People's Republic of China

Ex-post Evaluation of Japanese ODA Loan Project

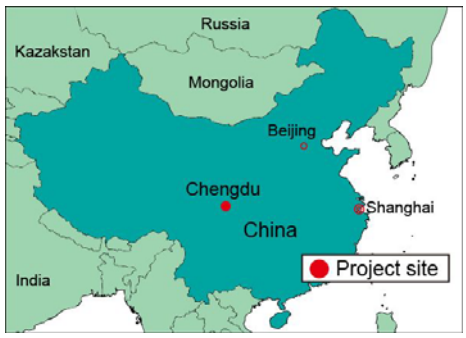
Chengdu Water Supply Project

Akemi Serizawa, Sanshu Engineering Consultant

0. Summary

This project to improve the water supply systems in Chengdu has been highly relevant with China's development plans, development needs, as well as Japan's ODA policy; therefore its relevance is high. The needs to enhance the water supply capacity were low during the originally-planned project period because the water demand in the central and suburban districts of Chengdu did not increase as much as anticipated after the relocation of factories following the new city planning policy since 2002. The water demand later increased and is now covered by the current supply capacity strengthened by this project. The project cost was lower than planned, but the project period was substantially longer than planned; therefore the efficiency is moderate. The project has largely achieved the development objectives, which were to enhance the water supply capacity and to respond to the water demand, thus to contribute to regular supply of safe water. Therefore, the effectiveness is high. Since no major problems have been observed in the operation and maintenance systems such as organizational setup, technical capacity and financial status, the sustainability of the project is considered high.

1. Project Description



Location of Project Site

Plant C,
Chengdu Sixth Water Purification Plant

1.1 Background

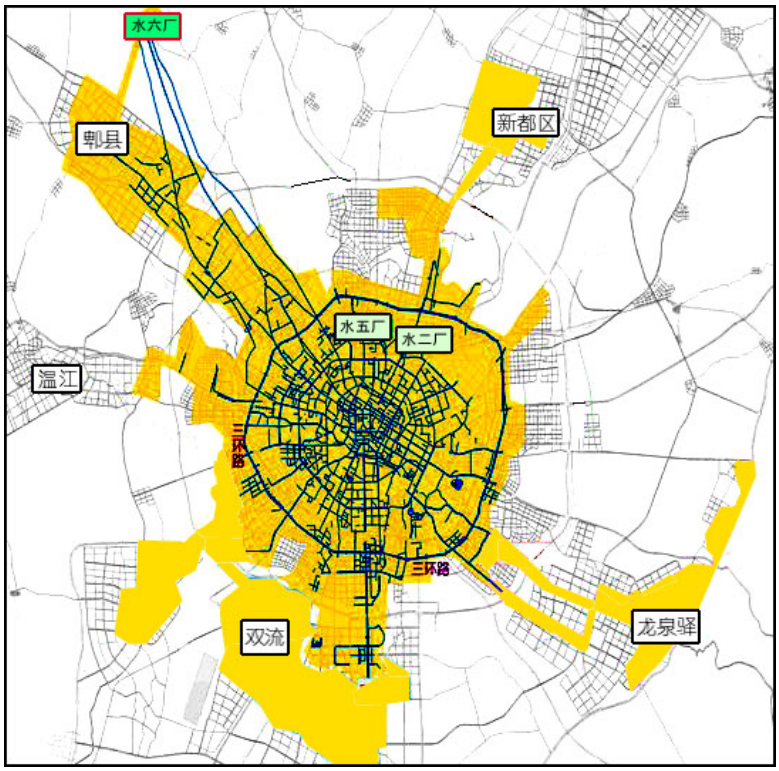
The demand-supply gap of water has been a problem in large cities in the inland China since the 1990s because of the rapid increase of the water demand for industrial and domestic use from the industrialization and the concentration of population.

Chengdu is the capital of Sichuan Province. In 1998, the population of the central districts, the suburban districts and the satellite cities was 9,890 thousand in total (the administrative

divisions of Chengdu are shown in Figure 2). Its main industries are machine, electronics, pharmaceutical products and agriculture, and its GDP growth rate was above 10% in the mid-1990s. The target areas of the project are the central and suburban districts of Chengdu, which had four water purification plants (first, second, fifth and sixth) with the total facility capacity of 1,053,000m^3/day at the time of appraisal in 2000. The capacity was not sufficient to cover the demand as shown by the fact that the maximum water supply record of 1,120,000 m^3/day exceeded the capacity. At the time of appraisal, the estimated water demand in 2005 was 1,730,000 m^3/day and it exceeded the anticipated water supply capacity of 1,453,000 m^3/day that included Plant B (400,000m^3/day) which was under construction at that time as the fourth phase of the Sixth Water Purification Plant project. In order to meet the needs to further enhance the water supply capacity, this project to construct Plant C (400,000m^3/day) as the fifth phase of the Sixth Water Purification Plant project was planned.

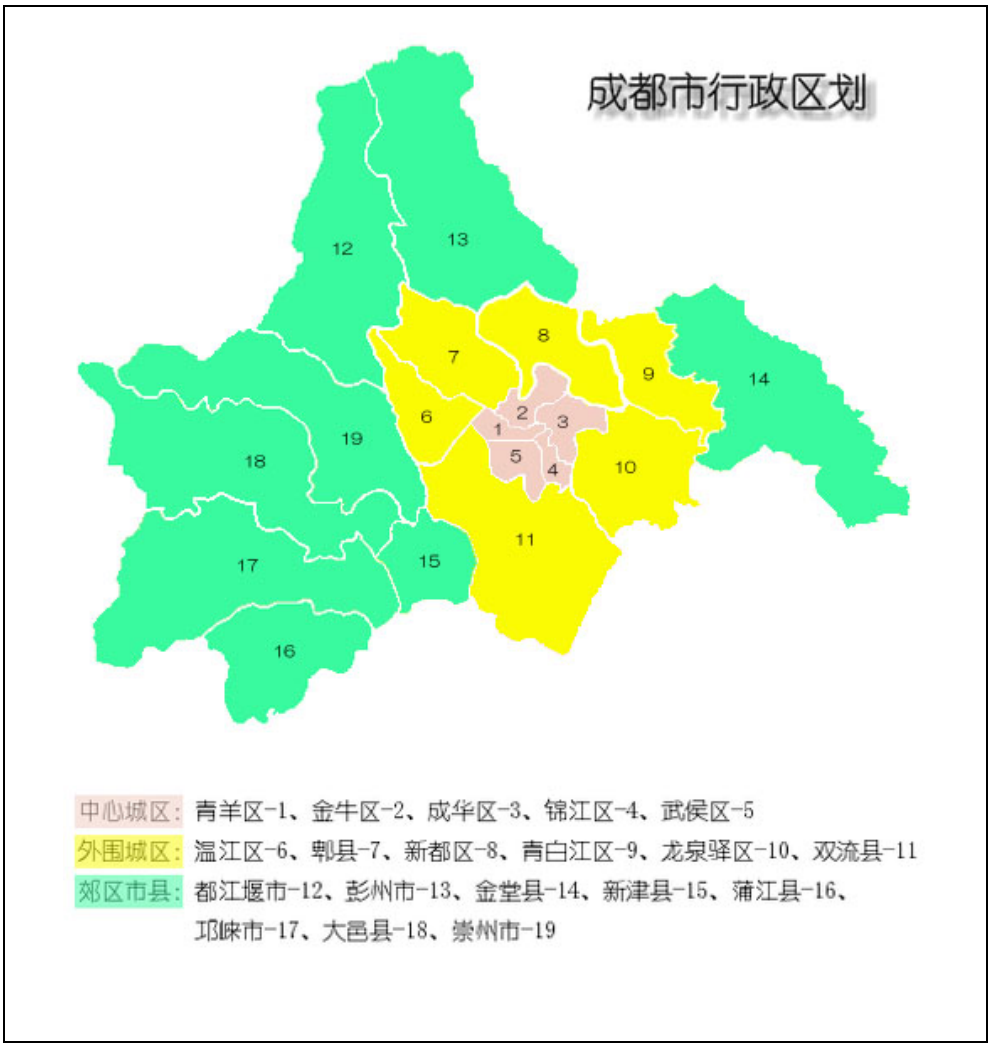
1.2 Project Outline

The project objective is to respond to the shortage of the water supply capacity and meet the demand in the future in the central and suburban districts in Chengdu and then to the stable supply of safe water through the expansion of the Sixth Water Purification Plant. The project areas are shown in Figure 1.



Source: Chengdu Municipal Waterworks Co., Ltd.

Figure 1. Project areas



Source: Wikipedia

Figure 2. Administrative divisions of Chengdu

The three water purification plants (Second, Fifth and Sixth) currently supply water to Chengdu central districts and five suburban districts (Wenjiang District, Pi County, Xindu District, Longquanyi District and Shuangliu County). The Second and Fifth Water Purification Plants are located in the central districts. The Sixth Water Purification Plant is in Pi County, about 27 km north-west from Chengdu central districts. It has three water purification plants, namely Plant A (600,000m^3/day), Plant B (400,000m^3/day) and Plant C (400,000m^3/day), with a total of 1.4 million m^3/day capacity. This project was to construct Plant C and install related transmission and distribution pipelines as the fifth phase of the Sixth Water Purification Plant project. The Second, Fifth and Sixth Water Purification Plants and pipelines form the water supply network of Chengdu central and suburban districts as a unit. Therefore, it is not possible to identify the specific areas served by Plant C constructed by this project.

Approved Amount/Disbursed Amount	7,293 million yen / 4,244 million yen
Exchange of Notes Date/Loan Agreement Date	March 2000 / March 2000
Terms and Conditions	Interest rate 1.70% Repayment period 30 years (Grace period 10 years) Condition of procurement: General Untied
Borrower/Executing Agency	Government of People's Republic of China / The People's Government of Chengdu City
Final Disbursement Date	December 2007
Main Contractor (over 1 billion yen)	-
Main Consultant (over 100 million yen)	None
Relevant Studies (Feasibility Study and others)	F/S by China Southwest Municipal Engineering Design Institute (November 1998)
Relevant Projects	Chengdu Générale des Eaux-Marubeni Waterworks Co., Ltd. "BOT Chengdu Water Supply" (Plant B, the fourth phase of the Sixth Water Purification Plant project, 400,000m^3/day) (started operation in February 2002) ADB "BOT Chengdu Water Supply" (Technical Assistance) (1997-2000)

2. Outline of the Evaluation Study

2.1 External Evaluator

Akemi Serizawa, Sanshu Engineering Consultant

2.2 Duration of Evaluation Study

The subject ex-post evaluation assignment was implemented as follows:

Duration of the Study: December 2010-December 2011

Duration of the Field Study: February 20-March 5 and May 15-28, 2011

2.3 Limitation of evaluation

The construction of the water purification plant (Plant C) started in 2009 using the local fund after the final disbursement date (December 2007), and it started operation in May 2010. At the time of ex-post evaluation in 2011, it was too early to obtain statistics of 2010 or to expect that the data reflect the impacts of this project. Therefore, the analysis of the impact largely depended on the qualitative information such as subjective opinions of the executing agency and the beneficiaries.

3. Results of the Evaluation (Rating[1] :A)

3.1 Relevance (Rating[2]:③)

3.1.1 Relevance with the Development Plan

The 9th Five-Year Development Plan of China (1996-2000) stated that the improvement of water supply systems in the regional cities was one of the most essential agenda, and set up the following targets to be achieved during the Five-Year Plan period: i) increase of nationwide water supply by 40 million m^3/day; ii) raise the water supply coverage in urban areas to 96%; and iii) increase the average water supply per person by 40ℓ/day. The water supply facility capacity increased by 13.15 million m^3/day by 1998, and thus the target should have been achieved by 2000 taking into account the facilities under construction. The target of water supply coverage in urban areas had been achieved by 1998, ahead of the schedule. The average water supply per person in 1998 was 214 ℓ/day, which has exceeded the target (210 ℓ/day). Since many areas still suffered from the shortage of water, however, the improvement of water supply systems was among the priorities in the urban development plan also in the 10th Five-Year Plan (2001-2005). The 11th Five-Year Development Plan (2006-2010) of China stated that the protection of water sources for urban areas was to be strengthened, and the construction of water supply facilities was to be further promoted. The ongoing 12th Five-Year Development Plan (2011-2015) also promotes the improvement of basic infrastructures including water supply and wastewater treatment systems to ensure supply of safe water.

The 11th and 12th Five-year Development Plans of Chengdu City prioritized the expansion of the water supply systems. The 12th plan aims that the percentage of population served should reach 100% in the central areas in two years and in the suburban and rural areas in five years.

The project was in line with the national policy of China and the development plans of Chengdu City because the improvement of water supply systems was among the priority areas, both at the appraisal and ex-post evaluation.

3.1.2 Relevance with the development needs

In 1998, the water supply capacity of the central and suburban districts of Chengdu was 1,053,000m^3/day in total. The maximum supply record was 1,120,000m^3/day, which exceeded the facility capacity by 7%. Due to the concentration of population into the central districts and the expansion of the water served areas in the suburban districts, it was estimated at the time of appraisal that the water demand in 2005 would reach 1,730,000m^3/day. However, it was anticipated that the total water supply capacity would be only 1,453,000m^3/day including the plant under construction at that time (Plant B, the fourth phase of the Sixth Water Purification

1 Overall rating: A: “very high”, B: “high”, C: “low in some aspects”, D: “low”
2 Rating: ③: “high”, ②: “moderate”. ①: “low”

Plant project). Therefore, this project to construct Plant C as the fifth phase of the Sixth Plant to add a 400,000m^3/day capacity was relevant to the development needs at the time of appraisal.

The growth of the water demand was slower than anticipated: it was only 1,147,500 m^3/day in 2003, the year in which the project was to be completed originally (the estimate was 1,620,000m^3/day). In 2007, the demand was 1,246,900 m^3/day, far below the estimate of 1,810,000m^3/day. The water supply capacity for Chengdu central and suburban districts had increased to 1,380,000 m^3/day with the completion of Plant B of the Sixth Water Purification Plant in 2002, and it was sufficient to cover the water demand in 2007. According to the executing agency, the reason for the slower growth of the water demand was that many factories relocated to the outside of the central and suburban districts following the Urban-rural Integrated Development policy of Chengdu (2002-2006), a new city planning policy to separate the residential and industrial areas. The relocated factories included a steel pipe factory, a geothermal power plant and a bearing factory among others of large to medium scale that had been in the eastern area of the central districts. Another reason for the slower growth of the water demand was the promotion of water-saving and recycling of water. While the original plan of this project was to start operation of Plant C in December 2003, its construction was postponed as it was not needed in terms of the actual water demand at that time, and the final disbursement date of the yen loan arrived in 2007.

Since then, the empty lots after the factories moved out became residential areas, and the water demand for the domestic use increased rapidly. The water demand of Chengdu central and suburban districts reached to 1,354,700m^3/day in 2008 and 1,512,800 m^3/day in 2009, which exceeded the supply capacity of 1,380,000m^3/day. Because of the insufficient capacity, water supply was short in the peak hours in the morning and evening as well as in summer, about which the customers complained. In order to respond to the increase in the demand, Plant C of the Sixth Water Purification Plant was finally constructed from 2009 to 2010 by the local fund. The water supply capacity of the city reached 1,780,000 m^3/day and it covers the demand 1,635,000 m^3/day in 2010. Chengdu City is planning to construct another water purification plant (the Seventh Plant) in order to respond to the increasing water demand.

From the above, the needs to expand the water supply capacity for Chengdu central and suburban districts existed both at appraisal and at the ex-post evaluation. During the planned project period, however, there were no urgent needs to expand the capacity because of the slower growth of the water demand in the central and suburban districts due to the relocation of the factories following the new city planning policy. However, as it was not possible to foresee at the time of appraisal the change in the city planning policy that led to the slower growth of the water demand, it was appropriate to postpone the construction of the plant according to the actual demand.

3.1.3 Relevance with the Japan's ODA policies

According to the Overseas Economic Cooperation Implementation Policy (issued on December 1, 1999 and valid up to March 2002), the Japanese aid policy towards China focused on the alleviation of the disparity between regions, particularly giving priority to the inland regions and the development of the economic and social infrastructure which would promote self-motivating economic development in order to promote the development of the private sector and democratic markets, and to urge the well-balanced development to promote the market-oriented economy. This project to improve water supply systems was in line with the Japanese aid policies.

The project has been highly relevant to the development policies in China, development needs, as well as Japan's ODA policies, and therefore the relevance of the project is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

The project outputs (planned and actual) are summarized in Table 1.

Table 1. Comparison of Project Outputs (Planned and Actual)

Item	Planned	Actual
① Intake facility (not included in this project. Constructed as a part of Plant B project)	・ Intake header 480,000m^3/day x 2 ・ Inlet pipes approx. 1.9km x 2	As planned. ・ Intake header 480,000m^3/day x 2 ・ Inlet pipes approx. 1.9km x 2
② Connection pipes (local fund)	・ Connection pipes approx. 0.16km	As planned. ・ Connection pipes approx. 0.16km
③ Water purification plant (it was to be funded by the yen-loan, but was funded by the local fund)	・ Plant C 400,000m^3/day (coagulation-sedimentation-rapid filtration system) Flocculation basin, sedimentation basin, filtration basin	As Planned. ・ Plant C 400,000m^3/day (coagulation-sedimentation-rapid filtration system) Flocculation basin, sedimentation basin, filtration basin
④ Water transmission facility (yen-loan fund and local fund)	・ Water transmission pipelines approx. 25km	Mostly as planned ・ 26km Water transmission pipelines approx. 26km (20 km of which used yen-loan)
⑤ Water distribution facility (yen-loan fund and local fund)	・ Water distribution pipelines approx.140km ・ Pressure station 40,000m^3/day	The distribution pipelines were 54 km shorter than the plan. The pressure station was cancelled. ・ Water distribution pipelines approx. 86km (42km of which used yen-loan) ・Pressure station was cancelled.

Source: Questionnaire responses

The planned outputs have been completed almost as planned. The revised items and the reasons for the change are as follows:

- The total extension of the distribution pipelines was 54 km shorter than the plan. The original plan was to install four pipes along the third ring road of Chengdu, but the design was revised and three pipes were sufficient.
- The pressure station was cancelled. The original plan was to construct it on the hill between the third ring road and Longquanyi District in order to obtain sufficient pressure to distribute water to the areas around the pressure station. It was confirmed later that it was possible to obtain sufficient water pressure without the pressure station. The water from the Sixth Water Purification Plant (560m above sea level) is sent to the central districts (500m above sea level around the third ring road) only by the gravity.

Water intake point

Chengdu Municipal Waterworks Co., Ltd.

3.2.2 Project Inputs

3.2.2.1 Project Cost

The project cost was lower than the plan. The estimated project cost at appraisal was 17,958 million yen, of which the Japanese loan was used only for the foreign currency portion amounting to 7,293 million yen and the rest was to be financed by Chengdu Municipal Waterworks Company's own-fund, loan from the China Construction Bank and investment from Chengdu Municipal Government. The actual project cost was 14,938 million yen, of which the Japanese loan covered the whole foreign currency portion amounting to 4,244 million yen, and the rest was financed by Chengdu Municipal Waterworks Company's own-fund, loan from the China Construction Bank and investment from Chengdu Municipal Government. The actual project cost was 83% of the plan in Japanese yen, and 89% of the plan in Chinese currency. The difference in Japanese yen was due to the shorter construction period of the water purification plant and the shorter total extension of the water distribution pipelines from the revision of the design, and the change of the exchange rate (1 yuan = 15 JPY at appraisal and 1 yuan = 14 JPY at ex-post evaluation), all of which were reasonable.

Table 2. Project cost

Item	Planned (million yen)			Actual (million yen)			Reasons for the difference
	Total	FC	LC	Total	FC	LC	
Land acquisition	1,973	0	1,973	652	0	652	A part of the cost of land acquisition is included in the cost of the water transmission facility (below) for an accounting reason.
Preparatory work	45	0	45	-	-	-	-
Water purification plant	3,948	2,024	1,924	3,113	0	3,113	The construction period of the water purification plant was only 15 months. The original plan was 36 months.
Water transmission facility	2,445	2,137	308	6,467	2,993	3,534	This item was larger than the plan because the law material price was high and a part of the cost of land acquisition is included here (see above).
Water distribution facility	6,040	2,628	3,412	4,706	1,311	3,395	The total extension of the distribution pipeline was 54km shorter than the plan.
Others	785	0	785	-	-	-	-
Price escalation	827	157	670	-	-	-	-
Contingency	803	347	456	-	-	-	-
Interest	1,092	0	1,092	-	-	-	-
Total	17,958	7,293	10,665	14,938	4,244	10,694	

Note: FC: foreign currency; LC: local currency
Source: Appraisal documents, questionnaire responses

Water purification plant (Plant C)

Water purification plant (Plant C)

3.2.2.2 Project period

The actual project period substantially exceeded the plan. The project period planned at appraisal was 46 months from March 2000 (signing of the Loan Agreement) to December 2003 (start of operation). The actual project period was from March 2000 (signing of Loan Agreement) to May 2010 (start of operation) with a total of 123 months, which was 267% of the plan. This prolonged project period is due to the postponement of the construction of the water purification plant, which took place from 2009 to 2010, as explained above.

The completion of the project is defined as the start of operation in May 2010. On the final disbursement date in December 2007, the construction of Plant C had not been commenced and only a part of the water transmission pipelines (17.8km) and the distribution pipelines were completed. These pipelines were installed between 2000 and 2004 almost as planned. The distribution pipelines were installed at the same time with road works in Chengdu City. The pipelines have been utilized as a part of the water supply network of the central and suburban districts of Chengdu even before the construction of Plant C.

From the above, the project cost was within the planned cost, but the project period was much longer than planned; therefore the efficiency is moderate.

3.3 Effectiveness (Rating: ③)

3.3.1 Quantitative effects

3.3.1.1 Results from Operation and Effect Indicators

(1) Enhancement of water supply capacity

Table 3 shows the balance of water demand and supply in Chengdu central and suburban districts.

Table 3. Balance of water demand and supply in Chengdu central and suburban districts

Year	1998	2003	2007	2008	2009	2010
Population served (10,000 persons)	209.5	261.7	301.0	307.6	309.6	(Note 2)
Water demand ($10,000m^3$/day)	135.0	114.9	124.7	135.5	151.3	163.5
Water supply capacity ($10,000m^3$/day) (Note 1)	105.3	138.0	138.0	138.0	138.0	178.0
Balance between water demand and supply capacity ($10,000m^3$/day)	-29.7	23.1	13.3	2.5	-13.3	14.5

Source: Appraisal documents, questionnaire responses

Note 1. In 2002, 400,000 m^3/day capacity of Plant B was added. The decrepit First Water Purification Plant of $73,000m^3$/day capacity was closed down. In May 2010, Plant C of the Sixth Water Purification Plant of 400,000 m^3/day capacity was added by this project.

Note 2. Population data of 2010 was not available at the time of the ex-post evaluation because the population statistics of Chengdu are published in September.

Monitoring room

Water quality inspection room

At the time of ex-post evaluation, the water supply capacity has been enhanced as planned and the balance between the water demand (1,635,000m^3/day) and supply (1,730,000 m^3/day) has been improved. Chengdu City is planning to construct its Seventh Water Purification Plant to respond to further increase of the water demand in the future. The Environment Bureau of Chengdu City certifies that the quality of treated water in Plant C satisfies the national standard of drinking water (pH, turbidity, coli form, etc.) and it is adequate as tap water. The result of beneficiary surveys also confirmed that the water quality had been improved in taste, smell and turbidity.

3.3.1.2 Internal Rate of Return

(1) Financial Internal Rate of Return (FIRR)

The FIRR at appraisal was 2.4% and that at ex-post evaluation was 2.7%. The Benefit includes water charge revenue and the Cost includes construction costs and operation and maintenance costs. The project life is 30 years. The reasons for the difference of FIRR are the timing to post the Cost which was later than the plan and the amount distributed to each year. At appraisal, the Cost was posted mainly in the second and fourth years of the project life. At the recalculation at the ex-post evaluation, the Cost was distributed evenly to the first six years of the project life, which reduced the negative values of the cash flow in the first years of the project life and led to the larger FIRR.

3.3.2 Qualitative effects

As its qualitative effects, the project expected (1) response to the increasing water demand and (2) stable supply of safe water.

(1) Response to the increasing water demand

As Table 3 shows, the water demand in Chengdu central and suburban districts had almost overtaken the supply capacity by 2008 and the shortage of water had been experienced in the peak hours in the morning and evening and in the summer. The water supply capacity has been enhanced by this project to construct Plant C of the Sixth Water Purification Plant which started operation in 2010. The demand has been met and the shortage of water shortage in the peak hours and in the summertime has been eradicated.

(2) Stable supply of safe water

According to the executing agency, after the project was completed, safe water is available in the areas where there was only ground water of poor quality or the water pressure was insufficient. Before the completion of the project, water supply was cut off often for repair work because the supply capacity was limited. After the completion of the

project, repair work does not always require cut-off of water supply because the capacity is sufficient. Also, there are few complaints about the insufficient water pressure in the peak hours. Residents in the upper floors of apartments no longer have to go fetch water or store water in buckets as enough tap water is always available.

Beneficiary surveys were conducted through structured interviews in the project target areas. The respondents are 100 residents of Chengdu central districts and Pi County where the Sixth Water Purification Plant is located, of which 58 are men and 42 are women.

Table 4. Results of beneficiary survey

Stable supply of water	95%
Sufficient amount of water	91%
Improvement of water pressure	94%
Improvement of water quality (turbidity, taste, smell)	95-96%
Improvement of standard of living in sanitation	97%
Reduction of time spent for housework	95%
Economy of the city has been more active	100%

Also, four organizations including enterprises and universities were interviewed. They used to take ground water by their own water pumps and tanks. The quantity, pressure and quality of water were not satisfactory. They reported that water of good quality is always available after the completion of this project.

From the above, the project has contributed to the response to the increasing water demand and to stable supply of safe water.

Therefore, the project has largely achieved the anticipated effects, and its effectiveness is high.

3.4 Impact

3.4.1 Appearance of intended impacts

(1) Contribution to the regional economic development

Since the project just started operation in May 2010, no statistics were available yet to show its contribution to the regional economic development. Still, the executing agency confirmed that the project has contributed to the attraction of the enterprises, especially electronics and electric industries, to the Chengdu High-tech Industrial Development Zone. In the interview with Foxconn, a Taiwanese electronics manufacturer, they explained that they were settled in Chengdu as its water supply is stable as a result of a comparison with some other cities in the Western China. Therefore, it can be concluded that the project has

contributed to the regional economic development to a certain extent.

3.4.2 Other impacts (positive and negative impacts)

(1) Impacts on the natural environment

No negative impacts on the natural environment have been observed regarding the project.

Sludge from the water purification process is dewatered, compressed and disposed to the landfill in the suburban area. At the appraisal stage, recycling of the sludge was planned, but the executing agency explained that it was not implemented because the quantity of sludge is small. Wastewater from the plant goes through the appropriate treatment process, and as Chengdu City has 1,300,000m^3/day capacity of wastewater treatment as of 2010, wastewater and sludge from the plant do not cause pollution of water and soil.

(2) Resettlement and Land Acquisition

Table 5 shows the land area acquired, cost for land acquisition, resettlement and compensation. The process of land acquisition and resettlement was implemented by the government of Pi County (where the Sixth Water Purification Plant is located) according the regulations of the national and regional governments. According to the executing agency, no problems were observed in the process of land acquisition, resettlement and compensation. The appraisal documents stated that the land for Plant C had already been acquired and resettlement of about 100 residents had also been completed by the time of appraisal in 2000. The executing agency reported at the time of the ex-post evaluation that the resettled residents were approximately 400, but the reason for the difference in numbers was unknown because no supporting documents were included the appraisal documents. At the ex-post evaluation, interviews with the resettled residents were not implemented as all process had completed more than ten years ago.

Table 5. Land area acquired, cost for land acquisition, resettlement and compensation

Land area acquired	Number of resettled population	Cost for land acquisition/ compensation for resettlement
8.3ha	About 400	46,510,000 yuan

Source: Questionnaire responses

From the above, the project has contributed to the regional economic development, and there were no particular negative impacts observed.

3.5 Sustainability (Rating: ③)

3.5.1 Structural aspects of operation and maintenance

Chengdu Municipal Waterworks Co., Ltd., a public corporation under the government of Chengdu City, is responsible for the operation and maintenance of Plant C (constructed by this project) and Plant A of the Sixth Water Purification Plant, as well as the Second and Fifth Water Purification Plants. Plant B of the Sixth Water Purification Plant is operated by Chengdu Générale des Eaux-Marubeni Waterworks Co., Ltd. by Build Operate Transfer (BOT[3]). Plant B started operation in February 2002, and its concession period is 18 years (construction: 2.5 years, operation: 15.5 years).

Among the staff members of Plant C, 30 are responsible for operation and maintenance, of which 22 are technical staff.

3.5.2 Technical aspects of operation and maintenance

All technical staff members responsible for the operation and maintenance of Plant C are engineers who are graduates from junior colleges or above. The company conducts 15 training sessions every year, which includes units about technology and knowledge such as electric work, chemical treatment and sanitary management. The company recruits new graduates from universities and young engineers and does rotations of the senior engineers in order to maintain the technical level the operation and maintenance staff.

Plant C has an operation and maintenance manual, which regulates operation and maintenance procedures for each unit and process.

3.5.3 Financial aspects of operation and maintenance

The revenue and expenditures of Chengdu Municipal Waterworks Co., Ltd. are shown in Table 6 and the water tariff is shown in Table 7. There is no separate accounting framework only for Plant C. The company collects water charges including also wastewater treatment charges from the clients, and the portion for the wastewater treatment goes to Chengdu City government then to the wastewater treatment company.

Table 6. Revenue and expenditures of Chengdu Municipal Waterworks Co., Ltd.

Unit: million yuan

Item	2007	2008	2009	2010
Annual sales (total revenue)	484.64	738.53	831.01	998.79
Expenditures	20.29	23.33	42.69	43.93
Cost for sales and other expenses	56.28	56.98	46.77	59.94
Cost for operation and maintenance	336.98	586.08	580.65	676.99
Operational Profit/loss	73.09	72.14	160.90	217.93

Source: Questionnaire responses

3 BOT (Build Operate Transfer): A modality of business in which a private company constructs facilities and implements operation and maintenance for a certain period, and transfers the facility to a public entity.

Table 7. Water tariff (as of May 2011)

Unit: yuan/m^3

Category	Water supply	Wastewater treatment	Total
Domestic use	1.95	0.90	2.85
Commercial and industry	2.90	1.40	4.30
Special sector (public bath)	10.50	4.50	15.00
Special sector (car wash)	6.60	3.40	10.00

Source: Executing agency

The financial status of the company is in surplus and it covers the operation and maintenance cost of the water purification plants. The water tariff, which is the most essential factor for the profitability of the water business, is determined by the Price Regulation Bureau of the city government taking into account the financial status of water companies, the price escalation rates and the level of the other public utility charges. When the financial status of the water company is worsened, the city government is supposed to provide the subsidy. Therefore, the financial status of the water company is considered stable and no major issues exist in the financial sustainability of the project. The executing agency considers that its budget for operation and maintenance is appropriate.

3.5.4 Current status of operation and maintenance

Plant C of the Sixth Water Purification Plant has its own annual and monthly operation and maintenance plans which are in line with the water company's annual production plan. Each machine and facility is regularly checked according to the plan. An automated equipment operation system has been set up to conduct real-time monitoring of the operational status and responds quickly when problems occur. When the evaluator visited the project site for the ex-post evaluation, all facilities constructed or installed by the project seemed to be running normally without particular problems.

From the above, no major problems have been observed in the operation and maintenance in the aspects of organizational setup, technical capacity and financial status. Therefore, the sustainability of the project is high.

4. Conclusions, Lessons Learned and Recommendations

4.1 Conclusions

This project has been highly relevant with China's development plans, development needs, as well as Japan's ODA policy; therefore its relevance is high. The needs to enhance the water supply capacity were low during the originally-planned project period because the water demand in the central and suburban districts of Chengdu did not increase as much as anticipated

after the relocation of factories following the new city planning policy since 2002. The water demand later increased and is now covered by the current supply capacity strengthened by this project. The project cost was lower than planned, but the project period was substantially longer than planned; therefore the efficiency is moderate. The project has largely achieved the development objectives, which were to enhance the water supply capacity and to respond to the water demand, thus to contribute to regular supply of safe water. Therefore, the effectiveness is high. Since no major problems have been observed in the operation and maintenance systems such as organizational setup, technical capacity and financial status, the sustainability of the project is considered high.

In the light of above, this project is evaluated to be highly satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the executing agencies

None.

4.2.2 Recommendations to JICA

The portion funded by the yen-loan was only the water supply pipelines that were completed in 2004, and the whole project, including the water purification plant constructed by the local fund, was completed in 2010. This ex-post evaluation was carried out in the fiscal year 2010, only one year after the completion of the whole project, before it would become too late to obtain information on the yen-loan funded portion that was completed in 2004. From the evaluator's point of view, the merit of the evaluation in this timing was that the cooperation from the executing agency has been easily available and the information necessary for the evaluation was ready. On the other hand, it was too early to grasp the economic impacts of the project as it would take some time to be reflected in statistical data. Since sufficient information on the effects and impacts of this project during the ex-post evaluation was not available, JICA is recommended to consider obtaining quantitative data (population in the target areas, population served, water demand, water supply capacity and GDP in the target areas) again in two to three years from present and to review the effects and impacts of the project.

4.3 Lessons learned

This project postponed the construction of the water purification plant in response to the changing trend of the increase in the water demand. JICA might want to consider establishing a modality of yen-loan projects that allows quick and flexible adjustment to respond to the changing demand.

Comparisons of the Planned and Actual Scope of the Project

Item	Planned	Actual
① Outputs		
Intake facility (not included in this project. Constructed in the project of Plant B)	・ Intake header 480,000m^3/day x 2 ・ Inlet pipes approx. 1.9km x 2	As planned. ・ Intake header 480,000m^3/day x 2 ・ Inlet pipes approx. 1.9km x 2
Connection pipes (local fund)	・ Connection pipes approx. 0.16km	As planned. ・ Connection pipes approx. 0.16km
Water purification plant (it was to be funded by the yen-loan, but was funded by the local fund)	・ Plant C 400,000m^3/day (coagulation-sedimentation-rapid filtration system) Flocculation basin, sedimentation basin, filtration basin	As Planned. ・ Plant C 400,000m^3/day (coagulation-sedimentation-rapid filtration system) Flocculation basin, sedimentation basin, filtration basin
Water transmission facility (yen-loan fund and local fund)	・ Water transmission pipelines approx. 25km	Mostly as planned ・ 26km Water transmission pipelines approx. 26km (20 km of which used yen-loan)
Water distribution facility (yen-loan fund and local fund)	・ Water distribution pipelines approx.140km ・ Pressure station 40,000m^3/day	The distribution pipelines were 54 km shorter than the plan. The pressure station was cancelled. ・ Water distribution pipelines approx. 86km (42km of which used yen-loan) ・ Pressure station was cancelled.
② Project Period	March 2000 (L/A) - December 2003 (start of operation) (46 months)	March 2000 (L/A) - May 2010 (start of operation) (123 months)
③ Project cost Foreign currency Local currency Total Yen loan portion Exchange rate	 7,293 million yen 10,665 million yen (711 million yuan) 17,958 million yen 7,293 million yen 1yuan＝15.00 yen (as of June 1999)	 4,244 million yen 10,694 million yen (763 million yuan) 14,938 million yen 4,244 million yen 1yuan＝14.01 yen (Average of 2000～2010)