FY2016 Project for Ministry of the Environment Japan

FY2016
Feasibility Study of Joint Crediting Mechanism Project by City to City Collaboration
(Study of Waste Material Sector in Ulaanbaatar, Mongolia)

Report

February 2017

Overseas International Environmental Cooperation Center, Japan

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February 17, 2017

Overseas Environmental Cooperation Center, Japan（OECC）

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I. Overview of the Project

1. Purpose of the study

The population of Ulaanbaatar, the capital city of Mongolia, has been increasing rapidly since the 21st century. In 2000, the city's population stood at 0.7 million; in the space of 15 years, however, it has almost doubled, reaching 1.39 million in 2016.

This growth has caused a variety of problems. For example, a remarkable increase has been seen in the volume of waste as a result of urbanization. Although a waste recovery system is finally being put in place, the disposal of this waste cannot keep pace with the speed of population growth. Moreover, appropriate management of disposal methods is lacking, so the waste is left unprocessed after being brought to landfill sites.

Waste disposal area in Ulaanbaatar City（East and West, June 2015）

In order to promote sustainable development in Mongolia, there is a need to deal with the complex issues that have arisen due to rapid population growth and urbanization, as well as recent individual environmental issues. Japanese municipal governments could play a part in efforts to present effective solutions by providing knowledge of how they overcame similar complex issues during Japan's period of rapid economic growth, and by introducing the kinds of policies and environmentally-friendly / energy-saving technologies that they used to combat these.

Hokkaido Government and Sapporo City are the biggest municipalities in Japanese cold region. As of 2015, the estimated population of Sapporo was 1.95 million people. As with Ulan Bator, in the 1960s Sapporo's main form of fuel was coal, which it produced in vast quantities within the prefecture, and air pollution resulting from smoke emissions from coal became a major social issue. However, the issue of air pollution in Sapporo was resolved in the 197os through a combination of a switchover from coal to oil and the implementation of environmental policies. Since the 1980s, the city has been pushing forward with energy saving projects, and is currently one of Japan's leading cities in

terms of environmental conservation.

Sapporo and Ulaanbaatar are members of the World Winter Cities Association for Mayors, an association with members from 10 countries and 21 cities worldwide. At the 15th conference, held in Ulan Bator in January 2012, the "Ulaanbaatar Declaration" was adopted. This declaration contains a number of goals, such as curbing emissions of greenhouse gases, cutting energy consumption volumes and the realization of urban activities of a kind that have a low impact on the environment.

In March 2015, Hokkaido signed a memorandum with Mongolia's Department of Energy concerning economic and technological exchanges in the field of energy, and is striving to further technological cooperation between Mongolia and private enterprises in Hokkaido.

"Ulaanbaatar Declaration (Jan. 2012)"
City of Sapporo & City of Ulaanbaatar

Memorandum Signing Ceremony between Hokkaido Government and Department of Energy Mongolia (Mar. 2015)

In this study, we seek to promote City to City collaboration between Ulan Bator and Hokkaido Government, a municipality in Japan's cold region, and Sapporo City, and to disseminate Japan's outstanding low carbon technologies through a Joint Crediting Mechanism (JCM). Specifically, at the same time as cutting Greenhouse Gases (GHG), it aims to implement projects to introduce facilities for cutting environmental pollutants and energy use based on a framework of collaboration between cities.

2. Contents of the study

(1) Feasibility study on introduced technologies, systems and services

In this enterprise, we undertook a study about a biomass power project using poultry (chicken) manure scheduled for implementation in the environs of Ulaanbaatar based on inter-city collaboration with Hokkaido and Sapporo.

At the time of the enterprise proposal, the idea was to introduce power generation technology for methane fermentation, using poultry manure as the raw material. However, for various reasons, we shelved the methane fermentation idea, and instead proposed to the Mongolian business operator an alternative method that involves producing fertilizer by carbonizing poultry manure as well as generating power from the residual heat at time of carbonization. The business operator is interested in the alternative method, and we agreed to form the proposal into a JCM project.

① Implementation structure

Accompanying the change in method, the implementation structure from time of proposal has changed. Instead of multiple facility suppliers now there is just one. And a Hokkaido company has stepped forward as the candidate on the Japanese side. From here on, we will sound at the company in Hokkaido to see if it wants to participate in the international consortium while we also proceed with preparations to apply for JCM facility assistance business.

② Financial structure for client and partners

The financial structure of the Mongolian representative company (business operator) shows it to have current long-term (five-year) debt. Nevertheless, even amidst the current economic slump in Mongolia, the company's main business (egg business) is increasing its share of the market, with business in a healthy state. Therefore, it is unlikely that repayment of debt will stagnate.

As to the financial structure of the Japanese representative company, we intend to investigate the finances of the Hokkaido candidate if it agrees to the deal.

③ Study of business feasibility and economic feasibility

Study of the profitability of the project resulted in us setting the investment recovery period to 8.4 years. We feel that further improvements to profitability must be made.

④ Confirming authorization formalities

It has already been decided that carbonizing poultry manure to make fertilizer is congruent with the business plans of the Mongolian representative company. Also, all 100kW of power generated from the residual heat of carbonization will be self-consumed. There are no private residences nearby, so an environmental assessment is not required. Therefore, we have confirmed that there are no authorization

formalities required in order to undertake this business.

⑤ Operation and maintenance (O/M) structure

Poultry carbonization skills are easy to learn as they are not as extensive as the knowledge required for something like methane fermentation. And only one permanently stationed technician (equivalent of a high-school graduate) will be needed for maintenance.

(2) Workshops in Mongolia and in Japan

The following workshops have been held between concerned parties from both Japan and Mongolia in an effort to encourage the formation of proposals at an early stage and form new proposals.

① Workshop in Mongolia

A workshop was held in Ulaanbaatar on October 27, 2016. Experts from Hokkaido and Sapporo participated in this workshop, during which they introduced successful examples of energy saving.

② Workshop in Japan

A workshop was held on January 20, 2017, on parallel with the below seminar in Tokyo. Experts from Ulaanbaatar Department of the Natural Environment were invited to this workshop.

(3) Conferences, Monthly reports and Progress report briefing sessions

① Attend at conferences

Representatives from Hokkaido and Sapporo attended the following two domestic conferences that were specified by the Ministry of the Environment.

- Feasibility Study of Joint Crediting Mechanism Project by City to City Collaboration Kitakyushu Seminar (October 20 – 21, 2016)

- Feasibility Study of Joint Crediting Mechanism Project by City to City Collaboration Tokyo Seminar (January 23, 2017)

A request was made by the office to invite to representatives from Ulaanbaatar, and experts from the city's departments related to the environment (Air Pollution Reducing Department and Natural Environment Department) participated in the

workshop.

②Monthly reports

During the period in which surveys were carried out (April 2016 – January 2017), the progress of the surveys was ascertained using Gantt charts submitted at the time of application and a monthly mail was sent out reporting the status of progress for each month.

③ Meetings in Japan

The following meetings were held in Japan during the period in which the survey was being carried out. Representatives from Hokkaido and Sapporo were requested to attend the Progress Report Briefing Sessions.

- Kick-off Meeting (May 10, 2016)
- Progress Report Meeting (July 6, 2016)
- 1st Progress Report Briefing Session August 8, 2016)
- Progress Report Meeting (September 15, 2016)
- Progress Report Meeting (November 25, 2016)
- 2nd Progress Report Briefing Session (January 12, 2017)
- Final Progress Report Briefing Session (February 9, 2017)

II. Feasibility study on introduced technologies, systems and services

1. Project for introduction of heat pump to beverage factories

(1) Outline of the project

The Mongolian business involved in this project is a poultry farm owned by M company (100% subsidiary of the local N company), which has more than half of the egg business market share in Mongolia, making it a major business in the local egg industry. And, in discussions with N company, we were told that there was nowhere to dispose of the manure that came from the poultry (hens), and that it just got piled up in buildings on the poultry farm, with the operators really struggling to find a solution.

N company's wish is to form a JCM project to generate biomass power from that poultry manure. We estimate that such a biomass power generation project is highly feasible for the following reasons.

① N company does not envisage selling power generated in this project, as it envisages using (consuming) the power at the farm, which means there would be no risk from selling electricity. The risk here is the feed in tariff (FIT), where in some cases businesses rely on fixed price power purchasing to maintain business, but there is a major impact on the ability to maintain business if the FIT system is removed. However, as the business group concerned here envisions using the power on site, and has no intention of making profit via the FIT system, there will be no impact from FIT.

② Saisan (local subsidiary Unigas established in 2004 in business expansion by Hokkaido company Ichitaka Takahashi Corp and Sumitomo Corp) considered participating in the plan to supply gas.

③ Business risk would be minimal because preliminary calculations show a positive balance in the initial income figure for biomass, which would be bolstered by egg sales exceeding 50% of the market in Mongolia.

Furthermore, the push for the project is immense because in the past a large number of hens froze to death due to a blackout and N company seriously want to avoid such blackouts as well as get involved in local production for local consumption.

Indeed, the track record shows that in 2013 the Belgian investment company for developing countries (BIO) provided finance of 5.4 million USD to N company, as did the German reconstruction finance corporation Kreditanstalt für Wiederaufbau (KFW). Therefore, we assume that N company is highly trusted in terms of credit.

The above background information leads us to consider this poultry manure project a highly feasible one as an applicant for business.

The following shows N company's finance record, including finance from overseas.

Fig. 1-1 Records of investment to N company

We will explain in detail later, but, at the time of the proposal for this project, we had in mind to introduce power generation technology for methane fermenting that would use the poultry manure as the raw material, or fuel. Nevertheless, due to the following reasons, we had to change the actual technology to be introduced.

- It is difficult to carry out methane fermentation with a raw material of just poultry manure.
- A device to remove ammonia (a hindrance to methane fermentation) needed to be introduced, but the manufacturer of that device on the Japanese side withdrew from the proposal, so delivery was not possible.

During a visit we made with the main company on the Japanese side to Mongolia in December 2016 to introduce the technology change from methane fermentation to carbonization, both N company and its subsidiary M company showed immense interest in the carbonization proposal, saying that they would really like to move ahead with the new idea. The big advantages that could be seen are that the initial investment for carbonization is less than that for methane fermentation, and the product material after carbonization will be fertilizer, which will lead to enhanced profitability.

In this work, we visited the site twice, once in June and again in December 2016, to study the feasibility of the project. The following is an outline of both visits.

① First visit (June 2016)

(a) Biogas power generation using poultry manure methane fermentation

We proposed (Fig. 1-(1)-2) power generation using methane fermentation.

We made facility scale calculations based on a plan to soon increase the hen count to 400,000 from the currently farmed number of hens of 300,000, which was a condition of the proposal.

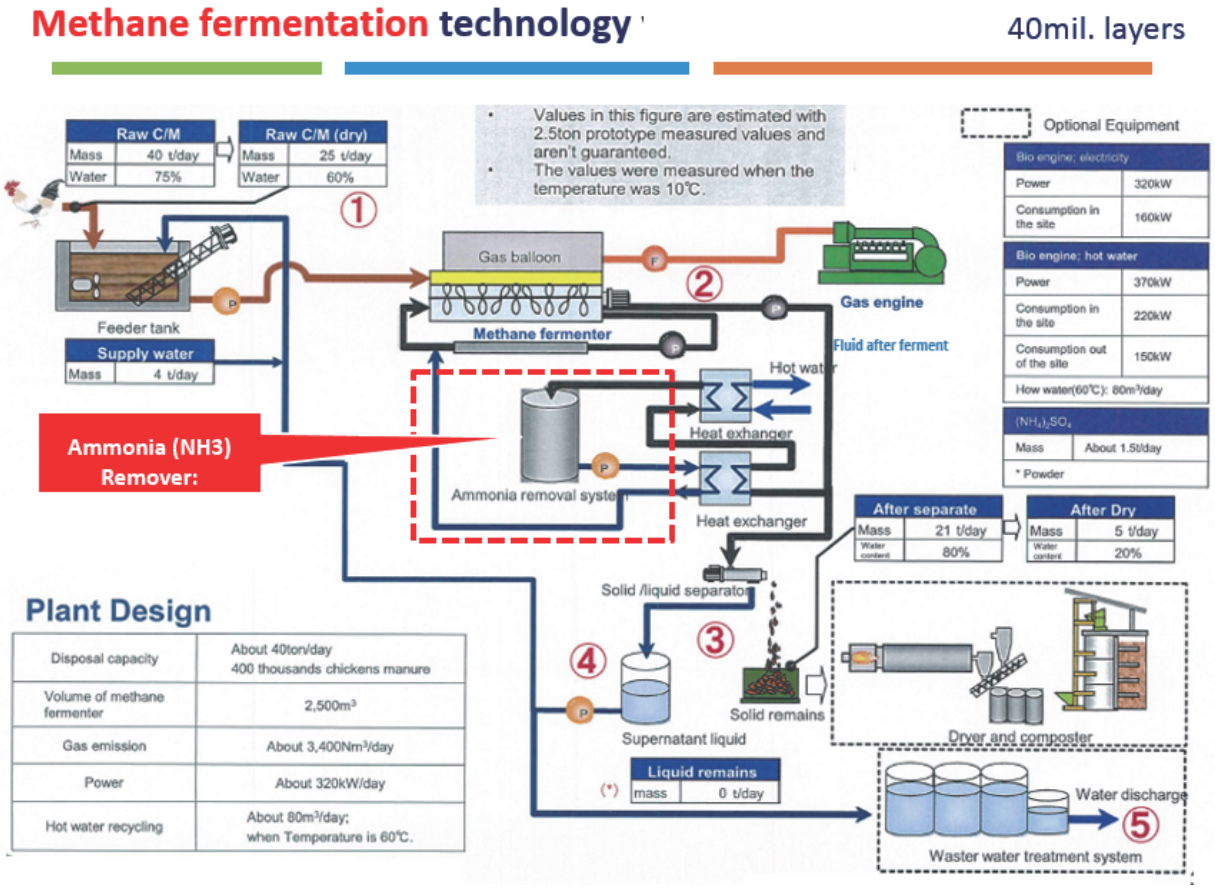

Fig. 1-2 Initial proposal for biogas power generation using poultry manure fermentation

(b) Issues that manifested themselves

The following describe the issues that manifested themselves regarding the above methane fermentation technology.

a) Lowness of calorific value of methane fermentation gas

Results of analysis on poultry (hen) manure components showed that producing methane fermentation gas using 100% poultry manure would probably mean a low calorific value.

b) Addition of agricultural leftovers and food leftovers

To solve the issue presented in item (a), it was deemed necessary to add agricultural and food leftovers to raise the calorific value. We considered mixing in such leftovers, but as temperatures drop below minus 30℃ in winter at the local site, we judged that it would be difficult to ensure a regular fixed supply of such agricultural leftovers. At that juncture, as noted in the proposal for this case, we considered mixing in the massive amount of alcohol lees output from a vodka distillery.

The APU company (a manufacturer of beverages, such as vodka, beer and milk, based in Ulaanbaatar, which was part of an OECC study in 2014) generates some 500 tons of waste, such as alcohol lees, every day, with nearly all of that waste becoming landfill to be disposed of at inappropriate landfill sites.

To get a constant supply of such waste alcohol lees to mix with poultry manure to increase calorific value, we visited APU company to ask about the disposal of alcohol lees. The answer was that the alcohol lees are sold cheaply as compost to the dairy farmers who deliver milk to the company. And, as there was talk from APU company about the daily amount required and the price of the transaction, we decided that we needed to renegotiate.

Meanwhile, at the point where we were considering the increase of calorific value using alcohol lees added to poultry manure, H company, the Japanese manufacturer of the equipment to remove ammonia that hinders methane fermentation, told us that it was dropping out of the business proposal. Therefore, we had no alternative but to abandon the methane-fermentation-driven biogas power generation proposal.

② Second visit (December 2016)

(a) Tour of local poultry farm

In December, once public affairs had settled down after the change of government due to the election in Mongolia, we made our second study visit to Mongolia.

The following present some images of the local visit.

i) M company's poultry farm (65km from UB)

ii) M company's CEO centralized management office

iii) M company representatives and technicians looking at material

iv) Egg screening & packing processes

v) Poultry farm model in showroom

vi) Plan includes organic fertilizer plant

vii) Poultry farm with temperature & humidity controlled

viii) Piling up of poultry manure

Fig. 1-3 Tour of M company's poultry farm (invitation to specialists from Japanese companies)

(b) Proposal to generate power and generate hot water via poultry manure carbonization as well as produce organic fertilizer

After conducting the first onsite study in June, we signed a non-disclosure agreement (NDA) with the local company in control, and continued to exchange information remotely. Amidst that, we sought out a Japanese company that has carbonization technology that could be used to replace the methane fermentation technology. And, after making a proposal about the carbonization technology and surveying the actual local site, we were able to invite a technician from a company with relevant technology to make a visit to Mongolia.

The following are diagrams that show the concepts of carbonization technology for the proposal this time round.

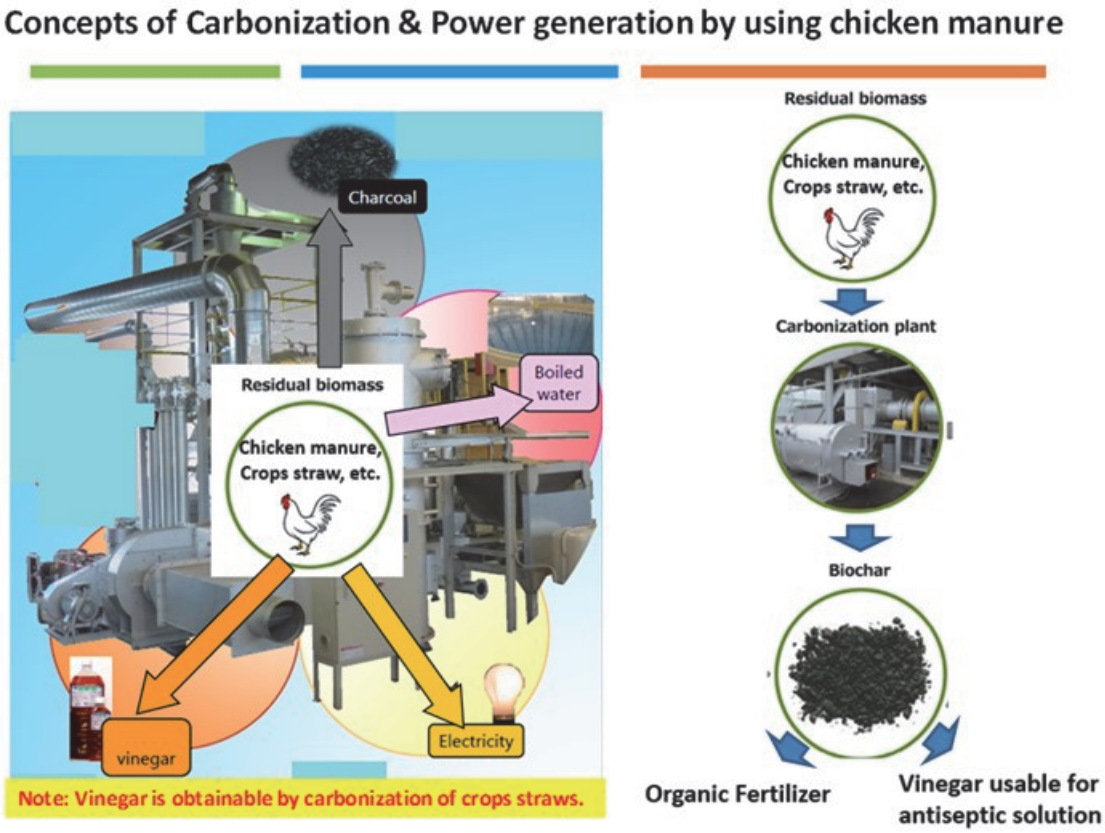

Fig. 1-4 Poultry manure carbonization technology to replace the methane fermentation plan

In this proposal, the concepts are to generate power for self-consumption by carbonizing 100% of the poultry manure as well as using semi-coke to fuel a highly efficient boiler to produce hot water for self-consumption, while also producing organic fertilizer and/or vinegar to enhance profitability.

The following are extracts from N company's ten-year plan that we received after signing the NDA.

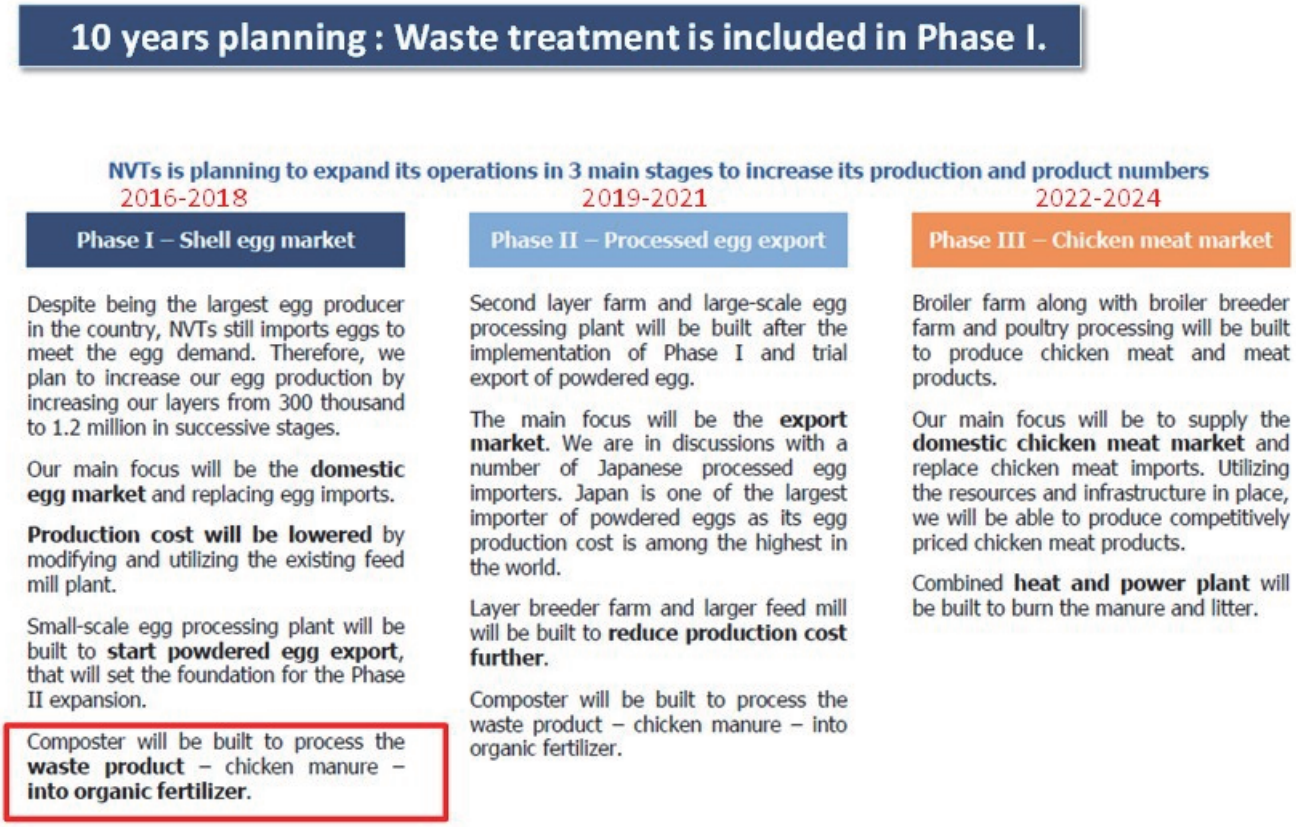

Fig. 1-5 Poultry manure carbonization technology to replace methane fermentation

Viewing the three phases posted in N company's ten-year plan, it is clear that Phase 1 (2016-2018) includes a statement about organic fertilizer plant, so N company's needs and the proposed technology are a good match.

The Japanese outfit M company possess this technology, and has an extensive track record in Japan. And, while there are issues to face in turning this technology into a JCM project, Fig. 1-6 below shows the proposed system flow.

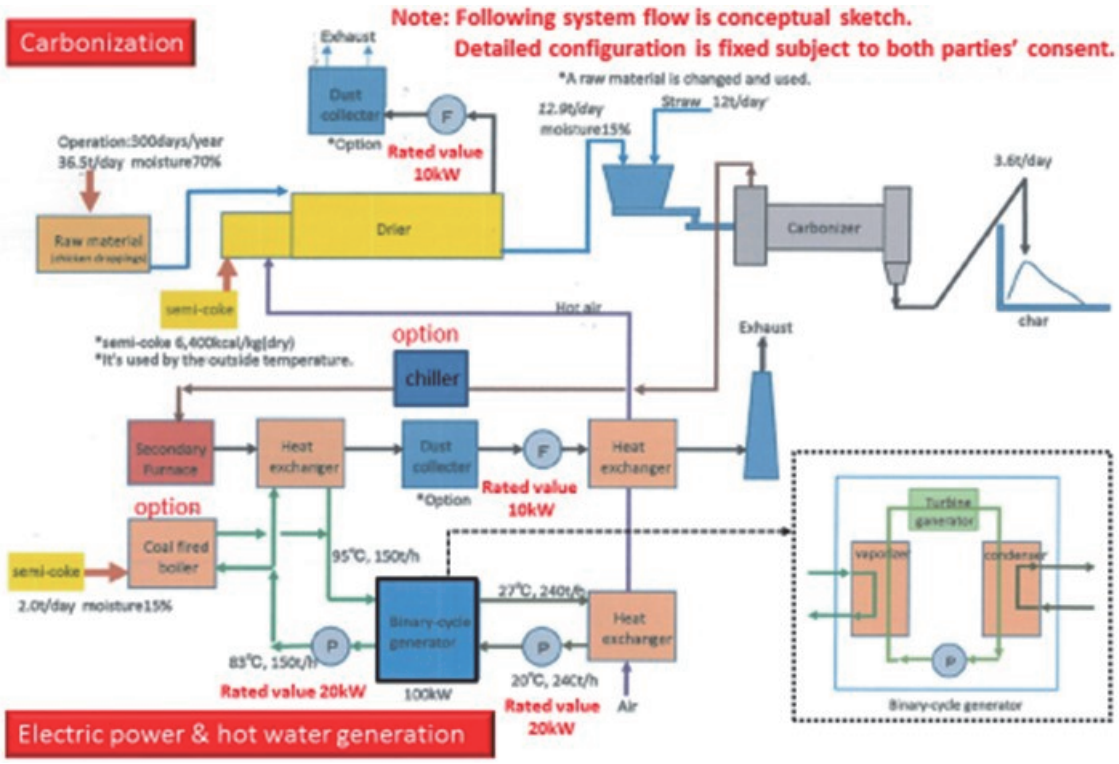

Fig. 1-6 System flow diagram for proposed carbonization technology

(c) The back data received from local site in order to create system flow

a) Poultry manure analysis (moisture ratio) results

Translation

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№	Test Parameter	Measuring Unit	Determination method	Test Result
1	Moisture	%	Weighing	70.0
2	Chemical characteristic	pH	potentiometer	6.73
3	Organic Carbon, C	%	Titrate method	13.81
4	Total nitrogen, N	%	Khel dale method	2.73
5	Total Phosphorus, P	%	Spectrophotometry	1.20
6	Total Potassium, K	%	Dolt photometry	1.00
7	Ammonium nitrogen, NH_4	%	Titration method	2.74

Fig. 1-7 Poultry manure results (moisture ratio: 70%)

b) Monthly power consumption and power charges at poultry farm

	Facilities	January		February		March		April	
		Consumtion by KW	Price by MNT	Consumtion by KW	Price by MNT	Consumtion by KW	Price by MNT	Consumtion by KW	Price by MNT
1	Pullet house 1, Security point 2.1	9,912.52	1,348,103	5,640.77	767,145	6,487.32	882,276	7,962.29	1,082,872
2	Pullet house 2	9,912.52	1,348,103	5,640.77	767,145	6,487.32	882,276	7,962.29	1,082,872
3	Layer house 1	11,215.43	1,525,298	6,768.93	920,574	7,784.26	1,058,660	9,553.18	1,299,232
4	Layer house 2	11,215.43	1,525,298	6,768.93	920,574	7,784.26	1,058,660	9,553.18	1,299,232
5	Layer house 3	11,215.43	1,525,298	6,768.93	920,574	7,784.26	1,058,660	9,553.18	1,299,232
6	Packaging, Office, Street lighting	9,121.58	1,240,535	7,897.46	1,074,054	10,451.60	1,421,418	5,125.88	697,119
7	Water reservoir tank	16,435.80	2,235,269	19,672.12	2,675,408	21,599.98	2,937,598	10,593.48	1,440,713
8	Garage, Well -2, Kitchen, Security point 2.2	8,884.22	1,208,254	10,633.58	1,446,166	11,845.15	1,610,941	5,809.33	790,068
9	Boiler room, Wastewater treatment plant	19,101.07	2,597,745	22,862.19	3,109,258	25,780.62	3,506,165	12,643.83	1,719,561
	Total	107,013.99	14,553,903	92,653.66	12,600,898	106,004.81	14,416,654	78,756.63	10,710,901

136MNT/kW

Refer to next page.

	Facilities	May		June		July		August	
		Consumtion by KW	Price by MNT	Consumtion by KW	Price by MNT	Consumtion by KW	Price by MNT	Consumtion by KW	Price by MNT
1	Pullet house 1, Security point 2.1	7,839.29	1,066,144	-	-	-	-	-	-
2	Pullet house 2	7,839.29	1,066,144	-	-	-	-	-	-
3	Layer house 1	9,414.91	1,280,428	10,395.59	1,413,800	15,458.62	2,102,373	17,090.06	2,324,248
4	Layer house 2	9,414.91	1,280,428	10,056.60	1,367,698	14,954.54	2,033,817	16,532.77	2,248,457
5	Layer house 3	9,414.91	1,280,428	10,056.60	1,367,698	14,954.54	2,033,817	16,532.77	2,248,457
6	Packaging, Office, Street lighting	5,054.01	687,346	9,080.67	1,234,972	13,503.29	1,836,448	14,928.37	2,030,259
7	Water reservoir tank	10,444.96	1,420,515	10,546.25	1,434,290	15,682.66	2,132,842	17,337.74	2,357,933
8	Garage, Well -2, Kitchen, Security point 2.2	5,727.88	778,992	5,838.10	793,982	8,681.47	1,180,680	9,597.68	1,305,284
9	Boiler room, Wastewater treatment plant	12,466.57	1,695,453	11,048.45	1,502,590	16,429.46	2,234,406	18,163.35	2,470,215
					-		-		
	Total	77,616.74	10,555,877	67,022.29	9,115,031	99,664.59	13,554,384	110,182.74	14,984,853

	Facilities	September		October		November	
		Consumtion by KW	Price by MNT	Consumtion by KW	Price by MNT	Consumtion by KW	Price by MNT
1	Pullet house 1, Security point 2.1	-	-	-	-	-	-
2	Pullet house 2	-	-	-	-	-	-
3	Layer house 1	11,814.66	1,606,793	8,718.08	1,185,659	11,735.07	1,595,970
4	Layer house 2	11,429.39	1,554,398	8,433.79	1,146,996	11,352.41	1,543,928
5	Layer house 3	11,429.39	1,554,398	8,433.79	1,146,996	11,352.41	1,543,928
6	Packaging, Office, Street lighting	10,320.24	1,403,553	7,615.35	1,035,687	10,250.73	1,394,099
7	Water reservoir tank	11,985.88	1,630,080	8,844.43	1,202,842	11,905.15	1,619,100
8	Garage, Well -2, Kitchen, Security point 2.2	6,635.04	902,366	4,896.02	665,859	6,590.35	896,288
9	Boiler room, Wastewater treatment plant	12,556.64	1,707,703	9,265.59	1,260,120	12,472.06	1,696,200
					-		-
	Total	76,171.25	10,359,290	56,207.05	7,644,158	75,658.17	10,289,512

Peak month: Jan.
↓
107MW ≒ 150KWh
∨
100KWh
(power generated)

Fig. 1-8 Power consumption and power charges at poultry farm (most recent year)

In the system put forward in this proposal, a binary power generator will be used to generate 100kWh.

Analyzing the monthly power consumption and power charges for the poultry farm in data received from one of the clients, we note that the power consumption in the peak month of January is 150Wh.

While it would be necessary to compensate for a power shortage from the grid in the month, power generation of 100kW from the project could cover power consumption in summer and much of winter.

c) Poultry manure drying technology that uses body heat of hens

With this project, we are applying poultry manure drying technology that uses the body heat of hens. Japan's M company, which will introduce the technology, tell us that the calorific value is 6kcal per hen. And M company have already introduced this technology for a client in Japan.

The efficacy of this technology has been verified in Japan, but extensive validation will be required to see if the same benefits can be achieved in the extreme cold (-40℃) of winter in Ulaanbaatar.

Once the efficacy of poultry manure drying using the body heat of hens can be confirmed, it should be possible to greatly reduce the cost of equipment used in the drying process.

The following show how this technology has been utilized in Japan.

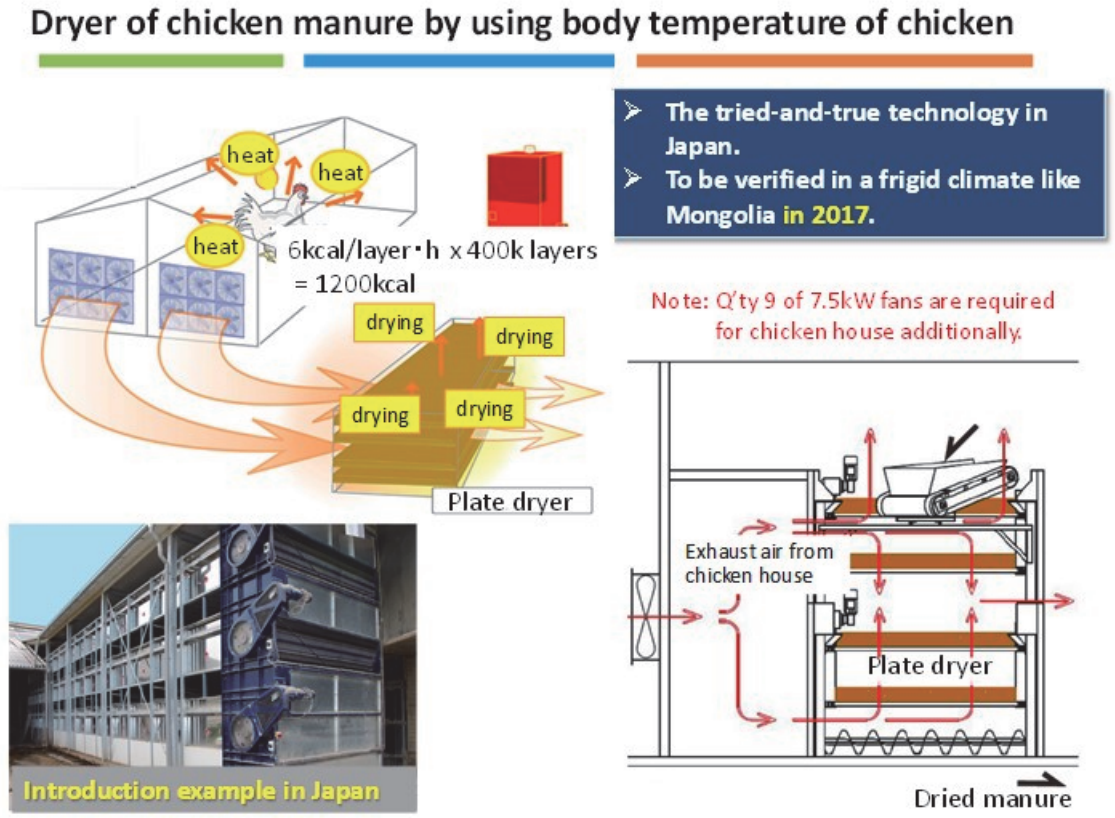

Fig. 1-9 Poultry manure drying system using body temperature of hens (actual results)

(2) Feasibility study

① Implementation structure

The following show the implementation structures for this project. The biomass power generation using methane fermentation (Fig. 1-10) was the implementation structure at time of the original proposal but that was changed to an implementation structure for carbonization technology (Fig. 1-11) after we conducted an onsite study.

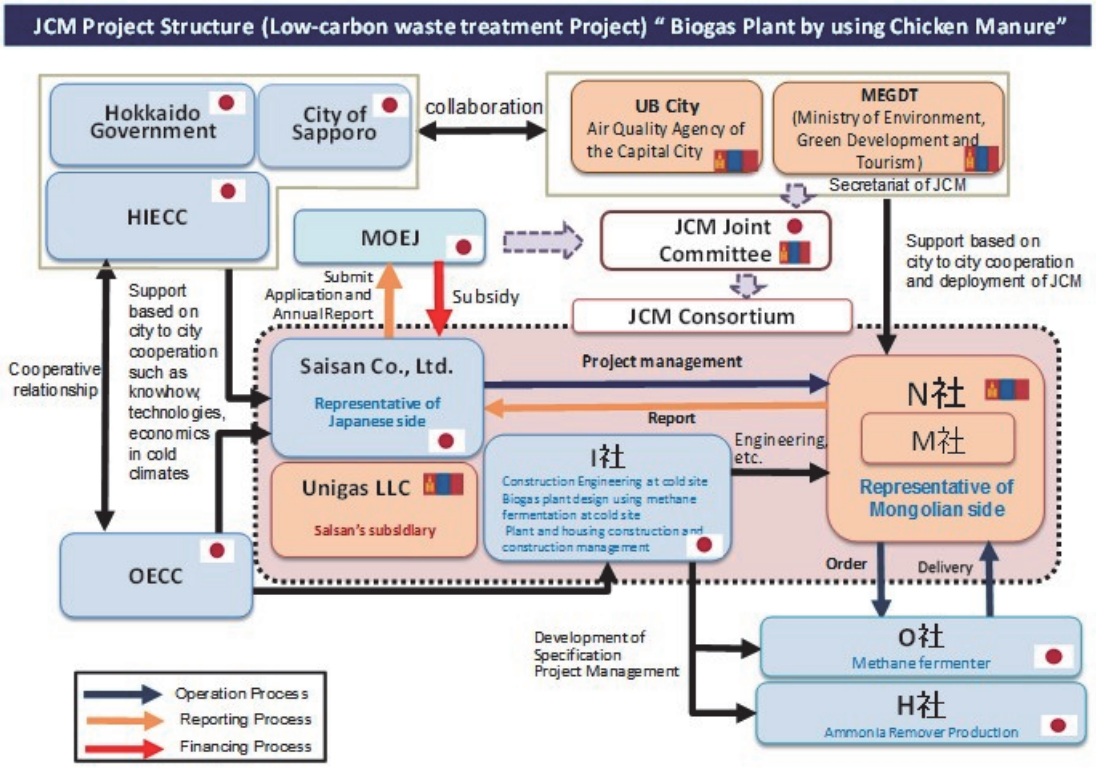

Fig. 1-1-10　Implementation structure for methane fermentation technology

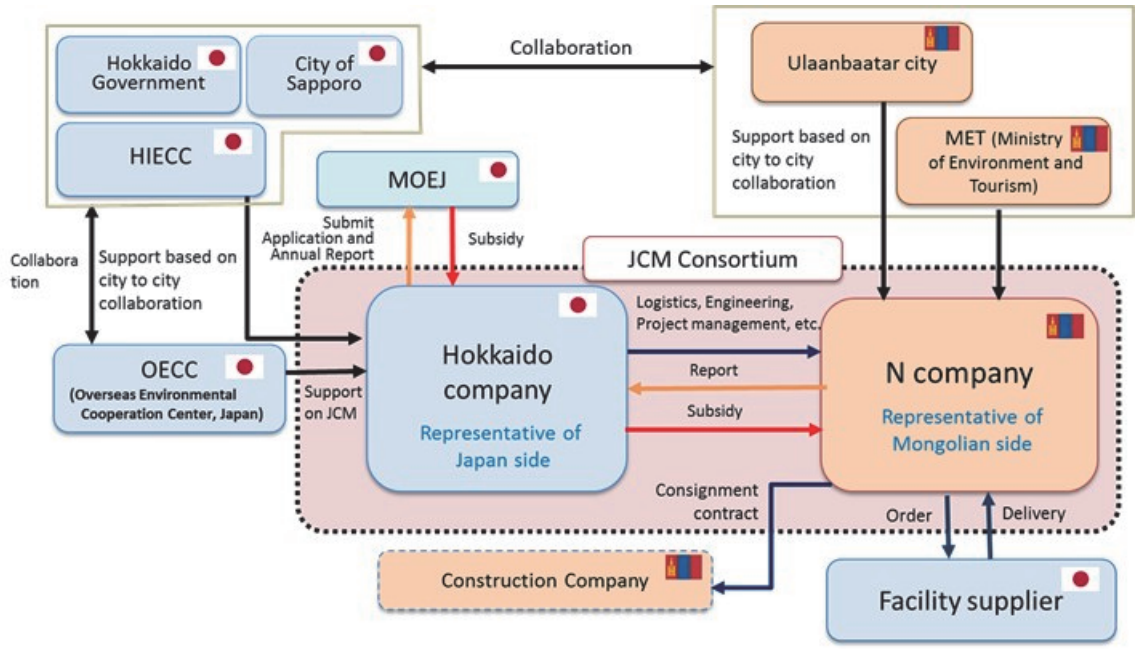

Fig. 1-11　Implementation structure (after onsite study) for carbonization technology

②Financial structure for client and partners

This is the financial structure of the client (local enterprise N company), which is

increasing its market share in the egg business even though Mongolia is in the midst of an economic slump – yet, while the egg business is healthy, N company is in long-term debt.

The term of repayment is five years hence, and N company is currently procuring capital from markets in China and Hong Kong.

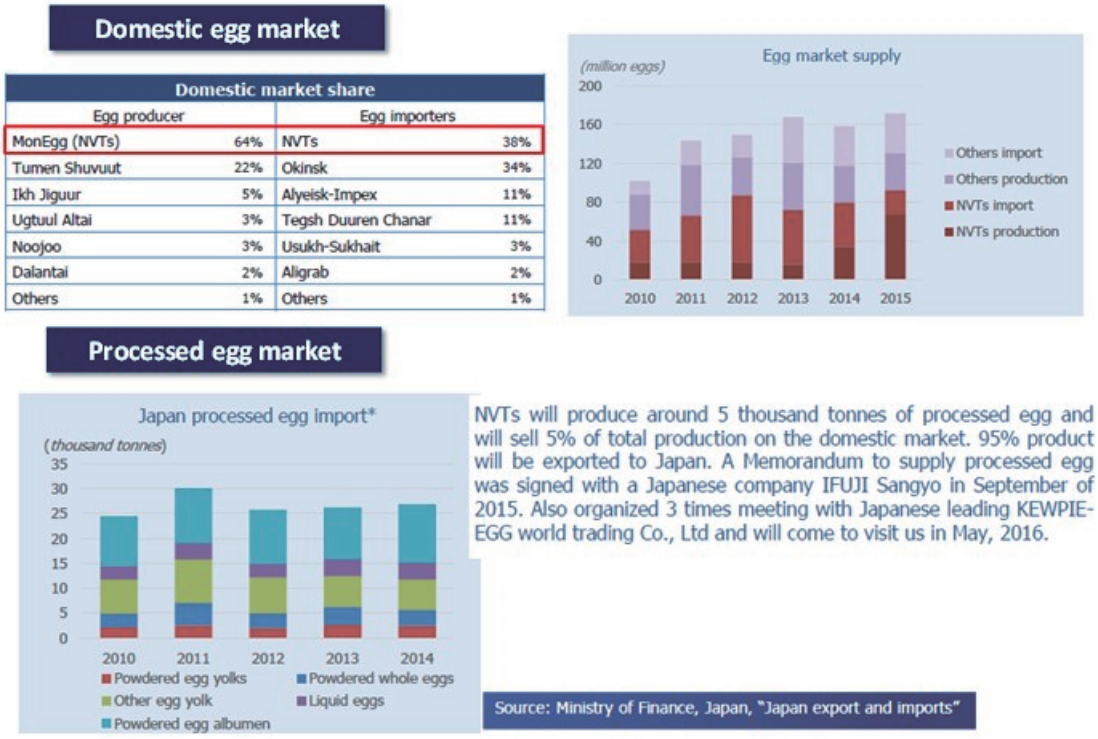

Fig. 1-12 Market share of client (N company)

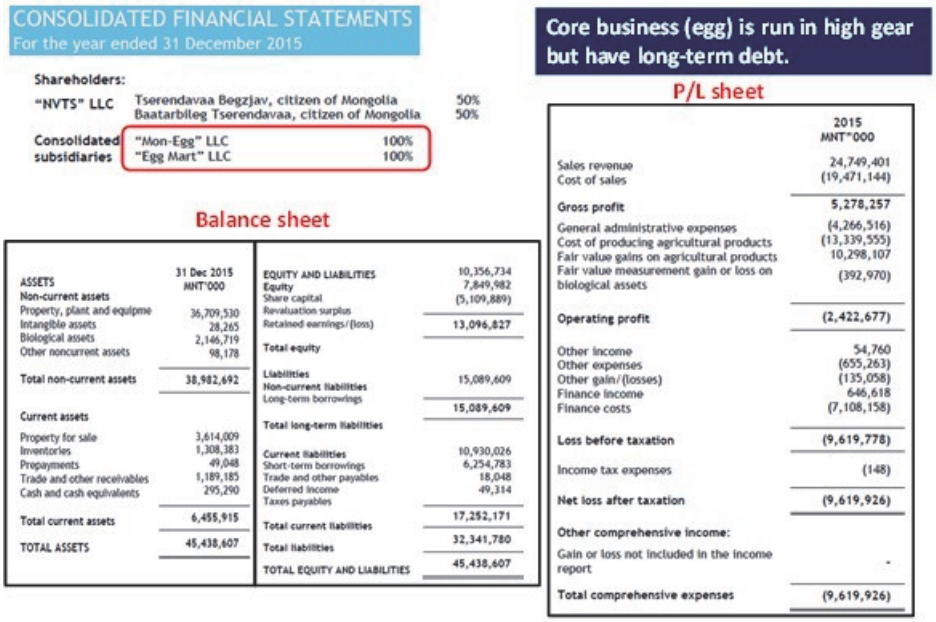

Fig. 1-13 Financial statements (BS & P/L) of client (N company)

③ Consideration of business feasibility and economic feasibility

As noted in item ②, the key factors to success are the economic situation in Mongolia on a macro level and N company's ability to repay long-term debt on a micro level.

Taking the clearance of the above key factors to success as a prerequisite, we made rough estimations of the profitability that would be required to make this project viable. The following parameters should be given due consideration as rough trial calculations.

(a) Gains from introducing system

a) Power generation that provides energy saving

b) Hot water production enabling reduction in brown coal used

c) Profit on sales of organic fertilizer

(b) Additional costs for system introduction

a) Addition of one technician for operation and maintenance

b) Semi-coke outlay

c) Electricity charges

The following shows a list of trial calculations.

(in J-KYen)

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
I. Revenue															
1. Energy saving * 82kW x 8760h/y x 136MNT/KW	4,880	4,880	4,880	4,880	4,880	4,880	4,880	4,880	4,880	4,880	4,880	4,880	4,880	4,880	4,880
2. Coal saving *547t/y (Baganuur =29kMNT/t)	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800
3 . Fertilizer (GP=25%) * 3600kg/day x 365d, 100J-Yen/kg,	32,850	32,850	32,850	32,850	32,850	32,850	32,850	32,850	32,850	32,850	32,850	32,850	32,850	32,850	32,850
total	38,530	38,530	38,530	38,530	38,530	38,530	38,530	38,530	38,530	38,530	38,530	38,530	38,530	38,530	38,530
Ⅱ. Expense															
1. O&M * 1 engineer	540	540	540	540	540	540	540	540	540	540	540	540	540	540	540
2. Semi-coke * 2ton/d, 3.7kJ-Y/t	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700	2,700
3. Electric tariff	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000	7,000
total	10,240	10,240	10,240	10,240	10,240	10,240	10,240	10,240	10,240	10,240	10,240	10,240	10,240	10,240	10,240
Profit (Ⅰ-Ⅱ)	28,290	28,290	28,290	28,290	28,290	28,290	28,290	28,290	28,290	28,290	28,290	28,290	28,290	28,290	28,290

(473,650 k-JYen (Initial investment) x 50% max.) / 28,290 k-JYen (Annual cost saving) ≒ 8.4 years (payback)

Fig. 1-14 Trial calculations for project gains

The payback period will be 8.4 years according to the above trial calculations. We feel that further improvements to profitability are needed.

④ Authorization formalities

It has already been decided that carbonizing poultry manure to make fertilizer is congruent with the business plans of the Mongolian representative company. Also, all 100kW of power generated from the residual heat of carbonization will be self-consumed. There are no private residences nearby, so an environmental assessment is not required. Therefore, we have confirmed that there are no authorization formalities required in order to undertake this business.

⑤ Operation and maintenance (O/M) structure

Only one permanently stationed technician (equivalent of a high-school graduate) will be needed for maintenance.

Poultry carbonization skills are easy to learn as they are not as extensive as the knowledge required for something like methane fermentation – therefore, the carbonization technology is the optimum one for a developing country like Mongolia.

In the project gain calculation of Fig. 1-14, the operation and maintenance cost of 540,000 yen per year (45,000 yen per month) is the average earnings of the M company worker shown in Fig. 1-15.

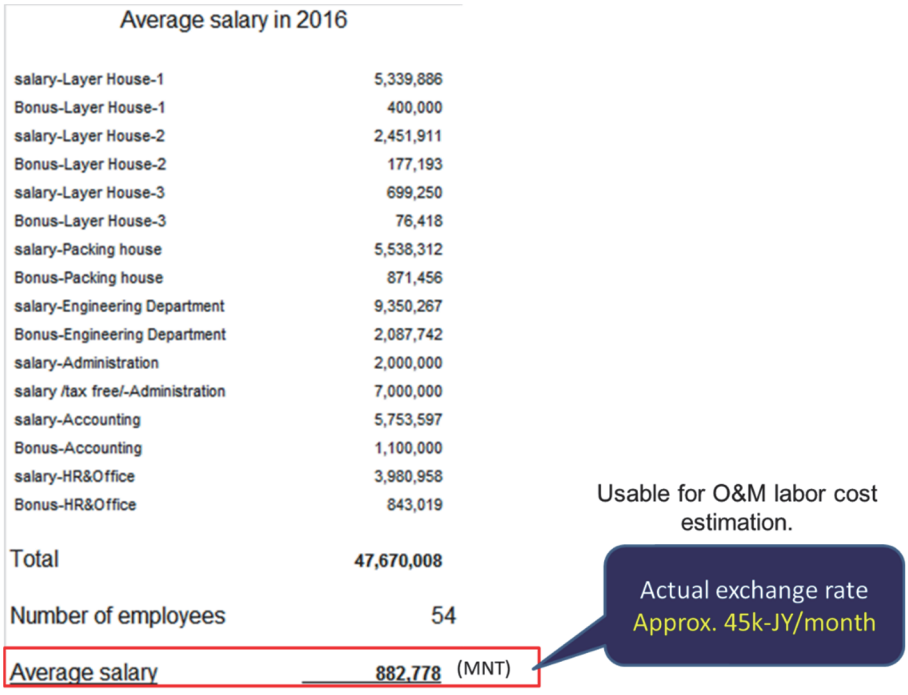

Fig. 1-15 Average earnings of M company employee (calculated for O & M cost)

(3) Consideration of CO2 reductions

CO2 reductions can be broken down into two elements in this project.

One is the efficacy from energy saving via the 100kW of power generation and the other is the reduction in brown coal consumption that will accompany hot water production using semi-coke boiler.

The following is a summary of the above scenario.

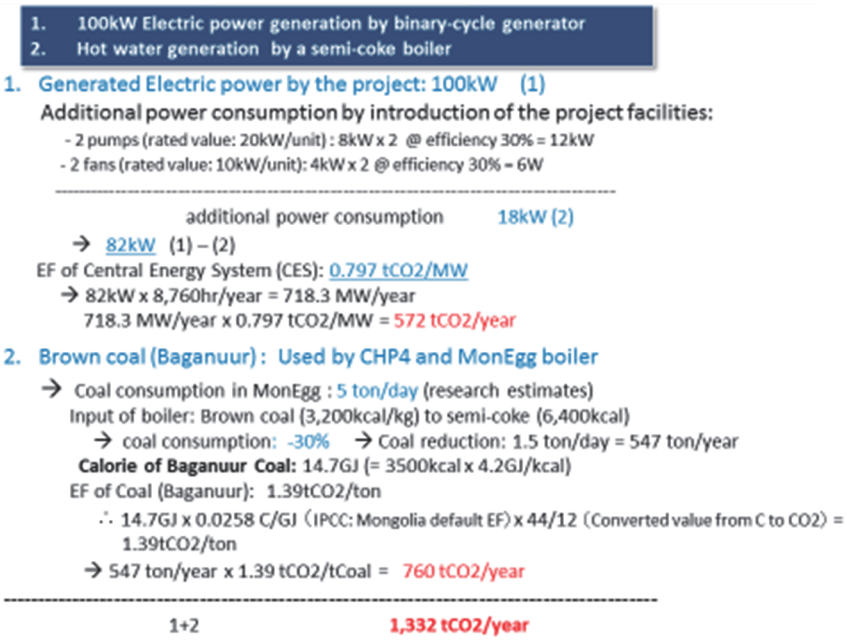

Fig. 1-16 CO2 reduction scenario

An annual CO2 reduction of 1,332 tons can be expected in the above scenario. If the legal durable years of the introduced system is set as 15 years, the investment efficiency at present is ¥10,000/tCO2.

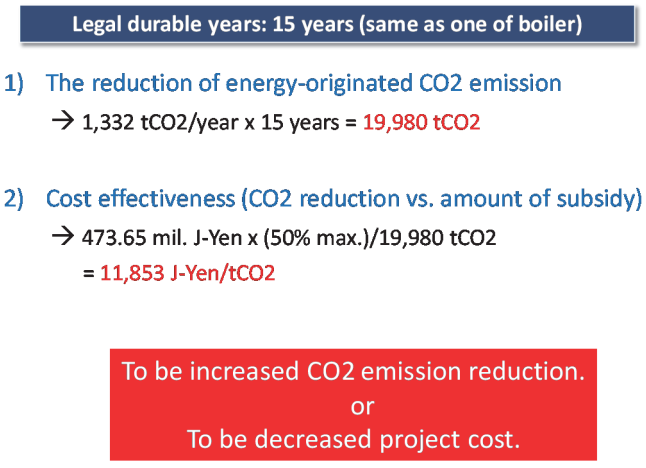

Fig. 1-17 Investment efficiency observations as seen from CO2 reductions

In this system, the reduction of methane (CH4) and nitrous oxide (N2O) generated by fermentation of poultry manure piled up as waste was not taken into account. Yet, the global warming potential (GWP) of methane and nitrous oxide are 21 and 310 times compared by CO2. Thus, by taking methane and nitrous oxide reduction into account, investment efficiency will be greatly improved.

(4) MRV methodologies and PDD

The following are the two CO2 reduction points provided by this project.

1) 100kW Electric power generation by binary-cycle generator
2) Hot water generation by a semi-coke boiler

Here, we compile the methodologies and PDD based on the above reduction points. The calculation of CO2 reduction amount added from the reduction of above methane and nitrous oxide will be considered to the next study stage.

(5) Problems in future

The following are summaries of the issues from here on.

① Funding issue

- Finding investors (obtaining construction funds)

② Technical issues

- Whether or not poultry manure drying process using body temperature of hens will be efficient in winter
- Obtaining manure necessary for carbonization
- Method for procuring semi-coke (2t/d) as supplement fuel

③ Other issues

- Reviewing cost effectiveness (add on methane and nitrous oxide reduction)
- Research of the market for organic fertilizer (and vinegar)
- Participation on Japan side in consortium for JCM project by the company in Hokkaido

III. Workshops in Mongolia and in Japan

1. Mongolia（Ulaanbaatar）Workshop

(1) Purpose of the workshop

A workshop was held to introduce representatives from Ulaanbaatar to the Joint Crediting Mechanism (JCM) and related projects, along with the City to City Collaboration Project between Ulaanbaatar and Hokkaido Government / Sapporo City. The aim behind inviting these representatives to come and hear about the JCM system and overview in person was to obtain their cooperation in existing projects and form new proposals for future projects.

(2) Presentation

① Schedule

Date: October 27, 2016 (Thursday) 09:00～12:00

Venue: "Khaan" Hall, The Ministry of Environment and Tourism of Mongolia (MET)

Organizers:
- Ministry of Environment and Tourism of Mongolia
- Ministry of the Environment, Japan
- Overseas Environmental Cooperation Center (OECC))
- Ulaanbaatar City / Air Pollution Reduction Department (APRD)
- Hokkaido Government and Sapporo City

Please see the attachment list of the details of participant.

② Program

Time	Topic	Lecturer
09:00-09:10	Introduction	MET
09:10–09:35	Summary of JCM Project and Study through City to City Cooperation	OECC
09:35-10:00	Current Development of JCM in Mongolia by Nature Conservation Fund, Mongolia	MET／Nature Conservation Fund
10:00-10:25	Problem and Plan of Greenhouse Effect Gas Reduction in Ulaanbaatar City	APRD
10:25-10:40	Coffee Break	
10:40-11:05	Energy Saving Measures in Sapporo City	Sapporo City
11:05-11:30	Study of Energy Saving Project in Cooperation with the Company in Hokkaido	Mongolian National University
11:30-11:40	Closing	Hokkaido Government (HIECC)

③ Brief of presentation

1) Introduction (Ministry of Environment and Tourism Mongolia)

- In September, registration of Mongolia's first ever JCM Project was approved and

credit was issued. Following on for this, the methodology for two solar power generation factories was approved and work is in progress on constructing these facilities.

- My hope is that this workshop will help improve understanding of JCM and lead to the formation of new projects to follow on from these.

2) Summary of JCM Project and Study through City to City Cooperation (OECC)
   - Sequence of events leading to the staging of this workshop
   - Overview of JCM and projects to fund facilities
   - Overview of City to City Collaboration Surveys
3) Current Development of JCM in Mongolia by Nature Conservation Fund, Mongolia (MET／Nature Conservation Fund)
   - Overview of JCM and an introduction to the survey proposals for Mongolia
   - Overview of MRV and third party organizations (in Mongolia, NREC is registered as a local organization)
4) Issues with curbing Greenhouse Gases in Ulaanbaatar and Countermeasures (APRD)
   - Examples of measures that have been introduced to curb greenhouse gases in Ulaanbaatar
   - Case studies of renewable energy (solar power, wind power, hydropower, earth thermal power, solar heat power) and issues
5) Energy Saving Projects in Sapporo City (Sapporo City)
   - Introduction to Sapporo City (population: approx. 1.9 million people, with a total area of 1/4 of Ulaanbaatar)
   - Transitions in annual emissions of greenhouse gases in Sapporo City (tendency to decline from 2006, but rising once more in the wake of the Great East Japan Earthquake (2011))
   - Initiatives to put in place energy saving measures
   - Assistance for the introduction of renewable energy and next generation automobiles
6) Demonstrating the Effects of Energy Saving through Cooperation with Businesses in Hokkaido (National University of Mongolia)
   - Introduction to thermal storage heater sold by Kita Denryoku Setsubi Koji
   - Explanation of the progress of experiments with solar water heaters
7) Closing remarks (Hokkaido Government (HIECC)))
   - Introduction to HIECC (explained by Mongolian word)
   - Comparison between the situation in Hokkaido 50 years ago and Ulaanbaatar
   - Environmental measures take time, but their effectiveness increases as steady steps

are taken to address the issues. We look forward to your ongoing cooperation in the future.

④ Questions and Answers

1) Is a change of fuel source from coal to gas really effective? (Mongolia Water Partnership)
   Efforts to address the problem of global air pollution are being made in a step by step manner. These efforts also change according to the economic circumstances of cities and other factors. In Mongolia, gas fuel is currently twice as expensive as electricity and four times as expensive as coal, but in order to improve the situation concerning air pollution, it will be necessary to make the change to gas over the long term. (Ministry of Environment and Tourism)
2) Will the city consider putting in place large solar power generation factories in the future, too? And how would you go about connecting small solar power generation factories to the system? (Department of Energy Regulations)
   We will continue to expand the number of large factories into the future as long as budget allow. Solar power is subject to large fluctuations, so we would deal with the second issue through standardization. (Department for the Reduction of Air Pollution)
3) What is the cost of thermal storage heaters?
   A 2kW costs in the region of 120,000 yen, so they are not cheap. But I think the cost will come down in the future with mass production. (National University of Mongolia)
4) Will it be possible to manufacture thermal storage heaters in Mongolia?
   They are not high tech products, so it would be possible in the long term. In Japan, there is not much difference between electricity during the day and night, so there is very little need for heaters. It would be possible if each of the production lines could be moved to Mongolia. (National University of Mongolia
5) Is it possible to adjust or stop the heaters?
   It depends on the level of stored heat, but in principle there are in continuous operation. The heat capacity can be switched between high, medium and low. (National University of Mongolia)

(Reference) Workshop in progress

(3) Results and problems

① Results

- This workshop created new business chances through direct contact with people from the Ministry of Environment and Tourism and organizations from Ulaanbaatar, with whom we had had no previous connections.
- In connection with the workshop, we were able to generate publicity of the JCM Project among newly appointed members of the government and businesses.

② Problems

- There are many organizations and business, also those who did not participate in the workshop, who wish to see projects take shape, and further work needs to be done in terms of promotion and disseminating information.
- In order for projects to take shape, the participation of organizations and business from Japan, especially Hokkaido, is desirable. At the Sapporo workshop, businesses from Hokkaido will give an introduction to their initiatives.

(4) Discussions and consultations related to the workshop

① Discussions with the Deputy Mayor in charge of the environment (October 27)

Following the workshop, Ulaanbaatar City Department for the Reduction of Air Pollution arranged for us to meet with the Deputy Mayor, who is in charge of the environment, with whom we held an exchange of opinions. Also present during these discussions was the Director of Ulaanbaatar City Department for the Reduction of Air Pollution and the Director of the Department for the Natural Environment, as well as other experts connected with the environment.

1) Explanation from the Deputy Mayor

- The population of Ulaanbaatar City is 1.3 million people, 1.7 million people when including those who commute from the suburbs.
- Half of the households in Ulaanbaatar (190,000 households) live in ger districts. Improvements to the living environments of people in ger districts is a pressing issue.
- 2016 was an election year, and there were many changeovers among government and city assembly members. Over the next 4 years, different policies will be pursued than before.
- Mongolia is currently suffering from economic stagnation, but I believe environmental policies are vital, and therefore ask for your cooperation in making sure projects take shape.

2) Explanation from OEC

- Since 2013, OECC has been engaging in fully fledged initiatives aimed at improving the environment in Mongolia, especially turning proposals for measures to curb greenhouse gases into reality.
- Various initiatives are taking shape through JCM's project to fund facilities, with 3 projects having gotten off the ground in Mongolia from last year to this year with the involvement of OECC.
- This year has seen the establishment of projects through City to City Collaboration between Hokkaido and Sapporo, one of which is a thermal storage warm air heater that utilizes nighttime electricity. This is the result of a collaboration between businesses in Hokkaido and the National University of Mongolia, and we would like to see plans put in place to introduce this system in the next fiscal year.
- Concerning a separate survey, we would be grateful if you would consider gas fired heaters from manufacturers who are working to make improvements to HOB as a substitute for HOB.

3) Answers from the Deputy Mayor

- We are set to negotiate budgets for environmental measures at the city assembly. As part of these negotiations, we have included the proposals from OECC.

- The plan contains several options, so I would like to see dialog continue with the Department for the Reduction of Air Pollution concerning the adoption of the proposals from OECC.

Meeting with Deputy mayer

② Meeting with Ulaanbaatar City Department for the Natural Environment

We received a request for a meeting regarding the JCM Project from the Director of the Department for the Natural Environment, who was in attendance at the meeting with the Deputy Mayor. On the day after the workshop, we met with the Head of the Natural Environment Resources Division in place of the Director to exchange opinions.

1) Explanation from the Head of the Division

Following a personal introduction from the Head of the Division and an explanation of the Natural Environment Resources Division, we were provided with an account of the problems and challenges facing the city in the field of the environment.

a) Problem of lack of infrastructure development (wells, sewage systems etc.) in holiday home areas in the suburbs (areas in which companies created vacation facilities for workers during the country's period of socialism) and ger districts.

b) Under the system of grid connection power purchasing inscribed in the country's Renewable Energy Law, renewable energy is limited to the 3 fields of solar power, wind power and hydropower. Therefore, the use of renewable energy through geothermal power and heat supply is not included within the scope of this law. Also, grid connection requires a high voltage of 35kV and had not been extended to 350V for the distribution system, meaning that there is no incentive for grid connection from solar panels installed on the roofs of houses in urban areas.

c) Power distribution systems are becoming increasingly outdated. As such, the problem of grid instability will occur if thermal storage heaters are running simultaneously.

d) There are predicted to be water shortages by 2050. Underground water is being pumped up from wells close to the eastern section of the city. Water volumes are being further secured by moving pumps to inland regions. One of the reasons why work has yet to begin on CHP-5 is this issue of securing water and problems with wells.

e) Water resources – food – excretion – decomposition – soil… Natural cycles such as these have been severed, and this has led to problems with soil contamination in ger areas. The Department for the Natural Environment is receiving support from the U.S. Million Development Fund for projects to combat soil contamination.

2) Opinion exchange

- Explanation of JCM City to City Collaboration (OECC)
- Explanation of Sapporo's sewage treatment system (Sapporo City)

  The city's sewage system is 99.8% complete. There are 10 sewage treatment factories, covering 930,000 households. This means an average of 1 sewage treatment factory per 100,000 households. Sapporo's total area is 1,120m2, and has a rate of conversion of toilets to flush toilets of 99.9%.
- Regarding issues with sewage treatment (Department for the Natural Environment)

  There are two distinct problems with sewage treatment in Ulaanbaatar: first, the improvement of facilities and measures to make them more energy efficient, and second, the construction of sewage treatment systems in ger areas etc. in the suburbs.
- Example proposal for a waste water treatment system (OECC)

  At OECC, we investigated a case in Erdenet for curbing greenhouse gases by cutting the amount of power needed to draw water from wells through the installation of a waste water treatment system.

3) Possibilities for JCM projects

a) Waste water treatment system

- Condominium developments are gaining pace in the airport area and I believe they are not connected to the existing sewage treatment system, so would it be possible to consider standalone sewage treatment systems like these for JCM?
- Plans for the city's sewage treatment systems are investigated by the Department for the Natural Environment.

b) Measurement to automobile exhaust gas

- Exhaust gas from automobiles is another factor behind the city's air pollution.

While automobile inspections are carried out on an annual basis, testing and measurements for exhaust gas are not in place. I feel that there is a need to construct testing centers for automobile inspections and to establish proper methods for measuring exhaust gas.

- In the past, OECC investigated the possibility of a JCM project to introduce electric automobiles.

c) REDD+

- The Department for the Natural Environment has plans to factory 4,000 ha of greenery along rivers within the city.
- While greening plans are handled by a different department, I would like you to consider the application of REDD+.

(Concerning this matter, we have received a reply stating that they would like us to consult with the person in charge at the Ministry of Environment and Tourism.)

d) Treatment of waste disposal

- All refuse in Ulaanbaatar goes to landfill. There are two landfill sites, one located in the northeast of the city and the other the southeast. 80% of the daily refuse amount from 4 districts in the city goes the one on the northeastern side.
- It seems that plans are in place to turn refuse sent to the northeastern landfill site into biomass.
- While there has been a JCM project for power generation in refuse incinerators in Myanmar, in Mongolia's case, consideration needs to be given as to whether it would be profitable in terms of scale.

③ Meeting with the Mayor of Ulaanbaatar

The president of an influential company in Mongolia arranged for us to meet with the Mayor of Ulaanbaatar. The following is a summary of this meeting.

1) Explanation from the company president

- I have heard that there are plans in place to construct a subway system in central Ulaanbaatar.
- The costs for constructing a subway system are high and the construction period is long. Compared with this, trams cost a lot less and take less time to construct.
- Last month, I met with representatives from Hokkaido (HIECC) in Sapporo and found out that they would be visiting Ulaanbaatar with representatives from Sapporo City, which is why I arranged a meeting and requested an explanation be given to the Mayor.

- If the Mayor is interested in the construction of a tram system, I would like him to write a letter to Sapporo City requesting cooperation.

2) Explanation of the status of Sapporo's tram system

- Hokkaido (HIECC) and Sapporo City gave an explanation on the total length of the existing tram system, along with details on such things as who it is run and maintained.

3) Reply from the Mayor

- I am quite interested in constructing a tram system. I think it is a very good idea.
- We will hold discussions with ADB on 10/31 concerning a construction project for a dedicated roadway for buses (BRT). If possible, I would like to have trams run along this BRT, but I would need to consult with ADB on this matter.
- Would it be possible to receive support in terms of an international yen loan etc. for laying down tram lines?
- I can send a request for support to Sapporo City, but where should I send it?

4) Reply from Sapporo City

- First of all, please send your request for cooperation to the office of the President of the World Winter Cities Association for Mayors.
- The members of our party on this visit are not in a position to provide an answer concerning this matter, and have yet to discuss it with the relevant parties in Sapporo City (International Department, Transport Department etc.).
- The sudden arrival of such a letter would probably create confusion among the relevant parties there. Therefore, those of us present today will explain this matter immediately upon our return, so please wait a little while before sending the letter.
- We at Sapporo City would like to do whatever we can to cooperate with you, and hope to discuss the details with Ulaanbaatar on a separate occasion.

5) Future action

- Ulaanbaatar and Sapporo City will discuss the possibility on introducing a tram system.
- We will ask Sapporo City to enquire with JICA etc. about the possibility of funding in the form of an international yen loan etc.
- Concerning the applicability of this matter under the JCM Project, it will be difficult to use it as an alternative proposal for fuel, given that diesel fuel for buses and the emission factor for Mongolia's electricity are reversing.
- Concerning Ulaanbaatar's urban plan, ALMEC VIP has been commissioned by the Ministry of Economy to carry out surveys, so we will exchange opinions on the possibility of introducing a tram system.


Meeting with the Mayor of Ulaanbaatar

2. Japan (Sapporo) Workshop

(1) Purpose of the workshop

In the course carrying out surveys in the current fiscal year, the following issues became apparent.

- An insufficient grasp of the environmental technologies for cold regions possessed by organizations in Hokkaido (businesses, research institutes etc.)
- Lack of promotional activities for the JCM Project aimed at organizations in Hokkaido
- Lack of PR concerning the environmental technologies desired by the Mongolian side

Taking into account the above, a workshop was held in Sapporo with the cooperation of municipalities to facilitate relationship building and direct dialog between organizations.

(2) Presentation

① Schedule

Date : January 20, 2017 (Fri.), 13:30 - 15:30
Venue : TKP Sapporo Business Center Conference Room, Sapporo City, Hokkaido
Attendees : Hokkaido Government, Sapporo City, HIECC, representatives from Ulaanbaatar City, businesses and organizations from Hokkaido

Please refer to the attachment for more details on the attendees.

② Program

Time	Session	Speaker
13 : 30	Opening session	HIECC
13 : 33	Overview of the JCM System and City to City Collaboration Surveys	OECC

14 : 30	Regarding the Possibility of Introducing Thermal storage Heaters in Mongolia through the JCM Project	Kita Denryoku Setsubi Kouji Co. Ltd.
14 : 50	Possibilities for the JCM Project through Technologies in Cold Regions	Hokude Sogo Sessei Corporation
15 : 10	Question and answer session	Presenter : HIECC
15 : 40	Closing of session	

③Overview of the session

a) Opening of session (Mr. Yoshimura, HIECC)
   - Mr. Delgerekh, Director of Ulaanbaatar City Department for the Reduction of Air Pollution, was originally scheduled to give a talk today, but unfortunately could not make it. He is not able to participate due to an urgent situation concerning air pollution in Ulaanbaatar.
   - Mr. Delgerekh has sent the materials he was due to use in his talk, so Mr. Nishimura of OECC will give an explanation in his place.
   - Mr. Bolortuya, Director of Ulaanbaatar Department for the Natural Environment, is taking part in today's workshop, and will kindly say a few words following the talk from OECC.

b) Overview of the JCM System and City to City Collaboration Surveys (Mr. Nishimura, OECC)

   Mr. Nishimura gave the following explanation.
   - Purpose of holding this workshop
   - Overview of JCM and projects to fund facilities
   - Overview of proposals underway through City to City Collaboration Studies
   - Explanatory materials from Ulaanbaatar City Department for the Reduction of Air Pollution (current situation concerning air pollution and countermeasures)

c) Remarks (Mr. Bolortuya, Ulaanbaatar Department for the Natural Environment)

d) Regarding the Possibility of Introducing Thermal storage Heaters in Mongolia through the JCM Project (Mr. Fushiki, Kita Denryoku Setsubi Kouji Co. Ltd.)

   Mr. Fushiki gave the following explanation.。
   - Company profile of Kita Denryoku Setsubi Kouji Co. Ltd.
   - Regarding the company's connections with Mongolia
   - What is a thermal storage heater?
   - Regarding the possibility of introducing thermal storage heaters in Mongolia

e) Possibilities for the JCM Project through Technologies in Cold Regions (Mr. Shinohara, Hokuden Sogo Sekkei Corporation)

   Mr. Shinohara gave the following explanation.

- Things which unite technologies in cold regions and the JCM Project
- Introduction to specific technologies in cold region

f) Question and answer session (Answerer: Mr. Yoshimura, HIECC)
- The content of this question and answer session is detailed in the following section.

g) Closing of session (Mr. Yoshimura, HIECC)

④Total question and answer

Are there any technologies under the JCM Project for areas outside cold regions? (Mr. Maeda, ELCOM))

The purpose behind this workshop was to introduce those technologies that are effective for cold regions. One example of a technology which is effective for other regions is the introduction of heat pumps to heating and cooling lines in drinks factories. (OECC)

a) What about the method of gasification power generation utilizing poultry manure? (Mr. Kagami, Setec)

To begin with, we aimed at a method of generating electricity which utilizes gas generated through methane fermentation, but with gave up on this for various reasons. At present, we are proposing binary power generation which utilizes the heat generated from the carbonization of poultry manure. (OECC)

b) Has Kita Denryoku Setsubi Kouji Co. Ltd. been able to gain inroads into Mongolia with its construction systems? (Mr. Ide, Sekisui Chemical Hokkaido Co., Ltd.)

Not yet. But if Mongolia's economy picks up in the future, there is the potential for us to participate there with construction companies. (Kita Denryoku Setsubi Kouji Co. Ltd.)

c) What advice would you give those who wish to turn candidate JCM proposals into reality?

To take solar power generation as an example, Japanese operators have already achieved success in terms of projects to fund facilities in Mongolia. When carrying out work, there are several items that operators need to get the green light for, such as authorization from the Mongolian government and electricity purchasing contracts, but overall things should proceed smoothly. Also, if a collaborative system between Mongolia and Japan can be established, there is the possibility of project applications at the beginning of the next fiscal year. (OECC)

(3) Results and problems

(Results)

- In this workshop, we were able to provide organizations and businesses in Hokkaido and explanation of the JCM Project and request them to consider the possibility of initiating projects.
- The participants actively fielded questions and seemed to be eager to engage with the project.

（Problems）

- Engaging in this project on an ongoing basis will result in success, something which municipalities also requested. We will put our utmost efforts into upcoming surveys.
- While Japan's tradition of technology is an important part of getting projects off the ground, some requested a more active stance in terms of interaction between people from both sides. In future surveys, we will consider the possibility of having people from Mongolia come to Japan for training and other purposes.

（Reference） Workshop in progress

(4) Discussions and consultations related to the workshop

In line with the workshop, a visit was made to the Central Energy Center of Hoku Netsu Corpration, which received an explanation of the project at an event held in Sapporo in October. Here, we received an explanation on the status of hot water supplies using biomass.

Attendees: Department of Environment and Lifestyle, Hokkaido Government, Hoku Netsu Corpration (3 people)
Ulaanbaatar City Department for the Natural Environment, HIECC, OECC

① Overview of the Central Energy Center

- Commences running as 1971 a facility for local heating in central Sapporo City.
- To begin with, its main source of heating was coal fired boilers. From 1986, it installed additional boilers fired by kerosene and natural gas, with today's heat supply coming mainly from these boilers.
- At one point, the coal fired boilers had biomass mixed in, but from 2009 the company started firing these boilers using biomass alone.

② Biomass boiler

- The boiler is a stoker type (moving bed combustion).
- The boiler is fired by wooden biomass, such as waste construction materials, timber from forest thinning and branches from when processing wooden materials.
- The amount of generated heat is 113GJ/h and the rate of consumption of biomass is 5t/h.
- Biomass creates a lot of moisture, so a natural gas boil has been put in place as a way of regulating heat volumes.
- The Central Energy Center supplies heat at 190 °C, which then cools down to 100 °C. This is determined by the diameter of the hot water piping and the amount of heat supplied.

(Questions)

- From where do you procure your biomass?

  We procure our biomass from a variety of sources, including construction companies, paper manufacturers and cement companies in the Sapporo City area. We supply combustion ash to cement companies at a cost.

・Is the biomass procurement enough?

  We procure around 40,000 tons of biomass on an annual basis. Every year, around 100,000 tons of construction waste is generated in the Sapporo City area. In addition, waste is also generated through timber from forest thinning, so at present we have plenty of biomass for our needs.

・Are you considering power generation using biomass?

  Our site is not very big and it would be difficult to expand our facilities to include power generation. Other reasons we are not considering moving in this direction include the presence of nearby houses and environmental measures.

（Reference） Workshop in progress

Biomass (consisting mainly of waste construction materials)

Boiler combustion section
(manufactured by Hitachi Zosen Corporation)

IV. Attend and presentation at Conference

1. JCM City to City Collaboration Seminar (Kita-Kyushu)

(1) Overview of the seminar

① Events in Sapporo

Around the time of the Kitakyushu seminar, a series of events and visits between cities were planned involving representatives from Ulaanbaatar. In addition to the events held by Hokkaido Government Office (Hokkaido International Exchange and Cooperation Center (HIECC)), the following presents an overview of the kinds of questions that were fielded on this occasion.

Date :	October 18, 2016 (Tue.), 13:00 – 15:00
Venue :	Hokkaido Government Office/ Hokkaido International Exchange and Cooperation Center (HIECC) 12th Floor Meeting Room
Attendees :	Ulaanbaatar Department for the Reduction of Air Pollution National University of Mongolia Department of Environment and Lifestyle, International Affairs Division Office of the Governor, Hokkaido Government (2 people) Sapporo City (2 people), HIECC (2 people), OECC

Program

Time	Topic and Presenter
13:15-13:25	Opening remarks (OECC), Introduction of attendees (HIECC)
13:25-14:00	Energy Saving Initiatives in Hokkaido Prefecture centering on Earth Thermal Heat Pumps Hokkaido Research Organization
14:00-14:20	Regarding District Heat Supplies in Central Sapporo City Hoku Netsu Corporation (2 people)
14:20-14:40	Q & A and discussion
14:40-14:45	Closing remarks (HIECC)

Speakers
(members of an industrial research institute and a heating supply company)

Q&A session in progress

1. Energy Saving Initiatives in Hokkaido Prefecture centering on Earth Thermal Heat Pumps

(1) Regarding heating systems utilizing horizontal reheating type underground thermal heat pumps

- Advantages and challenges of earth thermal heat pumps (short construction period but a temperature difference of around 10 °C)
- Overview of research (resin heat exchangers and laying them underground in shallow sections (1.5 – 2 m)
- Outline of resin palisaded earth thermal heat exchangers
- Heat collection experiments at trial homes

(2) Regarding hot water supply preheating systems in hot spring areas

- Background of research on utilizing the heat from hot springs (utilizing unused springs and waste hot water following use)
- Issues with conventional heat exchangers (metal and resin circular type)
- Outline of resin palisaded earth thermal heat exchangers
- Outline of hot water supply preheating systems at hot spring facilities and heat recovery experiments

(Questions)

- How much time is required to lay heat exchangers underground? → Work can be completed within a matter of hours when using heavy machinery.
- Are resin palisaded earth thermal heat exchangers only available through the company introduced during the talk?

  → I heard that they possess patents etc. for this equipment.

2. Regarding District Heat Supplies in Central Sapporo City

(1) District heat supplies in central Sapporo City

(A central energy sensor supplies heat at 190 °C and cools it down to 100 °C.)

(2) Initiatives utilizing cogeneration

(3) Utilization of unused energy etc. (Snow melt water (45 °C) is supplied in addition to hot and cold water.)

(4) Effects through the development of energy throughout the whole area

(5) Future initiatives in central Sapporo City (Increase the number of energy supply points.)

(Questions)

- Have you decided on the locations where you will increase the number of energy supply points?

→ So far, we have decided on 1 location. We will sound out other potential locations in cases where plans for major construction work are in place. This is because the heat supply factories cannot be easily installed unless the site has a space of 100,000 m2 or more.

- Will installation not be carried out under the supervision of the municipalities concerned? □ The way in which we go about this is for public corporations to request private corporations to explore the potential for installation at sites.

(Results)

- The Japanese company Sekisui Chemical Co. Ltd. has already successfully installed earth thermal heat pumps in Ulaanbaatar.
- With this project, there is the possibility that Hokkaido Research Organization and other public bodies will act as the representative operators on the Japanese side for subsidized work to put facilities in place.
- District heat supplies have been installed in central Ulaanbaatar and there is the potential to introduce further systems when expanding the number of heat supply districts in the future.

② Seminar in Kita-Kyushu

Following the events held in Sapporo, we travelled to Kitakyushu City and participated in a seminar held there. The schedule for the program was as follows.

Date :	October 20, 2016 (Thu.), 09:30 – 17:40
Venue :	Riga Royal Hotel Kokura “ORCHID” (Kokurakita Ward. Kita-Kyushu City)
Attendees :	International Cooperation Office, Ministry of the Environment

Representatives from Mongolia, Indonesia, Vietnam, Thailand, Myanmar, Cambodia and Malaysia
City to City Collaboration representatives from Japan (Kanagawa Prefecture, Yokohama City, Kawasaki City, Fukushima City etc.)
Institute for Global Environmental Strategies (IGES)
Kita-Kyushu Urban Center
Air Pollution Reducing Department of Ulaanbaatar City,
Hokkaido Government, OECC

Program

Time	Presentation Topic
09:30-09:35	Opening remarks　Mr. Mizutani, Ministry of the Environment
09:35-10:10	JCM City to City Collaboration Project and JCM Finance Support Scheme
10:10-10:50	Examples of proposals for JCM projects (Kitakyushu City, Yokohama City)
10:50-11:05	Coffee Break
11:05-11:45	Technology Selection and Budgeting in General Waste Disposal Kita-Kyushu International Techno-cooperative Association
11:45-12:30	Examples of Initiatives carried out by Overseas Municipalities participating in the Fiscal Year 2016 City to City Collaboration Project (Part 1) (Cambodia (2 titles), Indonesia, Malaysia)
12:30-13:30	Lunch
13:30-14:30	Examples of Initiatives carried out by Overseas Municipalities participating in the Fiscal Year 2016 City to City Collaboration Project (Part 2) (Mongolia, Myanmar (2 titles), Thailand, Vietnam)
14:30-15:40	Discussion 1 – "Current Status of Surveys and Issues in getting Projects off the Ground" (Hokkaido, Fukushima City, Kanagawa Prefecture and related parties)
15:40-16:00	Coffee Break
16:00-17:30	Discussion 2 – "Current Status of Surveys, Issues in getting Projects off the Ground and Proposals for Solutions" (Kawasaki City, Yokohama City, Kitakyushu City and related parties)
17:30	Closing remarks

(2) Presentation

Representatives from Ulaanbaatar Department for the Reduction of Air Pollution and the National University of Mongolia were invited as key players involved with the environment in Ulaanbaatar. The content of their talks in the "Examples of Initiatives carried out by Overseas Municipalities" segments is as follows.

"Current Status of Air Pollution in Ulaanbaatar" (Ulaanbaatar Department for the Reduction of Air Pollution)

- Causes of air pollution in Ulaanbaatar

- Monitoring of soot and dust
- Transitions in air pollution

Representatives from Hokkaido Government were invited as a Japanese municipality to give a talk along with OECCC on the "Current Status of Surveys and Issues in getting Projects off the Ground," the content of which is as follows.

"Regarding District Heat Supplies in Central Sapporo City"

- Background behind the surveys
- System under which the surveys were implements and targets of the surveys (3 sectors)
- Past case studies from Hokkaido and Sapporo City

There were no questions concerning Mongolia, given that this was the first instance of participation and that there are yet to be any examples of projects that have been put into practice.

(3) Results of the seminar and impression

(Results)

- This workshop facilitated the sharing of a wide range of information, including the status of municipal collaboration in other countries and examples of specific case studies, thus serving as a useful point of reference for dealing with future proposals.
- The municipalities participating in the workshop were able to exchange views on each municipality's systems for dealing with projects.

(Impression)

- The talks given by each country and municipality were extremely long and the content was wordy, which meant that the speakers spoke too quickly and it was difficult to pick up and understand everything.
- In the talks given by representatives from other countries, much of the content consisted of specific requests rather than expectations for the City to City Collaboration Project. We felt that it would be difficult for municipalities to meet these requests.
- Even in cases where projects had materialized, some were of the opinion that the overseas subsidiaries of Japanese companies would need to assume main control over projects.

2. JCM City to City Collaboration Seminar (Tokyo)

(1) Overview of the seminar

We participated along with representatives from Ulaanbaatar, Mongolia in a seminar

on surveys for City to City Collaboration held by the Ministry of the Environment in Shinbashi, Tokyo. For this session, there was a closed seminar in the morning and a public seminar in the afternoon. During the morning seminar, the participants were split into two groups and reported on the state of progress of the proposals for the current fiscal year. In the afternoon, a panel discussion was held among municipalities.

Date : January 23, 2017 (Mon.), 09:00 – 11:00, 14:00 – 17:00

Venue : TKP Shinbashi Conference Center (morning)
Iino Hall and Conference Center (afternoon)

Attendees : International Cooperation Office, Ministry of the Environment
Representatives from Mongolia, Indonesia, Vietnam, Thailand, Myanmar, Cambodia and Malaysia
City to City Collaboration representatives from Japan (Kanagawa Prefecture, Yokohama City, Kawasaki City, Fukushima City etc.)
Institute for Global Environmental Strategies (IGES)
Kita-Kyushu Urban Center
Air Pollution Reducing Department of Ulaanbaatar City,
Hokkaido Government, OECC

Program

Morning (closed seminar)

<table>
<tr><th>Time</th><th colspan="2">Topics</th></tr>
<tr><td>09:00-09:05</td><td colspan="2">Opening remarks from the organizers Mr. Mizutani, Director of the International Cooperation Office, Ministry of the Environment</td></tr>
<tr><td>09:05-09:10</td><td colspan="2">Move to venue (Group B moves to a separate room)</td></tr>
<tr><td rowspan="2">09:10-10:10</td><td colspan="2">Section 1: Reports on proposals</td></tr>
<tr><td>Group A
- Siem Reap City, Cambodia
- Bali Province, Indonesia
- Ayeyarwady Region, Myanmar
- Rayong Province, Thailand
- Phnom Penh Municipality, Cambodia
- Haiphong City, Vietnam
- Iskandar Development Area, Malaysia</td><td>Group B
- BatamCity, Indonesia
- Yangon City, Malaysia
- Bangkok City, Thailand
- Ulaanbaatar City, Mongolia</td></tr>
<tr><td>10:10-11:30</td><td colspan="2">Coffee Break</td></tr>
<tr><td>10:30-11:00</td><td colspan="2">Part 2: Overview of the Funding Support Scheme
(1) Projects to fund facilities
Mr. Bannai, Global Environment Centre Foundation
(2) JCM Japan Fund (JFJCM)
Mr. Teshima, Asian Development Bank
(3) Green Climate Fund (GCF)
Mr. Maruyama, Mitsubishi UFJ Morgan Stanley</td></tr>
</table>

Afternoon (open seminar)

14:00-14:10	Opening remarks from the organizers Mr. Kajiwara, Vice-Minister for Global Environmental Affairs, Ministry of the Environment
14:10-14:25	Promoting Low Carbon Initiatives in Asia's Cities that utilize City to City Collaboration (Ministry of the Environment Japan)
14:25-15:00	Introduction to the Funding Support Scheme to promote Low Carbon Initiatives in Asia's Cities and Case Studies (1) Projects to fund facilities (2) JCM Japan Fund (JFJCM) (3) Green Climate Fund (GCF)
14:25-15:50	Part 1 – "Introduction to Initiatives undertaken by Participating Cities in the City to City Collaboration Project (1) Bali Province, Indonesia (Tokyo Metropolis) (2) Rayong Province, Thailand (Yokohama City) (3) Ayeyarwady Region, Myanmar (Fukushima City) (4) Haiphong City, Vietnam
15:50-16:00	Coffee Break
16:00-17:20	Part 2 – "Panel Discussion" Japanese municipalities: Hokkaido Government/Sapporo City, Kawasaki City, Kanagawa Prefecture, Kitakyushu City Overseas municipalities: Ulaanbaatar City, Rayong Province
17:20	Closing remarks

(2) Presentation

Morning

The content of the explanations provided by OECC is as follows.

- Content of the most recent surveys (surveys and interviews)
- Proposals made under 3 sectors (renewable energy, energy saving and waste disposal)
- Status of the proposals and future initiatives

Afternoon

The participants in this afternoon session included Hokkaido Government and Sapporo City from among Japanese municipalities and Ulaanbaatar City's Bureau for the Natural Environment from among overseas municipalities. They discussed the following points during their talks.

- Status of Joint Crediting Mechanism (JCM) Formation Feasibility Investigation Work in municipal policies
- Matters that had become apparent upon reflection on the activities conducted as part of Joint Crediting Mechanism (JCM) Formation Feasibility Investigation Work for the current fiscal year

- The significance of City to City Collaboration, its merits for municipalities, and its issues and solutions

(3) Results of the seminar and impression

(Results)

During this workshop, we were able to hear about the following directly from the municipalities of the countries concerned, thus proving a useful point of reference for future proposals.

- Ways of thinking concerning support through City to City Collaboration
- Words of caution for when creating plans (not to set goals that are too high)
- Support organizations and activities for local private businesses

We were able to understand the status of initiatives for the JCM Project among the various municipalities.

(Impression)

This seminar consisted mainly of introductions to specific cases and the majority of presentations were conducted from the Japanese side. The content was relatively easy to understand, but the scripts for the talks were too long and had to be cut due to time constraints.

The presentation scripts contained too much content and it was difficult to get a total understanding to the content through a casual reading. In order to understand what was being said fully, it was necessary to reread the scripts later on.

We were able to sympathize with the opinions of Mr. Mizutani, Ministry of the Environment, in the following ways.

- The municipalities and other concerned parties are involved in this project from the standpoint of avoiding a repeat of the kind of environmental situation experienced by Japan 40 – 50 years ago.
- Improvements to the environment are not something which can be achieved easily in the short term. They require ongoing support


View of the morning session


View of the afternoon session

View of the panel discussion