No.

EX-POST EVALUATION REPORT OF JAPANESE ODA LOAN PROJECTS 2008 (CHINA)

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JAPAN INTERNATIONAL COOPERATION AGENCY

SANSHU ENGINEERING CONSULTANT

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Preface

Ex-post evaluation of ODA projects has been in place since 1975 and since then the coverage of evaluation has expanded. Japan's ODA charter revised in 2003 shows Japan's commitment to ODA evaluation, clearly stating under the section "Enhancement of Evaluation" that in order to measure, analyze and objectively evaluate the outcome of ODA, external evaluations conducted by experts shall be enhanced.

This volume shows the results of the ex-post evaluation of Japanese ODA loan projects that were mainly completed in fiscal year 2007. The ex-post evaluation was entrusted to external evaluators to ensure objective analysis of the projects' effects and to draw lessons and recommendations to be utilized in similar projects.

The lessons and recommendations drawn from these evaluations will be shared with JICA's stakeholders in order to improve the quality of ODA projects.

Lastly, deep appreciation is given to those who have cooperated and supported the creation of this volume of evaluations.

February 2010
Atsuo KURODA
Vice President
Japan International Cooperation Agency (JICA)

Disclaimer

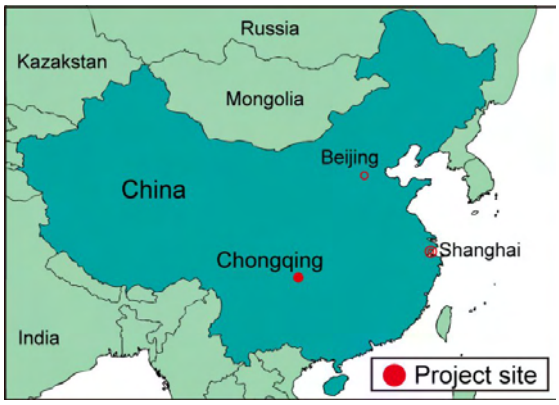
This volume of evaluations shows the result of objective ex-post evaluations made by external evaluators. The views and recommendations herein do not necessarily reflect the official views and opinions of JICA.

People's Republic of China

Chongqing Water Supply Project

External Evaluators: Yasuhiro Kawabata and Junko Miura
Sanshu Engineering Consultant
Study Period: April 2009 to December 2009[1]

1. Project Profile and Japan's ODA Loan



Location of Project Site

Fengshouba Water Plant

1.1 Background

Under China's reform and open-door policies which commenced in 1979, construction and improvement of waterworks facilities, especially in large cities along coastal regions, has been implemented as a part of actions to improve the investment environment for attracting enterprises. The average water usage per person as of 1998, was 214.1ℓ/day in urban areas, and it was equivalent to that of Japan (200 to 250ℓ/day). The coverage of the water supply system in urban areas has been steadily improving at rates of 81% in 1980, 89% in 1990, and 96% in 1998. On the other hand, following the rapid economic development in coastal areas, inland's medium to large cities have been suffering from the water supply and demand gap caused by the rapid increase based on the rapid industrialization and urbanization which started in mid 1990s.

Chongqing city[2] became a government-ruled city in 1997. It has a population of 30 million with a total land area of 82,000 ㎢ (equivalent to that of Hokkaido), and is a center of economy, transport and trade in the upper stream area of Changjiang river. It is

[1] Field surveys were conducted in June and August 2009.

[2] China's administrative division consists of levels of province, prefecture, county, township, and village.. In correspondent to each administrative level, the densely inhabited districts in provinces, prefectures, and counties are called municipalities, prefecture-level cities, county-level cities, respectively. In addition, areas with densely populated urban district in municipalities or prefecture-level cities are called city-ruled districts. Chongqing city is a municipality, which is directly controlled by the central government and has 19 city-level districts including Shapingba, Jiulongpo and Dadukou, 17 prefecture-level cities and 4 autonomous prefectures.

also historically famous as an industrial city. In the urban areas of Chongqing, water is supplied from 16 water plants, which have water resources in Changjiang and Jialing rivers , with a total capacity of 1.035 million ㎥/day. The central peninsula area, the target of this project, is provided with water from 7 water plants (with a supply capacity of 545,000 ㎥/day). However, due to increase of water demand with the rapid urbanization, water supply was some times restricted. Thus, it was essential to cope with the increasing water demand in the southwestern area of the central peninsula, which has been developing.

1.2 Objective

The project objective is to meet the increasing water demand from the newly developed areas and the enhancement of the quality of life by constructing a purification plant with a capacity of 300,000 ㎥/day in the upper Chongqing river region, thereby contributing to the development and improvement of the life and social infrastructure. The location of the project site is shown in Figure 1.

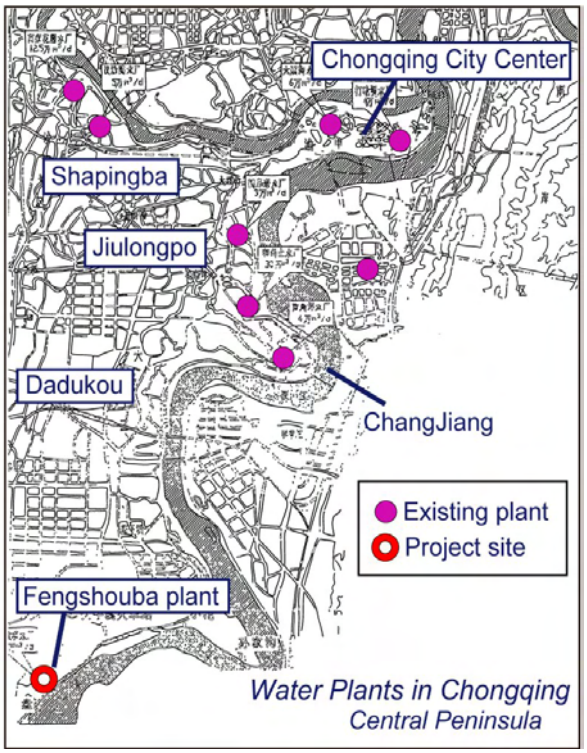


Figure 1 Location of Project Site

1.3 Borrower/Executing Agency

Government of the People's Republic of China / Chongqing Municipal People's Government (Later changed to Chongqing Water Supply Holding Company)

1.4 Outline of Loan Agreement

Loan Amount/Disbursed Amount	6,244 million yen / 3,589 million yen
Date of Loan Agreement/ Exchange of Notes	March 2000 / March 2000
Terms and Conditions -Interest Rate -Repayment Period (Grace Period) -Procurement	 1.7% p.a. (civil work) 30 years (10 years) General untied
Date of（Disbursement）Completion	July 2006
Main Contractors (More than 1 billion yen only is stipulated)	None
Consultant Services (More than 100 million yen only is stipulated)	None
Feasibility Study	F/S by Central and Southern China Municipal Engineering Design & Research Institute (August 1998)

2. Evaluation Results (Rating: A)

2.1 Relevance (Rating: a)

2.1.1 Relevance at the time of appraisal

Since the mid 1990s, China has been suffering from water supply and demand gap caused by the rapid industrialization and urbanization, and enhancement of capacity of water supply facilities has been required. In addition, issues of contamination of river water, which is the water source, and lowering of water table level were noted, and assurance of water sources and countermeasures to water conservation were required.

Under such condition, China's 9th Five-Year Development Plan (1996-2000) emphasized waterworks infrastructure in rural cities, specifically with the following targets;

① increase of nationwide water supply by 40 million ㎥ per day
② raise accessibility ratio to portable water in urban areas to 96%
③ increase average water supply per person by 40ℓ per day

From the development needs viewpoint, the southwestern area of the Chongqing central peninsula was covered only partially by public waterworks. Since with recent economic development, population has been increasing and expected to be further increased, and thus countermeasures to cope with the increasing water demand was essential. In addition, increase of water demand due to the economic development and enhancement of the quality of life, and increase of non-farming population due to urbanization have resulted in the supply-demand gap. In order to meet the increasing

water demand, enhancement of supply capacity is essential and construction of a new water plant in the project area was needed.

2.1.2 Relevance at the time of evaluation

The current 11th Five-Year Development Plan (2006-2010) aims at two numerical targets: 1) the economic growth rate be 7.5%/annum during the period, and 2) reduce energy consumption per unit of GDP by 20 percent during the period. In order to achieve these goals, the government established five principles/plans and one of them is "to accelerate well-balanced development among regions (to accelerate active and steady urbanization and to generate ripple effects by megalopolises)". With respect to the overall urban planning, consistency with the regional economic development plan, labor markets, urban infrastructure and public works would be taken into consideration. Particularly, a priority would be given to enforcement of control and conservation of sources for drinking water and increase of water supply facilities. One of 5 priority agenda under the Chongqing's 11th Five-Year Plan is: Water purification plants will be newly constructed; the share of water supply from public water plants will be increased; and rehabilitation of degraded water pipes will be accelerated.

According to the Chongqing water supply plan, the southwestern part of the central peninsula area will be developed as an important industrial zone focusing on metallurgy, construction and light industries. Moreover, in order for the southwestern part to be developed focusing on construction materials, high-tech industries and mechanical industries, increase of the water supply capacity needs to be urgently made. In the central peninsula area, increase of population due to the economic development is still continuing, and thus the project, which addresses increase of water demand and enhancement of the quality of life, is consistent with the development needs at this moment.

This project has been highly relevant with China's national policies and development needs both at the time of appraisal and at ex-post evaluation.

2.2 Efficiency (Rating: b)

2.2.1 Outputs

The project scope at the appraisal stage was as follows. All facilities for water intake, purification and transmission/distribution were constructed as planned.

Table 1 Output (planned and actual)

Item	Planned	Actual
Water intake facilities	intake volume: 300,000 ㎥/day	as planned
Water purification facilities	purification volume: 300,000 ㎥/day, rapid	as planned

	sand filtration method	
Water transmission and distribution facility	total length: approximately 135km, pressurized pump, regulating pond 20,000 ㎥	as planned

Chlorine dosage facility at Fengshouba Plant

Receiving well of Fengshouba Plant

2.2.2 Project period

The planned project period at appraisal was from March 2000 (Loan Agreement signing) to June 2004 (construction completion) with a total period of four years and five months. The actual period was from March 2000 to April 2006 (construction completion) with a total period of six years and two months, resulting in about twenty-one months delay (140% of the planned period).

The main reasons for delay are: Chongqing Municipal Government had to reorganize institutional set-up to establish a new Project Management Office (PMO) for the project and it took 18 months; and delay in completion of detailed designs (approximately 20 months). Following countermeasures were taken to make up for the delay in commencement of works; 1) applied strict schedule control so that the procurement process by International Competitive Bidding (ICB) and National Competitive Bidding (NCB) would not be further delayed; and 2) employed the staff who was familiar with the procurement guidelines of JICA to implement procurement activity and process more effectively. Due to delay in project implementation, Chongqing government applied one-year extension of the loan closing date through Ministry of Finance of China and the one-year extension was approved by JICA.

2.2.3 Project cost

The total project cost estimated at appraisal was 18,661 million yen, among which the Japanese ODA loan amount was 6,244 million yen and the rest was to be locally funded. The actual total project cost was 11,428 million yen and the Japanese ODA loan disbursed was 3,589 million yen and the rest was locally funded. The total project cost was reduced by 40% and the Japanese ODA loan disbursed was lower than planned by 42%. Cost reduction was made because of substantial reduction of taxes and

administration expenses (reduced by 76%). Its main reasons for reduction are:

1) Project Management Office (PMO) staff were reduced from originally planned 80 to 20;
2) works which are generally done by consultants were switched to the force account system;
3) a tendering company was not employed and instead procurement was processed by own staffs; and
4) reduced extra miscellaneous expenditures

The main reason for the decrease in foreign currency (Japanese ODA loan portion) is lowered bided prices of construction materials, equipment, and facilities. At the appraisal stage, cost estimation was made referring to actual prices used in the previous water supply projects, and those used were mostly imported goods. However, in the Fengshouba water plant project, most of goods (materials, equipment, and facilities) were locally procured, and those locally procured were paid by local currency as much as possible.

Table 2 Project Costs by Item (Planned and Actual)

Unit: million yen

Item	Planned			Actual		
	Foreign	Local	Total	Foreign	Local	Total
Intake facilities	462	276	738	432	417	849 (15% increase)
Purification facilities	2,117	1,188	3,305	1,254	1,965	3,219 (3%decrease)
Transmission/ distribution facilities	2,742	2,777	5,519	1,903	3,729	5,632 (2%increase)
Tax, Management expenses	923	8,176	9,099	-	1,727	1,728. (76%decrease)
Total	6,244	12,417	18,661	3,589	7,838	11,428

Note 1: Planned figures taken from appraisal documents
2: Exchange rate: 1 yuan = 15 yen

The project period was longer than planned, but the project cost (in Japanese yen) was lower than planned. Therefore, the evaluation for efficiency is moderate.

2.3 Effectiveness (Rating: a)

2.3.1 Enhancement of water supply capacity in the central Peninsula area

The estimated demand and supply capacity in the central Peninsula area are shown in Table 3. Upon completion of this project, the water supply capacity (300,000 ㎥/day) was increased. However, since the population of the area to be water-supplied (demand for water supply) was increased as well, water shortfall still remains. Currently, two additional purification plants are being constructed. One is Jingkou plant with water

supply capacity of 550,000 ㎥/day and the phase I construction work (water supply capacity: 200,000 ㎥/day) is being implemented. Another one is Yuelai plant with water supply capacity of 600,000 ㎥/day and the phase I construction work (water supply capacity: 200,000 ㎥/day) is being implemented. The lack of water supply will be resolved by the time when both phase I works have been completed,

Table 3 Estimated demand and supply capacity in the central Peninsula area

Indicators	1997 Baseline	2005	2006	2007	2008
Population in the area to be water- supplied (million person)	1.35	1.86 (1.55)	1.92 (1.59)	1.99 (1.62)	2.07 (1.66)
Demand for water supply (000 ㎥/day)	680	1,120 (941)	1,160 (975)	1,210 (1,009)	1,260 (1,043)
Supply capacity (000 ㎥/day)	545	645 (845)	945 (845)	980 (845)	980 (845)
Shortfall (000 ㎥/day)	135	475	215	230	280

Note 1: Purification facilities were completed in December 2005, and transmission/distribution facilities in December 2006. Heshangshan[3] purification facility (water supply capacity: 250,000 ㎥/day) was completed in 2008.

Note 2: Figures in ( ) are planned figures at appraisal

2.3.2 Stable water supply of safe and clean water

Monitoring results of water quality at Fengshouba Water Plant as of June 1, 2009 is shown in Table 4. The quality of treated water at purification plant fulfills all of the national standard requirements, and thus, it proves its adequacy as tap water. The water quality of Changjiang, the source for intake water, has been regularly monitored by the monitoring station, which was established by the Fengshouba water company in collaboration with environmental divisions of neighboring local government for monitoring the Changjiang on the real-time basis.

Table 4 Monitoring Results of Water Quality at Fengshouba Water Plant

Item	Intake water	Transmission/ distribution water after treatment	National standard for transmission/ distribution water after treatment
Ph	7.9	7.6	6.5-8
Turbidity (NTU)	64	0.1	1
Clarity	<15	<5	<15
Odor	none	none	None
Bacteria count (CFU/L)	1.7103	0	0
Coli form count (CFU/100mL)	2.0x104	0	0
Aluminum(mg/L)		.004	0.2

[3] One of existing plants, of which capacity was planned to be expanded at appraisal.

With respect to the stable supply of water, at the appraisal stage, water supply was insufficient as water supply was limited particularly in summer by setting time, day, and area to be served. Upon completion of the project, in the target area where water is supplied from Fengshouba Plant including Dadukou (where the water plant is located) in the central Peninsula and part of Shapingba, and Jiulongpo, no water interruption has been observed in the past three years. Thus, the project has achieved its original purpose.

The quantity of water intake and water supply of the completed Fengshouba Water Plant is shown in Table 5. The amount of water actually supplied for the past three years was compared with the planned water supply amount, assumed for calculation of FIRRs in the Feasibility Study report. The supply achievement ratio in 2008, two years later upon project completion was 75% and thus, the project more or less accomplished the original target. The operating ratio (actual water supply/supply capacity) of Fengshouba water plant is currently 50% and there still remains allowance of water supply. However, it is not possible to transmit the excess water to the areas beyond the targeted coverage area due to geographic conditions (existence of rivers/valleys) of Chongqing city.

Table 5 Quantity of water intake and supply of the completed Fengshouba Water Plant

Indicators	2006	2007	2008
Intake (000 m^3/day)	74	117	160
Population Served (000 person) Note 1	120	180	250
Actual Water Supply (000 ton/day)	70	110	150
Planned Water Supply (000 ton/day) Note 2	150	200	200
Supply Achievement Ratio (%) Note 3	47	55	75

Note 1: Areas served include Central Peninsula Dadukou District, and part of both Jiulongpo and Shapingba Districts

Note 2: Planned water supply amount in each year upon completion, assumed for calculation of FIRRs in the Feasibility Study report.

Note 3: Actual water supply÷Planned water supply

2.3.3 Internal rate of return

Financial internal rate of return (FIRR) at appraisal was calculated with conditions that the total project cost and operation/maintenance costs, increased through the operation stage, are “costs” and that the income from water charges is “benefits”. FIRR at the post evaluation was recalculated using the same conditions adopted at the appraisal stage. The re-calculated FIRR at post evaluation was 6.31%. The main reason for increase of FIRR is due to lowered construction costs by 40% than planned. .

Table 6 Financial internal rate of return

stage	FIRR

At appraisal	4.1%
At post evaluation	6.31%

2.3.4 Qualitative impact

(1) Response to the increasing demand of water

The project has achieved its initial objective, which would cope with the increased demand for water in Dadukou District upon completion of Fengshouba Plant with a capacity of 300,000 ㎥/day . In addition, Fengshouba water plant is also supplying water to the neighboring Jiulongpo and Shapingba districts.

(2) Promotion of economic activities through improvement of the life quality and infrastructure

According to responses to the questionnaire to Chongqing, upon completion of the project, stable and high quality water supply has been achieved. The improvement in the business and living environment in Dadukou District has attracted a number of domestic and foreign investments, and economic development in the district has been further promoted. The growth rate of GDP has been stable and GDP has been more than 11%. The year 2007 even recorded a GDP growth of 18.1%. The generated investment amount in the Shapingba Industrial Development Zone is prominent. The local government of Dadukou District has an ambition to make the district the most beautiful and comfortable district in Chongqing city.

(3) Stable supply of clean water

Before the completion of the project, water supply was insufficient as water supply was limited particularly in summer (average temperature was 34 centigrade in July and August) by setting time, day, and area to be served. Upon completion, the project has achieved stable water supply.. In the summer of 2007, when Chongqing city was hit by the extreme high temperature (more than 40 centigrade), the central peninsula area did not suffer from any interruption of water supply and the water pressure was sufficient and stable. No interruption in water supply was experienced in Dadukou District in 2007, 2008 and 2009.

Therefore, this project has largely achieved its objectives, and its effectiveness is highly satisfactory.

2.4 Impact

2.4.1 Improvement of the life quality and infrastructure

Since upon completion of the project, the water supply became stable in the project subject area, Dadukou, the project attracted numerous domestic and foreign investment and has recorded the GDP growth rate with more than 11% every year. The average per

capita income (in 2007) in the project target areas (Dadukou, Jiulongpo and Shapingba) has increased by approximately 40%, compared with that in 2000 as shown in Table 7. According to the results of beneficiary surveys, 75% of respondents do not necessarily perceive project's contribution to increase of the household income, but 93% do to promotion of regional economic activities. Thus, it is perceived that the project somehow contributes to enhancement of the quality of life. Changes in average per capita income are shown in Table 7.

Table 7 Average income per person

Unit: Yuan

Year	Supplied Area by this project
2000	6,980
2001	8,340
2002	9,863
2003	12,440
2004	14,357
2005	16,630
2006	19,215
2007	23,098

Beneficiary surveys through interviews were conducted in the project target areas. The total number of respondents was 130 and the classification of respondents by sex was 34% female and 66% male. Survey results are summarized below.

1) stable water supply achieved: 97%
2) water supply is sufficient: 99%
3) water pressure has been strengthened than before: 97%
4) water quality has been improved than before: 99%
5) appropriateness of water charges : 63% reasonable (37% high)
6) impact on enhancement of the quality of life : 89% (improved)
7) time for doing house work has been reduced: 58% (shortened)
8) increase of household income: 75% no impact on household income
9) improvement of environment: 71% (improved)
10) satisfied with the services provided by the water company: 93%
11) the regional economic activities: 93% (promoted)
12) negative impact by the project: 99% no negative impact

Regarding improvement of the quality of life, about 60% of local residents evaluate that the time for home works was reduced since the stable water supply was achieved and the water pressure was strengthened. Thus, the project contributes to the improvement/development of the life and social infrastructure.

Settling tank of Fengshouba Plant

Fengshouba Water Plant Water Storage (Underground)

2.4.2 Environmental and social impacts

(1) Impacts to the environment

A water supply project is related to an environmental protection, and thus it does not cause any environmentally and socially negative impacts. Any particular negative impact issues by construction of a water plant have not been noted (from monitoring results by Dadukou environmental protection division).

There is no environment issues related to the sludge disposed from the water purification plant since the sludge produced from the Fengshouba Plant is minimal, which was originally concerned. The reason why the amount is minimal is that the intake water from the river at the Fengshouba Plant is very clean. The reason for improved water quality of Changjiang is that the central environment authority has recently enforced the supervision and monitoring on the environmental protection especially after completion of the Three Gorges Hydroelectric Power Station including the following actions: i) more strict measures on illegal disposal and discharge have been taken to reduce the silt and sludge contents in the Yangtze River and ii) any factories affecting the natural environment have been closed. Enforced supervision and monitoring for environmental protection contributes not only to improvement of environment but also to reduction of maintenance costs for plants (the number of regular excavation work was reduced and the cost for work of clearing sludge was reduced).

While the project has increased the supply capacity in the central peninsula area, it also increased the city's discharged waste water. In order to address this issue, a Jiguanshan Waste Water Treatment Plant has been constructed and is now in operation with a treatment capacity of 600,000 m^3 per day.

(2) Land acquisition and resettlement

The acquired land area was about 150,000 ㎡, which is less than planned (200,000 ㎡). The reasons for the cut of acquired area are: 1) facilities originally planned to be installed on the ground were partially changed to multi-level structures; and 2) approach roads to the plant were constructed under the general public works. The number of resettled households was 5 as planned and the compensation paid was about 20.5 million yuan. Since a house was rebuilt with the compensation paid, the quality of life of resettled inhabitants has improved and they have been provided with safe and clean water from the Fengshouba plant without interruption. They enjoy benefits from the project.

2.5 Sustainability (Rating: a)

2.5.1 Operation and maintenance system

As originally planned, under Chongqing Water Company (under Chongqing Water Holding Group Co.), the Fengshouba water plant is responsible for operation and maintenance. Chongqing Water Company holds 7 other plants other than Fengshouba water plant. The Fengshouba plant consists of 5 divisions (operations and maintenance, finance, administration, transmission and distribution, and water charge collection) with a total of 130 employees including 3 senior management staff, 7 engineers, 18 technical managers, 29 technical operators, 28 clerical staffs, and 45 others.

At the commencement of the project, the executing agency was changed from the Chongqing Municipal People's Government to Chongqing Water Supply Holding Company. This change was made since the water supply and sewage department of the municipal government was restructured to the company entity. The staffing and organization has been almost unchanged and no issues have been reported in actual operation.

2.5.2 Technical capacity in operation and maintenance

There are 27 staff in charge of operation of the plant, among which 7 are university graduates, and 20 technical school graduates. There are 16 administration staff, among which 6 are university graduates, and 10 college graduates. Fengshouba Plant provides numerous training programs to the staff. The training module is diverse and staff receives training on laws and regulations on safety operations, quality control, labour law, the company's operation and maintenance rules and regulations, the technical manuals, operational manuals, and maintenance manuals of all the equipment. The following trainings are regularly undertaken:

Class 1 Training: Team-level training, at least twice each month;

Class 2 Training: Plant-level training, once each quarter;

Class 3 Training: External exchange training, once each year.

Apart from the training program mentioned above, the following measures are taken to enhance technical knowledge and skills: sharing and exchange of professional

staff; recruitment of skilled staff from other entities; recruitment of university graduates and training through on-job-training. Results of reviewing the qualification of staff and training accomplishment after recruited, the technical level of staff working at the plant is considered appropriate for implementing operation and maintenance of the plant.

2.5.3Financial status on operation and maintenance

(1) Financial status of Fengshouba water plant

The financial status of the Fengshouba water plant is shown in Table 8. Currently, the Fengshouba water plant has sufficient sales revenue to cover water plant's operation and maintenance. Moreover, sales revenue is expected to increase due to increasing water demand from the expected population growth. Operating expenses have been increasing every year and the increasing rate for the past two yeas was about 10%. Compared with increasing rate of revenues (about 41%), it is lower and the share of operating expenses among the revenue and expenses status will be lowered. Because of increase of water supply volume to 180,000 ton/day by 2010, it is expected that revenue will rise up to 600 million yuan and the net cash flow will reach 50 million yuan in 2010. In addition, Chongqing city is considering to raise water charges by 0.6 yuan/㎥ (already publicly announced). In 2009, revenue is expected to increase by 30 million yuan, which will turn net loss into net profit and it is expected that the business operation would be stable.

Table 8 Financial status of Fengshouba Water Plant

(Unit: million yuan)

Item	2006	2007	2008
Revenue	39.92	58.41	79.05
Operating expenses	66.32	72.02	80.46
(Depreciation among operating expenses)	42.66	43.18	43,50
Tax	0.24	0.35	0.47
Operating expenses	0.81	1.24	2.50
Financial expenses	16,91	13.03	12.04
Non-business revenue	4.23	6.19	8.38
Profit	(40.12)	(22.04)	(8.05)
Net Cash Flow	2.54	21.14	35.54

The current water charges are 2.8 yuan/㎥ for households, 3.35 yuan/㎥ for industrial use, and 2.8 yuan/㎥ for commercial use, respectively. However, these charges include sewerage charges (0.7 yuan/㎥ for households, and 1.0 yuan/㎥ for industrial/commercial uses). Water charges in Chongqing city are average compared with those at other cities. If the proposal for charge increase by 0.6 yuan/㎥ is approved by the city government, the financial status of the Fengshouba plant would be further improved.

(2) Financial status of Chongqing Water Company

The financial status of Chongqing Water Company is shown in Table 9. The main reason why the revenue turned to be loss in profit in 2008 is due to change of exchange rates. The profit in 2008 was CNY5.375 million before loss of exchange rates. The financial capacity (net cash flow) of Chongqing Water Company is sound and stable. The revenue is expected to increase further with increase of customers and expected increase of water charges. The equity capital ratio (net asset÷total of liability and net asset) as of 2008 was about 43%, and financial status is stable.

Table 9 Financial status of Chongqing Water Company.

(Unit: million yuan)

Item	2006	2007	2008
Revenue	490.14	528.98	581.40
Operating expenses	394.59	405.37	525.26
(Depreciation among operating expenses)	84.31	91.38	108.31
Profit	90.04	66.63	- 22.13
Net Cash Flow	177.7 0	279.65	145.37
Total Asset	2,106.45	2,195.07	2,228.74
Total Debt	1,294.22	1,230.50	1,265.40
Net Asset	812.23	964.57	963.34

2.5.4 Status of operation and maintenance

Operation staff cleans the facilities everyday and regularly paints facilities and buildings. Routine maintenance for facilities and an annual comprehensive inspection are conducted so that safe operation is secured. The overhaul of facilities/equipment is entrusted to private companies who possess qualification and technical capacity. It was confirmed during the field inspection that facilities were cleaned and well maintained.

No major problem has been observed on capacity of the executing agency nor the operation nor its maintenance system, therefore, sustainability of this project is high.

3. Conclusion, Lessons Learned, Recommendations

3.1 Conclusion

This project has been highly relevant with China's national policies and development needs both at the time of appraisal and at ex-post evaluation. The project has largely achieved its objectives, and effectiveness is highly satisfactory. Regarding efficiency, the project period was longer than planned, but the project cost was lower than planned. Therefore, the evaluation for efficiency is moderate. Sustainability of this project is high.

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

3.2 Lessons Learned

None.

3.3 Recommendations

None.

Comparison between planned and actual

Component	Planned	Actual
Output:	① Water intake facilities: intake volume: 300,000 ㎥/day ② Water purification facilities: purification volume: 300,000 ㎥/day, rapid sand filtration method ③ Water transmission and distribution facility: total length: approximately 135km, pressurized pump, regulating pond 20,000 ㎥	as planned as planned as planned
Period	March 2000 (L/A) – June 2004 (Construction completion) 4 years and 5 months (53 months)	March 2000 (L/A) – April 2006 (Construction completion) 6 years and 2 months (74 months)
Cost（Total Project Cost） Foreign currency Local currency Total Japanese ODA Yen loan Exchange rates	 6,244 million yen 12,417 million yen (827.82 million yuan) 18,661 million yuan 6,244 million yen 1 yuan = 15 yen (as of July 1999)	 3,589 million yen 7,838 million yen (522.254 million yuan) 11,428 million yen 3,589 million yen 1 yuan = 15 yen (March 2000 – July 2006)

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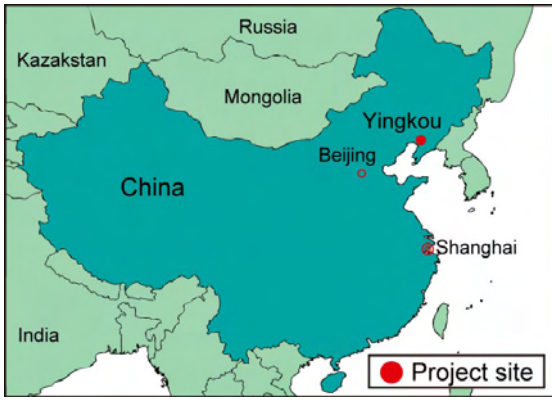
Study Period: April 2009 to December 2009[1]

1. Project Profile and Japan's ODA Loan



Location of Project Site


Yangjiadian Water Plant

1.1 Background

Under China's reform and open-door policies which commenced in 1979, construction and improvement of waterworks facilities, especially in large cities along coastal regions, has been implemented as a part of actions to improve the investment environment for attracting enterprises. The average water usage per person as of 1999, was 217ℓ/day in urban areas, and it was equivalent to that of Japan (200 to 250ℓ/day). The coverage of the water supply system in urban areas has been steadily improving at rates of 81% in 1985, 89% in 1990, and 96% in 1999. On the other hand, following the rapid economic development in large cities in coastal areas, suburban areas along coastal regions and inland's medium to large cities have been suffering from the water supply and demand gap caused by the rapid increase based on the rapid industrialization and urbanization which started in mid 1990s.

Yingkou city[2] has a population of 2.3 million in 2004 (equivalent to that of

[1] Field surveys were conducted in June and August 2009.

[2] China's administrative division consists of levels of province, prefecture, county, township, and village. In correspondent to each administrative level, the densely inhabited districts in provinces, prefectures, and counties are called municipalities, prefecture-level cities, county-level cities,, respectively. In addition, areas with densely populated urban district in municipalities or prefecture-level cities are called city- ruled districts. Yingkou city is a prefecture-level city, which belongs to Liaoning Province, and has 4 districts including Zhanqian, Hongqi, Laobian and Bayuquan, and 2 county-level cities (equivalent to cities in Japan) including Dashiqiao and Gaizhou.

Miyaghi Prefecture in Japan). In Yingkou City, water had been supplied from water plants, which have water resources in ground water and surface water in Liaohe River. However, due to increase of water demand with the improvement of living standard and the rapid urbanization, water supply was restricted. In addition, water was supplied only eight hours per day due to the lowering of the ground water level with the insufficiency of rain fall in recent years, as well as due to the underutilization of the water plant facilities with the pollution of Liaohe River. In the target area of this project, the average water usage per person as of 1999 was 70ℓ/day, which was half of the same scale cities (150ℓ/day) or one third of the national average (217 ℓ/day). Therefore, it was essential to cope with the increasing water demand.

1.2 Objective

The project objective is to meet the increasing water demand in Yingkou City along with economic development and urbanization, and to provide safe and stable water supply, by constructing a purification plant with a capacity of 120,000 ㎥/day in the four districts in Yingkou City[3], thereby contributing to the improvement of the quality of life. The location of the project site is shown in Figure 1.

Figure 1 Location of Project Site

[3] Zhanqian District, Honqi District, Laobian District and Bayuquan Economic Technology Development District.

1.3 Borrower/Executing Agency

Government of the People's Republic of China / Yingkou Municipal People's Government

1.4 Outline of Loan Agreement

Loan Amount/Disbursed Amount	2,504 million yen / 2,414 million yen
Date of Loan Agreement/ Exchange of Notes	March 2001 / March 2001
Terms and Conditions -Interest Rate -Repayment Period (Grace Period) -Procurement	 1.3% p.a. 30 years (10 years) General untied
Date of (Disbursement) Completion	September 2006
Main Contractors (More than 1 billion yen only is stipulated)	None
Consultant Services (More than 100 million yen only is stipulated)	None
Feasibility Study	F/S by Liaoning Province Engineering Design & Research Institute (August 1998)

2. Evaluation Results (Rating: A)

2.1 Relevance (Rating: a)

2.1.1 Relevance at the time of appraisal

Since the mid 1990s, China has been suffering from water supply and demand gap caused by the rapid industrialization and urbanization, and enhancement of capacity of water supply facilities has been required. In addition, issues of contamination of river water, which is the water source, and lowering of water table level were noted, and assurance of water sources and countermeasures to water conservation were required.

Under such condition, China's 9th Five-Year Development Plan (1996-2000) emphasized waterworks infrastructure in rural cities, specifically with the following targets;

1. increase nationwide water supply by 40 million m^3 per day
2. raise the coverage of the water supply system in urban areas to 96%
3. increase average water supply per person by 40ℓ per day

Furthermore, the Yingkou City's 9th Five-Year Development Plan (1996-2000)/Long-term Plan for 2010 targeted the increase of water supply capacity of Bayuquan Economic Technology Development District (hereinafter Bayuquan District) by 120,000 ton/day and the increase of the water supply capacity of overall Yingkou City

to 591,000 ton/day. Therefore, the Project had high compatibility with the national and municipal plans.

From the development needs viewpoint, as mentioned earlier, in order to respond to insufficient water supply with the improvement of living standard and urbanization, construction of a new water plant in the project area was needed at the same time when a water supply dam from water resources in Biliuhe River was constructed by the Department of Water Resources of Yinkou City.

2.1.2 Relevance at the time of evaluation

The current National 11th Five-Year Development Plan (2006-2010) aims at two numerical targets: 1) the economic growth rate be 7.5%/annum during the period; and 2) reduce energy consumption per unit of GDP by 20 percent during the period. In order to achieve these goals, the government established five principles/plans and one of them is "to accelerate well-balanced development among regions (to accelerate active and steady urbanization and to generate ripple effects by megalopolises)". With respect to the overall urban planning, consistency with the regional economic development plan, labor markets, urban infrastructure and public works would be taken into consideration. Particularly, a priority would be given to enforcement of control and conservation of sources for drinking water and increase of water supply facilities.

One of priority agenda under the Yingkou City's 11th Five-Year Plan (2006-2010) is to increase the average water usage per person to 180ℓ/day by 2010. In order to realize the policy, the Plan emphasizes sending water from the water sources in the East to West by the implementation of "*Dongshui Xitiao*" projects. As the water quality of Liaohe River is not up to the water quality standard due to the pollution of Liaohe River, it is essential to construct a water purification plant which has other water resources. Therefore, the project with water resources in Biliuhe River is consistent with the development needs. Futhermore, there is still urgent needs to increase water supply capacity to support the Bayuquan District developing as the Economic Technology Development Zone.

This project has been highly relevant with China's national policies and development needs at the times of both appraisal and ex-post evaluation.

2.2 Efficiency (Rating: b)

2.2.1 Outputs

The project scope at the appraisal stage was as follows. All facilities except the intake facility were constructed as planned. Intake facility was built into the design of the Yushi Dam, from water resources in Biliu He River, which was constructed by the Department of Water Resources of Yingkou City in December 2002. Therefore, the intake

facility was removed from the output of the project. The output of the project is shown below.

Table 1 Output (planned and actual)

Items	Planned	Actual
Water intake facilities	Intake volume: 120,000 ㎥/day Intake pipelines: approximately 20m x 2	Cancelled
Water conveyance facilities	Total length: approximately 26km, Total length of tunnel: approximately 11km	Almost as planned (Total length: approximately 26km, Total length of tunnel: approximately 11.3km)
Water purification facilities	Purification volume: 120,000 ㎥/day, floc formation pond, sedimentation pond, and filtration pond (rapid sand filtration method)	As planned
Water transmission facilities	Total length: approximately 65km	Almost as planned (approximately 66.2km)
Water distribution facilities	Regulating pond x 2 Total length: approximately 29km	Almost as planned (Regulating pond x 2 , Total length: approximately 27km)

Water Purification Plant

Monitoring Room

2.2.2 Project period

The actual project period was the same as planned from March 2001 (Loan Agreement signing) to December 2003 (commencement of operation) with a total period of two years and ten months (100% of the planned period).

2.2.3 Project cost

The total project cost estimated at appraisal was 5,778 million yen, among which the Japanese ODA loan amount was 2,504 million yen and the rest was to be locally funded. The actual total project cost was 6,458 million yen and the Japanese ODA loan disbursed was 2,414 million yen and the rest was locally funded. The total project cost was increased by 12% than planned (112% of the planned cost). The cost for the intake facility decreased to zero due to its cancellation. On the other hand, cost for other

facilities such as conveyance facilities, purification plant and distribution facilities were increased. Main reasons for cost increase of the conveyance facilities are as follows:

1) the price of the materials drastically increased from the original price;
2) the road for civil works required for installing conveyance facilities was added;
3) the volume of civil works for installing conveyance facilities deeper under small and medium scale rivers increased from the original plan;
4) the soil replacement works, which was not expected before the project started, were added.

Main reasons for cost increase of the water plant facilities are as follows:

1) the actual price of civil works for the plant and that of the installation of equipment were higher than those at appraisal;
2) sludge processing facility was added;
3) installation of electric wire outside the water plant and additional civil works for access road in front of the water plant was added.

Main reasons for increase of the distribution facilities are the increase of the price of materials and additional civil works due to the geological conditions.

Although the project period was as planned, the project cost slightly exceeded the plan; therefore, the evaluation for efficiency is moderate.

2.3 Effectiveness (Rating: a)

2.3.1 Enhancement of water supply capacity

(1) Water Supply Capacity by the Project

Water supply capacity by the project is shown in Table 2. Upon completion of this project, the water supply capacity was increased by 120,000 ㎥/day as planned, and the facility utilization rate has also been increasing steadily since the operation in 2004 and reached 100 % in 2008.

Table 2 Water supply capacity by the Project

Indicators (unit)	2004	2006	2007	2008
Water supply capacity (10,000 ㎥/day)	12	12	12	12
Average water supply amount (10,000 ㎥/day)	5	7	8	12
Facility utilization rate (%)	41.7	58.3	66.7	100

Source: Yingkou Water Supply Company Limited

(2) Water supply capacity in the project target area and the role of project

The water demand and supply capacity in the project area are shown in Table 3.

Table 3　Demand and supply capacity in the project target area (actual)

Indicators（Unit）	1999 Baseline	2004	2005	2006	2007	2008
Population served (10,000 persons)	72.2	82	83.6	85	86.3	87.6
Demand of water supply（10,000 ㎥/day）	23.3	30.8	30.9	31	31.1	35.5
Supply capacity (10,000 ㎥/day)	23.3	35.3	35.5[4]	35.5	35.5	35.5
Shortfall（10,000 ㎥/day）	0	4.5	4.6	4.5	4.4	0

Source: Yingkou Water Supply Company Limited

Note 1: The Project was completed in December 2003. The existing plant increased its capacity in 2005.

Upon completion of this project, the water supply capacity (120,000 ㎥/day) was increased as planned, and the project facility is responsible for approximately one third of the total capacity of the project target area. As the water demand is still increasing in Bayuquan District, two more new water plants are under construction[5]. Table 4 illustrates the population in the area to be water-supplied, accessibility ratio to portable water and other indicators.

Table 4　Population served, coverage of the water supply system and other indicators in the project target area (Planned and Actual)

Indicators（Unit）	1999（Baseline）	2008（Target）	2008(Actual)
Population served (10,000 persons)	72	93	87
Average water usage per person (ℓ/day)	70	95	102
Coverage of the water supply system（%）	100	100	100
Water leakage ratio（%）	24	15	22

Source: Yingkou Water Supply Company Limited

The actual population served as of 2008 was 870,000 persons, which was below the target of 930,000 persons. However, average water usage per person reached 102 ℓ/day, which exceeded the target of 95 ℓ/day for 2008. In addition, accessibility ratio to portable water also reached 100%. Main reasons why water leakage ratio could not reach the target for 2008 are as follows: 1) distribution pipelines outside the project became obsolete; and 2) 24 hour water supply as well as increase of water pressure by the project is accelerating the deterioration of the obsolete distribution lines. In spite of these, water leakage ratio is decreasing in the past two to three years along with the replacement of old distribution lines; therefore, it is expected that the water leakage ratio will decrease further in the near future.

[4] At the appraisal, it was expected that the existing water plant would increase its capacity by 44,000 ㎥/day by the improvement of water quality of Liaohe River, which is outside the scope of the Project. However, it increased only by 2,000 ㎥/day.

[5] One plant with the capacity of 70,000 ㎥/day is being constructed with the loan from the World Bank, and another plant with the capacity of 250,000 ㎥/day with the loan from the central government.　Both plants are planned to be completed in December 2010.

2.3.2 Response to the increasing water supply

As shown in Table 3, water demand drastically increased from 233,000 ㎥/day at appraisal in 1999 to 308,000 ㎥/day in 2004, then to 355,000 ㎥/day in 2004. It can be said that the project covered the increase of water supply demand by adding the capacity of 120,000 ㎥/day. Meanwhile, Table 5 illustrates water usage by purpose in the project target area.

Table 5 Water usage by purpose in the project target area

Purpose	Unit	2001	2004	2005	2006	2007	2008
Living use	10,000 ㎥/day	5.6	7.9	7.9	7.9	7.9	8
	%	23.9	25.5	25.4	25.4	25.3	22.4
Industrial use	10,000 ㎥/day	10.3	14.4	14.5	14.6	14.7	19
	%	44.1	46.8	46.9	47.1	47.3	53.5
Commercial use	10,000 ㎥/day	7.5	8.6	8.6	8.5	8.5	8.5
	%	32	27.8	27.6	27.5	27.4	24.1
Total	10,000 ㎥/day	23.3	30.8	30.9	31	31.1	35.5

Source: Yingkou Water Supply Company Limited

Water demand is increasing in all the categories, particularly in living use and industrial use. Therefore, it is deduced that the project responded to the increase of water demand particularly for living use and industrial use.

2.3.3 Stable supply of safe and clean water

Water from Yangjiadian Water Plant is purified by the chlorine dosage facility. The water quality is regularly monitored in the water quality inspection room. Monitoring results of water quality at Yangjiadian Water Plant as of June 2009 and the national standard requirements (revised in 2006) are shown in Table 6. The quality of treated water at purification plant fulfills all of the national standard requirements; and thus, it proves adequacy as tap water.

Table 6 Monitoring Results of Water Quality at Yangjiadian Water Plant

Item	National standard water quality after treatment (GB5749-2006)	Water quality before treatment	Water quality after treatment
Ph	>=6.5, <8.5	7.23	7.12
Turbidity (NTU)	<1	1.2	0.6
Odor	None	None	None
Bacteria count (CFU/L)	<100	4	1
Coli form count（CFU/100mL)	None	None	None
Iron (mg/L)	<0.3	0.03	0.02
Manganese (mg/L)	<0.1	0.06	<0.006
Aluminum (mg/L)	<0.01	<0.0007	<0.0007

Source: Yingkou Water Supply Company Limited

Chlorine dosage facility

Water quality inspection room

With respect to the stable supply of water, at the appraisal stage, water supply was insufficient as water supply was limited to three times a day (morning, day time and evening) in total of eight hours per day. Upon completion of the project, safe water is supplied for 24 hours to most households, commercial facilities and factories in the project target area[6]. However, some old residential areas where water interruption is still observed as the old distribution lines have not been replaced.

Regarding water pressure, according to Yingkou Water Supply Company Limited, the water pressure was between 0.08MPa[7] (non-peak time) and 0.2MPa (peak time), which forced three-story and higher buildings to use pumps for adding pressure before the project was completed. Since the completion of the Project, the water pressure has been kept at 0.3MPa, and only buildings with more than four floors require pressure pumps. According to the interviews with one of beneficiaries in Laobian District, as water pressure was not sufficient before the project completion, there were not so many buildings higher than four story, while sufficient water pressures are now secured so that more high buildings are observed in the district.

2.3.4 Internal rate of return

Financial internal rate of return (FIRR) at appraisal was calculated with conditions that the total project cost and operation/maintenance costs, from the operation stage are “costs”and that the income from water charges is“benefits”. FIRR at the ex-post evaluation was recalculated using the same conditions adopted at the appraisal stage. The re-calculated FIRR at the ex-post evaluation was 3.8%, almost as planned. The main reason for slight decrease in FIRR is due to increased construction costs by 12% than

[6] According to Yingkou Harbor Bureau, it was required to install water tanks to store water for ships at the wharf previously, but upon the project completion, there is no longer need to store water. According to the Yingkou Second Technology College, it used to store water, but it is not necessary now. Factories of plastics, textiles and hosiery were forced to stop their operations at the peak time in order to secure supply to households previously, but such problems have been solved upon the project completion.

[7] Unit for pressure. 1(bar)=0.1MPa (Mega Pascar).

planned.

Table 6 Financial internal rate of return

Stage	FIRR
At appraisal	4.3%
At ex-post evaluation	3.8%

Therefore, this project has largely achieved its objectives, and its effectiveness is high.

2.4 Impact

2.4.1 Improvement of the life quality

Beneficiary survey through interviews was conducted in the project target area (all the four districts). The total number of respondents was 110, and the classification of respondents by sex was 45% female and 55% male. According to the survey, while respondents had to wake up early morning in order to store water in basin for living use, they do not need to do so thanks to 24 hour water supply upon the completion of the project. In addition, thanks to the stable water supply, approximately half of the self-drilled wells in the project target area were closed. As a result, the unplanned digging of wells by residents was reduced, which enabled the improvement of sanitary environment such as water quality.

Survey results of the beneficiary survey are summarized in Figure 2. The improvement was felt, with respect to the time of interruption of water supply, water pressure, color and smell, by the respondents respectively: 83%(91persons), 96%(106persons), 73%(80persons), 67% (74persons), 68% (75 persons). 87% (96 persons) of the respondents also felt that the time for water fetching was reduced, and 85% (94 persons) felt the living environment such as sanitation was improved. However, it was also heard that old distribution lines should be replaced because interruption of water supply is still observed in parts of old residential areas.

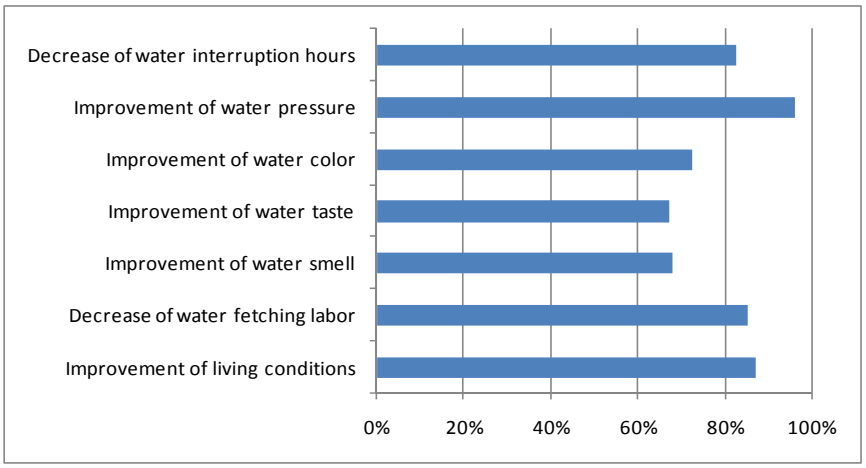


Figure 2 Result of Beneficiary Survey

Water charges are 2.65 yuan/㎥ for household, 7.05yuan /㎥ for business, 14.1 yuan/㎥ for others including car wash and massage centers. All the above charges are considered as average compared with those of other same scale cities. According to the beneficiary survey, 83% (91 persons) feel that the water charge is appropriate; 8% (9 persons) expensive; and 9% (10%) cheap respectively.

Thus, it is deduced that the Project contributed to the improvement of quality of life.

2.4.2 Contribution to economic activities through the improvement of living and social infrastructure

In the aspect of living infrastructure, there is a possibility that the time for storing water in households was reduced by 24 hour water supply while the time for economic activities and leisure increased, which results in the possible economic effects.

In the social infrastructure aspect, according to the interviews with the executing agency and the result of beneficiary survey, it is highly possible that stable and sufficient water supply for production activities enabled Chinese and foreign capital companies to start their business in Yingkou City. Such enterprises include Angang Steel Company and China Steel Group. Such explanation is also supported by the fact that the water for industrial use in the project target area increased by 1.5 times from 103,000 ㎥/day at appraisal to 144,000 ㎥/day in 2004 (see Table 5). Meanwhile, GDP in Yingkou City is also steadily increasing, and the GDP growth rate in 2004 was 21.2%, which is much higher than the national average (10.1%)[8]. Furthermore, as shown in Table 8 and 9, the number of enterprises in Bayuquan District and the cargo handling volume of Yingkou Harbor have been increasing particularly since 2003; thus it can be said the stable water supply is contributing to the economic development of the Bayuquan District.

Table 8 Number of enterprises in Bayuquan District (unit: number of companies)

Year	2001	2002	2003	2004	2005	2006	2007	2008
Number of enterprises	3,216	3,468	4,125	4,356	4,356	4,570	4,787	4,971

Source: Yingkou Statistical Bureau

Table 9 Cargo handling volume of Yingkou Harbor (unit: ton)

Year	2001	2002	2003	2004	2005	2006	2007	2008
Volume	2,520	3,127	4,009	5,978	7,537	9,477	12,206	15,085

Source: Yingkou Statistical Bureau

8 China Statistical Year Book

2.4.3 Environmental and social impacts

(1) Impacts to the environment

No environmental problem has been observed. Yingkou Water Supply Company Limited drafted an environmental monitoring plan in May 2004 and is monitoring properly in accordance with the plan. As mentioned earlier, no particular water quality issue has been observed. In January 2005, environmental monitoring and inspection center of Liaoning Province produced the environmental protection monitoring and inspection report for project completion, and no problem was pointed out in the report.

In the Project facilities, countermeasure to sludge is undertaken for environmental protection. At appraisal, it was planned to bury sludge in the approved site in the neighboring city, Gaizhou. However, a processing facility for sludge, which is one of the additional outputs, was installed in the Yangjiadian water plant. The amount of processed sludge is minimal (every ten days in summer time and once a month for winter time by ten-ton truck). Therefore, processed sludge has been buried within Yingkou City or provided to farmers for free of charge. The reason why the amount of sludge is minimal is that the intake water from Yushi Dam is very clean.

Processing facility for sludge

While the Project has increased the water supply capacity in Yingkou City, it also increased the city's discharged waste water. Although there is no waste water treatment plant at the present, a waste water treatment plant with a treatment capacity of 200,000 m^3/day is planned to be completed by 2010 with the loan from the World Bank.

There was no particular issues related to land acquisition, and there was no resettlement of houses.

2.5 Sustainability (Rating: a)

2.5.1 Operation and maintenance system

In December 2003, Yingkou Water Supply Company (which was originally planned to be responsible for operation and maintenance) merged with Yingkou Yushi Dam Construction Management Company (responsible for the management of Yushi Dam, used as water resources by the project). As a result, Yingkou Water Company Limited was established. As of now, Yingkou Water Company Limited is responsible for operation and maintenance of the water facilities constructed by the Project. The company consists of seven divisions (planning, production/technology, finance/inspection, personnel, security,

purification facility, pipeline management). Out of 36 employees working for the operation and management of the project, 30 employees including 2 university graduates, 10 college graduates, 15 technical school graduates, and 3 others are working in the newly installed water purification plant. Half of these employees have technical certificates (3 engineers, 6 assistant engineers, and 5 technicians).

2.5.2 Technical capacity in operation and maintenance

Yangjiadian Plant provided training to all the new staff before their replacement. They received training for three months at the Second Water Plant (which was constructed with the assistance by the World Bank in 1993 and has the same rapid filtration system as that of the project), and for one month at other plants in Dalian, Jinzhou and Chengdu. Technical staff also receives on-the job training every year. Furthermore, the staff to be employed for the Sixth Water Plant to be completed by 2010 is now receiving training at Yangjiadian plant, and it is highly possible that the operation and maintenance skills acquired from the project plant will be disseminated to other water plants.

2.5.3Financial status on operation and maintenance

(1) Cash flow status of Yingkou Water Supply Company Limited

The cash flow of the Company is shown in Table 10.

Table 10 Cash flow of Yingkou Water Supply Company Limited

(Unit: million yuan)

Item	2006	2007	2008
Revenue from water charges	93.10	99.05	153.47
Other revenue	7.7	0.78	0.84
Total revenue	100.80	106.85	161.89
O&M cost	91.78	94.5	125.64
Financial expenses	27.25	40.78	55.64
Total cost	119.03	135.28	181.28
Profit	-18.23	-28.43	-19.39

Source: Yingkou Water Supply Company Limited

Although the table shows that profit is minus, revenue from water charges is increasing steadily. The company has also been receiving subsidy of a total amount of 1,800 million yuan from the city government every year. Therefore, it could be said that the operation and maintenance cost is secured. Regarding the cost for replacement of deteriorated distribution pipelines, the company has already received subsidy of 800 million yuan from the Chinese government for FY 2009, and for the coming years after 2010, the budget of 11,800 million yuan is secured for the replacement of pipelines in the Shimen Dam Project (with the loan from the World Bank).

(2) Financial status of Yingkou Water Company Limited

The financial status of Yingkou Water Company Limited is shown in Table 11.

Table 11　Financial status of Yingkou Water Company Limited

(Unit: million yuan)

Item	2006	2007	2008
Financial performance			
Total asset	764.43	946.61	1,715.84
Current asset	197.44	145.16	229.28
Current liabilities	136.84	214.48	278.55
Equity capital	354.83	428.64	752.93
Financial indicator			
Total asset turnover（times）	0.12	0.10	0.09
Equity ratio（%）	46%	46%	44%

Source: Yingkou Water Supply Company Limited

Equity ratio is between 44% and 46% in the past three years, and the financial condition is stable.

2.5.4　Status of operation and maintenance

Routine inspection of the facilities is conducted every day, every week, every month or every three months depending on item in accordance with regulations. It was confirmed during the site visit that facilities were cleaned and well maintained.

No major problem has been observed on capacity of the executing agency nor its operation and maintenance system, therefore, sustainability of this project is high.

3. Conclusion, Lessons Learned, Recommendations

3.1　Conclusion

This project has been highly relevant with China's national policies and development needs both at the time of appraisal and at ex-post evaluation. The project has largely achieved its objectives, and its effectiveness is high. Regarding efficiency, the project cost was slightly higher than planned, but the project period was as planned. Therefore, the evaluation for efficiency is moderate. Sustainability of this project is high.

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

3.2　Lessons Learned

None.

3.3　Recommendations (to Yingkou Water Supply Company Limited)

As there is still some water restriction in parts of old residential areas due to the old water distribution lines, it is recommended that replacement of water distribution lines is

to be expedited in order to supply water from water plant constructed by the project to each household in stable manner.

Comparison of Original and Actual

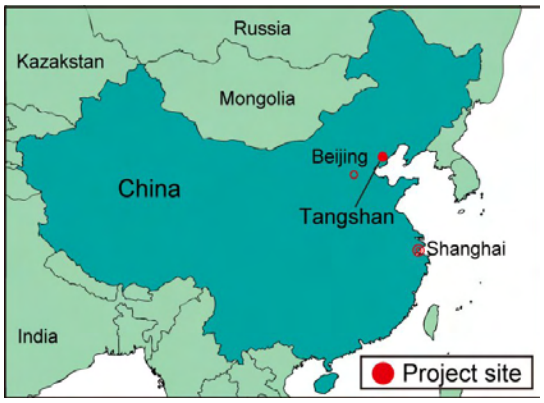
Item	Plan	Actual
1. Output		
1) Intake facilities	・ Total length: approximately 20m×2	・ Cancelled (Built into the Yushi Dam Construction Project)
2) Conveyance facilities	・ Total length of conveyance lines: approximately 26km ・ Total length of tunnel: approximately 11km	Almost as planned ・ Total length of conveyance lines: approximately 26km ・ Total length of tunnel: approximately 11.3km
3) Water Purification facilities	・ Capacity 120,000 m^3 /day, (rapid sand filtration method)	As planned
4) Transmission facilities	・ Total length of transmission lines: approximately 65km	Almost as planned ・ Total length of transmission lines: approximately 66.2km
5) Distribution facilities	・ Two water storage ・ Total length of distribution lines: approximately 29km	Almost as planned ・ Two water storage ・ Total length of distribution lines: approximately 27km
2.Project Period		
1) Intake facilities（Part of Yushi Dam）	January 2000- December 2001	October 2000- March 2002
2) Conveyance lines	July 1999- December 2002	July 1999- December 2002
3) Purification Plant	May 2000- December 2002	May 2000- June 2003
4) Transmission lines	May 2001- June 2003	January 2001- June 2003
5) Distribution lines	January 2001- June 2003	January 2001- June 2003
6) Test Run	July 2003- December 2003	July 2003- December 2003
3. Project Cost		
Foreign Currency	2,504 million yen	2,414 million yen
Local Currency	3,274 million yen (252 million yuan)	4,043 million yen (331 million yuan)
Total	5,778 million yen	6,458 million yen
Japanese ODA Loan Portion	2,504 million yen	2,414 million yen
Exchange Rate	1yuan＝13yen （As of 2000）	1yuan＝14.3yen (2001-2006 Average)

People's Republic of China

Tangshan Water Supply Project

External Evaluators: Yasuhiro Kawabata and Junko Miura
Sanshu Engineering Consultant
Study Period: April 2009 to December 2009[1]

1. Project Profile and Japan's ODA Loan



Location of Project Site

Water Plant in Qian'an

1.1 Background

Under China's reform and open-door policies which commenced in 1979, construction and improvement of waterworks facilities, especially in large cities along coastal regions, has been implemented as a part of actions to improve the investment environment for attracting enterprises. The average water usage per person as of 1999 was 217ℓ/day in urban areas, and it was equivalent to that of Japan (200 to 250ℓ/day). The coverage of the water supply system in urban areas has been steadily improving at rates of 81% in 1985, 89% in 1990, and 96% in 1999. On the other hand, following the rapid economic development in large cities in coastal areas, suburban areas along coastal regions and inland's medium to large cities have been suffering from the water supply and demand gap caused by the rapid increase based on the rapid industrialization and urbanization which started in mid 1990s.

Tangshan city[2] is the fourth largest city in Hebei Province with a population of

[1] Field surveys were conducted in June and August 2009.

[2] China's administrative division consists of levels of province, prefecture, county, township, and village. In correspondent to each administrative level, the densely inhabited districts in provinces, prefectures, and counties are called municipalities, prefecture-level cities, county-level cities,, respectively. In addition, areas with densely populated urban district in municipalities or prefecture-level cities are called city- ruled districts. Tangshan city is a prefecture-level city, which belongs to Hebei Province, and has 6 districts, 2 county-level cities (equivalent to cities in Japan) and 6 counties (between prefecture and county in Japan). The project target areas include 2 districts (Guye and Fengnan), 1 country-level city

7.19 million (2006) (equivalent to that of Saitama Prefecture in Japan). The city is a center of energy (coal and oil), industry and agricultural production in Huabei and Dongbei regions.

After the large scale earthquake in 1976, on the one hand, water plants with a total capacity of 500,000 ㎥/day were constructed to supply water to the three major urban districts in the city[3] (outside the project scope), where reconstruction was mainly undertaken. On the other hand, regarding the six project target areas, there were water plants only with a total capacity of 95,000 ㎥/day in Guye District and with a total capacity of 10,000 ㎥/day each in other counties. Thus, most households had to depend on self-drilled or community wells. In the areas where facilities were limited, there were a number of problems such as unplanned digging of self-drilled wells, unsafe quality of water, and subsidence of water resources. Therefore, it was essential to address these issues, to provide safe and stable water supply, and to cope with the increasing water demand along with the future economic development and urbanization, thereby improving living environment.

1.2 Objective

The project objective is to meet the increasing water demand in Tangshan City along with economic development and urbanization, and to provide safe and stable water supply, by constructing water plants with a total supply capacity of 210,000 ㎥/day in the six districts/counties[4] (Guye District, Luannan County, Qian'an City[5], Qianxi County, Tanghai County, Fengnan District[6]) in Tangshan City, thereby contributing to the improvement of the quality of life. The location of the project site is shown in Figure 1.

(Qian'an) and 3 counties (Qianxi, Luannan and Tanghai).

[3] Kaiping District, Lubei District and Lunan District.

[4] At appraisal, there was also a need for water supply in the other areas, but those areas which had sufficient own funds such as Leting County and Fengjun District were not selected as project target areas.

[5] Qian'an City was Qian'an County at appraisal.

[6] Fengnan District was Fengnan County at appraisal.

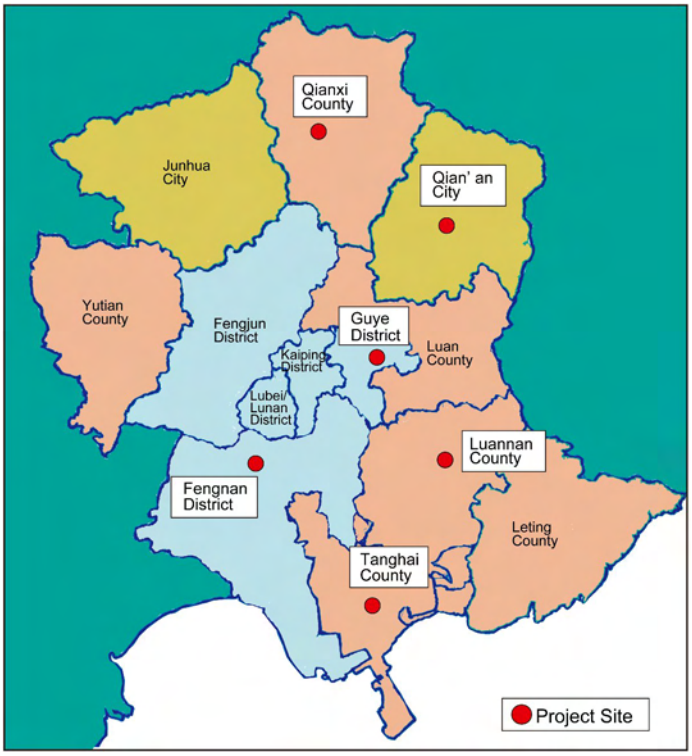


Figure 1 Location of Project Site

1.3 Borrower/Executing Agency

Government of the People's Republic of China / Tangshan Municipal People's Government[7]

1.4 Outline of Loan Agreement

Loan Amount/Disbursed Amount	2,841 million yen / 2,835 million yen
Date of Loan Agreement/ Exchange of Notes	March 2001 / March 2001
Terms and Conditions -Interest Rate -Repayment Period (Grace Period) -Procurement	 1.3% p.a. 30 years (10 years) General untied
Date of (Disbursement) Completion	July 2006
Main Contractors (More than 1 billion yen only is stipulated)	None
Consultant Services (More than 100 million yen only is stipulated)	None
Feasibility Study	F/S by Shanghai Municipal Engineering Design & Research Institute (February 2000)

[7] Actual implementation was carried out by each water supply company of the target areas.

2. Evaluation Results (Rating: B)

2.1 Relevance (Rating: a)

2.1.1 Relevance at the time of appraisal

Since the mid 1990s, China has been suffering from water supply and demand gap caused by the rapid industrialization and urbanization, and enhancement of capacity of water supply facilities has been required. In addition, issues of contamination of river water, which is the water source, and lowering of water table level were noted, and assurance of water sources and countermeasures to water conservation were required.

Under such condition, China's 9th Five-Year Development Plan (1996-2000) emphasized waterworks infrastructure in rural cities, specifically with the following targets;

1. increase nationwide water supply by 40 million ㎥ per day
2. raise the coverage of the water supply system in urban areas to 96%
3. increase average water supply per person by 40ℓ per day

The Tangshan City's 9th Five-Year Plan (1996-2000) is planning to keep the coverage of the water supply system in urban areas at 100% and to achieve 95.2% in counties by 2000. It is also targeting to expand the water supply capacity of 1.23 million ㎥/day in urban areas and 280,000 ㎥/day in counties. Thus, it could be said that this project contributed to the realization of the five year plan.

From the development needs viewpoint, as mentioned earlier, the construction of new water plants in the project area was needed, in order to address the issues including unplanned digging of self-drilled wells, unsafe quality of water and subsidence of water resources, to provide safe and stable water supply, to cope with the increasing water demand along with increasing economic development and urbanization, and to improve living environment.

2.1.2 Relevance at the time of evaluation

The current 11th Five-Year Development Plan (2006-2010) aims at two numerical targets: 1) the economic growth rate be 7.5%/annum during the period, and 2) reduce energy consumption per unit of GDP by 20 percent during the period. In order to achieve these goals, the government established five principles/plans and one of them is "to accelerate well-balanced development among regions (to accelerate active and steady urbanization and to generate ripple effects by megalopolises)". With respect to the overall urban planning, consistency with the regional economic development plan, labor markets, urban infrastructure and public works would be taken into consideration. Particularly, a priority would be given to enforcement of control and conservation of sources for drinking water and increase of water supply facilities.

The following priority agenda were articulated in the Tangshan city's Long-term Plan 2010: the coverage of the water supply system in urban areas would be kept at 100%; the coverage of the water supply system in counties would be increased to 100%; the water supply capacity would be increased to 1.44 million ㎥/day in urban areas and 0.58 million ㎥/day in counties. Thus, it could be said that this project contributes to the realization of the long-term plan.

In light of the above, this project has been highly relevant with China's national policies and development needs at the times of both appraisal and ex-post evaluation.

2.2 Efficiency (Rating: b)

2.2.1 Outputs

All the outputs were constructed and installed as almost planned. Table 1 shows the total outputs of the project (planned and actual), and Table 2 shows the outputs of each county (actual) respectively.

Table 1 Total outputs of the project (planned and actual)

Item (unit)	Planned	Actual
1. Intake wells (numbers)	70	Almost as planned (69)
2. Conveyance lines (total length: km)	57	Almost as planned (54)
3. Water plant(Capacity 10,000 ㎥/day)	21	As planned
4. Distribution lines (total length: km)	104	Almost as planned (115)

Source: Calculated based on the data from each water supply company

Table 2 Outputs of each county (actual)

County	Intake wells (number)	Conveyance lines (Km)	Water plant (10,000 ㎥/day)	Distribution lines (Km)
Guye	11	10 (+4)	5	14 (+2)
Luannan	20	11	5	39
Qian'xi	7	3	3	18
Qian'an	4	2	3	15
Tanghai	11(-1)	17(-1)	2	10(+8)
Fengnan	16	12(-6)	3	18
Total	69(-1)	54 (-3)	21	115 (+11)

Source: Each water supply company
Note: The figures of () shows the amount of increase/decrease from the planned.

Table 3 shows the reasons for the revision of the outputs for Guye District, Tanghai County and Fengnan District.

Table 3 Reasons for the revision of the outputs
in Guye District, Tanghai County and Fengnan District

County	Output	Reasons
Guye	Conveyance lines	The total length of conveyance lines was increased because the water plant was transferred to the east of the planned area.
	Distribution lines	As the planned areas for installing distribution lines crossed with railways, the design was modified, thus the length of distribution lines was increased.
Tanghai	Intake wells	The total actual number of intake wells was eleven against the target of twelve. According to the design, two intake wells are one pair. However, one location could not have a pair due to geological conditions and technical problems such as piston and steel pipes although they tried drilling at three different locations (all the east, west and north side of the first drilled well).
	Distribution lines	In response to the urbanization, the Tanghai county government made a decision to extend the total length of distribution lines to the newly developing area.
Fengnan	Conveyance lines	Although it was planned to construct the water plant at the southern area of the city, it was constructed at the north west of the city which is closer to the intake wells. Therefore, the total length of the conveyance lines was decreased.

Water storage constructed by the Project in Luannan County

Signboard in Tanghai Water Supply Company. It says that the water plant (20,000 ㎥/day) was constructed with the loan from former JBIC (JICA), Bank of China and government bond[8].

2.2.2 Project period

The project period was much longer than planned. The planned project period at appraisal was from March 2001 (Loan Agreement signing) to December 2002 (commencement of operation) with a total period of twenty two months.

In Tanghai City where the actual project period was the shortest among the project target areas, the actual period was from March 2001 to November 2004 (commencement of operation) with a total period of forty five months (204% of the planned period). Meanwhile, in Guye District where the actual period was the longest among the target areas, the actual period was from March 2001 to January 2008 with a total period of eighty three months (377% of the planned period).

Major reasons for delays which are common for all the counties are as follows;

[8] Similar signboard was also observed at the water plant in Qian'an City.

1. the time required for preparatory work including land acquisition and detail design, and for bidding process was not sufficiently estimated; and
2. each water supply company was responsible for the selection of contractors and the procurement of minor equipment while the Project Office of Water Supply Works Using Japanese ODA Loan of Tangshan Municipal People's Government (the "Project Office" hereinafter) was responsible for the procurement of major equipment. However, the commencement of the civil works and its progress were different from county to county, thus complicated coordination resulted in serious delays.

   Delays of each county are shown in Table 4.

Table 4 Major reasons for delays of each county

County	Major reasons for delays
Guye	1. More time was required than planned for land acquisition and revision of detail design because the water plant was shifted to the east of the planned area. 2. As the planned areas for installing distribution lines crossed with railways, the revision of detail design took time.
Luannan	1. More time was required to obtain local currency from county government 2. More time was required for bidding process of contractors
Qianxi	1. More time was required for land acquisition(i.e. approval from authorities concerned) 2. Procedures and civil works were tentatively suspended due to the epidemic of SARS from winter in 2002 to summer in 2003
Qian'an	1. More time was required for bidding process than planned 2. Change of design 3. Procedures and civil works were tentatively suspended due to the epidemic of SARS from winter in 2002 to summer in 2003
Tanghai	1. More time was required for bidding process than planned 2. More time was required for land acquisition than planned
Fengnan	1. More time was required for detail design than planned 2. Although it was planned to construct water plant in the southern area of city center at appraisal, as the city areas developed towards North West, the water plant was also constructed near the newly developed areas.

2.2.3 Project cost

The total project cost estimated at appraisal was 6,197 million yen, among which the Japanese ODA loan amount was 2,841 million yen and the rest was to be locally funded. The actual total project cost was 5,254 million yen and the Japanese ODA loan disbursed was 2,835 million yen and the rest was locally funded. The total project cost was 85% of the planned. Reasons for the decrease include the reduced cost due to the decreased length of conveyance lines in Fengnan Distrct and slightly reduced cost for unknown reasons in all the provinces except Guye District.

Although the project cost was lower than planned, the project period was much longer than planned; therefore, the evaluation for efficiency is moderate.

2.3 Effectiveness[9] (Rating: b)

2.3.1 Enhancement of water supply capacity

(1) Water supply capacity by the project

Table 5 shows water supply capacity increased by the project in each county.

Table 5 Water supply capacity increased by the project in each county
(Two years after the project completion)

Indicators (unit)	Guye (2008) Note1	Luannan (2006)	Qianxi (2005)	Xian'an (2005)	Tanghai (2004)	Fengnan (2006)
Capacity of the project facilities (10,000 ㎥/day)	5	5	3	3	2	3
Average water supply amount by the project (10,000 ㎥/day)	3.5 Note2	0.64	0.6	0.92	0.92	0.85
Facility utilization rate (average) (%)	70	13	20	31	46	28

Source: Each water supply company
Note1: The figure with () shows the year of project completion (commencement of water supply)
Note2: In Guye District, the latest data is that of 2008.
Note3: The facility utilization rate (average) is (average water supply volume)/(supply capacity).

Upon completion of the project, the total water supply capacity of all the target areas was increased by 210,000 ㎥/day as planned. However, two years after the completion of each target county, in the five counties out of the six target areas, facility utilization rate (average) remains lower than 50%. Particularly in Luannan and Qianxi, one of the reasons for the low facility utilization rate is that households are still using self-drilled wells. One positive prospect is that the water supply amount is increasing year by year in Qianxi by restricting the use of self-drilled wells through the enforcement of regulations for closing self-drilled wells. Regulations for closing self-drilled wells in each county and those enforcement situations are summarized in Table 6.

Table 6 Regulations for closing self-drilled wells in the target areas and enforcement situations[10]

County	Enforcement situations of regulations for closing self-drilled wells
Guye	Trying to introduce a regulation this fiscal year.
Luannan	Although a regulation for closing self-drilled wells took effects in 2005, a number of residents still use self-drilled wells. Therefore, there is a need to enforce the regulation more strictly in the near future.
Qianxi	A regulation for closing self-drilled wells was enacted in 2008. As far as the water supply company knows, 105 out of 170 wells were closed, and more to be closed in the near future.
Tanghai	A regulation for closing self-drilled wells was enacted in 2004 even before the project completion and enforced strictly. It is considered that this enforcement resulted in the steady increase of facility utilization rate of the project after 2005.

Source: Each water supply company

[9] This project does not target all the areas of Tangshan City, but only some parts of six prefectures/districts. Therefore, evaluation is to be conducted in light of indicators for each prefecture/district.

[10] Unknown for Qian'an Prefecture and Fengnan Prefecture.

In Fengnan, one of the reasons for the low facility utilization rate is that the construction of the north west newly developing area (where rapid increase of water demand was expected at appraisal) was started as late as in 2005 and consequently the resettlement of government buildings, enterprises and schools has not been completed at the time of the evaluation[11].

(2) Water supply capacity in the target area and the role of the project

The total water supply capacity in the target area is shown in Table 7.

Table 7 Water supply capacity in the project target area

Indicator (unit)		Guye (2008) Note 1	Luannan (2006)	Qianxi (2005)	Xian'an (2005)	Tanghai (2004)	Fengnan (2006)
Water supply capacity (10,000 ㎥/day)	Capacity of existing facilities (1999)	9.5	0.52* Note 2	0	1.3	1.8*	1
	Capacity of the project facilities	5	5	3	3	2	3
	Total capacity (2008)	14.5	5	3	4	2	4
	Average water supply two years after completion (Plan) Note 3	9.67	3.22	1.89	2.21	1.17	2.27
	Average water supply two years after completion (Actual)	6.27	0.64	0.6	1.53	0.92	1.05
	Achievement ratio (%) Note 4	65	20	32	69	79	46

Source: Each water supply company
Note 1: The figure with () shows the year of project completion (commencement of water supply)
Note 2: At appraisal, it was planned that the facility with * would be abolished.
Note 3: The figures for "Plan" are those which were calculated based on the figures specified in the appraisal document: baseline in 1999, estimated figures for the completion and for the target year.
Note 4: Average water supply (actual)/average water supply (plan)

Before the project completion, all the facilities except Guye had less than 20,000 ㎥/day, and there was no public water supply system in Qianxi. As shown in Table 7, the increase of water supply capacity in all the counties was brought only by this project. The project facility is the first and only water supply system in Qianxi. Likewise, the project facilities are only the water supply system in Luannan and Tanghai as their old facilities were abolished as planned upon the project completion. Meanwhile, compared

[11] According to the Fengnan Water Supply Company, if the resettlement, population increase and commercial development (hotels, department stores, restaurants, etc) make those progresses as planned at appraisal, it is expected that the facility utilization rate will double in two years and reach its maximum capacity by 2015.

with the planned figures for average water supply at the time of two years after the completion, there are three counties in which the actual figures are above 50% and three counties in which those are below 50%.

2.3.2 Stable supply of safe and clean water

Before the project completion, water supply was limited to three times a day (morning, day time and evening) in total of six hours a day (eight hours a day in Tanghai). According to the interviews with water supply companies and the beneficiary survey, it was confirmed that clean water is supplied for 24 hours upon the completion of the project.

Average water use per person increased and its targets were achieved in four counties. Table 8 shows average water usage per person in six counties.

Table 8 Average water use per person by county (planned and actual)

Indicator (unit)		Guye	Luannan	Qianxi	Xian'an	Tanghai	Fengnan
Average water usage per person (ℓ/day)	Baseline (1999)	100	267	NA	138	178	77
	Target (2007)	127[12]	145	122	145	145	150[13]
	Actual (2007)	178[14]	101	152	144	260	113
	% against the target	140%	70%	125%	99%	179%	75%

Source: Each water supply company

Meanwhile, the rate of pass for water quality test is 100% in all the counties and it proves safety and cleanness of water. According to Luannan Water Supply Company, many households used to use self-drilled wells, which were contaminated by small animals and insects, causing sanitary problems, but upon the project completion, safe and clean water has been supplied to each household.

Water from the water plant installed by the project is purified by the chlorine dosage facilities. The water quality is regularly monitored in the water quality inspection rooms. For example, monitoring results of water quality at Qian'an Water Plant as of June 2009 and the national standard requirements (revised in 2006) are shown in Table 9. The quality of treated water fulfills all of the national standard requirements; and thus, it proves adequacy as tap water.

[12] For Guye, the target is for 2003.
[13] For Fengnan, the target is for 2010.
[14] As Guye District started to operate in 2008, the figure is the actual one in 2008.

Table 9　Monitoring Results of Water Quality at Qian'an Water Plant

Item	National standard for water quality after treatment (GB5749-2006)	Water quality after treatment
Ph	>=6.5, <8.5	7.12
Turbidity (NTU)	<1	<1
Odor	None	None
Bacteria count (CFU/L)	<100	20
Coli form count （CFU/100mL)	None	None
Iron (mg/L)	<0.3	<0.3
Manganese (mg/L)	<0.1	<0.1
Aluminum (mg/L)	<0.01	<0.01

Source: Qian'an Water Supply Company

Chlorine dosage facility installed by the project in Qianxi County

Water quality inspection room in Tanghai County

2.3.3　Response to increasing water supply

In all the target areas, the project responded to the increased water demand, but the served population did not increase as estimated. Table 10 shows the served population in the target areas.

Table 10　Population served in the target area (estimate and actual)

Indicator (Unit)	Year	Guye	Luannan	Qianxi	Qian'an	Tanghai	Fengnan	Total
Population served (10,000 persons)	1999 (Baseline)	28	1	NA	3	3	5	40
	2007 (Estimate)	34	13	8	12	5	9	81
	2007 (Actual) % against	18.5[15]	5.5	5.4	11	3.83	5.5	49.73

[15] The figure of Guye District is the actual of 2008.

	the estimate	54%	42%	68%	92%	77%	61%	61%

Source: Each water supply company

Three major reasons why the actual served population served did not reach the target could be as follows; 1) the number of population did not increase; 2) many residents are still using self-drilled wells even after the project completion; and 3) the estimate of population served in Luannan and Qianxi for 2007 at the time of appraisal was calculated based on the total population served in those counties while the actual population served in 2007 is limited to the densely populated central areas in those counties.

With respect to water usage by purpose, the proportion of living use is the highest among various purposes in all the target areas. Actual water usage by purpose in the target areas as of 2007 is shown in Table 11.

Table 11 Water usage by purpose in the project target area (2007)[16]

Purpose	Unit	Guye	Luannan	Qianxi	Qian'an	Tanghai
Living use	10,000 ㎥/day	4.7	0.46	0.24	0.9	0.47
	%	75	87	40	61	47
Industrial use	10,000 ㎥/day	1.3	0.005	0.18	0	0.29
	%	20	1	30	0	29
Commercial use	10,000 ㎥/day	0.3	0.06	0.18	0.6	0.24
	%	5	12	30	39	24
Total	10,000 ㎥/day	6.3	0.5	0.6	1.5	1.0

Source: Each water supply company

As shown above, it is clear that approximately eighty percent of water is used for living use in Guye and Luannan. In Qian'an, sixty percent is used for living use and forty percent for commercial use. In Qianxi and Tanghai, 40-50% is used for living use, 20-30 % each for industrial and commercial use. In Tanghai, where rapid economic development is observed, water supply for living use steadily rose from 3,000 ㎥/day in 2001 to 5,000 ㎥/day in 2007, and water supply for commercial and industrial use drastically increased from 800 to 3,000 ㎥/day and from 200 to 3,000 ㎥/day respectively.

Based on the facts that proportion of water supply for living use is relatively high among others in all the target areas and that the average water supply for living use per person increased than before in all the target areas except Luannan county, it could be said that this project mainly responded to the increase of water demand for living use in all the target areas. In addition, this project is also considered to have responded to the increase of water demand for commercial and industrial use in Tanghai City.

[16] Not available for Fengnan Prefecture. For Guye District, the amount also includes the water from other water plants.

2.3.4 Internal rate of return

Financial internal rate of return (FIRR) at appraisal was calculated with conditions that the total project cost and operation/maintenance costs, from the operation stage are "costs" and that the income from water charges is "benefits". As it was not possible to obtain water charges only from the project facilities, it was not possible to re-calculate.

Therefore, this project has produced certain effects in the followings: 1) increase of water supply capacity (including average water use per person); 2) stable supply of clean and safe water (pass rate of water quality test at 100% and no interruption of water supply); and 3) response do water demand. However, considering the slower increase in the project facility utilization rate (average), achievement rate of average water supply amount in the target area and population served in the target area, the effectiveness of the project is moderate.

2.4 Impact

2.4.1 Improvement of the life quality

Beneficiary survey through interviews was conducted in the project target area (Qianxi County and Qian'an City). The total number of respondents was 130, and the classification of respondents by sex was 38% female and 62% male. Survey results of the beneficiary survey are summarized in Figure 2. The improvement was felt, with respect to the time of interruption of water supply, water pressure, color, taste and smell, by the respondents, respectively: 95% (123persons), 94%(122persons), 86% (112persons), 86% (112persons), 86% (112 persons). 85% (111 persons) of the respondents also felt that the time for water fetching was reduced, and 91% (118 persons) felt the living environment such as sanitation was improved. 87% (113 persons) also felt the project contributed to the economic activities.

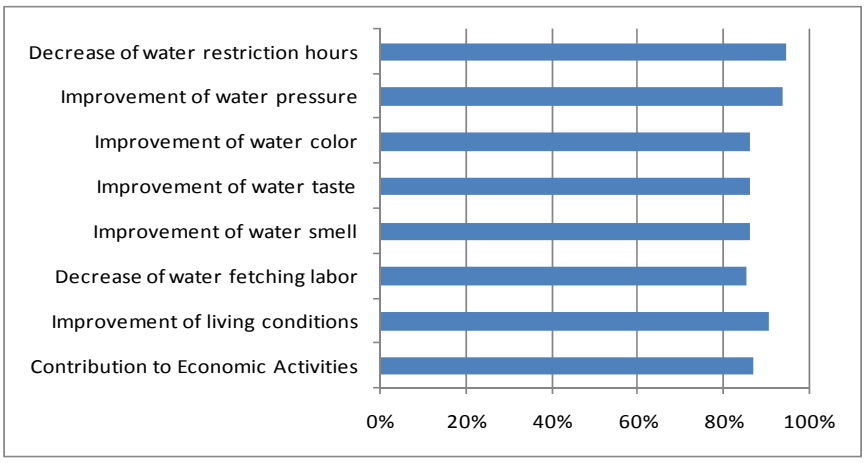


Figure 2 Result of Beneficiary Survey

The survey result also revealed that households no longer need to fetch water from self-drilled wells upon the project completion so that they can save their time; and that they no longer need to store water by using basin now that water is supplied for 24 hours.

Thus, it could be said that the project contributed to the improvement of quality of life.

2.4.2 Contribution to economic activities through the improvement of living and social infrastructure

It is highly possible that stable supply of safe water enabled enterprises to start their business in Tangshan City and contributed to industrial development. For example, Luannan county, it was confirmed that one of the Chinese largest dairy farms, *Mengniu*, started business in Luannan county in 2006 after stable supply of safe water was secured by the project. In the western developing area of Guye District, companies of various industries such as medicines, plastics, pharmaceutical products, cement and food began their production in the area. It was also pointed out that the project contributed to resolving water insufficiency issues.

It is considered that stable supply of safe water might also have impacts on the increase of the real-estate value in the project target area. For example, the price of the land around the Tanghai Water Supply Company used to be 0.16 million yuan/畝(*mu*[17]) in 2000, but it was increased to 2.1 million yuan/畝 by more than ten times in 2009.

The average per capita income (in 2008) in all the project target areas has increased by approximately two or three times, compared with that in 1999 as shown in Table 12. Table 13 illustrates that GDP in Tangshan City is also steadily increasing in the past three years, and the GDP growth rate has been much higher than the national average. It cannot be said that the increase of per capita income and of the GDP growth rate are economic effects brought only by stable water supply by the project, but it is considered that the project partially contributed to the economic development of Tangshan City.

Table 12 Average per capita income in the target area (unit: yuan)

County	1999	2008
Guye	4,850	12,064
Luannan	5,519	14,101
Qianxi	5,619	12,500
Qian'an	5,212	16,100
Tanghai	5,231	15,031
Fengnan	5,392	15,480

Source: Tangshan City Bureau of Statistics

[17] Chinese 1 畝（mu） is equal to 6.667 a (666.7 ㎡)

Table 13　National average and Tangshan City of Growth Rate of GDP (unit:%)

	2006	2007	2008
National average	11.10%	11.4%	9.0%
Tangshan City	14.8%	15.20%	13.10%

Source: China Statistical Year Book

Thus, it can be said the stable water supply by the project is contributing to the social and economic development.

2.4.3　Environmental and social impacts

Any particular negative impact issues by construction of water plants have not been noted. In order to protect water resources, surrounding areas of the intake wells are designated as for protection and it is prohibited to construct chemical factories near the wells. Any particular negative impact issues such as chlorine leakage, noise/ vibration at water plants or sludge have not been observed. All the water supply companies are making efforts to improve surroundings of the water plants by planting grass and trees in large scale, thus contributing to the reduction of air pollution and the improvement of ecosystem. Furthermore, neither subsidence of ground water level nor that of ground level was observed.

As the project has increased the supply capacity in the target areas, waste water treatment plants were constructed so that discharged water could be treated properly. Table 14 shows the waste water treatment capacity in each project target area.

Table 14　Waste water treatment capacity in each project target area

County	Treatment capacity（unit:10,000 ㎥/day）
Guye	4（Phase I）+　4（Phase II under planning）
Luannan	4
Qianxi	3
Qian'an	8
Tanghai	2（under construction）
Fengnan	5

Source: Each water supply company

There was no particular issues related to land acquisition, and there was no resettlement of houses.

2.5　Sustainability (Rating: a)

2.5.1　Operation and maintenance (O&M) system

As planned, each water supply company in the project areas is responsible for O&M[18], and required number of staff is allocated for O&M. Table 15 shows the

[18] In Qianxi county, a part of the water management bureau was separated from the county government and became Qianxi Water Supply Company as planned.

breakdown of employees of each company. In all the target areas, O&M is carried out in 3 shifts (4 shifts in Guye District). Particularly when the demand is low (late at night), non-operating pumps are maintained.

Table 15 Breakdown of employees（unit: person）

District/ county	Total (1+2+3)	1 Management/ General Affairs	2 Engineers/ Technicians	3 Others	Staff for water plants
Guye	368	57	61	250	50
Luannan	45	6	39	0	45
Qianxi	44	17	27	0	14
Qian'an	98	33	65	0	17
Tanghai	113	22	41	50	16
Fengnan	75	15	60	0	15

Source: Each water supply company

2.5.2 Technical capacity in O&M

In all the target areas, engineers and technicians with sufficient skills are assigned for O&M, and various training are conducted regularly and ad-hoc. In particular, Tanghai Water Supply Company's O&M skills are outstanding as known from the fact that it received O&M award (which is presented to excellent companies for those outstanding O&M skills), from Tanghai county government twice in 2008 and 2009. Training contents and frequency of each company are summarized in Table 16.

Table 16 Training contents and frequency of each water supply company

County	Training contents and frequency
Guye	1. Technology/Management: Every month 2. Safety control: Every three month
Luannan	1. Water quality inspection（Entrusted to Shijiazhung Water Supply Company[19], Tangshan City Water Supply Company and Tangshan City Bureau of Immunity）. 3 staff for one month training (completed in April 2005) 2. Entrusted to Safety Inspection Bureau of Luannan County training for managers and safety control staff (five days per year). 3. Engineers/technicians in charge of electric control receive training from the Power Bureau (three days every time). Engineers/technicians are obliged to obtain certificate for electric control prior to their placement.
Qianxi	1. It is obliged for engineers/technicians to take end-of-course exams after the one-week training course on safety control and operation prior to their placement 2. Electric control (at the Power Bureau). Engineers/technicians in charge of electric control are obliged to take exam by the water supply company after the above training twice a year.
Qian'an	1. Water quality inspection (National standard portable water training at Water Inspection Center in 2007) 2. Electric control (at the Power Bureau, once a year) 3. Taxation (Hebei Province Tax Payers Club, once a month)
Tanghai	1. Electric control (Irregularly) 2. Water quality inspection (3 staff three times at Hebei Province Water Inspection Center) 3. Safety control（Irregularly） 4. Inspection of transmission/distribution lines（Irregularly）
Fengnan	1. Safety control regulations

[19] Capital of Hebei Province.

	2. Operation of well pumps 3. Computer control 4. Water supply management (all the above are conducted irregularly) 5. Water quality inspection (4 staff at Tangshan Water Quality Center for two months)

Source: Each water supply company

2.5.3Financial status on O&M

(1) Cash flow status of water supply companies

Income statement of each company in the past three years was analyzed, and the status for FY 2008 is shown in Table 17.

Table 17 Income statement of each Water Supply Company (as of 2008)

(Unit: million yuan)

Item	Guye	Luannan	Qianxi	Xian'an	Tanghai	Fengnan
Revenue from water charges	22.07	3.1	2.5	6.53	8.14	4.33
Other revenue	1.44	0	0.14	0	0.02	0
Total revenue	**23.51**	**3.1**	**2.64**	**6.53**	**8.16**	4.33
Operating expenses	16.85	3.31	2.73	8.47	10.55	3.9
Financial expenses	6.6	4	1.46	1.04	1.83	1.31
Total expenses	**23.45**	**7.31**	**4.19**	**9.51**	**12.38**	**5.21**
Profit	**0.06**	**-4.21**	**-1.55**	**-.2.98**	**-4.22**	**-0.88**

Source: Each water supply company

Operating expenses of four companies (out of six) exceeded revenue from water charges in the past three years. However, revenue from water charges is increasing steadily. Water charge rates, which affect the amount of revenue, are lower than those of other large and medium cities such as Chongqing and Yingkou because the project target areas are counties and districts (equivalent to counties and cities in Japan). The rates are the same level of small cities (for example, the water rates for households in Guiyang City in Guizhou Province is 1.4 yuan in 2006). Water charge rates by county are summarized in Table 18[20].

Table 18 Water charge rates by county

(Unit : yuan /㎥)

County	Latest revision of water charge rate	Household	Commercial	Industry	Special
Guye	2006	1.7	4	2.2	15
Luannan	2003	1.05	1.8	1.8	NA
Qianxi	2005	1	2	1.2	6
Qian'an	2009	1.4	3.08	3.08	10
Tanghai	2004	1.3	2.3	3.5	8
Fengnan	2005	1.5	4.5	1.8	2.3[21]

[20] In China, Prices Bureau of each cities or counties has authorities to decide water fees and to revise water fees based on the request from water supply companies.

[21] Special category includes car wash, public bath, beverage production companies, etc. For Fengnan district, there is no category for "special", but for "public facilities".

Source: Each water supply company

(2) Financial status of water companies

The financial status of each water company is shown in Table 19.

Table 19 Financial Status of each Water Supply Company (as of Year 2008)

(Unit: million yuan)

Item	Guye	Luannan	Qianxi	Xian'an	Tanghai	Fengnan
Total asset	102.74	84.05	71.61	59.91	22.04	13.47
Current asset	22.42	3.69	24.70	11.49	13.62	0.72
Current liabilities	76.85	4.61	17.08	54.32	7.78	2.32
Capital	14.28	3.55	23.18	5.6	0.98	13.17

Source: Each water supply company

As mentioned earlier, the operating expenses of four companies (out of six) exceeded revenues in the past three years[22]. However, the revenues from water sales are steadily increasing. It is also expected that the financial status will recover due to the increase of facility utilization rate (with closing of more self-drilled wells) and the increase of water charge rates in the future. With regards to water charge rates, in Qian'an, the revision was approved by the Prices Bureau in 2009. Other water supply companies in Guye, Luannan and Qianxi have already requested Prices Bureaus to raise about 0.5yuan/ m^3 and are waiting for decisions. In all the target areas except Qian'an, three to five years have already passed since their revision of water rates, thus it is highly possible that the water supply companies' request for raising water rates will be approved by Prices Bureaus.

In addition, Qian'an and Fengnan receive subsidies every year[23], and it is highly possible that they will continuously receive. With respect to Luannan and Qianxi, both of them are planning to borrow loans from banks by surety from their county governments and started initial steps of procedures for borrowing[24].

It cannot be said that profitability of their financial status are in desirable situations. However, it is expected that the revenue from water sales will increase in proportion with the increase of facility utilization rate and of water charge rates in the near future. Furthermore, as those companies are State Own Enterprises (SOEs) and sole entities for water supply in their areas, it is guaranteed that their deficit issues can eventually be solved either by subsidies or by bank loans. Therefore, there are no

[22] Although Tanghai Water Supply Company's profit of FY 2008 is minus, that of FY 2006 and 2007 are plus. After the project completion, this company is expanding its business to consulting services related to water supply and is making efforts to cover O&M cost by increasing the revenue from consulting services in addition to the revenue from water charges.

[23] Qian'an City has received subsidies from the government since 2008, and the received amount in 2008 was 1.74 million yuan. Fengnan District has received subsidies since 2004, and the amount in 2009 was 1.19 million yuan.

[24] Luannan Water Supply Company received 370,000 yuan from the prefectural Finance Bureau to pay for personnel expenses for their staff as a tentative measure.

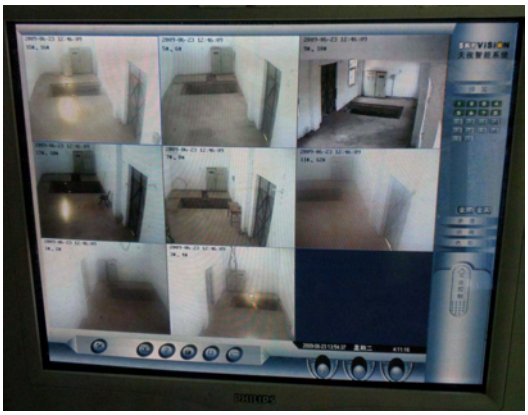
particular problems of financial sustainability.

2.5.4 Status of O&M

O&M manuals were developed[25] and routine maintenance for facilities is conducted in all the target areas. It was confirmed during the site visit that facilities were cleaned and well maintained. Most companies conduct weekly inspection of surroundings of intake wells, pumps, electric control board and distribution lines for possible contamination and daily inspection of voltage and water-level of intake wells[26]. In Guye District, electric supply for the water plant was not stable at the beginning, but with the assistance by the district government, transformers and electric lines were installed specially for the company in July 2009, bringing stable electric supply.

No major problem has been observed in the capacity of the executing agency nor its operation and maintenance system, therefore, sustainability of this project is high.

Power distribution panel installed by the project in Guye District



Monitor for security installed by the project in Fengnan District

3. Conclusion, Lessons Learned, Recommendations

3.1 Conclusion

This project has been highly relevant with China's national policies and development needs both at the time of appraisal and at ex-post evaluation. The project has brought certain effects, and its effectiveness is moderate. Regarding efficiency, the project period was much longer than planned, but the project cost was lower than planned. Therefore, the evaluation for efficiency is moderate. Sustainability of this project is high.

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

[25] Tanghai Water Supply Company is revising O&M manual every year.
[26] Guye Water Supply Company conducts more strict inspection by monitoring intake wells by monitor display and by checking wells on foot every two hours.

3.2 Lessons Learned

In this project, the Project Office was responsible for the procurement of major equipment, and each water supply company was responsible for the selection of contractors and the procurement of minor equipment, but the commencement of the civil works and its progress were different from county to county; which required complicated coordination resulting in serious delays. In a similar water supply project in which a number of water companies across administrative regions carry out, it is desirable to conduct procurement capacity assessment for each water supply company and to entrust both the selection of contractors and the procurement of equipment if their capacity is judged to be sufficient.

3.3 Recommendations (to each county government)

In Tanghai county, a regulation for closing self-drilled wells was enacted in 2004 even before the project completion and enforced strictly. It could be said that this enforcement resulted in the steady increase of Facility utilization rate of the project after 2005. It is also desirable to enforce such regulation more strictly in each target area so that safe water from the intake wells constructed by the project is supplied to households in stable manner.

Comparison of Original and Actual

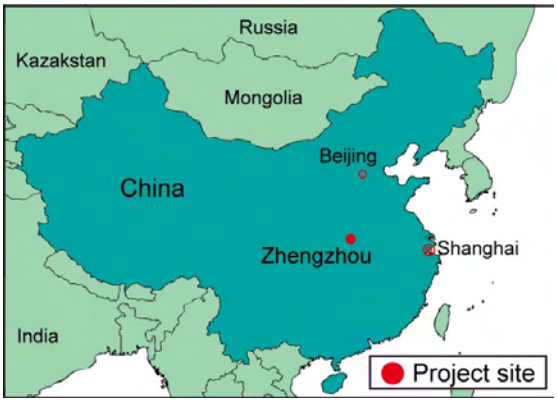
Item	Plan	Actual
①Output	(Total of the project target areas)	(Total of the project target areas)
1) Intake wells	70	Almost as planned (69)
2) Conveyance pipelines	Total length: 57km	Almost as planned (Total length: 54km)
3) Water plants	Capacity:210,000 ㎥/day	As planned
4) Distribution pipelines	Total length: 104km	Almost as planned (Total length: 115km)
②Project Period		
1) Guye District	March 2001- December 2002	March 2001 – January 2008
2) Luannan County	March 2001- December 2002	March 2001 –March 2006
3) Qianxi County	March 2001- December 2002	March 2001 –June 2005
4) Qian'an City	March 2001- December 2002	March 2001 –July 2005
5) Tanghai County	March 2001- December 2002	March 2001 –November 2004
6) Fengnan District	March 2001- December 2002	March 2001 –November 2006
③Project Cost		
Foreign Currency	2,841million yen	2,835 million yen
Local Currency	3,354million yen (258million yuan)	2,419 million yen (168 million yuan)
Total	6,197 million yen	5,254 million yen
Japanese ODA Loan Portion	2,841 million yen	2,835 million yen
Exchange Rate	1yuan＝13yen (as of 2001)	1yuan＝14.42yen (2001 – 2006 average)

People's Republic of China

Xinxiang-Zhengzhou Expressway Construction Project

External Evaluators: Yasuhiro Kawabata and Junko Miura
Sanshu Engineering Consultant
Study Period: April 2009 to December 2009[1]

1. Project Profile and Japan's ODA Loan



Location of Project Site

Xinxiang-Zhengzhou Expressway

1.1 Background

China's road transport has been rapidly expanding its share among transport modes since late 1970s with the adoption of the government's open-door policy. As of 1998, the total length of the national road network had reached 1.279 million km, but the total length was short relative to China's land area (960 million ㎢), with road density of 110 m/㎢ (3,160 m/㎢ in Japan as of 2005). Moreover, in over 2,000 townships, and 190,000 villages, roads were not well developed. Furthermore, roads had in general mixed traffic including several transport modes such as automobiles, tractors, animal-drawn carts, bicycles, and pedestrians, and thus moving speed was slow and transport efficiency was further deteriorated.

In order to make the road transport a main logistics mode, the Chinese government formulated a plan for the national high-grade trunk highway system (NTHS), covering the whole nation. First, a plan to construct 12 trunk highway routes, which traverse from north to south and from east to west in China, and serve as part of the NTHS was developed. NTHS was planned to be implemented in a series of five-year plan's period. NTHS was planned to connect between the nation's capital (Beijing) and central government ruled municipalities/provincial capitals, and between cities with population of over 1 million and those with 0.5 million. Xinxiang-Zhengzhou Expressway (XZE),

[1] Field surveys were conducted in June and August 2009

the subject project, is a section of Beijing-Zhuhai Route, which is one of 2 vertical routes among 12 trunk highways.

1.2 Objective

The objectives of the project are to enhance the transport effectiveness and improve the traffic conditions along the Xinxiang-Zhengzhou corridor, and to improve the transport efficiency with neighboring regions, by constructing a 80 km expressway between Xinxiang and Zhengzhou in Henan Province, a section between Beijing and Zhuhai, which is one of "the high priority 2 vertical-2 horizontal-3 routes" among NTHS in China, thereby contributing to improvement of the investment environment and promotion of the economic development along the corridor . The location of the project site is shown in Figure 1.

Figure 1 Location of Project Site

1.3 Borrower/Executing Agency

Government of the People's Republic of China/Henan Provincial Government

1.4 Outline of Loan Agreement

Loan Amount/Disbursed Amount	23.491 billion yen/20.630 billion yen
Exchange of Notes/Loan Agreement	March 2000/March 2000
Terms and Conditions -Interest Rate -Repayment Period (Grace Period) -Procurement	2.2%, 30 years (10 years), General untied Consultant: 0.75%, 40 years (10 years), Bilateral tied
Date of (Disbursement) Completion	July 2006

Main Contractors (More than 1 billion yen only is stipulated)	China Geo-Engineering Group Company, 4th Engineering Co. Ltd. of No.18 Engineering Bureau of CREC, China 4th Metallurgy Construction Company, Henan Highway Engineering Bureau, 1st Engineering Co. of 1st Highway Engineering Bureau of China, China Railway & Bridge Bureau (Group) Co. Ltd. of CREC, 20th Engineering Bureau of CREC, Beijing Civil Construction Group Co. Ltd. Corp, No.4 Engineering Bureau of China Construction Group Corp, Second Highway Engineering Bureau of Road and Bridge Group, Beijing Urban Construction Group Co. Ltd, China Road and Bridge Corporation (all Chinese contractors)
Consultant Services (More than 100 million yen only is stipulated)	None
Feasibility Study (F/S)	F/S by Henan Provincial Communications Design Institute (February 1999)

2. Evaluation Results (Rating: A)

2.1 Relevance (Rating: a)

2.1.1 Relevance at the time of appraisal

Under the China's Ninth Five-Year Plan (1996-2000), construction of the "5 vertical and 7 horizontal (five north-south and seven east-west)" highway network was proposed for further economic development in inland provinces. Among these 12 highways, "2 vertical, 2 horizontal, and 3 routes", or seven highways were planned to serve as main trunk lines traversing along the coast, and connecting between inland cities and main cities and ports along the coast. Three routes including "Beijing-Zhuhai", "Beijing-Shenyang", and "Beijing-Shanghai" were planned to be completed basically as an expressway by 2000. At the same time, the Chinese government intended to allocate budgets intensively to construction of roads in inland provinces to promote economic development in poor regions, and particularly had tried to promote road development in central and western regions[2]. Thus, the objective of the project is consistent with the government development policies/strategies.

From the development needs viewpoint, the average traffic volume of the existing National Highway 107 was about 16,000 vehicles/day, and 20,000 vehicles/day, particularly at the Yellow River crossing section, and urban areas were congested all day long. Moreover, the traffic volume was expected to increase by 6% per annum, and thus countermeasures to relieve the congestion were anticipated. The proposed expressway is the part of the Beijing-Zhengzhou-Wuhan-Zhuhai route, which is one of NTHS, and its construction was expected to commence by 2000 as an important route connecting inland regions with coastal cities and ports.

[2] From appraisal documens

2.1.2 Relevance at the time of evaluation

The national plan for constructing 35,000 km expressway network ("5 vertical and 7 horizontal" highways) by 2010 was implemented in advance, and by the end of 2005 a 41,000 km highway network, including XZE had been completed. In January 2005, the government announced the post "5 vertical and 7 horizontal" highway network with a total length of 85,000 km (7918 Plan), in which all regional major cities with a population of over 200 thousand would be connected in the next 30 years, and it is currently under the construction phase. The project section is included in the 7918 Plan and the project is relevant with development needs of the national development plan.

From the development needs viewpoint, the subject expressway (XZE) is part of the Beijing-Zhuhai route, which is the most important and essential route in China. By improving the transport efficiency and traffic condition, the project will contribute not only to improvement of the investment environment and promotion of the economic development along the Xinxiang-Zhengzhou corridor, but also to improvement of the economic development of whole China. XZE is one of the essential segments among highways which form the national trunk highway system.

This project has been highly relevant with China's national policies and development needs at the times of both appraisal and aex-post evaluation.

2.2 Efficiency (Rating: b)

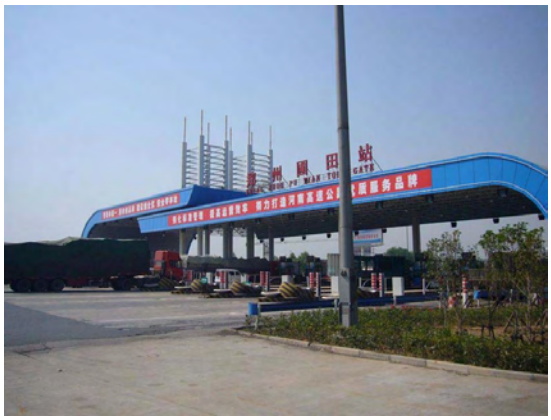
2.2.1 Outputs

The project scope and its outputs are shown in Table 1. The project scope and contents have been implemented almost as planned except extension of route length by 2 km due to change of location for Xinxiang Interchange and conversion of a service area to a parking area in Xinxiang.

Table 1: Project Scope and Output

Planned		Actual	Reasons for changes
Civil works :			
① Expressway:			
Length	79.8km	almost as planned. 81.8km	
Right of way	35m (6-lane section)	as planned	
	42.5m (8-lane section)	as planned	
Lanes	3-4 lanes for one direction	as planned	
Pavement	asphalt	as planned	
Type of highway	full access controlled, toll	as planned	
② Interchanges	4 sites	as planned	
③ Toll stations	3 sites	as planned	
④ Service areas	2 sites	1 site	Xinxiang Service Area, originally planned as a service area was converted to a parking area.

⑤ Bridges	Large: 6 sites with 5,616.5m Yellow Rive large bridge 9,570m Medium: 18sites with 1,032m Small: 12 sites with 444m	Large: 6 sites with 5,301m. almost as planned Yellow River large bridge 9,848 m Medium: 17sites with 983m Small: 12 sites with 444m	
⑥ Management facilities	Toll stations, communications system, surveillance system, vehicles for maintenance and operations	as planned	
Consulting services：			
48M/M (only for bridges) for review of detailed designs, and assistance in construction supervision of bridge sections、and 11M/M for overseas training		almost as planned 46.6M/M (only for bridges) + overseas training 11M/M	



Toll stations at Putian Interchange

Yellow Rive Large Bridge

2.2.2 Project period

The project implementation period planned at appraisal was from March 2000 (Loan Agreement signing) to December 2003 (construction completion) with a period of three years and 10 months (46 months). However, the actual period was from March 2000 to October 2004 (open to traffic) with a period of four years and 8 months (56 months). It was about 10 months delay against the planned (122% of the planned). The planned and actual period by item is shown in Table 2.

Table 2　Planned and Actual Implementation Schedule by Item

Item	Planned	Actual
Detailed designs	October 1999 - March 2000	March 2001 - August 2001
Land acquisition / resettlement	January 2000 - April 2000	July 2001- December 2001
Tendering for civil works	March 2000 – August 2000	January 2001 – March 2002
Civil works and Electrical/Mechanical works	October 2000 – December 2003	March 2002 – September 2004
Consulting services	July 2000 – September 2003	April 2002 – October 2004

Main reasons for delay are:

① It took more time to secure clearance for various items regarding the project implementation from relevant authorities. Thus, commencement of land acquisition activities was delayed by one year and 5 months.
② Since the number of people to be resettled was quite numerous, it took more time than expected to undertake the land acquisition and resettlement. The originally expected 3.5 months was extended to five months.
③ The originally expected tendering period was 5 months. However, the actual period needed was 14 months. The originally expected period of 5 months is considered to be unrealistic.

Due to the reasons mentioned above, commencement of civil works was delayed by 22 months against the planned schedule. However, the actual construction period was shortened by 8 months, and the project was completed (open to traffic) in October 2004 with one year delay.

2.2.3　Project cost

The total project cost estimated at appraisal was 58.126 billion yen, among which the Japanese ODA loan was 23.491 billion yen. The actual project cost was 57.752 billion yen, among which the Japanese ODA loan disbursed was 20.630 billion yen, and thus it was lower than planned (0.6% reduction) for the total project cost. The cost paid by local currency was slightly higher than planned. Reasons for higher cost are: 1) in the soft ground area, additional pile foundation works were needed; 2) the location for Xinxiang interchange was moved; 3) lighting facilities were installed along the roadway between Yellow River and Putian; and 4) planting and landscaping works were added. The Japanese ODA loan disbursed was lower than planned (about 12% reduction). Reasons for reduction are: 1) by the time when the foundation work and bridges were completed, the loan closing date has come. Thus, costs needed for remaining works were financed by local funds; and 2) Henan Provincial Communications Department (HPCD) decided that a firm/entity undertaking construction works and a firm/entity to be responsible for operations and maintenance must be separate from each other. Thus, equipment/materials

needed for operations and maintenance, which was originally to be conducted by force account (HPCD) were not procured under this project. Reduction of the total project cost is due to reduction of the Japanese ODA loan portion that exceeded the increased amount of local currency portion. The planned and actual project costs by item are shown in Table 2.

Table2 Project costs by Item (Planned and Actual)

Item	Planned Note 1:			Actual Note 2:		
	Foreign currency (million yen)	Local currency (million yuan)	Total (million yen)	Foreign currency (million yen)	Local currency (million yuan)	Total (million yen)
Civil Works	13,127	858	25,997	14,212	1,268	32,875
Base Course	5,264	345	10,439			
Pavement	4,002	261	7,917			
Interchange	2,786	182	5,516			
Traffic engineering	1,075	70	2,125			
Bridges	7,168	465	14,143	6,254	520	14,156
Facilities	1,317	100	2,817		48	729
Land acquisition / resettlement	0	239	3,585		318	4,827
Administration cost	0	17	255		10	152
Taxes	0	81	1,215		97	1,473
Research & development	0	70	1,050		69	1,048
Interest during construction	0	137	2,055		155	2,354
Consulting services	233	82	1,463	138		138
Price escalation	538	154	2,848			
Contingencies	1,108	106	2,698			
Total	23,491	2,309	58,126	20,609	2,485	57,752

Note 1: Exchange rates: US$1=120 yen, US$1=8 yuan, 1 yuan=15yen
Price increase: foreign currency 1.2%/year, Local currency 3.3%/year
Contingencies: foreign/local currencies 5%
Base year for cost estimation: November 1999
Note 2: Exchange rate: 1 yuan=15.19 yen

Although the project period slightly exceeded the plan, project cost was lower than planned; therefore the evaluation for efficiency is moderate.

2.3 Effectiveness (Rating: a)

2.3.1 Traffic volume on XZE

The annual average daily traffic of XZE is shown in Table 3.

Table 3　Annual Average Daily Traffic of XZE

(Unit: passenger car unit veh/day)

Section	2005	2006	2007	2008
Xinxiang-Zhengzhou	39,400 (40,745)	33,850 (43,600)	34,000 (46,500)	35,000 (49,400)
Actual against planned	97%	78%	73%	71%

Note: Numbers in (　) are estimated

The traffic volume on XZE decreased in 2006 and since then the volume has remained unchanged. The reason for non-increasing is that since in 2006/2007 two expressways (Dalian – Guangzhou Expressway[3] and Erenhot – Guangzhou Expressway[4]) parallel to XZE were completed, traffic travelling north-south direction was distributed to three expressways including XZE. Traffic volume as of 2008 on Dalian-Guangzhou Expressway and Erenhot-Guangzhou Expressway (in the section parallel to Xinxiang-Zhengzhou section) was both about 20,000 vehicles/day. Should the half of the traffic volume on these expressways use XZE, the traffic volume of XZE will be more than 55,000 vehicles/day, which is more than the expected at the appraisal stage.

2.3.2 Traffic volume on National Highway 107 (Xinxiang-Zhengzhou)

Traffic volume on the existing National Highway 107 between Xinxiang and Zhengzhou is shown in Table 4. At the appraisal stage, other expressways parallel to XZE were not planned and thus, it was assumed that the traffic volume on National Highway 107 would also gradually increase. However, as regional economy has developed, hesitation to pay toll was reduced and diversion to an expressway was accelerated more than expected. As a result, the traffic volume on National Highway 107 has been decreasing and traffic congestion has been relieved.

Table 4　Annual Average Daily Traffic on National Highway 107 (Xinxiang-Zhengzhou)

(Unit: passenger car unit veh/day)

Section	2005	2006	2007	2008
Xinxiang-Zhengzhou	20,000 (17,063)	18,000 (18,200)	16,000 (18,300)	14,000 (19,400)
Actual against planned	117%	99%	87%	72%

Note 1: Numbers in (　) are estimated

Note 2: National Highway 107 traverses parallel to the expressway.

2.3.3　Traffic accident rate on National Highway 107

The accident rate (number of accidents) on the existing National Highway 107 is shown in Table 5. After the expressway was open to traffic, traffic congestion has been

[3] parallel to XZE with 40 km apart

[4] parallel to XZE with 75 km apart

relieved and traffic accidents on National Highway 107 have been decreasing.

Table 5 Traffic accident rate on National Highway 107

(Unit: accidents/year)

Section	2005	2006	2007	2008	2009
Xinxiang -Zhengzhou	820	790	720	650	580
Number of accidents against previous year		96%	91%	90%	89%

2.3.4 Internal rate of return

Based on cost and benefit items assumed at the appraisal stage, using the actual cost with respect to construction costs, and actual costs for four years upon completion and projected costs afterward during the remaining project life period with respect to operation and maintenance costs and toll revenue, the financial internal rate of return (FIRR) was recalculated. FIRR at post evaluation is 13.3% and the financial viability is high. The reason for higher FIRR at post evaluation is that toll charges estimated at appraisal (e.g. 0.28 yuan/km for a passenger car) were doubled (0.55 yuan/km) and the toll revenue was increased. Based on the same assumptions and condition (costs include construction costs, and operation and maintenance costs, and benefits include savings of vehicle operating costs, reduction of travel distance, reduction of traffic congestion, reduction of travel time, reduction of traffic accidents and increase of generated traffic), the economic internal rate of return (EIRR) was recalculated. EIRR at post evaluation is 12.7%. Since the actual traffic volume is lower than expected by 30%, EIRR is also lowered. However, since it is more than 12%, which is the target for an expressway project finance by international aid agencies, the project is considered viable.

Table 6 Internal rate of return

IRR	At appraisal	At post evaluation
FIRR	9.6%	13.3%
EIRR	14.9%	12.7%

2.3.5 Qualitative effects

The qualitative impacts expected at appraisal were: i) enhancement of transport capacity along the Beijing-Zhuhai corridor and strengthening transport efficiency with neighboring regions; ii) acceleration of economic development along the corridor and iii) generation of travel demands. These impacts were confirmed by results of beneficiary surveys conducted under this post evaluation (please refer to the succeeding page, on the results of surveys).

Since two expressways, which were not planned at the appraisal stage, have been constructed parallel to XZE, certain volume of traffic (about half) which was expected to use XZE diverted to those expressways, and thus the traffic volume on XZE is less than planned. However, the total traffic volume along the corridor is much more than originally planned. The traffic volume on the existing National Highway 107 parallel to XZE has been decreasing since XZE was completed, and this proves that traffic has diverted to efficient expressways. Moreover, the traffic accidents on the existing National Highway 107 have been decreasing with reduction of traffic volume. From these data, it proves that the effective transport by XZE has been achieved, that traffic congestion along the corridor has been relieved and that the transport efficiency with neighboring regions has been enhanced.

Therefore, this project has largely achieved its objectives, and its effectiveness is high.

2.4 Impact

2.4.1 Improvement of investment environment and promotion of economic development

(1) Improvement of investment environment and economic development

With completion of an expressway, which has enough highway capacity (3-4 lanes for each direction) and provides substantial reduction of travel time (reduced to 1/3 of the original travel time), accessibility to markets has been enhanced and thus, the investment environment has been improved. As shown in the table 7, the average income of Zhengzhou city was increased by 68% and that of Xinxiang city by 85% in 2008 upon completion of the project. The economic growth rate of both cities for the past three years was more than 20% /annum.

The increase of average income in both Zhengzhou and Xinxiang within the project area is shown in Table 7.

Table 7 Average income (per person)

Unit: yuan

City	2004	2005	2006	2007	2008
Zhengzhou	9,364	10,639	11,822	13,692	15,715
		(114%)	(111%)	(116%)	(115%)
Xinxiang	7,146	9,312	9,544	11,236	13,218
		(130%)	(102%)	(118%)	(118%)

Note 1: Open to traffic in October 2004

Note 2: Numbers in ( ) are ratio against the previous year

Table 8 Economic growth rates

City	2004	2005	2006	2007	2008
Zhengzhou	112	119	119	120	
Xinxiang	118	124	125	125	

Note: Base year is 2000

(2) Results of beneficiary surveys

At the post evaluation stage, beneficiary surveys by interviews were conducted in three cities (Xinxiang, Yuangyan, and Zhengzhou) along the XZE corridor. The number of respondents was 150 in total with 13% of female and 87%[5] of male respondents. Main findings and results are shown below.

1) Contribution to promotion of regional economic activities and expansion of business chances[6]: 93% evaluate
2) Contribution to relieve traffic congestion between Xinxiang and Zhengzhou: 98% evaluate
3) Impact to increase of household income: 62% perceive
4) Amount of agricultural products transported to the market: 80% evaluate
5) Improvement of accessibility to public services such as market, school, hospital and government offices: 100% evaluate
6) Reduction of travel/commuting time[7]: 91% evaluate
7) Reduction of transport costs: 33% of respondents admit reduction by 10% and 27% by 30%.
8) Improvement of traffic safety and reduction of traffic accidents: 97% admit its contribution.
9) Among 150 respondents, 27 people (18%) happened to be somehow affected (land, houses, plants/trees) by the project. However, they reported that they were properly compensated.
10) Regarding the environmental issues, some of the residents along the corridor, who moved after XZE has been completed, reported that they are suffered from traffic noise during the night time. Some residents complain that the length of installed noise barrier is insufficient.

In summary, regarding improvement of transport capacity and efficiency, 98% of respondents of beneficiary surveys evaluate the project's contribution to relief of traffic congestion along the XZE corridor and 80% evaluate to transport of industrial and agricultural products to the markets. With respect to promotion of economic development, 93% of respondents evaluate the project's contribution to promotion of regional economic activities and expansion of business chances and 62% perceive project's impact to the

5 The reason for higher ratio of male respondents is that most of questions are more appropriate to ask male respondents because of nature of the project (expressway).

6 The following comments were obtained: Due to improvement of accessibility from Yuanyan to other cities, a few firms including Sanyuan Milk Group, one of the biggest manufacturers in China, and Diyi Rice Company constructed large factories and they are contributing to the city's economic development and increase of employment opportunities. According to the statistics of Yuangyan County Traffic Administration, the cargo handling volume in 2003 before the project was 1,720,000 tons and this was doubled to 3,420,000 tons in 2008 after the expressway was open to traffic.

7 The following comment was obtained: Before the expressway was completed, it took one and half hours from Yuanyan to Zhengzhou. It takes only 40 minutes now.

increase of household income. Regarding generation of travel demands, all the respondents evaluate its contribution to improvement of accessibility to public services and 91% reduction of travel/commuting time.

2.4.2 Environmental and social impact

(1) Impact to environment

Any issues on the impact to the environment have not been observed. During the project implementation, an environmental monitoring plan was prepared and the monitoring has been conducted by the Henan Provincial Environmental Bureau after the XZE got open to traffic.

Ecological condition: During the expressway construction, 62 borrow pits (with a total area of 331 ha) were selected. Upon completion, 40% of excavated area was converted to cultivated lands and 60% to either fish ponds or reservoirs. To protect slope erosion, protection works and planting were undertaken. During the construction, asphalt/concrete plants were installed at 11 locations. Upon completion, these sites were restored to the original condition and planting work was conducted. From the above mentioned facts, it was confirmed that the environmental protection was conducted properly.

Noise protection: Noise barriers were installed at 21 sites with a total length of 4,670 m along the expressway and the noise level was lowered by 3.6-4.8 db. The noise level actually measured at sensitive locations such as school zones meets the class 2 standard (national standard GB3096-2008). The noise level in other locations also meets national class 4 standard.

Water treatment: Water treatment facilities were installed at all the service areas, toll stations and parking areas. According to the results recently measured, treated water quality at these sites meets the class 2 standard (national standard GB3096-2008).

As a result, it was confirmed that the environmental protection has been well taken care of during construction and operation stages. According to the interview surveys conducted along the expressway, 90% of respondents also report that they are satisfied with the environmental protection taken and its outcome. From these points, the environmental protection taken (for traffic noise and exhausted gas) is considered to be satisfactory.

(2) Land acquisition and resettlement

At appraisal, land acquisition of 870 ha and resettlement of about 7,000 inhabitants were planned. The land area actually acquired was 720 ha and the number of resettled people was approximately 890. The total area of resettled houses was 55,158 ㎡ including 197 houses and 13 factories. The amount paid for land acquisition and compensation was about 318 million yuan, which is about 1.3 times of the originally estimated. The right consciousness of citizens has been recently increased in Henan as well and thus reasonable support/compensation for land acquisition and resettlement is required. In the area where an agreement on the compensation amount was not obtained, an alignment was partly shifted. It hints that the dissemination to the public on the compensation policy might not be sufficient and that the process for concurrence formation with the public might not be appropriate. One of the reasons for delay of project implementation is that it took more time than originally expected to acquire the land. The originally planned period (3.5 months) was extended to 6 months.

2.5 Sustainability (Rating: a)

2.5.1 Operation and maintenance system

Since the part of XZE is a section of an important route connecting with Zhengzhou Airport, the Xinxiang-Zhengzhou Administration Bureau for Beijing- Zhuhai Expressway under HPCD has been directly managing the expressway. The Xinxiang-Zhengzhou Administration Bureau is responsible for operation and maintenance of four routes with a total length of 159 km including XZE. The Bureau consisted of 11 divisions and is staffed with 50 professionals at its headquarters and 415 professionals and employees at field offices (toll stations and service areas). All the professional staff has qualified educational background (graduates of professional schools and college and universities, and among which 16 professionals have senior level qualifications and 30 medium level qualifications.

2.5.2 Technical capacity in operation and maintenance

In addition to the operation and maintenance manuals for each operation and maintenance work prepared by HPCD, manuals and regulation books particularly applicable to XZE have been prepared and distributed to all the staff and employees concerned. Some of the manuals include: a toll collection operational manual, a technical manual for repair of variable message sign board, a manual for patrol operations, and related documents on maintenance (issued in December 2007). Each staff in charge is obliged to participate in training programs in the related sector at least once a year. Each participant takes an examination after attending the program and the level of understanding of the training program is checked. Staff, who failed to pass the examination is requested to quit the job in some cases. Depending on training programs, reference books for training and sample examination papers are prepared. With these well

established training programs, the technical level of staff has been kept high.

2.5.3 Financial status on operation and maintenance

(1) Financial status of XZE

Table 8 Financial status of XZE

Unit: million yuan

Year	Income	Operation expenses	Profit
2005	729.64	161.78	567.86
2006	847.03	182.06	664.97
2007	918.88	185.51	733.37
2008	813.44	277.39	436.05
2009[8]	427.71	176.01	251.7

Income and profit have been increasing every year. Reasons for reduction of income and profit in 2008 are: i) XZE was closed for a few weeks due to heavy snow in winter (January and February); and ii) all the vehicles which were used for removal of snow and emergency purposes (including those used for the Sichuan Earthquake Disaster Reconstruction program) were allowed to pass free so that tolls were not collected. The reason for cost increase is that some repair and maintenance works were needed in 4 years after opening to traffic. The works included renewal of traffic signs, change of expansion joints, additional landscaping/planting work, and new construction of approaching ramps to Yuangyan Service Area.

(2) Breakdown of operation and maintenance expenses (2008)

The breakdown of operation and maintenance expenses is shown in Table 9.

Table 9 Operating Expenses

Unit: million yuan

Item	Amount
Personnel (salaries)	13.05
Operating expenses	1.16
Equipment and Materials	7.52
Maintenance works	35.42
Other expenses	6.68
Installation of surveillance cameras	1.88
Expansion of a service area	5.32

8 Data for 2009 covers only the period from January to July 2009.

Approach ramps to Yuanyang service area	15.92
Interest	190.39
Total	277.39

Since the financial status is sound, budget is well allocated to the maintenance works as well.

2.5.4 Status of operation and maintenance

During the field inspection, no crack/pothole on the asphalt pavement, nor settlement at the connection of bridge structure and earth work section including at the approach section to Yellow River Bridge were observed. This proves that maintenance has been properly undertaken. Enterprises, which would be responsible for routine maintenance (cleaning ditches, removal of obstacles on the roadway, trimming trees and others) are selected/recruited through National Competitive Bidding (NCB) procedures. Currently, the Xinxiang-Zhengzhou Administration Bureau for Beijing- Zhuhai Expressway under HPCD entrusts civil works to three firms and landscaping/planning works to three firms as well. Contractors needed for periodic maintenance work (repair of lighting, traffic signs, guardrail, etc.) and major reconstruction works (overlay, etc.) are recruited through NCB procedures depending on the type and work.

No major problem has been observed in the capacity of the executing agency, nor its operation and maintenance system; therefore, sustainability of the project is high.

3. Conclusion, Lessons Learned, Recommendations

3.1 Conclusion

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

3.2 Lessons Learned

1) There is substantial difference between the planned and actual with respect to the number of people resettled, land area acquired, and the amount of compensation paid. Due to unsatisfactory negotiations on land acquisition, an alignment was partly revised. Thus, it is suggested that during the project preparation, reasonable time for discussions be spent with attended people, and that a resettlement action plan, which incorporates the results of discussions and negotiations be prepared, and it should be monitored during the project implementation.

3.3 Recommendations

None.

Comparison between planned and actual

Component	Planned	Actual
Civil works:	□ Expressway: Length 79.8km Right of way 35m (6-lane section) 42.5m (8-lane section) Lanes 3-4 lanes for one direction Pavement asphalt Type of highway full access controlled, toll	almost as planned.81.8km
	□ Interchanges 4 sites	as planned
	□ Toll stations 3 sites	as planned
	□ Service areas 2 sites	1 site
	□ Bridges Large: 6 sites with 5,616.5m Yellow River large bridge 9,570m Medium: 18sites with 1,032m Small: 12 sites with 444m	Large' 6 sites with 5,301m almost as planned Yellow River large bridge 9,848 m Medium: 17 sites with 983m Small: 12 sites with 444 m
	□ Management facilities Toll stations, communications system, surveillance system, vehicles for maintenance and operations	Almost as planned
Consulting services:	48M/M (only for bridges) for review of detailed designs, and assistance in construction supervision of bridge sections、and 11M/M for overseas training	almost as planned 46.6M/M (only for bridges) + overseas training 11M/M
Period	March 2000 (L/A) – December 2003 (Project completion) 3 years and 9 months (45 months)	March 2000 (L/A) – October 2004 (open to traffic) 4 years and 7 months (55 months)
Cost（Total Project Cost） Foreign currency Local currency Total Japanese ODA loan Exchange rates	 23.491 billion yen 34.635 billion yen (2.309 billion yuan) 58.126 billion yuan 23.491 billion yen 1 yuan = 15 yen (as of 1999)	 20.690 billion yen 37.143 billion yen (2.485 billion yuan) 57.752 billion yen 20.69 billion yen 1 yuan = 15.19 yen (March 2001 – August 2003)