Indonesia

Ex-Post Evaluation of Japanese Grant Aid Project

"The Project for Water Supply in Gunungkidul Regency of Yogyakarta Special Territory"

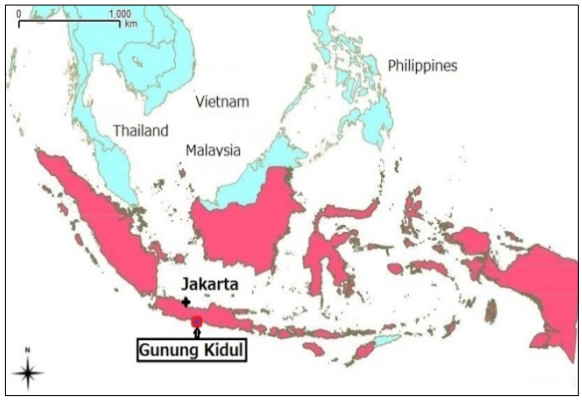
External Evaluator: Takayuki Kurita, ICONS Inc.

0. Summary

Project for Water Supply in Gunungkidul Regency of Yogyakarta Special Territory (hereinafter referred as "this project") was implemented for the purpose of improving water distribution facilities. Relevance of this project is high in terms of the development policy of Indonesia and needs for water supply in the target area. Effectiveness is fair because the targeted water supply population has not been achieved, although Impact is high as this project has contributed to improving the lives of residents in the target area. Efficiency is high as the project cost was less than planned, in addition in respect of the project period, this project was completed on schedule. Sustainability is fair as, even after the completion of this project, the local government-owned water company (the implementation agency of this project) carries out works in accordance with the plan and properly conducts staff training and technical management; however, although financial status has improved since 2012, there are still concerns in the long term.

Summing up the above points, this project is evaluated to be high.

1. Project Description



Project Location

Baron Atas catchment

1.1 Background

The project site, South area of Gunungkidul Regency, is located in the central part of Jawa.

Gunungkidul Regency is an area of permanent water shortage, and especially the targeted area of this project is karst plateau, therefore before the start of this project, only 30% of the local population in the targeted area of this project[1] could receive safe water. Also, even in case the residents receive provided water, the water supply was cut off for eight out of ten days, most people couldn't obtain

[1] As karst plateau allows easy osmosis water flow in the bedrock, so water-holding capacity is generally low and this causes water shortages.

necessary and enough amount of water for daily living, and residents were forced to use unsanitary water from rivers and shallow wells. Therefore, construction of water supply facilities as well as improvement of hygiene were the most important issues in the targeted area and this led to the implementation of cooperation project for public water supply.

1.2 Project Outline

The objective of this project is to contribute to improving the living environment of the residents through ensuring water supply for the residents and promoting safe and stable water supply by constructing a new water supply system in the south area of Gunungkidul Regency of Yogyakarta Special Territory.

Grant Limit / Actual Grant Amount	525million yen / 472million yen (I/II) 635million yen / 558million yen (II/II)
Exchange of Notes Date (Grant Agreement Date)	January, 2007 (I/II) July, 2007 (II/II)
Implementing Agency	Local Government of Gunungkidul Regency
Project Completion Date	April, 2008 (I/II) January, 2009 (II/II)
Main Contractor(s)	TOA Corporation
Main Consultant(s)	NIPPON KOEI CO., LTD
Basic Design	March 2005
Related Projects (if any)	Germany (GTZ): Underground dam construction

2. Outline of the Evaluation Study

2.1 External Evaluator

Takayuki Kurita, ICONS Inc.

2.2 Duration of Evaluation Study

Duration of the Study: December, 2011 – January, 2013

Duration of the Field Study: January 22, 2012 – February 14, 2012
and May 20, 2012 – June 2, 2012

2.3 Constraints during the Evaluation Study

Nothing Special

3. Results of the Evaluation (Overall Rating: B[2])

3.1 Relevance (Rating: ③[3])

3.1.1 Relevance with the Development Plans of Indonesia

Development projects in Indonesia are implemented under the "National Development Plan" (PROPENAS), which is established every five years. At the time of ex-ante evaluation of this project, "PROPENAS 2000-2004", which declared achievement of healthy living environment and supply of hygienic water in both urban and suburban areas as important goals, was under implementation.

"National Mid-term Development Plan (RPJM) 2010-2014", which was collected at ex-post evaluation, also declares poverty reduction as an important goal. This entails five important fields exist including the preparation of infrastructures, where water should be supplied through making the existing services more efficient and utilizing private sectors.

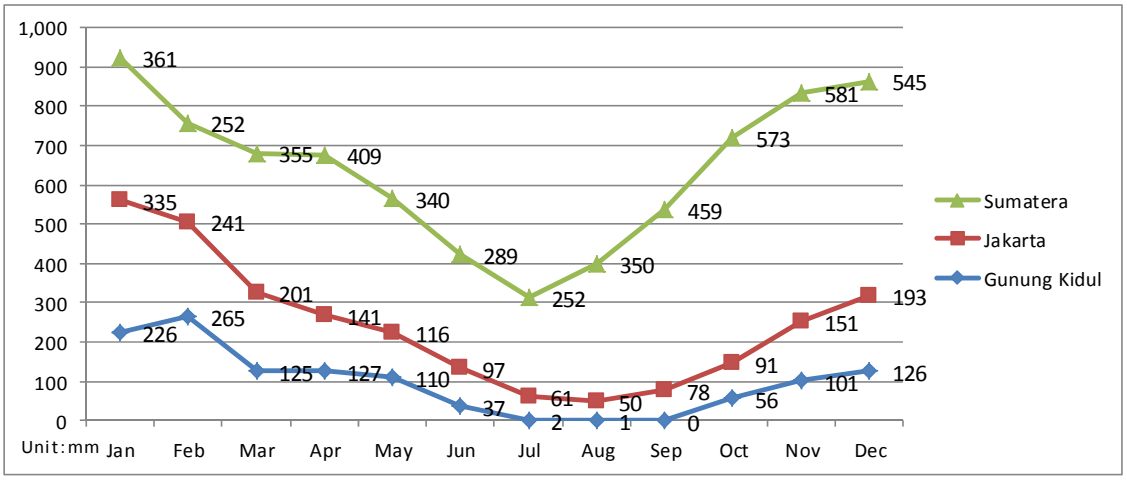
Thus the national development policy of Indonesia has been to keep declaring water supply as an important field from the time of basic design study to ex-post evaluation, and this project has been highly relevant with that development policy.

3.1.2 Relevance with the Development Needs of Indonesia

At the time of basic design study, the target area was very short of water in dry season since it had little rainfall compared to other areas, as shown in Figure 1. Since the target area is a karst plateau, it is very difficult to obtain safe water. About 70,000 inhabitants in this area were supplied with water by the Regency Water Supply Public Company (the organization that implements the operation and maintenance of this project, hereinafter referred to as "PDAM"), while 60,000 other inhabitants depended on water from water-supply trucks or reservoirs. The former, however, were still not supplied with enough drinking water especially in the dry season, when water from the water sources decreased in quantity, and the water supply had to be suspended eight days out of ten, or in some areas the water supply was completely stopped even if water supply pipes had been connected. Therefore, most inhabitants were forced to use unhygienic water such as river water and water from shallow wells, meaning that one sixth of the inhabitants suffered from water-induced diseases such as diarrhea. To improve such a situation, it became necessary to cooperate for the construction of water supply facilities.

[2] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[3] ③: High, ② Fair, ① Low



(Source) Gunungkidul dalam angka 2011 (Gunungkidul Regency Statistics Yearbook, 2011)

Figure 1 Rainfall in Gunungkidul Regency (2010)

On the other hand, there are two water sources in the target area: Ngobaran and Baron, which had facilities such as water collection pipes, etc.[4] At the time of basic design study, the water collection capacities of Ngobaran and Baron water sources were 80 L/sec and 15 L/sec respectively. Because of the earthquake that occurred in Central Java in 2006, there appeared cracks in the bottom of the reservoir of Ngobaran water source, and water flowed out from the reservoir. This caused the capacity of water collection at Ngobaran water source reservoir to drop to 15 - 20 L/sec. This decrease in water collection capacity in Ngobaran water source made it necessary to supply water from Baron Water source to the target area. In such situation, the water supplying facilities in Baron water source and those constructed in this project became much more important than before, since the development needs in the target area did not change from the time of basic design study, while the quantity of water collected in Ngobaran at the time of ex-post evaluation was reduced.

This project consists with the development needs at the time of ex-post evaluation, since it is possible to supply water economically, utilizing water from existing water source and existing facilities.

3.1.3 Relevance with Japan's ODA Policy

At the time of basic design study, the Government of Japan established "Country Assistance Plan for Indonesia" (2004), and listed as important fields "sustainable development by private sectors", "creation of democratic and fair society" and "peace and stability." In "creation of democratic and fair society" fields, improvement of basic services was listed as a concrete content.

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[4] The situation of the existing facilities before the implementation of this project were as follows:
Baron System: completed in early 1980's, two 15 L/sec water collecting pumps and three water distributing tanks ($50m^3 \times 2$ and $18m^3$) were installed, water was supplied every two days in usual and every three or four days in case of failure.
Ngobaran System: constructed in 1994-1995, three water collecting pumps and 13 water distributing tanks were installed (Source: JICA "Basic Design Study Report on the Project of the Construction of Water Supplying Systems in Gunungkidul Regency, Republic of Indonesia", 2005).

JICA's country development plan proposes "construction of areal infrastructures" and "construction of suburban infrastructures" considering that in Indonesia, there was a shortage of public properties necessary for the development of areas, and/or public services are insufficient in terms of both quality and quantity because of inadequate systems of operation and maintenance. In consideration of the above points, this project is judged to be consistent with Japan's ODA policy.

This project has been highly relevant with the country's development plan, development needs, as well as Japan's ODA policy, therefore its relevance is high.

3.2 Effectiveness[5] (Rating: ②)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

This project was implemented in order to improve the situation of water supply in the target area. At the time of basic design study, "Population of people who can obtain safe and stable water" was set up as an indicator. In this ex-post evaluation, in addition to the indicator, "Escherichia coli" and "Turbidity" are added as indicators in order to better understand the effectiveness of this project. The situation of their achievement is described below.

Table 1 Achievement of indicators

Indicators	Baseline (2001)	Actual (2001)	Target (2008)	Actual (2012)
Population of people who can obtain safe and stable water	< 40,000	24,382	93,800	≥ 48,860 (estimated as 57,000) ratio of increase: 45.5%[6]
Rate of residences connected to water supplying pipes	45%	18% (estimated)	70%	≥ 35.5%
Escherichia coli	positive	positive	negative	negative
Turbidity (Standard value of Indonesia: equal and less than 5NTU)[7]	-	1 NTU (October 2004)	-	2 NTU (July 2012)

(Source) Data from PDAM

At the time of ex-post evaluation, the population of the target area is 137,596[8], which is an increase of about 3,000 from the time of basic design study (134,000). On the contrary, according to the information from PDAM, 48,860 inhabitants (7,274 households) in this area are supplied with water. This value is the population estimated from the number of families that entered into contracts[9]. In addition, as the result of beneficiary survey[10], there were found some cases of buying water supplied by PDAM from neighbors without entering into contracts with PDAM (17.8% of the respondents sell

5 Sub-rating for Effectiveness is to be put with consideration of Impact
6 Calculated as (result of increment) ÷ (target value - baseline value)
7 NTU: Nephelometric Turbidity Units. Unit indicating the turbidity of the water
8 Source: data from Bureau of Statistics of Indonesia
9 PDAM calculates the number of inhabitants supplied with water, assuming the number of family members per household for each village (5 - 11). This ex-post evaluation also uses those values.
10 The beneficiary survey was implemented to selected 421 general residences in 37 groups in 19 villages, considering accessibility including road condition. In the investigation, four investigators visited each residence and interviewed following a prepared questionnaire.

water to neighboring families[11]). Therefore "the population of people who can obtain safe and stable water" is thought to be larger than the number of people that entered into contracts (estimated to be more than 57,000).

The reasons for the late achievement are the following two.

(1) High target values set up in the ex-ante plan of this project

At the time of ex-ante evaluation, it was assumed that less than 40,000 inhabitants (45%) were supplied with safe and stable water. This value is calculated from baseline survey in the basic design study[12]. According to the information from PDAM, however, only 24,382 inhabitants were supplied with water at that time. It is considered that the result was far from the target value because the baseline value was much higher than the reality.

(2) Electricity conditions in the target area

In 2009, it was difficult to increase the quantity of water supply, since the production cost was beyond the amount of sales due to the higher electricity charge for corporate persons (the details are described in "Sustainability")[13].

To improve this situation, the operating time of the pumps was expanded from 10 hours per day to 18 hours per day in April 2011. As a result, the percentage of fixed cost of personnel expenses and facility expenses decreased and the electricity cost for re-pumping from the water source located in lowland to each village located in highland (200- 300m) was cut down. And the selling revenue went beyond the production cost because of increased income due to increased water supply[14]. PDAM plans to continue the increase in water supply because increase of accounted-for water has so far resulted in the improvement of its financial situation.

As shown in Table 2, the water supply in the target area has been increasing since 2009 when this project was implemented, and the water supply situation is being improved. As shown in Table 3, enough water quantity is ensured and the water supply is possible through expanding the operating time of pumps by about one hour compared to the current situation, even if the population supplied with water becomes 93,000.

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[11] According to PDAM, the reasons people buy water from neighbors without entering into contracts with PDAM are as follows: ① People do not like to pay the initial installation expense (at least Rp. 450,000, depending on the distance from the water supplying pipe to the residence) and ② people do not want to pay the fundamental charge (Rp. 37,000) in rainy season in which they need little water supplied by PDAM, etc.

[12] The baseline survey was implemented on total 312 samples from 26 villages of the area supplied with water in this project, 12 samples per village.

[13] According to the data of 2009 from PDAM, the mean sales price was Rp. 2,937 per m^3, while the mean production cost was Rp. 4,053 per m^3, resulting in a deficit of Rp. 1,116 per m^3.

[14] As the policy of PDAM, it does not charge the basic fee to inhabitants of areas served with less water than the maximum quantity ($10m^3$), such as highlands. According to a staff member of PDAM, however, it became possible to charge due to the increase in water supply in many cases.

Table 2 Water quantity data in the target area (unit: m^3)

	2005	2006	2007	2008	2009	2010	2011
Pumped	7,920,463	6,757,044	6,831,965	6,312,729	7,181,517	7,548,469	9,538,811
Supplied	7,627,251	6,655,689	6,711,194	6,201,435	6,726,151	7,390,218	9,392,920
Accounted-for water	4,204,902	4,192,851	4,505,210	4,706,595	5,151,901	4,871,134	5,343,952
Non-Revenue Water	3,501,237	2,462,829	2,205,984	1,444,840	1,574,322	2,519,084	4,048,968
Non-Revenue Water Ratio	44.20%	36.45%	32.29%	22.89%	21.92%	33.37%	42.45%

(Source) Data from PDAM

Table 3 Water sources and water supply capacity of PDAM

	Water quantity (m^3/day)	a) Water supply capacity (L/sec)[15]	Operating time	b) Water supply capacity (m^3/day)	Before this project (m^3/day)	Water demand (m^3/day)[16]
Ngobaran	5,184	20	18 hours	1,296	3,200	
Baron	432,000	100	18 hours	6,480	Unknown	**7,960**
Total water quantity	**437,184**		**Total water supply capacity**	**7,776***		

* Water supply capacity is calculated under the assumption of the current operating time of 18 hours per day. If it is expanded to 19 hours per day, the capacity is estimated to become 8,208 (m^3/day).

(Source) The author, referring JICA: "The basic design study report on the project for water supply in Gunungkidul Regency of Yogyakarta Special Territory in the Republic of Indonesia"

Though the population supplied with water has not reached the target, the water supply situation has been greatly improved by this project. Before this project, in the target area, the inhabitants were supplied with water no more than once a week, even in areas where water supplying pipes were installed, and were forced to purchase water mainly from water-supply trucks. At the time of ex-post evaluation, however, the inhabitants in the target area get water more and more from PDAM compared to the baseline survey as shown in the following Table 4, the result of beneficiary survey, and about 80% of the investigated inhabitants answered that they use the water supplied by PDAM for both drinking and other living purposes in the dry season.

As shown in Table 5, the water supply situation has improved so that almost all the inhabitants have become capable of getting water at least once per week after the implementation of this project. The percentage of the inhabitants supplied with water every day decreased compared to the result of the baseline survey: this is thought because the baseline survey was a sampling investigation. However, it is thought that this project was effective, since more than 60% of the inhabitants designated that "it became easier to get water" as a benefit of this project (see Table 6).

[15] a) Water supply capacity (L/sec) indicates the capacity of water supplying pumps at each water source, while b) Water supply capacity (m^3/day) indicates the value of each pump multiplied by the operating time.

[16] Source: JICA, "The basic design study report on the project for water supply in Gunungkidul Regency of Yogyakarta Special Territory in the Republic of Indonesia", 2005

Table 4 Source of water obtained by inhabitants in the target area (multiple answers allowed)

(Unit: percentage of answers)

	Drinking water				Water for living purposes			
	Rainy season		Dry season		Rainy season		Dry season	
	BL survey	Ex-post	BL survey	Ex-post	BL survey	Ex-post	BL survey	Ex-post
Personal water supply	N/A	0.46%	N/A	0.38%	N/A	0.00%	N/A	0.00%
Public water tap	1.90%	2.05%	0.00%	0.38%	1.30%	1.97%	0.00%	0.36%
Well	7.40%	0.46%	7.10%	0.19%	8.30%	0.22%	7.10%	0.18%
Groundwater	6.70%	0.00%	4.50%	0.00%	6.10%	0.00%	3.20%	0.00%
Rainwater (reservoir tank)	5.40%	6.39%	74.70%	43.76%	4.50%	8.77%	73.40%	41.79%
River water	0.60%	0.23%	0.00%	0.38%	1.90%	0.88%	0.30%	1.09%
Water-supply truck	50.00%	4.57%	0.30%	0.77%	51.30%	4.17%	0.60%	0.55%
Reservoir	0.00%	0.00%	0.00%	0.00%	4.20%	0.88%	4.80%	0.36%
Purchasing from neighboring inhabitants	3.20%	4.57%	1.30%	0.96%	3.20%	3.51%	1.30%	0.91%
PDAM	24.70%	81.28%	12.20%	52.98%	19.20%	79.61%	9.30%	54.74%

(Source) Result of beneficiary survey

*BL survey: acronym of baseline survey

Table 5 Water supply situation in the target area

(Unit: percentage of answers)

Questions		At time of baseline investigation[17]	At time of ex-post evaluation
How many days is water supplied per month?	Every day	19%	5.19%
	More than once per week	15%	90.65%
	Less than once per week	N/A	4.16%
	More than once per month	16%	0%
	Less than once per month	21%	0%
	No supply	29%	0
How long is water supplied per day?	Anytime	No BL data available	4
	12~18 hours		37
	6~12 hours		150
	Less than 6 hours		191

(Source) Result of beneficiary survey

3.2.2 Qualitative Effects

Since the operation and maintenance system for water supplying systems by the Special Region of Yogyakarta and Gunungkidul Regency was inadequate, technical guidance was performed on

[17] Implemented in September 2004 for 12 samples per village, 26 villages, total 312 samples (households).

maintenance and financial management in this project, and the acquired technology is utilized in the work. Its effectiveness is described in “Sustainability”.

3.3 Impact

3.3.1 Intended Impacts

(1) Economic effects because the inhabitants were able to get water more easily

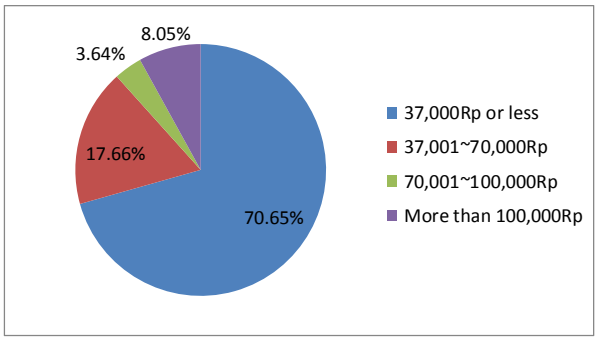
As the result of beneficiary survey, the inhabitants received the following benefits after the implementation of this project.

Table 6 Benefit for the inhabitants due to this project (multiple answers allowed)

Benefit	Number of answers	Answers %
Lower water expenses	267	63.42%
Getting water more easily	257	61.05%
Being able to get enough amount of water	44	10.45%
General improvement in lifestyle	42	9.98%
Clean water available	25	5.94%
Useful for business	7	1.66%
Contribution to health	4	0.95%
Disappearance of water disputes	1	0.24%

(Source) Result of beneficiary survey

Result of interview investigation to the inhabitants shows that they used to get water mostly from water-supply trucks before this project. Water from trucks was sold at the price of 50,000Rp/5m^3 and most residents paid about 100,000Rp (about 860JPY) per month in the dry season. After PDAM started supplying water, however, most residents (about 72% of residents paying charge for water supply to PDAM) pay 37,000Rp (basic charge for consuming 0 - 10m^3 of water) as shown in Figure 2, then the economic burden is lightened.



(Source) Result of beneficiary investigation

Figure 2 Charge for water supply paid by the inhabitants

(2) Reduced time for water collection

As the result of beneficiary survey, no effect regarding “reduced time for water collection” was confirmed, although this effect was expected at the time of basic design. One of the reasons is that there were few cases of water collection, since rainwater and water purchased from water-supply

trucks were mainly used in the target area. It is thought that the effect of "reduced time for water collection" did not have to be assumed at the time of basic design study.

(3) Reduction in water-caused diseases

As the result of site survey, it was found that it was impossible to measure the reduction in water-caused diseases. It was confirmed in the beneficiary survey that in most houses in the target area, people store water in reservoir tanks and mix water from PDAM and rainwater in the tanks, and no households use tap water directly.

It is considered that it is unavoidable for residents to secure enough water by mixing rainwater and tap water even after the completion of this project given living practice and the situation not being supplied water all the time.

Photo: Common reservoir tank used by the inhabitants. Water supplied from PDAM is stored through pipes and rainwater and tap water are mixed there and used.

On the other hand, most of the inhabitants in the target area concern very much that the supplied water is hard. Though there is no scientific proof that drinking hard water affects health, medical facilities in the target area indicate that tap water must not be drunk directly since it contains much potassium. Such activity has been performed since before the start of this project. The inhabitants generally boil water before drinking to remove potassium and purify. A medical facility in the target area said that in 2012 there are no confirmed diseases caused by drinking hard water. The hardness satisfies the water quality criteria of Indonesia[18]. It is desirable that PDAM and medical facilities hold explanatory meetings on the measures to deal with hard water etc. together in order to remove the excess reaction and anxiety of the inhabitants.

3.3.2 Other Impacts

(1) Impacts on the natural environment

On holidays, Baron water source becomes a place of rest and relaxation for people living in the local area and surrounding cities. The staff members of Public Works Bureau of the regency and PDAM were interviewed on the impacts on the natural environment of this project and they answered as follows:

- After the implementation of this project, no complaint was made by the inhabitants on noise, vibration and drainage of dirty water etc. caused by the operation of water collection pumps and water distribution pumps.
- The Waste Treatment Unit of Public Works Bureau of the regency once implemented environmental monitoring when the works of this project started in order to confirm existence and

[18] Water quality tests show not more than 90mg/l, while the criterion of Indonesia is 500mg/l (as of July 2012).

non-existence of influence of construction. Check items were existence and non-existence of modification of the natural environment, the existence and non-existence of influence of the protection of natural resources and natural relics, etc., and there was no designated point. Environmental monitoring was not performed during the period of the work.

- As a problem occurred during the period of the work, there were cases excavated soil became piled up on roads and hindered vehicle traffic. The soil was backfilled during the installation of pipes and caused no problem at the time of ex-post evaluation.

In consideration of the above points, no serious impact is confirmed on natural environment.

(2) Land Acquisition and Resettlement

The Indonesian side acquired 9,412m^2 of land to construct reservoirs at the time of implementation of this project. Such works were performed mainly by the National Land Agency of Gunungkidul Regency. It consisted of the procedure of (1) explanatory meetings to the inhabitants and (2) land acquisition agreements with the inhabitants after price negotiation following the juristic system of Indonesia. The price was basically 150,000Rp (about 1,300JPY) per square meter and some differences occurred due to the conditions of the land (land appropriateness for agriculture, land near a road, etc.) and the contents of the negotiation. A staff member of the National Land Agency of Gunungkidul Regency commented that the necessary land was acquired under the agreement of all landowners and no resettlement of the inhabitants occurred since the land purchased for this project was idle.

In consideration of the above points, no serious impact is confirmed on land acquisition and resettlement as well.

(3) Other Impacts

Many female inhabitants commented that before the implementation of this project, especially in the dry season, they had to spend about three hours for washing their clothes in neighboring ponds etc., but after the completion of this project, the time necessary for washing clothes was reduced to about 30 minutes, thereby helping reduce their workloads.

In the beneficiary survey, there were comments that, thanks to the stable supply of water, they became able to bathe even in the dry season and this project contributed to the activation of businesses such as laundry and fish farming in reservoir ponds (water supplied by PDAM is also used) by the inhabitants in the target area.

In consideration of the above points, regarding “the population served with safe and stable water” compared with actual water supply population in 2001, the water supply population in 2012 has doubled. However as (1) the target value that was set based on the results of the baseline survey at the time of the basic design study was too high, and (2) only around 1,000 PDAM connections were implemented per year, the number was not reached to the target. On the other hand, as a result of beneficiary survey, the improvement of water supply conditions was confirmed in that water can be

obtained more easily and so on. No serious negative impact was found on natural environment, land acquisition and resettlement, while positive impacts such as reduction in economic burden (charge for water supply) of the inhabitants were confirmed. This project has somewhat achieved its objectives, therefore its effectiveness is fair.

3.4 Efficiency (Rating: ③)

3.4.1 Project Outputs

The outputs of this project are listed in Tables 7 and 8 below. There is no difference between the plan and the result.

Table 7 Outputs of this project (Japanese side)

Items	Contents	Difference analysis
Construction of water collecting facilities	2 sites	No difference
Installation of distribution ponds and pumping facilities	7 sites	No difference
Installation of water sending pipes	Total length: 26,600m	No difference
Installation of water distribution pipes	Total length: 13,600m	No difference
Soft component	Instructions on maintenance, execution and finance	No difference

Table 8 Outputs of this project (Indonesian side)

Contents	Difference analysis
Land acquisition, tree felling, land development, fences, gates, electricity generation facilities, various procedures and expenses (total 58 million JPY)	No difference

3.4.2 Project Inputs

3.4.2.1 Project Cost

The project cost planned at the time of ex-ante evaluation and the actual cost are listed in Table 9 below. The actual costs of phases I/II and II/II were both lower than planned.

Table 9 Project Cost

	Project cost at the time of ex-ante evaluation	Actual Project cost	Ratio to the planned
Phase I/II	525 million JPY	472 million JPY	89.9%
Phase II/II	635 million JPY	558 million JPY	87.9%

3.4.2.2 Project Period

The period of this project planned at the time of ex-ante evaluation was 32 months from the detailed design to the completion. However, the target area of this project was affected by the earthquake that occurred in the middle of Java Island in 2006. This project was delayed because of safety confirmation for construction works. Discontinuation period were from July 2006 to January 2007. After the safety was confirmed, implementation review study was performed and the period was planned to be 24 months. After that, the exchange of notes (E/N) on this project was signed by the Government of

Indonesia and the Government of Japan and this project was restarted. Phase I/II was completed on April 4, 2008 after signing the consultant agreement on February 2, 2007, and Phase II/II was completed on January 23, 2009 after signing the consultant agreement on August 9, 2007. The total period of Phase I/II and Phase II/II was 24 months, which was as planned.

In consideration of the above points, both project cost and project period were within the plan, therefore efficiency of this project is high.

3.5 Sustainability (Rating: ②)

3.5.1 Structural Aspects of Operation and Maintenance

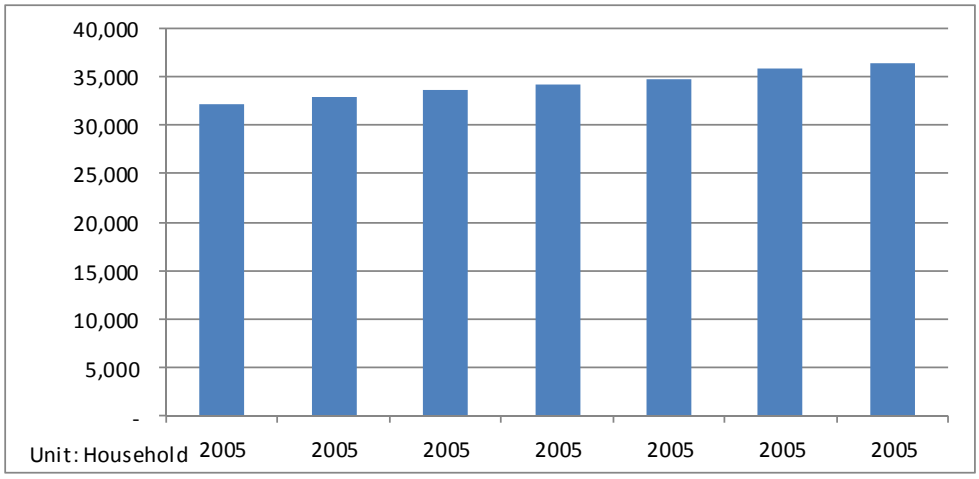
The Gunungkidul Regency Public Works Bureau constructed the pump facilities between the distribution ponds and distribution pumping facilities using the budget of the Department of Public Works, and PDAM is in charge of managing the facilities and operating and maintaining the pipes that connect the distribution pumps to each household. PDAM also possesses the design drawings and completion drawings required for maintenance and conducts repairs of distribution pipes. Incidentally, because PDAM as a public corporation is prohibited under Indonesian law from receiving budget for design and construction work conducted as activities of the Department of Public Works, these activities are the responsibility for Gunungkidul Regency Public Works Bureau.

Gunungkidul Regency PDAM has a permanent workforce of around 155 members and it periodically recruits new staff. In 2011 it recruited six new engineers and in this way appropriately enhances its manpower. Meanwhile, employees of the regency public works bureau are recruited by the head office in Yogyakarta, after which they are either dispatched to Yogyakarta or are directly recruited by the regency public works bureau. Personnel are never assigned from the Department of Public Works or regency public works bureau to PDAM.

According to the interview survey of employees in related agencies, all personnel realize it is their mission to “Provide stable water supply to residents,” indicating that the vision of the organization is clearly permeated among the workers.

3.5.2 Technical Aspects of Operation and Maintenance

After the completion of this project, planning and implementation of water supply expansion by the regency public works bureau and operation of facilities by PDAM have been conducted as planned without mishap, indicating that there are no technical problems. Figure 3 indicates movements in the overall number of pipe connections that have been conducted in Gunungkidul Regency including this project target area.



(Source) Data from PDAM

Figure 3 The number of households connected to the pipe in Gunungkidul overall

Table10 Water supply expansion plans in the target area covered by this project in the future

Year	No. of water supply households	Rate of target achievement
2011	7,274	53%
2012 (plan)	9,695	75%
2013 (plan)	11,634	90%
2014 (plan)	12,927 * Population: approximately 93,000	100%

(Source) Data from PDAM

Concerning future plans, as a result of interviews with PDAM employees and data obtained from PDAM, it is found that PDAM is planned to expand the water supply area and realize a supply population of 93,000 (estimated as 12,927 households) by 2014. As is indicated in Figure 3, PDAM implements the planned connection of water distribution pipes, and both the amount of water supply and the number of supply population are increasing each year. Moreover, according to the interviews with PDAM employees, since pipe repairs have been completed in areas where installed pipes were leaking, it is expected that the number of supply population will increase even more from now on. Meanwhile, as is indicated in Figure 3, since the number of households connected to the pipe in Gunungkidul Regency overall has been increasing by about 1,000 households per year, it will be necessary to secure even more budget and personnel to ensure the realization of future plans.

Concerning the expansion and training of personnel, new employees are recruited at periodic intervals, and training is constantly provided by the Department of Public Works and regency public works bureau. PDAM does not keep training records, however, according to the interviews conducted with related personnel, in addition to OJT (on-the-job training) conducted in regular work, training opportunities are offered to each employee around five to seven times per year[19]. The regency public works bureau determines the contents of training based on requests from PDAM. Moreover, training is constantly implemented at the training center in the head office of the Department of Public Works,

[19] Contents of training include operation and maintenance of regional agencies, sanitary control of water supply, fundraising management and so on.

and the technical management setup is established based on the ministry.

Furthermore, in the soft component, guidance was implemented concerning the preparation and recording of facilities control ledgers, and maintenance and monitoring of facilities and equipment. All PDAM employees who received this training are still working and are engaged in controlling ledgers, cleaning settling basins, checking and maintaining pumps and pipes and conducting sterilization of E. coli utilizing the systems and guidance contents that were provided in the soft component.

3.5.3 Financial Aspects of Operation and Maintenance

The basic water charge is set as 37,000 rupiah (approximately 320 yen)/10m^3 per month, and charges are set according to the amount of water used. There is no data concerning charge collection rates, however, according to the beneficiary survey, it was confirmed that all respondents except for one pay their water bills. Moreover, in the interview survey of PDAM employees, it was found that payment of charges by residents is carried out appropriately based on the readings of water meters in each household.

Concerning collection of charges, an invoice issue system was introduced under the soft component and personnel utilize this upon receiving guidance. A database is maintained with respect to the operation of collections, recording of ledgers, control of payments, and handling of complaints concerning charges. Moreover, as a result of interviews with PDAM employees, there are no problems such as late collection of charges, while customer complaints have stopped arising thanks to the improvement of water supply conditions in this project. Therefore, the effects of this project are recognized.

PDAM finances are managed by the system that was introduced by the BPKP (Financial Development Comptroller: the agency responsible for government internal audit). Depreciation came to be included under the system that was introduced around 2006, and the financial condition of PDAM has been improving in recent years, although it is still in the deficit balance. See Table 11 for detailed data.

Table11 Income and Expenditure Data of PDAM (From 2006 – November, 2011)

(Unit: Million Rupiah)

	2006	2007	2008	2009	2010	As of November 2011
Income	9,866	12,220	12,761	16,253	18,863	18,614
Profit after depreciation	-9,029	-8,451	-5,895	-4,888	-2,956	-58

(Source) Data from PDAM

Since the finances show a deficit following depreciation in recent years, in cases where PDAM needs to upgrade equipment, it is unable to secure the necessary budget under its own finances. However, Yogyakarta Special Territory, to which Gunungkidul Regency belongs, ordinarily offers financial support and allocates budget for the rehabilitation of facilities and upgrade of equipment. Table 12 shows data pertaining to the budget and subsidies offered by the government of Yogyakarta

Special Territory regarding drinking water projects.

Table 12 Budget on drinking water project in Yogyakarta Special Territory

(Unit: Rupiah)

	Budget on drinking water projects in Yogyakarta	Subsidy on other drinking water projects	Total
2006	16,610,000,000	4,960,000,000	21,570,000,000
2007	11,695,778,000	9,850,000,000	21,545,778,000
2008	11,487,536,000	10,346,000,000	21,833,536,000
2009	33,532,000,000	14,667,000,000	48,199,000,000
2010	27,433,000,000	3,100,628,182	30,533,628,182
2011	41,990,800,000	4,409,240,000	46,400,040,000

(Source) Data from Department of Public Works in Yogyakarta Special Territory

The primary reasons for the deficit of recent years have been high production costs mainly caused by high power tariffs, and the high ratio of non-revenue water. Details are given below.

(1) Production costs arising from high power tariffs

PDAM is unable to secure sufficient budget to pay the high corporate power tariffs.

The annual revenue of PDAM is around 18,000 million rupiah, and power charges account for approximately 20% of total income (Table 13 shows the monthly electric bill for the Baron system).

However, concerning production costs, following increase in the operating time of water supply pumps in the Baron system from 10 hours to 18 hours in April 2011, the ratio of fixed costs such as personnel expenses and equipment costs has decreased; moreover, due to reduction in the cost of power for pumping water from sources in lowland areas to villages in highland areas, production costs have been reduced and the amount of water supply has increased, thereby leading to a gradual improvement in the situation. As is shown in Table 14, gross profit of the Baron system alone had been deficit up to 2011, however, it has greatly improved in 2011 and 2012 compared to 2010, and the sale price has come to exceed the production cost since 2012. Judging from the results of the interview survey with PDAM employees too, PDAM reckons that the financial situation can be further improved through extending the operating time of water supply pumps. It will be necessary to strive for further improvements over the long term in future to ensure that water supply can be conducted with such a surplus.

Table13 Monthly electric bill in Baron system (2011)

(Unit : Rupiah)

January	160,380,570
February	116,313,085
March	70,022,245
April	174,459,465
May	111,017,030
June	224,426,231
July	304,238,921
August	361,927,581
September	298,807,014
October	292,326,982
November	321,382,714
December	317,356,245
Total	**2,752,658,083**

(Source) Data from PDAM

Table 14 Income and expenditure situation in Baron system

(Unit: Rupiah)

	Total in 2010	Total in 2011	2012 (Jan- Feb)
A Billed water rate			
1 Water rate	2,099,896,400	3,391,096,450	451,545,000
2 Administration charge	94,636,000	126,992,000	22,308,000
3 Income from maintenance	236,590,000	317,455,000	56,020,000
B Other business income			
1 Income other than water project	1,467,932,900	46,525,000	5,574,000
2 Other income	0	40,757,850	1,307,950
C Administrative cost			
1 Direct expense	3,407,616,261	3,902,869,770	365,911,690
2 Administration overhead	235,530,970	436,376,452	80,974,529
D Gross profit	-1,301,821,931	-416,419,922	89,968,731

(Source) Data from PDAM

(2) Concerning the non-revenue water ratio

The regency public works bureau is also conducting appropriate repair works in order to deal with theft of water and leaks from broken pipes. As is shown in Table 2, both the quantity and ratio of non-revenue water have been increasing since 2010. There are two reasons for this.

① In areas where water distribution pipes had already been installed but water supply was not carried out prior to implementation of this project, water leaks from damaged pipes and so on were discovered for the first time when water supply was started thanks to the greater water intake made possible by this project,.

② The policy of PDAM is to not levy the basic charge from inhabitants in areas (highland areas, etc.) where water supply does not reach the peak capacity ($10m^3$)[20]. Moreover, in interviews conducted with PDAM employees, it was reported that PDAM is not charging inhabitants in those areas where water supply wasn't conducted before this project as a form of promotional campaign.

Meanwhile, as is shown in Table 2, concerning water leaks, the non-revenue water ratio was falling every year until 2009 when this project was commenced. PDAM employees conduct daily visual checks of distribution pipes and immediately respond to failures and accidents by performing confirmations and repairs. Moreover, since PDAM has plans to repair pipes in areas where water supply is newly commenced, it is anticipated that the ratio of non-revenue water will decline further from now on. As for the non-collected water charges indicated in ②, the situation is expected to

[20] Amount of uncollected water charge is unknown although inquiry has been made to PDAM.

improve due to the increase in water supply volume; moreover, if charges can be introduced in the areas where the supply capacity is less than $10m^3$, there is a potential that the amount of collected water charges will increase even more and this will lead to further improvement of the financial situation.

3.5.4 Current Status of Operation and Maintenance

PDAM conducts the following kind of routine maintenance with respect to the facilities and equipment provided in this project, and it is implementing the water supply without any problem.

- Checking of water transmission pipes (implemented daily)
- Daily checking of water quality and transparency in Barn Atas distribution ponds (visual). Turbidity is also checked wherever necessary (30 NTU is set as the post-treatment target).
- Cleaning of filters in three distribution ponds of Baron Atas (once per month)
- Continuous sterilization based on chlorine injection
- The public sanitation section of Gunungkidul Regency conducts water quality inspections at all times (and following heavy rains during the rainy season).

Table 15 below shows the results of water quality tests for Baron as reference. Indonesia national standards are met in all items

Table 15 Water examination results in Baron (as of July 2012)

Test item	Unit	Result	Standard value of Indonesia
Odor	-	Odor free	Odor free
Chromaticity	TCU[21]	3	15
Residue on evaporation	mg/l	190	500
Taste	-	Tasteless	Tasteless
Arsenicum	mg/l	-	0.01
Fluorine	mg/l	0.09	1.5
Total chromium	mg/l	＜0.0126	0.05
Cadmium	mg/l	＜0.0015	0.003
Nitrous acid	mg/l	＜0.0025	3
Nitric acid	mg/l	6.58	50
Cyanogen	mg/l	-	0.07
Selenium	mg/l	-	0.01
Aluminum	mg/l	-	0.02
Iron	mg/l	0.3774	0.3
Hardness	mg/l	89.10	500
Chlorine	mg/l	7	250
Manganese	mg/l	0.0129	0.4
pH	-	7.6	6.5-8.5
Zinc	mg/l	0.5639	3
Sulfuric acid	mg/l	＜2	250
Copper	mg/l	＜0.0098	2
Ammonia	mg/l	0.0106	1.5
Hydrargyrum	mg/l	-	0.001
Antimony	mg/l	-	0.02
Barium	mg/l	-	0.7
Boron	mg/l	-	0.5

[21] TCU: True Color Unit

Molybdenum	mg/l	-	0.07
Nickelic	mg/l	-	0.07
Natrium	mg/l	-	200
Chlorine residual	mg/l	No detected	5
Lead	mg/l	-	0.01
Uranium	mg/l	-	0.015
Organic substance	mg/l	-	10

(Source) Data from PDAM

Concerning spare parts, whereas some of them could not be procured before because they were too expensive or were not available locally, at the time of the ex-post evaluation survey, they were being purchased as required, and the facilities were operating smoothly.

In addition to the routine monitoring carried out by employees, computer maintenance is conducted based on the periodic facilities maintenance alarm system that was introduced and instructed in the soft component. Currently, four computers are being used (in addition to eight office computers) and data is shared by means of centralized management. PDAM maintains the system and, following implementation of the soft component, it has operated the computers while making modifications and so on[22]. As a result, water transmission and distribution facilities are maintained and the water supply is smoothly continued through performing inspections and repairs of equipment and facilities before failures occur. Therefore, this project is deemed to have been effective.

Summing up the above points, while operation and maintenance system for this project is deemed to have no problem in terms of both structural and technical aspects, some problems has been observed in terms of the financial condition. Therefore sustainability of this project effect is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project was implemented for the purpose of improving water distribution facilities. Relevance of this project is high in terms of the development policy of Indonesia and needs for water supply in the target area. Effectiveness is fair because the targeted water supply population has not been achieved, although Impact is high as this project has contributed to improving the lives of residents in the targeted area. Efficiency is high as the project cost was less than planned, and this project was completed on schedule in respect of the project period. Sustainability is fair as, even after the completion of this project, the local government-owned water company (the implementation agency of this project) carries out works in accordance with the plan and properly conducts staff training and technical management; however, although financial status has improved since 2012, there are still concerns in the long term.

Summing up the above points, this project is evaluated to be high.

[22] PDAM adopts a system for automatically notifying the schedule of periodic repairs and inspections of equipment and facilities on PCs to ensure they are definitely implemented. In addition to visual checks, equipment and facilities undergo repairs and inspections based on this system. This system also manages complaints from inhabitants and responds by conducting repairs whenever necessary.

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

(1) Project management by PDAM

Since residents indicated a high level of satisfaction regarding services provided by PDAM at the time of the ex-post evaluation, it is desirable that it maintains current service levels and tries to further improve profitability through increasing water supply capacity (by extending pump operating times and so on), increasing sales and reviewing water charges if necessary.

(2) Response to hard water

A number of residents in the target area made comments concerning the fact that hard water is supplied. There is no scientific proof that drinking hard water affects health, and public health and medical facilities have no data that points to a health risk. Moreover, the hardness satisfies the water quality criteria of Indonesia; however, it is desirable to stage public meetings in order to allay the concerns of the inhabitants and explain that risks can be eliminated through boiling the water.

4.2.2 Recommendations to JICA

Nothing special

4.3 Lessons Learned

The findings of the baseline survey, which was the basis for the target numerical values indicated in the preliminary planning table, significantly deviated from reality. In view of this, it is desirable to set appropriate target year and values to be configured upon grasping the local conditions.