

I. Outline of the Project	
Country: Thailand	Project: Project for Improvement of Sewage Treatment Plants Management in Thailand
Sector: Sewage works	
Division in charge: JICA Thailand Office	
Cooperation scheme: Technical cooperation project	
Period of cooperation	(R/D): May 26, 2004 – November 25, 2007
	Cooperation amount: 261,351,000 yen (estimate by the end of the Project)
	Partner country's implementing organization: Wastewater Management Authority (WMA)
	Supporting organizations in Japan: Ministry of Land, Infrastructure, Transport and Tourism
Other related cooperation: Former project-type cooperation "Training Center for Sewage Works"	
1-1 Background to and outline of the cooperation	
<p>In Thailand, various environmental problems have occurred due to rapid economic growth and urbanization. To deal with the water pollution problem, the Ministry of Interior's Department of Public Works and Town & Country Planning and the then Ministry of Science, Technology and Environment (divided into the Ministry of Natural Resources and Environment (MONRE) and the Ministry of Science and Technology in 2002) have promoted the development of sewerage facilities throughout the country since the 1990s. Meanwhile, because there was a shortage of engineers who can operate and manage rapidly constructed sewerage facilities, JICA carried out a project called the "Training Center for Sewage Works" for five years between August 1995 and July 2000 to provide training to persons engaged in sewerage throughout the country. Although about 1,000 engineers received training under the project, many sewerage facilities did not operate normally, due to inadequacies in the design of sewerage treatment plants and the operation and management systems. In this situation, the "Project for Improvement of Sewage Treatment Plants Management in Thailand" (hereinafter referred to as the "Project") started, in order to improve the efficiency of sewerage treatment plants. The Project was scheduled to be carried out for three and a half years from May 2004. The Project began with the repair and improvement of the model sewerage treatment plants that had not fully displayed their functions. After that, the methods for operating and maintaining them were improved, and referential materials were prepared to be used in the training programs for relevant parties so that the knowledge gained during the processes could be utilized for other sewerage treatment plants. In addition, training has been provided to persons engaged in sewerage. In March 2006, recommendations were made concerning the project activities, including the mid-term evaluation team's "Strengthening of Cooperation with the Pollution Control Department (PCD) of the Ministry of Natural Resources and Environment." In response to the recommendations, efforts were made to carry out activities, including recommended ones, and as of this terminal evaluation it was judged that "The project goal is highly likely to be achieved at a certain level at the end of the Project."</p>	

1-2 Contents of the cooperation

(1) Final goal

Improvement of the quality of water in public waters

(2) Overall goal

Efficient and effective operation and maintenance of sewage treatment plants in Thailand

(3) Project goal

Establishment of an efficient and effective method to operate and maintain sewage treatment plants

(4) Outputs

- 1) Recovery of the functions of the model sewage treatment plants
- 2) Preparation of reference materials effective for the operation and maintenance of sewage treatment plants
- 3) Operation and maintenance of the model sewage treatment plants by skilled personnel
- 4) Construction of an information system to popularize the reference materials and collect information on the operation and maintenance of the sewage treatment plants

(5) Inputs

(Japanese side)

Number of long-term experts: 6 Provision of equipment: about 8,517,000 yen
 Number of short-term experts: 7 Project implementation budget: 261,351,000 yen
 Number of accepted training participants: 5

(Thai side)

Number of counterpart members: 27 Project-related budget: about 2,451,000 yen
 Provision of project offices and equipment (about 627,900 Thai bahts)

II. Outline of the evaluation team

Team members	Leader: Masazumi Ogawa, Deputy Resident Representative of JICA Thai Office Operation management of sewerage: Nobuyuki Horie, Deputy Director-General, East Japan Headquarters, Japan Sewage Works Agency Planning management of sewerage: Hiroko Kamata, JICA Senior Advisor Cooperation planning: Kazuya Maruo, Member of JICA Thai Office Evaluation supervision: Ms. Athaneeporn Boonrad, Program Officer of JICA Thai Office Evaluation analysis: Minoru Fujii, RECS International Inc (consultant)
Period of the evaluation: June 18 – July 20, 2007	Type of evaluation: Terminal evaluation

III. Outline of the evaluation results

3-1 Confirmation of the achievements

(1) Output 1: Recovery of the functions of the model sewage treatment plants

(Indicator) At the sewerage treatment plants, the unit cost of treatment decreases by 20%, the volume of treated sewage increases by 30%, and the drainage fulfills the water quality standards.

- The unit cost of treatment decreased by 34% at the Pathum Thani sewage treatment plant, but only by 10% at the Kamphaeng Phet sewage treatment plant. Because the Kamphaeng Phet plant has adopted the stabilization pond method and therefore has no machinery that consumes electricity for sewage treatment, cost reduction is limited in the field of the operation and maintenance of the plant. Because of this, at the time of the midterm evaluation, a recommendation was made to consider each element's effect of cost reduction, resulting in a 34% reduction in electricity use.
- Although the volume of treated sewage increased by 25% at the Pathum Thani plant, the volume decreased by 20% at the Kamphaeng Phet plant, compared with the standard volume. In this point, the average volume in the dry season was adopted as the standard volume according to the recommendation at the time of the midterm evaluation. However, the matters described below might have influenced confirmation of the indicator at the Kaphaeng Phet plant. In addition, because it is difficult to reach the target in the volume of treated sewage only by the improvement of operation and maintenance, with regard also to "technical suggestions about the whole sewage collection system in the model sewage treatment plants," which were additionally recommended at the time of the midterm evaluation, suggestions have been positively made concerning "acceptance of business drainage from hospitals, paper mills, etc." and others after the inclusion of local governments into the Joint Coordination Committee.
 - The standard volume might have been set higher because precipitation in the base year is high and therefore ground water entered sewage pipes in greater quantity than usual during the period of calculation of the standard volume.
 - The volume of treated sewage might have decreased due to a defect in the automatic screen that prevents foreign substances from flowing into the plant.
- The quality of drainage from the model sewerage treatment plants for 2007 fulfilled the standard.

(2) Output 2: Preparation of reference materials effective for the operation and maintenance of sewage treatment plants

(Indicator) Reference materials effective for the operation and maintenance of sewage treatment plants are prepared.

- With regard to the preparation of reference materials, WMA established a Reference Material Committee and, based on "strengthening of cooperation with PCD" recommended at the time of the midterm evaluation, actively exchanged useful opinions and suggestions with central government agencies, local governments' officers concerned, and academic experts, including the Japanese side, the Thai side's PCD, and the Ministry of Interior's Department of Local Administration (DOLA).
- Nine types of reference materials have been prepared as scheduled.

(3) Output 3: Operation and maintenance of the model sewage treatment plants by skilled personnel

(Indicator) Skilled personnel are engaged in the operation and maintenance of the model sewage treatment plants.

- Training began concerning the oxidation ditch method (OD method: the method adopted by the Pathum Thani sewage treatment plant) and the stabilization pond method (SP method: the method adopted by the Kamphaeng Phet sewage treatment plant), and “training in which those other than the personnel engaged in the model sewage treatment plants also participate,” one of the recommendations at the time of the midterm evaluation, has continued to be held. Many persons from the Thai side have participated in this training, and more than 70% of them satisfied the contents.
- In addition to these seminars, on-the-job training, drills, and timely follows-up have been provided to the Thai counterpart continuously.
- The personnel in charge of the model sewage treatment plants who participated in training thought that, after the training, they were able to reflect their reconfirmed expertise and expanded knowledge and the contents of the training in their work.

(4) Output 4: Construction of an information system to popularize the reference materials and collect information on the operation and maintenance of sewage treatment plants

(Indicator) Construction of an information system for the dissemination of the referential materials and the collection of operation and maintenance data

- At the time of the terminal evaluation, among the nine types of reference materials, three types have been available to the public on the website of WMA in English.
- By the end of the Project, the nine types of reference materials (in English and in Thai) will be available to the public on the website of WMA.
- The sewage treatment plants under the jurisdiction of WMA have submitted operation and maintenance data to WMA monthly in digital format. At present, WMA is preparing a format unified for the operation and maintenance data.
- By the end of the Project, compiled operation and maintenance data will be provided to the sewage treatment plants under the jurisdiction of WMA through the information system.

3-2 Summary of the evaluation results

(1) Relevance

As a result of the “amendment to the WMA Establishment Law” in 2005, the Thai side’s responsibility and power have been expanded as a public corporation that gives technical support to local governments concerning the operation and maintenance of sewage treatment plants. Meanwhile, with regard to the sewage treatment problem, Japan’s general framework of ODA states that health problems and human security against infectious diseases and others should be considered more closely and specifically. Judging from such consistency in the environmental improvement policies and the consistency with the overall goal, the validity of

the Project can be highly evaluated. In addition, given that the awareness of environmental conservation and protection has been conspicuously growing in Thailand, the provision of support to WMA, which has to foster plant operation and maintenance engineers for efficient and effective management of sewerage, seems to be very useful for developing sewerage in Thailand in the future.

(2) Effectiveness

According to the results of this evaluation, it can be thought that the Project is highly likely to achieve an indicator for the project goal, “reference materials are adopted concerning the operation of the sewage treatment plants under the jurisdiction of WMA,” by widely disseminating reference materials through the technical seminars scheduled to be held in September and October 2007, resulting in an improvement in the degree of achievement of the current project goal. In addition, with regard to another indicator, “drainage from the sewage treatment plants under the jurisdiction of WMA fulfills the water quality standard,” this indicator has been achieved at the time of the terminal evaluation.

In addition, it has been confirmed that the external conditions are effective. Based on PDM, it can be concluded that the project goal will be achieved at a certain level at the end of the Project.

(3) Efficiency

The results of examination of relevant materials and interviews with persons concerned were able to confirm that the inputs were generally made as initially planned.

The results of the questionnaire survey carried out on the Thai side during the period when the Japanese experts were dispatched were able to confirm that the Japanese experts’ timing and technical abilities were highly evaluated.

The Thai side also took the initiative in appropriate placement of counterpart members and smooth implementation of the Project.

(4) Impact

Under the sewerage rehabilitation master plan, a total of 46 treatment plants are scheduled to be rehabilitated by 2009. In addition, PCD has been establishing standards for the quality of water treated in underground sewage treatment plants. If the number of sewage treatment plants under the jurisdiction of WMA increases according to WMA’s “four-year action plan” in the future, the local governments will operate and maintain their sewage treatment plants appropriately, resulting in the fulfillment of the standards for the quality of treated water. As a result, it can be expected that the overall goal will be achieved. However, given the current status of achievement of external conditions, such as the collection of sewerage charges and the drainage collection system, it seems appropriate to judge that the degree of achievement of the overall goal is lower than an adequate level.

It is very difficult to judge how much time is needed to achieve the overall goal and the final goal. However, because local governments not under the jurisdiction of WMA have given technical advice concerning sewage treatment plants, it has been confirmed that activities for achieving these goals have already begun.

(5) Sustainability

The methods to operate and maintain sewage treatment plants efficiently and effectively were established under this Project. Given the following technical and financial facts, these methods

seems highly likely to take root autonomously in Thailand in the future (in addition, the scheduled dissemination activities of reference materials are to be reviewed periodically even after the end of the Project because they are very important):

- At the seminar on the promotion of WMA's activities held on June 7, 2007, the representatives of MONRE, DOLA, and the Ministry of Finance (MOF) stated that the government's relevant agencies will support WMA's "four-year action plan (2008-2011)."
- With regard to the rehabilitation of existing sewage treatment plants, their operation and maintenance, and the planning and design of new plants, 45 local governments submitted requests for technical advice and support to WMA.

However, to promote activities according to the "four-year action plan," it is essential for WMA to make efforts to resolve organizational issues, such as improvement of the efficiency of operations and an increase in the number of engineers.

3-3 Factors for the emergence of the effects

(1) Contents of the plan

During the preparation of reference materials, other relevant government agencies, such as PCD and DOLA, participated as members of the Reference Material Committee to exchange skills positively, resulting in strengthening of cooperation. This is useful also for widening their knowledge and field of vision and contributes to the achievement of the outputs.

(2) Implementation process

The counterpart side was eager about the Project. For example, it actively carried out activities, such as voluntary planning and proposal of technical workshops and the beginning of water quality measurement peculiar to the sewage treatment plants throughout Thailand. Its eagerness is a factor for smooth technical transfer and the achievement of the outputs.

3-4 Problems and factors that caused problems

(1) Problems related to the contents of the plan

None in particular

(2) Problems related to the implementation process

Because the management of the sewage collection systems in Thailand is under the jurisdiction of each local government, WMA cannot directly intervene. It was not assumed during planning that this would influence the indicators for the project outputs. Because of this, technical suggestions to local governments were improved based on the recommendations at the time of the midterm evaluation. However, Indicator 2 for Output 1 had a considerable negative effect.

3-5 Conclusion

It can be said that the overall evaluation of the Project as a whole is good, because of the following reasons:

- a) The functions of two model sewage treatment plants were recovered. Moreover, many

useful pieces of advice about operation and maintenance improved the efficiency of the model sewage treatment plants to the extent possible.

- b) Nine types of reference materials were prepared. The main contents of these materials are not textbook-like contents but practical know-how. In addition, such practical knowledge and skills were gained through the rehabilitation of sewage treatment plants and the provision of technical assistance to the counterpart.
- c) The ability of the counterpart itself improved as a result of the technical support that the counterpart cooperated to give to other sewage treatment plants under the jurisdiction of WMA. It is therefore predicted that this will make the project outputs expand widely all over Thailand.

3-6 Recommendations

1. Recommendations to be considered by the end of the Project

- a) Positive use of reference materials

It is recommended to disseminate technical knowledge on nine types of reference materials through WMA-sponsored technical seminars for persons engaged in sewage treatment plants under the jurisdiction of WMA. Moreover, regarding practical ideas, including cases where the installation of coarse screens and the introduction of timer control made it possible for a model sewage treatment plant to recover its function and operate efficiently, it is necessary to disseminate such ideas widely through seminars and other activities.

- b) Construction of an information system

WMA should construct an information system suitable for the actual situations of all the local governments. It is necessary to be able to choose a method to disseminate reference materials – delivering the data by CD or downloading them from the website of WMA. Moreover, the data on the operation and maintenance of the sewage treatment plants under the jurisdiction of WMA should be incorporated into WMA's server system so that outlines of data on each plant can be provided at any time.

At the time of this evaluation, three types of reference materials are available on WMA's website. It is necessary to make the remaining six types available on the website by the end of the Project.

2. Recommendations after the end of the Project

- a) Renewal of reference materials

New ideas accumulated through WMA's technical consulting activities and practical trouble shooting are very important to continue efficient and high-quality operation of a sewage treatment plant. Because of this, it is highly recommended that the Reference Material Committee, which consists of MONRE, PCD, DOLA, WMA, and other outside experts, should regularly renew the materials.

- b) Sustainable dissemination of technical knowledge by WMA

In the Project, technical seminars were held concerning the OD method and the SP method. From the viewpoint of sustainability, it is desirable to hold technical seminars with a wide range of contents and continue to create curriculums and textbooks.

Moreover, it is thought to be effective to disseminate practical technical knowledge through WMA's newsletters. These efforts seem to contribute to the sustainable development of WMA.

c) Human resources

To provide wide and effective support to local governments, WMA needs to improve the management of projects and hire a sufficient number of engineers in keeping with the number of sewage treatment plants WMA supports. Because of this, regarding the development of human resources, it is necessary to carry out continuous efforts in cooperation with other government agencies, such as Bangkok Metropolitan Administration (BMA), PCD, the Office of Natural Resources and Environmental Policy and Planning (ONEP) and the Department of Environmental Quality Promotion (DEQP) of the Ministry of Natural Resources and Environment, as well as DOLA.

d) Government measures

To carry out activities more efficiently and effectively, WMA should immediately establish government measures, such as the enactment of a sewerage law under the leadership of MONRE and the introduction of a sewage charge collection system.

e) Provision of financial support to local governments

Although the range of local governments' activities has been widening because of the decentralization policy, the central government's financial support is insufficient in reality. Because of this, in the near future, it is necessary to consider detailed conditions concerning environmental funds for support of local governments' activities and the use of other financial sources.

3-7 Lessons learned

a) Collection of baseline data

In the Project, standard values could not be fixed concerning the unit cost of a model sewage treatment plant before the project inputs and the indicator for the volume of treated water. Because of this, at the time of the terminal evaluation, it is not clear whether the initially established indicators are appropriate for the Project. To avoid such a problem, it is necessary to write down the views at that time in the ex-ante evaluation report in as much detail as possible.

b) Cooperation with other organizations

To make project activities more effective, WMA took the lead in carrying out joint operations with other relevant agencies, such as the Reference Material Committee, in which other relevant government offices participated. In this way, positive interaction with other agencies not only enables to evaluate reference materials from various angles but also seems useful for smoothly promoting WMA's "four-year action plan."

3-8 Status of follow-up

WMA has a policy to provide more support to local governments in the future. WMA should consider whether or not follow-up can be carried out one year after concerning the continuous efforts by the use of the reference materials and the information system created by the Project.