Indonesia

Ujung Pandang Water Supply Development Project (Stage 1)

External Evaluator: Takuya Okada

Field Survey: October 2004

1. Project Profile and Japan's ODA Loan

Project site location map

Water treatment facilities (settling tanks)

1.1 Background

Ujung Pandang (Makassar hereunder[1]), the capital city of South Sulawesi Province, is developing as a hub for economic and administrative activity in eastern Indonesia. When the appraisal was undertaken for this project (1993), the municipality's mains water was being supplied by the Panaikang Water Treatment Plant, which is located virtually in the center of the city and Ratulangi Water Treatment Plant which is located west of the city[2]. At that time, just one third of the city's population of 980,000 had access to mains water (the service population) and there was an urgent need to build a new water treatment plant in order to expand the service population in line with municipal development. In addition, inadequate water pressure from household faucets due to heavy leakage from aging water mains meant that there was also a pressing need to rehabilitate the existing mains pipelines.

1.2 Objectives

This project's objective was to meet water demand in Ujung Pandang (now Makassar) in South Sulawesi Province through the construction of new water treatment facilities, thereby promoting economic growth and contributing to improvements in the health and hygiene of local residents.

1.3 Borrower/Executing Agency

[1] Ujung Pandang was renamed Makassar in October 1999. With a population of 1.13 million (2004) and spanning an area of 176km^2, Makassar is slightly larger than Saitama City, Japan (pop. 1.07 million, municipal area: 168 km^2).

[2] Panaikang Water Treatment Plant (supply capacity 500 liters/sec.) was constructed in 1979 and expanded in 1991 (1,000 liters/sec.) By contrast, the Ratulangi Water Treatment Plant (supply capacity 50 liters/sec.) was constructed in 1924.

Government of the Republic of Indonesia/Directorate General of Human Settlements (now the Directorate General of Urban and Regional Development) under the Department of Public Works (DEP-PU)/Ujung Pandang Water Utility (PDAM) (now Makassar PDAM)

1.4 Outline of Loan Agreement

Loan Amount/Disbursed Amount	7,034 million yen/6,850 million yen
Exchange of Notes/Loan Agreement	October 1993/November 1993
Terms and Conditions Interest Rate Repayment Date (Grace Period) Procurement	 2.6% 30 years (10 years) General untied
Final Disbursement Date	June 2002
Main Contractors	DEGREMONT SA, PT. AHDI KARYA, etc.
Contracted Consultants	Nihon Suido Consultants, Co., Ltd., etc.
Feasibility Studies (F/S), etc.	1985: Master Plan (M/P), F/S, JICA 1987: IP-317 Ujung Pandang Water Supply Development Project (E/S) (Engineering Services contract) 1988: IP-332 Ujung Pandang Water Supply Rehabilitation Project

2. Results and Evaluation

2.1 Relevance

2.1.1 Relevance of project plans at appraisal

Indonesia's fifth five-year development plan (REPELITA V: 1989-1993) sets forth the following policy goals for Makassar: improve municipal water supplies, extend distribution networks, and regulate the siphoning-off of groundwater to prevent subsidence and saltwater intrusion. The development of Makassar as a center of commerce in eastern Indonesia had also been identified as a priority for regional economic growth. The city was then suffering from supply shortages due to insufficient water resources and inadequate water treatment and supply capacity, and mains water was available to just 30% of the population. There were thus calls to expand water treatment and supply capacities and to enlarge the service area. Accordingly, this project was a high priority undertaking that was designed to meet demand for water in Makassar[3].

2.1.2 Relevance of project plans at evaluation

PROPENAS (2000-2004), Indonesia's current development plan is calling for the service levels of public facilities and infrastructure, such as improvement of water supply rate and expansion of distribution networks, to be maintained and improved. The

[3] Ahead of this project, in 1988 Japan extended an ODA loan to Indonesia to fund the rehabilitation of the existing Panaikang and Ratulangi water treatment plants, the replacement of pipelines in northern areas of the city (main pipes: 17km; branch pipes: 140km), etc.

government is continuing to champion the development of Makassar, a central city in eastern Indonesia, as a priority for regional economic growth. Under these circumstances, shortages of treated water continue to plague the city, and the necessity of expanding water treatment and supply capacities and of enlarging the service area remains current. As this shows, the project has maintained a high degree of significance in that it is attempting to meet demand for water in Makassar.

2.2 Efficiency

2.2.1 Outputs

A comparison of planned and actual outputs for this project is given in Table 1. Output components included in the original plans were completed as scheduled with extensions. Further, because age-related deterioration of both raw water and service pipes was an ongoing problem at the existing Panaikang Water Treatment Plant, rehabilitation of raw water pipes and laying of mains pipes were added to the project's outputs.

Table 1: Comparison of Planned and Actual Outputs

Planned	Actual
[Original outputs] Construction of Somba-Opu Water Treatment Plant : 1,000 liters/sec.[4] Laying of main service pipes : 75.5 km Laying of branch service pipes : 350 km Installation of faucets (with meters) : 61,000 units	As planned Extended to 116 km Extended to 521 km As planned
	[Additional outputs] Rehabilitation of raw water conduits: 5.0 km Laying of main service pipes: 2.1 km Detailed design (D/D) for additional outputs

2.2.2 Project Period

The loan agreement for this project was signed in November 1993, with the implementation schedule set at 58 months and completion scheduled for August 1998. However, a review of the consulting services component pushed back the start of the consultant selection process (by approx. 7 months), this delay was compounded by the preliminary survey of the contractor undertaken for the equipment purchase and auxiliary work order package and the executing agency's inexperience in handling office procedures, which held up the bidding and contractual process (by upwards of one year); the start of subsequent processes and the completion schedule were pushed back and the project, including the additional outputs, was finally completed in March 2002 (an

[4] 1,000 liter per second equates to filling approximately 1,600 bottles of beer, or slightly less than one-twentieth of the capacity of the Tokyo Kanamachi Water Treatment Plant (1.6M m^3/day; supplies water to 2.5 million residents in 9 adjacent wards).

overrun of 101 months). Omitting the additional outputs, originally planned components were completed 81 months after the L/A signing in July 2000, i.e. an overrun of 23 months, or 39 % on the original estimate.

Table 2: Comparison of Planned and Actual Implementation Schedules

	Planned	Actual
Loan agreement	November 1993	As left
Consultant selection	Jul. 1993 – Jun. 1994	Feb. 1994 – Dec. 1994
Consulting services	Jul. 1994 – Aug. 1998	Dec. 1994 – Mar. 2002
Preliminary survey, bidding, contracts	Jan. 1994 – Jun. 1995	Mar. 1995 – Nov. 1999
Construction of water treatment facilities	Jul. 1995 – Jun. 1998	Jan. 1997 – Apr. 2000
Laying of main service pipe	Jul. 1995 – Nov. 1997	Oct. 1995 – Jul. 2000
Installation of faucets	Jul. 1995 – Jun. 1998	Nov. 1995 – May 2000
Additional works	N.A.	Feb. 1999 – Mar. 2002
Project completion	August 1998	March 2002

2.2.3 Project Cost

The total cost of the project was kept within the initially estimated budget because the implementation schedule overlapped with the Asian currency crisis of late 1997, which caused the local currency (Rupiah) to depreciate in excess of inflation, and because efforts made by the executing agency to promote efficient ordering through competitive bidding were successful.

Table 3: Comparison of Planned and Actual Project Costs

	Planned	Actual
Foreign currency	3,620 million yen	2,621 million yen
Local currency	4,656 million yen (78,905 million Rupiah)	4,413 million yen (160,004 million Rupiah)
Total costs	8,276 million yen	7,034 million yen
ODA loan portion (exchange rate)	7,034 million yen Rp. 1 = 0.059 yen	6,850 million yen Rp. 1 = 0.028 yen*

Note: Averages for appraisal (1995 average) and completion (2002 average)

2.3 Effectiveness

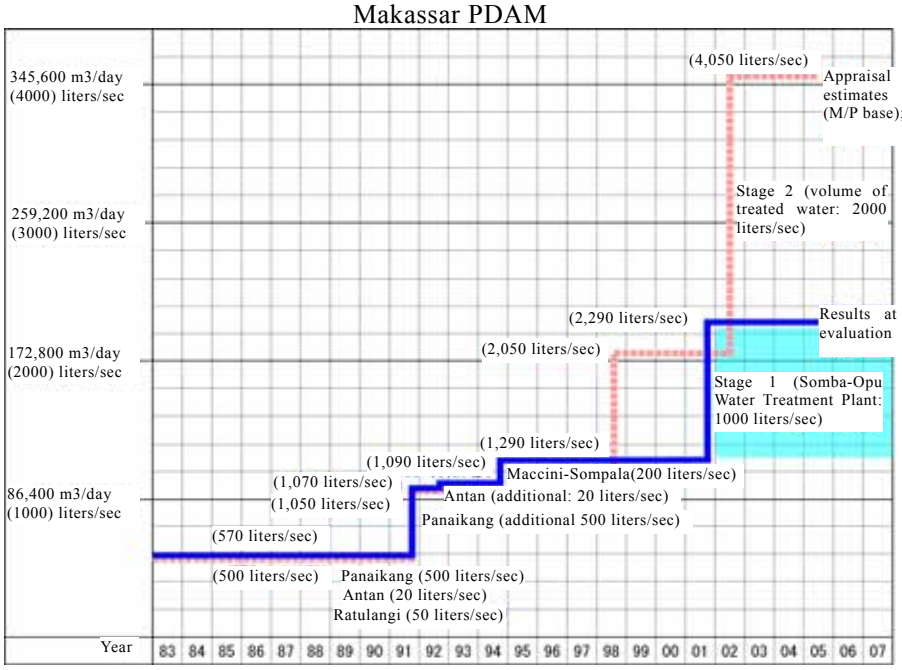
2.3.1 Increased supplies of treated water

The construction of the Somba-Opu Water Treatment Plant (supply capacity 1,000 liters/sec.) increased the volume of treated water supplied by Makassar's water utility (Makassar PDAM) by a wide margin, i.e. from 1,290 liters/sec. to 2,290 liters/sec. Figure 1 shows the annual development target supply volumes under Makassar PDAM's long-term plan[5] and extent to which the target have been attained. The figures suggest that, thanks to the completion of this project, the targeted level of 2,000 liters/sec. has finally been reached three years later than planned. As of 2004, had supplies continued to be expanded on schedule, Makassar PDAM should have been capable of supplying 4,050

[5] This plan was developed by Makassar PDAM on the basis of the Ujung Pandang Water Supply Development Project, the master plan (M/P) devised in 1985 by the Japan International Cooperation Agency (JICA).

liters of treated water per second, but was pumping out just 2,290 liters/sec. This gap of some 2,000 liters/sec. was planned to be filled by the completion of the Somba-Opu Water Treatment Plant Phase 2 project (this project is Phase 1), but has yet to be realized due to cash flow problems within Makassar PDAM.

Fig. 1: Development goals (dotted red line) and results (solid blue line) for treated water supplies, Makassar PDAM



Source: Makassar PDAM

2.3.2 Changes in the Annual Average Operating Rate of Somba-Opu Water Treatment Plant

Demand for water in Makassar's annual average was 2,251 liters/sec. (actual figure for 2003), which means that Makassar PDAM is utilizing its current supply capacity (2,290 liters/sec.) close to capacity. The Somba-Opu Water Treatment Plant went into commercial operation in mid-2001, reaching full year operation since 2002. The plant is supplying water at nearly 10% over of its design capacity (1,000 liters/sec.), which suggests that Somba-Opu is operating at high intensity in order to compensate for city-wide supply shortages.

Table 4: Comparison of Planned and Actual Treated Water Supplies
(Unit: thousand m^3/year; figures to the right of the "/" are the per second conversions [liters/sec.])

Year	Makassar PDAM Service Area		Somba-Opu Water Treatment Plant	
	Planned	Actual	Planned	Actual
1995	40,681/1,290	25,674/814	---	---
1996	↑	29,141/924	---	---
1997	↑	24,749/785	---	---
1998	46,988/1,489	38,243/1,213	---	---
1999	↑	40,595/1,287	---	---
2000	↑	38,929/1,234	31,536/1,000	---
2001*	73,794/2,340	55,356/1,755	↑	23,340/ ----

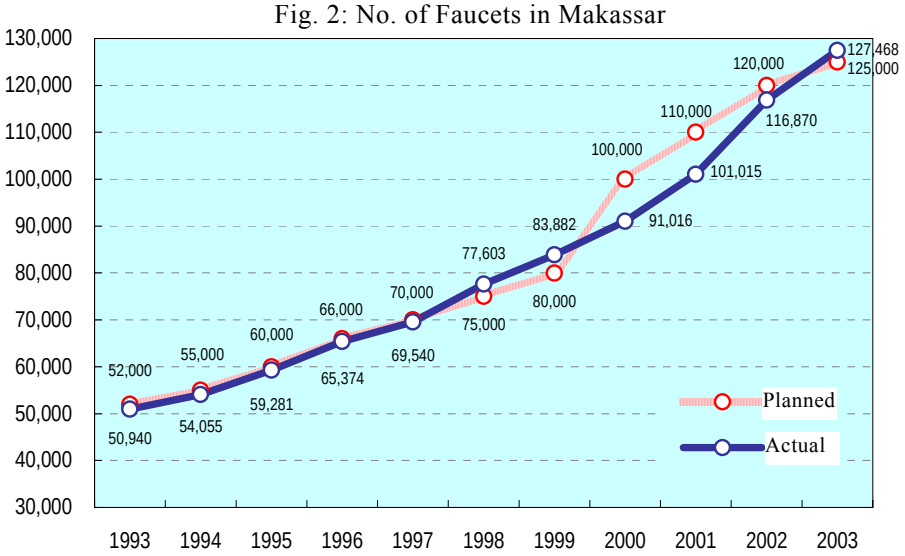
2002	↑	60,646/1,923	↑	32,639/1,035
2003	↑	70,983/2,251	↑	34,631/1,098

Source: Makassar PDAM
*Somba-Opu Water Treatment Plant was completed in 2000 and went into operation in 2001.

2.3.3 Increased Numbers of Water Faucets

The increases in treated water supplies and expansions to the distribution network were undertaken in conjunction with the installation of a total 61,000 faucets and water meters (including replacements of worn out meters) between 1995 and 2000. The number of faucets installed in 2003 was approximately 2.5 times higher than at appraisal.

Fig. 2: No. of Faucets in Makassar



Source: Makassar PDAM

2.3.4 Changes in the Supply Coverage Rate

Fig. 3: One of the replacement water meters

The coverage of the water supply system has improved steadily in line with the increases in numbers of water faucets installed throughout the city. In the past three years, the ratio of the city's population with access to PDAM water has increased from 60% in 2001, to 62% in 2002 and 70% in 2003. Makassar PDAM's long-term plan already mentioned, established a 90% coverage rate as its target for 2002, but because the planned extensions to the water treatment plant that should have followed on from this project have not come to pass, there are major constraints on supply and the goal has yet to be reached.

2.3.5 Recalculation of the Financial Internal Rate of Return (FIRR)

Fig. 5: Non-revenue water

Year	Planned	Actual
1998	30	47
1999	29	46
2000	28	42
2001	27	46
2002	24	46
2003	23	49

Source: Makassar PDAM

The financial internal rate of return (FIRR) of the project was recalculated using the same method as was employed at appraisal: i.e. using project costs (initial investment and post-completion operating costs) and revenues (water rates and revenues from new service subscribers/installations), to yield a figure of 7.1 %, or lower than the estimated 10.1 %. The predominant reason for the lower rate of return was the high ratio of non-revenue water (NRW)[6]. Under initial plans, NRW was to be kept to within 30 % in 1998, with gradual reductions anticipated in subsequent years; however, there are no signs of improvement, and in 2003 the rate was up to 49 %. An NRW rate of this level (49%) means that if municipal demand is 1, water must be treated and supplied at a rate of 2 in order to fully satisfy demand. With half of all treated water being lost en route before it reaches end users, the city's inefficient distribution system is pushing up Makassar PDAM's operating costs and hampering its ability to raise profits.

Fig. 4: Administrative buildings (left) and the raw water intake unit (right) at Somba-Opu Water Treatment Plant

2.4 Impacts

2.4.1 Improvements in the health and hygiene of local residents

When the project was in its planning stages, it was anticipated that completing the project and increasing supplies of treated water would serve to improve the health and sanitary conditions of municipal residents. According to an interview on fifty beneficiaries[7], with respect to the use of domestic water for laundry and bathing, it was confirmed that all respondents have now switched to PDAM water for their potable needs (formerly 2% → now 100%), although a high percentage (formerly 96% → now 50%) continues to rely on well water for these purposes, Furthermore, positive responses were

[6] According to the International Water Association (IWA), non-revenue water is defined as unaccounted for water (UFW) as water loss, plus unbilled authorized consumption (water used for fire fighting and public hydrants, etc.). UFW is separated into operational losses and technical losses, with the former resulting from illegal intake/illegal connections and meter discrepancies, and the latter from physical leakages from service pipes or pipe connections.

[7] Fifty individuals were selected at random from Rapocini, Ujung Pandang, and Panakukang in the Somba-Opu Water Treatment Plant service area and interviewed using a questionnaire.

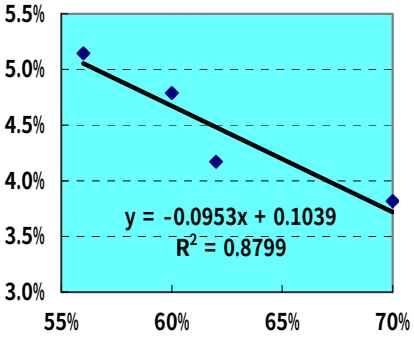
received from more than 80%, who stated that "improvements in the quality of drinking water have reduced the incidence of diarrheal disease (dysentery, cholera, abdominal typhus, etc.)".

Fig. 5: Interviewing beneficiaries

2.4.2 Improving living standards through guaranteed water supplies

According to the results of the same survey, interviewees stated that the switch to mains water has allowed them to save on the time formerly required to draw well water (70% of respondents). Housewives were particularly pleased at being able to devote more time to housework and childcare.

Fig. 6: Relationship between water supply and diarrheal disease rates[8] (Horizontal axis: water supply rate; vertical axis: disease rate)



2.4.3 Stimulating industrial and commercial activity and regional development through stable water supplies

Fig. 7: Somba-Opu Water Treatment Plant service area and area-specific population increases (2000-2003)

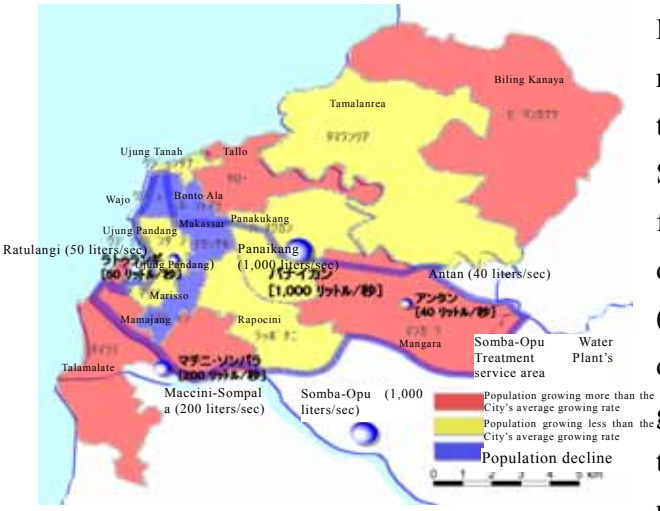


Figure 7 shows changes in the population of Makassar in recent years (2000-2003) by municipal district (average 1.4%/year) and the service area of the newly constructed Somba-Opu Water Treatment Plant[9]. The figure shows that while the population is declining in older areas of the city (colored blue) it is growing in adjacent districts (colored red), evidencing a general trend for more people to move out to the suburbs as urban development progresses. With the Makassar, Wajo and Mamajang districts in the older part of the city being given over to commercial and business activity, the residential population of these areas is declining (-0.5%-2.2%/year), while the population is becoming increasingly scattered over adjacent districts such as

[8] The relationship between increases in water supply rates and diarrheal disease incidence between 2000 and 2003 in Makassar.

[9] The Somba-Opu Water Treatment Plant is located in neighboring Kabupaten Gowa. Water from the plant is supplied to the Makassar service area through pipes with a diameter of 1 meter.

Mangara (5.0%/year) and Tamalate (2.4%/year) districts[10]. The completion and startup of the Somba-Opu Water Treatment Plant means that basic living environmental components (water supply services) are now available[11] to adjacent districts, which formerly had difficulties receiving a sufficient supply of treated water and thus had difficulties receiving residential population, suggesting that the water supplies are helping to stimulate industrial and commercial activity in the target area.

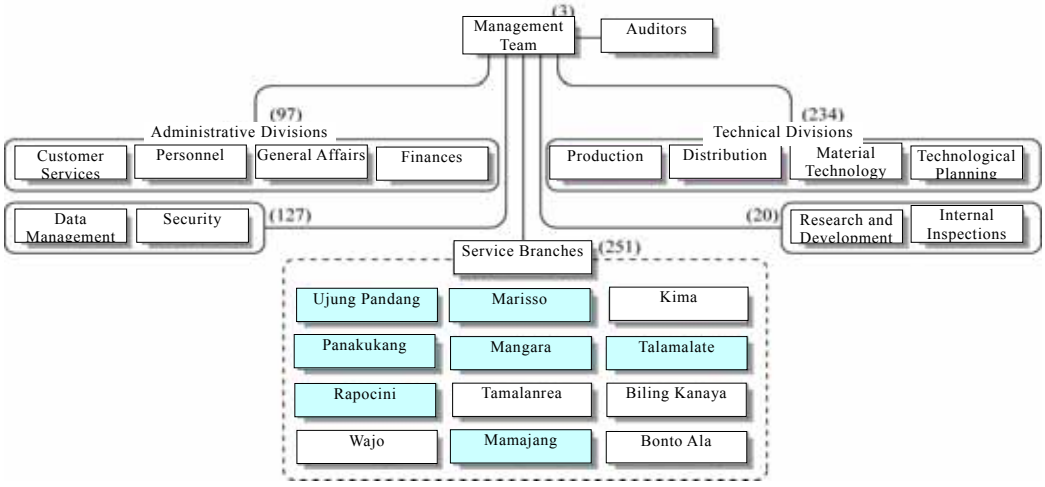
2.5 Sustainability

2.5.1 Executing Agency

2.5.1.1 Technical Capability

The Somba-Opu Water Treatment Plant that was constructed via this project is operated and maintained by Makassar PDAM. The water utility had a full-time staff of 732 as of September 2002. The Somba-Opu Water Treatment Plant is operated and maintained by the Somba-Opu facilities unit (55 full-time staff members), which is affiliated to the production division under technical division, while the service pipes are the responsibility of the water service division (29 full-time staff), also under technical division supervision.

Figure 8: Organizational Chart of Makassar City PDAM



Source: Compiled from the organizational chart supplied by Makassar PDAM.

Note: The divisions marked in red are those with responsibility for the operation and maintenance of project facilities; the districts marked in blue are those served by the Somba-Opu Water Treatment Plant. Figures in brackets indicate the number of staff assigned to each of the divisions.

[10] Outside the Somba-Opu Water Treatment Plant service area, Biling Kanaya district is witnessing the largest population growth at 6.1%, followed by the Tallo district at 2.3%, where the growth level parallels that in the Tamalate district.

[11] Tamalate, which is at the southern tip of the city, was a designated "flood-prone district" and was susceptible to inundation from the lower reaches of the Jeneberang River, but the implementation of major flood control projects under Japanese ODA loan funding in 1990s (the "Lower Jeneberang River Urgent Flood Control Project" completed in March 1994, and the "Bili-Bili Multipurpose Dam Project (1) (2)" completed in November 2001), substantially increased the safety of the area, and in supplying treated water to its residents, this project is believed to have promoted the development of the living environment.

According to the manager of the technical division, although the number of staff on the payroll and educational level[12] of individual staff members are both adequate, efforts to secure additional personnel and to improve skill levels are essential if Makassar PDAM is to improve its operational efficiency and the level of services it provides to its customers. Specifically, the utility needs to lower high non-revenue water (NRW) rates, an immediate problem, and endeavor to reduce both technical and operational losses. To address technical losses it is necessary to identify precisely where (service district) and to what extent water is leaking (losses) and to undertake appropriate countermeasures in these locations, but Makassar PDAM does not have any employees with the necessary technical skills to perform this task. Operational losses, meanwhile, require an efficient billing and collection system, but the utility has no staff capable of taking on this developmental role. The predominant reason for consistently high rates of NRW is aging[13, 14] service pipes in northern areas of the city, and Makassar PDAM must start by ascertaining the actual condition of these pipelines. The next step will be to take appropriate countermeasures in problem areas, but the utility does not currently have the personnel with the requisite knowledge and skills to execute this task.

2.5.1.2 Operation and Maintenance System

In organizational terms, Makassar PDAM is under the control of the municipal government, while the technical aspects of its operations are supervised by the central government (Directorate General of Human Settlements under the Ministry of Settlement and Regional Infrastructure). Water rates are approved by the municipal assembly in consideration of actual production (treatment) costs, and are revised at odd intervals. The most recent revision was made in 2001 (when rates were raised from an average Rp. 1,187/m^3 to Rp. 2,750/m^3), with the new rates going into effect the following year. Despite concerns that these price hikes would result in an increase in non-paying customers, in so far as is evidenced by bill collection rates (the amount collected to the amount billed), these fears appear to have been unfounded.

[12] 154 staff members, or a little over 20 % of the entire staff (732) have university degrees.

[13] Many of the pipes are believed to have been laid more than fifty years ago, but there is no inventory (piping ledger, for example) available that would enable this information to be accurately verified.

[14] Water pipes (mains: 17km; branch: 140km) in northern areas of Makassar served by the Ratulangi and Panaikang water treatment plants were replaced under the Ujung Pandang Water Supply Rehabilitation Project (L/A 1998) that was implemented prior to this project, but this failed to produce a marked effect on the leakage problem. The rehabilitation of service pipes that was undertaken via this project was predominantly carried out in southern areas of the city (those served by the Somba-Opu Water Treatment Plant) and had no direct benefit on the distribution network in the north.

Table 6: Average water rates and collection rates

	2000	2001	2002	2003
Average water rates (Rp./m^3)	1,187	2,750	2,750	2,750
Collection rates (%)	62.3	73.4	80.5	92.4

2.5.1.3 Financial Status

Table 7 shows Makassar PDAM's profit and loss performance and cash holdings during the past three years (2001-2003). The completion and startup of the Somba-Opu Water Treatment Plant substantially increased supplies of treated water from fiscal 2002 onwards and the accompanying hike in water rates has resulted in a surge in revenues for the utility. Although this has pushed gross profits into the black, Makassar PDAM has considerable administrative costs, including personnel-related outlays, and net profits after fixed costs are deducted remain negative. Nonetheless, given the diminishing margin of loss and the recovery of some general administrative costs that had been written off for tax purposes, the utility is finding that it has an increasingly large cash balance available at the end of successive fiscal years.

Table 7: Makassar PDAM Income Summary and Cash Holdings

(Unit: Rp. million)

	2001	2002	2003
Income	**39,395**	**70,118**	**79,449**
Water rates	33,320	60,901	69,828
Other revenues	6,075	9,217	9,621
Expenditure	**43,717**	**47,624**	**52,858**
Raw water	960	2,734	3,178
Treatment costs	22,682	25,178	28,129
Distribution costs	20,075	19,712	21,551
Gross profit (GOP)	**-4,322**	**22,494**	**26,591**
General administrative costs	**26,992**	**28,813**	**42,368**
Interest due	**32,286**	**1,179**	**3,673**
Net profit (NOI)	**-63,600**	**-7,498**	**-19,450**
Non-operating profit and loss	**1,635**	**1,781**	**2,371**
Pre-tax profit	**-61,965**	**-5,717**	**-17,079**
Taxes paid	**0**	**0**	**0**
After-tax profit	**-61,965**	**-5,717**	**-17,079**
Current cash holdings	856	376	328
Cash balance	3,764	4,140	4,468

Source: Makassar PDAM

2.5.2 Operation and Maintenance Status

The newly constructed Somba-Opu Water Treatment Plant and the main/branch service pipes that were laid via this project are currently being maintained in appropriate working order. Periodic maintenance is carried out for the plant and main service pipes at three-month intervals, and service pipes are flushed out twice a year for cleaning.

However, avalanches (in March and June, 2004) in the upper reaches of the Bili-Bili dam catchment area, which supplies the Somba-Opu Water Treatment Plant, due to the collapse of the caldera wall of Mt. Bawakaraeng and subsequent heavy rains during the wet season, has produced large volumes of sediment and pushed water treatment costs up as a result. It is believed that the sediment will eventually settle, but to prevent the recurrence of such conditions there is a need to implement separate measures to deal with avalanches in the catchment area of the Bili-Bili Dam, and this matter is being addressed via a Japanese ODA loan-funded project: the “Urgent Disaster Reduction Project for Mt. Merapi/Progo River Basin and Mt. Bawakaraeng”.

3. Feedback

3.1 Lessons learned

Nothing specific.

3.2 Recommendations

Nothing specific

Comparison of Original and Actual Scope

Item	Planned	Actual
(1) Outputs	Construction of water treatment plant: 1,000 liter/sec.	As planned
	Laying of main service pipes: ∅150-1,100mm Length: approx. 75.5km	116.0km
	Laying of branch service pipes: ∅50-150mm Total length: approx. 350.0km	521.0km
	Installation of faucets: 61,000 units (including replacements)	As planned
(2) Project period		
-L/A	November 1993	As left
-Consultant selection	Jul. 1993 – Jun. 1994	Feb. 1994 – Dec. 1994
-Preliminary survey, bidding, contracts	Jan. 1994 – Jun. 1995	Mar. 1995 – Nov. 1999
-Construction of water treatment plant	Jul. 1995 – Jun. 1998	Jan. 1997 – Apr. 2000
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-Additional works	---	Feb. 1999 – Mar. 2002
-Consulting services	Jul. 1994 – Aug. 1998	Dec. 1994 – Mar. 2002
-Project completion	August 1998	March 2002
(3) Project cost		
Foreign currency	3,620 million yen	2,621 million yen
Local currency	4,656 million yen (78,950 million Rupiah)	4,413 million yen (16,004 million Rupiah)
Total	8,276 million yen	7,034 million yen
ODA loan portion	7,034 million yen	6,850 million yen
Exchange rate	Rp. 1 = 0.059 yen (April 1993)	Rp. 1 = 0.028 yen (Average for 1995-2002)