Columbia

Aguablanca Water Supply and Sewerage Project

External Evaluator: Keishi Miyazaki

Field Survey: August 2004

1. Project Profile and Japan's ODA Loan

Region map of project site

Aerial view of sewage treatment plant

1.1 Background

The city of Cali[1], which is situated in the Cauca River Gorge, was the third largest city in Columbia, with a population of approximately 1.5 million (cf. almost the same as the current population of Yamaguchi Prefecture, Japan), but the United Nations predicted that the population would increase by 1.57 million persons by 2000, to 3.07 million persons. As Cali's population increased, there was a rapid increase in the influx of low-income laborers, particularly in the Aguablanca region (11.45km^2, equivalent to Chiyoda City, Tokyo (11.64km^2)) located in the southeastern part of Cali. However, public services were unable to keep pace with the rapid population growth and lagged far behind. With regard to water and sewer service, approximately 70% of the 23,000 households in the Aguablanca region lacked access. Moreover, because the Aguablanca region consisted of low-lying land along the Cauca River, the sanitary condition became very poor, as sewage flowed in the streets, etc, during the rainy season (March to May and September to November).

1.2 Objective

The project's objective was to promote the supply of drinking water and the treatment of household and industrial wastewater through installing water and sewage facilities in the city of Cali, thereby contributing to the improvement of the living and sanitary conditions of the city's residents and to the prevention of contamination of the Cauca

[1]Cali is located in the province of Valle del Cauca, which had a population of approximately 2.8 million persons at the time of appraisal (1984), or roughly 11% of the entire country's population.

River.

1.3 Borrower/Executing Agency

Empresas Municipales de Cali (EMCALI)

Guarantor: (Government of the Republic of Colombia)

1.4 Outline of Loan Agreement

Loan Amount/Loan Disbursed Amount	182,285 million yen/182,285 million yen
Exchange of Notes/Loan Agreement	June 1985/May 1986
Terms and Conditions -Interest Rate -Repayment Period (Grace Period) -Procurement	 4.75% 25 years (7 years) Partially Untied
Final Disbursement Date	May 2002
Main Agreement	CONING (Columbia), CONSTRUCCIONES CIVIL・CONSTRUTRA NORBERTO・ONDEO DEGREMONT S.A.・ONDEO DEGREMONT S.A.・Mitsubishi Corporation (Columbia, Columbia, Columbia, Argentina, Japan), etc.
Consultant Agreement	Nihon Suido Consultants Co., Ltd.・Tokyo Engineering Consultants Co., Ltd.・GANDINI AND OROZCO・INGESAM LTDA (Japan, Japan, Columbia, Columbia), INESCO LTDA (Columbia)
Feasibility Study (F/S), etc.	1984 Empresas Municipales de Cali (EMCALI)

2. Results and Evaluation

2.1 Relevance

2.1.1 Relevance of the Plan at the Time of Appraisal

In Columbia's 6th national development plan (1982-1986), provision of public services including water and sewers was upheld as one of the important policies. In the Cali City Development Plan (1983-1991) at that time, it had been decided to promote provision of public services in the city including water and sewers. The project planned to provide water and sewers in that city, and thus its priority was high.

2.1.2 Relevance of the Plan at the Time of Evaluation

In the 10th national development plan (2002-2006), expansion of public services including expansion of the supply capacity of the water and sewer systems is upheld as one of the important policies. In the current Cali City Development Plan (2000-2010) as well, expansion of public services in the city including water and sewers continues to be a priority issue. This is a project to expand the water supply and sewer systems in that city, and thus it continues to retain its importance.

2.2 Efficiency

Major alterations were made in the output, particularly in the sewer portion. The project period was extended considerably, by 131 months, but the project cost remained within the planned amount. This project was a coordinated financing project that consisted of loans from Inter-American Development Bank and others, in addition to JBIC.

2.2.1 Output

Table 1 shows a comparison of the output planned at the time of appraisal and the actual output.

Table 1: Output

Item	Planned (at appraisal)	Actual
Water Supply Portion ((a), (b) and (d) funded by JBIC)		
(a) Expansion of Puerto Mallarino Purification Plant	285,120 m^3/day	As planned
(b) Water mains in eastern part of city	11 km	As planned
(c) Water supply reservoir	16,000 m^3	30,000 m^3
(d) Water pipes	36 km	168 km
* (c) and (d) were funded by the Inter-American Development Bank (IDB), (a) and (d) by Italy's export- import bank		
Sewer Portion ((i) and (j) funded by JBIC)		
(e) Stormwater drains	10 km	As planned
(f) Stormwater management pond (for stormwater drainage)	781,000m^3	Suspended
(g) Stormwater drainage pump station	12 m^3/second	As planned
(h) Sewer pipes	12 km	As planned
(i) Aguablanca pump station (for sewage)	372,000 m^3/day	176,256 m^3/day
(j) Sewage treatment plant	181,000 m^3/day	656,640 m^3/day
* (e), (f), and (h) were funded by the Inter-American Development Bank (IDB), (g) were by Italy's export-import bank	—	Additions: Chemical infusion facility; Deodorization facility

The difference in the planned output and the actual one was due to the following reasons.

(c) Initially, the construction of the water supply reservoir was divided into two phases. This project was to be in charge of the first phase, which consisted of construction of 16,000 m^3 of the water supply reservoir. It was decided to implement the second phase (14,000 m^3) in view of consistency between the demand and the timing of the first and

second phases, and thus the capacity of the reservoir was expanded from 16,000 m^3 to 30,000 m^3.

(d) The total length of water pipes installed was expanded from 36 km to 168 km because alterations were made in the locations of the pipes, in keeping with the actual distribution of population at the time the water pipes were laid.

(f) Rehabilitation of the stormwater management pond was suspended because of difficulties in resolving the problems posed by environmental restrictions on disposal of soil and sand dredged from the pond and the problems involved in relocating residents who illegally occupied the area around the pond[2].

(i) The demand for sewage treatment in the Aguablanca region was reviewed at the time of construction based on the latest data, and the size of the pump station was revised from 372,000 m^3/day to 176,256 m^3/day.

(j) In Cali's basic sewer system plan at the time of appraisal, construction of sewage treatment plants in three locations in Cali was planned, but this project revised the plan to construct a sewage treatment plant in one location, from the standpoint of effectiveness. It was decided to expand the area covered by the project's sewage treatment plant to the entire city of Cali, and so the facility capacity of the treatment plant was increased significantly from 181,000 m^3/day to 656,640 m^3/day.

Furthermore, a chemical infusion facility and a deodorization facility[3] were constructed as additions in response to the environmental standards for water discharge which were strengthened in 1998[4].

2.2.2 Project Period

The project period planned at the time of the appraisal was May 1986 to May 1992 (73 months); however, the actual project period was May 1986 to December 2002 (200 months), representing a significant delay of 127 months (or 10 years and 7 months). The main reasons for the delay in the water supply portion of the project include the delay of 13 months (from the planned 11 months to an actual 24 months) for selection of consultants, a delay of 1 year and 3 months due to a review[5] of the feasibility study, and a

[2] Due to the postponement of rehabilitation of the stormwater management pond, floods occur in the eastern part of Cali, but heretofore the effects have been limited. Currently EMCALI and the city government of Cali have made efforts to resolve this problem, but they are unable to implement an effective policy due to lack of funds.

[3] The deodorization facility was added based on requests from area residents.

[4] As a measure to prevent pollution of the Cauca River, the environmental authorities (Corporacion autonoma Regional del Cauca) set environmental discharge standards (with targets of BOD removal volume of 31,300 kg/day; TSS removal volume of 51,700 kg/day). EMCALI is obligated to build a second treatment plant by 2000 and to meet the above-mentioned standards.

[5] The review was necessary due to design alterations in the water mains in the eastern part of the city, water pipes, and the water supply reservoir accompanying the changes in the water demand forecast.

delay of 1 year and 2 months due to revision of bidding documents related to expansion of the purification plant.

The main reasons for the delay in the sewage system portion of the project include a delay of 19 months (from the planned 9 months to an actual 28 months) for selection of the consultants, a delay of 1 year and 9 months for the city council of Cali to enact an ordinance concerning land usage and to approve usage of the land for the sewage treatment plant, and a delay of 3 years related to the construction of the sewage treatment plant due to revision of bidding documents because of design alterations including the addition of deodorization facilities, etc.

2.2.3 Project Cost

The total project cost planned at the time of appraisal was 38,220 million yen (of which 18,285 million yen was Japan's ODA loan). However, the actual project cost was 26,293 million yen (of which 18,285 million yen was Japan's ODA loan), and thus the project cost was less than the amount planned[6].

2.3 Effectiveness

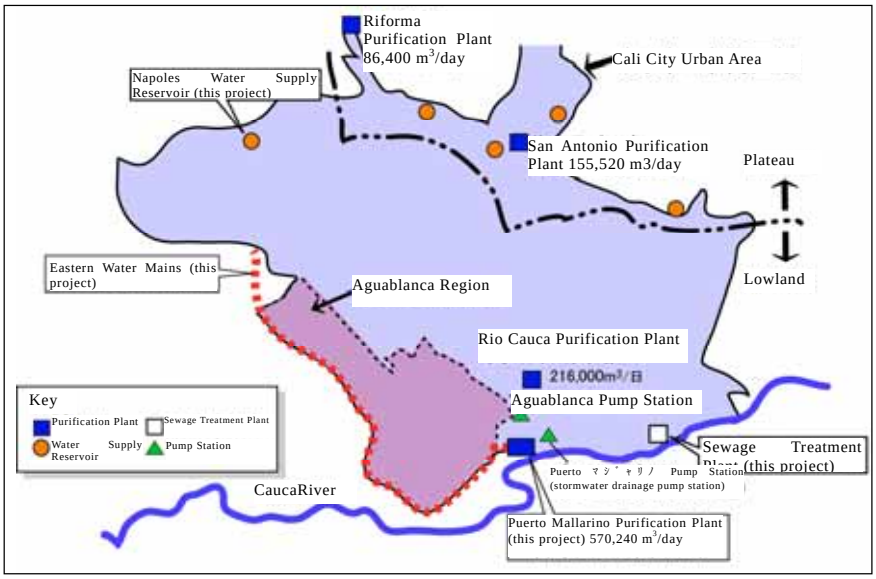
2.3.1 Water Supply

(1) Drinking water supply in Cali

There are four water purification plants in Cali (San Antonio Purification Plant, Riforma Purification Plant, Rio Cauca Purification Plant, and Puerto Mallarino Purification Plant. The areas supplied with water are divided into two areas, the plateau area (which includes approximately 24% of the water-supplied population of Cali) supplied by the San Antonio Purification Plant and the Riforma Purification Plant, and the lowland area (which includes approximately 76% of the water-supplied population of Cali) supplied by the Rio Cauca Purification Plant and the Puerto Mallarino Purification Plant (Figure 1).

[6] The breakdown for the water supply and sewer system portions of Japan's ODA loan (excluding charges) in the original plan was 8,851 million yen for the water supply portion and 12,504 million yen for the sewer system portion. However, the actual cost was 3,359 million yen for the water supply portion and 14,907 million yen for the sewer system portion. In the water supply portion, costs were cut by 5,493 million yen, and in the sewer system portion, there was a cost overrun of 2,403 million yen, resulting in a cost underrun of 3,070 million yen for both portions together. In the water supply portion, the cost of consultant service increased by 190 million yen due to the extension of the project period, but costs were reduced by altering the diameter specifications for water mains in eastern Cali and the water pipes. Because all costs, except the cost of the consultant service, were less than planned, the cost of the water supply portion overall was less than planned. The main reason for the cost overrun in the sewage system portion was that the construction costs for the sewage treatment plant increased by 5,324 million yen over the initial plan due to expansion of the facility capacity of the sewage treatment plant and the additional facilities. The second reason for the cost overrun was the cost increase of 1,179 million yen for consultant service due to the extension of the project period.

Figure 1: Areas that Benefited from Project



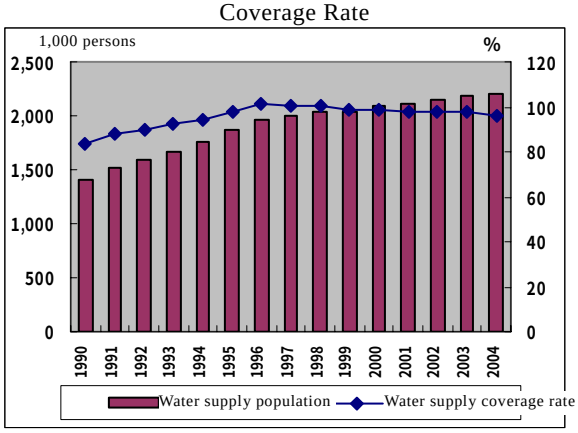
In the plan at the time of the appraisal, the planned level for water supply coverage in Cali was 92% for the year when construction was scheduled to be completed (1990). However, when construction was actually completed (1997), the actual level of coverage was 100%, which exceeded the planned level. In 2004 when the ex-post evaluation was conducted, the coverage was 96%[7] (Figure 2). Likewise, Cali's water supply population was forecast at 1.55 million persons in the plan; however, when the project was actually completed (1997), the water supply population, at 2 million persons, exceeded the planned figure, and in 2004, the water supply population had climbed to 2.2 million persons[8]. Also as stated above, the Rio Cauca Purification Plant and the Puerto Mallarino Purification Plant cover approximately 76% of Cali's water supply population. Because the facility capacity of this project's Puerto Mallarino Purification Plant is approximately 2.6 times that of the Rio Cauca Purification Plant, it is estimated that this project's (Puerto Mallarino Purification Plant's) beneficiary population in 2004 was 1.21 million persons.

In the plan, Cali's daily average water supply volume was to be 600,000 m^3/day; however, the actual water supply volume in the year construction was complete (1997) was 568,011 m^3/day, or 95% of the planned level, and in 2004, it was 612,350 m^3/day[9]. There are large fluctuations from year to year in the water supply volume, and a 17%

[7] In the Aguablanca region, the actual levels in 1997 and 2004 were 93% and 96%, whereas the planned level was 100%.
[8] In the Aguablanca region, the actual levels in 1997 and 2004 were 350,000 persons and 380,000 persons, whereas the planned level was 420,000 persons.
[9] In the Aguablanca region, the actual levels in 1997 and 2004 were 57,089 m^3/day and 62,931 m^3/day, 85% and 94 % respectively of the planned level 67,005 m^3/day.

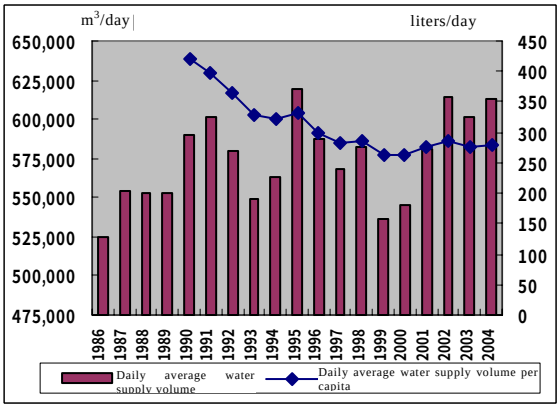
growth in the volume was visible during the 18 years from 1986 when construction began to 2004 (Figure 3). Meanwhile, the water supply volume per capita was 356 l/day in 1987, but declined to 285 l/day in 1997 and then to 279 l/day in 2004[10]. According to the analysis of the executing agency, this was due to (1) higher fees for water, (2) a sluggish economy in Cali, and (3) educational activities concerning water conservation by the executing agency.

Figure 2: Water Supply Population and Water Supply Coverage Rate



source: EMCALI

Figure 3: Daily Average Water Supply Volume and Water Supply Volume Per Capita



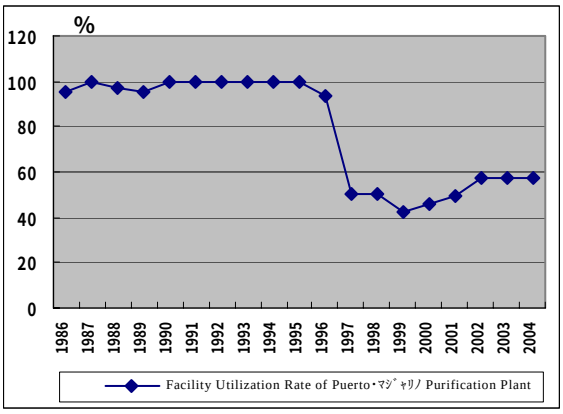
source: EMCALI
Note 1: Daily average water supply volume per capital for 1986 to 1989 is unknown because there is no data on water supply population for that period.

At the Puerto Mallarino Purification Plant, facility capacity prior to the project was 285,000 m^3/day and the facility utilization rate was approximately 100%, thus it was operating at full capacity. Following the project, while the facility capacity was doubled to 570,000 m^3/day[11], the facility utilization rate was only 57% in 2004 (Figure 4). There was no change in the facility capacity of the other three purification plants in Cali before and after the project, but the average facility utilization rate for the three facilities in aggregate dropped from 71% before the project to 64% in 2004[12]. The primary cause of this decline was that water demand did not increase as much as forecasted in the plan due to a sluggish economy in Cali[13], thus the water supply volume in Cali overall did not increase as much, and consequently the facility capacity was not fully used. In addition, other factors in the decline in water consumption were the above-mentioned fee hike and

[10] In the Aguablanca region, the volume was 164 l/day in 1990 and 167 l/day in 2004.
[11] In response to the water demand in 1997.
[12] Incidentally, the change in the facility utilization rate at each of the remaining three purification plants before and after the project was San Antonio Purification Plant, 80% to 72%; Riforma Purification Plant, 32% to 41%; and Cauca Purification Plant, 81% to 68%.
[13] The economy in Cali was strong in the early 1990s, with a city GDP growth of 12.7% recorded in 1992. However, the Columbian economy suddenly deteriorated starting in 1995 due to low prices on the international market for primary products, a high interest rate policy, and economic downturns in neighboring countries. Consequently, economic activities in the city of Cali have also been slack, leading to a continually negative economic growth rate and city GDP growth of minus 9.96% in 1999.

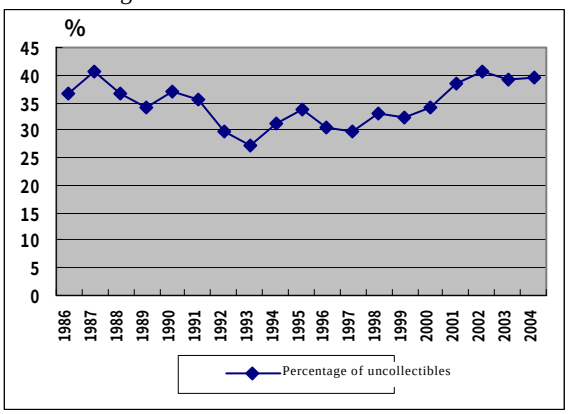
water conservation movement. The actual rate of unaccounted for water[14] was 30% in 1997 (when construction was actually completed), which was the same as the planned level of 30% (Figure 5). Subsequently, however, the rate of unaccounted for water worsened each year due to difficulties in repairing the existing antiquated pipe network and water meters because of the deterioration of EMCALI's financial condition, with the rate reaching 39% in 2004. EMCALI intends to work on plans for decreasing the rate henceforth, including repair of the pipe network and replacement of water meters.

Figure 4: Facility Utilization Rate of Puerto Mallarino Purification Plant



source: EMCALI

Figure 5: unaccounted for water rate



source: EMCALI

The water met the water quality standards of Columbia from 1997 to 2004 for color, clarity, and pH (color of 15 or less, clarity of 5 or less, and pH of 6.5 to 9.0), and the water nearly met Japan's standards (color of 5 or less, clarity of 2 or less, and pH of 5.8 to 8.6).

(2) Recalculation of Financial Internal Rate of Return (FIRR) for the Water Supply Portion

The financial internal rate of return (FIRR) at the time of appraisal was 16.4%, taking as expenses the construction cost and the operation and maintenance cost, taking as a benefit the fee income from water supplied by this project, and assuming a project life of 45 years. When the FIRR was recalculated for this evaluation using the same conditions, the result was 19.3%. The level was higher than at the time of appraisal because the benefit increased due to the hike in water fees.

[14] Rate of unaccounted for water ＝ water volume on which fees were not collected ÷ volume of water supplied×100

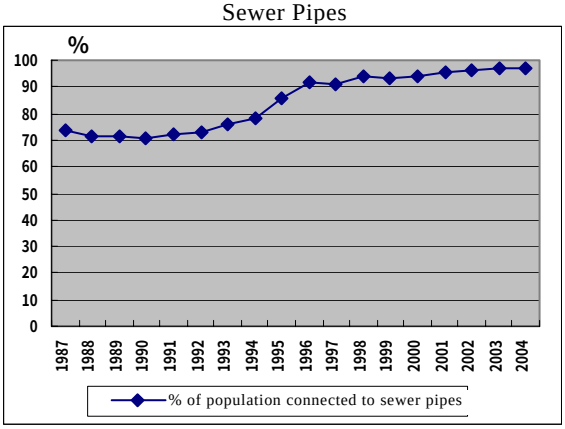
2.3.2 Sewer System

(1) Treatment of Household and Industrial Wastewater in Cali

In the original plan, this project was to construct a sewage treatment plant mainly for the Aguablanca region of Cali City. However, as stated in section 2.2.1, Cali's basic sewer system plan was revised to combine the three sewage treatment plants planned in the city into one in order to save costs. Thus, the treatment capacity of this project's sewage treatment plant was expanded by approximately 3.6 times, from the originally planned 181,000 m^3/day to 656,640 m^3/day[15]. The beneficiary area was also expanded from the Aguablanca region to the entire city of Cali.

In 1985, Cali's sewage pipe network covered approximately 70% of the population. Installation of the sewage pipe network progressed steadily after that, and in 2004, 97% of the population was connected to sewage pipes[16] (Figure 6). However, there was no sewage treatment plant in Cali until the completion of this project's sewage treatment plant in December 2002, and so until then untreated household and industrial sewage was discharged into the Cauca River.

Figure 6: Percentage of Population Connected to Sewer Pipes



source: EMCALI

The sewer system of Cali is divided into the northern area (approximately 15%-20% of the square area of Cali City) bounded by the Cali River which runs in the northern part of the city and the southern area (approximately 80%-85% of the square are of Cali City). The majority of the sewer pipe network installed in the southern area was connected to the sewage treatment plant following the completion of this project. For the sewer pipe network in the northern area, EMCALI is currently devising a plan to connect to the sewage treatment plant.

The daily average wastewater treatment volume that was originally planned was 475,200 m^3/day[17], whereas the actual figure in 2003 was 228,960 m^3/day and in 2004 was

[15] To meet the total water demand of Cali City in 2015.

[16] In the Aguablanca region, there was no sewer pipe network in 1985 prior to the project, but in 2003 following completion of the project, approximately 83% of the population was connected.

[17] In the original plan for the sewer system portion, 1990 (the originally scheduled year of completion) was the baseline year and the Aguablanca region was the main beneficiary area, but for reasons previously stated, alterations were made in the facility capacity and the beneficiary area. For this reason, this evaluation decided to use the sewage treatment volume of 475,200 m^3/day which the executing agency assumed for 2003 and 2004 as the planned level of facility capacity after project expansion.

198,720 m^3/day, representing a 48% and a 42% achievement of the planned level, respectively. The facility utilization rate was 35% in 2003 and 31% in 2004. The reason why the actual figures are low for both the daily average wastewater treatment volume and the facility utilization rate is, according to EMCALI, that many residents illegally dispose of household wastewater in stormwater pipes rather than in sewer pipes and also that the sewer pipes become clogged because residents throw garbage in them and then sewage overflows from the sewers into the stormwater pipes[18]. For these reasons, a large amount of wastewater that the pipes are supposed to carry to the treatment plant for treatment is discharged directly into the Cauca River without going through the treatment plant. According to the executing agency, approximately 50% of the wastewater that is supposed to be treated at the treatment plant is discharged untreated into the Cauca River for the above reasons. Also, the BOD concentration[19] when the treated water is discharged from the plant was 150 mg/l in 2003 and 133 mg/l in 2004. The BOD concentration in wastewater that flows into the treatment plant is higher than the planned level (of 121 mg/l), and thus the plant has not achieved the planned BOD level for the treated water discharged (79 mg/l BOD concentration, 35% removal rate at time of discharge). However, the amount of reduction in the BOD concentration has exceeded the planned level of 42 mg/l, achieving 61 mg/l (2003) and 65 mg/l (2004). The TSS concentration at the time of discharge[20] was 84 mg/l in 2003 and 72 mg/l in 2004, and the removal rate was 52% in 2003 and 58% in 2004. Because the concentration in wastewater that flows into the treatment plant is high, the planned level (52 mg/l TSS concentration, 60% removal rate at time of discharge) has not been achievable, but the amount of reduction in the TSS concentration in 2004 was 99 mg/l, which exceeded planned level of 78 mg/l. The reason why both the BOD and the TSS concentrations in wastewater flowing into the plant are higher than planned appears to be that residents throw garbage, etc., into the sewer pipes.

[18] The sewer system carries both stormwater and sewage from households and factories. The system where sewage and stormwater are removed by the same pipes is called the combined system, and the system where they are removed by separate pipes is called the separate system. This project uses the separate system.

[19] Biochemical Oxygen Demand (BOD) is an index that indicates the level of contamination due to organic matter in river water, etc. It represents the amount of oxygen that is consumed when organic matter in the water is oxidized by microorganisms during a fixed time at a fixed temperature. The higher the numerical figure, the greater the amount of organic matter and the greater the contamination

[20] Total Suspended Solids (TSS) refers to the amount of matter floating in the water. TSS concentration is tested by passing a certain amount of water through filter paper, drying the paper, and then weighing the paper. The higher the figure, the more pollution there is in the water.

Table 2: BOD and TSS Concentrations at the Sewage Treatment Plant

	Planned (at appraisal)		2003		2004 Note 1)	
	BOD	TSS	BOD	TSS	BOD	TSS
Intake Note 2) (mg/l)	121	130	211	176	198	171
Discharge Note 2) (mg/l)	79	52	150	84	133	72
Removal Rate (%)	35%	60%	29%	52%	30%	58%

source: EMCALI
Note 1: 2004 figures are actual figures from January through June.
Note 2: Intake and discharge amounts for BOD and TSS are annual averages.

Meanwhile, the Corporacion Autonoma Regional del Cauca (CVC), which is in charge of environmental administration of the Cauca River, sets the BOD and TSS removal rates that are supposed to be achieved by this project's sewage treatment plant. The CVC prescribed removal rates (for 1998 to 2003) of 31,300 kg/day and 51,700 kg/day for BOD and TSS, respectively. Since the facility utilization rate of the sewage treatment plant is still low, the goal levels for the removal rates have not been achieved. Another reason why the goal levels have not been achieved is that the chemical infusion facility is not functioning adequately because it is difficult to procure chemicals due to lack of funds.

(2) Recalculation of Financial Internal Rate of Return (FIRR) for the Sewer System Portion

When the financial internal rate of return (FIRR) was calculated at the time of appraisal, the result was negative, taking as expenses the construction cost and the operation and maintenance cost, taking as a benefit the fee income from the project's sewers, and assuming a project life of 45 years. When FIRR was recalculated for the evaluation using the same conditions, the result was 7.3%. The level was higher than at the time of appraisal because the benefit increased due to the hike in sewer fees.

2.4 Impact

2.4.1 Improvements in Residents' Living and Sanitary Conditions

(1) Results of Beneficiary Survey

To confirm the impact of this project on improvements in residents' living and sanitary conditions, a beneficiary survey was implemented with the participation of 100 residents' households in Cali. Due to this project, 89 households received access to tap water for the first time. Also, 96 out of the 98 households that are currently able to access the tap water also mentioned release from the job of carrying water as one of the project's impacts. The number of households that have experienced outbreaks of water-borne infectious illnesses dropped to four households following the project. Moreover, 91 households installed flush toilets for the first time as a result of this project, and thus the project appears to be contributing to the improvement of households' sanitary condition (Table 3).

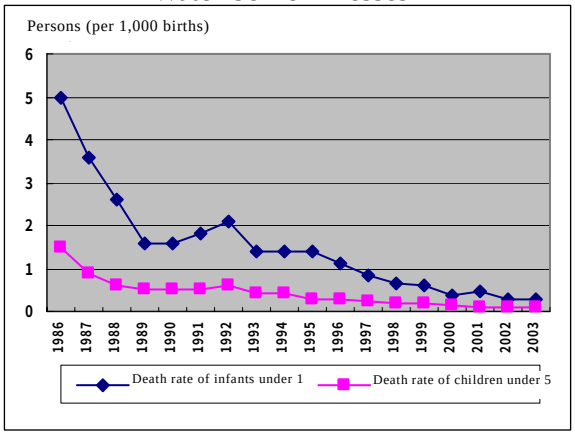
Table 3: Results of Beneficiary Survey of 100 Residents' Households

	Before Project	After Project
Water tap in house	9 households	98 households
Sufficient volume of water supply	5 households	98 households
Released from carrying water	—	96 households
Outbreak of water-borne infectious illness	15 households	4 households
Flush toilet in house	8 households	99 households

(2) Decrease in Infant and Child Mortality Rate in Cali Due to Water-Borne Illnesses

The infant mortality rate (less than one year old) in Cali caused by water-borne illnesses such as diarrhea decreased from 5 (1986) per thousand births to 0.3 (2003) per thousand births. The child mortality rate (under 5 years old) also declined from 1.5 to 0.07 children per thousand births during the same period. (Incidentally, Columbia's infant mortality rate in 2003 was 18 per thousand births.) According to the Cali Public Health Bureau, these improvements can be attributed to this project

Figure 7: Infant and Child Death Rate Due to Water-borne Illnesses



source: Cali Public Health Bureau

2.4.2 Prevention of Contamination of Cauca River

Table 4 displays the water quality data for the Cauca River from 2002 to 2004. It is difficult to evaluate, however, the impact of this project on prevention of contamination of the Cauca River based only on the data, because the data is from spot checks taken at one location on certain days and the measurement site is 49 km downstream from the Cali sewage treatment plant. Moreover, Cali City is located on the lower reaches of the Cauca River and wastewater from cities with no sewage treatment plants is discharged into the Cauca River upstream from Cali. For reference, if this water quality data is compared to Japanese water quality standards for rivers that are used for purposes similar to the Cauca River, then only the pH[21] meets the standards, and the BOD, TSS, and DO[22] do not meet the standards. The plausible reasons are that (1) 50% of the sewage that is supposed to be treated at the sewage treatment plant is released into the Cauca River untreated and (2) untreated sewage from cities upstream is also released into the Cauca River.

[21] Hydrogen ion concentration (pH) is an index that indicates the concentration of hydrogen ions in water. It reveals whether the water is acid or alkaline.
[22] Dissolved oxygen (DO) is one index of water quality. It indicates the amount of oxygen dissolved in water. The lower the figure for DO, the worse the water quality.

Table 4: Water Quality of Cauca River

Item	Water Quality of Cauca River [Note 1)]			Japanese Water Quality Standards for Rivers [Note 2)]
	2002	2003	2004	
pH	7.10	6.97	6.66	6.5 - 8.5
BOD (mg/l)	8.80	4.23	3.33	3 mg/l or less
TSS (mg/l)	172.0	84.0	115.7	25 mg/l or less
DO (mg/l)	0.60	2.17	2.14	5 mg/l or less

source: CVC

Note 1: The measurement site was 49 km downstream from the Cali sewage treatment plant. Also, the data are from spot checks and does not represent annual averages

Note 2: Japanese water quality standards for rivers are the standards for “tap water, grade 3, and marine products, grade 2.”

2.5 Sustainability

2.5.1 Executing Agency

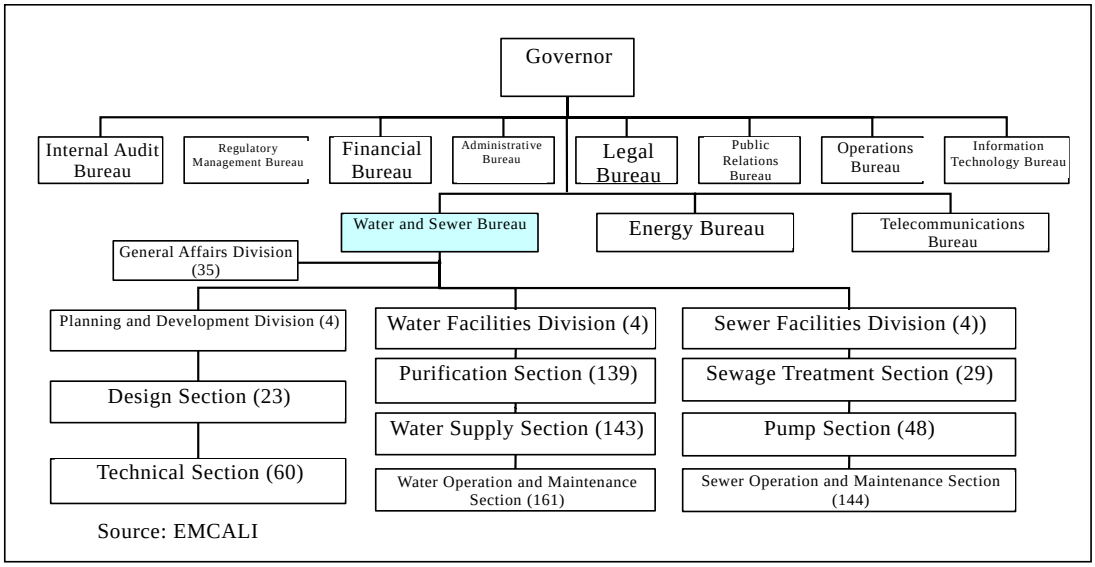
2.5.1.1 Technical Capacity

With regard to the Puerto Mallarino Purification Plant expanded by this project and other water-related facilities, EMCALI, the executing agency, has many years of experience. EMCALI carrys out operations smoothly, and there are no technical problems. On the other hand, because the technology for running, operating, and maintaining the sewage treatment plant is new to the staff of EMCALI, technology transfer was planned during the trial operation period. However, at the time of the on-site inspection, it was found that the screw pumps, sedimentation ponds, and the sludge condenser tank, etc., were not functioning adequately. One cause of this is that operation and maintenance based on the manuals are not pervasive. Therefore, a need for improvement of the operation and maintenance is recognized.

2.5.1.2 Operation and Maintenance System

EMCALI is an independent public company that carries out the construction, running, operation, and maintenance of several facilities related to the water and sewage systems, energy, and telephone service in Cali and the surrounding cities. The operation and maintenance of this project’s facilities are handled by the Water Facilities Division (447 staff members) and the Sewer Facilities Division (225 staff members) of the Water and Sewer Bureau in EMCALI. According to EMCALI, there is a particular shortage of operation and maintenance workers at the sewage treatment plant, and as a measure to deal with this, EMCALI is studying a plan for outsourcing operation and maintenance of the sewage treatment plant.

Figure 8: Organizational Chart of EMCALI



Source: EMCALI

2.5.1.3 Financial Status

The financial condition of EMCALI deteriorated due to the massive increase in debt owed to foreign parties in the 1990s and the high cost structure of the energy sector (i.e. the relatively high electricity purchase price), etc. In 2003, EMCALI was essentially bankrupt due to its debts of approximately 1.25 billion dollars, including pension obligations. Due to the deterioration in EMCALI's financial condition, administration and supervision of EMCALI was transferred from the city government of Cali to the central government of Columbia[23] in April 2000. Currently, management is being restructured under the guidance of the central government[24]. As a part of this restructuring, the relatively high purchase price for electricity from the power company in which EMCALI has invested has been rectified in recent years. While the equity ratio decreased from 47% in 2002 to 39% in 2004, earnings in the first half of 2004 improved and a profit was posted. The Columbian Government continues to take the lead in promoting a government-led restructuring of management, and EMCALI's financial sustainability, along with progress of the restructuring, needs to be monitored.

[23] By presidential order, a committee has been formed by the Public Utilities Supervisory Agency, National Planning Agency, Ministry of Energy and Mining, Ministry of Telecommunications, and a US consultant, and EMCALI is being restructured.

[24] EMCALI and its creditors have agreed that, by May 2003, (1) the debts of EMCALI will be coordinated and the amount determined, (2) based on the amount determined in (1) above, installment payments appropriate to EMCALI's ability to pay will be rescheduled for payment from July 30, 2005, to July 30, 2018, (3) privileges (allowances, special pension system, etc.) received by EMCALI staff heretofore will be cancelled, and (4) the central government will take responsibility for debts owed to foreign parties. Meanwhile, the central government granted EMCALI the authority to raise water fees to improve EMCALI's financial condition and to adopt policies and take other steps for sound financial management and administration. After the reconstruction of EMCALI is on track, supervisory authority will be handed over from the central government to the city government of Cali.

Table 5: Main Financial Data of EMCALI

	2002	2003	2004[Note 1)]
Total Assets	5,347,046,827	4,807,914,643	4,989,002,079
Current Assets	698,584,172	854,393,680	1,079,622,358
Current Liabilities	325,616,008	342,258,780	332,380,386
Capital	2,512,145,132	1,857,968,428	1,937,983,765
Net Sales	949,666,825	1,119,725,496	574,720,330
Net Profit	-199,101,555	-470,021,607	44,662,514
Return on Equity (ROE) (%)	-3.72	-9.78	0.90
Net Income to Net Sales (%)	-20.97	-41.98	7.77
Turnover Ratio of Total Liabilities and Net Worth	0.18	0.23	0.12
Current Ratio(%)	214.54	249.63	324.82
Equity Ratio(%)	46.98	38.64	38.85

source: EMCALI (unit: 1,000 Columbian pesos)

Note 1: The 2004 figures are for January through June 2004. (The Columbian accounting year starts in January and ends in December.)

2.5.2 Operation and Maintenance Status

There is no problem in the operation and maintenance of the water supply portion of the project. In the sewer system portion, due to lack of technological capabilities, human resources, and budget, the operation and maintenance of the sewage treatment plant and the sewer pipe network is not being conducted adequately, and a need for improvement is recognized (see section 2.3.2).

3. Feedback

3.1 Lessons Learned

None

3.2 Recommendations

In order to enhance utilization of the sewage treatment plant and to prevent contamination of the Cauca River, it is desired that the city government of Cali crack down on illegal connections to stormwater drains, improve the trash collection system to prevent dumping of garbage in sewer pipes, and conduct educational activities for residents. Also, the executing agency, EMCALI, is advised to work on developing its capabilities for operation and maintenance of the sewer facilities.

Comparison of Original and Actual Scope

Item	Planned	Actual Performance
1. Output Water Portion (JBIC portion is (a),(b), and (d)) (a) Expansion of Puerto Mallarino Purification Plant (b) Eastern Water Mains (c) Water Supply Reservoir (d) Water Pipes Sewer Portion (JBIC portion is (i) and (j)) (e) Stormwater Drains (f) Stormwater Management Pond (for stormwater drainage) (g) Stormwater Drainage Pump Station (h) Sewer Pipes (i) Aguablanca Pump Station (for sewage) (j) Sewage Treatment Plant ※(c), (d), (e), (f), and (h) were funded by the Inter-American Development Bank (IDB); (a),(d), and (g) were by Italy's export-import bank	 285,120 m^3/day 11 km 16,000 m^3 36 km 10 km 781,000 m^3 12 m^3/second 12 km 372,000 m^3/day 181,000 m^3/day	 As planned As planned 30,000 m^3 168 km As planned Suspended As planned As planned 176,256 m^3/day 656,640 m^3/day Additions: Chemical Infusion Facility; Deodorization Facility
2. Project Period	May 1986-May 1992 (73 months)	May 1986-December 2002 (200 months)
3. Project Cost (Japan's ODA loan portion only) Foreign Currency Local Currency Total Exchange Rate	 12,800 million yen 8,555 million yen (3,719 million Columbian pesos) 18,285 million yen 1 Columbian peso ＝ 2.3 yen (as of January 1985)	 13,693 million yen 4,592 million yen (30,613 million Columbian pesos) 18,285 million yen 1 Columbian peso ＝ 0.15 yen (simple average of 1987 to 2002)