garbage, wood, ceramic plate etc
Recyclable	1/week	can pet bottle glass bottle used battery
Mixed paper	1/week	Paper waste
Plastic container	1/week	Plastic container for food
Small size waste		Metal waste under 30cm
Oversized waste 2/month		Metal waste over 30cm or other waste over 50cm





Arousing Public Awareness for Proper Waste Separation

Cooperation with "Waste Reduction Leader"

Kawasaki city appoints "Waste Reduction Leader" from citizens who are expected to provide information for proper waste separation and reduction, and check stations for waste collection to be clean.

Number of "Waste Reduction Leader"

= 1,880 appointed in 2013



Public Meeting



> Utilizing Various Media, PR tools



Trend of Solid Waste Disposal Cost in Kawasaki Disposal Cost per weight **Total Disposal Cost** 450円/kg 250億円 400円/kg ■ 廨棄物事業積 普通ごみ
 #大ごみ
 四缶 200億円 350円/kg 空瓶 ____ い物金属 ペットボトル ミックスペール ブン製容器包装 300円/kg 150億円 250円/kg 200円/kg 100億円 150円/kg 100円/kg 50億円 50円/kg 0円/kg 0億円 H'2 H13 H14 H15 -116 H17 H18 H19 H20 H21 H22 H23 H24 H25 廃棄物事業費 |216 遼円 | 208 億日 | 201 億円 | 193 遼円 | 179 億円 | 174 億円 | 169 億円 | 163 億円 | 157 億円 | 152 億円 | 138 億円 | 144 億円 | 144 億円 | 139 億円 | 普通ごみ 40円/4g 40円/kg 38円/kg 36円/4g 41円/kg 39円/kg 38円/kg 37円/kg 37円/kg 37円/kg 35円/kg 37円/kg 39日/kg 39円/kg 粗大ごみ 111円/kg 143円/kg 131円/kg 102円/kg 174円/cg 171円/kg 164円/kg 175円/kg 137円/kg 119円/kg 75円/kg 70円/ka 70円/kg 69⊟/kg 124円/kg 133円/kg 130円/kg 118円/kg 132円/kg 119円/kg 117円/kg 98円/kg 98円/kg 109円/kg 116円/kg 116円/kg 114円/kg 05円/kg 空缶 空瓶 108円/kg 116円/kg 113円/kg 104円/kg 114円/kg 115円/kg 117円/kg 113円/kg 110円/kg 109円/kg 102円/kg 86円/kg 55円/kg 277円/kg 307円/kg 373円/kg 283円/kg 398円/kg 295円/kg 272円/kg 259円/kg 234円/kg 221円/kg 103円/kg 104円/kg 101円/kg 10円/kg 小物金属 ペットボトル 318円/㎏296円/㎏278円/㎏246円/㎏257円/㎏232円/㎏214円/㎏195円/㎏191円/㎏194円/㎏142円/㎏133円/㎏124円/㎏132円/㎏132円/㎏ 85円/kg 64円/kg 64円/kg 44円/kg ミックスペーパ・ プラ製容器包装 138円/kg 81円/kg 80円/kg 65円/kg

Efforts for Environmental Improvement in Kawasaki ③

"Kawasaki Eco-town "



Kawasaki Eco-town

- "Kawasaki Eco-town plan" was approved by MITI (METI) in 1997
- Appointed area : Kawasaki waterfront area



Recycling Facilities in Kawasaki Eco-town







LNG High Efficiency Power Plant

Biomass Power Plant

4. Potential of City-to-City Collaboration between Yangon and Kawasaki

Potential of City-to-City Collaboration (1)

Low carbon society	 Eco town planning and sharing experience Introduction of energy saving products/technologies from Japanese private entities Support on Private sector collaboration, such as chamber of commerce etc. Support on capacity development through JICA scheme etc.
Monitoring	 Support on system development on car exhaust/air pollution/water quality / soil condition, including analysis know-how
Solid waste	 Planning/implementation of solid waste collection system Planning/implementation of garbage separation program Planning/implementation of compost promotion program Knowledge sharing of industrial waste management Establishment of solid water database etc.

Potential of City-to-City Collaboration (2)

Water supply /Sewerage	 Sharing of management knowledge on water supply / sewerage system Sharing of water tariff collecting / water quality management knowledge 	
Education	Planning / implementation of environmental education programs	
Other options	 Implementation of site tour on Kawasaki eco town etc. Establishment of Environmental Impact Assessment (EIA) system 	
+		
Introduction of Japanese advanced products / technologies from private entities, if necessary		

JCM Project Formulation Study through City-to-City Collaboration between YCDC and Kawasaki city





Part 1 : Outlines of the Study



Background and Objective of the Study

[Background]

Yangon city is one of the rapid growth cities in the world, however, the city has faced several issues, such as energy supply, transportation, water supply/sewerage etc. Also, the private investment has been facilitated from not only domestic entities but also foreign entities, so the city has big commercial potential.

Objectives

To contribute to sustainable development and realize low carbon society in Yangon, the study aims to formulate prospective JCM projects collaborate with Kawasaki city and Japanese private entities, which have high-efficiency and low carbon technologies.


What is Joint Crediting Mechanism (JCM) ?

- 1) Facilitating diffusion of leading low carbon technologies, products, systems, services, and infrastructure as well as implementation of mitigation actions, and contributing to sustainable development of developing countries.
- 2) Appropriately evaluating contributions from Japan to GHG emission reductions or removals in a quantitative manner and use them to achieve Japan's emission reduction target.
- 3) Contributing to the ultimate objective of the UNFCCC by facilitating global actions for GHG emission reductions or removals.



JCM Partner Countries

Japan has held consultations for the JCM with developing countries since 2011 and has established the JCM with Mongolia, Bangladesh, Ethiopia, Kenya, Maldives, Viet Nam, Lao PDR, Indonesia, Costa Rica, Palau, Cambodia, Mexico, Saudi Arabia, Chile, Myanmar and Thailand.



respectively.

Outlines of the Study



Overall Schedule of the Study

	201 Oct	5	Nov.	D	2 ec. Ja	2016 an.	Feb.	M	ar.	ı ı Apı	r. May
City-to-City Collab	Inforr ons e city-tu collab		ormation/opini exchange on -to-city aboration		Discussion of contents of cit city collaborat	:y-to- tion	Signing MOU	of Preparatio			Consideration of private entity partnership Consideration of city-to-city collaboration , using various
oration	Kick mi @Y0	tg CDC	JCM WS @Yokoh ama		Site visit by YCDC in Kawasaki	v JC	CM VS	in of next i			fund and supporting scheme
JCM Project Formu	ſ	Needs assessment in YCDC							Low carbon IPs		
			Information collo on JCM candidat	ection e activ	rs' activ	Low carbon buildings		Consideration of JCM subsidy application with private entities			
			Coordination private ent	n of JC ities	ities	Low carbon water/sewe.					
lation	Preparation of JCM application on candidate activities							Renewable energy etc.			

Part 2 : City-to-City Collaboration between YCDC and Kawasaki city



Objectives of the Collaboration

- It aims to support establishment of Low Carbon Society in Yangon in order to mitigate GHG emissions.
- Also, it aims to scrutinize mid-and-long term city-to-city collaboration between Yangon and Kawasaki.
- Under the process of JCM project formulation, it aims not only "diffusion of advanced low carbon technologies" but also "share of knowledge and know-how" between Kawasaki city and YCDC in the JCM scheme.

Advanced low carbon products /technologies from Japanese entities



- Overcome of pollution and establishment of low carbon society
- Operation experiences of institutions and infrastructures

Establishment of low carbon societies in Yangon , in order to solve its current/urgent issues

Merits of the Collaboration

YCDC's Merits

- Establish the low carbon society with utilization of Japanese advanced products/technologies and saving YCDC's effort including administrative cost etc. by JCM scheme.
- Share the mid-and-long term support with Kawasaki city.
- Enjoy private support from not only domestic but also Japanese entities.
- Raise the quality of life by enjoying the co-benefits that the improvement of energy supply, air and water pollution, waste management etc.

City to city collaboration with Kawasaki city

Myanmar local entity's Merits

- Available to acquire/install the advanced products/technologies with reasonable cost with JCM financial support programme.
- Can contribute to low energy consumption activities.
- Can save operating and maintenance costs.
- Feel the security for the introduction of new low carbon products /technologies by expectation of assistance and support.

Overall Schedule, City-to-city Collaboration



Part 3 : JCM Project Formulation in YCDC



Incentives of the JCM



- Scope of the financing: facilities, equipment, vehicles, etc. which reduce CO₂ from fossil fuel combustion as well as construction cost for installing those facilities, etc.
- Eligible Projects : starting installation after the adoption of the financing and finishing installation within three years.





Examples of the JCM projects (1/4)

MP2013-ID01&02

Energy Saving for Air-conditioning and Process Cooling at Textile Factory

Indonesia







Project Owner

Japan \div Ebara Refrigeration Equipment & Systems and Nippon Koei Co., Ltd. Indonesia \div PT. Primatexco and PT. Ebara Indonesia

In Indonesia, humidity control is indispensable for the textile industry to maintain product quality and massive energy output, which is required for the adjustment of factory air conditioning. The target factory replaces old-fashioned chillers (230USRt and 250USRt) with high-efficiency chillers (500USRt), in order to save energy and mitigate CO₂ emissions. High-efficiency chillers adopt a high-performance economizer cycle and a super-cooling refrigerant cycle in order to save energy. Also, the chillers use low-pressure refrigerant (HFC-245fa) with zero ODP(Ozone Depletion Potential).



Source : JCM Feasibility Studies, GEC



Source : JCM Feasibility Studies, GEC

Examples of the JCM projects (3/4)



Source : JCM Feasibility Studies, GEC

Examples of the JCM projects (4/4)



Candidate project in YCDC, low carbon industrial park (1/2)

[Outlines of Mingaladon Industrial Park] Mingaladon Industrial Park a) Official opening : February 1998 b) Construction : Mitsui Construction Co., Ltd. c) Total area : approx. 90 ha d) No. of tenants : 41plots e) Size of Plots : 1 ha ~ 4 ha f) Lease Period : Up to February 7, 2048 g) Lease Period : 7 km from Yangon int'l airport 23 km from city center 24 km from Yangon port h) Infrastructures : Electricity, Communication, Water supply, Waste Treatment Plant, Fire hydrants etc.

Candidate project in YCDC, low carbon industrial park (2/2)



Candidate project in YCDC, the others

Low carbon building management system

- High efficiency air conditioning system
- High efficiency lighting system
- Solid waste energy system
- Back-up power supply system
- Heat shield film/panel
- Solar power system etc.

Low carbon water supply/sewerage system

- High efficiency water pump system
- High efficiency waste water pump system
- Solid waste energy system etc.

Project identification of renewable energy /new energy

- Solar power system
- Biomass power generation system
- Biogas power generation system
- Back-up power supply system
- Application of natural gas etc.



Thank you for your kind attention. aus;ZI;wifygw,f



Manager, Renewable Energy & Climate Change Group Environmental Science & Engineering Dept. EM : Ishikawa-ms@n-koei.jp



Kawasaki Eco-Tech Walker







Welcome to Kawasaki innovation

> The City of Kawasaki is home to many manufacturing companies working to achieve a low-carbon society. as well as world-class research institutes focused on the life sciences and environment fields. This powerful harmony between the environment and industry that has developed in the city allows for the creation of new industries and dynamic business matching. A model for Japan, the city has become an "environmentally-advanced city" with the capacity for sustainable development.

This publication looks at Kawasaki's untiring innovation through a number of angles that include an interview with the mayor, comments from environment-related companies. and information about energy saving and creating sites in each region.

OInterview with the Mayor

To make Kawasaki the fortunate city

Tackling pollution problems as an environmentally-visionary municipality, the City of Kawasaki is a world leader in achieving sustainability. Mayor Norihiko Fukuda, who continues to passionately lead the way in advancing these initiatives ever further, talks below about his near-term vision for Kawasaki.

leasures to Combat Pollution

Through proactive efforts conducted variously by companies, city residents, and the government to overcome serious pollution issues, the City of Kawasaki seems to have achieved a remarkable measure of success. What are your thoughts on this?

The skills to solve pollution issues as the bedrock of Kawasaki innovation During Japan's era of high-speed economic growth (1960s and 1970s), Kawasaki was, as the center of the Keihin industrial area, a driving force of Japanese economics. The downside to this growth was harm done to the environment through air and water pollution, as well as waste disposal. However, the many persistent efforts made by companies, city residents, and the government since then has restored Kawasaki's blue skies and brought back the former beauty of its rivers and coast.

Companies have actively invested and developed technologies to solve pollution problems, while residents have become more aware of these issues. Government has joined this circle, contributing by signing agreements with companies over air pollution control and passing pollution control regulations.

This has led to a great wealth of world-class environmental technologies and knowledge centered on air purification, waste treatment, and recycling. The city's contribution to achieving harmony between industry and the environment through

most on Earth!

Fukuda Norihiko

these technologies and knowledge, which has allowed it to succeed in casting off its image of a municipality struggling with pollution, has people now calling it an "environmentally-advanced city".



The Keihin industrial area in the 1960s

Advancing the Kawasaki eco-town concept

In 1997, the City of Kawasaki was officially recognized as the first eco-town region in Japan. Companies here are making leading-edge recycling efforts.

Enhancing economic growth while also succeeding with environmental measures

The City of Kawasaki has built up a base of technologies and knowledge through the process of overcoming pollution throughout

the region, a region once plagued with pollution problems. It has used this base to reduce environmental impact, recycle resources, and otherwise stimulate industry centered on the environment. From this it framed the eco-town concept targeting Kawasaki's entire coastal region, receiving recognition in 1997 from the former Ministry of International Trade and Industry as the first eco-town region in Japan. The eco-town region covers the entire Kawasaki coast, an area of about 2,800 hectares.

Since being recognized as an eco-town, companies have shifted to production involving resource recycling and new

Advancing the Kawasaki eco-town concept

Chemical recycling of waste plastics for ammonia production facility Produces synthetic gases for ammonia production from waste plastics Showa Denko K.K.



PET to PET recycling facility Chemically decomposes waste PET bottles to produce virgin



recycling Recycles consumer electronics (televisions, refrigerators, air conditioners, laundry machines, etc.) JFE Urban Recycle Cornoration



Born in 1972. Graduated from Kawasaki City Junior High School, Majored in political science at Furman University in the United States, Was elected to Kawasaki City Mayor for the first time in 2013.

> recycling facilities have been built. The city is now home to a number of recycling facilities, which take advantage of the high concentration of companies on the coast and the large number of environmental technologies to recycle and make effective use of sustainable resources and waste products produced inside the city.

> The eco-town has received high acclaim for succeeding with environmental measures while demonstrating the ability to succeed economically, and attracts an endless number of overseas visitors looking to understand this success.

The eco-town of Kawasaki is home to a range of recycling facilities that effectively use and reuse resources in coordination with other facilities in the area.

Kawasaki Zero-Emission Industrial Park An industrial park developed as a pioneering model facility of the Kawasaki eco-town

Hard-to-recycle waste paper recycling facility The world's first zero emissior paper production plant that roduces toilet paper solely from ard-to-recycle waste paper San-ei Regular Co., Ltd.

Production of reducers for blast furnaces from waste plastics

Production of boards for concrete formworks Produces concrete formwork boards for concrete placement using waste plastics JFE Plastic Resource Corporation

Advanced technology visualization, lifestyle

Showcasing environmental technologies

Since the Great East Japan Earthquake, power generation facilities on the coast and environmental technologies used within the city have garnered attention in Japan and abroad. Word is that the city is making progress in visualizing superlative environmental technologies.

Coastal power generation potential garnering attention in Japan and abroad Global warming is now an urgent problem for mankind. In the interest of using alternative energy such as renewable energy and improving energy efficiency, further focus is being placed on generating clean power. Since the Great East Japan Earthquake, there has been a growing coastal concentration of renewable energy generating facilities such as high-efficiency thermal power stations, biomass power generation facilities. solar power generation facilities, and wind power generation facilities.



CC Kawasaki Energy Park: informing the world of Kawasaki's environmental expertise

The CC Kawasaki Energy Park is home to many such state-of-the-art facilities, which work closely together to broadly share information about expertise on environmental matters. The CC Kawasaki Energy Park was designated a "Next-Generation Energy Park" by the Ministry of Economy, Trade and Industry in 2011. With shades of both an industrial tourism city and environmental city, it is a place where people can enjoy themselves while feeling an intimacy with the environment.

Kawasaki Eco Show Window Model Project

In addition, the Kawasaki Eco-Show Window Model Project is being carried out citywide to bring energy-saving and creating technologies into wider use. This involves using environmental products and a range of facilities within the city to save and create energy in an effort to make environmental technologies more visible in a way anyone can see. The dissemination of this publication is a part of this project.



Three 2014 certified model businesses paying a courtesy visit to the mayor

Tonomachi international strategic hub (King Skyfront)

Located on the shore opposite Haneda Airport, King Skyfront strives to develop pharmaceuticals and medical equipment while achieving innovation in industries connected with manufacturing and health.



Manufacturing Nano Innovation Center (iCON) (tentative name) Will begin operations in April 2015

- Kanagawa Prefecture Life Innovation Center (tenative name) Will begin operations in FY 2016

Johnson & Johnson's Tokyo Science Center Began operations in August 2014

Japan Radioisotope Association Construction to be completed in FY 2016

CYBERDYNE

Land transfer deal signed in October 2014

FUJIFILM RI Pharma Co., Ltd. Land transfer deal signed in August 2014

CIEA's Regenerative — Medicine and New Drug Development Center Began operations in July 2011

Kawasaki Life Science & -Environment Research Center (LISE) Began operations in July 2013

Daiwa House Industry Co., Ltd. – Land transfer deal signed in June 2014

Create Medic Co., Ltd. Will begin operations in FY 2016

National Institute of Health Sciences Construction to be completed in FY 2016

innovation, and smart cities.

King Skyfront's aspirations

King Skyfront in the Tonomachi district appears to be working towards creating a new hub for life innovation, where people gather from around the world.

Kawasaki's new mission for the 21st century

In the Japanese word Tonomachi, "tono" refers to the top member of a samurai organization. "King" comes from this idea, and is formed from the first letters of Kawasaki INnovation Gateway. King Skyfront represents a new mission for the City of Kawasaki: to build a new hub aimed at facilitating sustainable development around the world. King Skyfront is an area of about 40 hectares, located across the Tama River from Haneda Airport. Home to many world-class research institutes focused primarily on the life science and environmental fields, which are expected to see worldwide growth, it is an open

innovation hub that creates new industries.

With Kawasaki's involvement in resolving the problem of aging societies, environmental problems, and other issues faced by mankind, King Skyfront seeks to jumpstart innovation and generate global business in these fields while developing growth strategies for Japan.

Advancing the Smart City concept

It is said that the public and private sectors are working together towards achieving a sustainable smart city.

A new approach towards urban development, made possible through collaboration

One of Kawasaki's strengths is its presence as an industrial center for environment-related technologies and its high concentration of state-of-the-art research facilities. Collaboration between the city and a range of companies located here allow their achievements to be shared among companies, residents, and the community at large.

One part of this is advancing specific initiatives aimed at building a sustainable smart city focused on goals such as reducing our carbon footprint through the judicious use of energy, improving city residents' convenience and quality of life by leveraging ICT and other technologies, and ensuring safety and security in the event of a disaster. Model projects are already underway in the districts surrounding Kawasaki and Musashi-Kosugi stations. The former is the largest regional center in the city, and is making extensive efforts aimed at the efficient use of energy. The latter is working to optimize energy usage with city resident participation. We hope to offer these models to the world as a new approach to urban development from Japan.

Zoom

Reducing carbon footprint and improving convenience and safety through sustainable smart communities

Toshiba Corporation Community Solutions Company Community Solutions Division Koichi Hirooka, Synthesis Center Director

..................



There are four points concerning the smart community we are developing in the City of Kawasaki. The first is "energy solutions". With our integrated BEMS (Building Energy Management System) service, we are making energy usage visible at the community, building, floor, and tenant levels. This involves managing carbon footprint reduction and energy optimization

while enhancing people's comfort. Starting in 2013, our service has been deployed at multiple businesses in front of Kawasaki Station. We also foresee a 32% improvement in energy savings throughout our entire Smart Community Center building (Comparison by Toshiba to the total primary energy consumption in the reference year as per the Law Concerning the Rational Use of Energy).

The second point is "commercial revitalization solutions". We conducted a proof of concept for the revitalization of areas around Kawasaki Station by connecting up shopping districts in the area using ICT and providing a smartphone-based shopping guide. The third point is

.............



Using the City of Kawasaki as a venue for assisting with reconstruction support events

"healthcare solutions". We are working to develop and commercialize advanced healthcare solutions that achieve a widespread benefit for residents' quality of life. The last point is "disaster prevention information sharing solutions". This includes new plans for deploying emergency power supplies and providing electric buses that emit no exhaust gases and reduce the carbon footprint.

Going forward, we will be taking commercialization and convenience a step further while also focusing on both improving municipal sustainability and comfort for the individual as we implement "smart" solutions tailored to solving key issues in the community.

Staging an energy revolution, providing and achieving sustainability.

Towards building a hydrogen network

In addition to building a smart city, Kawasaki also appears to be ambitiously engaged in model businesses designed in line with community characteristics in the coastal region.

A long-awaited energy revolution begins in Kawasaki

Along with entering into agreements with Toshiba on collaboration and cooperation concerning a smart community, the City of Kawasaki has signed a comprehensive agreement on collaboration and cooperation with Chiyoda Corporation concerning the realization of a hydrogen society. This project will bring the hydrogen mass storage and transportation technologies of Chiyoda Corporation together with the diverse industrial resources in the areas of petrochemicals and energy in the Kawasaki coastal region to reduce the carbon footprint and diversify energy sources. In order to establish the world's first hydrogen network and develop commercial hydrogen stations, the City of Kawasaki is working to relax regulations and accelerate procedures through efforts that include making joint proposals to the Cabinet Office for a "national strategic special zone" plan and holding discussions with the national government and relevant organizations.

Strengthening the region's competitive strength while expanding the use of hydrogen¹ in transportation and city residents' everyday life, we hope to bring about an energy revolution the likes of which only Kawasaki can achieve.



Kawasaki International Eco-Tech Fair 2014

Support for overseas development

The city seems to be providing support for business matching for companies with exemplary environment-related technologies, especially overseas companies.

Bringing environmental technologies to the world through business matching The Kawasaki International Eco-Tech Fair is held every year. In 2014, some 200 people came to tour the city from 14 countries. This fair calls people to action to solve environmental problems around the world by utilizing the exemplary environmental technologies of companies based overseas and in the city, as well as the administrative expertise of the city itself. To improve the water environment around the world, the Kawasaki Water Business Network makes a difference by packaging together the products, skills, and expertise of companies with the city's skills and expertise in business administration for waterworks and sewerage projects.

Contributing to sustainability around the world by supporting hydrogen companies born in Kawasaki

Chiyoda Corporation

Zoom Up

> Technology Development Unit and Hydrogen Chain Business Unit Yoshimi Okada, Chief Engineer



Making the most of the Kawasaki coastal region's potential as a major consumer of hydrogen, we aim to work in step with hydrogen power stations' operations to build a hydrogen supply chain that handles everything from procuring hydrogen to its transport and supply by the time of the Tokyo Olympics in 2020. Achieving this will be two revolutionary technologies from Chiyoda

Corporation that will upturn conventional thinking concerning hydrogen.

One is a technology for transporting hydrogen at ambient temperature and pressure. Fixing hydrogen to toluene enables the production of methylcyclohexane (MCH), a liquid easier to handle than hydrogen. With this technology, it is now possible to transport hydrogen across long distances and store it in large quantities safely at low cost without cryogenically freezing it or pressurizing it in hydrogen cylinders. The other technology is one for extracting hydrogen from MCH. Long considered impossible to achieve, Chiyoda Corporation's nanotechnology has allowed it to be the first to succeed in producing a catalyst for such extraction. This allows only the necessary amount of hydrogen to be supplied where



SPERA hydrogen demonstration plant

hydrogen to be supplied whenever, wherever it is needed.

The result is green power from a renewable energy source. Hydrogen can be produced from water in a variety of places, and is an inexhaustible energy source that produces zero CO_2 emissions. By leading the way in commercializing this ideal energy source, hydrogen, we hope to help the world realize a sustainability that achieves harmony between energy procurement and the environment.

business matching,

I also thoroughly advertised these eco-technologies in Vietnam, Thailand, and Laos when visiting the ASEAN region.

Advancing green innovation

The City of Kawasaki appears to be undertaking "green innovation" initiatives to bring about next-generation vitality to the region. What are these initiatives?

Further development and expansion of sustainable city Kawasaki

These initiatives clarify a direction for our sustainable city to take by further developing and expanding the strengths and characteristics of the city, namely efforts made to date that have leveraged environmental technologies and industries.

We seek to take advantage of the knowledge and expertise we have accumulated through the process of our companies, residents, and government overcoming pollution to bring top-notch eco-technologies, products, and services

from companies here to places both in Japan and abroad. The goal of this is to improve the environment and awareness of the environment in other regions while also stimulating industry and enhancing quality of life in Kawasaki itself.

Making Kawasaki the most fortunate city on Earth

Finally, what are your hopes as expressed in the "Kawasaki, most fortunate city on Earth" slogan, and your outlook going forward?

Even as the national population declines, the City of Kawasaki's population continues to grow. There are few accidents or crimes. It is a nice place to live, where people are happy and safe. Looking at the national an international landscape, however, we do feel the desire to provide solutions to issues such as global warming and growing numbers of elderly and declining birth rates. Key to this are myriad environment-related



technologies developed, built up, and honed in Kawasaki. The creation of a sustainable city based on these technologies is the path that will lead to making "Kawasaki the most fortunate city on Earth", an idea its residents can be proud of. We will be devoting all energies to achieving this in as smooth and simple a way as possible, and we ask for everyone support in this endeavor.



Recent photo of the coastal region

Kawasaki eco-technologies in use around the world

Kawasaki is working to help resolve the world's environmental problems utilizing the top-notch eco-technologies of companies in the city and the city's administrative expertise.

Shenyang, China Exchange with Shenyang Water Group Co. Ltd Kawasaki City Waterworks Bureau

Shanghai, China High pressure washing of super high-rise condominiums Fujiks Co., Ltd.

Dammam, Saudi Arabia and elsewhere Saudi Arabian environmental management project Fujitsu, Fuji Electric Co., Ltd., Kawasaki City Environment Bureau et al

Northern Mozambique Feasibility study for sustainable drinking water supply business using a filtration system that does not require filter placement Nihon Genryo Co., Ltd.



Penang, Malaysia

echnologies Bureau, et a



Carbon footprint reduction project using waste-to-energy Kawasaki City Environment

Queensland, Australia Water saving and sustainable water recycling project JFE Engineering Corporation, Kawasaki Waterworks Bureau,

The fruits of implementing and promoting energy-

The Kawasaki Eco Show Window Model Project is an initiative that implements and promotes energy-saving and energy creating technologies, and involves soliciting from business operators in the city ideas themed on "making environment-related technologies visible" in a way that everyone can understand and that actually saves and creates energy. Here we introduce three model projects from among eight solicited during FY 2014.



The three 2014 certified model businesses paid a courtesy visit to the mayor

Interview with 2014 certified model businesses

Nikken Ishibashi Co., Ltd.

Bringing energy-saving, efficient lighting into wider use

A desire to convey the appeal of

electrodeless lamps

Electrodeless lamps are extremely eco-friendly products that provide a soft light capable of illuminating an entire space. They consume 75% less power and last for a long 34 years if kept on every day for eight hours.

Hiro Ishibashi, President

Takayoshi Shimizu, President

Yet electrodeless lamps are little-known in Japan, and neither written nor spoken explanations convey the product's merits. So in order to give people a direct sense of what makes electrodeless lamps great, we made a call out for model projects.

Working to brighten up the entire region

Receiving model project certification increased the profile of electrodeless products, increased the number of inquiries made by companies and other local governments, and otherwise made big waves for the product.

This model project involves installing electrodeless lamps in a shopping district, which will work to not only brighten up the city, but also prevent crime and stimulate the economy. They are also used in medical equipment, which indicates that they have almost no impact on precision machinery, a fact that has been scientifically proven.

I hope they will see broader adoption, just like LED lighting, as lighting that is good for both people and the environment.

Mu-fit Japan Corporation

Aiming to share information in a safe and eco-friendly way



Developing ecological materials

Adhesive sheets are used for indoor and outdoor advertising display sheets. As the adhesive ages, it can affect the surface it is attached to, becoming unable to be pulled off and leaving adhesive behind. As Mu-fit micro suction cups do not use glue, they

can be easily pulled off and do not affect the surface they attach to. They also insulate against heat, block light, and prevent fogging, and consist of a micro suction cup filled made with an acrylic emulsion agent that is good for both people and the environment. With conventional film marking, affixing and peeling off were complicated processes. With Mu-fit micro suction cup film, "difficult" becomes "easy".

Asurabbit Co., Ltd.

The keyword is intellectual property

Kimio Osanai, President



An idea born from dissatisfaction

The new type of disposable shopping bag proposed by this project uses a material that cuts down on CO_2 emissions when incinerated. The idea for this bag was something that came out of my dissatisfaction, and is the result of repeated trial and error. My problem with

traditional bags is that they can get dirty inside when they tip over. This lowers the rate of reuse, and is just an unpleasant experience. When I had a chance to meet with Mayor Fukuda the other day, it made me happy when he said he "had been waiting for a product like this".

The keyword for business in the future is intellectual property. It seems to me that we are in an age where products born from individuals' flexible thinking can satisfy consumers' needs, regardless of the size of the company making the product.

A micro suction cup film with grand potential Being certified as a model product improved people's awareness of and

being certified as a model product improved people's awareness of and trust in our company and product, and orders from Japan as well as the USA and Europe increased. Overseas, the suction cup sheet is most often used for wallpaper/interior design and applications related to advertising display sheets, but it also has potential for use in reducing environmental impact and in disaster prevention. Using micro suction cups to replace the glue surface of wallpaper, for example, allows it to be more easily affixed and peeled off. They can also be attached to LED panels and easily peeled off and affixed elsewhere to display advertisements, or used as a special sign-two-ways display that can be switched out as a sign directing people to an evacuation area during a disaster. In the future, through developing new functionality (micro suction cupping) by combining it with other products, I hope the product will take on new value not just as something used with printable media.

Model project as an opportunity to share many ideas

Although our product has taken shape, a lack of opportunities to advertise our product due to a small marketing team has made things a real struggle. Becoming certified as a model project has increased people's trust in and awareness of our product and granted more opportunities to advertise, and we are enjoying a good response.

Using things like 3D printers that can create prototypes of 3D models at low cost will hopefully allow us to develop products with added value in terms of eco-friendliness, even in niche areas.

In the City of Kawasaki, there are no doubt many small and medium-sized enterprises that start a business utilizing technological and developmental expertise but have a hard time finding success. I hope to see a continuation in Kawasaki of projects like these that shine a light on such companies.

saving and energy creation technologies

Kawasaki Eco Show Window Model Project 2014

Energy

Soft light from electrodeless lamps make for a safer, more secure city while lifting spirits.

Nikken Ishibashi Co., Ltd. [Joint proposer] Gentle Lighting Co., Ltd.

[Proposal key points]

 Greatly reduce power costs by deploying electrodeless lighting (use 1/4 the power of mercury lamps; have long life of about 100,000 hours)

- Is highly compatible with antitheft cameras; produces clear
- picture to improve antitheft effectiveness. [Location of deployment] Seki Shopping District (2/3 chome,

Tama-ku)







Mu-fit Japan Corporation Energy

[Proposal key points]

 Suction cups that can be affixed and peeled off any number of times. Blocks light, provides heat insulation, and controls glass fogging. Can be printed on both sides, allowing window glass to become advertising space.

[Deployment location] Eco-Town Assembly Hall (6-6 Mizuecho, Kawasaki-ku)

http://www.mu-fit.co.jp/



Demonstration test for 3-wheel electric

vehicle and Kawasaki Smart City PR

Lightweight disposable shopping bag that reduces CO₂ emissions and does not tip over

Asurabbit Co., Ltd.

[Joint proposer] Sato Green Engineering Co., Ltd. [Proposal key points]



Disposable shopping bag for ready-made meals, with dramatic improvements to ability to stay upright. No more lunchboxes

tipping over, no more bags getting dirty on the inside! •Uses less polyethylene (about 33%) and cuts CO₂ emissions when incinerated (about 60%).

[Deployment location] Kawasaki Science Park (KSP) (3-2-1 Sakado, Takatsu-ku) and Solid Square (580 Horikawacho,

Saiwai-ku) Also deployed at about 30

stores in the city. http://www.asurabbit.jp/





A step towards a zero energy lighting system







Bicycle sharing with self-operated rental cycle system

Pedal, Ltd.

[Deployment location] Tech Hub Innovation Kawasaki Keihin Building, 1-1 Minamiwataridacho. Kawasaki-ku



Kawasaki Eco Show Window Model Project **2012**



solar power generation module Terao Sasshi Kogyo Co., Ltd. [Deployment location] Kincam International Schoo 37-1 Tsutsumine, Kawasak [Joint proposers] Showa Yakuhin Kako Company Limited, JANB Co., Ltd., Fukushima Electronics Co., Ltd., Fluid amics Studio. Inc., Initiative for Development of

Feed-type LED lighting system with direct current power and dimming function

Tokyo Rectifier Co., Ltd. [Deployment location] Kuji Branch, Yachiyo Bank, Ltd. 4-13-3 Kuji, Takatsu-ku



We brighten the futures of children with light gentle on the eyes and body. Nikken Ishibashi Co., Ltd.

(Deployment location) Kawasaki Metropolitan Inada Junior High School gymnasium 4-1-1 Shukugawara, Tama-ku Hybrid agricultural system based on clean energy



畫. ลีเซากอกกอกป [Certified product] Kondo Kogei Co., Ltd. Delta Rays Power energy-saving lighting fixtures



Shading and heat

insulation panels for

[Certified product] my m "Mu-fit label sheets that do not use adhesive materials", Mu-fit Japan Corporation, 2012 model



Entrepreneurship

Saving energy with bus stop signs that use solar panel and LED technologies

Alphax Co., 1td. Alphax Co., Ltd. [Deployment location] Noborito Station entrance and Kormukai Nishimachi bus stop 374 Noboritoshinmachi, Tama-ku 4-71 Komukai Nishimachi, Saiwai-ku



Creating, storing, and using energy at various location Kondo Kogei Co., Ltd. [Deployment location] Takatsu Ward Office 2-8-1 Shimosakunobe Takatsu-ku



Natural energy generation from wind and solar -Providing safety and security through manual power generation Taiyo Denon Corporation



(NAM) Taiyo Denon Corporation Taiyo Denon Corporation WINTEX wind power generation series



VAN Light Boy Co., Ltd. "mobile balloon projector containing electronic ballast"





Building 4-1 Ogawacho, Kawasaki-ku [Certified product] m ELIIY Power Co., Ltd. "Large lithium ion battery cell for storing electrical power" ELIIY Pow

More information available on the following website: http://www.kawasaki-showwindow.jp/



A range of Public-Private Collaborative Efforts

With the end goal of creating world-renowned brands originating in Kawasaki, the City of Kawasaki provides support for reducing the carbon footprint, manufacturing, and business matching for environment-related technologies, something it achieves through a variety of public- private initiatives. Examples of this are the Low-Carbon Kawasaki Brand, the Kawasaki Monodukuri Brand, and the Kawasaki International Eco-Tech Fair.

Low-Carbon Kawasaki Brand

Support for manufacturing and services leading the way in reducing the carbon footprint

A certification system that seeks to cut greenhouse gas emissions on a global scale, the Low-Carbon Kawasaki Brand Project began in FY 2009 and went through a three-year trial run before becoming a full-scale project in FY 2012. This project involves not only ascertaining and managing the amounts of CO_2 emitted directly from factories and business sites but also conducting comprehensive assessments of business activities through the entire lifecycle of a product, etc. and then carrying out suitable initiatives.

This program targets a product's, technology's, or service's contribution to curbing global warming throughout its entire lifecycle, and certifies a wide range of products, etc. without restrictions based on company size or business category. It also evaluates products, technologies, and services developed in Kawasaki, works to prevent global warming through broad-based information dissemination, and promotes the concept of evaluating CO_2 reduction throughout an entire

lifecycle. Through these efforts, the program improves city residents' and companies' related skills and regard for the environment.



Low-CO2 Kawasaki brand

Kawasaki Monodukuri Brand

Certification of first-rate industrial products and technologies developed by small and medium-sized enterprises in the city

This program certifies first-rate industrial products and technologies developed by small and medium-sized enterprises in the City of Kawasaki and disseminates information about them in Japan and overseas in order to stimulate the local economy. It involves the Kawasaki Monodukuri Brand Promotion Council, which is comprised of organizations that include the Kawasaki City government and Kawasaki City Chamber of Commerce and Industry, conducting "Kawasaki Monodukuri Brand" projects.

The certification of products and technologies came about as a result of the progression of Japan's aging society and increased awareness concerning the environment and disaster prevention. As such, the program seeks to accurately identify a variety of latent needs and problems in society, apply dynamic solutions, and allow small and medium-sized businesses to demonstrate their manufacturing expertise in a variety of scenarios. The program also recognizes that there are many who contribute to the safety and security of residents' quality of life. With the expectation of helping more "only one, number one" companies set out into the world with expertise and skills developed in Kawasaki, the program continues to benefit from collaboration with related organizations as it works to stimulate regional industry and build a strong industrial city.



Kawasaki International Eco-Tech Fair

Contributing to the international community and conducting industrial exchange with eco-technologies

Kawasaki conducts the Kawasaki International Eco-Tech Fair with the goal of conducting industrial exchange in the environment field and contributing to the international community through the transfer of technologies. To accomplish this, it disseminates information about initiatives taken towards the environment, about first-rate environmental technologies that belong to companies in Japan and overseas, and about environmental technologies, etc. that are part of production processes. It also provides opportunities for companies with world-class environmental technologies, products, or services to link up with other companies and organizations in Japan and overseas.

Every year, some 150 companies and organizations—most of them based in the City of Kawasaki—set up 200 or more booths that are visited by more than 10,000 people during the fair's run. The fair assembles a wide range of environmentally-conscious technologies and expertise, brings first-class environmental technologies to Asia and other regions, and seeks to contribute to the international community. At the same time, it serves as an opportunity to show people the projects the city is conducting that involve environmental technologies and products.



Aimed at Enhancing Kawasaki's Value

Exa Corporation

Using IT to assist energy-saving efforts around the world Enterprise Development Division Maritime Environment &

Engineering Solutions Department

Yukihiro Yamashita, Solutions Development Group



Working as an IT solutions professional Exa is an IT engineering company that provides solutions for problems encountered by companies in various industries.

Ship operating control systems are something that has been around for a while, but they have all been either extremely expensive, or inexpensive but ineffective. Leveraging Exa's unique expertise, we developed the FCR Navi Eco+ ship energy-saving control support system, which allows operators to check operation status with a standard PC. It is an affordable system that provides necessary information in real time, and can be installed quickly. We have already received many inquiries from

Low-Carbon Kawasaki Brand Certified Busine Nihon Genro Co., Ltd.

Aiming for the world market with high-level technological expertise unique to specialized manufacturers Yasuhiro Saito, President



Monozukuri DNA passed down through the generations Our wish at Nihon Genryo Co., Ltd. is to provide people with delicious water that is

safe for the world's people to drink. We are a specialized manufacturer with an over 80% share in the market for water treatment filters at water purification plants in Japan. Our Siphon Tank product, selected as a Kawasaki Monodukuri Brand, is a compact filtration system that does not require filter replacement. Remaining continually focused on our strengths as a manufacturer, we have been active as a pioneer in filter recycling. This has allowed us to develop the proprietary "siphon cleaning technique", interested overseas parties. Through efforts such as developing systems for ocean-going vessel operation, we hope to continue taking advantage of our high level of technological expertise to support energy-saving initiatives around the world using IT solutions.

Brand awareness as a driving force behind future business

Perhaps because we have our own name despite our parent companies being IBM Japan and JFE Steel, people have said they do not know what kind of company we are. However, since being certified as a Low-Carbon Kawasaki Brand, awareness of and trust in our company has improved. This not only helped us talk business with our first customer, it has also led to an increase in inquiries from parties in both Japan and overseas. Another fortunate outcome has been an improved eco-consciousness among our employees. The Low-Carbon Kawasaki Brand, a status for which we applied due to the importance and sense of responsibility we felt towards eco-initiatives as an IT manufacturer, has been a driving force behind increased business opportunities for us.

which allows for the production of safe water. Since our founding, manufacturing DNA has been passed down through the generations. We develop products usable in times of emergency and in countries and regions without electricity, and our business extends overseas. By deploying water purification systems in places around the world, we hope to continue using water to contribute to society.

New technological development in

collaboration with local governments Becoming certified as a Kawasaki Monodukuri Brand has made it easier to work with local governments and has laid the groundwork for developing new technologies. For our company, which just celebrated its 75th year, this is an irrefutable testament to our technological expertise. Through continued refinement of our visionary nature and distinguished technologies, and through bold innovation, I hope we continue to remain a one-of-a-kind company.

Low-Carbon Kawasaki Brand 2013 Grand Prize

This system helps achieve optimal ship operation by ascertaining ship operating information in real time, then analyzing data and making suggestions such as the recommended rotational frequency for the main engine. In addition to a low cost of deployment and quick installation, the system can cut fuel costs by an estimated ¥100 million or more over five years per ship (standard coastal vessels with a weight class of several thousand tons). The system allows for considerable cost reduction by saving energy while at the same time mitigating global warming on a global scale.



http://www.exa-corp.co.jp/

FY 2004 (Year 1) 2010 Kawasaki Monodukuri Brand / Low-Carbon Kawasaki Brand Certified Business

Using primarily sand as a raw material, the "siphon cleaning technique" we developed allows for filters to be cleaned and repeatedly reused. Our Siphon Tanks are filtration systems that use this technique. These tanks reduce environmental impact and costs by keeping filters continually clean and thus eliminating the need to dispose of used filters as industrial waste. They are used in a range of applications from waterworks to sewerage to wastewater treatment.



http://www.genryo.co.jp/

Kawasaki Coastal Area

A showcase of Kawasaki's energy innovation, this area is home to many mega solar facilities, wind power generation plants, and other types of next-generation eco-power generation facilities and facilities with cutting-edge environmental energy technologies.

Miyamae Ward Nakahara Ward Saiwai Ward

Takatsu Ward

Tama Ward

Asao Ward

Asao Ward





Energy creating facilities Energy saving facilities Industrial tourism sites

A Kawasaki Eco Gurashi Mirai-kan



The Environmental Power of Coastal Regions





Aim High! Eco-Friendly Living

Learn about cutting-edge technologies of tomorrow through game-like activities

OAbout the facility

The Kawasaki Eco Gurashi Mirai-kan focuses on three themes: global warming, which causes unusual weather and other phenomena, renewable energy such as solar power, and resource recycling, including the recycling of trash. An environmental education facility, it provides visitors fun ways to learn as they experience specific ways to protect the environment. The facility provides regular tours that let visitors gaze at the spectacular mega solar plant as they watch planes taking off and landing from Haneda Airport. ◎Tour information

This is an interactive environmental education facility established with the concept of "learn by seeing, hearing, and touching". In addition to showing videos that tell the environmental history of Kawasaki and its triumph over pollution, the facility teaches visitors about trash sorting through game-based activities. The power output of the mega solar facility can be viewed in real-time.

Tour time: 90 - 120 mins

- 📳 http://eco-miraikan.jp/ 🚺 509-1 Ukishimacho, Kawasaki-ku Inside the Ukishima Treatment Center
- 💽 044-223-8869 (Kawasaki Eco Gurashi Mirai-kan)
- OK Free, open tours. Closed on Mondays.
- Take the Kawa 03 bus bound for "Ukishima Bus Terminal" from the East Exit of JR Kawasaki Station. The Mirai-kan is a 10-minute walk from the "Ukishima Bus Terminal" (the last stop).

III Website II Location Contact II Tours 🖪 Access



🕜 Kawasaki Mega Solar Power **Generation Plant**

Mega solar pioneer in Japan

This plant started operations in 2011 as a pioneer in Japan. The maximum output from its approximately 100,000 solar panels is 20 MW. http://www.city.kawasaki.jp/kurashi/category/

- http://www.city.kawasaku.pp/kurashi/category/ 29-4-3-2-4-0-0-0-0-0.html
 Ukishima Solar Power Plant: Ukishimacho, Kawasaki-ku Ogishima Solar Power Plant: Ogishima, Kawasaki-ku
 044-223-8869 (Kawasaki Eco Gurashi Miral-kan)
 Ukishima Solar Power Plant: Inquire at Kawasaki Eco Gurashi Miral-kan (reservation required)
 0gishima Solar Power Plant: Not open to visitors
 Tava the Kawa QA the bound for "Illiviting alug Terminal" from
- Take the Kawa 03 bus bound for "Ukishima Bus Terminal" from the East Exit of JR Kawasaki Station. The Mirai-kan is a 10-minute walk from the "Ukishima Bus Terminal" (the last stop)



Ogishima Wind Power Plant

Produces 3 million kWh annually using wind power This plant generates power only with natural energy, so it does not emit greenhouse gases, which are said to be a cause of global warming. The turbines are 123 m tall http://www.noe.ix-group.co.jp/
 1-2 Ogishima, Kawasaki-ku (Located within JX Nippon Oil & Energy Corporation Kawasaki

- Office, Ogishima Section) Office, Ogishima Section) O3-6275-5184 (JX Nippon Oil & Energy Corporation, Power Operations Department, Power Business Group)
- Not open to visitors
- The plant can be viewed from Higashi Ogishima Nishi Park or from Kawasaki Marien.



Mawasaki City Ukishima Processing Center

The largest environmentally-conscious waste treatment facility in the city

This facility has deployed environmental management systems and conducts strict self-regulation. The power it sells is generated from making effective use of waste heat generated during waste incineration.

- heat generated during waste incineration.
 http://www.city.kawasaki.jp/Shisetsu/categor/y43-1-0-0-0-0-0-0-0.html
 509-1 Ukishimacho, Kawasaki.et al. (al. 2016)
 4 Available; reservation required (residents of the City of Kawasaki) Generally closed Saturdays, Sundays, and holidays, as well as periods when furnace equipment is undergoing maintenance; reservations not available during New Year's holiday.
 Take the harbor bus (Kawa 03) bound for "Ukishima Bus Terminal" from the East Exit of JR Kawasaki Station. The facility is a 10-minute walk from the last stop.



Environment Research Center (LiSE)

A cutting-edge research facility leading the way in

This center researches leading technologies in the life

science and environment fields. The building utilizes son

GKawasaki Life Science &

creating international strategic hubs

🕄 Kawasaki Steam Net

the supply of steam

reduction.

Power Office)

Contributing to energy saving and CO2 reduction with

This facility supplies steam from the Kawasaki Thermal

Power Plant to 10 companies in the surrounding area,

and significantly contributes to energy-saving and CO2

[] 5-1 Chidoricho, Kawasaki-ku 7 045-394-5309 (Tokyo Electric Power Company Nishi Thermal

Take the city bus bound for "Shiei Futo" at the East Exit of JR Kawasaki Station, and get off at "Toden-mae".



🕢 Kawasaki Natural Gas Power Plant A power plant with one of the world's highest levels of uptime

Achieving world-class uptime with few personnel! This facility utilizes efficient and eco-friendly methods to provide a stable supply of electricity.

- 🗓 http://www.kngg.co.jp
- 12-1 Ogimachi Kawasaki-ku
- 044-366-8671
- Take a harbor bus bound for Mitsui Futo from bus stop 8 at the East Exit of JR Kawasaki Station, and get off at "JX Nikko Nisseki Enerugi Kawasaki Jigyosho-mae".



🕑 Iriezaki Wastewater Treatment Center Eco-friendly wastewater treatment facility with environmental technologies

This wastewater treatment facility incorporates a variety of environmental technologies, including a specialized treatment method that improves the water quality of Tokyo Bay and small hydroelectric power generation.

- http://www.city.kawasaki.jp/800/cmsfiles/contents/0000035/ 25833/office/iriezaki_mc.html

- 30639/07002/172284_mc.nmtn 317-1 Shiohama, Kawasaki-ku 044-287-5202 Available; reservation required. Take the city bus bound for "Shiei Futo" from the East Exit of JR Kawasaki Station, and get off at "Iriezaki Mizushori Center-mae".



🕑 Kawasaki Biomass Power Plant Japan's largest power generation facility using only biomass as fuel

This facility has the distinction of being Japan's largest power generation facility using only biomass as fuel. It is the first urban biomass power generation facility built tailored to urban environments.

- http://www.kawasaki-biomass.jp/

- http://www.kawasaki-biomass.jp/
 12-6 Ogimachi Kawasaki-ku
 044-201-6775
 Wewable by reservation. Companies and organizations only. Inquire with the Economic and Labor Affairs Bureau, City of Kawasaki, A 12-minute walk from Showa Station on the JR Tsurumi Line.
 Or, take the city bus bound for "Ogimachi" from bus stop 13 at the East Exit of JR Kawasaki Station. The facility is then a 3-minute walk from "Ogimachi". Or, take the harbor bus bound for "Mitsui Futo" from bus stop 22 at the East Exit of JR Kawasaki Station. The facility is then a 10-minute walk from "Showa Denko-mae".



🕝 Kawasaki Clean Power Generation Plant

Power generation plant that uses a high-efficiency, natural gas-fueled engine

This plant supplies electricity to residential customers by generating approximately 30,000 kW of power with a highly fuel-efficient gas engine that runs on clean natural gas.

- 🗓 None 🚺 4-1 Mizuecho, Kawasaki-ku
- 03-3282-2602
- Available; reservation required (weekdays); approximately 1 hour required for a tour. Reception time and number of visitors must be discussed

About 15–20 mins by taxi from JR Kawasaki Station

Kawasaki City Southern Area Kawasaki, Saiwai, and Nakahara (one section) Wards

This is a cutting-edge area where leading industries and companies have established bases. The entire region engages in eco-friendly activities that include working to establish shopping districts, places for people to relax, and a smart community that uses state-of-the-art technologies.



BToshiba Science Museum







"Science Stage" science is fun!

Get on the "Nanorider" machine and depart for the world of nanotechnology!

Come, look, touch, and experience science!!

O About the facility

With a theme of "Interaction between people and science", the Toshiba Science Museum helps educate the children who will be our future to kindle in them an interest in science. The facility is at once a place to preserve and display industrial heritage as well as a center for information about the Toshiba brand and a place for cultural exchange in collaboration with the community. In an intuitive way, the facility presents the past, present, and future sciences and technologies that have and will be at work around us.

Tama Ward

Asao Ward

Takatsu Ward

○ Tour information

From static electricity generators to the Smart Building Experience to the Nanorider exhibit, visitors will enjoy many interactive exhibits that let you use your own body to experience the latest technologies. Also not to be missed are the superconduction demonstrations and the science shows performed three times a day. There are also a number of science experiment classes and events available free of charge on the weekends.

- Tour time: 60 90 mins
- 🔢 http://toshiba-mirai-kagakukan.jp/

Smart Community Center 2nd Floor (LAZONA Kawasaki TOSHIBA building), 72-34 Horikawacho, Saiwai-ku Kawasaki

- 044-549-2200
- Tuesday ~ Friday 10:00 18:00 Saturday, Sunday & Holidays 10:00-19:00 Closed: Mondays and days designated by the museum (please see the museum's website)
 - Fee: Free Visits are generally self-guided. Reservations are required for the following: . Tours by groups of 20 or more
 - · Guidance in a foreign language (English or Chinese)
 - · If an attendant is required for corporate visitors
- 🗚 A 1-minute walk from the West Exit of JR Kawasaki Station, or a 7-minute walk from Keikyu Kawasaki Station

Website Location Contact Tours Access



Kawasaki Station East Exit Station Square

A people- and eco-friendly station plaza

The East Exit Station Square was revamped based on the two design themes, being eco-friendly and barrier-free, while being conscious of giving the square an appearance suited to becoming the "face of Kawasaki." http://www.city.kawasaki.jp/kurashi/category/26-2-1-1-5-0-0-0-0.html Ekimaehoncho, Kawasaki-ku

044-200-3021

Self-guided tours are available. Adjacent to the East Exit of JR Kawasaki Station



Kawasaki Underground City Azalea The third biggest underground city in Japan, at Kawasaki Station Square

Through means such as reducing CO₂ by way of its high-efficiency air conditioning system, this underground city actively contributes to improving the environment.

http://www.azalea.co.jp 26-2 Ekimaehoncho, Kawasaki-ku

044-211-3871 (main line) Not available

A 1-minute walk from JR Kawasaki Station, or a 1-minute walk from Keikyu Kawasaki Station



Egasaki Power Station

Micro hydroelectric power generation using natural energy

This station is the first in Japan to be jointly run by a local government and private-sector company. It helps prevent global warming by using energy from the natural flow of water.

http://www.city.kawasaki.jp/800/cmsfiles/contents/0000035/ 35839/business/micro.html

6 Egasakicho, Tsurumi-ku, Yokohama-shi 044-866-0335 Available; reservation required.

From JR Kawasaki Station, take the Harbor bus bound for

"Sueyoshibashi and Yako Sotomawari Junkan." The power station is a 2-minute walk from the "Denki no Shiryokan Iriguchi" bus stop.



Toshiba Smart Community Center Cutting-edge environmentally-friendly office building This center utilizes the cutting-edge technologies of Toshiba and balances comfort with high-level energy-saving performance. During disasters, it uses limited energy supplies effectively.

http://www.toshiba.co.jp 72-34 Horikawacho, Saiwai-ku

Not available

A 1-minute walk from JR Kawasaki Station or a 7-minute walk from Keikyu Kawasaki Station



Kawasaki Chamber of Commerce and Industry

A cutting-edge office building friendly for both workers and the environment

Airflow windows that circulate air inside the building and special heat-insulating glass led to this building achieving CASBEE Kawasaki's S rank, the highest rank.

http://www.kawasaki-cci.rjp http://www.kawasaki-cci.rjp 044-211-4111 Not available Jodjacent to Kelkyu Kawasaki Station, a 2-minute walk from JR Korwaseli Chethon

Kawasaki Statio



🙆 Yumemigasaki Zoo

Recreation area for citizens that utilizes natural energy This zoo is home to some 400 animals representing 60 species. It utilizes automatic solar-tracking solar power equipment for the air-conditioning facilities inside its veterinary hospital and elsewhere.

- http://www.city.kawasaki.jp/shisetsu/category/30-26-0-0-0-0-0-0-0-0-0-0-0.html
 1-2-1 Minami-kase, Saiwai-ku

044-588-4030

A 20-minute walk from Kashimada Station on the JR Nambu Line, or a 15-minute walk from Shin-Kawasaki Station on the JR Yokosuka Line



Shin-Kawasaki Forest of Creation NANOBIC

Global Nano Micro Technology Business Incubation Center This nanotechnology research facility contributes to technological innovations in the environment field,

including solar power generation efficiency.

- Http://www.kawasaki-net.ne.jp/sozo/ 7-7 Shin-Kawasaki, Saiwai-ku 044-587-1105 Available (spaces occupied by enterprises, etc. are not for viewing; tours may be possible upon consultation). A 10-minute walk from Shin-Kawasaki Station on the JR Valorable los are a 15-eijouth walk from Karbimada Stati Yokosuka Line, or a 15-minute walk from Kashimada Station on the JR Nambu Line.



Bhoei Co., Ltd. Saving and creating energy with a building certified as S-rank by CASBEE Kawasaki

This manufacturer of environment-related devices seeks to save energy as it creates it, giving back to society as a leading company in the area of environmental preservation.

http://www.shoei-roka.co.ip

2-6 Shin-Kawasaki, Saiwai-ku 044-589-1601

Yes

A 15-minute walk from Shin-Kawasaki Station on the JR Yokosuka Line



Mitsubishi Fuso Truck and Bus Corporation

A plant that uses two kinds of natural energy

This environmentally-conscious plant saves energy by using geothermal heat pumps to cool the building, and creates energy with solar panels installed on the roof. http://www.mitsubishi-fuso.com

- 10 Okuracho, Nakahara-ku Not available; One day a year is open to the public A 15-minute walk from Shin-Kawasaki Station on the JR Yokosuka Line

Kawasaki City Central Area - Nakahara and Takatsu Wards Tama Ward Takatsu Ward An area where energy saving and creation has taken strong root in Asao Ward citizens' lives, evident in everything from solar cell-equipped hospitals Mivamae Ward Asao Ward Nakahara Ward and schools to facilities that use ICT to save energy. Saiwai Ward Kawasaki Ward Tokyo Den-en-chofu Aiyauchi-kitagawa Keihin Ka Takatsu Ward Maru Tachibana Shinmaruk Nakahara Ward 2 Motos Energy creating facilities 8 Yokohama City Energy saving facilities

CKawasaki Center for Climate Change Actions – CC Kawasaki Exchange Corner



Showcase of energy saving/creation facilities

Monthly themed exhibit

Global warming prevention promotion sites in the city

OAbout the facility

This facility has an information counter where visitors can ask questions and consult about everyday issues concerning things like energy saving in the home. The Information Corner provides information about initiatives being conducted by citizens and businesses. Visitors can also check out books about global warming. The facility also hosts exhibits on different themes each month related to global warming measures, in addition to conducting seminars and classes on different themes. These efforts help the facility promote awareness of global warming measures and build networks between city residents, business operators, and the government.

○Tour information

The themed exhibits, which use the CC Kawasaki Exchange Corner, change every month. This gives something new to enjoy 12 times a year. Seminars and classes are also held once a month alongside the themed exhibits, providing visitors with information on a wide range of topics. Tour time: Visits are self-ouided

http://www.cckawasaki.jp/kwccca/

.................

1-4-1 Mizonokuchi, Takatsu-ku, inside Takatsu Civic Hall (Nocty Plaza 2, 11F)
 044-813-1313

- Available; Closed Mondays and days Civic Hall is closed. Application is required for participation in classes, etc. Visit website for more information about classes, etc.
- A 5-minute walk from Musashi-Mizonokuchi Station on the JR Nambu Line, or a 5-minute walk from Mizonokuchi Station on the Tokyu Den-en-toshi or Oimachi Line

Information Counte

B Website Location Contact Tours Access



🕧 Tokyo Gas Nakahara Building High-efficiency air conditioning system that utilizes

solar heat for cooling and heating This building has a vacuum tube type solar heat collector on its roof. It makes effective use of collected heat for heating as well as a gas absorption water cooler and heater http://eee.tokyogas.co.jp/industry/industrial/

- architecture/solution/case02.htm 2-215 Kosugimachi, Nakahara-ku 044-211-7212

Available; reservation required

A 12-minute walk from Musashi-Kosugi Station on the JR Nambu Line and Tokyu Toyoko Line, or a 10-minute walk from Shin-Maruko Station on the Tokyu Toyoko Line.



Kawasaki International Association (Kian) Center

An international exchange facility equipped with a solar power system

Kawasaki's first citizen-initiated "Ohisama" (Mister Sun) Solar Power Station was installed in August 2008 thanks to. donations from citizens and the Green Power Fund. This facility features space for events and accommodation.

- http://www.kian.or.jp/
 2-2 Kizukigioncho, Nakahara-ku
 044-435-7000

- Available (reservation is advised) Not available on facility inspection dates and closure days
 A 10-minute walk from Motosumiyoshi Station on the Tokyu Toyoko Line and Meguro Line



MEC Tamagawa Solutions Center An eco-office that has adopted advanced energy-saving measures

This office has reduced CO2 emissions by about 60% relative to conventional offices through cutting-edge energy-saving equipment and ICT use. It is a true example of a "total eco-solution for the office.

- http://jpn.nec.com/
- 🕒 1753 Shimonumabe, Nakahara-ku 044-435-1048

Not available

A 3-minute walk from Mukaigawara Station on the JR Nambu Line, a 5-minute walk from Musashi-Kosugi Station on the JR Yokosuka Line, or a 13-minute walk from Musashi-Kosugi Station on the JR Nambu, Tokyu Toyoko, or Tokyu Meguro lines



Takatsu Ward Office An eco-city hall and environmental showcase, through and through

This facility has introduced initiatives such as a solar power generation system and green roof, and provides Ecological City Hall Tours.

http://www.city.kawasaki.jp/takatsu/cmsfiles/contents/0000035/ 35881/p03.html/

- 2-8-1 Shimosakunobe, Takatsu-ku 044-861-3131
- Available; Please inquire in advance to receive information from facility staff.
- Nambu Line, or a 3-minute walk from Mizonokuchi Station on the Tokyu Den-en-toshi Line.



🕄 Fujitsu Kawasaki Factory Fujitsu Technology Hall — Touching Fujitsu's technology and enthusiasm

At the Fujitsu Technology Hall, visitors can see everything from products of the age to the latest ICT used around the world. The facility uses state-of-the-art ICT to save energy and reduce CO_2 emissions.

- energy and reduce CU₂ emissions.
 http://jp.fujitsu.com/facilities/kawasaki/exhibition/
 41-1 Kamikodanaka, Nakahara-ku
 44-177-1111 (Fujitsu Technology Hall)
 Available; reservation required. Tours are provided only to agencies and organizations such as middle schools and high schools (requires a chaperong), as well as intermediary organizations for city halls, chambers of commerce and industry, and city halls, chambers of commerce and industry, and totrism hureaus (fours are not provided to individuals). Reservations: https://www-s.fujitsu.com/jpfacilities/kawasaki/exhibition/reserve.html
 A a-minute waik from Musashi-Nakahara Station on the JR Mambu Line (to front entrance)
- Nambu Line (to front entrance)



6 Tokyu Toyoko Motosumiyoshi Station Environmentally-friendly station utilizing natural energy This is an environmental model station engaging in solar power generation, rainwater reuse, and the greening of its premises. The station is equipped with a 140 kW solar energy system.

http://www.tokyu.co.jp/rallway/west/torikumi/kankyou/html/ 1-36-1 Kizuki, Nakahara-ku 03-3282-2602

Available; Tours are not provided on an individual basis

🔝 Motosumiyoshi Station on the Tokyu Toyoko Line and Meguro Line



Nishimaruko Elementary School in Kawasaki City

Eco-conscious school facility

This school has a solar power system with a peak output of 100 kW. The school's indoor heating and lighting

- solutions are also environmentally friendly. http://www.keins.city.kawasaki.jp/school/info/ke204701.html 2-19-1 Kosugijinyacho, Nakahara-ku
- 044-733-4413

Available upon consultation. Nambu Line



🚯 Kawasaki Municipal Ida Hospital

A green hospital living in harmony with the sun This facility has solar panels on its roof and works to preserve the environment surrounding Mt. Ida. http://www.city.kawasaki.jp/33/cmsfiles/contents/0000037/

- 37855/ida/
- 2-27-1 Ida, Nakahara-ku 044-766-2188
- Not available

Take the bus from Hiyoshi Station on the Tokyu Toyoko Line or Yokohama City Subway Line, and get off at "Ida Byoin Seimon-mae", Free shuttles for Ida Hospital also run from the North Exit of Musashi-Kosugi Station



🕑 Kawasaki Peace Museum A municipal peace and exchange facility equipped with

a solar power system

A project funded through the Green New Deal, this facility has been outfitted with equipment to make it eco-friendly, improving energy-saving effectiveness and cutting CO2.

- 0-0-0.html
- 33-1, Kizukisumiyoshicho, Nakahara-ku
 044-433-0171
 Available; Exhibits in the facility are available for viewing, but
- Available: Exhibits in the facinity are available for Viewing, but rooftop equipment is not.
 Free admission; Closure days: Mondays and every third Tuesday (the week day immediately following in the event of a holiday), New Year's holiday (December 29–January 3)
 A 10-minute walk from Musashi-Kosugi Station on the JR number, Yokosuka, Tokyu Toyoko, or Meguro lines, or a 10-minute walk from Musashi-Kosugi Station on the JR number, Station on the
- Motosumiyoshi Station on the Tokyu Toyoko or Meguro lines

A 5-minute walk from Musashi-Mizonokuchi Station on the JR

Kawasaki City Northern Area - Miyamae, Tama, and Asao Wards

In addition to unique environmental facilities that make effective use of local natural resources, this area achieves harmony between urban development and environmental protection through research centers for plant factories, facilities for promoting culture, and initiatives to preserve the area's rich natural environment.



Energy creating facilities Energy saving facilities Industrial tourism sites

DRecycle Park Asao Environment Education Promotion Facility (name tentative) (100 pen (10



Recycling and Disposal Facility image

Health Commuion Plaza image

A fun approach to studying environmental problems at a hands-on learning facility

Tama Ward

Miyamae Ward

Asao Ward

Asao Ward

Takatsu Ward

Nakahara Ward

Saiwai Ward

Kawasaki Ward

O About the facility

This facility aims to be a place where visitors can have fun learning about things like reducing and recycling trash (resource recycling), global warming and energy saving (reducing CO2 emissions), and preserving biodiversity (natural symbiosis) in game and quiz formats. Taking advantage of its adjacency to a trash incineration facility and recycling facility, the Recycle Park allows visitors to observe actual trash treatment and recycling processes, and uses the its "rooftop greening plaza" and "health communion plaza."

Tour time: 60 - 90 mins (estimated)

- III http://www.city.kawasaki.jp/shisetsu/category/43-4-5-4-0-0-0-0-0.html (Recycling plant construction work website)
- 🔲 1285 Ozenji, Asao-ku Inside the Ozenji Processing Center Recycling and **Disposal Facility**
- C 044-200-2591 (Facility Construction Section, Facilities Department, Environment Bureau, Kawasaki City)
- More details will be provided when they are decided in time with the opening of the facility in April 2016.
- Adjacent to the Nagasawa Iriguchi bus stop on the city bus line, or a 3-minute walk from "Den-en Chofu Gakuen Daigaku-mae"

🕐 Website 💽 Location 💽 Contact 🔟 Tours 🔝 Access



Kawasaki Frontale Solar water heater at the Asao Clubhouse In conjunction with the Ohisama Project, Kawasaki

Frontale has installed a solar hot water heater at its clubhouse as one effort to cut CO2 emissions.

http://www.frontale.co.jp/ 1517-10 Azakanaibara, Katahira, Asao-ku

0570-000-565

Available 🚺 A 25-minute walk from Kurihira Station on the Odakyu Tama Line



🕗 Ozenji Municipal Solid Waste **Disposal Center**

Making every effort possible to achieve harmony with and preserve the environment

This highly-efficient power generation facility uses residual heat from waste incineration and conforms to strict self-imposed rules for pollution control. 1285 Ozenji, Asao-ku 044-966-6135 Available for groups of elementary school students (reservation

required) Adjacent to the Nagasawa Iriguchi bus stop on the city bus line, or a 3-minute walk from "Den-en Chofu Gakuen Daigaku-mae" bus stop

via Odakyu or Tokyu bus.



Cawasaki Municipal Tama Hospital A hospital equipped with a multi-panel solar power system

Installed at the southwest side of the premises, a multi-panel solar power system produces eco-friendly clean energy.

- http://www.marianna-u.ac.jp/tama/
- 1-30-37 Shukugawara, Tama-ku
- 044-200-3861 (Operation and Planning Office, Kawasaki Municipal Hospital Management Bureau) Not available
- A 3-minute walk from Noborito Station on the JR Nambu Line and Odakyu Line



This station is the first in Japan to be jointly run by a local government and private-sector company. It helps prevent global warming by using energy from the natural flow of water.

http://www.city.kawasaki.jp/800/cmsfiles/contents/0000035/ 35839/business/micro.htm

- 3-1-1 Tsuchihashi, Tama-ku 044-866-0335
 Available; reservation required.



🕄 Kawasaki City Tama Sports Center Using solar panels for natural energy This center supplies electricity to its buildings via a solar

power system in its small gymnasium. The system is used to continuously light its common areas.

- http://kawasaki-tamaspo.com/ 4-12-5 Sugekitaura, Tama-ku
- V4-946-6030 Tours of the solar power equipment are Available; reservation required. (Tours are not available for individuals) Closure days
- are December 29 January 3 (New Year's holiday) Take bus from Inadazutsumi Station on the JR Nambu Line or Keio Line, or the Yomiuri-Land-mae Station on the Odakyu Line. The center
- is a 1-minute walk from the "Minami Suge Chugakko-mae" bus stop.



Advance Plant Factory Research **Center of Meiji University**

Researching a new model for agriculture

This facility conducts research into fully artificial light-type plant factories that grow vegetables not with sunlight but with artificial lighting. The facility is partially powered by natural energy.

- http://www.mejia.cs.jp/jolant/
 http://www.mejia.cs.jp/jolant/
 1-1-1 Higashimita, Tama-ku On Meiji University's Ikuta Campus
 044-934-7076 (E-mail: plant@mics.meji.ac.jp)
 A valiable; reservation required (plaesa inquire by e-mail)
 A 10-minute walk from the Exit of I kuta Station on the Odakyu Line, or a 17-minute Odakyu bus ride to "Meiji Daigaku Seimon" from the North Exit of Mukogaoka-Yuen Station on the Odakyu Line



🕜 Kawasaki City Fujiko F Fujio Museum Uses LED lighting special to exhibits to show works as their artists intended

This art museum makes the most of its abundant natural surroundings and uses LED lighting, cool tubes, and natural ventilation to reduce its environmental load.

- http://fujiko-museum.com
 2-8-1 Nagao, Tama-ku
 0570-055-245 (9: 30~18: 00)
- Beservation required; must specify date and time. Tickets must be purchase in advance (sold at Lawson throughout Japan. Separate purchasing options available to residents of Kawasaki
- City). Generally closed on Tuesdays and the New Year's holiday. Take the city bus from Noborito Station on the JR Nambu Line and Odakyu Line. The museum is a 16-minute walk from Mukogaoka-Yuen Station on the Odakvu Line, or a 15-minute walk from Shukugawara Station on the JR Nambu Line.



Baint Marianna University School of Medicine

Promoting energy-saving efforts at the Saint Marianna University School of Medicine

Along with generating power using a large gas cogeneration system, the school achieves considerable energy savings by making effective use of exhaust gas. http://www.marianna-u.ac.ip/

- 2-16-1 Sugao, Miyamae-ku 044-977-8111 Available; reservation required. Closed on Saturdays. Tours are available to both individuals and corporations. Take A bus bound for "Sei Mariana Ika Daigaku" from Mukogaoka-Yuen Station, Shin-Yurigaoka Station, or Yurigaoka
- Station on the Odakyu Line, or the Azamino Station on the Tokyu Den-en-toshi Line or Yokohama Municipal Subway. The school is also a 10- to 20-minute drive from the Tomei Kawasaki Interchange.



Asao Ward Office

A solar power system on the roof of the Asao Ward Office

The Asao Board Cool Earth Promotion Board conducts tours of this rooftop solar power system.

- http://www.city.kawasaki.jp/asao/ 1-5-1 Manpukuji, Asao-ku

044-965-5116

Available; reservation required. Weekdays only, except for events. A 2-minute walk from the North Exit at Shin-Yurigaoka Station on the Odakvu Line

- 🕞 Saginuma Power Plant Micro hydroelectric power generation using natural energy

- A 4-minute walk from Saginuma Station on the Tokyu Den-en-toshi Line





Being next door to Japan's main entrance, Tokyo International Airport (Haneda Airport), allows for easy access from anywhere overseas or in Japan.





Kawasaki City Economic and Labor Affairs Bureau, International Economic Affairs Office

11-2 Ekimaehoncho, Kawasaki-ku, Kawasaki-shi 210-0007 Kawasaki Frontier Building 10th floor Tel:044-200-2313 Fax:044-200-3920 28keisu@city.kawasaki.jp



FY 2014 Project of introduction promotion of new energy conservation and creation technologies Appendix : Discussion materials with YCDC

Large Scale JCM Feasibility Study

Title : JCM Project Formulation Study through City-to-City Collaboration in Yangon

Objectives

To contribute to sustainable development and realize low carbon society in Yangon, the study aims to formulate prospective JCM projects collaborate with Kawasaki city and Japanese private entities, which have high-efficiency and low carbon technologies.

Yan	gon city <	Kawasaki city	
Current situation of potential sectors [Power] Unstable power supply, stand-by(bac commercial facilities etc.	Support on environmental technology and industrial development collaborate with member of Kawasaki green innovation cluster etc. Low CO2 Kawasaki brand entity certified Low CO2 Kawasaki brand entity certified		
[Transportation] Heavy traffic jam, demand of mass ra lots, lack of consolidated logistics sys [Water supply & sewerage] Decrepit water supply/sewerage facil etc.			
Target sector	Technologies to be introduced	Japanese private	
1) Low carbon industrial park	a) High efficiency air conditioning facilities, energy saving fluorescent light, etc.	company Japanese private	
2) Low carbon building management system	b) High efficiency air conditioning facilities, energy saving fluorescent light, etc.	company	
3) Low carbon water supply/sewerage facilities	c) High efficiency pumping system, low carbon technologies in water sector etc.	Nippon Koei	
4) Project identification of Renewable energy/New energy	d) Solar power, biogas, biomass, mini hydropower etc.	project formulation between Japanese and Myanmar companies	

Objectives of JCM Project Formulation Study through City-to-City Collaboration in Yangon

- It aims to support establishment of LOW CARBON SOCIETIES in Yangon in order to reduce GHG emission.
- Also, it aims to scrutinize mid-and long term city-to-city collaboration between Yangon and Kawasaki
- Under the process of JCM project formulation, it aims NOT ONLY diffusion of advanced low carbon technologies BUT ALSO share of knowledge and know-how between Kawasaki city and YCDC in the JCM scheme



Yangon city's Merits

- Establishment of LCS with Lower Administrative Experiences and Cost by JCM model project scheme
- Raising the quality of life by enjoying the co-benefits that the improvement of air and water pollution, waste management, energy supply, not only GHG emission
- Enjoy mid-and-long term support from Kawasaki city
- Enjoy private support from both Myanmar and Kawasaki Chamber of Commerces.

City to city collaboration with Kawasaki city

Local company's Merits

- Available to install the advanced but expensive low carbon technologies by JCM financial support programme
- Enjoy the lower life cycle cost which include not only CAPEX but also OPEX
- Feel the security for the introduction of new low carbon products/technologies by expectation of assistance and support

Targeted schedule of City to city collaboration in JCM scheme





Establishment of LCS by city-wise with Leapfrog



Case of Yokohama city

Y-PORT= Yokohama Partnership of Resources and Technologies An international technical cooperation project through a public-private partnership that harnesses Yokohama's technology and know-hows to contribute to the emerging countries, since January 2011.



Reference of city to city collaboration in JCM scheme

Case of Yokohama city



Reference of city to city collaboration in JCM scheme


Kawasaki Eco-Town - The cooperative approach with municipal government and local enterprise

13th. Nov. 2014 Kawasaki Environment Research Institute Takahiro Fukahori

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- 1. General information of Kawasaki-city
- 2. Kawasaki Eco-town
- 3. From "Eco-town" to "Eco-city"

1. General information of Kawasaki-city



City profile

- > Population:
- Area:
- Gross Product of the City:
- 7 wards:

1,458,542 (2014) 144.35 Km2 APPROX 50.1billion US\$ (2011) Kawasaki, Saiwai, Nakahara, Takatsu, Miyamae, Tama, Asao





2. Kawasaki Eco-town

Background

~ history of industrialization and environmental deterioration ~

Chronological viewpoint about environmental issue change in Kawasaki

I 1940-1960	Development as "Industrial-city" Economic development > Environment	
Ⅱ 1960-1975	Deterioration of environment: mainly caused by industries	
Ⅲ 1975-1990	Deterioration of environment: mainly caused by household	
№ 1990-	Issue of "Sustainability" (Earth Summit in Rio, Brazil): Search for the way to balance between economic and environment	

Formation of Kawasaki waterfront area

Expansion of reclaimed land in Kawasaki waterfront area





Kawasaki waterfront area (1950s-60s)



Rapid economic growth and environmental deterioration (1960s-70s)















Current environmental situation in Kawasaki (2010)





"How did Kawasaki accomplish an improvement of severe environmental situation ?"

"Sharing of roles" and "Cooperative action"

- Regulation, Pollution control agreement
- Introduction of pollution control technologies, Monitoring
- Technology development

Point: Innovativeness of municipal government in terms of anti-pollution control measures



Kawasaki Eco-town

- "Kawasaki Eco-town plan" was approved by MITI (METI) in 1997
- Appointed area : Kawasaki waterfront area



Characteristic of Kawasaki Eco-town

- Leadership of municipal government (<u>Vision & Strategy</u>)
- Cooperative action with municipal government and local enterprise (<u>Implementation</u>)
- Self-contained 3R model of waste utilization (<u>Sound business model based on regional characteristics</u> such as accumulation of various manufacturing industries)

The characteristic has developed through experience of overcoming the severe environmental problems.

"Sharing of roles" and "Cooperative action"

Kawasaki Eco-Town Plan

Step1: To promote environmental consciousness and action by company itself

Step2: To promote environmental consciousness and action through collaboration among companies

Step3: Research for sustainable development of Kawasaki waterfront area based on environmental technologies

Step4: Dissemination of information about outcome which has achieved by the companies or the area, and Contribution to developing countries through the outcome

Recycling Facilities in Kawasaki Eco-town



Resources Recycling Facilities

Reuse of waste plastics for blast furnace 2000 ~	Capacity (plastics) 25,000t/year JFE Plastic Resource Corp.
Recycling of used electric appliances 2001 ~	Capacity 400,000~500,000 sets / year JFE Urban Recycle Corp.
Concrete setting frame production from waste plastic 2002 ~	Capacity (plastics) 20,000t/year JFE Plastic Resource Corp.
Material production for ammonia from waste plastics 2003 ~	Capacity (plastics) 65,000t/year Ammonia production 58,000t/year SHOWA DENKO K.K.
Used paper recycling 2002 ~	Capacity (used mix paper) 81,000t / year Produced toilet and tissue paper 54,000t / year SAN-El Regulator CO.,LTD
PET bottles material recycling - PET to PET - 2004 ~	Capacity (used PET bottles) 27,500t / year Produced material for new bottles 22,300t / year PET REFINE TECHNOLOGY CO.,LTD

X Others DC (Cement products) and YAKIN-Kawasaki (Non-ferrous products) implement recycling



From "Eco-town" to "Eco-city"



Eco-town concept and other similar concepts



Conclusion

Role of municipal government for transition to "Eco-city"

- Raising public awareness
- Promoting participation of various players
- Giving motivation
- Evoking action

through these practice.....

Seeking for the "Eco-city" model in Kawasaki which would also contribute to solve global environmental problems.

Appendix : Study tour in Kawasaki city

	Jan.10 th (Sun)	Jan.11 th (Mon)	Jan.12 nd (Tue)	Jan.13 th (Wed)	Jan.14th(Thu)	Jan.15 th (Fri)
9:00 10:00 11:00 12:00	9 : 50-11 : 40 Move from Yangon to BKK		11 : 00 Meeting with Kawasaki chamber of	10 : 00 Discussion with Kawasaki city 11 : 00 Meeting with Kawasaki city		Visiting JFE office and have discussion on ongoing project in Yangon
13:00		13 : 30 Site visit for	commerce Lunch	Lunch		
14:00 15:00	14 : 50-22 : 30 Move from BKK to Tokyo(Haneda)	green park development area and redevelopment	13 : 30 Visiting Sanei regulator	13 : 30 Visiting Kawasaki biomass electric	13:30 Visiting JFE Plant in	
16:00		area of Kawasaki	recycling plant	power	14 : 30	
17:00	17:00 station		15 : 30 Visiting Kawasaki Environment research center	15 : 30 Visiting Toshiba Science Museum	Visiting Kawasaki Eco Kurashi Miraikan	

JCM Project Formulation Study through City-to-City Collaboration in Yangon

Schedule for Site visit to Kawasaki city

Members: Mr. Cho Tun Aung (Pollution Control & Cleansing Dept, YCDC), Mr. Than Lwin Oo (City Planning and Land Administration Dept, YCDC), and Mr. Thike Soe(City Planning and Land Administration Dept, YCDC)

Appendix : JCM model project related materials

KAWASAKI Green Innovation Cluster member, cooperation group

S#	Company	Sector	Technology	Achievements
1	ELIIY Power Co., Ltd.	renewable energy	Lithium-ion batteries, Electricity storage batteries for indoor use, Electricity storage system (2.5 k Wh, 6.2kWh、 \sim 270kWh), backup power supply during power cut	Awarded for Good Design and Creation of Landscape by Kawasaki City and others
2 3 4 5 6	Kureha Ecology Management Co., Ltd. (KEM)	power generation	Waste treatment, Recycling, Exhaust heat use turbine generation (kiln-stoker furnace, Fluidized Bed Furnace)	Installation of WASTECH IWAKI (incineration facility) and WASTECH KANAGAWA (Thermal recycling generation by the waste heat use 4.8MW crushing136t/day)
	JFE Plastic Resource Corporation	recycling	Plastic recycling, Chemical recycling (CO2 emission reduction: 3t/t), Hot cut-type pellet, Strand-type	Installation in many parks and factories. Awarded "Environment Communication Award" by
	SOWSHOW CO.,LTD.	energy saving	UV and heat cut film for construction and vehicle. 90% of heat is cut while general mirror glass cuts 75%. Heat of sunlight is much reduced by cutting 87% infrared light. Air conditioner efficiency is increased (-6.4°C compared to other product)	Hundreds of installation records in ministries, municipal offices, banks, factories, convenience stores, and airports.
	TOSHIBA CORPORATION (Community Solutions Group)	energy saving	Infrastructure solution (energy, water management), Integration BEMS, Energy saving air conditioning and lighting, LED lighting with sensor control, BEMS interlocking control elevator, Energy- efficient heat pump systems	Power peak mitigation (10%) in municipal building (2015), demonstration of high-end technology in sewer treatment center.
	NANOFUEL CO., LTD.	renewable energy, power generation	Fuel reuse, Nano-Emulsion fuel (water content 15%, uniformly dispersing water particles in nano-level diameter in oil droplets, increases combustion efficiency), Nano- Emulsion Fuel System (1-3kL/h), Liquid biomass power generation (removal of phosphorus, improved combustion, low cost for biofuel processing (1-3YEN/L, 16- 23YEN/kWh)	Nano-Emulsion fuel: demonstration of four-stroke engine 2700 kW and other in engine manufacturers and factories, Nano-bio fuel is demonstrated in NEDO project.

KAWASAKI Green Innovation Cluster member, cooperation group

S#	Company	Sector	Technology	Achievements
7	Nihon Genryo Co., Ltd.	energy saving	SIPHON WASHING (vortex flow produced by a gravity and screw lift force on filtering sand), Mobile Siphon Tank (3m3/h), and Non-Electric Source SIPHON filtering tank. Semi permanent filtering material (filter replacement is not necessary). Reverse washing is not needed. This reduces CO2 emission.	In Japanese grant aid programs, 6 mobile units were installed in Laos, and other units are installed in a university in Vietnam and typhoon affected area in Philippine, etc. Low Carbone brand certified by Kawasaki City. Awarded by MECSST.
8	JAPAN FUTURE ECO- SYSTEMs CORPORATION	recycling	Recycle (persistent plastic and food, bamboo) air environment improvement (hybrid photocatalyst) 、 Chemical recycle (distillation recovery of hydrocarbon as kerosene or heavy oil, 40% CO2 reduction compared with simple waste plastic incineration), Recycle with biomass oil.	Waste tire, waste plastic, polyethylene for agriculture and fishing. 1.5 - 6 ton/day size installation experience.
9	Nippon Basic Co., Ltd.	water and sewerage	Five types of water-purifying equipment: Gasoline- type small water purifier (about 1500 l /h), Cycloclean bicycle, a Portable series, Cycloclean RO75G and Desaliclean	Desaliclean 2501 is included in city buildings and Bangladesh water plant. Small scale water treatment plant for 1500 people. JICA Study adopted.
10	UNION.CO., LTD	_	Flammable plastic/UNI-PELE (compound resin mixed with bamboo powder) No emission of poisonous gas during combustion. CO2-reduction compared with the petroleum resins. Antibacterial. Tableware.	Certified Kawasaki Monodukuri (Craftsmanship) Brand
11	EBARA REFRIGERATION EQUIPMENT & SYSTEMS CO., LTD	energy saving	High-efficiency energy-saving chiller for air conditioning of large buildings and factories (Centrifugal chiller, Screw chiller, Absorption Chiller/heaters, Cooling tower), district air conditioning system, including design, installation and after service.	from 1930', more than 2000 chillers have been installed. Including world 1st JCM project in Indonesia with 117 ton- CO2/yr reduction by 500 USRt chiller, three JCM projects in Indonesia and one in Bangladesh have been implemented. Tokyo Sky-Tree district-wise air conditioning system, Tokyo metro heat pump system (670 ton-CO2 reduction, -24% CO2 and -40% running cost and many other examples.

KAWASAKI Green Innovation Cluster member, cooperation group

S#	Company	Sector	Technology	Achievements
12	Ebara Corporation	energy saving	Pump (standard, large size and high pressure, for municipal water supply and sewage, infrastructure, flood control, industrial water, petrochemical, etc., with custom-made high efficiency system), industrial compressor, hydropower, fan, and gas turbine co-generation.	Plan/Design/Built over 20,000 projects, >90 yrs in Japan and >50 yrs in overseas market. For example in Viet Nam, 0.3 mil m3/d Thu Duc BOO water works implemented and other sewage, drainage, irrigation for >100 projects conducted. JCM F/S in Hanoi high efficiency pump plan estimated 152 ton CO2/yr reduction (saving 30-60 MWh/yr with 26 nos x 75 kW +8 nos x 90 kW units).
13	Cool Japan	energy saving	"Ecofinee CCFL" (old cathode fluorescent lamp) has aspects of 40~70% energy saving (40W type:27W consumption, 20W type: 14W consumption), >40,000hrs life (5-10 times longer than general CFL), low heat generation, wide light angle, good color rendering, small blue-light hazard, small Hg, recycle possible.	CCFL is applied in Tokyo metropolitan government building, Miyagi pref. road office, Tokyo metro, Kitakyusyu high speed railway, Matsuyama airport, and many food cort, hospital and elderly facilities, libraries, etc, by JCLA.

MoE: Ministry of Energy, Japan, NEDO: New Energy and Industrial Technology Development Organization, Japan MECSST: Ministry of Education, Culture, Sports, Science and Technology, Japan

Technology & Product : Factory /building air conditioning system etc.

Summary of Technology

◆ Outlines : from 1930s', more than 2000 chillers have been installed. world 1st JCM project in Indonesia conducted with 117 ton-CO2/yr reduction by 500 USRt chiller. Tokyo Sky-Tree districtwise air conditioning system, Tokyo metro heat pump system (670 ton-CO2 reduction, -24% CO2 and -40% running cost) and many other examples have been implemented.

Characteristics of technology

- 1) Environmental friendly refrigerant, HFC 245fa
- 2) COP more than 6.0
- Low noise, low vibration by using latest technologies such as ball-bearing.
- 4) Reliable and durable.
- 5) Enhanced operational/observing function by applying new micro-computer control panel.

A yearly overhaul contract is available, covering visiting inspections, as well as servicing and cooling/heating mode changeover before the start of cooling/heating season

Company Profile

- Company name : EBARA REFRIGERATION EQUIPMENT & SYSTEMS CO., LTD
- Head office :3-2-16 Ohmorikita, Ohta-ku, Tokyo, 143-0016 Japan
- www.ers.ebara.com
- ◆ Establishment : September 2, 2002 (company split from Ebara) corporation) with 675 employees, capital 450 mil. JPY



High efficiency centrifugal chiller "RTBF" model

Systematic Maintenance

Proposed target area

Air conditioning in factory, office building, commercial facilities such as shopping mall and hotel. High-efficiency energy-saving chiller for air conditioning of large buildings and district air conditioning system, including design, installation and after service.

Area of Business:

JCM Projects in Indonesia and Bangladesh, and global network in China, Korea, Taiwan, Thailand, Malaysia, Indonesia, Pakistan, Singapore, Philippines, Australia, U.A.E., Kuwait, Saudi Arabia, Egypt, Russia, Italy, Hungary, and Turkey

SOWSHOW CO., LTD.

JCM City to City Collaboration bet. Kawasaki city & Yangon city

Technology & Product : Energy saving by glass protect and sun control film

Summary of Technology

Outlines :

Sowshow procuces UV and heat cut film for buildings and vehicles. It as low heat absorption and possible to install most type of windows. It reflects infrared rays and mitigates temperature increase in summer. It transmits visible wave lights and no impact on lighting. It prevents disperse of broken grass when accidents and natural hazard occurs.

Characteristics of technology

Film for Construction / Car Films / Car Wash operation ECO X-3 heat and electronic wave cut film UV and heat cut film for construction and vehicle. UV cut up to 99%. 90% of heat is cut while general mirror glass cuts 75%. Heat of sunlight is much reduced by cutting 87% infrared light. Air conditioner efficiency is increased (-6.4°C compared to other product).



Company Profile

Company name : SOWSHOW CO.,LTD.

♦ Head office : 3896 Nogawa, Takatsuka, Kawasaki Shi, Kanagawa, 213-0027, Japan <u>http://www.soushow.co.jp</u>

Establishment : November 1976 capital 1 mil JPY

Area of Business:

Installation of film

Japan. Hundreds of installation records in ministries, municipal offices, banks, factories, convenience stores, and airports. Experience in China, Vietnam, USA, Thailand, Australia,

and Maldives

Technology & Product : High efficiency cold cathode fluorescent lamp

Summary of Technology

Outlines :.

Cool Japan applies high efficiency and cost effective CCFL (cold cathode fluorescent lamp) and conducts energy saving and CO2 reduction with CCFL installation with a concept "Suitable lighting for suitable place".

Characteristics of technology

"Eco- Finee"

New generation CCFL

40~70% energy saving (40W type:27W consumption, 20W type: 14W consumption), >40,000hrs life (5-10 times longer than general CFL), low heat generation, wide light angle, good color rendering, small blue-light hazard, small Hg, recycle possible. Inverter build-in type and one-ballast type are available.

Images



Installation of CCFL



CCFL for plant growing

Proposed target area

Installations in factories, storage, schools and classrooms, hospital, offices, commercial facilities, etc.

Company Profile

Company name: Cool Japan Co., Ltd.

Head office : Tokyo Denki-kaikan 3F, 1-7-8 Akasaka Minato-ku Tokyo 107-0051 Japan http://www.cooljapan-l.com/

Establishment : October 2013, capital 10 mil. JPY

Area of Business: Japan and world

NANOFUEL CO., LTD.

JCM City to City Collaboration bet. Kawasaki city & Yangon city

Technology & Product : High Efficiency Fuel Processing

Summary of Technology

Outlines

Emulsion fuel, is to add water to liquid fuel to disperse water in the oil. The emulsion fuel is achieving fuel saving by improved combustion efficiency, to reduce PM (Particulate Matter) by aiming complete combustion, further to reduce NOx.

Characteristics of technology

By uniformly dispersing water particles in nano-level grain diameter, combustion efficiency is improved, which results in high fuel efficiency ,CO2,and harmful matter emission reduction.

- Nano-emulsion fuel : 15% water content in oil, thin oil film thickness and fine oil droplet results in improvement of flammability and high combustion efficiency

- Nano-Bio Fuel : JPY1-3/L process cost while BDF cost is 15-JPY 30 /L, fuel cost JPY16-23/kWh, low phosphorus

concentration and high degumming 油膜厚 Sim thickness 油滴の 微粒化 pization of oil dr 燃焼効率 oustion efficiency Oil fil 厚い Thick 噴射ノズル 粗い Large 低い Low Proposed target area 油滴 oplets 50~100 µm Nano-emulsion fuel for high-efficient diesel generation Nano-bio fuel for processing biofuel 水の気化による 油液の帯却少 水 Water such as Jetropha ノエマルジョン

Company Profile

- Company name : NANOFUEL CO., LTD
- Head office : 1-19-4 Tonomachi, Kawasaki-ku, Kawasaki, Kanagawa, 2100821 JAPAN www.nanofuel.co.jp/

Area of Business:

薄い

Japan and overseas (demonstration test is conducted 5 domestic engine companies and one overseas company)

細かい

高い

Establishment : Oct 2006, capital 101 mil JPY

Technology & Product : Power Storage (for renewable energy & back-up)

Summary of Technology

Outlines :

ELIIY Power makes safety a top priority in the development of our products. All large-size lithium-ion electricity storage battery cells included in each of our electricity storage systems are manufactured at our plant in Japan. Olivine-type lithium iron phosphate, which offers superior safety, is used as a material for cathode. First in the world to have passed international certification organization TÜV Rheinland's product safety test.

Characteristics of technology

Extended lifespan: even if charged and recharged repeatedly for 10 years (DOD 100%, approx. 12,000 times)

-The POWER YIILE PLUS large-size lithium-ion electricity storage system for indoor use (2.5 kWh)

- Power Storager 10 general-purpose electricity storage system for industrial use (15, 30, 45, 60 kWh)

- POWER iE 6 stationary electricity storage system for household use (6.2 kWh, receives a Good Design Award 2013)

Company Profile

Company name : ELIIY Power Co., Ltd.

◆ Head office : 19th Floor, Shin-Osaki Kangyo Building, Osaki 1-6-4, Shinagawa-ku, Tokyo, 141-0032 eliiypower.co.jp

Establishment : September 2008, capital 31.5 mil JPY





Proposed target area Energy storage during power cut, energy saving Up to 270 kWh system

POWER iE 6

Area of Business: House maker and manufacturers, Japan and world

Nippon Basic Co., Ltd.

JCM City to City Collaboration bet. Kawasaki city & Yangon city

Technology & Product : Water treatment (low carbon)

Summary of Technology

Outlines

To alleviate the suffering of people who lack clean drinking water due to adverse environmental causes manufacturing and marketing state-of-the-art water purifying equipment that is both affordable and portable.

Characteristics of technology

Water purification with activated carbon filter and microfiltration membrane filter

- CycloClean: bicycle type water purificatio nsystem, with solar PV. water purification for 1500 people

- Cycloclean Portable: a water cleaning capacity per hour of 100 or 200 liters

- Desaliclean: So compact in size with the RO membranes loaded (about 5 ton/10 hours). Designed to carry it anywhere where it is urgently needed.

Images





CycloClean in Dakha

Desaliclean 2501/9000

Proposed target area

Communal building or apartments Water supply for emergency and natural hazards Non-electrified areas where no clean water is available

Company Profile

- Company name : Nippon Basic Co., Ltd.
- Head office :Ujihashi Building, 2-767 Shin-Maruko-cho, Nakahara-ku, Kanagawa, 211-0005 Japan www.nipponbasic.ecnet.jp/
- Establishment : May 2005, capital 35 mil JPY

Area of Business:

Japan (emergency water supply), Bangladesh (nonelectrified village)

Technology & Product :Waste treatment and recycle

Summary of Technology

Outlines

Kureha Ecology Management Co., Ltd. (KEM) has been contributing to the global environment by providing industrial waste services, and expanded its services in environmental engineering. KEM is a Japanese government-certified service provider to handle and detoxify micro-level PCB wastes since February, 2013.

Characteristics of technology

Westec lwaki waste treatment plant: 400 t/day Facility: Rotary kiln Waste type, treating including chemical wastes (PCBs, DXNs, Cl, F, Br, Pb, Cd, As, etc.) and medical wastes

Westec KAWASAKI: waste generation plant, 210 t/day, Power Generation: 4,800 kW

- Facility: Rotary kiln + Stoker (Plastics, Wood, Paper, etc.) - Medical wastes and Construction/Demolition wastes

Company Profile

- Company name : Kureha Ecology Management Co., Ltd.
- Head office : 30 Shitanda, Nishiki-machi, Iwaki City, Fukushima 974-8232 ,Japan

http://www.kurekan.co.jp/en/contact/

Establishment : Dec.1971, capital 240 mil JPY

Images





Westec KANAGAWA

Westec IWAKI

Proposed target area

- Waste treatment plant, waste generation plant, heat recovery turbine generation,

-Water purification

- Recycling

Area of Business:

Japan (Kawasaki plant in Kanagawa pref., Iwaki plant in fukuoka pref., sales offices in Tokyo, Ibaragi, Sendai, Nagoya, Osaka) and world

FOR THE ENHANCEMENT OF INTERNATIONAL WATER ENVIRONMENT



BUSINESS INTRODUCTION CATALOG



"Kawasaki Water Business Network" (KaWaBiz NET) is a platform which consists of water-related companies and organizations, and City of Kawasaki. Under the cooperation between the companies and City of Kawasaki, KaWaBiz NET supports the overseas waterrelated business to enhance international water environment.

The "Business Introduction Catalog of Kawasaki Water Business Network" was produced in cooperation with interested members to introduce excellent and cutting-edge technologies, products and projects which is related to the business to domestic and foreign people.

It would be grateful if the brochure could serve in some small way to enhance the international water environment.

Kawasaki Water Business Network Management Office





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Kawasaki Water Business Network's Outline KAWA-BIZ-NET A platform "Kawasaki Water Business Network" (KaWaBiz NET) was established in Aug. 2012 between companies with water-related technologies/products and City of Kawasaki with technologies and expertise of water/sewerage management. The purpose of the establishment is to enhance the international water environment through water business cooperating with relevant ministries/organizations. Water Enhancing the international Global water water environmen business issue Kawasaki Water **Business Network** City of Kawasaki with technologies and expertise Mye Companies with water-related technologies,

Activity models of KaWaBiz NET

products and know-how



Ministry of Health, Labour and Welfare/ Ministry of Economy, Trade and modely Ministry of Land, Infrastructure, Transport and Tourism/ Japan International Cooperation Agency and others



of waterworks and sewerage management

Kawasaki Water Business Network List

Chairman : Akira Koizumi, Dr. Eng. (Professor Emeritus, Graduate School of Urban Environmental Sciences, Tokyo Metropolitan University) Special Adviser : Mayor of Kawasaki City / Chairman of the Kawasaki Chamber of Commerce & Industry

Members List (56	mempers)		
AQUA ZEST	AQUA ZEST Corporation	A	DAI-ICHI HIGH FREQUENCY CO.,LTD.
azbil	Azbil Corporation	The	TABUCHI CORP.
ITOCHU Corporation	ITOCHU Corporation	TSUKISHIMA KIKAI	TSUKISHIMA KIKAI CO.,LTD.
図 NJS 日本上下水道設計株式会社	NJS CONSULTANTS CO., LTD	TEC	TEC International Co., Ltd.
🕐 NTTAT	NTT Advanced Technology Corporation	GTAKANO	DG TAKANO,Inc.
ili	ELIIY Power Co.,Ltd.	TEIJIN Human Chemitzin; Human Satudion;	TEIJIN LIMITED
のいたが、	Osumi Co.,Ltd	T	TESCO CO., LTD.
株式会社オスモ	OSMO Co.,Ltd.	HEATHENT	Tohzai Chemical Industry Co.,LTD
OEC ORIGINAL ENGINEERING CONSULTANTS CO.,LTD	Original Engineering Consultants Co.,Ltd.	TOSHIBA Leading Innovation >>>	TOSHIBA CORPORATION
KAJIMA CORPORATION	KAJIMA CORPORATION	n)(Nihon Suido Consultants Co.,Ltd.
10.50 10 10 10 10 10 10 10 10 10 10 10 10 10	Kawasaki Constructors' Association		NEC Corporation
se se a	Kawasaki Plumbing Constructor's Association	🐠 nihon genzyo	NIHON GENRYO Co.,Ltd.
	The Kawasaki Chamber of Commerce & Industry	日本ヘーシック株式会社 Ukpor have Funchi	Nippon Basic Co.,Ltd.
Aqua Street	Kankyo Kougaku Inc.	浜銀総合研究所	Hamagin Research Institute,Ltd
	KIMURA TECHNICAL CO, LTD		Hitachi,Ltd.
KURIMOTO, LTD.	KURIMOTO,LTD.	Hitz Hitachi Zosen	Hitachi Zosen Corporation
CTi	CTI Engineering International Co.,Ltd.	FUĴĨTSU	FUJITSU LIMITED
COSMO	COSMO KOKI Co. Ltd.	Fuji Electric	Fuji Electric Co., Ltd.
	SANSHIN CORPORATION	🐯 Maezawa Industries, Inc.	Maezawa Industries, Inc.
SANYU REC CO.,LTD.	SANYU REC CO.,LTD.	МІХИЮ	Mizuho Bank,Ltd.
O JFE	JFE Engineering Corporation		Sumitomo Mitsui Banking Corporation
geoplan	Geoplan Co.,Ltd.	AMITSUBISHI KAKOKI KAISHA, LTD.	MITSUBISHI KAKOKI KAISHA,LTD.
SHOEL	Shoei Co.,Ltd		The Bank of Tokyo-Mitsubishi UFJ,Ltd.
SHOWA	SHOWA DENKO K.K.	YASKAWA 安川電機	YASKAWA ELECTRIC CORPORATION
7K ing	Swing Corporation	yec	YACHIYO ENGINEERING CO., LTD.
OGUS	SUDOH KOGYO Co.,Ltd.	Yokogawa 🔶	Yokogawa Solution Service Corporation
Sumitomo Corporation	Sumitomo Corporation	Exister Prasmers.	The Bank of Yokohama,Ltd
SEKISUI	SEKISUI CHEMICAL CO.,LTD.	KAMASADI OTY	City of Kawasaki

* As of Jan. 4. 2016

Cooperators List (11 organizations) Ministries and Agencies Ministry of Health, Labour and Welfare / Ministry of Economy, Trade and Industry / Ministry of Land, Infrastructure, Transport and Tourism Affiliates Japan International Cooperation Agency / JAPAN BANK FOR INTERNATIONAL COOPERATION / JAPAN WATER WORKS ASSOCIATION / JAPAN EXTERNAL TRADE ORGANIZATION JETRO YOKOHAMA / JAPAN SEWAGE WORKS ASSOCIATION / Kawasaki City Industrial Promotion Foundation Overseas Governments Danang Representative Office in Japan / Queensland Government Trade and Investment Office- Japan





CORPORATE PROFILE

会社案内



ナノテクによる新燃料で 新しい価値を創造します。

現在、再生可能エネルギーを活かす動きや、 原子力発電所から脱しようという流れがあります。 しかし、「次の主力エネルギーとは?」という問いへの 明確な答えはまだ見つかっていません。 当社は、物質をナノメーターレベル(100万分の1ミリメートル)に 微粒子化するナノテクノロジー分野において、 世界をリードする最先端の技術を有しています。 そしてこの技術を環境・エネルギー分野に活用することで、 次世代の新燃料の開発に成功しました。 高い燃焼効率で省エネを達成し、有害排気ガスを大幅に削減し、 人々の暮らしや社会の発展に貢献いたします。

Create new value by new fuel based on Nano-tech.

Currently, there is a flow movements to take advantage of renewable energy, and try to find a way out of nuclear power plant. However, we have not yet found clear answer to the question: "What would be next primo energy?" Our company owns most advanced and world leading technology in the technical field of micro-particulation of materials in nano-meter level (parts per million millimeter). And we have successfully developed new fuel for next generation by utilizing the technology to environmental and energy arena. To achieve energy saving with high combustion efficiency, and significantly reduce harmful emission, will contribute to the development of society and people's lives.

他の追従を許さない、30年にわたる研究開発。

当社等は主として海洋工学で研究されていたキャビテーションにいち 早く着目し、これをナノテクに応用することを考案しました。キャビテー ションは高速で流れる液体とその管壁との間で生じるエネルギーで、 流路等によりその発生量が大きく異なります。当社は様々な流路の形 状とキャビテーションの関係を解明し、より高いエネルギーを発生さ せ、更に圧縮力、せん断力、衝撃力、摩擦力等の物理的力も加えること で高い微粒化効果を達成しました。この技術を活用し、「ナノエマルジョ ン燃料事業」「液体バイオマス発電事業」「燃料改質事業」の3つの事業 を推進しています。





Unrivalled, three-decade-long research and development.

Our company was quick to focus attention on cavitation effect which was mainly studied in marine technology arena, and worked out to apply the effect to Nano-technology. Cavitation is the energy generated in between high speed liquid flow and the pipe wall of the flow, of which amount of emergence differs substantially by flow channel and so forth. Our company has found out the relationship between cavitation impact and various shapes of flow path and has successfully attained very high atomizing effect by using the cavitation on addition to conventional physical forces such as compaction force, shearing force, impact power and frictional forth.Utilizing this technology, our company is promoting three businesses: "Nano-Emulsion Fuel Business", "Liquid Biomass Power Generation Business", and "Fuel Reutilization Business".

ナノエマルジョン燃料事業

いわゆる「エマルジョン燃料」は燃焼を改善し、燃費の向上スモーク等排ガスの低減が期待され、50年ほど 前から世界中の様々なエンジンメーカーやボイラーメーカーが開発に取り組んできました。しかし、ディーゼ ル機関への悪影響、不十分な有効性、高いコストなどの課題を克服できず本来の実用化には至っていませ ん。当社はナノテクノロジーを活用しナノエマルジョン化することでこれらの課題を克服することに成功。ナノ エマルジョン燃料を製造する装置並びにこれに使用する添加剤等のソリューションを提供します。

Nano-Emulsion Fuel Business

So-called "Emulsion Fuel" has more than 50 years of history of development by world-wide various engine makers and boiler makers, under expectation for improvement of fuel consumption and reduction of emission such as smoke, due to combustion quality improvement. However, it has not yet been practically used as it was expected, because such issues like harmful effect to engine, insufficient efficacy and high cost are not yet solved. We have successfully solved those issues by Nano-emulsification based on our Nano-technology. We can provide System to generate Nano-emulsion fuel along with solutions like Surfactant for the system and so forth.





従来のC重油エマルジョン C重油ナノエマルジョン Conventional HFO emulsion HFO Nano-Emulsion

やトロフプ# ¹⁹⁷⁶ (トトロッパロング) 1985年 - 1985年 - 1997年 - 19977 - 19977 - 19977 - 19977 - 19977 - 19977 - 19977 - 19977 - 199



エンジン噴射ノズル比較 Engine Injection nozzle comparison





FCC廃触媒ナノ処理前後比較 FCC waste catalyst Before & After comparison by Nano-processing

液体バイオマス発電事業 (NEDO 「新エネルギーベンチャー技術革新専業」に採択

バイオマス原油はリンの含有、並びに高粘度、高沸点、低蒸発性により燃焼性が悪いことから、ディーゼル 機関内に未燃物が残存、固結し機関に過大な悪影響を与えるため直接燃料として使用することができま せんでした。当社は独自のナノテクノロジー駆使することで、効率的なリンの排除、大幅な燃焼性の改善を 実現。直接大中型ディーゼルエンジンの燃料として使用できる「ナノバイオ燃料」の開発に成功しました。 そして、これを用い世界初の液体バイオマス発電、売電事業を展開しています。

Liquid Biomass Power Generation Business Adopted as "New Energy Venture Innovation Business" The Biomass crude oil was not able to be used directly as a fuel to engines, since the engine is very badly influenced by the unburned residual remained and get stuck in the engine, which is caused by phosphorus contained in the crude oil and by the characteristics of biomass: high viscosity, high boiling point and low evaporability. By fully utilizing unique Nano-technology, our company has achieved efficient elimination of phosphorus and significantly improved flammability. We've successfully developed "Nano-Bio Fuel" which can be directly supplied and used as a fuel for large and medium-sized diesel engines. We are developing world first "Liquid Biomass Power Generation" and electric power selling business.

燃料改質事業

石油、特に重油には石油精製時に使用した残存触媒を含む大粒子の炭素状物質(スラッジ)が1%程度含 有しています。このスラッジはディーゼル機関に悪影響を及ぼすため、使用する際に除去し、廃液として焼 却処理されています。すなわち、1%の燃料ロス、無駄なCO2の排出、更には燃料処理コストの負担を強い られています。当社はナノテクノロジーを用いて処理することで、燃料として再利用することを実現。スラッ ジをリサイクルするソリューションを提供します。

Fuel Reutilization Business

Petroleum, especially Heavy fuel oil, contains about 1%-large particles of Carbon Matter (sludge) including residual catalyst used in petroleum refining. The sludge has bad impact for diesel engine so it is to be removed at the time of use and is to be incinerated. That is to say 1% of fuel is lost, unnecessary CO₂ is discharged and fuel treatment cost is burdened. By treatment with nano-technology, we've realized to reuse it as a fuel. We provide a solution to recycle sludge.



当社は機械工学、電気工学、工業化学等の研究者、技術者を配し、またこれら が有機的に結びつくことで、従来にはない新しい発想で研究開発をしてまい りました。また、化学試験設備、装置試験設備を有し、様々な新燃料を開発し 評価、実証してきました。更に関連するメーカー企業だけでなく、NEDO(独立 行政法人新エネルギー・産業技術総合開発機構)や大学との共同開発を行う 等、官学連携も推進することで、常に最先端の技術開発を行っています。

Many researchers and engineers in the fields of mechanical engineering, electrical engineering, industrial chemistry are appointed in our R&D organization. We have been promoting R&D activities based on such organically-bonded formation with such non-conventional ideas. We have been evaluating and validating various types of new fuel developed at our chemical and system test facilities. Furthermore, we also have been always promoting most

advanced technical development under collaboration not only with related manufacturing companies but with governmental and academic organizations such as NEDO (New Energy and Industrial Technology Development Organization) and universities.









ナノフュエル株式会社 NANOFUEL CO., LTD.

〒210-0821 神奈川県川崎市川崎区殿町1丁目19番4号 TEL:044-270-1611 FAX:044-270-1612

1-19-4 Tonomachi, Kawasaki-ku, Kawasaki, Kanagawa, 2100821 JAPAN Tel:+81-44-270-1611 Fax:+81-44-270-1612 www.nanofuel.co.jp



i de p
植物原油を発電機用エンシンで ・ 直接使用可能な燃料化に成功 ucceeded in fuelization of crude vegetable oil that can be used directly by power generators

液体バイオマス発電

(ナノバイオ燃料) Liquid-Biomäss Power Generation (Nano-Bior Fuer)

世界初となる 液体バイオマス発電の実用化を目指して

世界中でバイオマス発電が行われていますが、その原料のほとんどが稲わら、綿花、木材、 もみ殻等の固形バイオマスであり、液体バイオマスを利用したものはありません。 液体バイオマスである植物原油はディーゼルエンジンを対象としますが、 直接燃料として使用することは困難な為、複雑なプロセスによる精製・加工が必要です。 このためコスト高となり発電に使用することはできませんでした。 当社は、独自の最先端ナノテクノロジーを駆使することで直接ディーゼルエンジンの 燃料として使用できる液体バイオ燃料:ナノバイオ燃料の開発に成功しました。 この技術を用いることで世界初の液体バイオマス発電が可能となります。

To become the world's first Aiming at practical use of liquid biomass power generation

Biomass power generation have been made all over the world, but most of its stuff is solid biomass such as rice straw, cotton, wood, rice husk, etc., there's no one using the liquid biomass. Crude vegetable oil is a liquid biomass which is intended for diesel engines, while it's difficult to be used directly as a fuel therefore it requires refining and processing by a complex process. For this reason, it was not possible to use it for power generation by increased cost. We, succeeded in developing a Nano-Bio Fuel, a liquid bio-fuel which can be used directly as a fuel by power generators, making full use of original cutting-edge nano-technology. The world's first Liquid biomass power generation becomes possible by using this technique.

大手エンジンメーカーとの共同研究により実現したナノバイオ燃料

大手エンジンメーカーがヨーロッパのユーザーから「植物原油を直接燃料に使用したい」という要求を受け、当社に技術開発を依頼。ここから共同開発が始まりました。さらにこの開発の必要性が認定され、NEDO(独立行政法人新エネルギー・産業技術総合開発機構)事業として採択。これを受けて基礎研究開発および実用化研究開発を成功裏に完了しました。

Nano-Bio Fuel was realized in collaboration with a major engine manufacturer

A Major engine manufacturer received the request from European users that "Want to use crude vegetable oil directly as a fuel", subsequently they asked us for technical development. Joint development began from here. The need for this development is further authorized, adopted as a NEDO (New Energy and Industrial Technology Development Organization) project. In response to this, both fundamental and pratical use' research and development have been completed successfully.



植物原油での低コスト発電を実現

バイオ燃料の代表的なものとして、BDFとバイオエタノールがありますがいずれも自動車等移動体の代替燃料です。BDFはディーゼル発電用エンジンへの適用も可 能ですが、その製造工程が複雑なことから大変高価であり発電用に使用することは現実的ではありません。また、バイオエタノールは高価なことに加えてカロリーが 石油のおよそ半分しかなく、大きな出力を必要とする中・大型エンジンに使用することは困難です。一方で植物原油を直接燃料としてディーゼルエンジンに適用する と、未燃焼残渣がシリンダー内に固着し短期間で停止に至ります。この原因は、①植物原油中に含まれるリンが塩を形成し固化する、②植物原油は高粘度、高沸点、 低蒸発性であることから燃焼性が悪いこと、によります。当社はナノテクノロジーを駆使することでこれらの課題を克服し植物原油の燃料化に成功しました。これに よりディーゼル発電での利用が可能となりました。

Realization of low-cost power generation with crude vegetable oil

Representative examples of biofuel include BDF and bioethanol, both are alternative fuel for dynamic body, such as automobiles. BDF is also applicable to diesel engines, while it is not realistic as for its high price due to its manufacturing process is complex. Bio-ethanol, in addition to being expensive, it only contains about half calories of petroleum, as a result it's difficult to be used for large and medium-sized engines that require a large output. On the other hand, non-combustion residual substance adheres in cylinders and leads to a stop in a short term when applying crude vegetable oil directly to diesel engines. The reason is due to the fact that @Phosphorus contained in crude vegetable oil forms a phosphate and solidified, @ Combustion of crude vegetable oil is poor because of the high viscosity, high boiling point, low evaporation characteristic.We solved these problems by making full use of nanotechnology, and succeeded in fuelization of crude vegetable oil. As a result, the use for diesel power generation becomes possible.



ナノバイオ燃料のメカニズム

脱ガム(リンの排除)は通常、植物原油中に水を分散し、水和させて水と共に分離、排除します。当社はその水をナノサイズで分散 させることによりその表面積を1,000倍程度にし、極めて効率よく脱ガムすることを可能にしました。更に脱ガムされた植物油に 水と添加剤を加えナノエマルジョン化させることでその燃焼性を大幅に改善。これによりジャトロファ油等の植物原油を極めて 低コストでディーゼルエンジンに直接使用できる燃料にすることが可能となりました。

Mechanism of Nano-Bio Fuel

Usually, degumming is to distribute water to crude vegetable oil, along with the separation of water hydrated, and eliminated (elimination of phosphorus). We enabled degumming extremely efficient with the surface area as around 1,000 times by scattering the water at nano-size. Furthermore, the flammability is greatly improved by adding water and surfactant into degummed crude vegetable oil to make it nano-emulsified. By this way, it became able to make crude vegetable oil such as Jatropha oil directly usable fuel to diesel engines at extremely low cost.



すぐれたコストパフォーマンスを発揮

軽油を代替する代表的なバイオ燃料であるBDFの製造コ ストのおよそ1/10まで抑えることができます。また、ナノ エマルジョン燃料の燃焼効率の改善による燃費削減効 果も期待できます。

Manifest Superior Cost Performance

It is available to control its production cost to approx. 1/10 of BDF which is representative biofuel substituting with light oil. In addition, fuel saving effect can be expected from Nano-Emulsion fuel by the improvement of combustion efficiency.



地産地消型発電事業の実現

世界初の液体バイオマス発電所の技術を東南アジアへ輸出することで、現地の 植物原油を使ったナノバイオ燃料による発電が可能となり、電力の地産地消を 実現します。

Realization of local production for local consumption type power generation business

Power generation with Nano-Bio fuel using local crude vegetable oil is enabled by exporting the technology of the world's first liquid biomass power station to Southeast Asia and realizes local production for local consumption of electricity.



ナノバイオ燃料製造システム Nano-Bio Fuel Production System 既存ディーゼル発電所に組み込むだけで、液体バイオ燃料発電所へ転換可能。脱ガム工程とナノエマルジョン化工程を経て、 植物原油を発電機用エンジンで直接使用可能なナノバイオ燃料になります。 Just incorporated into existing diesel power plant, convertible to liquid biomass power plant. Crude vegetable oil becomes Nano-Bio fuel after degumming process and Nano-emulsification process, which can be used directly by the power generators. ナノエマルジョン化処理 Nano-emulsification Processing 脱ガム処理 ng Process ガム質除去・排水 水添加·乳化 水添加・分散 Water addition • Emulsification Water addition · Dispersion Gum removal · Drainage ٩ ディーゼル バジン 植物原油 供給 Crude vegetable oil Supplied to the diesel engines [NEFS-S1000] [NEFS-S1000] 【遠心分離機】 NEFS-51000 NEES-\$1000 Centrifugal separator

主たる再生可能エネルギー(太陽光、風力)との比較 Comparison with main renewable energy (solar, wind)

7k

Water

添加剤

Surfactant

水 Water

ガム

Gum

低コストでの発電が可能で、かつ天候に影響されず安定供給が可能です。 Steady supply at low cost power generation is possible without being affected by the weather.

水

Water

エネルギー源 Energy source	発電コスト Power generation cost	発電適地選定 Suitable sites selection for power generation	
液体バイオマス発電 Liquid Biomass Power Generation	16~23円 /kWh ^{**1}	適地に対する制約条件が少ない Less constraints on suitable sites selection	
太陽光発電 Solar Energy	30~46円 /kWh ^{**2}	日照時間等の条件検討 広大な設置面積 設置面での緑地破壊等 Consideration of conditions such as daylight hours Immense installation area Land destruction of green tract on installation	
風力発電 Wind Power	10~17円 /kWh ^{**2}	設置場所の風況 生活環境への影響等 Wind conditions at the installation site Influence on living environment.,etc.	

※1 23円/kWh は現在のパーム油市場価格76円/kg(2013年10月)を基に算出。16円/kWh は将来的に調達可能と考える油価格50円/kgに基づき算出。

※2 コスト等検証委員会報告書平成23年12月19日エネルギー・環境会議コスト等検証委員会より引用

23 JPY/kWh is calculated on the basis of current market price of palm oil 76 JPY/kg (October 2013). 16 JPY/kWh is calculated on the basis of oil price of 50JPY/kg which is considered a possible procurement in the future. Cost, etc. verification committee report Quoted from Energy and Environment Council Cost, etc. verification committee December 19, 2011 ×1

*2

ナノフュエル株式会社

NANOFUEL CO., LTD.

〒210-0821 神奈川県川崎市川崎区殿町1丁目19番4号 TEL:044-270-1611 FAX:044-270-1612

1-19-4 Tonomachi, Kawasaki-ku, Kawasaki, Kanagawa, 2100821 JAPAN Tel:+81-44-270-1611 Fax:+81-44-270-1612 www.nanofuel.co.jp



Overturned conventional wisdom of emulsion fuel Revolutionary New Fuel to achieve excellent combustion efficiency, environmental responsiveness and cost reduction

> ナノエマルジョン燃料 Nano-Emulsion Fuel

> > ナノフュエル株式会社 NANOFUEL CO., LTD.

新世代のエネルギーソリューション ナノエマルジョン燃料

環境への負荷が少なくクリーンでしかも低コストを実現する 新エネルギーの登場が待望されています。 当社は、物質をナノレベル(100万分の1ミリメートル)に 微粒子化する独自の最先端ナノテクノロジーを駆使することで、 今までのエマルジョン燃料の問題点を克服した、 画期的な新燃料「ナノエマルジョン燃料」の開発に成功しました。 新世代のエネルギーソリューションの誕生です。

1.9

A new generation of energy solution Nano-Emulsion Fuel

Appearance of new, clean energy with least adverse impact on environment and low cost is highly awaited. By utilizing our unique and most advanced technology to atomize materials at the "nano" level (parts per million millimeter), our company has successfully developed revolutionary new fuel – "Nano-Emulsion Fuel", which has solved the issues of conventional emulsion fuel. It is actually the birth of energy solution for new generation.

待望の画期的な新燃料の誕生

石油に水を添加したエマルジョン燃料は燃焼が改善されることから、燃費が向上し、スモーク等の有害な排ガスが低減するとされ、およそ50 年前から様々な研究開発が行われきました。しかしその有効性が不十分なことに加え、燃料としての基本性能、コスト等に多くの課題があり 実用化には至っていませんでした。そこで当社は添加する水をナノレベルに微粒子化することで従来の課題を克服し、新燃料「ナノエマルジョ ン燃料」を開発しました。

Long-awaited birth of new and epoch-making fuel

Improvement of combustion efficiency of emulsion fuel by the addition of water into oil results in improvement of fuel efficiency and in reduction of harmful emission. So, all kinds of research and development have been conducted since approximately 50 years ago. However, there have been issues in basic performance as fuel, cost and so forth, in addition to the lack of efficacy, which has hindered the practical use of emulsion fuel. Our company has developed "Nano-Emulsion Fuel" as a new fuel, overcoming the issues by atomizing water to be added at the "Nano" level.

従来のエマルジョン燃料 Conventional Emulsion Fuel

およそ50年前から研究開発が続けられてきたが期待されながらも 実用化には至らなかった従来のエマルジョン燃料。

Conventional emulsion fuel, despite expectations, not yet practically used after more than 50 years of R&D.

加水率:15% Water content: 15% 油滴の直径:100 µ m Diameter of oil droplets: 100 µ m 水粒子2 : 10 µ m Water oatlide dimenter: 10 µ m

水粒子数:150 個 No. of water particles: 150 表面積:0.19mm² Surface area: 0.19mm²

周囲の油膜厚:3.52µm

Surrounding oil film thickness : 3.52μ m



diameter, combustion efficiency has been much more improved that resulted in drastic fuel efficiency improvement and reduction of harmful emission. 加水率:15% Water content:15% 油滴の直径:100µm Diameter of oil droplets:100µm 水粒子径:0.3µm Water paticle diameter:03um 水粒子数: 5,555,000 個 No. of Water Particles: 5,555,000 表面積: 6.28mm² Surface area: 6,28mm²

ナノエマルジョン燃料の燃焼メカニズム

ディーゼル機関においては燃焼室内に噴霧された(液体)燃料が急激に温度上昇、油滴の表面から芯に向かって燃焼し、熱や圧力といったエネル ギーを発生させます。エマルジョン燃料はこの温度上昇の過程で油より先に内包された水が気化、体積膨張(大気圧下で約1700倍)し周囲の油を 分散させることで油滴を微粒化します。これにより油滴の表面積が大きくなることから燃焼効率が改善します。ナノエマルジョン燃料は従来のエマ ルジョン燃料より、油膜厚が32分の1にもなります。これにより油滴が更に細かくなり、その表面積が格段と大きくなることで効果が増大します。

Combustion mechanism of Nano Emulsion Fuel

In diesel engine, sprayed (liquid) fuel in combustion chamber rapidly rises in temperature, and oil droplets burning from surface toward center core, generate energy such as heat and pressure. In the process of temperature rising, water enveloped by oil comes to evaporate earlier than oil and to expand in volume (1,700 times larger under atmospheric pressure), and to decompose and atomize circumjacent oil droplets. By this, surface area of oil droplets enlarges and burning efficiency is to be improved. The thickness of oil film of Nano-Emulsion Fuel is 1/32 part of that of conventional emulsion fuel, which make the oil droplets much fine and dramatically enlarge the surface area thus the effect can be much bigger.



従来のエマルジョン燃料をはるかに超える高性能

ナノエマルジョン燃料は従来のエマルジョン 燃料とは異なり、燃料として期待される「燃費 削減効果」「有害排ガス削減効果」「コスト削 減」等すべてを高い次元で満たしています。

High performance far beyond conventional emulsion fuel

Contrary to conventional Emulsion Fuel, Nano-Emulsion Fuel achieves in higher dimension, all the effects expected for a fuel such as "Fuel Consumption Reduction", "Harmful Emission Reduction", and "Cost Reduction".

	エマルジョン燃料 Emulsion Fuel	ナノエマルジョン燃料 Nano-Emulsion Fuel
燃費削減効果 Fuel consumption reduction	油滴の微粒化が不十分の為、燃費削減効果は小さい。 Due to insufficient atomization of oil droplets, fuel consumption reduction is minimally-effective.	油滴の超微粒子化により、その表面積が格段と大き く、高い燃焼効率と燃費削減効果を得られる。 By super atomizing oil droplet, the surface area dramatically grow larger, attaining high combustion efficiency and Fuel consumption reduction.
有害排ガス 削減効果 Harmful emission reduction	CO ₂ : 燃費削減率に依存 → 削減効果 小 SO _X : 燃費削減率に依存 → 削減効果 小 PM: 燃焼効率に依存 → 削減効果 小 NO _X : 水 分 量 に 依 存 → 削減効果 同等 CO::Depends on fuel reduction rate → Reduction effect: Low SOX:Depends on fuel reduction rate → Reduction effect: Low MD::Depends on combustion efficiency → Reduction effect: Low NO _X :Depends on volume of water → Reduction effect: Equivalent	CO2: 削減効果 大 SO2: 削減効果 大 PM: 削減効果 大 NO2: 削減効果 同等 CO2:Reduction effect : High SO2:Reduction effect : High PM:Reduction effect : High NO2:Reduction effect : Equivalent
燃料としての 基本性能 Basic performance as a fuel	水の粒子が大きく不均一なため燃焼が不安定。 Unstable burning, due to large and inhomogeneous water particle.	水の粒子が小さく均一なため安定した燃焼ができる。 Stable combustion due to small and uniform water particles.
コスト Cost	添加剤を2.5~5%使用する為、コスト高。 High cost by surfactant with additive percentage of 2.5~5%.	水粒子をナノレベルにすることで保存安定性が格段 と向上。添加剤の添加率を0.1~0.5%に抑えることが 可能となり大幅なコスト削減に成功。 Preservation stability is remarkably improved by making nano-level water particles. Successful significant cost savings is achieved by suppressing surfactant addition rate to 0.1~0.5%.

性能が実証されているナノエマルジョン燃料

ナノエマルジョン燃料は国内大手エンジン メーカー5社、海外大手エンジンメーカー1社を はじめ、船舶、道路、食品、化学、アルミ等幅広 い分野の大手企業で評価試験を実施し、その すべてで燃費の削減と有害排ガスの大幅な削 減が立証されています。

Nano-Emulsion Fuel with validated performance

Evaluation tests for Nano-Emulsion Fuel have been conducted not only by 5 domestic and one oversea major engine manufacturers but at major companies among various industries such as shipbuilding, road construction, foods, chemical, aluminum and so forth, all of which have proved improvement of fuel efficiency and drastic reduction of harmful emission.





●15% A 重油ナノエマルジョン燃料 約 7% 燃費削減
 ●About 7% FOC reduction at 15% Marine Diesel Oil Nano-Emulsion Fuel

陸用、舶用エンジン Land-based, Marine Engines

【4-Stroke Engine実証試験】4-Stroke Engine demonstration test

Land-based GenSets:2700kW/900rpm Bore:250mm, Stroke:330mm

20% MDO ナノエマルジョン 約 3% 燃費削減
 20% HFO ナノエマルジョン 約 8% 燃費削減
 大幅な排ガス低減を達成

About 3% FOC reduction at 20% MDO Nano-Emulsion Fuel
 About 8% FOC reduction at 20% HFO Nano-Emulsion Fuel
 Achieved in significant emissions reduction



リサイクルキルンバーナー
 15% 灯油ナノエマルジョン燃料 約 15% 燃費削減
 About 15% FOC reduction at 15% kerosene Nano-Emulsion Fuel on recycling kiln burner

製品 Product

■ナノエマルジョン燃料製造装置

ナノエマルジョン燃料製造装置(NEFS)は既存の燃料系統に組込むだけで、簡単に使用することができます。標準タイプは幅 広い燃料組成に対応している他、遠隔地で燃料の製造量やメンテナンス時期等の情報を通信で得ることができます。

Nano-Emulsion Fuel System

Nano-Emulsion Fuel Manufacturing System (NEFS) can be used easily by installing in the existing combustion process. The standard type of NEFS can cope with wide-range of fuel composition, and has monitoring function of volume of produced fuel and to notice maintenance cycle at remote site.

プ: 広範囲の設置環境、燃料組成に対応 e: Applicable for wide-range installation environments and oil composition
S300:300ℓ/hr
S1000:1000ℓ/hr
ついてはレンタルもご用意しております。 pe, "Rental" system is also available
タイプ: 設置環境、燃料組成等を限定することで低価格化 ype: Low cost system for limited installation environment and oil composition
L1000:1000ℓ/hr(受注生産) (Build to order)

中・大型陸用発電機用:エンジンの燃料消費に追従してナノエマルジョン燃料を製造 For medium/large land-based power generator use: Nano-emulsion fuel production follows fuel consumption of engine

- INEFS-E1000:1000ℓ/hr(受注生産)(Build to order)
- NEFS-E2000:2000 ℓ /hr (受注生産) (Build to order)
- INEFS-E3000:3000 ℓ /hr (受注生産) (Build to order)



電源電圧 Power-supply voltage	3 phase AC200V. 50/60Hz
消費電力 Electricity consumption	13.2 kVA
使用圧縮空気 Compressed air	0.3 MPa. over 30L/min
外形寸法 External dimensions	W1350×D1380×H1750
製品重量 Product weight	1300 kg

■ナノエマルジョン燃料専用添加剤

ナノエマルジョン燃料専用の添加剤です。用途によって使い分けします。

Surfactant dedicated for Nano-Emulsion Fuel

Surfactants exclusively used for Nano-Emulsion fuel with types depending on the intended use.

インライン用添加剤 In-line use Surfactant

- Nanoemer GFA-101(A,B)
- Nanoemer GFA-102(A,B)

タンク貯蔵用添加剤 Tank-storage use Surfactant

Nanoemer GFA-001(A,B) Nanoemer GFA-002(A,B)

*ナノエマーは当社とミヨシ油脂株式会社の共同開発品です。

*ナノエマーは当社の登録商標です。

*Nanoemer is co-developed product by Miyoshi Oil & Fat Co., Ltd. and Nanofuel. *Nanoemer is our registered trademark.



NANOFUEL CO., LTD.

〒210-0821 神奈川県川崎市川崎区殿町1丁目19番4号 TEL:044-270-1611 FAX:044-270-1612

1-19-4 Tonomachi, Kawasaki-ku, Kawasaki, Kanagawa, 2100821 JAPAN Tel : +81-44-270-1611 Fax : +81-44-270-1612 www.nanofuel.co.jp

