2013

Feasibility Studies on Joint Crediting Mechanism Projects towards Environmentally Sustainable Cities in Asia

Project Report on

“Project for Leapfrog Development in Waste and Wastewater Sector”

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Contents

I. Executive Summary

Under 2013 Feasibility Studies on Joint Crediting Mechanism Projects towards Environmentally Sustainable Cities in Asia Project Report on “Project for Leapfrog Development in Waste and Wastewater Sector”, three investigations have done with Environmental department of North Sumatra province.

- Policy planning for low carbon development in the waste and wastewater treatment sector
- Finding of GHG mitigation projects
- Capacity development for North Sumatra province for JCM projects

After consideration of above investigation, “Johkasou project” was selected as most necessary mitigation project in the waste and wastewater sector in North Sumatra province. In this report, necessary action for Johkasou project in the next fiscal year has been compiled.

Also, in this fiscal year, to prepare for Johkasou supply, meeting with relevant organization has been conducted five times in Japan.

II. Report

1. Project Studied

(1) Projects that can be considered in cutting Indonesia's GHG emissions in waste disposal and wastewater treatment sectors

According to the "Indonesia Second National Communication under the United Nations Framework Convention on Climate Change," the primary source of GHG emissions in Indonesia's waste and wastewater sector is "the discharge of CH4 and N2O accompanying industrial wastewater treatment." This is followed by "the discharge of CH4 accompanying waste disposal" and "the discharge of CH4 and N2O accompanying domestic wastewater treatment." With regard to "the discharge of CH4 and N2O accompanying industrial wastewater treatment," there is extremely high uncertainty in the CH4 discharge coefficient.[1] In that sector, there is a need to refine the GHG calculation methods and GHG emissions coefficient prior to introducing concrete steps to reduce GHG. At present, "CH4 discharge accompanying waste disposal" and "CH4 and N2O discharge accompanying domestic wastewater treatment" are the areas that can be considered for reducing Indonesia's GHG emissions.

In this study, in terms of specifications, we examine not only projects to reduce GHG emissions in the waste and wastewater sector but also those to reduce energetic origin CO2 emissions in the waste and wastewater treatment sector and in the energy sector that are listed in the energy sector. Below are examples of measures for cutting energetic origin CO2 in the waste and wastewater sector.

[1] Result of Indonesia Office of Environment (KLH) greenhouse gas inventory unit hearing

Chart 1　Projects that can be considered for reducing energetic origin CO2 in Indonesia's waste and wastewater sectors

Ways to reduce energetic origin CO2 (suggested)	Concrete Proposals (Suggested)
Substitute fossil energy consumption with biogas	Bio-gasification of organic waste
	Recover landfill gases at landfills
	Methane recovery in industrial wastewater treatment facilities
Substitute fossil energy consumption with use of waste oil and waste plastic as fuel	Introduce solid waste separation system, raise separation ratio
	Increase sophistication of waste oil and waste plastic recycling
	Incentivize use of fuel derived from waste material
Use of organic waste as fuel alternative to fossil energy consumption	Manufacture solid fuel using black water and sludge
	Manufacture solid fuel from coconut and palm residue
Incineration point energy recovery to reduce fossil energy consumption	Introduce energy recovery facilities (electrical generation, heat) at point of incineration
Alternatives to fossil energy consumption during waste collection and hauling	Introduce bio-gasoline and bio-diesel to vehicles used in collection and transportation
Reduce energy consumption during waste collection and hauling	Cut volume of waste generated (Point of Origin Measures, Improved Recycling)
	Improve efficiency of waste collection and hauling
	Use fuel efficient vehicles for waste collection and hauling
Cut energy consumption with distributed wastewater treatment facilities	Introduce low-carbon Johkasou

(2) Selection of project to examine in this study

Treatment of domestic wastewater in Indonesia mostly utilizes septic tanks, but these have low water purification capability, with effluent density at around 100mgBOD/L. In addition, maintenance such as sludge extraction is rarely done, meaning that systems often do not operate at their full purification capability. This has become a problem in water conservation. Also, the pollution load from domestic wastewater is influenced less by black water than by grey water, which septic tanks do not treat, and this also is an issue for water conservation.

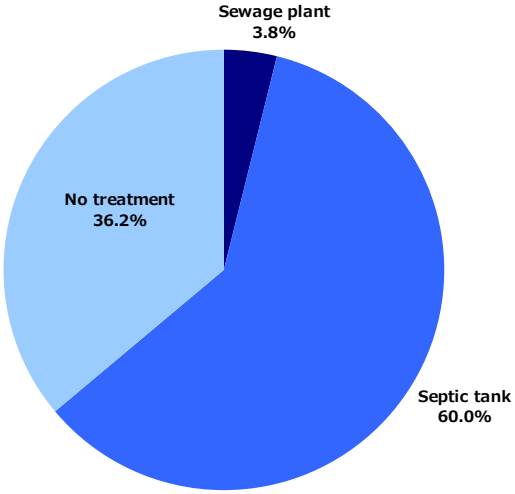

Figure 1　Example of domestic wastewater treatment in Medan City
(2011. Source: Government of North Sumatra, Environment Bureau)

Meanwhile, Japan's combined treatment Johkasou have excellent water quality purification capability (less than 20mgBOD/L), and they treat both black water and grey water, making them effective in water conservation. In addition, they are able to reduce CH4 emissions to levels far below those of septic tanks (about 75 percent reduction in terms of compared CH4 emission coefficients), so they are effective not only for water conservation but also as means of GHG reduction. Also, Japan in recent years has begun to see the increasing popularity of low-carbon Johkasou that cut energetic origin CO2 by about half, and there is growing expectation that these will prove effective in GHG reduction.

On the basis of the above, and as result of our discussions with the Government of North Sumatra Environment Bureau as our counterpart organization, we selected the "Johkasou Introduction Project" as the project to be examined by this study.

Chart 2　Summary of **Johkasou Introduction Project** Examined in this Study

Project Summary	Project Content
Replace septic tanks with Johkasou	Replace septic tanks (family use) currently installed in individual residences with Johkasou.
Place Johkasou in residences with currently no tanks	Newly install Johkasou (family use) in individual residences where domestic wastewater is currently untreated.
Septic system maintenance	Maintain and manage Johkasou

Over a period of more than 40 years, Japan's Johkasou have developed from single treatment Johkasou that treated only black water to combined treatment Johkasou that treat both black water and grey water and finally to advanced treatment type Johkasou, with a higher wastewater treatment capacity, and low-carbon Johkasou effective in reducing CO2 emissions. By introducing low-carbon Johkasou to Indonesia, it will be possible to contribute to this country's leapfrog development.

（３） Summary of Japan’s Technology and Systems Used in This Study

In this study, we will be importing Japan’s low carbon Johkasou

Chart 3　Main Differences between Indonesia’s Septic Tanks and Japan’s Johkasou

Septic tank (Indonesia)	***Johkasou* (Japan)**
■ Treat only black water. ■ (mainly) bottomless and causes underground water contamination. ■ BOD in Effluent is around (or over) 100 mg/L. No regulation for Nitrogen. ■ No disinfection. ■ Annual CH_4 emission factor is around 7.1 $kgCH_4$/population. (this data will be updated)	■ Treat both gray water and black waster. ■ Tank with bottom. ■ BOD in effluent is less than 20 mg/L. ■ TN in effluent is less than 20mg/L. ■ Disinfection by chlorine. ■ Annual CH_4 emission factor is around 1.8 $kgCH_4$/population. (this data will be updated)

2. Method of Study

(1) Content of Study

In this study, the following matters were studied so as to realize the Johkasou Introduction Project (hereafter “the project”).

Chart 4　Content of Study in This Study

Summary	Detail
Understanding this project’s GHG reduction effects	Trial calculation of this project’s effect on GHG reduction in terms of energetic origin CO2 and other GHG
Identifying a Johkasou system appropriate for Sumatra	Considering an Indonesian Johkasou system modeled after the design used in Japan’s cities, towns and villages.

(2) Study Regime (Indonesia)

In performing this study, we worked with the North Sumatra Environment Bureau as our counterpart organization to consider concrete methods for the study, data collection and the calculation of GHG emissions reduction. In Indonesia, domestic wastewater in homes is managed by the local province or city (Kapupaten / Kota). So as to make the feasibility study more specific, we obtained the cooperation of Kota Tebing Tinggi, which had a particularly low ratio of domestic wastewater being treated among North Sumatra’s 33 Kabupaten / Kota and established this city as a pilot site.

(3) Study Regime (Japan)

In performing this study, a committee (or study group) was initiated with participants from a the trade organization Johkasou Systems Association, the six principal Johkasou manufacturers and scholars from the National Institute for Environmental Studies and the Ibaraki City Pharmaceutical Inspection Center. The purpose of the committee was to examine how Johkasou could be supplied to Indonesia, the various systems related to introducing Johkasou into Indonesia and the possibilities for localizing Johkasou in line with Indonesia’s special characteristics. The committee met five times during the fiscal year with a goal toward trial implementation of the introduction of Johkasou into Indonesia in 2014 and full-fledged implementation in Indonesia beginning in 2015.

(4) Study Schedule

Studies were carried out in North Sumatra, Indonesia, and in Japan according to the following schedule.

Chart 5 Project Schedule (North Sumatra and Japan)

	North Sumatra, Indonesia		Japan	
	Meetings on Site	Workshops, etc.	Study Group	Topics Discussed
July	Visited North Sumatra Environment Bureau			
August	(Ramadan)		Study group initiated with Johkasou trade association, six principal manufacturers, scholars, MURC	
September	-Met with North Sumatra Environment Bureau -Courtesy visit to Kota Tebing Tinggi		1st study group	-JCM system overview -Example of Johkasou Project in Indonesia -Goals for the year
October	-Met with North Sumatra Environment Bureau -Met with Kota Tebing Tinggi	-First workshop -JICA emissions coefficients study	2nd study group (attended by Environment Ministry, Director of North Sumatra Environment Bureau)	-Overview of North Sumatra, expectations for Johkasou project -Methods to reduce GHG emissions -Project support structure
November	-Met with North Sumatra Environment Bureau -Met with Kota Tebing Tinggi		3rd study group Director of North Sumatra Environment Bureau visits Japan (Johkasou-related workshop)	-Methods to reduce GHG emissions -Providing Johkasou at low cost -Maintenance regime to be introduced into North Sumatra

December	-Met with North Sumatra Environment Bureau			
January	-Met with North Sumatra Environment Bureau -Met with Kota Tebing Tinggi	JICA inventory study	4th Study Group	-Maintenance regime to be introduced into North Sumatra -Providing Johkasou at low cost -Preparing for next feasibility study
February		2nd Workshop DNPI Report Meeting	5th study group	Prepare report

3. Study Results

(1) GHG Emission Reduction Effect

(a) Scenarios Set for This Project

In this project, scenarios were set as follows with the primary purpose being to create credits for the reduction of energetic origin CO2.

Baseline Scenario 1

- Assume the use of septic tanks as is presently the case

Baseline Scenario 2

- Baseline Scenario 2 assumes that the new installation of current model septic tanks are effectively prohibited by the North Sumatra government setting additional standards for BOD discharge and new regulations on ammonia and total nitrogen and that Johkasou complying with the discharge standards will be introduced (limited to those with verified wastewater treatment capability).

Project Scenario

- The Project Scenario assumes that, in addition to the conditions in Baseline Scenario 2, low carbon Johkasou are introduced, with funds provided by Japan, for the purpose of reducing energetic origin CO2.

Chart 6 Scenarios Set for This Project

Scenario	Homes with septic tanks	Homes without septic tanks
Baseline Scenario 1 (Current Case)	Continue to use existing septic tank	Install septic tank
Baseline Scenario 2 (New Regulations by State Gov.)	Replace existing septic tank with conventional model Johkasou sold in Indonesia.	Install Johkasou (conventional model currently sold in Indonesia)
Project Scenario	Replace existing septic tank with low carbon Johkasou effective in reducing energetic origin CO2	Install low carbon Johkasou effective in reducing energetic origin CO2

JCM credit will be supplied for the energetic origin CO2 reduction effects between Baseline Scenario 2 and to Project Scenario. As for the CH4 reduction effects when going from Baseline Scenario 1 to Project Scenario, there appear to be two options. The first is to make them subject to JCM credit and the second is to include them in the State

government's GHG reduction effects. As it is difficult to make a decision on this at the current time, we will wait until a decision can be made on the basis of how CM methodology is developed and on discussions with relevant persons in the two countries.

(b) GHG emission volume by scenario

GHG emission volumes by emission source and gas type are indicated below for each scenario

Chart 7 GHG emission volumes for each scenario by origin and gas type
(Emission volume per 10 persons: tCO2/year)

Origin	GHG	Septic Tank (Baseline Scenario 1)	Combined Treatment Johkasou (Baseline Scenario 2)	Low Carbon Johkasou (Baseline Scenario 3)
Black water	CH4	0.69	0.46	0.46
	N2O	0.02	0.14	0.14
Grey water	CH4	1.10	--	--
	N2O	0.08	--	--
Electricity	CO2	--	0.60	0.30
Total	--	1.9	1.2	0.9

(c) GHG Reduction effect (CO2reduction effect)

The energetic origin CO2 reduction volume subject to JCM credit (moving from Baseline Scenario 2 to Project Scenario) will be 0.3tCO2/year per 10 persons. Also, in the case that Johkasou are deployed on a large scale in North Sumatra (meaning they are used by 10% of the 13 million populations), the volume of energetic CO2 reduction will be 39,000 tCO2/year. If large scale Johkasou deployment is achieved throughout Indonesia (50% of the 240 million population), the CO2 reduction will become 3,450,000 tCO2/year.

The reduction of CH4 through this project (going from Baseline Scenario 1 to Project Scenario) will be 0.7tCO2/year per 10 persons (reduction effect obtained by subtracting the increased emission of 0.6tCO2/year from CH4 reduction effect of 1.3tCO2/year). In the case where Johkasou are deployed on a large scale in North Sumatra (as above), the CH4 reduction effect will be 91,000 tCO2/year. If large-scale deployed of Johkasou through Indonesia (as above) is achieved, the CH4 reduction effect will be 8,050,000 tCO2/year.

(2) Co-Benefit Effects other than GHG Reduction

Co-Benefit Effects of this project are indicated below

Chart 8 Co-Benefit Effects other than GHG Reduction

Effects from this project other than GHG Reduction		Co-Benefit Effects
Improve water quality of sewage from homes[2]	Reduced BOD load volume	Water (rivers, wetlands, oceans) conservation
	Reduced TN load volume	Water (rivers, wetlands, oceans) conservation, Means of Eutrophication
Treatment of grey water		Water (rivers, wetlands, oceans) conservation, Means of Eutrophication
Chlorine disinfection of wastewater		Reduce ground water and water pollution from pathogens
Prevent underground seepage of wastewater		Reduction ground water pollution
Johkasou system maintenance	Prevent inferior products through design and production standards	Water (rivers, wetlands, oceans) conservation
	Prevent shoddy construction through construction standards	Water (rivers, wetlands, oceans) conservation
Improved wastewater treatment ration through introduction of Johkasou into homes where wastewater is currently untreated.		Water conservation

(3) Overall Project Cost

In this project, Johkasou will be introduced year by year. The Johkasou localization verification test scheduled for next fiscal year (see 4 Points to Consider for Commercialization) will be used to develop a Johkasou suited to Indonesia's climate and culture. Also, local production of Johkasou will be pursued, so it is difficult to calculate the concrete integrated project costs at this point.

During the next fiscal year (fiscal 2014), as indicated in 4. Points to Consider for Commercialization, there will be (a) Analysis of reducing Johkasou installation and maintenance costs, (b) Analysis of the funding mechanism for introducing Johkasou, (c) Analysis concerning the establishment of a maintenance and management system for Johkasou and (d) Analysis on establishing the JCM methodology.

[2] In this study, we attempted a trial calculation of the reduction of BOD and TN load volumes resulting from the introduction of Johkasou and the reduction rate of BOD and TN load volumes in North Sumatra, but were unable to show concrete calculation results due to the inability to obtain material that would let us understand the effluent water quality from septic tanks and to the fact that the seepage rate from septic tanks into the ground is unknown. There is a need to conduct research to resolve this agenda item next year and quantifying the co-benefit effect.

(４) Cost versus Benefit (Overall project cost divided by reduced energetic origin CO2 volume) (when project is executed)

In the case that 1,000 Johkasou are installed with 0.3tCO2/year reduction effect on energetic origin CO2 per unit, the annual reduction of energetic origin CO2 will be 300tCO2/year. If the project period using JICA foreign investment and other funds is assumed to be 10 years, a total 10,000 low carbon Johkasou will be installed over this period, and the cumulative reduction of energetic origin CO2 will be 16,500tCO2/10 years.

4. Points to Consider for Commercialization

(1) Issues in Commercialization

Indonesia, which lags behind in the widespread use of sewers, has an urgent need to create a distributed domestic wastewater treatment system for the sake of water conservation. However, the septic tanks currently widely used in the country must be described as insufficient from the aspect of wastewater treatment capability and the maintenance and management system. Meanwhile, Japan's Johkasou possess sufficient wastewater treatment capability for water conservation. Also, Japan has established standards for the manufacture, installation, maintenance-management and testing of Johkasou, and this technology can be described as suited to Indonesia's needs in domestic wastewater treatment and water conservation.

Issues to examine in a future large scale deployment of Johkasou in Indonesia include (a) reducing the cost of Johkasou installation and maintenance-management, (b) analyzing the mechanism by which Johkasou can be introduced, (c) establishing a Johkasou maintenance-management system and (d) establishing the JCM methodology.

Chart 9 Issues in a Large-Scale Deployment of Johkasou in Indonesia

Issues	Contents
(a) Reducing Installation and Maintenance-Management Costs	The local price for septic tanks is between 20,000 and 200,000 yen, while Johkasou are several times as expensive. The gap needs to be narrowed.
(b) Introduction mechanism	A system whereby installation, management and collection of use fees are performed by the state government would be desirable, but ways need to be found for the state government to secure the necessary funds.
(c) Maintenance-management	Sludge extraction from septic tanks is almost never performed, and the infrastructure needed for sludge treatment is weak. A new system needs to be established for Johkasou maintenance-management.
(d) Establish JCM methodology	As was indicated in "4", there are differences of opinion regarding the JCM credits from this project. There is a need to establish a JCM methodology and improve the accuracy of forecasts on the amount of credits to be acquired.

(２) Policies on Analysis of Issues in Commercialization

During the next fiscal year, each of the issues listed above will need to be analyzed so as to move toward the commercialization of the Johkasou Introduction Project. The policies for the analysis of each issue are given below.

(a) Policy for analyzing reducing installation and maintenance-management costs

Compared to Japan, the water temperature in Indonesia is high (25 degrees C) with little fluctuation, it has a culture in which toilet paper is not used, and its effluent discharge standards are more relaxed. Based on this, technical analysis will be performed next fiscal year with the primary aim to localize the Johkasou so as to reduce installation and maintenance-management costs.

Specifically, some 20 verification Johkasou will be installed in Kota Tebing Tinggi, the pilot site, and analysis will be conducted on the simplification of the structure and functions and the prolongation of the maintenance period. Verification tests will require at least a half a year. Installation of the verification Johkasou should be completed around the end of August so that various types of data can be collected as we move toward the end of the fiscal year.

Together with this, the water quality and electrical consumption of these verification Johkasou will be monitored regularly so that the effect of improving wastewater water quality (co-benefit effect) and the GHG reduction effect can be verified more accurately. This will allow for the establishment of GHG reduction methods and the creation of JCM credits.

(b) Policy for analyzing mechanism to fund Johkasou introduction

Costs for the purchase, installation and maintenance-management of low carbon Johkasou are higher than for septic tanks, so there is little possibility for that a spontaneous effort within Indonesia will move forward with the introduction of low carbon Johkasou. For this reason, it will be desirable to have a systemization of the installation and maintenance-management of Johkasou by the state government, using Japan’s “Project to Establish Johkasou in Cities, Towns and Villages” as a reference point and looking upon the Johkasou as social infrastructure.

Specifically, a model will be set up whereby the state government shoulders the majority (or the entirety) of costs to have low carbon Johkasou installed and then collects set use fees from homes where installation has occurred so that installation costs are recovered over the long term. A portion of the budget needed for the installation and maintenance-management of Johkasou by the state government has been secured in the North Sumatra Budget Bureau’s budget, so analysis will be conducted based on the execution of these funds during 2014.

A large amount of funds will be needed for a future large scale deployment of low carbon Johkasou in Indonesia, so analysis needs to be performed on additional sources of funding other than the state government, such as subsidies from Japan, ODA, yen loans and

funding from other international organizations and private sources.

(c) Policy on Analysis of Johkasou Maintenance-Management System

Septic tanks are also supposed to be maintained and managed, but this is almost never done in reality. Similarly, it is difficult to expect users to perform the maintenance and management of low carbon Johkasou, both from the aspect of cost and practicality. As in “(b)” above, it will be essential for this project to establish a system whereby the state government carries out the maintenance and management of Johkasou.

A Johkasou maintenance-management system would require specifically the following: 1) design and manufacturing standards, 2) construction standards, 3) standards for maintenance inspections, 4) infrastructure for cleaning (including sludge extraction and treatment) and 5) a system of statutory inspections.

The 2014 North Sumatra Budget Bureau budget is being pursued in a direction where public corporations will be established to take charge of the maintenance and management of Johkasou under the state government. Analysis is moving forward in the direction that has the public corporations taking charge independently of the maintenance and management. Also, budgetary funding (though a small amount) has been secured in the 2014 North Sumatra Environment Bureau, which is the primary target. We will support the government in analyses related to these.

The direction for a concrete Johkasou maintenance-management system that we are proposing to North Sumatra, Indonesia, is as is discussed in Reference Material 3 “Direction for a Johkasou System than Can be Considered for Indonesia.”

(d) Policy on Analyzing Establishment of JCM Methodology

In the Johkasou Introduction Project, a baseline scenario is needed whereby the state government introduces new regulations requiring the introduction of treatment equipment with treatment capabilities higher than existing septic tanks. So support will be provided to the state government t in establishing there regulations.

Reduction methods suited to this baseline scenario and the project scenario will be established, and the volume of CO2 reduced by the Johkasou introduced for verification as in “(1)” above will be turned into credits.

(3) Preparations by the North Sumatra State Government for this project

The North Sumatra Environment Bureau is responsible for the treatment of domestic wastewater in the state and is working in connection with this project to plan for the introduction of Johkasou and to establish a system for their maintenance and management.

Concretely, a Johkasou Maintenance and Management Public Corporations are to be established under the state government. These corporations are scheduled to create the infrastructure needed for the maintenance and management of Johkasou using the budget of the Environment Bureau, establish new and tighter standards for wastewater treatment and various standards pertaining to the installation and maintenance-management of Johkasou and create manuals and other documents.

The state government has secured funding in the 2014 budget (we are told it is about 8 million yen), and a new section will be created within the Environment Bureau (we are told it will be an organization of about five people), and we can look forward to making progress during the next fiscal year in connection with this project.

In connection with the execution of this project during the next fiscal year, we have received the following opinions from the North Sumatra Environment Bureau.

Opinions of the State Environment Bureau on Related to the Execution of This Project

- We would like for both black and grey water to be treated in the Johkasou.
- If multiple homes share a single Johkasou, there is strong concern that users will quarrel over payment of electricity costs, so we would like for the norm to be one Johkasou for each house.
- In comparison with similar products from other countries, only the Japanese Johkasou has the function of sanitizing the effluent discharge, and we evaluate this point highly.
- Residential areas for high income families are equipped with drainage networks, including gutters, and so are suited for the introduction of Johkasou in the early stages.

(４) Ideas to Promote the Introduction of Technology from Japan

(a) The international superiority of Johkasou

Wastewater treatment equipment similar to Johkasou (FRP mold product with floor) are also manufactured and sold within Indonesia, but they are manufactured at a specification satisfying Indonesia's own effluent discharge standard (100mgBOD/L) and fall short of the treatment capability of Japan's combined treatment Johkasou (20mgBOD/L). In the current project, it is planned for the purpose of water conservation that additional standards will be placed on top of the current standards required by the North Sumatra state government (BOD, Nitrogen and others). The tighter the standards become, the more the advantages of Japan's Johkasou will be demonstrated.

Also, in the current project, there is a plan to establish a certification system for Johkasou, and the North Sumatra government plans to establish this system using Japan's certification system as a model. Japanese Johkasou products will have an advantage in that it will be easier for them to obtain certification.

(b) Strategies for large-scale deployment

1) Strategy to promote transitioning from Septic Tank to Johkasou

The reasons currently being given by the local government for transitioning from septic tanks to Johkasou are "excellent BOD, TN and ammonia removal capability," "treatment of grey water," and "sterilization of Escherichia coli and other bacterium". Reduction of green house gas emissions is seen as an ancillary merit. In pursuing the Johkasou Introduction Project, it will be important to keep in mind such needs and understandings in the local area.

Septic tanks also require regular maintenance and management, such as the extraction of sludge, but in reality this is almost never done. Johkasou require even more detailed maintenance and management than septic tanks, so it will be important to firmly establish a system of maintenance and management of Johkasou by the state government prior to the large-scale introduction of Johkasou and to develop the capacities of the relevant personnel. Such activities to support the state government will need to be performed within the feasibility study project.

1) Strategy for Japan's Johkasou to be given priority in introduction

In the current project, it is planned for the purpose of water conservation that additional standards will be placed on top of the current standards required by the North Sumatra state government (BOD, Nitrogen and others). The tighter the standards become, the more the advantages of Japanese Johkasou will be demonstrated.

Also, in the current project, there is a plan to establish a certification system for Johkasou, and the North Sumatra government plans to establish this system using Japan's certification system as a model. Japanese Johkasou products will have an advantage in that it will be

easier for them to obtain certification.

2） Strategy for the large scale deployment of Johkasou in North Sumatra

As mentioned above, the introduction of Johkasou by individuals would be extremely difficult because of the cost. We believe a desirable scheme will be to have Japan's ""Project to Establish Johkasou in Cities, Towns and Villages" be adopted as a model so that the state government carries out the introduction and maintenance-management and collects a set use fee from homes where Johkasou have been installed (use collection by the state government). In this case, a Johkasou installation fund will be created within the state government, and it will be necessary to establish funding for this fund through yen loans, JICA overseas investment funds or private sector funding schemes.

3） Strategy for large scale deployment of Johkasou throughout Indonesia

In a large scale deployment of Johkasou throughout Indonesia, it will be essential to connect with central government offices. It will be necessary to strengthen relationships not only with JCM-related offices but also with the Office of the Environment and the Office of Public Works.

In Indonesia, domestic wastewater treatment projects come under the state governments, and it is necessary to work with the Environment Bureau to establish maintenance-management systems aimed at the introduction of Johkasou. For this reason, it is necessary to contact the environment bureau in each state government in a step by step fashion. The current North Sumatra project will establish a "North Sumatra model," so we believe it will be desirable to plan the deployment to other states using this model as a prototype.