

Meta Analysis of Ex-Post Evaluation Reports
by Country and Sector

Sector Review Report

Water Supply / Sewerage /
Sanitation Sector

Final Report

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This sector review report (Water Supply / Sewerage / Sanitation Sector) was compiled and analyzed by Global Group 21 Japan at the request of Development Assistance Operations Evaluation Office, Project Development Department of the Japan Bank for International Cooperation (JBIC).

Forward

This analyses ex-post evaluation reports (henceforth, evaluation reports) for 33 water supply, sewerage and sanitation sector projects supported by the Japan Bank for International Cooperation (JBIC).

In order to improve the quality of aid projects in developing countries, JBIC has conducted ex-post evaluations of completed projects. Ex-post project evaluation is the assessment of how a project was implemented and administrated in contrast with initial plans, and whether the expected results were realized after completion of the project. The ex-post evaluations are conducted with two goals in mind. The first is to compile the lessons learned from the project evaluations, and use the lessons in the implementation of future projects. The second goal is to improve transparency of aid projects, and to increase the accountability for people both in Japan and the borrowing countries through disclosure of evaluation results.

The goal of this review is to create an overview of the performance of completed water supply, sewerage and sanitation sector projects using ex-post evaluation reports, to analyze the data to determine the cumulative effect of the Japanese ODA loan projects in the sector, and to derive possible lessons or recommendations for future yen loan projects. In addition, by reviewing and studying the evaluation indices, it is hoped that reference material for future appraisals, administration and evaluations will be provided. According to the classification system of the JBIC, the “water supply,” “sewage system,” and “sanitation” components are treated as a single sector.

This report consists of four chapters. The first chapter outlines all projects in the sector as well as the 33 water supply, sewerage and sanitation sector projects analyzed in this report. Chapter two establishes a framework for the analysis, and chapter three analyzes the performance of 33 projects based on the evaluation reports. Chapter four presents the comprehensive results of the analysis, and offers lessons learned and recommendations for future water supply, sewerage and sanitation sector projects.

The performance analysis is performed through the establishment and analysis of five primary criteria broken down into 23 evaluation check criteria.

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Attached Materials: Reviewed Projects

1. The Japanese ODA Loan Projects in the Water Supply / Sewerage / Sanitation Sector

1.1 Loan Conditions for the Water Supply / Sewerage / Sanitation Sector

By the end of the Japanese fiscal year 2000, the authorized loan amount for the water supply, sewerage and sanitation sector totaled ¥1,262.1 billion, making up 7.5% of all project loans.¹ The regional distribution for the authorized value of loans to the water supply, sewerage and sanitation sector is as follows: 61% in Asia, 23% in Latin and South America, 9% in the Middle East, and 7% in Africa. In comparison with other sectors, a lower percentage of loans were made to Asia, and a higher percentage of loans were made to Latin America, South America and the Middle East. The number of projects in each of the three sub-sectors was as follows: 141 water supply projects, 50 sewage system projects and 9 waste treatment projects (in each case, the projects are counted using the number of loan agreements).² Water supply projects made up 80% of the total number of projects.

Chart 1: Water Supply / Sewerage / Sanitation Sector Total Authorized Loan Amount and Sub-sector Distribution by Region

	Approved Loan Value		Number of Loan Agreements			
	In millions of yen	%	Water	Sewage	Sanitation	Total
South East Asia	345,147	27.3%	54	10	5	65
South Asia	157,23	12.5%	16	4	1	17
East Asia	261,788	20.7%	30	13	2	44
Middle East	111,665	8.8%	4	1	0	4
Africa	91,719	7.3%	17	5	0	20
Central and South America	287,069	22.7%	17	15	1	22
Others	7,446	0.6%	3	2	0	4
Total	1,262,071		141	50	9	176

Looking at the annual variations in the number of loan agreements to the water supply, sewerage and sanitation sector, there was a steady growth trend in the water supply and sewage system sub-sectors, while a relatively small number of loans were made for waste treatment projects.

¹ Including engineering service loans

² In the case of projects which included multiple water supply, sewerage system and waste treatment components, the components are counted separately, so the total is not equal to the total number of projects.

Chart 2: Variations in the Number of Loans Authorized by Sub-sector

Japanese fiscal year	Number of Loan Agreements			
	Water	Sewage	Sanitation	Total
Pre-1975	9	0	0	9
1976-1980	10	2	0	12
1981-1985	15	7	1	23
1986-1990	25	3	2	29
1991-1995	35	17	3	43
1996-2000	47	21	3	60
	141	50	9	176

The country receiving approval for the largest authorized loan amount for water supply, sewerage and sanitation sector projects was China, followed by Thailand, Turkey, India and Peru. Turkey, Mexico, Brazil and Malaysia are listed high in the ranking despite only having entered into two or three loan agreements. This is partially because of large-scale water and sewage projects, but it is also believed that there is a relation to the fact that these are developing countries, so loans could only be made in a limited number of environmental projects.

Chart3: Ranking of Authorized Loan Amount and Total Number of Projects by Country

	Approved Loan Value		Number of L/A
	In millions of yen	%	
China	176,404	14.0	27
Thailand	141,380	11.2	23
Turkey	94,783	7.5	2
India	90,778	7.2	6
Peru	86,121	6.8	7
Republic of Korea	85,384	6.8	17
Mexico	80,742	6.4	3
Brazil	63,056	5.0	3
Malaysia	59,319	4.7	3
Indonesia	59,276	4.7	11
Philippines	52,630	4.2	14
Vietnam	32,542	2.6	4
Sri Lanka	31,677	2.5	6
Other	207,979	16.5	50
Total	1,262,071		176

1.2 Overview of Reviewed Projects

This review focuses on 33 water supply, sewerage and sanitation sector yen loan projects (51 loan agreements) for which ex-post evaluations were completed by the year 2000. Information including the country, sector (subcategorized), date the loan agreement was entered, construction results, and the year of evaluation are included in the material appended to this

report.

Chart4: Sub-sector Distribution of Projects where Project Evaluations were Completed

Sub-sector	Number of Loan Agreements	Actual Loan Amount (in millions of yen)
Water	39	129,470
Sewage	10	53,573
Water and Sewage	1	2,512
Sanitation	1	2,796
Total	51	188,351

The projects were implemented since the 1970's, primarily in Asian countries. The total actual loan amount for these projects was ¥188.4 billion, with the following regional distribution: ¥154.6 billion (82%) was loaned in Asia, ¥13.5 billion (7%) was loaned in Latin and South America, ¥13 billion (7%) was loaned in the Middle East, and ¥7.1 billion (4%) was loaned in Africa. There were a total of 12 borrowing nations, with over 70% of executed loan value being loaned to four countries. The largest borrowing nation was Republic of Korea, with 13 loan agreements totaling ¥47 billion (25%), followed by Thailand, with 11 loan agreements totaling ¥37.5 billion (20%), China, with 6 loan agreements totaling ¥36.1 billion, and Indonesia, with eight loan agreements totaling ¥20 billion (11%) (Chart 5).

Chart 5: Number of Reviewed Projects and Actual Loan Amount by Country

Country	Number of Projects	Total Cost (in millions of yen)
Republic of Korea	13	46,978
Thailand	11	37,484
China	6	36,091
Indonesia	8	20,015
Philippines	5	9,843
Pakistan	1	4,195
Yemen	1	3,844
Egypt	2	9,195
Ethiopia	1	2,155
Kenya	1	4,979
Mexico	1	13,482
Papua New Guinea	1	90
Total	51	188,351

The majority of the loans analyzed in this report were implemented during the 1980's, and two-thirds of all 1980's water supply, sewerage and sanitation sector projects are included herein. Two-thirds of all water supply projects and 80% of all sewage system projects which were completed before Japanese fiscal year 1990 have already been evaluated.

1.3 Types of Reviewed Projects and their Characteristics

The content of water supply, sewerage and sanitation sector projects included the following differences: 1) differences in sub-sector (water supply, sewage system, waste treatment), 2) differences in water supply projects (new construction, construction and improvement, repair), 3) differences in components in water supply projects (water intake/purification, water conveyance, water distribution), 4) differences in area for water supply projects (major metropolises, cities, rural villages). The characteristics of these differences are as follows:

(1) Differences in sub-sector

Broken down by sub-sector, water supply projects were the most common, with nearly 90% of projects involving the development of water supply, followed by sewage system development projects and projects for the development of waste treatment systems (Chart 6). Broken down by region, water supply projects were implemented in 55 cities and areas, sewage system projects were implemented in 11 cities, and one waste treatment project was conducted in 1 city.

Chart6: Number of Reviewed Projects by Sub-sector

Sub-sector	Number of Projects
Water Supply	29
Sewerage System	4
Waste Treatment	1

Note: A project including both water supply and sewage system components was included in both categories.
In the Sewerage System category, the construction of 11 sewage facilities in 9 cities in Korea was counted as a single project.

In developing countries, demands upon each sub-sector were not being met, and the basic goal for all water supply, sewerage and sanitation sector projects was to meet demand through the increase of water supply capacity, water supply diffusion ratios, and water supply coverage. Water supply is a basic human need which is vital to life. In cities where pumping of underground water was causing the ground to subside, project goals were to regulate the use of ground water and prevent ground subsidence through expansion of aboveground water supply such as rivers.

Sewerage system projects analyzed in this report were implemented in China, Republic of Korea and Mexico, and the lone waste treatment project was implemented in Republic of Korea. Sewerage system projects targeted the decrease of pollution including water pollution and improvement of living conditions through the construction of sewage processing facilities.

The waste treatment project targeted the reduction of waste volume through the construction of a waste incineration facility and a final processing facility.

(2) Differences in water supply project type (new construction, construction and improvement, repair)

Of the 29 water supply projects analyzed in this report, 28 projects included new construction or extensions of existing equipment, and only one project involved the repair of existing equipment. It is believed that this is because projects reflected priorities resulting from conditions in developing countries and focused on strengthening water system function to meet needs (Chart 7)

Chart 7: Number of New Construction, Extension and Repair Water Supply Projects

New Construction	Extension/ Improvement	Repair	Number of Projects
○	○	○	2
○	○		7
○		○	6
	○	○	1
○			10
	○		2
		○	1
25	12	10	29

(3) Differences in water supply project components (water intake/purification, water conveyance, water distribution)

Half of analyzed projects comprised of all three components. In order for development to progress without waste, it is necessary expand systems while balancing water purification, conveyance and distribution, making it necessary for the majority of projects to involve multiple components. It is believed that the comparatively lower number of projects involving water distribution equipment is due to the ability of borrowing countries to handle water distribution using their own resources.

Chart 8: Number of Projects Involving water intake/purification, conveyance and distribution components

Intake and Purification Facility	Conveyance Facility	Distribution Facility	Number of Projects
○	○	○	13
○	○		5
○		○	4
	○	○	2
○			2
	○		3
		○	0
24	23	29	

(4) Differences in Project Location cf. water supply projects

If a metropolis is defined as a city with over 1,000,000 people, a village is defined as having fewer than 10,000 people and a city as having a population between the two, 15 projects were implemented in metropolises, nine projects were implemented in cities, and five projects were implemented in villages. In metropolitan areas where alternative resources to aboveground water are limited, projects prioritized aboveground water equipment. The exception to this rule (including unevaluated projects) was the projects in Metro Manila in the Philippines.

2. Framework for Analysis

2.1 Five Primary Check Criteria and Evaluation Check Items

This chapter consists of a performance analysis of 33 projects based on the projects' evaluation reports. The framework for analysis consists of five primary criteria. These five primary criteria are based upon the "Principles for Evaluation of Development Assistance" established by the Development Assistance Committee (DAC) in 1991, which evaluates a project from the standpoint of project relevance, efficiency of implementation, effectiveness, impact and sustainability. To perform a more detailed analysis for this report, each of the five parameters was broken down into the 23 "evaluation check items" listed in Chart 9. Also, the Effectiveness parameter has come to include the operation and effect indicator.

Chart 9: The Five Evaluation Criteria and Evaluation Check Items

Project Relevance	Does the goal and the approach to the project match the priorities and policies of the target group, aid receiving country and the donor?
<u>A1. Conformation to Development Policy and Priority Issues</u>	Do the project goals and broader goals of this project conform to the development policy (including the national policy and master plan) and important issues of the country or region in question?
<u>A2. Project Plan</u>	Was the project plan (scope and approach) at the time of appraisal judged appropriate to achieve the broader and project goals?
<u>A3. Plan Alterations</u>	In cases where project scope was altered after the project was implemented, were the alterations relevant?
<u>A4. Project Goals at the Time of Evaluation</u>	In cases where terms and conditions were altered after the planning stage, are the project goals still valid at the present?
Efficiency of Implementation	Was the impact appropriate and achieved as planned in terms of quality, quantity and timing? Was the method used the most efficient in regard to output?
<u>B1. Output</u>	Was the output (project results) completed as planned?
<u>B2. Implementation Period</u>	Were there any problems in the project that caused the construction period to exceed original plans?
<u>B3. Project Costs</u>	Were there any problems in the project that caused the project costs to exceed original plans?
<u>B4. Implementation System</u>	Was the system appropriate for decision-making, monitoring and troubleshooting during the project?
Effectiveness	Goal Realization. Was the project able to achieve goals?
<u>C1. Output Utilization</u>	Is the output (project results) being used sufficiently? (Determined primarily using operation indicators. In cases where there is no planned value, sufficiency will be determined using absolute values.)
<u>C2. Project Goal Realization</u>	Were the direct effectiveness of the project sufficiently realized, and were project goals sufficiently achieved? (Determined primarily using the effect indicators. When there is no planned value, sufficiency will be determined using absolute values)
<u>C3. EIRR (FIRR)</u>	Is the Economic Internal Rate of Return (Financial Internal Rate of Return) sufficient when compared with initial project values?
<u>C4. Technical Assistance</u>	Were the training and technological instruction component effects sufficiently realized?
Impact	Were project goals and overall goals realized? Direct, indirect and subordinate effects in terms of technical, economical, socio-cultural, systematic and environmental aspects.
<u>D1. Contribution to Goal Achievement</u>	To what level were the original overall goals of the plan achieved, and to what extent did the project contribute to their realization?
<u>D2. Policy and Organization Systems</u>	What impact did the project have upon development policy of the country in question and the systems of the sector in question? Was the impact positive

	or negative?
<u>D3. Socio-economic</u>	What kind of impact was there on the regional society and economy? Was the impact positive or negative?
<u>D4. Technical</u>	What contribution did the project make to technological innovation and improvement in the country in question?
<u>D5. Environmental</u>	What impact was there on the regional environment? Was the impact positive or negative?
<u>D6. Resident Relocation and Site Acquisition</u>	What impact was there on regional society in terms of resident relocation and site acquisition?
Sustainability	After completion of aid, to what extent will the agencies and organizations of the partner country be able to sustain the output and effects of the project?
<u>E1. Output</u>	Is the output (project effects) being maintained and operated appropriately? Is facility in good condition?
<u>E2. Administrative and Maintenance System</u>	Are the systems, human resources (quality and quantity), work procedures (manuals) technology, maintenance facilities and equipment, and stock and procurement of spare parts sufficient?
<u>E3. Financial Resources</u>	Is there access to sufficient financial resources to administrate, and maintain the project? Is it predicted that the funds will be sustainable?
<u>E4. Needs</u>	Is it predicted that need for the project will continue in the future?
<u>E5. External Factors</u>	What external factors will have a major affect on project effects and sustainability (environment, government, policy, systems, market, other related projects, etc.)? Is it predicted that positive factors can be maintained in the future?

2.2 Sector Specific Evaluation Check Items

The projects analyzed in this report concern the sub-sectors of water supply, sewage systems, and waste treatment. Major water supply components include a water source facility (a facility to intake water from sources such as rivers, lakes or underground water), purification facility (improvements water quality so it is potable or acceptable for industrial use), and transport facility (pipe system and pumping stations to transmit, deliver, distribute and supply water). Sewerage system components include pipe system and pumping facilities, waste treatment facilities, and pipe for discharging treated sewage into rivers or the ocean. Waste treatment components included a waste collection system (garbage trucks and relay stations), processing facilities (spallation or incineration) and final processing stations (a dump site).

Each of the sub-sectors consists of functioning networks. For example, for a water supply improvement project to have great effects and impacts, it is necessary to have a well maintained pipe network for delivery and distribution, besides good purification operations, so that planned amount of water produced is distributed to users without waste. Problems related to non-revenue water ratios can jeopardize project sustainability, especially in urban areas of developing countries. Non-revenue water ratio problems occur when source water cannot be consumed due to leaks in piping, water theft or damage to meters, or when bills cannot be collected, it jeopardizes project sustainability. This is especially true in urban areas of developing countries. Another major problem obstructing independent system expansion is the financial resources and soundness of the implementing organization. It is difficult to set a rate level which can cover costs because income levels are low in developing countries, and neither national nor regional governments can provide sufficient subsidies. Therefore, it is necessary to constantly battle waste and to share the defrayal of costs between users and the public sector. Without taking these steps, system expansion will be impossible, as will appropriate operations and maintenance. Therefore, it can be said that the financial situation of the implementing organization, including tariff rate and ability to collect the fees, is significant on the realization of effects in this sector.

However, because the aforementioned two factors are included in the “effects” and “sustainability” criteria and will be analyzed therein, no sector-specific check items were created.

3. Performance Analysis

3.1 Relevance

(1) Compatibility with development policy and priority issues

Excluding the two projects that did not explicitly mention compatibility, all of the projects analyzed were judged compatible with government development policy and priority issues. For example:

1) Projects which were central to development plans created by the government (five-year plans) or to central or regional government sector development plans. For example, in the case of an Indonesian “Ujung Pandang Water Supply Rehabilitation Project”, the country’s fourth five-year plan included an improvement of water supply diffusion rates, increase in water supply capacity and improvement of water supply project administration. In the case of a sewage system improvement projects in Republic of Korea, the Korean government had declared sewage upgrading projects a priority issue within capital spending related to citizen lifestyles. The Japanese ODA was utilized for a project that had been the target of active government investment since the 1980’s.

2) Projects which respond to clearly defined problems which must be resolved. These problems included the provision of impure water due to insufficient water supply facility, chronicle water shortages, and increasing demand due to population increase. The Rural Water Supply Project (I) and (II) in the Philippines provided water for regions that had not previously had access to clean water. Water Supply Projects implemented in 10 local cities in China were implemented to increase the capacity of supplied water volume in cities where water shortages were worsening, based on goals outlined for strengthening of the water supply capacity in a five-year plan.

Judged from post-project utilization of project output, there was no project where the equipment utilization rate was low due to lack of demand. This demonstrates that the plans focused on priority issues and met area needs.

On the other hand, even though five-year plans and sector development projects for improving water supply were being implemented, difficulties in fund acquisition arose due to cutbacks in the national government’s subsidy, resulting in extended work periods³. However, this must be understood as being the result of area financial situations, not a decrease in priority, and

³ Water Supply Projects implemented in 10 local cities in China, etc.

should not reflect negatively on project relevance.

(2) Project plan relevance

In almost all cases, initial plans were judged to sufficiently reflect needs and external conditions. However, in some cases, projects were implemented without determining a detailed scope at the appraisal stage, resulting in significant changes to the initial plan. Likewise, changes in economic situation or insufficient research at the time of appraisal sometimes resulted in a decrease in project scope. More sufficient studies at the stage of appraisals in terms of authorization of project planning are deemed necessary in such projects. For example:

1) Inadequate research

Some cases are found that lack of preparation prevented the projects to take efforts. In the “Greater Cairo Water Supply Improvement Project” in Egypt, the project plan was created based on a JICA study report, but in the period after the exchange of notes but before the loan agreement was made, routes were changed or added, and the additional part was implemented without the creation of a basic plan. There was no accounting for plan or route changes in the Contractor’s TOR, or there was a lack of preparation which impeded the realization of project results. In the Thai “Chiengmai Water Supply Expansion Project,” difficulties in land acquisition for a purification facility forced a change in the detailed design and bidding documents, but it is believed that proper study before the project could have prevented the problem.

2) Inadequate coordination with users

Cases arose where project sites or systems were changed due to demands by residents at the investigative stage because plan scope was decided without considerations and the prior consultation of users. In the “Rural Water Supply Project” in Yemen, requests by residents to change the location of a water tank and to change the system from a common-tap system to a household-tap system during detailed designing of the project plan resulted in work delays and cost overruns.

As long as the facility established in a water supply project is being used, some effects will be realized and at least a certain level of project goals will be achieved. However, it must be kept in mind that it is difficult to determine whether project plans are the most appropriate plans to achieve the project goals without conducting a considerably detailed study.

(3) Relevance of plan changes

If slight changes such as figures are included, some change in project plan occurred in the majority of projects. Generally, changes were judged relevant.⁴ The main reason for changes included changes to reflect environmental conditions at the site that were realized at the time of detailed design, changes to reflect the opinions and demands of residents, and changes in processing capacity to respond to source water pollution and increasing water demand. However, it is indicated that there were cases where not all changes were relevant. For example, as in the Thai “Khon Kaen Water Supply Expansion Project,” there were cases where plans to replace distribution pipes were ignored, and new distribution pipes were buried with old distribution pipes remained and not replaced. The subsequent increase in capacity at a purification facility resulted in increased pressure, which cracked the pipe and worsened status of non-revenue water. Or, as in the Indonesian “Equipment Supply for Standardized Package Water Supply for Medium and Small Sized Towns,” procurement of equipment and materials was delayed, and projects were implemented using stock already on-hand. As a result, part of equipment and materials purchased using the Japan’s ODA loans were used in a project in other areas. Although it is deemed there would be no other way, considering the urgency of the project, the problem in terms of the procedure of amendment of the Loan Agreement for diversion was pointed out.

(4) Relevance of project goals at the time of evaluation

It is believed that water supply projects are generally conducted in situations where it is impossible to sufficiently meet the widespread demand for water. As the projects are implemented to provide potable water and to alleviate water shortages, as long as the equipment is being used properly, the volume of water supplied will increase, and lifestyles will improve due to the improvement in the water supply diffusion ratio. Therefore, as long as there is no problem with the plan and the equipment does not exceed demand, results including increased water supply capacity and improvements in water supply diffusion ratios were seen in all projects.

⁴ However, even if the change was appropriate, extensions of work period still sometimes resulted.

3.2 Efficiency

(1) Planned Output

In 80% of projects, output was realized as planned. In the remaining 20% of projects, output was not realized as planned⁵, or it was impossible to confirm the status of output. In some cases, severe delays in the work period meant that projects had not begun implementation⁶, or were not completed⁷ at the time of evaluation for the following reasons:

1) Shortfalls in domestic funds

This includes cases where the project was not completed on schedule due to shortfalls in the area government's domestic budget. In the Indonesian "Jakarta Water Supply System Project, First Phase, First Stage," the implementing organization's lack of coordinating ability combined with domestic budget shortfalls due to worsening public finance resulted in portions of the project being left uncompleted.

2) Insufficiency in pre-project studies and problems of implementing organizations and implementing ability of contractors

A) Insufficient pre-project studies

1) In the "Rural Water Supply Project" in Yemen, the project was implemented without sufficiently consulting area residents, whose later strong requests resulted in drastic changes of scopes in site and water supply system and delay of implementation. As a result, at the time of evaluation no project site was completed, and in some sites, project implementation had not yet begun.

2) In the "Greater Cairo Water Supply Improvement Project" in Egypt, insufficient pre-project preparation resulted in route changes during project implementation. The resulting interruption of work for re-investigating and re-planning the project were a major factor in delaying progress.

3) There were cases where, as in the Chinese "Urban Water Supply Project," problems arose with the quality of the underground water source after the intake started, even though no problems had been detected during the project preparatory study. The

⁵ In cases where plans were changed, were not achieved as in the revised plan.

⁶ Yemen: The Rural Water Supply Project

⁷ Jakarta Water Supply Project: At the time of evaluation, the distribution pipe to connect the Pulogadung water purification facility was underway. Non-yen loan end-distribution pipes and water supply pipes were not completed due to budget shortages. However, part of the problem in this case involves the timing of the evaluation, and can not be wholly attributed to the project.

problems required the establishment of an additional filtration facility, and the project was not completed at the time of evaluation due to the need to plan and budget for its creation.

B) Implementing organization abilities

- ◆ In the “Greater Cairo Water Supply Improvement Project” in Egypt, the implementing organization as mentioned above, did not performed sufficient pre-project planning, and did not monitor project process, and did not have enough ability to apply for project authorization with the relevant authorities. As a result, authorization had to be procured by a consultant, leading to significant project delays.

C) Implementation ability of consultants and contractors

- ◆ In the “Greater Cairo Water Supply Improvement Project” in Egypt, consultants and contractors had insufficient experience with large diameter pipe engineering, which significantly affected project progress.

(2)Implementation period

Approximately 20% of projects were delayed up to a year beyond the initial planned project completion date. Broken down by country, project delays were comparatively rare in the Philippines, Thailand and Republic of Korea, while delays were prominent in countries such as Indonesia, countries in the Middle East, and Africa. The primary reasons for delays of over a year were as follows:

1) Plan changes

In over 30% of projects, the time required for changes in plans and increases in scope resulted in delays of over a year.⁸

2) Delays in the procurement process

In nearly 30% of projects, delays in bidding and selection of consultants and contractors resulted in delays of over a year.⁹ In the Thai “Khon Kaen Water Supply Expansion Project,” a factor analysis showed that the initial plan allowed too short a time for hiring consultants

⁸ In seven projects in Indonesia, three projects in the Philippines, two projects each in Thailand and Republic of Korea, and one project each in Yemen, and Pakistan.

⁹ In six projects in Thailand, three projects each in the Philippines and Republic of Korea, two projects each in Indonesia and Egypt, and one project in Pakistan.

and contractor procurement.

3) Problems with implementing organization and contractor competence

In 20% of projects, lack of technical ability and low organizing ability of the implementing organizations and contractors resulted in delays of over a year.¹⁰

4) Shortfalls in domestic funds

In 20% of projects, inability of the area government to prepare sufficient domestic funds in time due to difficult financial situations resulted in delays of over a year.¹¹

5) Problems in land acquisition

In fewer than 10% of projects, land acquisition did not proceed as planned, resulting in delays of over a year.¹²

6) Insufficient materials, equipment or labor due to rushed construction

In multiple projects in Thailand, rushes in construction domestically led to delays in the acquisition of materials, equipment and the procurement of labor, making it impossible for work to proceed smoothly and resulting in delays of over a year.¹³

7) Other reasons, including regime changes and border disputes (Ethiopia) and worsened public safety (Philippines)

In evaluation of the work period, the evaluation is affected drastically by whether the project schedule was designed with an ideal situation in mind, or whether the schedule was based on actual experience. In fact, delays occurred in the majority of projects, so it is important to determine whether an ideal schedule or a schedule based on actual experience should be used in evaluating a project.

(3) Project Cost

¹⁰ In six projects in Indonesia, two projects each in Thailand and Egypt, and one project in Republic of Korea.

¹¹ In four projects each in Indonesia and China, and two projects in Republic of Korea.

¹² In one project each in Indonesia, the Philippines and Thailand.

¹³ In three projects in Thailand

In half of the projects, project costs¹⁴ were within estimates. In approximately 10% of projects, project cost overruns were held to within 10% above plan. The majority of project cost overruns were primarily the result of increases in domestic costs. Broken down by country, project cost overruns were notable in the Philippines. The primary reasons for project cost increases are as follows:

1) Increased materials, equipment and labor costs due to work period delays

In over 30% of projects, increases in materials and equipment costs resulted in project cost overruns of over 10%.¹⁵ In the majority of these cases, delayed implementation and delays during work caused actual costs to overrun predicted costs. In China, the introduction of a market economy drove prices higher than predicted, and in Thailand, a construction boom drove materials, equipment and labor costs higher.

2) Supplemental construction due to project changes

In over 10% of projects, expansion of project scope and increases in work volume resulted in project cost overruns of over 10%.¹⁶

3) Other reasons, including price overruns due to the necessity of repairing pipes damaged in border disputes (Ethiopia)

On the other hand, in approximately half of the projects, project costs were below predictions for the following reasons:

1) Competitive bidding

Competitive bidding for orders resulted in order costs far below projections.¹⁷

2) Changes in exchange rates

Appreciation of the Yen resulted in a significant decrease in foreign currency cost.¹⁸

¹⁴ yen equivalent

¹⁵ In five projects in Indonesia, four projects in China, two projects each in Thailand, the Philippines and Egypt, and one project each in Yemen and Ethiopia.

¹⁶ In two projects in Egypt, and one project each in Yemen, Indonesia, Pakistan, the Philippines, Republic of Korea and China

¹⁷ In three projects in Republic of Korea, five projects in Thailand, and one project in Indonesia.

¹⁸ In four projects in Thailand and one project each in China, Republic of Korea, Indonesia and Kenya.

3) Decreases in project scope

In three projects, some portions of the project scope were implemented using domestic government funds or was cancelled, lowering project costs.¹⁹

(4) Project implementation system

In half of the projects, it was judged that the project implementation system was acceptable, or no specific problems were indicated. Weaknesses were found in the project implementation system of approximately 30% of projects, while significant problems were found in approximately 20%. Broken down by country, implementation systems in R. O. Korea, China and Thailand were generally judged acceptable, while indications of problems with implementation ability of the implementing organizations were more frequent for projects in the Philippines, Indonesia, Yemen and Egypt. The significant reported problems in project implementation systems were as follows:

1) Problems with implementing organization competence

In 12 projects, it was indicated that the budget management abilities, technical capabilities, personnel, operation and maintenance abilities of the implementing organization were lacking, and had a significant effect on project implementation.²⁰ For example, in the "Greater Cairo Water Supply Improvement Project" in Egypt, the implementing organization's lack of competent operation and maintenance ability caused delays in the procedures to receive project approval. This and lack of coordination with sections involved inside and resulting changes in specifications significantly led to the project delays.

2) Problems with consultant and contractor competence

In two projects in Egypt and one project in Thailand, lack of technical capability and experience of consultants and contractors resulted in worsened performance and affected program implementation.

¹⁹ In one project each in Republic of Korea, Indonesia and Thailand.

²⁰ In six projects in Indonesia and one project each in Egypt, the Philippines, Yemen, Republic of Korea and Pakistan.

3.3 Effectiveness

(1) Output Utilization

In approximately 70% of projects, project upgraded equipment is being utilized sufficiently and is providing quality service to area residents. In some projects, however, incompleteness of project components resulted in 60% level of output utilization against the initial projection (the Indonesian “Jakarta Water Supply System Project First Phase of the First Stage”). In the “Rural Water Supply Project (III)” in the Philippines, delays in the organization of the water cooperative which maintained and operated the water facility, lack of technological competence, lack of spare parts and problems with operation and maintenance were indicated. Although all facilities were completed during implementation of the project, only 84% of the equipment is normally utilized.

(2) Project Goals

The level of attainment of project goals is judged by whether or not increases in water supply capacity, distribution ratio of water supply or sewage processing volume were realized. For water supply projects, we took up the target values regarding increase in water supply capacity and distribution ratio of water supply as indices, and projects were judged by whether they achieved those values. However, in cases where no numerical target was established, (or for which they were established but not recorded in the project evaluation), projects were evaluated considering factors including the distribution ratio of the water supply and the actual volume of water provided. Of the projects analyzed in this report, 70% achieved the target operation index values or have achieved projected results. In approximately 20 of projects, while they contributed to improvements in water supply capacity, increases in users and realization of stable water supply were all realized, the expected results were not obtained for reasons including increased leaks due to cracks in older pipes, lack of expected improvement in the non-revenue water ratio despite increase in water supply capacity, and increases in demand due to population increases during work extensions. In the remaining 10% of projects, insufficient operation and maintenance actually resulted in increases in the non-revenue water ratio. Examples of these included:

(1) Cases where leaks resulted from lack of maintenance and the superannuation of existing facilities and effects did not come up.

In the Kenyan “Greater Nakuru Water Supply Project,” water supply capacity to the city of

Nakuru decreased due to damage to existing facilities and insufficient maintenance.²¹

(2) Cases where work-period extensions resulted in incompleteness, or where increases in demand during work resulted in the inability to alleviate shortages

In the Indonesian “Jakarta Water Supply System Project First Stage,” one section of distributing pipe was not completed, and the goal of extending the water supply to 77% of the population was not met. Likewise, in the “Greater Cairo Water Supply Improvement Project” in Egypt, increases in population and water demand during work delays overwhelmed the increased water supply capacity resulting from the increase in equipment, and water shortages continued.

(3) Internal Rate of Return

Only 30% of the projects analyzed in this report used the Financial Internal Rate of Return (FIRR) as an index (where it was recorded that a pre-project FIRR estimate was prepared in the evaluation report). Of these projects, 60% generally realized the planned project FIRR, while 40% fell short of when FIRR values were recalculated after the project. Reasons FIRR values were above predicted values included decreases in initial construction costs due to bidding prices below projections, decreases in operation and maintenance costs and higher than projected fee revisions. Lower FIRR values resulted from water fee increases falling below projections and worsening non-revenue water due to water leaks and other causes.

(4) Technical Assistance

In three projects among entire projects, the evaluation report mentioned either the effects of technical support by consultants or consultant performance. In the Chinese “Beijing Sewage Treatment Plant Construction Project,” consultant service included calls for technical training from Japan which was significant to the introduction of new technology and project sustainability. Technical ability was improved by the guidance of employees of the Bureau of Sewerage of Tokyo Metropolitan Government. In the Indonesian “Ujung Pandang Water Supply Rehabilitation Project,” it was indicated that the receipt of water fees was sluggish at the stage of engineering service appraisal that had preceded implementation, and as a result, education and training was provided as part of consulting services at the time engineering services were implemented. As a result, the non-revenue water ratio fell from 52% to 39%, and the payment of accounts receivable improved (from 17.5 months to 10.1 months). In the

²¹ Another reason for decreases in water supply capacity included limits to service water capacity resulting from defaults of the City of Nakuru in payment of water fees to the NWCP, which was the previous water provider of the City of Nakuru

Ethiopian “Underground Water Resources Development Project,” it was reported that technological service based on equipment supply contract and the continuous implementation of technological guidance by Japanese Overseas Cooperation Volunteers contributed to increasing technicians’ abilities and to the operation and maintenance of machinery.

(5) Operation and Effect Indicators

In the water supply sector, 1) equipment use ratios, 2) water supply capacity, 3) number of users, 4) water quality, and 5) the ratio of non-revenue water or revenue water are frequently used as operation indices, while 1) water supply distribution ratio, 2) consumption volume per person per day, 3) non-revenue water or revenue water ratios, and 4) ground subsidence (volume of underground water removed) are used as result indices.

Each of these indices has been judged acceptable as a way to measure operation conditions or effect, but in many cases sufficient analysis is difficult because projected target values are not recorded. Analysis is difficult in cases where goals were not clearly defined at the appraisal stage, or when insufficient data was gathered when the project was evaluated. Recently, at the project authorization stage, pre-project evaluations which include the establishment of clear, quantifiable goals are done. Each index is expected to be continuously monitored to determine the level of achievement as the project progresses. However, the demands of monitoring will be a heavy burden upon implementing organizations, so indices must be carefully selected.

Operation indices for the sewage system sector include the diffusion ratio of sewage systems, sewage processing capacity and river water quality (Biochemical Oxygen Demand (BOD): mg/l). Like the water supply sector, in the majority of projects, target values were not recorded and it is difficult to judge whether the effects were sufficiently achieved. In waste treatment projects, daily incineration capacity was used as an operation index, but the lack of implementation of separated garbage collection resulted in the interfusion of non-burnable garbage, resulting in actual values below projected values for all incinerating facilities.

3.4 Impact

(1) Contribution to Achievement of Overall Goals

In this review, overall goals are defined as the indirect socio-economic effects that are realized when the direct effects of water, sewage and sanitation sector projects (increased water supply capacity, improved diffusion ratio of water supply and sewage systems, increased beneficiary population, and deductions in water pollutants) are realized. Projects are evaluated by the level of realization of overall goals, and by the level to which the project contributed to that realization. In half of the projects, however, broader goals were not recorded. For the projects that did report broader goals, the almost all projects were confirmed to have contributed to socio-economic and lifestyle improvements through the improvement of national water supply capacity and increases in the diffusion ratio of water supply and sewage systems. Specific direct socio-economic results that make up broader project goals are presented in the section titled “socio-economic impact.” There was no project where it was judged that there were problems with the project’s contribution to broader project goal achievement.

(2) Impact on policy and organizational systems

Only two projects referred to impact on organizational systems, and no projects referred to impact on policies. In the Thai “Map Ta Phut—Sattahip Water Pipeline Project” and “Nong Pla Lai—Nong Kho Water Pipeline Project,” it is reported that the privatized corporation responsible for operation and maintenance increased operational efficiency and drastically improved toll collection rates through automation. The project became a positive example of privatization resulting in improved operational efficiency.

(3) Socio-economic impact

Socio-economic impact should be noticeable in all of the projects analyzed in this report, but in fact only seventy percent of the evaluation reports mentioned it explicitly. As these references to socio-economic impact were not quantitative, it is believed that some references were based on conjecture and it is difficult to establish a causal relationship with the project. In the cases where impacts were mentioned, it was positive impacts that were mentioned, and only one report mentioned negative impacts. The following socio-economic impacts were reported:

1) Improvements in living conditions and public sanitation

In the case of water supply and sewage system projects, living conditions are improved if water supply capacity and diffusion ratio are increased. However, only ten projects specifically reported that impact.²²

2) Emancipation of women and children from water pumping duties

In seven projects, it was reported that women and children were released from the heavy work of pumping and delivering water and given more opportunities to engage in other productive activities or academics through the development of water supply.²³

3) Promotion of commerce and industry

In ten projects, it was reported that the projects contributed to the promotion of economic and industrial activity through the sufficient supply of tap water and water for industrial purposes.²⁴

4) Prevention of water-borne infectious diseases

In 11 projects, it was reported that the provision of potable water and the improved water quality around water intakes by the establishment of sewage processing facilities lowered the incidence of water-borne and eye diseases by improving the water quality of aboveground water sources.²⁵

5) Suppression of ground subsidence

In one report of an Indonesian project, it was reported that the creation of new aboveground water sources contributed to the retardation of ground subsidence by decreasing the volume of water pumped from underground sources.

6) Other than the aforementioned impacts, the creation of a sewage processing facility in Korea acted as PR to help citizens understand the importance of sewage systems and the importance of clean water. Likewise, the creation of a waste processing facility raised citizen consciousness of garbage related issues, and resulted in the furtherance of a separated garbage collection and increased the popularity of recycling programs.

²² In two projects each in Indonesia, China, the Philippines, and Republic of Korea, and one project each in Kenya, Thailand and Papua New Guinea.

²³ In three projects in the Philippines and one project each in Yemen, Kenya, Thailand and China.

²⁴ In five projects in Thailand, two projects each in Republic of Korea and Indonesia, and one project each in China and Yemen.

²⁵ In nine projects in Republic of Korea and one project each in Indonesia and the Philippines.

On the other hand, in the Indonesian “Jakarta Water Supply Distribution Pipeline Project,” negative impacts such as the magnification of the poverty gap resulted because water fees were set so high that the poorest segment of the population could not afford water services.

(4) Technological Impact

This item evaluates the technological results outside of technology transfer by consulting services. In a series of Korean sewage system development projects, the original project was implemented as a joint venture between Japanese consultants and Korean corporations, and the transfer of technology from Japan through the dispatch of technicians to Korea was implemented. By the 1980’s the Korean system became able to construct and operate facilities alone, demonstrating the efficacy of the technology transfer from Japan. Similarly, in the Korean “Sewage Treatment Plant Construction Project,” the project was jointly implemented by Japanese corporations and Korean consultants and contractors. The technology transferred in that process made it possible for the Korean corporation to use the project management experience they had gained to implement multiple incineration facility construction projects at a later date.

In the Chinese “Three Cities Water Supply Project (Xiamen, Chongqing, Kunming),” when an ozone processing method was introduced for deodorization processing, the inspection parties were dispatched to Switzerland and Japan to hold discussions on the exchange of water quality management technology, activated charcoal processing technology, and the introduction of new facilities. Likewise, in the Chinese “Beijing Sewage Treatment Plant Construction Project,” it was reported that the consulting service requested training in Japan, and employees of the Bureau of Sewerage of Tokyo Metropolitan Government were dispatched to introduce technology. Thus, from the viewpoint of the introduction of new technology and project sustainability, the project was meaningful.

(5) Environmental Impact

It is believed that in water supply projects, the discharge from purification plants and in the sewerage projects, the water quality of discharge from sewage systems and sludge treatment have main impacts on the environment. Therefore, it is expected that all water, sewage and sanitation sector projects will have an impact on the environment, although only half of the project evaluation reports mentioned such impacts. Among the projects that reported environmental impacts, the majority reported positive impacts such as improved water quality and discharge below target values after treatment, or that water quality management of discharge and sludge processing was implemented properly in sewage system projects.

Problems were reported in the following two projects.

In the Indonesian “Jakarta Water Supply Distribution Pipeline Project,” it was reported that water environment improvement was necessary after the quality of river water was deteriorated by residential and industrial drainage and distribution pipe network was polluted. Regarding ground subsidence, although the project increased the population with access to the water supply network, the population without access to water services remained stable, and there was no decrease in use of underground water sources.

In the Korean “City Water Facilities Expansion Project (Pusan, Seoul, Chinju),” there were no specific environmental problems with the constructed water supply equipment, but sludge with a high moisture level was being discharged into the river by the purification plant in Chinju, requiring improvement. Likewise, degradation of water source quality in Pusan requires the rapid creation and implementation of water quality improvement measures.

(6) Resident relocation and land acquisition

It is believed that problems arose during land acquisition in most projects, but only three projects reported such problems. Of the three, land acquisition was implemented without significant problems in two. In the Thai “Chiengmai Water Supply Expansion Project,” it was indicated that the conformation of the ability to procure land is necessary during detailed planning. This was noted because after construction was begun, landowners opposed the sale of the land designated for the construction of a purification plant, resulting in work delays.

3.5 Sustainability

(1) Output

In about 70% of projects, problems were reported with the physical condition of facilities. Broken down by country, only a few problems were found in R. O. Korea, but in over half of the projects in other countries problems are reported. Broken down by type of project, problems were indicated in 18 of the 29 water supply projects and in one of the four sewage system projects. The following is a detailed analysis of water supply, water quality, non-revenue water ratios (revenue water ratios) and other results of water supply improvement projects.

1) Water supply

In eight of the 29 water supply projects, work was not completed due to delays in implementation, which resulted in the inability to maintain the projected water supply²⁶. For example, in the Indonesian “Jakarta Water Supply Project Parts One, Two and Three of the Second Phase,” one portion of distributing pipe at the purification facility was still under construction when budgeted shortfalls prevented the construction of distal distribution pipes and supply pipes. As a result, project utilization rates were limited to 60% of capacity. Cases were also reported where, as in the Thai “Map Ta Phut—Sattahip Water Pipeline Project,” delays in purification of domestic water supply and the construction and development of distributing pipe resulted in the actual utilization factor in the first year falling significantly below that of initial plans.

2) Water quality

Nine of the 29 water supply projects reported problems relating to water quality.²⁷ For example, in the Indonesian “Jakarta Water Supply Project Parts One, Two and Three of the Second Phase,” severely polluted source water frequently blocked pumps, making it necessary to remove earth and sand sediment, which impeded performance ratios. Similarly, there were cases where intestinal diseases resulted from insufficient preparation of water quality tests, testing equipment and chemicals. In the “Metropolitan Water Supply Project (SIMLY)” in Pakistan, one portion of necessary water quality analysis was not sufficient, and the government neglected to set a standard of water purity for drinking water. As a result, the establishment of a uniform standard of water purity is still necessary. In the Kenyan “Greater

²⁶ In four projects in Indonesia, three projects in Thailand, and one project in Egypt.

²⁷ In five projects in Indonesia, two projects in Republic of Korea, and one project each in Kenya and Pakistan.

Nakuru Water Supply Project, it was reported that it was unclear whether water purity standards had been met, because fiscal difficulties and lack of personnel meant that only some water purity maintenance items were implemented. Although there were cases where external factors, worsened source water quality caused by water discharged from factories, there were also cases where insufficient water purity maintenance caused a degradation of water quality.

3) Non-revenue water ratio (Revenue water ratio)

Problems related to non-revenue water ratio were reported in 14 of the 29 water supply projects.²⁸ The majority of these were cases where new pipes were juxtaposed with old pipes (mainly asbestos pipes), and the pressure increase that accompanied increased purified water capacity caused leaks from cracks in the old pipes. As a result, it is necessary to implement leak-prevention measures including the replacement of superannuated pipe. In other cases it is reported that other factors including theft of water or damage to pipes by residents prevented improvements in the non-revenue water ratio (Kenya).

4) Other

In multiple projects, it was difficult to fully understand the actual volume of water being used because water meters were not installed. In the “Rural Water Supply Project (III)” in the Philippines, problems indicated included the organizational delays of the Water Cooperative that was to operate the project facility, resulting in insufficient operation and maintenance training, insufficient technical competence, and a lack of spare parts.

Three of the four sewage system projects are operating smoothly, but there were cases where the utilization capacity of equipment is up to 30% below projected values. There were also cases where one portion of processing facilities released sludge containing heavy metals discharged by industry into the ocean, giving rise to environmental concerns

As for waste treatment projects, a case was reported where lack of implementation of separated garbage collection resulted in the utilization of only 70% of incineration capacity, due to the necessity of suspending operations to remove jams created by large or non-flammable garbage in the incinerator.

(2) Operation and maintenance system

²⁸ In five projects in Thailand, four projects in Indonesia, three projects in China, two projects in Republic of Korea, and one project in Kenya.

In approximately half of the projects, concerns or problems with the operation and maintenance system were reported. In the remaining half of projects, it was confirmed that the operation and maintenance system was acceptable, or no specific problems were reported. Broken down by country, no problems were reported in Chinese projects, but were indicated in all other projects. It was indicated that in the majority of cases, personnel shortages and lack of technicians meant the system was unable to properly operate and maintain projects, resulting in frequent facility damage. For example, in the case of Kenya it was reported that water purification administration was not sufficiently implemented due to personnel shortages and lack in the technical abilities of on-site workers. It was also reported that specific countermeasures for problems such as frequent pipe damage and water theft were not sufficiently investigated, and that insufficient maintenance of equipment and materials resulted in breakdowns. In the case of Thailand, it was reported that at the time of approval, even though concerns over the implementation ability of the operating organization had led to conduct training and to create a manual, consultant personnel shortages resulted in cancellations of training and the under-utilization of the operation and maintenance manual.

Also, in an Indonesian project, it was planned that after the completion of facilities a Water Cooperative would be created for operation and management in settlements. Delays in organization of the cooperative, however, raised fears that operations will be impeded by insufficient training of employees.

(3) Financial resources for operation and maintenance

Of the 26 projects that mentioned financial resources for operation and maintenance, it was judged that less than 30% of projects would be able to secure a sufficient budget for future operation and maintenance, while over 70% reported there reasons for concern. A common problem in the majority of water supply projects was that the ratio of non-revenue water remained high resulting from leaks due to aging pipes and water fees were not set at levels able to cover that high ratio of non-revenue water. As described in the "Output" section above, 14 projects indicated problems with non-revenue water ratios, among which there were projects where price of water set by a supplier exceeded water fee rates (Kenya). Also, it was reported that high non-revenue water ratios due to use of superannuated pipes, the lack of water meters, and the lack of a sufficient bill collection system was inviting a financial urgency.²⁹ On the other hand, in projects in Indonesia, R. O. Korea and China, it was reported that despite improvements in the non-revenue water ratios, ordinary revenue was in the red due to low water charges, high amortization burden and high interest burden, ultimately

²⁹ For example, in Thailand

making it necessary to revise water tariff to an appropriate level.

In sewage system projects, it was reported that bill collection rates were high in Republic of Korea, but operation and maintenance costs were not satisfactorily covered by income, and foreign currency losses and interest payment related to the loans when construction was implemented exerted pressure on budgets for sewage systems in each city. This makes it necessary to study the entire financial situation of sewerage including the establishment of sewer service rates and the government subsidy budget for the apportionment of sewage systems.

(4) Needs

Demand for water supply projects will continue until the water supply meets the demand for water. Population increase and the industrial development result in increases in the demand for water, and it is believed that increases in the demand for high-quality water supply will be constant in all countries. As seen in Korean water supply projects, there were cases where concerns over industrial drainage drove residents to choose mineral water over tap water, showing that the project is a necessary measure to keep up with continuing need for high-quality water supply. In 12 projects, the necessity of continued improvement to the water supply was recorded.

In sewage system projects, it is reported that there is a gap between processing capacity and the actual volume of sewage water output, meaning the need for improvement of sewage processing facilities will be sustained.

(5) External Conditions

In water supply projects where improvements in supply capacity were implemented to stabilize the supply of high quality water and to improve water supply diffusion ratios, private funds and funds from other donors were vital to supplement the JBIC-supported improvement projects. In evaluation reports that mentioned this factor, it was reported that improvements made using by JIBC aid implemented simultaneously with water supply projects supported by other funding are progressing and delivering comprehensive water supply improvements. Also, countermeasures to respond to increasing urban sewage discharge that accompany expansion of water supply facilities are necessary, as in China, where the simultaneous planning and implementation of improvements to the water supply and expansion of sewage processing facilities was reported

In sewage processing projects, the necessity of considering the efficiency of the entire sewage

processing system, establishing clear quality standards for discharge water, developing legal systems and establishing a monitoring system were indicated. Also, two projects reported the introduction of technology to the implementing organization through using JICA's schema, dispatch of experts and the project-type technical cooperation.³⁰

³⁰ In the Thai “Chiengmai Water Supply Expansion Project,” and “Bangkok Water Supply Improvement Project (Tunnel Rehabilitation).”

4. Conclusions

4.1 Performance Analysis Overview

(1) Summary

In general, the 33 water supply, sewerage and sanitation projects subjected to ex-post evaluation were considered highly relevant, directly bringing about an increased, stable supply of quality drinking water as well as improving the coverage of water supply systems. This indirectly resulted in improved living environment and public sanitation, reduced instance of waterborne disease, and promotion of industry. In addition, sewage and waste-processing projects enabled positive environmental and socioeconomic impact.

Efficiency, however, has been reported as a problem for a number of projects, with reasons including modifications made to project plans and additions to project scope subsequent to the conclusion of the ODA loan contract, as well as delays in administration procedures stemming from competence issues on the part of the executing agency; lack of local currency budget; rising costs for construction materials, machinery, equipment, and labor - due to inflation incurred over extended construction periods - and so on. In terms of sustainability, physical problems with facilities were reported for approximately 70% of projects, with concerns or problems related to operations and maintenance systems evident in approximately 50% of projects. In particular, issues related to inadequate operations and maintenance agency staff, lack of technical competence, structural problems, and so on, led to a greater rate of non revenue water, and to the setting of water tariff rates at levels too low to cover costs. This scenario, in turn, resulted in problems related to securing financial resources for operations and maintenance in over 70% of projects.

(2) Relevance

ODA loan projects for the water supply, sewerage and sanitation sectors were in general consistent with development policy and/or development plans of the countries concerned; they were also highly relevant, occupying an important place in governmental development plans (including sector plans), or were delegated priority as an issue in need of resolution.

A number of projects were formulated in accordance with specific conditions/needs, and in line with sector development plans. Some projects, however, were implemented without properly determining project details at the appraisal stage, resulting in extensive changes to project plans and/or necessitating significant downscaling of scope due to shifts in the economy. Ideally, these projects should have been studied more carefully at the appraisal stage, when

project plans were established.

Although most projects involved some type of planning modification including minor changes in project material/equipment quantities, most of these changes were pertinent in that they were designed to ensure appropriate, efficient, and effective project implementation. However, in a few projects, plans changed in which new pipe systems switched to superannuated ones. Unable to withstand the pressure, the decrepit pipes burst, resulting in leaks.³¹

(3) Efficiency

Output for 80% of projects was realized in accordance with original plans. In terms of both degree of completion of facilities as well as project duration and cost, the projects are deemed to be sufficiently efficient. However, a number of cases reported problems with low efficacy due to incomplete facilities. Approximately 20% of projects were completed with delays of one year or less, while 60% of projects were finished under budget or within 10% excess of budget.

Major reasons for lower efficiency levels included modifications to project plans or additions to project scope subsequent to the conclusion of the ODA loan; delays in administrative procedures stemming from lack of competence on the part of the executing agency; insufficient local currency budget; and higher costs for materials, machinery, equipment, and labor related to inflation incurred during the delayed construction periods, and so on. On a positive note, around half of the projects surveyed were implemented with less than the funds allotted at preliminary planning stages, mainly due to highly competitive bidding and the rising yen during that period.

Analyzing by country, Thailand and the Republic of Korea scored relatively highly with regard to efficiency of the construction schedule as well as implementation competence. In the Philippines, however, projects were plagued by excess costs, and those in Indonesia were hindered by delays in construction period and implementation capacity.

(4) Effectiveness

Judging by the status of operations of water supply and sewerage facilities and the degree of direct impact of the project in several respects, approximately 70% of water supply and sewerage projects are deemed to have sufficiently attained project objectives, with output usage levels appropriate. A range of effects are attributed to the implementation of the projects, including improved water purification and drawing capacity; improved water supply;

³¹ In the Thai, "Khon Kaen Water-Supply Expansion Projects."

growth in the percentage of the population with access to water; a higher coverage of water supply and sewerage systems and, stemming from these factors, a higher standard of living for residents, and improved sanitary conditions. On the down side, 20-30% of projects exhibited problems such as leakages due to poor facility management, or were unable to accommodate new demand for water supply caused by population influx that occurred during the course of delays in construction.

Among projects for which FIRR was calculated, more than 60% surpassed target figures due to factors such as lower initial investment and/or operations and maintenance costs as well as tariff rates that were revised to a level higher than expected. On the down side, several projects fell short of target figures due to increased rate of non-revenue water caused by leakages as well as problems with tariff rates set lower than originally expected.

Three projects are reported to have contributed to improved technical competence of engineers of operations and maintenance/executing agencies through technical training in Japan and technical assistance in the countries of implementation through consultants. The results of such assistance include, for instance, the introduction of new technology, reduction of non-revenue water, and improved collection of receivables.

(5) Impact

Through outcomes such as increased water supply, higher rates of availability of water supply systems, and an increase in the population with access to drinking water, 70% of projects were reported to have indirectly enabled positive socioeconomic impact including improved living environment/public sanitation; elimination of water-drawing labor which had been borne by women and children; development of regional economic and industrial activity stimulated by industrial access to water; and prevention of land subsidence caused by the drawing of underground water.

In addition, sewage treatment projects reduce the instance of waterborne and eye disease by improving water quality at water intake areas. In light of these effects, the importance of sewage and aquatic environment conservation has become clear to local residents - a development recognized as an important public relations step. Industrial waste disposal projects have also served to enhance citizen awareness on garbage issues, encouraging the sorting of garbage and recycling.

The projects were also shown to have had some positive impact on the environment. Water treatment facilities enabled better river water quality and a reduction in sludge levels, where previously drainage from purification plants had in some cases been substandard, or sewage

has been dumped into rivers without being treated.

Some projects, however, require improvement in this area. Negative impact included a decline in the quality of river water due to household drainage and factory wastewater; lower drinking water quality due to contamination caused by pipe systems; and discharge of highly contaminated fluid waste from purification plants into the river.

As for technical aspects, a number of projects involved the transfer of important technology from Japanese contractors to local contractors and/or executing agencies. Sewerage systems and waste treatment projects in the Republic of Korea, for instance, had been jointly implemented by a Japanese-Korean joint venture at the beginning stages, following which the Korean counterpart proceeded to independently implement construction and operations. The projects thus made a significant contribution to project management skill building and technology transfer in Korea.

(6) Sustainability

Water supply projects are not generally considered highly sustainable. Problems with facilities exist with approximately 70% of projects, and there are either problems or reason for concern with regard to operations and maintenance for approximately half of the projects in this sector. Analyzing by country, the Republic of Korea displayed few problems; for all other countries, however, there were some sort of concerns, the salient points of which are summarized as follows.

- The ability of the projects to adequately supply water at target levels was hindered by insufficient water distribution and water supply pipes, a shortage which stemmed from delays in construction periods and lack of funds, as well as by inadequate operations and maintenance.
- Drinking water quality as well as operational status has been compromised by problems with water control systems including lack of appropriate means of treating contaminated water at source, financial administrative difficulties, and lack of staff, etc.
- Presence of dilapidated asbestos pipes in the facilities, which have in some cases burst and caused leaks, lack of water meter equipment, destruction of pipes by local residents, water theft and so on, leading to a scenario where rates of non revenue water have not improved.

These issues are largely attributed to systemic problems such as lack of operations and

maintenance agency staff, technical capacity, and budget.

Sewerage facility projects are generally effectively run; some, however, are operating at less than 30% of their original capacity, or are causing environmental damage such as the dumping of sludge into the ocean.

Some waste disposal projects were reported that due to unsorted waste operations had to be suspended because of dumping and clogging of inappropriate waste including oversized and non-burnable material in the facilities.

Operations and maintenance agencies in good financial standing account for less than 30% of the total. All projects in this sector have certain problems in common, including high rate of non-revenue water caused by leakage, and the setting of water tariff rates at levels too low to cover overhead costs. Some projects also lacked water meter equipment, which created obstacles to proper fee collection.

4.2 Lessons Learned / Recommendations

(1) Improvement of financial standing and operational efficiency of project operational agencies

Problem-free projects in the water supply, sewerage and sanitation sector amounted to less than 30% of the total; the remainder, meanwhile, were plagued with financial pressures, and some were unable to effectively implement operations and maintenance due to inability to secure budget. In cases where it is clear at the appraisal stage that financial status must be bolstered, the issue of whether tariff rates have been appropriately set (in light of revenues, depreciation, collection costs, interest and operations/maintenance costs) should be ascertained. Also, policies should be devised, beginning with the formulation and appraisal stages, and incorporated into the projects, to enhance water supply project operations (i.e. to establish an efficient user fee collection system, to install meter facilities, to reduce non revenue water by enhancing countermeasures against illegal acquisition; to establish realistic business planning procedures in order to enhance management efficiency; to strengthen management with a view to improved operations; and to incorporate consulting services for the training of employees in user fee collection competence). In addition, financial status should be tracked on a regular basis at the monitoring stage via jointly held meetings between the executing agency and the various related governmental agencies.

(2) Enhancement of structure and competence of the operations and maintenance agencies

More than half of the projects surveyed exhibited problems or reason for concern with regard to their operations and maintenance structures, mostly related to inadequate staffing and technical competence. In cases where these problems are foreseeable at the formulation and appraisal stages, consulting services such as assistance with training systems and/or compilation of manuals on operations and maintenance should be incorporated into the project in order to expand upon and enhance systems and staff and to bolster staff morale and organizational competence. Ongoing follow-up to track the situation is advisable. Technical assistance via SAF, JICA, and so on is also considered an effective option.

Contracting sewerage facility operations and maintenance to private corporations may result in greater efficiency. However, certain pre-conditions should be applied, including limiting contracting to service provided to large-scale users and/or contracting following a preliminary period where operations are conducted by government agencies. If privatizing of operations and maintenance is to be an effective option, these conditions should be carefully considered for viability at the formulation and appraisal stages, and past examples should be analyzed.

(3) Attention to total balance of water supply system networks

In order to achieve greater water purification and conveying capacity via expanded water purification facilities, distribution capacity must be raised; otherwise overall project effect and its sustainability will be compromised. Some water supply projects, however, are plagued by issues such as the existence of superannuated pipes alongside new facilities - under higher pressure levels enabled by enhanced water purification capacity, the decrepit pipes have frequently burst, causing leakage and hindering capacity. The defective equipment has thus resulted in slow pace of improvement of revenue water rate and higher long-term costs.

As a consequence, it is advisable to ascertain the status of existing pipe networks in order to facilitate, if necessary, incorporation of the process of removal of superannuated pipes into project planning and rehabilitation of networks into project scope prior to implementation.

(4) Consideration to local water supply and sewerage projects

In order to maintain the quality of the water provided by water supply projects, measures including implementing satisfactory water testing at water purification plants need to be complemented by appropriate treatment of local sewage and contaminated water; and joint development with other water and sewage projects should be taken.

The issue of protecting ODA loan-sponsored water supply project sources from contamination, caused potentially by increasing household and industrial water - a product of the popularization of water supply systems - is particularly important. In order to accomplish this, coordination with other projects on creating an effective balance between water waste facilities and sewage treatment facilities is considered effective strategy; in so doing, the status of water supply and sewerage systems with regard to cities located upstream of the project site as well as water supply/sewerage planning by related agencies and other donors should be considered at the appraisal stage.

Reviewed Projects (Water, Sewerage / Sanitation Sector)

Project Name	Country	L/A
BEIJING SEWAGE TREATMENT PLANT CONSTRUCTION PROJECT	China	Aug 1988
URBAN WATER SUPPLY PROJECT	China	Aug 1988 - Oct 1991
QINGDAO DEVELOPMENT PROJECT (WATER SUPPLY AND SEWERAGE)	China	Aug 1993
URBAN SEWERAGE TREATMENT PLANT CONSTRUCTION PROJECT	R. O. Korea	Jan 1980 ~ Jun 1988
CITY WATER FACILITIES EXPANSION PROJECT	R. O. Korea	Oct 1983
CITY WATER PROJECT (TAEJON)	R. O. Korea	Aug 1984
CITY WATER PROJECT (SEOUL)	R. O. Korea	Aug 1984
URBAN SOLID WASTES TREATMENT FACILITIES PROJECT	R. O. Korea	Aug 1987
DAEJEON CITY WATER SUPPLY EXTENSION PROJECT (3)	R. O. Korea	Aug 1989
JAKARTA WATER SUPPLY PROJECT	Indonesia	May 1974 ~ Apr 1982
EQUIPMENT SUPPLY FOR STANDARDIZED PACKAGE WATER SUPPLY FOR MEDIUM AND SMALL SIZED TOWNS	Indonesia	Jun 1981
UJUNG PANDANG WATER SUPPLY REHABILITATION PROJECT	Indonesia	Jul 1988
JAKARTA WATER SUPPLY DISTRIBUTION PIPELINE PROJECT	Indonesia	Dec 1990
RURAL WATER SUPPLY PROJECT	Philippines	Nov 1978
RURAL WATER SUPPLY PROJECT (II)	Philippines	Jun 1980
RURAL WATER SUPPLY PROJECT (III)	Philippines	May 1986
PROVINCIAL CITIES WATER SUPPLY PROJECT	Philippines	Jan 1988~ May 1992
PROVINCIAL CITIES WATER SUPPLY PROJECT (II)	Philippines	
THE CHIENGMAI WATER SUPPLY EXPANSION PROJECT	Thailand	Mar 1977
BANGKOK WATER SUPPLY IMPROVEMENT PROJECT (STAGE I- PHASE II)	Thailand	Jun 1979
BANGKOK WATER SUPPLY IMPROVEMENT PROJECT (II-I)	Thailand	Sep 1984 ~ Oct 1985
KHON KAEN WATER SUPPLY EXPANSION PROJECT	Thailand	Mar 1986
NAKHON RATCHASIMA WATER SUPPLY EXPANSION PROJECT	Thailand	Sep 1987
MAP TA PHUT - SATTAHIP WATER PIPELINE PROJECT	Thailand	Nov 1988
BANGKOK WATER SUPPLY IMPROVEMENT PROJECT (TUNNEL REHABILITATION) (STAGE 2 - PHASE 1)	Thailand	Nov 1988
THE FOURTH BANGKOK WATER SUPPLY IMPROVEMENT PROJECT (PHASE 1)	Thailand	Sep 1991
NONG PLA LAI - NONG KHO WATER PIPELINE PROJECT	Thailand	Jan 1993
METROPOLITAN WATER SUPPLY PROJECT (SIMLY)	Pakistan	Mar 1989
THE WABAG WATER SUPPLY PROJECT	Papua New Genie	Sep 1978
THE RURAL WATER SUPPLY PROJECT	Yemen	Aug 1977
GREATER CAIRO WATER SUPPLY IMPROVEMENT PROJECT	Egypt	Jun 1977 ~ Dec 1978
UNDERGROUND WATER RESOURCES DEVELOPMENT PROJECT	Ethiopia	May 1973
GREATER NAKURU WATER SUPPLY PROJECT	Kenya	Mar 1987
MONTEREY WATER SUPPLY AND SEWERAGE PROJECT	Mexico	Oct 1992

The first Loan agreement year/month and the last Loan agreement year/month are described for multi-phased projects, etc.