Paraguay

Asuncion Metropolitan Area Potable Water Project

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Field Survey: December 2005

1. Project Outline and Japan's ODA Loan

Map of project area

Ise Water Supply Center

1.1 Background

Up until the early 1990s in Paraguay, while much emphasis was placed on providing infrastructure for the farming and livestock industries and for the economy generally, public infrastructure had lagged behind significantly. In particular, Paraguay lagged far behind other Central and South American countries in public services such as water and sewer services, basic hygiene and sanitation. Above all, regarding the rate of expansion of water and sewer services, while the average rate of expansion of water supply and sewer systems in Central and South American countries in 1993 was 80% and 53% respectively, according to data from the Inter-American Development Bank (IDB), Paraguay's expansion rate was 29% for water supply systems (53% in urban areas and 16% in rural areas), and 11% for sewer systems (22% in urban areas and 0% in rural areas). Of all Central and South American countries, Paraguay was thus second only to Haiti in having the lowest standards.

Table 1. Expansion Rate of Water Supply
and Sewerage Systems in Paraguay in 1993

	Population (million people)	Rate of expansion of water supply systems (%)	Rate of expansion of sewerage systems (%)
Urban areas	2.070 (50.5%)	53	22
Asuncion (the capital city)	1.010 (24.5%)	63	40
Regional towns and cities	1.060 (26.0%)	48	3
Rural areas	2.029 (49.5%)	16	0
Total	4.099 (100.0%)	29	11

Data from IDB

Water supply services were provided by different companies depending on the size of the local population. Corporación de Obras Sanitarias (Corposana) handled regional bodies with populations above 4,000 people, and El Servicio Nacional de Saneamiento Ambiental (Senasa) handled regional bodies below 4,000 people.[1] In areas where neither Corposana nor Senasa was providing services, water was apt to come from water wells or private water supply vendors. In most cases, the water supplied in this way did not meet safety standards for drinking water. This was a major social problem from the standpoint of public health. In addition, Paraguay's provision of sewer services had also lagged behind, such that numerous regions allowed sewer water to discharge freely. As a result, giardia, diarrhea, and contagious diseases were commonplace in Paraguay on account of the unhealthy environment and the assimilation of unsanitary water. For example, among children below four years of age, diarrhea and giardia were the leading cause of death; diarrhea in particular accounted for roughly one death in four.

According to data from the IDB, even in the capital city of Asuncion, which enjoyed a relatively high standard of 63% diffusion rate of water supply, due to deterioration of existing facilities, the lack of meters and delays in installing them, the non-collection rate[2] in 1994 remained high at 37%.

[1] At present, Empressa de Servicios Sanitarios del Paraguay Sociedad Anonima (ESSAP, Corposana's later incarnation) handles autonomous regions with populations greater than 10,000, and Senasa is responsible for areas with a population below 10,000.

[2] The non-collection rate (%)= lost water rate (%) + the portion of water distributed for which fees were not collected (%).
The lost water rate (%) = the percentage leaked at time of production (%) + the percentage leaked at the time of distribution (%).

Under the circumstances, improving the environment of the capital city Asuncion through water distribution facilities as well as the expanded outfitting of a water supply network and water supply facilities were matters of urgency.

1.2 Objective

The present project aims to improve the non-collection rate and improve water supply reach in the capital city of Asuncion, and thereby help improve local residents' living environment. This will be accomplished by installing or expanding water distribution facilities, a water supply network, and water supply facilities in the capital city.

1.3 Borrower/Executing Agency

Republic of Paraguay/Corporación de Obras Sanitarias (Corposana)[3]

1.4 Outline of Loan Agreement

Loan Amount/ Disbursed Amount	6,068 million yen/5,509 million yen
Exchange of Notes Loan Agreement	August 1995 September 1995
Terms and Conditions - Interest Rate - Repayment Period (Grace Period) - Procurement	 3.0% p.a. 25 years 7 years General untied
Final Disbursement Date	March 2002
Feasibility Study (F/S) etc.	1983: Corposana creates a master plan for the first phase of the waterworks outfitting project in Asuncion. 1988: IDB concludes contract to finance the first phase of the waterworks outfitting project in Asuncion (loan amount 47.8 million dollars). The French government offers 20.4 million dollars in cofinancing. Total project costs come to US$75.8 million. 1993 Phase 1 of the project is concluded.

[3] Incorporated in 2002. The Empresa de Servicios Sanitarios del Paraguay S. A. (ESSAP) was established. It is in the process of being privatized.

	1994 Corposana creates a master plan for the waterworks outfitting project in Asuncion (including a feasibility study for the present project).

2. Evaluation Result

2.1 Relevance

2.1.1 Relevance at the time of appraisal

As described above, the area of public services like water and sewer services and basic hygiene and sanitation was one where Asuncion lagged far behind other Central and South American countries. For that reason, Paraguay's Socioeconomic Development Plan of 1994-1998 placed high priority on the provision of public services and environmental conservation, positioning them as major areas of public investment.

In the capital city of Asuncion, the rate of water supply distribution was relatively high, but on account of the rapid urbanization caused by the influx of people from the countryside, the lack of water distribution facilities was becoming more serious. In addition, not only were existing facilities related to water supply services continuing to deteriorate, but the non-collection rate was 37% on account of uninstalled or defective meters and water supply equipment. The need to provide and expand water distribution facilities had become urgent matters for the nation.

Under such circumstances, and given the need to cope with the rising demand in the ever-expanding capital city of Asuncion, improving the living environments of local residents through the effective use of water resources attained a high degree of urgency. From that perspective, the present project's necessity was felt to be high.

2.1.2 Relevance at the time of evaluation

In Paraguay's national development plan following the above-mentioned Socioeconomic Development Plan of 1994-1998, the provision of water and sewer services continued to be a high-priority area for public investment. Environmental issues were one of four major areas raised in the newly adopted Strategic Development Plan of 2005-2015, and within the field of the environment, water was a prominent government policy topic. In addition to the environmental perspective, the above plans also treated water resources as a critical resource for economic development.

In particular, the provision of water and sewer systems in the poorer districts of urban areas like the capital city of Asuncion has been recognized as a critical area for public

investment in order to improve environmental hygiene.

Through the execution of this project, the water supply dissemination rate in Asuncion reached 80%[4]. Capacity at the present time in the capital city is felt to be capable of meeting the peak-time water demand. However, if one considers the fact that there is a large migration of people from the countryside into the city, there will clearly be a need to once again strengthen the water supply in the near future. From that viewpoint, it is felt that the need to expand provisions for water supply services will remain the same in the future, and that in the future there will continue to be an urgent need to bolster the capabilities of water purification facilities.


Viñas Cué Water Purification Treatment Plant Facilities

2.2 Efficiency

2.2.1 Outputs

Km 2 elevated tank at a water supply center

Water distribution pump at the Lama Pyta water supply center

[4] According to ESSAP data, 80% of households were supplied with running water in the capital city of Asuncion. Sixty-four percent received their service through ESSAP, and the other 16% were serviced by private water supply enterprises.

The present project was organized around the following areas: 1) the provision and expansion of water distribution facilities (including a) water transmission pump stations, b) water mains, c) water distribution centers); 2) the provision and expansion of the water supply network and water supply facilities (including a) water supply network, b) water supply equipment and water flow meters); and 3) consulting services. Table 2 provides actual and target figures for these areas.

Table 2. Project Outputs (Comparison of Plan and Actual Performance)

Plan	Actual
(1) Provision and expansion of water distribution facilities	(1) Provision and expansion of water distribution facilities
1) Expansion of Viñas Cué Water transmission pump station	1) Expansion of Viñas Cué Water transmission pump station
・Installation of six water pumps each having a flowrate of 750l/s	・Installation of three water pumps each having a flowrate of 750l/s
2) Installation of new water mains (12 lines with a total length of 63,529m)	2) Installation of new water mains (10 lines with a total length of 53,703m)
・Viñas Cué-Trinidad water main (total length 3,982m, 1000mm dia.) ・Viñas Cué-Ise water main (total length 12,354m, 1,200mm dia.) ・Ise-Fernando de la Mora 2 water mains (total length 4,378m, 1,000mm dia.) ・Luque-former Luque water main (total length 1,300m, 500mm dia.) ・Fernando de la Mora 2- Ñemby water main (total length 3,240m, 800mm dia.) ・Ñemby-San Lorenzo 2 water mains (total length 5,187m, dia. 800mm and 600mm) ・Ise-Lambare 1 (total length 4,330m , dia. 800mm) ・Lambare 1-Lambare 2 (total length 4,071m, dia. 500mm) ・Trinidad-Lama Pyta water main (total length 5,531m, dia. 800mm) ・Lama Pyta-Mariano.R. Alonzo water main (total length 7,316m, dia. 500mm) ・Trinidad-Luque water main (total length 10,300m, dia. 800mm) ・Luque-Laurelty water main (total length 1,540m, dia. 600mm)	・Viñas Cué-Trinidad water main (total length 3,962m, 1000mm dia.) ・Viñas Cué-Ise water main (total length 12,008m, 1,200mm dia.) ・Ise-Fernando de la Mora 2 water mains (total length 4,370m, 1,000mm dia.) ・Luque-formar Luque water main (total length 167m, 500mm dia.) ・Fernando de la Mora 2- Ñenbi water main (not installed) ・Ñenbi - San Lorenso 2 water mains (not installed) ・Ise-Lambare 1 (total length 4,277m , dia. 800mm) ・Lambare 1-Lambare 2 (total length 3,941m , dia. 600m) ・Trinidad-Lama Pyta water main (total length 6,245m, dia. 700mm) ・Lama Pyta-Mariano Luque Alonzo water main (total length 7,166m, dia. 500mm) ・Trinidad-Luquewater main (total length 9,798m, dia. 800mm) ・Luque-Raulerudi water main (total length 1,760 m, dia. 600 mm)
3) Water distribution centers (reservoir, elevated tank, water distribution pump facilities) expansion/new construction (13 locales)	3) Water distribution centers (reservoir, elevated tank, water distribution pump facilities) expansion/new construction (11

・Ise water distribution center (expansion) ・ Lambare 1 water distribution center (construction) ・ Lambare 2 water distribution center (construction) ・Km2 water distribution center (expansion) ・Fernando de la Mora 2 water distribution centers (expansion) ・ Ñonbi water distribution center (construction) ・San Lorenso 1 water distribution center (expansion) ・San Lorenso 2 water distribution center (construction) ・ Trinidad water distribution center (expansion) ・Lama Pyta water distribution center (construction) ・Mariano.R. Alonso water distribution center (construction) ・ Luque water distribution center (construction) ・ Laurerelty water distribution center (construction) (2) Outfitting and expansion of water supply network and water supply equipment 1) Water supply network (total expansion 204,000m, total surface area 98.25 km^2) ・Lambare district (total expansion 99,000m, total surface area 15.65m^2) ・ Lama Pyta district (total expansion 44,000m, total surface area 22.70m^2) ・ Mariano Luque Alonso district (total expansion 20,000m, total surface area 25.20m^2) ・Luque district (total expansion 41,000m, total surface area 34.7m^2) 2) Installation of water meters and other water supply devices (20,000 sets) ・1/2-in diameter (0 sets) ・3/4-in diameter (18,520 sets) ・1-in diameter (1,440 sets) ・1-1/2-in diameter (0 sets) ・2-in diameter (40 sets) 3) Consulting services (1,026 M/M) Hiring of a consultant to perform bidding	locales) ・Ise water distribution center (expansion) ・ Lambare 1 water distribution center (construction) ・ Lambare 2 water distribution center (construction) ・Km2 water distribution center (expansion) ・Fernando de la Mora 2 water distribution centers (expansion) ・ Ñonbi water distribution center (not installed) ・San Lorenso 1 water distribution center (expansion) ・San Lorenso 2 water distribution center (not installed) ・ Trinidad water distribution center (expansion) ・Lama Pyta water distribution center (construction) ・Mariano Luque Alonso water distribution center (construction) ・ Luquewater distribution center (construction) ・ Rauleruti water distribution center (construction) (2) Outfitting and expansion of water supply network and water supply equipment 1) Water supply network (total expansion 94,962m, total surface area 63.49 km^2) ・ Lambare district (total expansion 29,190m、total surface area 14.59m^2) ・Lama Pyta district (total expansion 13,609m, total surface area 19.38 m^2) ・ Mariano Luque Alonso district (total expansion 22,696m, total surface area 14.24m^2) ・Luque district (total expansion 29,467 m, total surface area 15.28 m^2) 2)Installation of water meters and other water supply devices (73,627 sets)[5] ・1/2-in diameter (63,337 sets) ・3/4-in diameter (10,000 sets) ・1-in diameter (100 sets) ・1-1/2-in diameter (150 sets) ・2-in diameter (40 sets)

[5] Through a change in plans, the IDB furnished water meters and other devices, and the executing agency installed them. These fell outside the domain of the JBIC ODA loan.

contract support, construction supervision, operation and maintenance support, and environmental control management. ・Foreigners 92 M/M ・Local staff 934 M/M	3) Consulting services (1,361 M/M) Hiring of a consultant to perform bidding contract support, construction supervision, operation and maintenance support, and environmental control management. ・Foreigners 123.5 M/M ・Local staff 1237.5 M/M

There were a number of major reasons for the differences between planned and actual figures. First, one can point to the effect of currency fluctuations, namely a reduction in the value of the yen. In this particular case, in August 1995 Japan and the Republic of Paraguay signed exchange documents, and the following month, entered an ODA loan agreement providing an ODA loan with an upper limit of 6,068 million yen. This loan figure was based on the exchange rate current at the time (US $1 = 100 yen), and so corresponded to 60,680,000 dollars. Had the loan been predicated on a dollar basis, it is felt that 100% of the initial plans could have been carried out. But after that, on account of exchange fluctuations, at the time of actual disbursement (August 1998), on the local market the yen had dropped 32% to US $1 = 146 yen. This meant that the ODA loan of 6,068 million yen amounted to only 41,561,643 dollars. With that amount of money it was simply not possible to perform everything that had been planned. Because the ODA loan targets had to be revised in part, priority was assigned to the main construction work. As a result, out of the initially planned construction worked, construction for the two districts of Ñemby and San Lorenzo were excluded from the loan targets. Out of the remaining construction work, on account of budget shortfalls, considering the fact that services were provided by private enterprises, they were performed in order of priority.

There was a second reason for the discrepancy between the planned and actual figures. A detailed review of the initial plan performed by the consultant at the time of the project execution showed that there were a number of issues that would be difficult to perform according to plan in the choice of land and the capabilities of facilities and equipment, and that a number of points needed fixing. As a result, there were changes made to the structures of water mains and water distribution centers.

The main differences in output are described below.

Expansion of Vinas Cué water transmission pump station

By using the pre-existing pumps effectively, despite reducing the number of pumps installed, it was possible to reach the initial target objectives. As a result, the number of pump units newly installed was reduced from six to three.

Installation of new water mains

The initial plan was to install 12 new lines. Because of the yen's depreciation and the resulting budget shortfalls, however, in the end only 10 new lines were installed. The following two lines were not installed.

- Fernando de la Mora 2 - Ñenbi water main
- Ñenbi 2 - San Lorenso 2 water main

Installation and expansion of water distribution centers

The initial plan was to perform new constructions and expansions at 13 locations. Because of the yen's depreciation and the resulting budget shortfalls, however, in the end installation and expansion was performed at only 11 sites. The following two centers were not built.

- Ñenbi water distribution center
- San Lorenso 2 water distribution center

Outfitting of water supply networks

A private enterprise had previously installed water supply networks in the Lambare and Luque districts. Accordingly, as far as possible, efforts were made to effectively utilize those pre-existing grids. The ODA loan was mainly used to outfit districts that did not enjoy the benefit of pre-existing water supply networks provided by private enterprises.

In the Mariano. R.Alonso district, there were no private companies. Moreover, because it is a district within the capital where the population was rising the most, it was given very high priority.

A paring down of expansion efforts in three districts other than the Mariano. R.Alonso district meant that the total expansion was reduced from 204,000m to 94,962m.

Installation of water meters and other water supply equipment

In order to improve the collection rate in the capital city of Asuncion, priority was given to the installation of water flow meters at individual homes. Due to a change in plans, IDB provided water meters, and the executing agency installed them. These activities were therefore removed from the scope of the JBIC loan target.

2.2.2 Project period

Figure 3 compares the initially planned and actual work execution period for the project.

Table 3. Comparison of Project Period in the Initial Plan and Actual Performance

Item	Initial Plan	Actual
Signing of the loan contract	September 1995	September 1995
Land acquisition	By September 1996	August 1997
Consulting services	September 1995-September 2000	October 1997-February 2002
Water distribution facilities	October 1995-September 1999	December 1997-March 2002
Water supply network and water supply equipment	October 1995-September 1999	January 1999-December 2001

A prerequisite for conducting the present project is the acquisition of land. Land acquisition was delayed by approximately one year on account of procedural delays in Paraguay's parliament. The start of construction was delayed for two reasons. First, the initial plan was repeatedly changed on account of technological considerations. Secondly, Paraguay's procedural delays greatly affected the procurement of machinery. In particular, regarding the latter, many things had to be procured from abroad, and much time was lost getting things through customs. As a result, whereas the initial plan was to conduct the project over a five-year period from September 1995 to September 2000, in fact the project lasted six years and six months, running from September 1995 to March 2002. In other words, the project overran time projections by 130%.

2.2.3 Project cost

Table. 4 compares target costs and actual costs for the present project.

Table. 4 Comparison of Project Costs in Initial Plan and Actual Performance

(1) Project Costs in Initial Plan

Item	Foreign Currency (Millions of yen)	Local Currency (Total: millions of guaranis) (ODA loan portion: millions of yen)	Total (millions of yen)

	Total	ODA Loan	Total	ODA Loan	Total	ODA Loan
Water distribution facilities	1,993	1,993	46,042	2,302	4,295	4,295
Water supply network	688	688	21,676	0	1,772	688
Material reserve funds	268	268	6,772	267	607	535
Consulting services	456	456	1,875	94	550	550
Land acquisition	0	0	1,958	0	98	0
Administrative expenses	0	0	920	0	46	0
Taxes	0	0	14,447	0	722	0
Total	3,405	3,405	93,688	2,663	8,090	6,068

Note: Based on the November 1994 exchange rate of 1 yen = 20 guaranis.

(2) Actual Performance Costs

Item	Foreign Currency (million yen)		Local Currency (Total: Millions of guaranis) (ODA loan portion: millions of yen)		Total (millions of yen)	
	Total	ODA Loan	Total	ODA Loan	Total	ODA Loan
Water distribution facilities	2,089.8	2,091.9	74,505.0	2,221.9	4,309.5	4,313.8
Water supply network	297.4	297.7	---	---	297.4	297.7
Consulting services	363.5	363.9	15,287.7	534.0	897.0	897.9
Land acquisition	---	---	2、962.4	---	102.2	---
Administrative expenses	---	---	2,625.0	---	90.5	---
Total	2,750.7	2,753.5	95,380.1	2,755.9	5.696.6	5,509.4

Note: Based on a weighted average exchange rate of 1 yen = 32.4 guaranis.
Source: ESSAP

Total project costs were initially expected to be 8,090 million yen, but in fact costs came to only 70% of the initial targets, or 5,696.6 million yen. Out of that figure, whereas the ODA loan targeted portion was expected to be 6,068 million yen, it only came to 5,509.4 million yen, or 91% of the initially planned level. As described earlier, this was due to a lowering of the dollar conversion amount from a depreciated yen. The main reason was that out of all the construction work initially targeted by the ODA loan, work pertaining to the Ñemby and San Lorenzo 2 was not performed. As for the other construction work, due to budgetary shortfalls individual tasks were performed in order of priority. The water supply network for the Lambare district and Luque districts were contracted, and as a consequence, project work pertaining to the outfitting of water distribution was also greatly reduced.

2.3 Effectiveness

2.3.1 Water supply reach and non-collection rate

At the time of the preliminary appraisal, two values were set as indicators of administrational efficacy: the water supply reach, and the non-collection rate. According to ESSAP data, in 1991 the water supply reached 52% of the population, and it was hoped that the plan would achieve a reach percentage of 83% by the time of project completion (which at the time was supposed to be 2001). As part of that policy, 20,000 sets of water

supply devices and water flow meters were to be installed through this project, and the executing agency itself was supposed to install 16,700 sets. In this way, 36700 new connections would be made, and it was hoped that the objectives could be reached. In fact, by 2002 the water supply service for which ESSAP is responsible had a reach of only 66%, and by 2005, reach had not gone past 64%. On its own, ESSAP was not able to surpass the water reach targets initially established. However, in the capital city of Asuncion, it is estimated that private water supply enterprises other than ESSAP reach 16% of the population. If one combines the reach of these private companies with that of ESSAP, then in 2005 the water reach can be seen as being close to 80%. In particular, when the project came to the execution stage, the devaluation of the yen made it difficult to carry out all of the work that had been initially planned. Accordingly, in districts where private enterprises already had a water supply network in place, it was decided to use those water supply networks as effectively as possible. When one looks at the fact that work was carried out under a policy wherein districts that were not supplied by private water supply enterprises were given preferential treatment as ODA loan targets, this was a perfectly logical approach. A number of reasons accounted for the fact that water supply reach did not meet target levels. First, the population of the capital city of Asuncion rose dramatically, far exceeding expectations. Secondly, even though 73,000 water flow meters and other water supply devices were installed (more than 3.5 times the 20,000 to be installed by ESSAP), this did not lead to effective increase in the tallying of people receiving the water supply on account of illegal utilization and the like. As shown in Fig 5, the percentage of people receiving water did not reach initial estimates.

Table. 5 Forecast and Actual Values for Water Supply Reach

Year	Forecast (1991)			Actual		
	District population (people)	Population receiving water (people)	Water supply reach (%)	District population (people)	Population receiving water (people)	Water supply reach (%)
1991	990,405	515,010	52	990,405	NA	NA
1992	1,018,137	549,794	54	1,056,804	590,775	56
1993	1,046,644	565,187	54	1,081,991	NA	NA
1994	1,074,996	580,497	54	1,108,591	NA	NA
1995	1,105,270	617,450	56	1,136,705	NA	NA
1996	1,131,534	675,700	60	1,166,442	NA	NA
1997	1,158,661	761,039	66	1,197,922	825,350	69
1998	1,186,713	931,707	79	1,231,274	NA	NA
1999	1,215,702	972,365	80	1,266,638	NA	NA
2000	1,245,671	1,014,798	81	1,304,165	NA	NA
2001	1,271,291	1,052,823	83	1,344,020	NA	NA
2002	1,297,585	1,092,273	84	1,384,271	918,270	66
2003	NA	NA	NA	1,430,302	949,945	66
2004	NA	NA	NA	1,479,324	961,900	65
2005	NA	NA	NA	1,531,570	975,130	64

Source: ESSAP

At the time of the initial appraisal, it was hoped that the non-collection rate could be lowered from its 1992 level of 36% to 28%. This would be accomplished by renovating water distribution facilities, the supply network and water supply devices so as to reduce leaks in the system, as well as by installing water flow meters and other water supply devices. However, in fact the non-collection rate steadily worsened over the years, reaching 45% in 2002 and 48% in 2005. Various reasons account for this state of affairs. First, the population in the capital city of Asuncion increased dramatically. Secondly, the installation of water flow meters was not continued on account of the fact that water came to be supplied for free on account of pro-welfare policies. Thirdly, there was a social culture where people did not feel any obligation to abide by the law, and thus there was a staggering prevalence of people simply stealing water under the premise that water is a free commodity. As a result the water supply for which fees were not recovered are increasing.

Table. 6 Change in the Non-Collection Rate

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Non-recovery rate (%)	36	36	37	36	41	44	42	45	43	45	45	45	46	45

Source: ESSAP

2.3.2 Other indices

Because indices other than the above-mentioned water supply reach and the non-collection rate were not established at the time of the preliminary appraisal, it is difficult to analyze and evaluate the extent to which goals were reached by comparing target values and actual figures. However, there are other indicators that show that water supply services did improve through the execution of the present project. According to Table. 5 above, whereas the population receiving water prior to project execution in 1992 was 590,775, following project execution in 2002, that figure had reached 918,270 people, representing a roughly 55% increase. Because the population in that region increased 31% from 1,056,804 to 1,384,271, one can appreciate that the increase in population receiving water increased more than the general population at large. In addition, the average daily water supply also increased approximately 50%, from 183,678 m^3 per day in 1992 to 275,577 m^3 per day in 2002.

Table. 7 Average Daily Water Supply Volume (m^3 per day)

Year	Avg. daily water supply volume
1992	183,678
1997	259,132
2002	275,577
2003	276,147
2004	279,063
2005	299,631

2.3.3 Recalculation of the FIRR

At the time of the preliminary appraisal, the Financial Internal Rate of Return was anticipated to be 6.1%. In the project follow-up report, the FIRR was recorded as being 7.6%. The data underlying that calculation, however, has not been provided by the executing agency, and so the relevance to the evaluator of the recalculation of 7.6% has not been confirmed.

2.4 Impact

2.4.1 Improvement of local residents' living environment

A number of interview-based surveys were to conducted to determine the efficacy of the present project. The results indicated that in many households in districts where ESSAP provides water services, it had become possible to receive water continuously all year long, 24 hours a day. In other words, prior to the execution of the present project, facilities relating to the water supply system were deficient, with the result that in peak demand times such as summer or when temperatures rose midday, water was repeatedly cut off. But thanks to the provision of infrastructure through this project, it was possible to resolve the issue of low water supply pressure, which had been a bottleneck hindering water supply stability. Thus, as the surveys point out, it had become possible to provide sufficient volumes of water 24 hours a day.

In order to determine how local residents reacted to this effect, a survey of 100 local water supply beneficiaries was conducted. In the study, 21% of the subjects responded that the amount of time that they could use running water had increased[6], 25% noted that the water supply pressure had improved[7], only 16% said that they were now able to use more water[8]—results that were not consistent with the above interview-based studies. It turns out that many of the subjects in the study of beneficiaries had already been receiving water before the present project was conducted, and so unlike those who were receiving water for the first time, it seems that they had a hard time feeling the effects of the project.

2.4.2 Impact on the environment

In the initial plan, two primary water mains—namely, the Viñas Cué-Ise water main and the Viñas Cué-Trinidad water main, which constitute major structural elements of the project—were supposed to run through the grounds of a botanical garden in Asuncion city. At the request of the city, the installation was made to detour around the botanical garden, and consequently, the construction work from this project did not have any impact on trees or plants.

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[6] In response to the question as to whether the amount of time that tap water could be used had increased, 2% said it had increased a lot, 19% said it had increased somewhat, 29% reported no significant change, 46% said there had been no change whatsoever, and 4% said they did not know.

[7] In response to the question as to whether the water pressure had improved, 6% said it had improved greatly, 19% said it had improved somewhat, 36% saw no significant change, 37% reported no change whatsoever, and 2% did not know.

[8] In response to the question as to whether the amount of water they could used had increased, 0% felt it had increased greatly, 16% saw some increase, 45% saw no significant increase, 21% felt there was no change whatsoever, and 18% did not know or did not answer.

2.4.3 Land acquisition and relocation of residents

There were no reports of having to relocate residents as a result of land acquisitions made for the present project.

2.4.4 Other

According to the executing agency, the present project resulted in the direct creation of jobs for roughly 36,000 people per month. The agency reported that this hiring brought benefits to some 12,000 households.

2.5 Sustainability

2.5.1 Executing Agency

Operation and maintenance of maintenance facilities through this project is handled by the Empressa de Servicios Sanitarios del Paraguay Sociedad Anonima (ESSAP S.A.), which was the project's executing agency. At the time of the preliminary appraisal, the executing agency was Corposana, an independent public health corporation supervised by Ministry of Internal Affairs. However, in March 2003, it took on its present corporate form as ESSAP. At the time of the evaluation, the company had gone public, though the company remained a nationally owned company with 99% of shares held by the Paraguayan government.

As for the state of outfitting and facilities for the present project, there are basically no problems relating to the facilities functions per se, as they are fulfilling their prescribed capabilities. However, from the standpoint of ensuring sustainability, it is felt that a more solid operation and management system than that provided by ESSAP needs to be put in place. The sections below the current state and issues relating to technical capacity, structure, and financial status.

2.5.1.1 Technical capacity

On the technical front, ESSSAP is felt to have no major problems. Out of all ESSAP's employees, roughly 10% are university graduates, and approximately 20% are technicians having the equivalent of a high school education. Thus, the company's own technicians are felt to be sufficiently capable. Maintenance is handled by the operation division, but the actual work is entrusted to an outside party through a public offering. From the standpoint of sustainability, one issue is that, along with the aging of technicians, allowances for needed parts and sufficient budgeting for the education of personnel have not been secured. In any case, as the state of ESSAP's maintenance is expected to be influenced by restructuring through incorporation, it will be necessary to observe closely their orientation towards restructuring. Expenditure outlay for operation and maintenance

is as shown in the table below.

Table 8 Expenditure for operation and maintenance (unit: million dollars)

Fiscal year	Maintenance outlay	Management costs	Total
1996	1.79	0.90	2.69
1997	1.73	1.10	2.83
1998	1.20	1.12	2.32
1999	1.20	1.15	2.35
2000	1.22	1.18	2.40
2001	1.30	1.20	2.50

2.5.1.2 Structure

From an organizational standpoint, one could say that ESSAP needs strengthening. At present, while ESSAP is theoretically incorporated, in fact, it is a nationally owned corporation with 99% of its shares held by the Paraguayan government. Consequently, the company is really only on the road to privatization, and the direction the organization should go has yet to be established. Given that, as far as can be told based on interviews with employees and other people close to matters, until the orientation of privatization takes shape a wait-and-see attitude will continue to be prominent, and in various respects, things are such that it will be difficult to employ new decision-making. At the present time, it is felt that it would be difficult to make new efforts towards organizational strengthening. If one hopes to make the effects of the present project lasting, it seems that it would be important to find out how to benefit from privatization by first fortifying an orientation towards reform.

Furthermore, pursuant to the incorporation and in the interest of restructuring, the number of employees was reduced. A target of five employees for every 1000 households served was set. Although this target value was reached (in 2005 there were 4.7 employees per 1000 households), there remain other balancing issues, such as how to keep needed personnel and how to sustain employee morale.

2.5.1.3 Financial status

After Corposana was reformed as ESSAP, it was basically organized and managed using a self-supporting accounting system. At the present time, however, water supply fees, which form the bulk of revenue, are set under the influence of the government, and as things stand, ESSAP is not be permitted to revise fees on its own accord. Moreover, in Paraguay, there is also the fact that through laws and ordinances water fees are kept artificially low as a matter of policy. Given pro-privatization attitudes and a desire to

establish an independent accounting system, thought must be given to establishing reasonable water fees.

In the current situation fees are not being set autonomously; while ESSAP has been maintaining a positive current account balance, given its current relation to the government ESSAP is also responsible for the payment of foreign debt. Once the foreign debt payments are made, the balance of income and expenditure is in the red. From the standpoint of the organization's financial status, proper management of the payment of foreign debt is vital.

2.5.2 Operation and maintenance

ESSAP is in charge of operation and maintenance. As described above, there are no technical problems with ESSAP taking on the responsibility of operation and maintenance. However, in the context of conducting operation and maintenance in a way that is both appropriate and sustainable, a number of problems can be pointed out. First, in the backdrop of rather tight economic conditions, it is not possible to ensure budget amounts needed for operation and maintenance; operation and maintenance must therefore be prioritized and performed on an as-needed basis. According to the persons concerned, approximately 120 million guaranis in costs are needed for annual operation and maintenance of the water transmission and distribution mains. However, the allowance procured amounts to no more than half that figure, or 60 million guaranis. Thus, it is simply not possible to carry out all the repairs that have been planned, and work must thus be done in order of priority. Secondly, it has been pointed out that parts for operation and maintenance are not being properly managed. Third, looking at personnel education, it has been pointed out that systematic training of employees is not being performed, and this relates to the fact that the company is still only half-way privatized.

3. Feedback

3.1 Lessons Learned

3.1.1 When the project was just getting started, delays in obtaining approval from the Paraguayan parliament and time lost in bidding procedures led to the project being delayed. Such delays are not limited to this particular case, and are seen often in relation to international ODA loans. Accordingly, in the planning stage sufficient margin should be set in terms of project duration by taking such possibilities into consideration.

3.1.2 In this case, on account of a depreciation in the yen it was not possible to execute all the work that had been initially planned. Unfortunately, exchange rate fluctuations had a

financial effect on the ability to pursue project goals, and there were cases where it was not possible to achieve the initially planned targets. Bearing such project risks in mind in one's outlook, a system for flexibly accommodating exchange rate fluctuations needs to be built into the ODA loan system.

3.2 Recommendations

(For the executing agency)

3.2.1 The executing agency must promptly look into the state of affairs for its organizational structure, which is currently underdeveloped. They must further implement appropriate organizational reform taking the operation and management system into consideration.

3.2.2 Reductions in the free non-collection rate, which was one of the project's important goals, has not been achieved. In fact, the current figures are actually becoming worse than they were before the project began. Drastic remedial measures need to be considered as soon as possible.

3.2.3 There is an urgent need to expand the capabilities of the water purification plant. As the goal is to ensure a stable water supply in the future, expansion of the water purification plant's capabilities (which were not a target of this project) are urgently needed given the increasing demand brought about by the dramatic demographic influx.

Comparison of Original and Actual Scope

Item	Plan	Actual
(1) Outputs	1) Expansion of the water distribution facilities at the Viñas Cué water pump station. ・ Addition of six pumps each having a flow rate of 750l/s. 2) Construction of new water mains ・ 12 routes having a total length of 63,529m 3) Outfitting of the water distribution center ・ 13 locations 4) Outfitting of the water supply network ・ Four districts targeted ・ Total length of extension 204,000m ・ Total area covered 98.25km^2 5) Installation of water flow meters and other water supply devices ・ total of 20,000 sets	1) Expansion of the water transmission and distribution facilities at the Viñas Cué water pump station. ・ Addition of three pumps each having a flow rate of 750l/s. 2) Construction of new water mains ・ 10 routes having a total length of 53,703m 3) Outfitting of the water distribution center ・ 11 locations 4) Outfitting of the water supply network ・ Four districts targeted ・ Total length of extension 94.962m ・ Total area covered 63.49km^2 5) Installation of water flow meters and other water supply devices ・ total of 73,627 sets
(2) Project Period Land acquisition Consulting services Water distribution facilities Water supply network and water supply equipment	 By September 1995 September 1995-September 2000 October 1995-September 1999 October 1995-September 1999	 August 1997 October 1997-February 2002 December 1997-March 2002 January 1999-December 2001
(3) Project Cost Foreign Currency Local Currency Total ODA Loan Portion Exchange rate	 3,405 million yen 4,685 million yen (93,688 guaranis) 8,090 million yen 6,068 million yen 1 yen = 20 guaranis (as of November 1994)	 2,750.7 million yen 2,945.9 million yen (95,382.1 guaranis) 5,696.6 million yen 5,509.4 million yen 1 yen = 32.4 guaranis (weighted average rate)