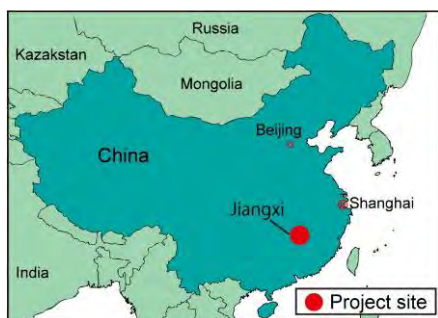


People's Republic of China

Ex-Post Evaluation of Japanese ODA Loan Project
Jiangxi Water Supply Project

Yasuhiro Kawabata, Sanshu Engineering Consultant

1. Project Description



Location of Project Site



Ganzhou No.3 Water Plant

1.1 Background

Under China's reform and open-door policies which commenced in 1979, construction and improvement of the waterworks facilities, especially in large cities along coastal regions, have been implemented as part of actions to improve the investment environment for attracting enterprises. The average water usage per person in 1999 was 218ℓ/day in urban areas, and reached the same level (200 to 250ℓ/day) as that of Japan in 2000. The coverage of the water supply system in urban areas has been steadily improving at the rates of 81% in 1980, 89% in 1990, and 96% in 1998. On the other hand, following the rapid economic development in the coastal areas, inland's medium to large cities have been suffering from the water supply and demand gap caused by the rapid increase in water demand as result of rapid industrialization and urbanization which started in mid 1990s.

Jiangxi Province is located to the south of Changjiang River, to the west of Fujian Province and to the north of Guangdong Province, with mountainous and hilly terrain covering 70% of the land area and a population of approximately 42 million. Jiangxi Province is rich in mineral resources, including copper. It has 11 types of mineral resources, which are ranked top in China in terms of reserve. The province's average water usage per person at the time of appraisal was 249ℓ/day, exceeding the national average of 214ℓ/day. On the other hand, only 92.8% of the population of the urban areas of Jiangxi received water supply in 1998, ranked 27th in China and lagging behind the national average (96% in 31 provinces and centrally controlled cities), which was classified from the time when urban areas did not have water

distribution pipelines and water supply. As a result, increasing the water supply capacity and expanding the water pipelines were necessary.

1.2 Project Outline

The objective of the project is to contribute to the improvement of living/hygienic environment and development of the region's economy by constructing the water supply system in Jingdezhen, Ganzhou, Jian, and Nankang of Jiangxi Province that will help deal with the increasing water demand, and provide a stable supply of the safer water. The location of the project site is shown in Figure 1.



Figure 1 : Location of Project Site

Approved Amount / Disbursed Amount	4,147 million yen / 3,092 million yen	
Exchange of Notes Date / Loan Agreement Signing Date	March, 2000 / March, 2000	
Terms and Conditions	Interest Rate: 1.7 % ; Repayment Period: 30years (Grace Period: 10years) ; Conditions for Procurement: General Untied	
Borrower / Executing Agency	The Government of the People's Republic of China / Jiangxi Provincial People's Government (Department of Construction)	
Final Disbursement Date	December, 2005	
Main Contractor (Over 1 billion yen)	None	
Main Consultant (Over 100 million yen)	None	
Feasibility Study, etc.	Jingdezhen: F/S by China Municipal Engineering Central and Southern Design Institute Jingdezhen: EIA by Jingdezhen Environmental Science Institute Ganzhou, Jian, Nankang: EIA by Jiangxi Province Environmental Protection Institute Ganzhou, Jian, Nankang: F/S by Nanchang Colored Metallurgy Research Institute of	February, 1998 February, 1998 April, 1998 July, 1998

2. Outline of the Evaluation Study

2.1 External Evaluator

Yasuhiro Kawabata, Sanshu Engineering Consultant

2.2 Duration of Evaluation Study

Duration of the Study : November, 2009 to August, 2010

Duration of the Field Study : January, 3rd to 16th, 2010 and April 11th to 22nd, 2010

3. Results of the Evaluation (Rating: A)

3.1 Relevance (Rating: a)

3.1.1 Relevance with the Development Policy of China

Since 1990s, China has been suffering from water supply and demand gap (industrial water, daily life water and others) caused by the rapid industrialization and urbanization. As a result, it was considered necessary to enhance the capacity of water supply facilities. In addition, there were issues of contamination in the water source from the river, as well as low water table level, therefore requiring for better water sources and water conservation measures. Consequently, it

was noted in China's 9th Five-Year Development Plan (1996-2000) that the waterworks infrastructure in rural cities was the most essential agenda, thereby setting the following objectives: (a) increase the nationwide water supply by 40 million m³/day, (b) raise accessibility ratio of portable water in urban areas to 96%, and (c) increase average water supply per person by 40ℓ/day during the planned period. The current 11th Five-Year Development Plan (2006-2010) gives priority to the enforcement of control and conservation of sources for drinking water and increase of water supply facilities.

The 9th Jiangxi Province Five-Year Plan (1996-2000) was aimed to increase urban water supply capacity by one million m³/day, while the capacity increased to approximately 410,000 m³/day, resulting in increase of average water usage per person by 30 ℓ/day from 1997. At the time of appraisal, it was intended to construct facilities accommodating the remaining approximately 600,000 m³/day. Further construction of infrastructure in the urban area is in the current 11th Jiangxi Province Five Year Plan (2006-2010), and the water supply project is one of its top priorities.

3.1.2 Relevance with the Development Needs of China

The development needs of the four cities (Jingdezhen, Ganzhou, Jian, and Nankang) are:

In Jingdezhen, the water demand had exceeded the supply capacity due to rapid economic development and improvement of living standard. According to the water demand projection, the supply facilities would run short by 110,000 m³/day in 2000, and 140,000 m³/day in 2003 (without the project). At the time of ex-post evaluation, the water demand was still high due to social development and improvement of living standard, and improvement of water quality meeting the national standard was anticipated.

In Ganzhou, the water demand had been continuously rising due to economic development and opening of Jingjiu Railway. According to the water demand projection, the shortfall of water supply would reach 50,000 m³/day in 2000 and 100,000 m³/day in 2005 (without the project). At the time of ex-post evaluation, Ganzhou's urban population was expected to reach 750,000 in 2010. By that time, the city's water supply capacity will need to be upgraded to 600,000 m³/day, and thus the water demand will still be high.

In Jian, the urban population had been increasing with inflow of rural population, and so the existing water plants had not met the water demand. According to the water demand projection at the time of appraisal, the shortfall of water supply would reach 2,000 m³/day in 2000 and

50,000 m³/day in 2005 (without the project). At ex-post evaluation, Jian's urban population was expected to reach 530,000 by 2010 with water demand reaching 150,000 m³/day, and thus the water demand will still be high.

In Nankang, there was a shortfall of water supply due to rise in the city's population. The shortfall of water supply was estimated at 5,000 m³/day in 2003 (without the project) at the time of appraisal. At ex-post evaluation, the water demand had been increasing due to development of industries and rise in population, and thus increasing the water supply capacity is still needed.

3.1.3 Relevance with Japan's ODA Policy

According to the Overseas Economic Cooperation Implementation Policy (December, 1999), the Japanese aid policy towards China focused on development of the economic and social infrastructure which would promote self-motivating economic development. Thus, the subject project is consistent with the Japanese aid policy at the time of appraisal.

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

3.2 Efficiency (Rating: b)

3.2.1 Project Outputs

The outputs for the four cities (Jingdezhen, Ganzhou, Jian, and Nankang) were almost as planned. An output summary for these cities (planned/actual) is shown in Table 1 and the actual output by city is shown in Table 2. The names of the plants at each city, constructed under the project, are as follows: Jingdezhen (No. 4 Water Plant), Ganzhou (No. 3 Water Plant), Jian (Wuyueguan Water Plant), and Nankang (No. 2 Water Plant).

Table 1 : Total Output (Planned and actual)

Facilities (Unit)	Planned	Actual
① Intake facilities		
Intake pipes (000 m ³ /day)	210	As planned (210)
Intake pump stations (000 m ³ /day)	200	As planned (200)
② Conveyance facilities (Total length: km)	5.1	almost as planned (5.6km)
③ Purification facilities Capacity (000 m ³ /day)	300	As planned (300)
④ Transmission/distribution facilities (Total length: km)	210	almost as planned (223)

Source: JICA appraisal documents, Responses to the questionnaire

Table 2 : Output by city (Actual)

	Intake facilities (000 m ³ /day)	Conveyance facilities (km)	Purification facilities (000 m ³ /day)	Transmission/dis tribution facilities (km)
Jingdezhen	Intake pipes 10	0.1 x 2	100	41 (+1)
Ganzhou	Intake pump stations 10	0.15x2 (-0.16)	100	120
Jian	Intake pipes 11 Intake pump stations 5	2.7 (+0.7)	50	30
Nankang	Intake pump stations 5	2.4	50	32 (+12)
Total	Intake pipes 21 Intake pump stations 20	5.6 (+0.5)	300	223 (+13)

Source: JICA appraisal documents, Responses to the questionnaire

Note: () shows increased/decreased amount from the planned

The water transmission/distribution facilities (pipelines) were extended in Nankang to take into account the actual demand conditions.



Nankang (No.2 Water Plant)
Sedimentation Basin



Jian (Wuyueguan Water Plant)
Filter Basin

3.2.2 Project Inputs

3.2.2.1 Project Period

The project period took much longer than originally planned. The planned project period for the four cities was from March 2000 (Loan Agreement signing) to December 2003 (project completion¹), for a total of 46 months. The actual project period was from March 2000 (Loan Agreement signing) to June 2006 (when Jian commenced its water supply service), for a total period of 76 months (165% of the planned period). On the other hand, Nankang was the first city to start its water supply service and its project period was from March 2000 (Loan Agreement signing) to December 2003, for a total period of 46 months (118% of the planned period (39 months)). The main reason for the delay was the procurement of equipment for all four cities. It was entrusted to a tendering company, which took more time to coordinate the

¹ Project completion means a time point when the last (Jian) of four cities completed its installment.

procurement process and procedures between the executing agencies in four cities. The major reasons for delay for each city are shown in Table 3.

Table 3 : Major reasons for delay by city

	Major reasons for delay
Jingdezhen	<p>①Civil works were divided into 16 packages and procured through National Competitive Bidding (NCB) procedures, while equipment was procured through International Competitive Bidding (ICB) procedures with 10 packages. It took more time since the executing agency was not familiar with the ICB procedures.</p> <p>②Contractors for civil works and machinery/equipment were different, which led to inconvenience at the time of equipment installment, and resulted in modification and revision of civil works.</p> <p>③Took more time to coordinate among executing agencies in 4 cities regarding procurement process and procedures.</p>
Ganzhou	<p>①The executing agency was not familiar with ICB procedures, and thus it took more time for procurement of equipment.</p> <p>②Took more time to coordinate among executing agencies in 4 cities regarding procurement process and procedures.</p> <p>③Took more time to deliver the equipment procured through ICB procedures.</p> <p>④Contractors were not familiar with the installment of imported equipment.</p>
Jian	<p>①Accommodating the city authority's request, a previous brick factory site (160m south from the originally planned site) was acquired to construct a water purification plant. The acquisition of a brick factory site took time, and thus commencement of construction work was delayed by 1 year.</p> <p>②Since the construction work was delayed by 1 year, the planned funding was no longer available, and it needed to make up with alternative local funding.</p> <p>③Geological structures at intake pumping stations were complex and the technical difficulty level for construction was high, and thus it needed to avoid flooded season for construction work.</p>
Nankang	Took more time to coordinate among executing agencies in four cities regarding procurement process and procedures.

Source: JICA appraisal documents, Responses to the questionnaires.

3.2.2.2 Project Cost

The total project cost estimated at appraisal was 6,710 million yen (of which the Japanese ODA loan amount was 4,147 million yen and the rest was to be locally funded), while the actual total project cost was 5,973 million yen (of which the Japanese ODA loan amount was 3,092 million yen and the rest was locally funded), which was lower (89%) than the estimate. The main reasons for cost variation by city are summarized as follows. In Ganzhou, the estimate for equipment at appraisal was made assuming that equipment would be imported. As a result of the bidding, most of the equipment was domestic products which cost less, resulting in substantial cost savings. In addition, the municipal government provided more subsidies (local currency), and reducing Japanese ODA loan portion. According to the executing agency in Jian, the initial cost of equipment (foreign currency portion) was overestimated. In Nankang, equipment (foreign currency portion) was procured at lower cost due to competitive bidding. However, the

installation cost for distribution and transmission lines was higher (local currency portion) by 60% since pipes were installed taking into account the actual demand conditions.

Although the project cost was lower than estimated, the project period was significantly longer, therefore efficiency of the project is fair.

3.3 Effectiveness (Rating: a)

3.3.1 Quantitative impacts

3.3.1.1 Results from Operation and Effect Indicators

(1) Enhancement of Water Supply Capacity and Stable Water Supply

Since the monitoring indicators to examine the project's effectiveness was not established at appraisal, the operating ratio of a purification plant was selected as a monitoring indicator at post evaluation because the data collection can be easily put together and verified in the quantitative form. The operating ratio of water plants in two years after the project completion is more than 80% in three cities, except for Nankang exceeding 80% in three years after project completion. Thus, the effectiveness is considered high. The status of water supply in four cities is shown below.

Table 4 : Water Supply Capacity of No. 4 Water Plant (Jingdezhen)

Indicators (Unit)	2006 (2 yrs after completion) (Actual)	2007 (3 yrs after completion) (Actual)	2008 (4 yrs after completion) (Actual)	2009 (5 yrs after completion) (Actual)
Population (000 person)	459	468	472	483
Population served (000 person)	157	159	162	163
Supply capacity (000 m ³ /day)	100	100	100	100
Average daily water demand (000 m ³ /day)	96	97	91	87
Facility operating ratio (%)	96	97	91	87
Average water usage per person (l/day)	610	610	559	537

Source: Responses to the questionnaire

Note 1: Population is the total of Zhushan and Changjian districts

Note 2: Population served covers the people served from Changjian No. 4 Water Plant

Note 3: Average daily water demand, Facility operating ratio and Average water usage per person are on No. 4 Water Plant

In terms of lack of water supply capacity in Jingdezhen and in response to water demand, the capacity was increased by 100,000 m³/day under the project. However, the city still suffers from water supply shortage (102,000 m³/day) since the population served (supply

demand) was increased in the entire city. Currently, the city is planning Phase II project (supply capacity of 100,000 m³/day) of the No.4 water plant (detailed designs are now being implemented).

In terms of city's stable water supply, the area served by No.4 water plant (mainly the western part of the city, Changjian district) has not experienced water outage, which used to occur frequently, since project completion. Thus, the project has achieved its objective.

Table 5 : Water Supply Capacity of No. 3 Water Plant in Ganzhou

Indicators (Unit)	2006 (Completion) (Actual)	2007 (1 yr after completion) (Actual)	2008 (2 yrs after completion) (Actual)	2009 (3 yrs after completion) (Actual)
Population (000 person)	571	573	575	578
Population served (000 person)	180	185	190	195
Supply capacity (000 m ³ /day)	100	100	100	100
Average daily water demand (000 m ³ /day)	55	70	80	85
Facility operating ratio (%)	55	70	80	85
Average water usage per person (L/day)	305	378	421	436

Source: Responses to the questionnaire

Note 1: Population is total of the central area of Zhanggong district

Note 2: Population served covers the area where No.3 water plant supplies water (mainly southern city and development area)

Note 3: Average daily water demand, Facility operating ratio and Average water usage per person are on No. 3 Water Plant

In terms of lack of water supply capacity in Ganzhou and in response to water demand, the capacity was increased by 100,000 m³/day under the project, and additionally capacity of No.2 water plant was increased by 100,000 m³/day, resulting in surplus of 15,000 m³/day in the city.

In terms of city's stable water supply, the area served by No.3 water plant (mainly the southern part of the city and development areas) has not experienced water outage, which used to occur frequently, since the project completion. It was concluded that project has achieved its objective.

Table 6 : Water Supply Capacity of Wuyueguan and Yangming Water Plants in Jian

Indicators (Unit)	2006 (Completion) (Actual)	2007 (1 yr after completion) (Actual)	2008 (2 yrs after completion) (Actual)	2009 (3 yrs after completion) (Actual)
Population (000 person)	323	327	331	332
Population Served (000 person)	199	202	204	206
Supply capacity (000 m ³ /day)	120	120	120	120
Average daily water demand (000 m ³ /day)	70	95	96	102
Facility operating ratio (%)	58	79	80	85
Average water usage per person (ℓ/day)	352	470	471	495

Source: Responses to the questionnaire

Note 1: Population is the total of city's population

Note 2: Population served covers the area where Yangming (existing) and Wuyueguan water plants supplies water (Hexi district)

Note 3: Average daily water demand, Facility operating ratio and Average water usage per person are on both water plants

In terms of lack of water supply capacity in Jian and in response to water demand, the capacity was increased by 50,000 m³/day in addition to the current capacity (70,000 m³/day) under the project, creating a surplus of 9,000 m³/day.

In terms of city's stable water supply, the area served by Wuyueguan water plant (mainly the city's western Jizhou district, new southern district and the hi-tech development area) had been experiencing water outage an average of five times a year before project completion, but not any longer. Thus, the project has achieved its objective.

Table 7 : Water Supply Capacity of No. 2 Water Plant (Nankang)

Indicators (Unit)	2006 (3 yrs after completion) (Actual)	2007 (4 yrs after completion) (Actual)	2008 (5 yrs after completion) (Actual)	2009 (6 yrs after completion) (Actual)
Population (000 person)	150	160	170	180
Population served (000 person)	145	156	165	170
Supply capacity (000 m ³ /day)	50	50	50	50
Average daily water demand (000 m ³ /day)	40	46	49	50
Facility operating ratio (%)	80	92	98	100
Average water usage per person (ℓ/day)	303	301	297	294

Source: Responses to the questionnaire

Note 1: Population is the total of city's population

Note 2: Population served covers the area where No. 2 Water Plant supplies water (whole city area)

Note 3: Average daily water demand, Facility operating ratio and Average water usage per person are on No. 2 Water Plant

Note 4: No. 1 water plant (10,000 m³/day) and self-supply system (23,000 m³/day) stopped water supply upon completion of the project.

In terms of lack of water supply capacity and in response to water demand in Nankang, the capacity was increased by 50,000 m³/day under the project, and the lack of water supply capacity of the city was resolved. However, since the operating ratio has reached 100% in 2009 and lack of supply capacity is anticipated, the second phase construction of No. 2 Water Plant has been implemented. Civil works have been completed by local funds under the phase I project. Once installation work of equipment is completed in July 2010, supply capacity will be further increased by 50,000 m³/day, which would result in surplus in capacity.

(2) Supply of safer water

According to the inspection results (October – December 2009) of water quality of four plants constructed under the project, the water quality after treatment meets all the criteria of the national standards (turbidity, bacteria count, coli form count, aluminum, iron, zinc content, etc.), and it was determined to be appropriate as tap water. Each water plant has a chemical testing laboratory and the water quality has been regularly monitored.

The following results were also confirmed by a staff in charge of reservoirs. Regarding the water pressure², MPa at the distribution gate in Ganzhou upon completion of the project is 0.33MPa. The water pressure in the water-served area ranges between 0.13 and 0.33 MPa depending on the location and size of pipes, and the average is above 0.2 MPa. It is reported that MPa at the distribution gate in Nankang is 0.3MPa and the water pressure in the water served area ranges between 0.2 and 0.45 MPa.

Due to water outage at Jiangxi Teachers College in Ganzhou, daily water restriction was enforced during three fixed hours (6:00 - 8:00, 11:00 - 13:00, 17:00 - 19:00) before No. 3 Water Plant was completed. Upon project completion, water became available 24 hours a day and the water pressure of 0.2 MPa has been maintained. It is reported that water outage has not occurred in Jingdezhen after the project has been completed.

² MPa (Megapascal) , which indicates water pressure of normal water supply ranges between 0.05 and 1.0 MPa in Japan depending on geographical conditions. Ex. Water pressure of 0.5 MPa is the level it can pipe up to about 35 m (10 to 11th floor of a building).

3.3.1.2 Results of Calculations of Internal rate of return (IRR)

Financial internal rate of return (FIRR) :

(Unit: %)

	Jingdezhen	Ganzhou	Jian	Nankang
At appraisal	3.9	2.6	2.7	4.0
At post evaluation	8.1	3.6	5.2	11.7

Source: JICA appraisal documents, Responses to the questionnaire

FIRR was recalculated at post evaluation. FIRRs of four projects exceeded the estimated figures at appraisal, which indicate that the projects are financially viable. The reasons for higher returns are: 1) actual cost (project cost) was lower than estimated; and 2) water charges assumed at appraisal were 0.98 yuan/ m³ in Jingdezhen and 1.05 yuan/ m³ in other three cities. However, the current rates, which were used for recalculation of FIRRs, are at least 1.2 – 1.3 yuan/ m³ (average of all usages) and more revenue is expected. The assumptions used for calculation of FIRRs are as follows:

Benefits: revenue from water charges

Costs: construction cost, maintenance and operating costs

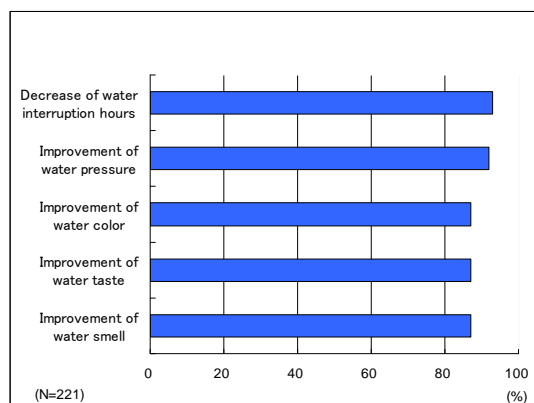
Project life: 30 years

Since EIRR was not calculated at appraisal, it was also not calculated at post evaluation.

3.3.2 Qualitative Effects

During post evaluation, beneficiary surveys through interviews were conducted in Jingdezhen, Ganzhou, Jian, and Nankang. There were 221 respondents (50 in Jingdezhen, 61 in Ganzhou, 50 in Jian, 60 in Nankang) and the classification of respondents by sex was 25% female and 75% male.

Respondents perceived the improvement in the following criteria: (a) the time of interruption of water supply 93% (206 persons); (b) water pressure 92% (203 persons); (c) color 87% (192 persons); (d) taste 87% (192 persons); and (e) smell 87% (192 persons). The survey showed that the project has contributed to the stable supply of clean water.



Source: Responses to the questionnaire

Figure 2 : Survey Results (N=221)

This project has largely achieved its objectives, and therefore its effectiveness is high.

3.4 Impact

3.4.1 Intended impacts

Ninety percent (200 persons) of the beneficiary survey respondents evaluated that the project has contributed to the improvement of sanitary and living conditions, and 97% (215 persons) indicated that the project has brought economic growth to the city (attracting new corporations/organizations, thus creating more employment opportunities and others). In addition, 89% (197 persons) considered the time saved from water drawing as one of the impacts.

3.4.2 Other impact

(1) Impacts on the natural environment

Treatment of sludge from the purification process was a concern during appraisal. However, no negative impacts were identified. The discharge condition from purification plants and treatment of sludge are stated in Table 8.

Table 8 : Discharge Condition and Treatment of Sludge in each city

Discharge condition and Treatment of Sludge	
Jingdezhen	Since the water quality at the intake source is satisfactory, the amount of sludge produced is less and used as fertilizer for trees.
Ganzhou	The supernatant water at the sedimentation basin is discharged through transmission pipes to 100 m downstream of the intake facility. Raw sludge is sent to the dryer, and hauled to the waste deposit area and varied once the water content reaches below the specified level.
Jian	Since the national standards on the waste treatment became strict, the water quality at the intake sources has been recently improved and thus, sludge is not produced.
Nankang	The same treatment method adopted in Ganzhou is applied.

Source: Responses to the questionnaire

(2) Land Acquisition and Resettlement

Figures on resettlement and land acquisition activities are shown in Table 9. Although resettlement was originally anticipated in Jian, resettlement did not occur because the site of a closed brick factory was acquired where the water plant was constructed. The land area acquired was increased by 50% against the planned area in Jian, while land acquisition was not needed in Nankang since the water plant was constructed in the site owned by the municipal government.

Table 9 : Land acquisition and Resettlement in each city

	Resettlement		Land acquisition	
	Planned: person	Actual: persons	Planned: 000 m ²	Actual: 000 m ²
Jingdezhen	-	-	80	80
Ganzhou	-	-	70	70
Jian	30	-	40	60
Nankang	-	-	50	0
Total	30	-	240	210

Source: Responses to the questionnaire

3.5 Sustainability (Rating: a)

3.5.1 Structural Aspects of Operation and Maintenance

As originally planned, the maintenance and operation of the water plant will be undertaken by a water company in each city and companies will be well staffed to maintain the plant. Breakdown of staff of each company is shown in Table 10.

Table 10 : Breakdown of Regular Staff in charge of Operation and Maintenance of Plants

Water Plant	Plant Manager/ Deputy Manager	Management / Business	Testing laboratory	Operation/ control	Maintenance/ Repair	Waste water treatment	Total
Jingdezhen (No.4 Water Plant)	3	5	5	25	6	2	46
Ganzhou (No.3 Water Plant)	1	3	1	20	6	note	31
Jian (Wuyueguan Water Plan)	1	3	2	17	5	note	28
Nankang (No.2 Water Plant)	1	2	4	18	4	note	29

Source: Responses to the questionnaire

Note: Staff in charge of waste water treatment is included in the category of operation/control.

Operation and maintenance of water plants constructed in four cities under the project have been implemented with appropriate number of staff.

3.5.2 Technical Aspects of Operation and Maintenance

Academic background of staff in charge of operation and maintenance of water plants are as follows.

Table 11 : Academic background of operation and maintenance staff

Water Plant	University graduates	College graduates	Technical school graduates	High school graduates	Total
Jingdezhen (No.4 Water Plant)	1	18	18	9	46
Ganzhou (No.3 Water Plant)	0	2	9	20	31
Jian (Wuyueguan Water Plan)	2	5	16	5	28
Nankang (No.2 Water Plant)	0	2	25	2	29

Source: Responses to the questionnaire

Staff (technicians) working at water plants in four cities are equipped with technical skills and the manuals for operation and maintenance are well prepared. The training contents provided by each water company are shown in Table 12.

Table 12 : Training Contents for Water Company Staff

	Training Content
Jingdezhen	Training contents include national standards/laws on labor safety/quality control, relevant industrial standards/regulations, company regulations, technical aspects related to the operation of plants and others. A training program was conducted six times in 2009. An excellent team/individual is selected and awarded every month. In order to improve skills of staff, training is regularly conducted and the qualification system for each job assignment is established.
Ganzhou	Training contents include national standards/laws on labor safety/quality control, company regulations, and technical aspects related to the operation of plants (maintenance and repair). A newly recruited staff is provided with a series of training, and training programs on technical aspects and labor safety is offered every year.
Jian	Similar to those provide in other cities, training programs include national standards/laws on labor safety/quality control, relevant industrial standards/regulations, company regulations, technical aspects related to the operation of plants and others. Training is mostly undertaken in a company. However, relevant staff are sent to the labor safety seminar sponsored by the municipal government every year and some staff are regularly sent to the external training programs
Nankang	Most training programs are targeted to staff in charge of pump operation, purification basin, and maintenance of electrical and mechanical facilities and programs are on actual operation and maintenance. A newly recruited staff is provided with a series of training, and training programs on technical aspects and labor safety is offered every year.

Source: Responses to the questionnaire

3.5.3 Financial Aspects of Operation and Maintenance

The financial status of water companies in each city and water plants constructed under the project is shown in the following tables.

Table 13 : Financial status of Jingdezhen Water Company
(Unit: million yuan)

Item	2006	2007	2008	2009
Revenue	30.6	30.8	31.7	32.2
Operating expenses	29.9	26.4	27.0	49.0
(Depreciation among operating expenses)	2.5	0.2	1.6	6.4
Tax	2.7	2.8	3.2	3.7
Financial expenses	0.8	0.5	0.4	0.2
Non-operating revenue	11.2	11.2	12.1	23.3
Profit	0.0	-1.6	0.0	0.1

Source: Responses to the questionnaire

Table 14 : Financial status of No.4 Water Plant
(Unit: million yuan)

Item	2006	2007	2008	2009
Revenue	4.9	5.3	5.8	N/A
Operating expenses	4.0	4.1	5.3	N/A
(Depreciation among operating expenses)	0.8	0.9	1.1	N/A
Profit	0.9	0.7	-0.2	N/A

Source: Responses to the questionnaire

Note: In 2009, reorganization of water business related agencies was implemented, and since then the financial status of No. 4 Water Plant by itself is not available.

A water company in Jingdezhen has four water plants. For the past four years after the project was completed (till 2008), the revenue from the water charges was expected to cover the costs of operation and maintenance of water supply. However, there was shortage of funds due to capital investment for other purposes arose last year (2009), and subsidies from the city's general budget were established.

Revenue from No.4 Water Plant (the project) was sufficient to cover the operation and maintenance costs for the plant. The plant was run in the red in 2008. However, a positive financial status is expected upon approval of water charge rates increase in 2010. Moreover, the water supply business has been implemented as public works by the municipal government. If the budget is not sufficient, the municipal government will provide subsidies, which would guarantee the project's sustainability.

Table 15 : Financial status of Ganzhou Water Company

(Unit: million yuan)

Item	2006	2007	2008	2009
Revenue	56.3	62.8	69.1	96.8
Operating expenses	40.2	46.0	51.8	62.3
(Depreciation among operating expenses)	10.2	13.2	14.3	17.3
Tax	4.0	5.3	5.6	7.6
Financial expenses	0.1	1.4	1.7	2.1
Non-operating revenue	20.9	23.5	26.3	27.4
Profit	3.6	-3.0	-6.8	10.2

Source: Responses to the questionnaire

Table 16 : Financial status of No.3 Water Plant

(Unit: million yuan)

Item	2006	2007	2008	2009
Revenue	9.2	14.4	15.3	23.5
Operating expenses	4.8	8.6	8.6	8.6
(Depreciation among operating expenses)	3.2	4.7	5.5	8.0
Profit	0.1	-0.8	-1.0	2.0

Source: Responses to the questionnaire

A water company in Ganzhou has three water plants. For the past three years after the project was completed (till 2009), the revenue from the water charges was expected to cover the costs of operation and maintenance of water supply. However, the company ran in the red in years when capital investment was needed.

Revenue from No.3 Water Plant (the project) was sufficient to cover the operation and maintenance costs for the plant. The plant was run in the red in 2007 and 2008. However, a positive financial status is expected upon approval of the proposed increase in water charge rates in 2009. Similar to Jingdezhen, if the budget is not sufficient, the municipal government will provide subsidies, which would guarantee the project's sustainability.

Table 17 : Financial status of Jian Water Company

(Unit: million yuan)

Item	2006	2007	2008	2009
Revenue	16.0	17.0	20.0	23.0
Operating expenses	15.0	16.0	17.0	18.5
(Depreciation among operating expenses)	6.0	6.5	7.0	7.5
Tax	0.1	0.1	0.1	0.1
Financial expenses	2.0	2.0	1.7	1.5
Non-operating revenue	3.0	3.0	3.0	1.2
Profit	-5.0	-4.0	-3.0	-2.7

Source: Responses to the questionnaire

Table 18 : Financial status of Wuyueguan Water Plant

(Unit: million yuan)

Item	2006	2007	2008	2009
Revenue	6.0	5.0	6.0	N/A
Operating expenses	5.8	4.9	5.7	N/A
(Depreciation among operating expenses)	4.0	4.0	4.0	N/A
Profit	0.2	0.1	0.3	N/A

Source: Responses to the questionnaire

The financial status of Jian Water Company has ended in a deficit for the past four years. Jian municipal government recently contributed 10 million yuan as operating capital. Since the approval of the water charge rates increase in January 2010, a positive financial status is expected in 2010.

Wuyueguan Plant, constructed under the project, has had a surplus for the past three years (2006-2009), therefore there is no doubt in the project's sustainability.

Table 19 : Financial status of Nankang Water Company

(Unit: million yuan)

Item	2006	2007	2008	2009
Revenue	6.8	8.8	9.6	10.5
Operating expenses	7.4	8.6	10.5	11.3
(Depreciation among operating expenses)	1.3	1.3	1.3	1.3
Tax	0.8	1.0	1.0	1.1
Financial expenses	0.0	0.0	0.0	0.0
Non-operating revenue	2.7	2.1	3.2	3.1
Profit	0.1	0.1	0.1	0.1

Source: Responses to the questionnaire

Table 20 : Financial status of No.2 Water Plant

(Unit: million yuan)

Item	2006	2007	2008	2009
Revenue	6.8	8.8	9.6	10.5
Operating expenses	5.7	6.8	7.9	8.5
(Depreciation among operating expenses)	1.3	1.3	1.3	1.3
Profit	-0.2	0.7	0.4	0.7

Source: Responses to the questionnaire

The revenue from No.2 Water Plant (the project) has been insufficient to cover the operation and maintenance costs for the plant for the past four years, except in 2007. However, the municipal government has provided subsidies, creating no financial problem.

Water charge rates in each city are as follows.

Table 21 : Water charges in Jingdezhen

(Unit: yuan / m³)

Category	Current rates	Planned revised rates
Households	1.00	1.10
Commercial	1.60	1.80
Industrial	1.10	1.30
Other (special purpose)	4.40	4.60

Source: Responses to the questionnaire

The current water charge rates in Jingdezhen are slightly lower than those in other cities. Once the proposed revised rates are approved by the City's Price Control Bureau, rates will be more or less standard.

Table 22 : Water charges in Ganzhou

(Unit: yuan / m³)

Category	Rates as of 2008	Revised rates in 2009
Households	0.75	1.15
Commercial	1.25	1.85
Industrial	0.90	1.20
Other (special purpose)	2.25	5.00

Source: Responses to the questionnaire

The previous water rates in Ganzhou were lower. Since the increase in rates was approved in 2009, rates became more or less standard, the same as those for rural cities.

Table 23 : Water charge in Jian

(Unit: yuan / m³)

Category	2009 Rates	Revised rates in 2010
Households	0.95	1.15
Government	1.15	1.20
Commercial	1.70	2.00
Industrial	1.15	1.20
Other (special purpose)	5.50	5.50

Source: Responses to the questionnaire

Note: Revised rates became effective on January 1, 2010.

In Jian, revision of water rates was approved (effective January 1) in January 2010 and rates became more or less standard, the same as those for rural cities.

Table 24 : Water charge of Nankang

(Unit: yuan / m³)

Category	Current rates	Revised rates in 2010
Households	1.30	N/A
Government	1.40	N/A
Commercial	1.90	N/A
Industrial	1.30	N/A
Other (special purpose)	5.00	N/A

Source: Responses to the questionnaire

Although current water rates in Nankang are set higher compared to those in other cities, twenty (20) % increase in rates is expected.

3.5.4 Current Status of Operation and Maintenance

The operation and maintenance condition of each water company is stated in Table 25.

Table 25 : Operation and Maintenance Condition of Each Water Company

	Operation and Maintenance Condition
Jingdezhen	At water plants, three-level monitoring and inspection system is applied including an inspection by the operational team, technical maintenance staff, and without an advance notice by plant managers. Daily patrolling and inspections have been undertaken every day by professional staff according to technical manuals and major repairs have been made as needed. Regular inspections and repairs on all equipment are undertaken every two years.
Ganzhou	Similar to Jingdezhen, a three-level monitoring and inspection system has been applied. In order to enforce monitoring and surveillance for facilities, an installation of monitoring TVs and adoption of the automatic operating system are being implemented.
Jian	Similar to other cities, a multi-level monitoring and inspection system has been applied including an inspection by the operational team, maintenance staff and safety experts. Daily inspections and regular maintenance work have been implemented according to the maintenance and management manuals. Major repairs are undertaken as needed and regular inspections and repairs on all equipment are undertaken every winter.
Nankang	At intake gates, the change of water sources is monitored and results are recorded every day. Operating conditions of purification plants and pumps are monitored every 30 minutes. Regular maintenance work on electrical and mechanical facilities is undertaken three times a year. Transmission and distribution facilities are monitored and inspected every day. In case water leakage was found, repairs are made immediately.

Source: Responses to the questionnaire

No major problems have been observed in operation and maintenance of the plant (institutional setup, technical skills, financial status), therefore sustainability of the project is high.



Distribution Pumps in No. 3 Water Plant in Ganzhou



Testing Laboratory of No.4 Plant in Jingdezhen

4. Conclusion, Lessons Learned, Recommendations

4.1 Conclusion

This project has been highly significant with China's development plan and needs, as well as Japan's ODA policies, therefore its relevance is considered high. Although the project cost was lower than planned, the project period was significantly longer, therefore the efficiency of the project is considered moderate. This project has largely achieved its objectives, and therefore its effectiveness is considered high. No major problems have been observed in operation and maintenance of the plant (institutional setup, technical skills, financial status), and therefore sustainability of the project is considered high.

In light of above, this project is evaluated to be (A) highly satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the executing agency

None.

4.2.2 Recommendations to JICA

None.

4.3 Lessons Learned

Civil works, including buildings and installation of water pipes, and goods, such as pumps, were procured under separate contract packages. Since coordination and adjustment were needed with respect to the implementation schedule and installation work in the field among contract packages during the construction and supply/installation stage, eventually the overall construction period was delayed. In future projects, the executing agency should pay extra attention to the implementation schedule and construction management among each contract package, especially when procurement and installation of large equipment and plants were involved. In addition, it is suggested to advise the executing agency to prepare more realistic and practical procurement and project implementation plans, including review of applicability of the procurement method for the contract package, combining both civil work and supply/installation of equipment and plants at the preparation stage.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
① Project Outputs	(Total of four cities)	(Total of four cities)
1) Intake facilities		As planned
Intake pipes	Capacity: 210,000 m ³ /day	
Intake pump stations	Capacity: 200,000 m ³ /day	As planned
2) Conveyance facilities	Total length: 5.1km	Almost as planned (Total length: 5.6km)
3) Purification facilities	Capacity: 300,000 m ³ /day	As planned
4) Transmission /distribution facilities	Total length: 210km	Almost as planned (Total length: 223km)
② Project Period		
1) Jingdezhen	March 2000 - December 2002 (34 months)	March 2000 - April 2004 (50 months)
2) Ganzhou	March 2000 - June 2003 (40 months)	March 2000 - December 2005 (70 months)
3) Jian	March 2000 - December 2003 (46 months)	March 2000 - June 2006 (76 months)
4) Nankang	March 2000 - May 2003 (39 months)	March 2000 - December 2003 (46 months)
③ Project Cost		
Amount paid in Foreign currency	4,147 million yen	3,092 million yen
Amount paid in Local currency	2,564 million yen (171 million yuan)	2,882 million yen (204million yuan)
Total	6,710 million yen	5,973 million yen
Japanese ODA loan portion	4,147 million yen	3,092 million yen
Exchange rate	1 yuan = 15 yen (As of June 1999)	1 yuan = 14.10 yen (Average between March, 2000 and June, 2006)