

China

Water Supply Improvement Project of Beijing City (1)(2)

Report Date: September 2001

Field Survey: June 2001

1. Project Profile and Japan's ODA Loan



Site Photo: 9th Water Purification Plant

1.1 Background:

In the middle of the 1980s, the urban areas of China experienced serious water shortage. According to the surveys conducted on the 324 cities throughout China at that time, more than 180 cities faced a shortage of 12 million cubic meters/day of water, especially 40 cities of which were confronted with a huge shortage of water, amounting to 4.3 million cubic meter/day. The total population of the 40 cities was approximately 30 million, which is equivalent to about 30 % of the urban population of China at the time.

Such a disaster urged the Chinese government to increase the water supply by 2.08 million cubic meters per day under the 6th 5-Year Plan (1981-85). Subsequently, under the 7th 5-Year Plan (1986-90), the Government formulated a plan to expand water supply capacity by 2.5-3million cubic meters/day every year, in order to double the supply capacity of 1986 by 2000.

Meantime, in 1987, at the time of the appraisal of this project, Beijing City had been supplying purified water using seven under ground water purification plants (with total treatment capacity of 1.4 million cubic meters/day) and a surface water purification plant (with the treatment capacity of 0.17 million cubic meters/day). But land subsidence problems emerged due to an excess drawing of underground water, which led to the de facto restriction of water supply, such as the curtailment of operation hour of factories, etc. (The governmental guidance was issued to reduce water supply by 3% annual rate).

Furthermore, due to the concentration of population on the urban areas, the water-supplied population in the urban area of Beijing City was expected to increase from 4.5 million persons in 1987 to 5.3 million in 1992 (a 3.6% of increase annually), and per capita water consumption was estimated to expand from 162 liters/day in 1987 to 220 liters/day in 1992 owing to the improvement in living standards (increase at a 8.0% annual rate). These estimations resulted in the anticipation that water consumption in the urban area of Beijing City would amount to 2.4 million cubic meters/day in 1992, about 1.5 times the consumption in 1987.

Consequently, the project (the second phase) was worked out to coop with growing water demand after 1992. The project aimed to increase the water treatment capacity by 0.5 million cubic meters/day to the first phased facilities of the surface water purification plant (with the treatment capacity of 0.5 million cubic meters/day) that had been under construction at the time of appraisal, in order to expand capacity up to the level of one million cubic meters/day.

1.2 Objectives:

The objectives are to eliminate water shortage and respond to an increasing water demand, by building up the surface water purification facilities with the capacity of 0.5 million cubic meters/day in order to

encourage an improvement in living infrastructure and industrial development in Beijing City.

1.3 Project Scope:

- ① Construction of water intake facilities with the capacity of one million cubic meters/day
- ② Construction of a water purification plant with the capacity of 0.5 million cubic meters /day
- ③ Construction of related raw water transmission and water distribution facilities
- ④ Technology exchange

ODA loan is equivalent to the total amount of the foreign currency portion. The loan agreements were executed in two phases in August 1988 and May 1989 respectively.

1.4 Borrower/Executing Agency:

The Government of the People's Republic of China/ Beijing Public Utilities Agency (changed to Beijing Municipality Management Commission in 1999)

1.5 Outline of Loan Agreement:

	Phase 1	Phase 2
Loan Amount Loan Disbursed Amount	10,614 million yen 10,614 million yen	4,866 million yen 4,697 million yen
Date of Exchange of Note Date of Loan Agreement	July 1988 August 1988	May 1989 May 1989
Terms and Conditions (grace year) Procurement	Interest Rate 2.5% Repayment Period (Grace Period): 30(10) years General Untied (of which consulting service is by partially untied)	Interest Rate 2.5% Repayment Period (Grace Period): 30(10) years General Untied
Final Disbursement Date	August 1995	May 1996

2. Results and Evaluation

2.1 Relevance

At the time of the appraisal, this project has been regarded as an important initiative in the nation's politics as part of the national project for capacity expansion of purified water supply in urban areas. At the same time, it was the project objective to solve land subsidence problems in Beijing City caused by the excessive water drawing and also water shortage problem, which is essential for industrial development and improvement in living standard. Thus, the relevance of the project is very highly appreciated.

At the time of the evaluation, also, this project played a significant role in promoting purified water supply in Beijing City, especially in intensifying the utilization of surface water. This is, also, consistent with "Beijing City National Economy and Social Development, the 10th 5-Year Plan Outline (2001)", which attached an importance to an expansion of purified water supply capacity in Beijing City. Thus the relevance of the project is maintained.

2.2 Efficiency

2.2.1 Project Scope

The extension of the water distribution pipe exceeded the original project by 10 km (16.1% of the total length). The water purification method adopted at the facilities was changed from the originally-planned coagulation sedimentation method to the three-staged process method i.e. a mechanically mixing pond, a reaction pond having a big wave making board and a by-pass settling pond having a big wave making board. Beijing Water Supply Group Company Limited, which is the organization responsible for O&M explained the reasons for the change in the project scope as follows:

① The extension of the water distribution pipe

At the time of the appraisal of this project, the construction project of the 3rd belt line of Beijing City (called hereafter "3rd belt line"¹) was not yet discussed in details, and so the laying of a water distribution pipeline along "3rd belt line" was not included in the plan. Later in the process of the materialization of the construction project of "3rd belt line", however, it was recognized that a pipelining along "3rd belt line" would help greatly rationalize the water supply network of the whole area ". As its result, the pipeline work along "3rd belt line" was added to the plan.

② The change of water purification method

While the originally planned coagulation sedimentation method purifies water in only one process, the new changed method can offer efficiency, and in addition, reduce drastically chlorine injection and lower the production cost, through by dividing the original one process into three processes,

2.2.2 Implementation Schedule

The time schedule for completion of water intake/raw water transmission/water purification and water distribution facilities was 3-5 years delayed than the plan. The reason is that the difficulty in local fund-raising caused a temporary delay of relocation related with the construction, which led to the delay of the project as a whole.

A large amount of compensation (in local currency, 4,002 RMB) was needed to implement a relocation of residents for the implementation of this project. However, since the budget bill for the construction of infrastructure of the Beijing City Government had been already fixed and the fund for this project had been limited by this budget bill. Moreover, implementation of this project was concurrent with that of "3rd belt line", which resulted in the subordination of this project to the construction of "3rd belt line" of Beijing City in terms of the fund-raising.

2.2.3 Project Cost

There was not much difference between the actual payment and actual payment in the foreign expenditure, but the local currency expenditure considerably exceeded the planned budget. This was caused by the following reasons: ①price hikes of materials due to the inflation, and ②compensation not only for unplanned relocation of residents/factories but also for temporary relocation required for the construction of raw water transmission facilities, etc.

A few of the examples of price hikes in materials are that the average price of steel increased from RMB1,800/ton in 1988 to RMB 4,200-4,300/ton in 1993-1994 and the cement price increased drastically from RMB 100 /ton in 1988 to 300 /ton in 1992.

2.3 Effectiveness

2.3.1 Actual water supply volume in Beijing City Area ²and the role of this project.

As shown in the table 1, the purified water supply volume in Beijing City Area increased from 1996, the year of this project completion, up to 1999, but decreased in 2000 from the previous year. This was owing to ① the decreasing tendency of industrial water consumption due to the relocation of

¹ This belt line is the third of the four belt lines so far constructed in Beijing City. The line is 65km long and passes east to west through office building areas and tourist spots. With the construction of this belt line, the redevelopment on a large scale of the surrounding areas was promoted, centering on construction of new residential complex and office complex.

² Beijing City consists of 13 districts and 5 prefectures. Beijing City Area means the urban area which includes the whole part of 4 areas of Dongcheng area, Xicheng area, Zongwen area, Xuanwu area, and a part of Choayang area, Haiding area, Fengtai area. These areas are covered by the water distribution network of **Beijing Water Supply Group Company** and are subject to this project.

factories to the suburbs, ②the successful results of calling for water conservation to Beijing citizens and implementation of water conservation measures by Beijing City Government, and ③the restriction of the population inflow into Beijing City Area, etc.

One of the main measures which had a remarkable effect on water conservation was the recent change in meter system from the traditional group-based common meter system to a household-based meter system. This changed very much residents' practices of water consumption while they traditionally consumed water without limit. The per capita water consumption in 2000 was decreased from the previous year. (Refer to the table 2). Accordingly, the actual water supply volume in Beijing City Area in 2000 was below the estimated consumption at the time of the appraisal by 50,000 cubic meter/day.

Meanwhile, the water supply volume of this project increased from 0.34 million cubic meters/day in 1996, the year of construction completion, to 0.50 million cubic meters/day in 1999, with an increase in the rate of utilization from 68% to 100% during the same period. In 2000, however, both the supply volume and the rate of utilization dropped. It can be said that this has a background similar to that of the purified water supply tendency of the whole Beijing City as already described above.

There is, however, a certain limit to an affect of measures on the purified water conservation and the restriction of the population inflow into the city to prevent a surge in purified water consumption. Demand for purified water is expected to gradually increase in the long run because the population increase tendency remains unchanged.

Table1: Trend of Actual Purified Water Supply Volume in Beijing City

		1988	1989	1990	1991	1992	1993	1994	1995	1996 completion of the project	1997	1998	1999	2000
Supply of domestic water(10,000m3/day)	Plan	76	81	83	91	98	107	114	124	127	131	137	140	149
	Actual	81	83	89	98	104	112	121	125	128	134	137	146	142
Supply of Industrial water(10,000m3/day)	Plan	33	35	36	35	35	35	35	36	35	34	34	31	31
	Actual	35	35	36	35	35	34	36	35	35	34	33	31	27
Total Supply of Water(10,000m3/day)	Plan	129	135	138	143	153	164	173	189	188	191	200	199	206
	Actual	130	133	137	145	158	169	181	185	193	196	197	203	201
Water Supply of this project (10,000m3/day)	Plan	-	-	-	-	-	-	-	-	N.A.	N.A.	N.A.	N.A.	N.A.
	Actual	-	-	-	-	-	-	-	-	34	45	44	50	40
Rate of Utilization of this project(%)	Plan	-	-	-	-	-	-	-	-	N.A.	N.A.	N.A.	N.A.	N.A.
	Actual	-	-	-	-	-	-	-	-	68	90	88	100	80
Rate of Water Supply Of this project(%)	Plan	-	-	-	-	-	-	-	-	N.A.	N.A.	N.A.	N.A.	N.A.
	Actual	-	-	-	-	-	-	-	-	17.6	23.0	22.3	24.6	19.9

Sources: Beijing Water Supply Group Company

Note: 1)"Water Supply" means "Purified Water Supply".

2)"Total Supply of Water" not only includes supply of domestic water and industrial water but agriculture water and city construction water.

3)"Supply of domestic water" includes commercial water and non-commercial household water.

4) After the appraisal of this project, the planned volume of water supply was amended as 1.53 million cubic meters/day in 1992 from 2.40 million cubic meters/day by the executing agency.

2.3.2 Diffusion Rate of Purified Water Supply³ and Per Capita Average Water Consumption⁴

The diffusion rate of purified water supply inside of Beijing City area is 100% both on planning basis and on actual basis. Per capita average water consumption (domestic non-commercial water) continued to increase from the completion of the construction to 1999 but decreased in 2000 from the previous year. As reported before, the background is that residents' practices of water consumption were improved by the change in the meter system from the traditional group-based common meter

³ Diffusion Rate of Purified Water Supply indicates the ratio of water-supplied population in the total population in the area(Beijing City Area) covered by the water distribution network of **Beijing Water Supply Group Company**

⁴ Per Capita Average Water Consumption indicates the resident-living water consumption (= domestic water — commercial-use water) divided by the water-supplied population.

system to the household-based meter system. On the other hand, per capita average water consumption of domestic water including commercial water is 255liters/day/capita in 2000, which exceeds the planned 250 liters/day/capita at the time of appraisal.

Table 2: Trend of Diffusion Rate of Purified Water Supply in Beijing City and Water-supplied Population

		1988	1989	1990	1991	1992	1993	1994	1995	1996 completion of the project	1997	1998	1999	2000
Diffusion Rate of Purified Water Supply (%)	Plan	100	100	100	100	100	100	100	100	100	100	100	100	100
	Actual	100	100	100	100	100	100	100	100	100	100	100	100	100
Per Capita Average Water Consumption (Domestic non-commercial water)(litter/day/person)		65	70	73	81	83	89	98	101	110	114	119	128	120
Water-supplied Population (10,000 persons)		501	510	517	522	530	539	545	549	530	536	538	542	556
City Population (10,000 persons)		501	510	514	522	530	539	546	549	530	536	538	542	556

Source: Beijing Water Supply Group Company

2.3.3 Water Quality

Beijing Water Supply Group Company added 5 items to the existing National Sanitary Standard for Drinking Water, which was set up as the sanitary quality standard of drinking water to be applied to companies. The frequency of quality inspection by item by the company is shown in the table. The company has stated that all the results of water quality inspections that have been made so far meet the standard.

2.3.4 Financial Internal Rate of Return (FIRR)

The recalculated FIRR based on the actual results was 5.3% of FIRR on the assumption of 40 year payback period, which is lower than the estimation of 7.4% for 40 year payback period and 5.8% for 35 years payback period at the time of the appraisal. This is mainly due to the substantial overrun of the project cost in comparison with the planned cost at the time of the appraisal. Since a raise in water rate from 2001 has been already approved by Beijing City Price Section, an improvement in revenue is expected,

Table 4: Actual Results and Estimation of Revenue and O & M Expenditure of this Project (Unit: 10,000RMB)

Year	1996	1997	1998	1999	2000	2001	2002
Revenue	8,269	11,145	15,254	21,032	28,191	32,692	43,589
O & M Expenditure	9,135	10,981	12,575	14,401	18,794	18,794	18,794
Year	2003	2004	2005	2006	2007	2008	2009
Revenue	43,589	43,589	43,589	43,589	43,589	43,589	43,589
O & M Expenditure	18,794	18,794	18,794	18,794	18,794	18,794	18,794

Source: Beijing Water Supply Group Company

2.4 Impact

2.4.1 Improvement of Public Health

There is no statistics on a year-on-year basis, or investigation reports available on the betterment of waterborne infectious diseases through diffusion of purified water supply, which makes it difficult to identify its impact quantitatively. However, it is generally considered that an increase in per capita consumption of domestic non-commercial water promotes an improvement in sanitary environment for

residents. It is presumed, therefore, that this project has had a positive effect on the improvement of residents' sanitation.

Furthermore, the executing agency reported that the purified water produced by the company after the commencement of the operation of the water purification plant by this project always satisfies the national sanitary standard and the same agency's standard, and it has not caused any sanitary problems.

2.4.2 Development of Commercial and Industrial Activities

In 1987 when the appraisal of this project was carried out, factories in Beijing City were subject to restriction of water supply. However, the tight water supply situation was eased by the completion of this project, and in addition, with the decreasing industrial water demand derived from relocation of factories to the suburbs, water supply restriction to factories in Beijing City has been now totally released. Furthermore, GDP of Beijing City is showing a steady increase. The increase in purified water supply capacity, which is a basic infrastructure, is deemed to be supporting the development of general economic activities of the city.

Table 5: GDP Growth Rate and GDP

Year	1996	1997	1998	1999	2000
GDP Growth Rate (%)	9.2	9.6	9.8	10.2	11.0
GDP (100 million RMB)	1615.73	1810.09	2011.31	2174.46	2478.76

2.4.3 Underground Water Conservation and Prevention of Land Subsidence

It is the policy of Beijing Water Supply Group to prevent land subsidence by using surface water as much as possible as a water source and reducing the utilization of underground water. This project has achieved an effect as one of such efforts. As seen in the table 6, the ratio of underground water in purified water supply of Beijing City Area has steadily decreased since 1996 when the construction of this project was completed. It seems, however, that there have happened no adverse impacts on the eco-system by intake of a large amount of surface water, or on the eco-system such as waste water contamination by the increased purified water supply.

Table 6: Trend of Ratio of Underground Water in Water Supply of Beijing City Area (Unit: %)

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Ratio	83	72	60	54	54	56	57	54	50	45	44	41	39

Source: Beijing Water Supply Group Company

2.4.4 Relocation of Residents

As reported before, the raising of compensation funds to relocating residents was temporarily delayed. However, the executing agency reported that the payment of compensations from the city government was carried out through the Chaoyang Area Government where the 9th Water Purification Plant is located, and that there have not arisen any problem after the relocation, nor any troubles in stabilizing local infrastructure for residents.

2.5 Sustainability and Self-supporting Development

Beijing Water Supply Group Company, which is the organization responsible for O & M of this project, has a sufficient system for production, management, engineering management and water quality management. As for the financial situation, both security and profitability are sound. Accordingly, there appears no particular problem of sustainability of this project.

2.5.1 The Organization Responsible for O & M (Operation and Maintenance)

At the time of the appraisal, Beijing Water Supply Company was designated as the agency in charge of O & M, but the company's name was changed to Beijing Water Supply Group Limited Liability Company on August 26, 1999. Moreover, Beijing Public Utilities Agency, which was a higher level organization of the company, was abolished in 1999 as part of the organizational change and the company come under the control of Beijing Municipality Management Commission.

2.5.2 Maintenance System

Beijing Water Supply Group has 14 branches and 10 subsidiaries. The subsidiaries were established to encourage diversification of business management in the surrounding field more or less related with water supply. The branches are the organizations engaged directly in operation of water supply business, and the 9th Water Purification Plant, taking charge of O & M of this project, belongs to the branches.

The engineers of various sections (such as pumping, chlorine injection, and administration section like water quality inspection) of the 9th Water Purification Plant are responsible for controlling collectively the facilities of the first phase, the second phase (this project) and the third phase as one block. The following table 7 shows not only the second phase facilities of this project but the whole situation of the 9th Water Purification Plant.

Table 7: Job Constitution of the Employee of the 9th Water Purification Plant

Job	Operator of Facilities	Technical Worker	Management Specialist and Engineer	Clerical Worker
Number(Persons)	223	106	116	119

Source: Beijing Water Supply Group Company

In the 9th Water Purification Plant, there are 76 qualified engineers, who are assigned not only to the plant's engineering section in charge of technical problems of the whole facilities, electricity supply, meter, and water quality etc., but to each section of facilities of the first phase, the second phase and the third phase construction.

It is appreciated that these members of the technical team have technical capabilities required for maintenance of the 9th Water Purification Plant including the second phase facilities of this project and sufficiently cope with the maintenance.

The maintenance of the water distribution pipeline of the whole Beijing Water Supply Group, including the 9th Water Purification Plant, is carried out by "Water Distribution Pipeline Maintenance Branch"(a branch). Although there is a temporary shortage of manpower, an increase in personnel is planned and no report of major problems has reported.

2.5.2 Water Quality Control System

The water quality control organization of Beijing City Water Supply Group Company comprises "Water Quality Chemical Analysis Center" at the head office level, "Water Quality Chemical Analysis Section" at the water purification plant level and engineers assigned to each workshop of the plant.

Laws related with water quality inspection have not been enacted yet, but the national standard of water quality is instituted. Water quality inspection results are collected and summarized by Beijing Health Control Office. Moreover, inside the executing agency, punitive provisions are formulated to be applicable when the regulations of periodical inspection of water quality and the water quality standard are not complied with. Therefore, water quality control is executed systematically and is playing a roll to maintain the sustainability and self-supporting development of this project.

2.5.3 Water Rate Collection Organization, Ratio of Uncollected Rate⁵ and Ratio of Water Leakage⁶

Water Supply Marketing Branch under Beijing Water Supply Group is the branch in charge of water rate collection, which has a qualified section to check water meters. As for collection of water rate, Water Supply Marketing Branch concludes agreements with customers and staff of the branch visit each customer to check a water meter and collects a water rate. A special inspection team is organized to tackle with irregular practices such as default of payment.

⁵ Ratio of uncollected rate" means the ratio of water volume, whose rate was not collected, to purified water supply volume.

⁶ Ratio of water leakage" means the ratio of water leakage volume, which was not subject to rate collection, to purified water supply volume.

The ratio of uncollected rate and the ratio of water leakage did not largely exceed the planned figures until 1999, but have considerably exceeded the plan since 2000. In this respect, the following two points shall be noted.

- ① In proportion to the growth in water-supplied population, an increasing number of more apartments and building complex adopt a group-based common meter system (a general meter) as well as an household-based meter system. The difference amount between the general meter and the household-based meter of these buildings is absorbed by the Water Supply Group, which results in an increase in the ratio of uncollected rate.
- ② The maintenance service cannot catch up with the extension of the water supply pipeline and the expansion of the service areas. Furthermore, the aging of some of water distribution facilities causes rate of water leakage to increase. However, the executing agency explained that this is a temporary phenomenon and the maintenance problem can be remedied by an increase in staff in future.

Table 8: Trend of Ratio of Uncollected Rate and Ratio of Water Leakage of Beijing City Water Supply

		1988	1989	1990	1991	1992	1993	1994	1995	1996 completion of the project	1997	1998	1999	2000
Ratio of Uncollected Rate	Plan	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
	Actual	0.63	0.53	0.65	0.63	0.71	0.75	0.75	0.75	0.95	0.79	0.81	0.79	1.14
Ratio of Water Leakage	Plan	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.5	0.5	0.5	0.5	0.5
	Actual	0.04	0.05	0.08	0.22	0.22	0.31	0.33	0.38	0.45	0.52	0.55	0.58	0.69

Source: Beijing Water Supply Group Company

2.5.4 Financial Standing

**Table 9: Trend of main Financial Data of Beijing Water Supply Group
from 1998 to 2000**

Financial Data	1998	1999	2000
Current Assets(10,000RMB)	78,087	98,827	122,039
Fixed Assets(10,000RMB)	425,906	503,466	595,256
Total Assets(10,000RMB)	506,416	666,542	726,533
Current Liabilities(10,000RMB)	15,490	22,261	25,055
Total Liabilities(10,000RMB)	126,034	142,575	138,881
Shareholder's Equity(10,000RMB)	380,382	523,967	587,653
Sales(10,000RMB)	55,677	72,201	87,329
Net Profit(10,000RMB)	581	1,168	423
Depreciation(10,000RMB)	27,102	32,533	36,991
Cash and Cash Equivalents (10,000RMB)	69,815	86,101	100,522
Current Ratio (%)	504.1	443.9	487.1
Sales Profit Ratio (%)	1.05	1.62	0.48
Profit Ratio of Net Worth and Total Liabilities (%)	0.12	0.18	0.06

Net Profit/(Net Profit + Depreciation)(%)	2.1	3.5	1.1
Depreciation/(Net Profit + Depreciation)(%)	97.9	96.5	98.9

Source: Calculated based on Financial Statements of Beijing Water Supply Group Company

According to the financial data from 1998 to 2000 of the above table 8, the financial standing of Beijing Water Supply Group Company, which is the organization in charge of O & M, is generally sound and backs up the sustainability and the self-supporting development of this project.

① Security

Current Ratio, which is an indicator of security, is over 400% every year, namely well over 200% which is an ideal level. This supports their ample liquid fund and high level financial security.

② Profitability

There seems to remain a problem with their profitability, because the sales profit ratio and profit ratio of net worth and total liabilities calculated based on the financial statements are quite low. However, their cash flow(Table 4) clearly shows that there is not really a problem with profitability. Namely, a large amount of depreciation recorded every year is a main reason of the low profitability. The cash flow generated by the business operation and the balance at the end of the period of cash and cash equivalents show an upward tendency by generating a large amount of revenue.

There is also a problem with too small profit ratio in the total of net profit and depreciation. This has been mainly caused by low water rate which was kept low until 2000 by the Government department responsible for water supply. The increase in water rate starting 2001 has already been decided and endorsed by Beijing Price Agency and an improvement of net profit after 2001 is expected.

Comparison of Major Plan and Actual Scope

Item	Plan	Actual
①Project Scope (1)Water Intake Facilities (2)Raw Water Transmission Facilities (3)Water Purification Facilities (4) Water Distribution Facilities (5) Technology Exchange	-Water Source -Water Intake Method: Intake Gate (Existing) -Intake Volume: 1 million cubic m/day -Main Devices of Intake Facilities: Intake Volume Control Device Water Quality Check Device Chlorine Injection Device -Raw Water Transmission Pipe: Ø2,600mmx35km (Ductile Cast Iron Pipe28km Steel Pipe 7km) Ø2,200mmx35.5km (Steel Pipe) Natural Falling Method Water Supply Capacity:0.5million cubic meters/day Method: coagulation sedimentation method Fast Filtration Activated Carbon Filtration -Main Auxiliary Facilities :Water Distribution Pumping Station :Control Device :Sludge Treatment Facilities Water Distribution Pipe(Steel Pipe): Ø1,600mmx26km Ø1,200mmx7km Ø 1,000mmx19km -Materials for Maintenance -Dispatch of Examination Team, Training	Same as in the left -Mechanically Mixing Pond -Reaction Pond having a big wave making board -By-pass settling pond having a big wave making board Same as in the left Ø1,600mmx30km Ø1,200mmx13km Same as in the left
② Construction period (1) Water Intake Facilities (2) Raw Water Transmission Facilities (3) Water Purification Facilities (4) Water Distribution Facilities	June 1988~March 1992 June 1988~March 1991 June 1988~June 1991 January 1989~March 1992 January 1989~December 1991	December 1990~December 1996 May 1993~December 1994 December 1990~March 1995 December 1990~May 1995 May 1992~December 1996
③Project Cost Foreign Currency Domestic Currency Total ODA Loan Portion Exchange Rate	15,480 million yen 5,542 million yen (161.10 million RMB) 21,022 million yen 15,480 million yen RMB 1=JP¥34.4 (1988)	15,311 million yen 30,364 million yen (1308.80million RMB) 45,675 million yen 15,311 million yen RMB1=JP¥23.2 (Weighted average Rate)

