China

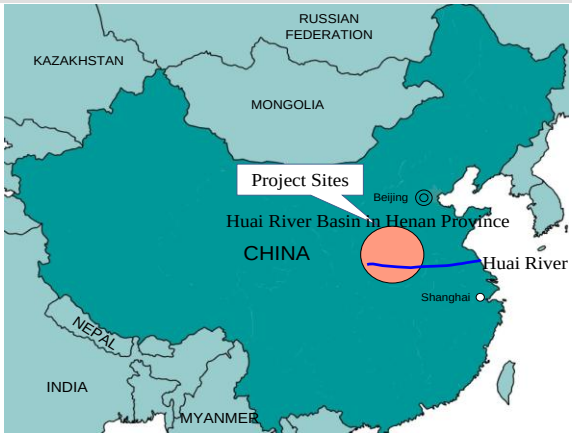
Ex-Post Evaluation of Japanese ODA Loan Project

Huai River Henan Water Pollution Control Project

Huai River Henan Water Pollution Control Project (II)

External Evaluator: Yuko Kishino, IC Net Limited

1. Project Description



Project Site

Louhe Pulp and Paper Making Factory

1.1 Background

Located midway between the Yellow River and the Yangtze River, the Huai River in the People's Republic of China is one of the Seven Great Rivers[1] of the country. The river has a drainage area of 269,000 square kilometers, and a total length of 1,000 kilometers, with its aquatic resources amounting to 79 billion 400 million cubic meters[2] in total. The Huai River consists of the Huai Main Water System and the Gijyutsushi Water System. The former water system flows eastward from its source in Mt. Tongboguan, Henan Province, and via Anhui Province, enters Lake Hongze in Jiangsu Province. From there the river turns southward and finally meets the Yangtze River. Meanwhile, the latter water system originates from the southern part of Shandong Province, and partly flows into the Yellow Sea via the northern part of Jiangsu Province. The Huai River Basin is inhabited by 45% of the 315 million populations of the four provinces, with major agricultural and industrial zones of the country stretching out around it.

At the time of the appraisal of this Japanese ODA Loan Project (1997-1998), these regions were experiencing rapid economic development, which resulted in a sudden increase in industrial/domestic wastewater. On the other hand, due to the lack of maintenance in sewage treatment facilities, most of the untreated wastewater was being discharged into the tributaries of the Huai River, thus aggravating water pollution.

Amid such circumstances, the Chinese Government enacted and enforced the "Provisional Act

[1] Songhua, Liao, Hai, Yellow River, Huai, Yangtze, Pearl River

[2] Huai Basin Water Resources Committee, "Evaluation of Water Resources in the Huai River Basin" (2004)

Against Water Pollution in the Huai River Basin" in 1996, and the Central Government and four provincial governments in the basin region orchestrated the "Huai River Basin Water Pollution Control Project and the 9th 5-year Project" (1996-2000), thereby initiating efforts toward the improvement of water quality.

1.2 Project Outline

The objective of this project is to improve the water quality of the Huai River Basin in Henan Province by constructing sewage treatment facilities and sewage networks in major cities located in the area, as well as installing effluent treatment equipment in factories that are discharging contaminants above the standard level into water systems in the said basin, thereby contributing to the improvement of the living environment of the local residents. The contractual details of this project are as follows:

Approved Amount/ Disbursed Amount	(I) 4,945 million yen / 3,956 million yen (II) 7,230 million yen /6,654 million yen[3] Total 12,175 million yen / 10,610 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	(I) September, 1997 (II) December, 1998 / (I) September, 1997 (II)December, 1998
Terms and Conditions	Interest Rate (I) 2.1% (II) 0.75% Repayment Period (I) 30 years (Grace Period 10 years) (II) 40 years (Grace Period 10 years) General Untied Loan
Borrower / Executing Agencies	Guarantor: Government of People's Republic of China / Henan Provincial People's Government
Final Disbursement Date	(I) April, 2003 (II) July, 2004
Main Contractor (Over 1 billion yen)	None
Main Consultant (Over 100 million yen)	None
Feasibility Studies, etc.	Feasibility Studies of Respective Subprojects
Related Projects (if any)	World Bank, "Huai River Pollution Control Project"

As shown in Table 1 and Table 2 below, this project consists of 4 subprojects selected at the appraisal in 1997 and 7 subprojects selected at the appraisal in 1998, classified as the "Huai River

[3] The amount deducted 575 million yen (data provided by JICA) from the disbursed amount (II). That amount was advance redemption, associated with cancellation of the subproject, "Wastewater Treatment Project for Feiyafei Paper Industry Company".

Henan Water Pollution Control Project" and the "Huai River Henan Water Pollution Control Project (II)," respectively.

In this ex-post evaluation of the project, the subprojects were divided into the following 2 types for analysis:

Type 1: Sewage treatment subprojects (mainly dealing with domestic wastewater in urban areas)

Type 2: Factory contaminant source treatment subprojects (dealing with factories discharging contaminants)

Table 1 List of subprojects at the time of evaluation in 1997 (I)

Number	Subproject Name	Type	Implementation Body
1)	Sewage Treatment System Construction Project in Zhengzhou City	1	Zhengzhou Wangxinzhuang Wastewater Treatment Plant
2)	Sewage Treatment System Construction Project in Pingdingshan City	1	Pingdingshan Sewage Purification Company
3)	Sewage Treatment System Construction Project in Xuchang City	1	Xhuchang Wastewater Treatment Plant
4)	Kaifeng Chemical Fertilizer Plant Waste Water Synthetic Treatment Project	2	Kaifeng Chemical Fertilizer Plant

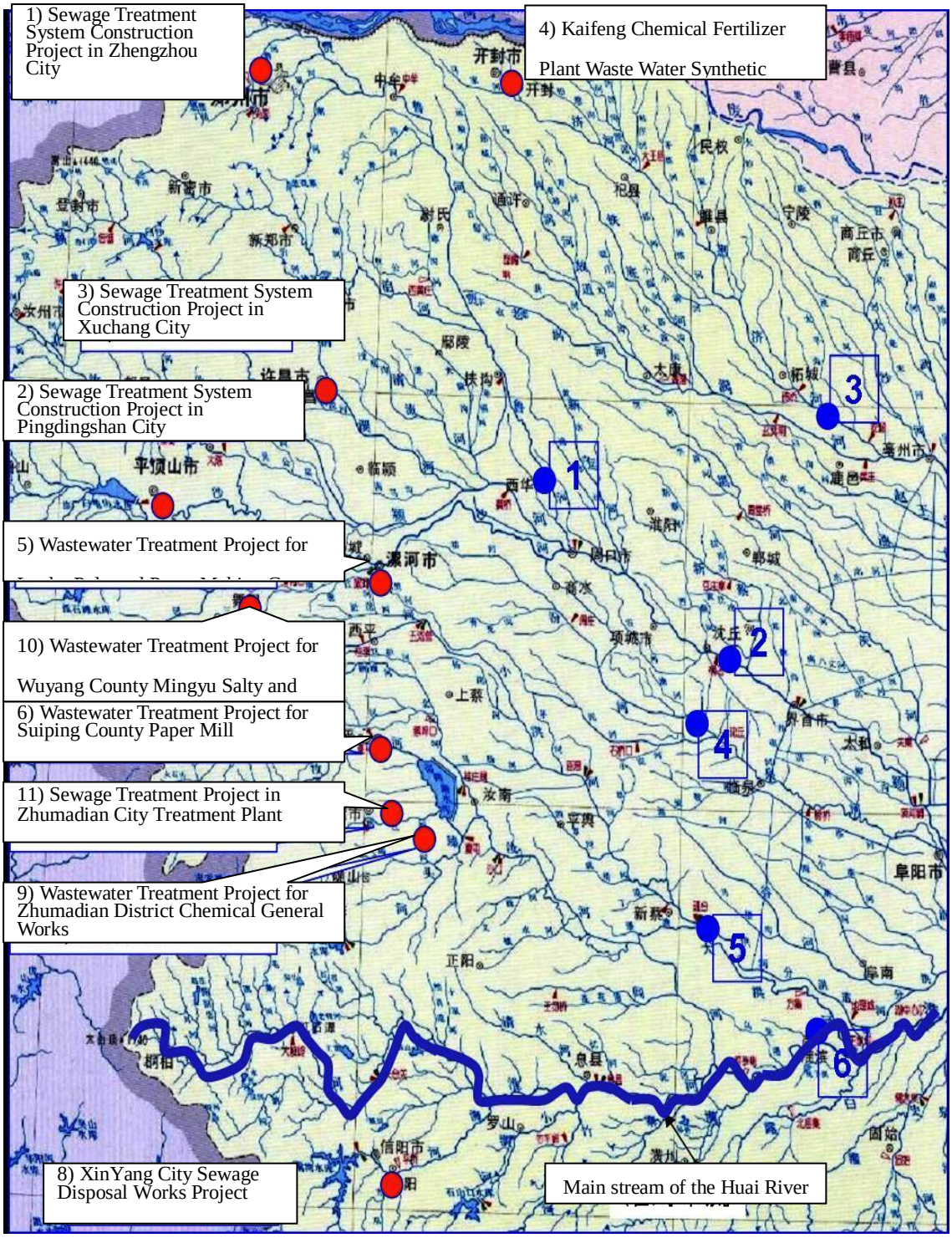
Table 2 List of Subprojects at the time of Evaluation in 1998 (II)

Number	Subproject Name	Type	Implementation Body
5)	Wastewater Treatment Project for Louhe Pulp and Paper Making Group	2	Louhe Yinge Paper Industry Company Limited
6)	Wastewater Treatment Project for Suiping County Paper Mill	2	Suiping country paper Making mill
7)	Wastewater Treatment Project for Feiyafei Paper Industry Company[4]	2	Feiyafei Paper Industry Company
8)	Wastewater Treatment Project for Zhoukou Paper Factory	2	Zhoukou country Papermaking mill
9)	Wastewater Treatment Project for Zhumadian District Chemical General Works	2	Zhumadian District Chemical factory

[4] In this evaluation report, the contractual name for yen loan "Wastewater Treatment Project for Feiyafei Paper Industry Company" is used instead of "Wastewater Treatment Project for Ruzhou Pulp Paper Industry Company" used in the assessment document.

10)	Wastewater Treatment Project for Wuyang County Mingyu Salty and Chemical Group Company	2	Wuyang County Mingyu Salty and Chemical Group Company Second Papermaking mill
11)	Sewage Treatment Project in Zhumadian City	1	Zhumadian city Wastewater Treatment Company Limited

Note: The numbers are in order listed in the assessment document.



1- Jialuhe River Xihuaxian Dawangzhuang

2- Shayinghe River Shenqiuxian Zhidian

3- Huiji River Luyixian Dongsunying

4- Quan River Shenqiuxian Lifen

5- Hong River Xincaibantai

6- Huai River Huaibin Hydrologic Station

[Explanatory notes]

●: Subproject Sites

●: Downstream Monitoring Sections

Note: Excludes subprojects before replacement or those cancelled

Figure 1 Executed subprojects and map of monitoring sections in downstream basin

2. Outline of the Evaluation Study

2.1 External Evaluator

Yuko Kishino, IC Net Limited

2.2 Duration of Evaluation Study

This ex-post evaluation was implemented as follows:

Duration of the Study: October, 2009 – October, 2010

Duration of the Field Study: January 17 – February 6, 2010; May 14 – May 20, 2010

2.3 Constraints during the Evaluation Study

In general, the analysis of differences between original and actual constitutes the basis of an ex-post evaluation. In this project, however, due to the obscurity of the planning (project objectives) and constraints of the investigation, evaluations of effectiveness could only be based, to a certain extent, on speculation.

Although an appraisal document by JICA cites "water quality improvement in the Huai basin, Henan Province" as a project objective, there is no mention of further specific goals. In the preliminary survey and Sino-Japanese Intergovernmental Conference, we interviewed the executing agency as to the objectives of this project for both nations. Judging from the interview results, scale of the project, and expected effects, we interpreted the goal of both nations as "water quality improvement in the subproject downstream basin," and thus decided to adopt the water quality data in the subproject downstream basin as the indicators of effectiveness.

The next problem was to clarify exactly where the subproject downstream basin was located. In order to verify the relationship between the subprojects and improvement of water quality, it is necessary to obtain water quality data from the monitoring sections in the vicinity of treated wastewater discharge points. For this reason, we attempted to obtain the water quality data from the monitoring sections in the vicinity, but the city/provincial environmental agencies did not have successive data from the time of appraisal to ex-post evaluation since it was only a couple of years ago that they had started collecting such data. Consequently, we decided to adopt the available water quality data from monitoring sections under the direct jurisdiction of the Department of Environment Protection of the Henan Provincial Government[5].

To evaluate effectiveness, it is also necessary to analyze to what extent this project has contributed to water quality improvement. However, since the monitoring sections under the jurisdiction of the Department of Environment Protection are geographically distant from the subproject sites, water quality is subject to various types of influences along the way. In other words, even if water quality

[5] The monitoring sections are established and water quality data are controlled by respective organizations including the Ministry of Environmental Protection/Ministry of Water Resources, Huai Basin Water Resources Committee, Environmental Protection Agencies/Water Resources Agencies of provincial governments, and Environmental Protection Agencies/Water Resources Agencies of city/couty governments. Accordingly, more often than not, monitoring points and the number of sections may or may not be the same depending on the organization. The data from the Henan Environment Protection Agency that was directly involved in this project had the highest availability.

improvement is confirmed, validating the relationship with this project is impossible. With the time and budgetary constraints of this ex-post evaluation survey, it was difficult to carry out an investigation into numerous factors influencing the water quality of each river in vast expanses of the basin area.

3. Results of the Evaluation (Overall Rating: B)

3.1 Relevance (Rating: a)

3.1.1 Relevance with the Development Plan of China

(1) Development Policy at appraisal

The most important issues in China's environment protection policy in accordance with the Ninth Five-year National Plan (1996-2000) were measures against water/air-quality pollution and improvement of urban environments. The goal advocated in the "National Environment Protection Ninth Five-year Plan and 2010 Long-term Goal" was to "prevent environmental pollution and ecosystem deterioration, improve environments in some cities/districts, maintain model cities/districts for ecosystem development, economic protection and environmental conservation." The water pollution control project targeted the "Three Rivers and Three Lakes"[6] including the rivers targeted in this project, as well as the Seven Great Rivers.

The "Henan Province Huai Basin Water Pollution Control Project and the Ninth Five-year Plan" (1996-2000) stipulated that it be imperative to construct sewage treatment facilities in principal cities within the province such as Zhengzhou, Pingdingshan, Xuchang, and Zhumadian, and implement measures against water contaminants from major factories with high pollution loads. It was declared that the chemical oxygen demand (COD)[7] at all the 48 monitoring sections[8] in the Huai River Basin in Henan Province would be improved from Class V of the National Surface Water Quality Standard (25 mg/L or below) to either Class III (15 mg/L) or Class IV (20 mg/L or below)[9]. This project was implemented pursuant to this plan.

(2)Development Policy atex-post evaluation

In the Eleventh Five-year National Plan (2006-2010), a goal of reducing the total amount of discharged major contaminants by 10% is laid out with an eye on strengthening ecosystem conservation, environmental protection and resources management. The National Environmental Protection Eleventh Five-year Plan (2006-2010) proposes goals such as increasing the ratio of water systems exceeding Class III in the Seven Great Rivers to 40% or above, decreasing the COD and the total amount of ammonia nitrogen discharge by 5% and 3%, respectively, compared with 2005, as well

[6] Huai River, Hai River, Liao River, Taihu Lake, Dian Lake, and Chao Lake.

[7] A unit used to represent the degree of water pollution, signifying the amount of oxygen consumed when organic compounds in the water are oxidized by oxidizing agents.

[8] The number of sections in Henan Province under the jurisdiction of the Huai Basin Water Resources Committee.

[9] GB3838-1988, enforced by the Environmental Protection Agency (the current Environmental Protection Ministry) in 1988, classifies 30 indices pertaining to water quality, such as COD, into Class I to V. GB3838－2002, revised in 2002, eases the COD concentration standard compared to GB3838-1988: Class III-20 mg/L or below; Class IV-30 mg/L or below; and Class V-40 mg/L or below.

as increasing the ratio of urban wastewater treatment to 60% or above.

The "Henan Province Huai River Basin Water Pollution Prevention Project and the Eleventh Five-year Plan" (2006-2010) speculates that the COD and discharge targets for ammonia nitrogen be set at the 46 monitoring sections in the Huai River Basin in Henan Province, thereby improving the values to between Class III and V in each section. The 12 cities under the direct jurisdiction of the province[10] intend to propose strict COD reduction goals, improve the treated water quality from wastewater treatment plants, and increase reuse rates.

This project is aimed at water quality improvement in the Huai River Basin—a prioritized area in relation to national, basin, and provincial policies; therefore its relevance is high.

3.1.2 Relevance with the Development Needs of China

3.1.2.1 The need for Water Quality Improvement in the Huai River Basin in Henan Province

At the time of appraisal, water quality pollution in the Huai River Basin in Henan Province was becoming grave. According to the COD measurement results (1996), 83% of the Huai River Basin sections within Henan Province exceeded Class V levels of the National Surface Water Quality Standard—the most polluted classification. In some sections, even heavy metal contaminants such as arsenic and hexavalent chromium were observed to exceed Class V levels. With Henan Province situated in the most upstream reaches of the Huai River Basin, water quality pollution within the province was having a serious impact on the downstream provinces of Anhui, Jiangsu and Shandong, thus necessitating urgent antipollution measures. Since this project is aimed at installing wastewater treatment equipment in principal cities and companies focusing on antipollution measures, the necessity of its implementation was high both at the time of appraisal and ex-post evaluation.

Meanwhile, the treated water discharged from the wastewater treatment facilities inaugurated in this project falls short of the water quality standard required by the government. In order to fulfill the national standard of contaminant discharge at the time of appraisal, wastewater treatment plants were constructed by employing the methodology and scale for effluent processing commensurate with the present needs. However, between 2001 and 2008, the discharge standard for contaminants in domestic/industrial wastewater was strengthened, thus resulting in an inability to achieve the required levels solely with the facilities installed in this project. With the view of complying with the discharge standard, the implementation bodies initiated efforts to remodel the technology and add installations at their expense in all subprojects.

3.1.2.2 Relevance of the Project

(1) Relevance of Project Goal Setting

Since the evaluation system at the time of appraisal did not require setting a goal with strict objectives and indicators, the goals set in this project cannot be regarded as adequate by JICA's present evaluation standards. Although a project goal of "water quality improvement in the Huai River Basin

[10] Zhengzhou, Kaifeng, Pingdingshan, Xuchang, Luohe, Zhumadian, Xinyang, Shangqiu, Zhoukou, Nanyang, and Luoyang.

in Henan Province" was announced at planning, no concrete objective was set in detail, nor was there any clarification as to how the goal was to be achieved and why the subprojects were selected. In light of the considerable discrepancy between the objective and scope of the project, we believe that a more realistic goal should have been set.

As shown in Figure 1, the Huai River in Henan Province branches into multitudes of tributaries with a vast basin area. If the project goal was interpreted literally as water quality improvement in the entire basin, the number of selected subprojects would be too small. Moreover, considering the dispersion of project sites in each tributary, overall positive effects on water quality were unlikely.

Taking into account the various factors that influence water quality, it appears that there was a lack in perspective: To what extent and in which section of the river should water quality be improved? What is the adequate scale and location in order for subprojects to achieve the given objectives? Are they appropriate as targets of a Japanese ODA loan project? Thorough consideration should have been made on the logical structure of the project as well as other external factors such as strategic selection of subprojects in close collaboration with the other water quality improvement projects in the Huai River Basin executed by Henan Province, and project goal setting proportionate to the subproject scale.

(2) Relevance of Subproject Selection

Of the 11 subprojects selected at the time of appraisal, one was replaced, another cancelled, and the equipment was removed in another factory shortly after the start of operation. The implementation bodies of these subprojects were paper mills and a chemical fertilizer plant that were unable to adjust to large shifts in their environments, namely the reform of state-run enterprises, adjustment of industrial structure, and environmental policies. As a result, effects could only be seen in only the remaining 9 subprojects, thus affecting the achievement of the project goal.

Although further details will be provided in 3.2.1, the 4) Kaifeng Chemical Fertilizer Plant Waste Water Synthetic Treatment Project, in which the equipment was removed, was forced into production closure or suspension due to a business downturn 4 years after inauguration. Of the 4 treatment facilities that had been installed in this subproject, 1 was removed and the remaining 3 went out of service for approximately 1 year. The installation of some disposal equipment built more than 30 years ago that produce high concentration nitric acid or sulfuric acid might have contributed to the outcome where the equipment had to be removed on account of dilapidation merely 5 to 9 years after the start of operation. In spite of the concern about the financial conditions of the factories voiced at the time of appraisal, financial analysis and fact-finding investigations were insufficient. Financial sustainability had been confirmed through mid-term evaluation and management and Special Assistance for Project Implementation (SAPI) by JICA on the basis of the proposals made at the time of appraisal. However, in hindsight, the factories could not respond to the changes in domestic policies and markets. If more in-depth investigation had been implemented at the time of appraisal, it can not be denied that situations of this kind could have been averted.

In contrast, sewage treatment system construction subprojects, which are more public in nature, are

being implemented in a steady manner thanks in part to the sponsorship of the government. From an environmental pollution prevention standpoint, projects for large-scale factories that generate COD and sewage treatment system construction projects in principal cities are both highly necessary and urgent. However, from the viewpoint of Japanese ODA loan targets, it might have been preferable to focus on more public sewage treatment facilities rather than factories whose sustainability is greatly susceptible to policies and markets.

In conclusion, it is essential for appraisals to fully ascertain the relevance of the project in question through processes such as the clarification of project objectives, concrete goal setting, and strategic selection of subprojects. Furthermore, as in the case of this project, if a project consists of multiple subprojects which are to be determined by loan contracts, it is desirable to put in place structures and systems that can swiftly respond to replacement at the implementation stage. There should be more flexible project planning in which loan contracts do not determine subprojects, and can also be adjusted for achievement of the objectives. In such cases, it is essential that an attentive and flexible management structure for project operation be in place in order to carry out subprojects that are more pertinent to goal attainment.

3.1.3 Relevance with Japan's ODA Policy

In the Economic Assistance Program for China (2001), a country-specific assistance policy, it was declared that "emphasis should be put on areas that centre on environment and ecosystem conservation, livelihood improvement and social development in inland regions, human resources training, system establishment, and technology transfer." The program places "cooperation on dealing with global-scale problems such as environmental issues" as the highest priority issue in the strategic field of assistance; therefore, the relevance between this project and the Japan's ODA policy is high.

In conclusion, this project has been highly relevant with the China's development plan, development needs, as well as Japan's ODA policy; therefore its relevance is high[11].

3.2 Efficiency (Rating: b)

3.2.1 Project Outputs

(1) Changes in Subprojects

After the appraisal, the loan contract was changed twice, ultimately leaving 10 subprojects to be implemented.

[11] Assessment on the "relevance of the project" was not reflected in the relevance rating for the following reasons: (1) The evaluation system at the time (1997-1998) did not require planning subject to assessment or strict and definite indicators for goal setting as today. (2) JICA interprets projects consisting of multiple subprojects such as this one as a sort of sector loan, and thus regards rigorous evaluation on each individual project as being practically difficult.

Table 3 List of changed subprojects

Projects at the time of appraisal	Actual
7) Wastewater Treatment Project for Feiyafei Paper Industry Company	Cancelled
8) Wastewater Treatment Project for Zhoukou Paper Factory	8) XinYang City Sewage Disposal Works Project (Replaced)

In the loan contract change in 2002, the "Wastewater Treatment Project for Zhoukou Paper Factory" was replaced with the "XinYang City Sewage Disposal Works Project." At the time of appraisal, the Zhoukou Paper Factory was producing 17,000 tons of pulp annually, and was planning to expand the production to 25,000 tons per year by installing a new manufacturing line. However, owing to the structural adjustment of the pulp and paper industry initiated since 2002 in Henan Province, manufacturing lines with an annual production capacity of 17,000 tons or less, including the Zhoukou Paper Factory, were closed down by 2003.

On account of the cancellation of the "Wastewater Treatment Project for Feiyafei Paper Industry Company" subproject, the loan contract was modified in 2006. This outcome stems from the concurrence of a number of adverse conditions. Although the possibility of replacing it with another subproject was explored, the plan never materialized on the grounds of the time required for its execution and the length of the loan period. In retrospect, had the decision for replacement been made earlier, the impact on the project goal accomplishment might have been minimized. The following are the circumstances leading up to the cancellation.

The plan at the time of appraisal was that wastewater disposal facilities and recycled pulp mills would be constructed within the premises of the factories in Ruzhou, a city under the jurisdiction of Pingdingshan, whereupon the treated water would be discharged into the Beiru River. However, in 2002, regulations on COD discharge into the Beiru River were tightened, thereby rendering it impossible to construct new factories in the city. This caused the project site to be relocated to Pingdingshan. In 2006, the Henan Provincial Government drastically strengthened the discharge standard of water pollutants from paper factories, thus forcing the subproject to review the wastewater disposal plan as a whole. Furthermore, the land acquisition cost and corporation tax, which the subproject was supposed to be exempt from, were no longer subject to exemption in accordance with a decision by Pingdingshan, with the resulting burden further aggravating the financial standing of the factory. Under such circumstances, the merger and reorganization of enterprises was encouraged as part of a structural adjustment policy of the paper industry. That being the case, the municipal government recommended that the Feiyafei Paper Industry Company merge with a state-owned money-losing enterprise as a condition for the execution of the Japanese ODA loan project. However, since the paper company refused to acquiesce to this condition, the subproject was discontinued after the loan contract was modified in accordance with a conference between the Chinese government and JICA.

(2) Subproject Outputs (See Attachment 1)

In 3 subprojects, modifications were made to the original plan. We consider this decision to be appropriate as these modifications were made to correspond to the changes in the environment surrounding these subprojects at the implementation stage. They had no significant influence on either the project period as a whole or the costs of the project.

Of the Type 1 subprojects, modifications were made to the 3) Sewage Treatment System Construction Project in Xuchang City. The construction of advanced water treatment equipment was temporarily suspended as the expected demand by the recipients of the water supply disappeared for the time being. Construction resumed in a self-funded manner after water supply destinations were secured. Meanwhile, foreign currencies were funneled into the construction of the sewer culverts, which had been scheduled to be built using domestic currency, due to the difficulties in financing by the local governments. This change resulted in an extension of the project period by 6 years and an increase in subproject costs by 1.6 times the original amount. By contrast, the water catchment area in Xuchang was expanded, with the operational rate of the facilities increasing from 30% to 90% or above.

Of the 5 Type 2 subprojects, changes were made in the 6) Wastewater Treatment Project for Suiping County Paper Mill and 10) Wastewater Treatment Project for Wuyang County Mingyu Salty and Chemical Group Company. As a result of the aforementioned industrial structural adjustment policy in 2002, small-scale paper mills were either shut down or suspended, substantially decreasing the demand for pulp in the market. Faced with the necessity to equip themselves with production lines of their own that encompassed the entire process from pulp making to paper manufacturing in order to continue production, the Suiping County Paper Mill and the Wuyang County Mingyu Salty and Chemical Group Company added printing paper manufacturing equipment and cardboard manufacturing equipment, respectively.

In 2 other subprojects, equipment was either scaled back or removed after the completion of the subprojects as scheduled. One is the 1) Sewage Treatment System Construction Project in Zhengzhou City, with the capacity of the wastewater treatment facility curtailed to 240 thousand tons daily from the originally planned 400 thousand tons daily 3 years after the start of operation in 2006. This is due to 2002's tightening of the discharge standards for contaminants in treated urban wastewater, which urged the addition of new equipment for removing ammonia nitrogen, E. coli and phosphorous. In 2006, 3 internal circumfluence system pumps were added to the reaction tank for the purpose of eliminating ammonia and nitrogen, and at the same time, the mode of treatment was changed. Since system capacity was limited, the implementation body scaled back the facilities maintained by the Japanese ODA loan and installed new equipment capable of treating 160 thousand tons per day using private funds.

The other subproject where equipment was scaled back or removed was the 4) Kaifeng Chemical Fertilizer Plant Waste Water Synthetic Treatment Project mentioned in the "relevance section". In April 2003, a business downturn stemming from market factors forced the Kaifeng Chemical Fertilizer

Plant (name at the time of appraisal)[12] to suspend all of its operations producing arsenic, cyanogen, high concentration nitric acid, and sulfuric acid[13]. At this stage, the production of arsenic was discontinued and the treatment equipment for arsenic wastewater was removed. Although the production of cyanogen and high concentration nitric acid was succeeded and resumed by the "Kaifeng Jinkai Chemical Limited Liability Company" founded thereafter in May 2004, the company was unable to conform to the industry standard for environmental protection technology for nitrogenous fertilizers set by the Department of Environment Protection in Henan Province; therefore in September 2005, the treatment equipment for cyanic wastewater was removed. Meanwhile, the treatment equipment for concentrated nitric acid discharge installed in the production equipment for concentrated nitric acid introduced in the 1960s was removed along with the production equipment in 2004 due to dilapidation. Although the Kaifeng Chemical Fertilizer Plant (name at the time of appraisal) resumed the production of nitric acid in 2004, its 2 production systems, having been made in the 1960s and 80s and poorly maintained, were both in a state of severe disrepair. Consequently, on the basis of safety inspection results in 2008, the treatment facility for nitric acid discharge was removed along with the production equipment.

Fig. 2 Reaction Tank in a Sewage Treatment Facility in Zhengzhou

Fig.3 After Equipment Removal, Kaifeng Chemical Fertilizer Plant Waste Water Synthetic Treatment Project

3.2.2 Project Inputs

3.2.2.1 Project Period

The project periods were (I) September 1997 – December 2006 (112 months) and (II) December 1998 – June 2008 (115 months) as opposed to the schedules of (I) September 1997 – December 2000 (40 months) and (II) December 1998 - December 2001 (49 months), resulting in ratios of 280% and 235%. With the exception of the 4) Kaifeng Chemical Fertilizer Plant Waste Water Synthetic

[12] The name was changed to the Kaifeng Chemical Collective Company Limited in 1998, but the name at the time of appraisl is used here.

[13] Of arsenic, cyanogen, high concentration nitric acid, and nitric acid,, the production of cyanogen, high concentration nitric acid, and nitric acid was suspended only temporarily before the resumption in 2004.

Treatment Project at a ratio of 65%, the period of each subproject was significantly longer than planned at a ratio of 150% (See Attachment 2). This is partly attributable to the considerable amount of time squandered in the cumbersome procedures from the official launch to the approval of completion inspection and measures to prohibit business trips due to severe acute respiratory syndrome (SARS).

The reasons for the delay in the 5 subprojects where the project ratios exceeded 200% were as follows:

Government policy had a great influence on the 5) Wastewater Treatment Project for Louhe Pulp and Paper Making Group and 10) Wastewater Treatment Project for Wuyang County Mingyu Salty and Chemical Group Company. As the structural adjustment of the paper industry carried out between 2002 and 2005 changed the market, the companies were compelled to either discontinue or modify their production lines, production scale, and investment plans in waste water treatment facilities, etc. Furthermore, due to the alteration in the stock structure as a result of the reform of state-owned enterprises, the Suiping County Paper Mill needed significant time before deciding its management policy. Meanwhile, the Wuyang County Mingyu Salty and Chemical Group Company, having been affected by the structural adjustment, went bankrupt after falling into distress. It took some time for a new company to be established and operations to be resumed. The delay in the 3) Sewage Treatment System Construction Project in Xuchang City and 6) Wastewater Treatment Project for Suiping County Paper Mill derived from the fact that fund-raising by the local governments lagged behind schedule. The delay in the 9) Wastewater Treatment Project for Zhumadian District Chemical General Works was caused by a suspension of construction due to personnel changes in the company's executive board, as well as a review of shopping and bidding lists.

3.2.2.2 Project Cost

The total project costs combining (I) and (II) were 29.95 billion yen (including 10.61 billion yen in foreign currency) in actuality as opposed to the initial estimate of 32.176 billion yen (including 12.175 billion yen in foreign currency), thus lower than planned. That is 97.5% of the planned total project costs of 30.729 billion yen (including 11.432 billion yen in foreign currency) excluded cancelled subproject.

In conclusion, although the project cost was mostly as planned, the project period was significantly longer than planned; therefore the efficiency of the project is fair.

3.3 Effectiveness (Rating: b)

3.3.1 Quantitative Effects (Water Quality Improvement in the Subproject Downstream Basin)

With the project objective regarded as "Water Quality Improvement in the Subproject Downstream Basin" as described above, analysis will be conducted on the following 2 levels:

(1) Results from Operation and Effect Indicators (Effects of the Project as a Whole and Individual Subprojects)

(2) Water Quality in the Monitoring Section of the Subproject Downstream Basin (COD)

3.3.1.1 Results from Operation and Effect Indicators

(1) Effects of the Project as a Whole

Judging from the project design, the COD elimination quantity was estimated to be 243,165 tons at the time of appraisal. In response to the cancellation of the 7) Wastewater Treatment Project for Feiyafei Paper Industry Company, the planned COD elimination quantity was revised downward to 197,610 tons annually. The 2009 gross COD elimination quantity of the 9 subprojects in operation at the time of ex-post evaluation was 140,457 tons, i.e. 71% compared to the plan.

Table 4 COD Elimination Quantity

(Unit: Tons)

	Original	Actual	Ratio
Type 1: Sewage Treatment Subprojects	98,740	115,097	117%
Type 2: Factory Contaminant Source Treatment Subproje	98,870	25,360	26%
Total	197,610	140,457	71%

As opposed to the planned ratio of 117% in Type 1, the ratio for Type 2 was lower, at 26%. In parallel with the expansion of the piping construction area and annual increase in the drainage volume, the COD elimination quantity is also in an increasing trend in sewage treatment plants. Nevertheless, the fact that the drainage volume decreased in the plants compared with the figure at the time of planning as a result of efforts to save production water and enhance the cyclic utilization ratio through the introduction of cleaner production made a difference. In addition, it was also significant that in reaction to the tightening of wastewater discharge standards for the paper industry by both the National and Henan Provincial Governments, the COD discharge per production unit was reduced by adding/installing new deep-layer aeration apparatus and anaerobic treatment equipment using private funds. As shown in Figure 4, the water and COD discharge volumes in the paper mills decreased 64-72% and 81-94%, respectively. Although the water discharge volume did not change in the 9) Zhumadian District Chemical General Works as it had been planned that at least 95% of the treated water would be reused as gas washing water in the factory, the COD discharge volume per production unit was curtailed by 32%. In terms of water quality improvement, these positive factors warrant favourable assessment.

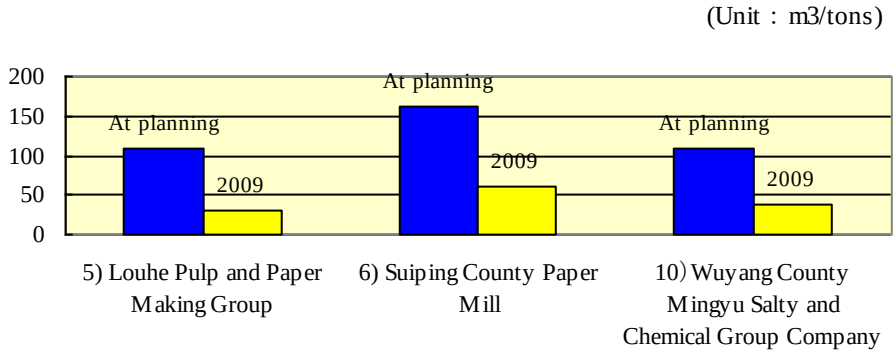


Figure 4 Change in Water Discharge Volumes per Production Unit

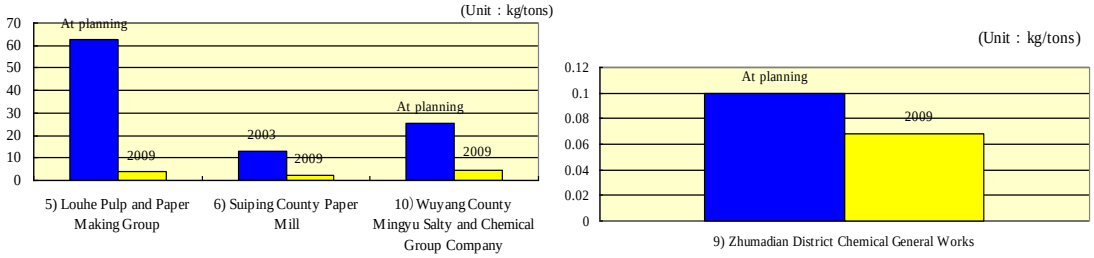


Figure 5 Change in COD Discharge Volumes per Production Unit

As shown in Table 5, all the achievement rates in Type 1 were at least 80%. The elimination rates of COD, biochemical oxygen demand (BOD)[14], and suspended solids (SS)[15] were also high, with at least 92% in Type 2 as well. Therefore, this project can be considered sufficiently effective.

[14] A water pollution indicator especially important as one of the regulation items for industrial wastewater, etc. Represented as an oxygen volume consumed when microorganisms decompose organic substances in the water, the larger the value is, the higher the degree of water pollution.

[15] Refers to insoluble particulate substances suspended in the water. Includes zoo/phytoplankton and their remains, organic substances deriving from sewage/industrial wastewater, metal precipitates, etc.

Table 5 Plan/Achievement Ratios of Major Indicators

Type 1

	Original (1997	Actual (2009)	Ratio
Sewage Treatment Population (10 thousand people)	311	274	88%
Sewage Treatment Volume (10 thousand cubic meters/day)	83	84	101%
COD elimination volume (tons/year)	98,740	115,097	117%
COD elimination ratio (%)	78	89	114%
BOD elimination volume (tons/year)	45,825	50,793	111%
BOD elimination ratio (%)	86	91	106%
SS elimination volume (tons/year)	67,215	84,739	126%
SS elimination ratio (%)	87	93	107%

Sources: Original-appraisal documents; Actual-individual subprojects

Note 1: The elimination rates are the comparisons between the water quality at the time of wastewater inflow and that of treated water, and are the mean values of each subproject.
Note 2: The actual values include the effects of the equipment constructed additionally using private funds.

Type 2

	Original	Actual	Ratio
Sewage Treatment Volume (10 thousand cubic meters/day)	11	7	61%
COD elimination volume (tons/year)	78	83	106%
COD elimination ratio (%)	N/A	92	N/A
BOD elimination volume (tons/year)	27,968	6,827	24%
BOD elimination ratio (%)	N/A	95	N/A
SS elimination volume (tons/year)	34,885	13,919	40%
SS elimination ratio (%)	N/A	96	N/A

Source: Individual subprojects

Note 1: The elimination rates are the comparisons of the water quality at the time of wastewater inflow and that of treated water, and are the mean values of each subproject.
Note 2: The actual values include the effects of the equipment constructed additionally using private funds.
Note 3: The above figures apply only to the subprojects in operation at the time of ex-post evaluation.
Note 4: The above figures do not include the BOD and SS values of 9) Zhumadian District Chemical General Works as they were not available.

(1) Effects of Individual Subprojects

1) Type 1: Wastewater Treatment Subprojects (See Attachment 3)

The amount of wastewater treated[16] and the rate of facility utilization[17] are indicators to determine whether or not the sewage treatment facilities have been fully operated and utilized. In Type 1, the amount of wastewater treated and rate of facility utilization in 2009 were all at least 80%; thus, the equipment was being operated/utilized efficiently at the time of ex-post evaluation. Nevertheless, there were sewage treatment facilities that had a low facility utilization rate for a few years since their inauguration. These are the cases in which the piping branch lines in the disposal areas were constructed after the completion of the facilities: in the 3) Sewage Treatment System Construction Project in Xuchang City, the rate of facility utilization was of the order of 30% for 2 years after the start of operation; and in the 11) Wastewater Treatment Project for Zhumadian District Chemical General Works, it was 50% for 1-2 years. In the 8) XinYang City Sewage Disposal Works Project, there are still areas where piping has yet to be laid down at present; thus the rate has not reached 100%.

An issue in relation to water quality is that part of the untreated sewage is discharged directly into

[16] Volume acceptable by a sewage disposal facility.
[17] Average daily disposal volume/equipment capacity.

rivers in ten-odd days during the summer when there are heavy downpours, thereby contributing to water quality pollution. This kind of situation occurs when the sewage volume exceeds the amount assumed for sunny days at once by a certain percentage because with the exception of the 3) Xhuchang Wastewater Treatment Plant, a combined drainage system, which drains out rainwater and sewage in the same piping, is utilized. Although the government recommends that this system be converted to a separate drainage system, problems such as construction expenses are hindering the conversion in old towns.

Thanks partly to the addition of privately funded equipment, the quality of the treated water in all the subprojects satisfies the Grade Pre-1 Discharge Standard for Urban Wastewater Treatment Facilities (Grade A or Grade B)[18].

2) Type 2: Factory Contaminant Source Treatment Subprojects (See Attachment 4)

Although the rate of facility utilization of the 6) Wastewater Treatment Project for Suiping County Paper Mill and 9) Wastewater Treatment Project for Zhumadian District Chemical General Works were satisfactory, those of the 5) Wastewater Treatment Project for Louhe Pulp and Paper Making Group and 10) Wastewater Treatment Project for Wuyang County Mingyu Salty and Chemical Group Company were 48% and 44%, respectively, indicating an insufficient utilization of the facility's capacity. In the Louhe Pulp and Paper Making Group, the fact that the drainage volume had decreased by a large margin due to measures such as water saving and reuse of wastewater had an impact. In the Wuyang County Mingyu Salty and Chemical Group Company, of the 5 plants that had been targeted at the time of appraisal, only 1 remained as a target after the other small-scale plants were shut down on account of the structural adjustment of the industry. Furthermore, the government's policy prescribed that the manufacturing process be modified so that 70% of the industrial water would be reused in the production lines for recycled pulp. This also contributed to the reduction of wastewater.

As in Type 1, with the addition of wastewater disposal equipment through private funds, the COD concentration in the treated water conforms to the discharge standard of water pollutants for the paper industry[19] and the discharge standard of water-quality pollutants for synthetic ammonia plants[20].

[18] The contaminant concentrations prescribed in GB18918-2002 are as follows: COD-50mg/l (Class A), 60mg/l (Class B); BOD-10 mg/l (Class A), 20 mg/l (Class B); SS-10 mg/l (Class A), 20 mg/l (Class B)

[19] The contaminant concentrations prescribed in GB3544-2008 are as follows: COD-120 mg/l (recycled pulp), COD-150 mg/l (other pulp products).

[20] The contaminant concentration prescribed in GB13458 -2002 is COD-150 mg/l.

Fig.6 Wuyang County Mingyu Salty and Chemical Group Company

Fig. 7 Treated Water in Zhumadian District Chemical General Works

3.3.1.2 Water Quality in the Subproject Downstream Basin (COD Concentrations)

The monitoring sections of the subproject downstream basin under the jurisdiction of the Department of Environmental Protection of Henan Province are as follows. With the exception of No. 1, the other 5 locations are monitoring sections situated on the border between Henan Province and Anhui Province. With these sections being geologically distant from the subproject sites, the water quality at these locations is subject to the influence of domestic/industrial wastewater from numerous locations outside the coverage of the subprojects, as well as that of other water quality improvement projects. Consequently, as stated in the constraints during the evaluation study in segment 2.3, it is impossible to corroborate the correlation between the subprojects and changes in water quality in the monitoring sections, much less evaluate the effectiveness of this project in an accurate manner. In this segment, therefore, we intend to ascertain how the COD concentrations in the downstream monitoring sections of the subprojects fluctuated, and whether or not the COD concentration objectives set by the Chinese government at the time of appraisal were achieved.

Table 6 Monitoring Sections in Subproject Downstream Basin

No.	Name of Downstream Monitoring Section	Subproject	Rivers/water systems into which treated water flows
1	Jialuhe River Xihuaxian Dawangzhuang	1) Sewage Treatment System Construction Project in Zhengzhou City	Jialu river /Shaying river
2	Shayinghe River Shenqiuxian Zhidian	2) Sewage Treatment System Construction Project in Pingdingshan City	Zhan river/Sha river, Ying river, Shaying river

		3) Sewage Treatment System Construction Project in Xuchang City	Qingyi river/Qingni river, Shaying river
3	Huiji River Luyixian Dongsunying	4) Kaifeng Chemical Fertilizer Plant Waste Water Synthetic Treatment Project	Wohe river/Huiji river
4	Quan River Shenqiuxian Lifen	5) Wastewater Treatment Project for Louhe Pulp and Paper Making Group	South magou river/Hei river, Ni river, Quan river
5	Hong River Xincaibantai	6) Wastewater Treatment Project for Suiping County Paper Mill	Liwang river/Beiru river, Ru river, Hong river
		9) Wastewater Treatment Project for Zhumadian District Chemical General Works	Huangyou river/Suya lake, Hong river
		10) Wastewater Treatment Project for Wuyang County Mingyu Salty and Chemical Group Company	Hong river
		11) Sewage Treatment Project in Zhumadian City	Lianjiang river/Suya lake, Hong river
6	Huai River Huaibin Hydrologic Station	8) XinYang City Sewage Disposal Works Project	Shi river/ Main stream of the Huai River

(Unit: mg/l)

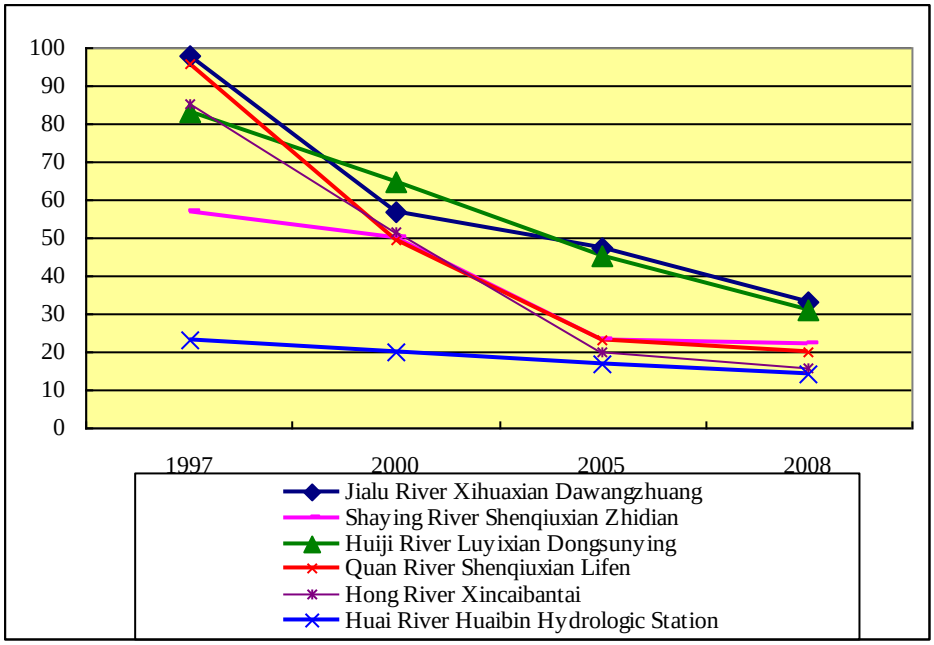


Figure 8 COD Concentrations in the Monitoring Sections in Subproject Downstream Basin

As shown in Figure 8, COD was improved in all 6 monitoring sections. The water quality at the Huai River Huaibin Hydrologic Station situated in the main stream of the Huai River improved to the extent where it is now potable. This can be regarded as the effects of not only this project but also the projects and policies for water quality improvement in the Huai River under the auspices of the Central and Henan Provincial Governments, as well as environmental measures taken by enterprises discharging pollutants[21, 22].

On the other hand, as shown in Table 7, the Hong River Xincaibantai and Huai River Huaibin Hydrologic Station where the only 2 locations that achieved the target values proposed by the Chinese government at the time of appraisal[23]. In spite of an attainment rate of 30%, if factors that adversely affect water quality such as population growth and economic development are taken into account, the fact that COD improved to 2008 levels is praiseworthy. In fact, in the cities and counties where the subprojects are located, their populations increased by approximately 6% between 1997 and 2009,

[21] Presidential Decree No.22 in the Environmental Protection Law of the People's Republic of China (December 26, 1989) stipulates that companies discharging contaminants should strive to prevent pollution by their own factories through technical innovations. If their contaminant discharge exceeds the standard prescribed by the government, they are required to pay discharge expenses pursuant to the regulations.

[22] The gross investment planned in the 9th~11th 5-year program (1996-2010) in the "Henan Huai Basin Water Quality Pollution Control Project" amounted to 22.1 billion yuan (403 projects).

[23] Since no specific numerical targets were set at the time of evaluation, it was decided that the COD values in the national surface water quality standard proposed in the "Henan Province Huai Basin Water Pollution Control Project and the 9th 5-year Plan" (1996-2000) were to be regarded as the target values. In 2002, the COD values in the national surface water quality standard were eased in China. Therefore, in the ""Henan Province Huai Basin Water Pollution Control Project and the 11th 5-year Plan" (2006-2010), downwardly-revised figures from target values at the time of evaluation are listed as the targets for the year 2010.

with the local and industrial gross products soaring by 3 times and 4 times, respectively[24] resulting in an increased strain on the environment.

Table 7 COD Concentrations in the Monitoring Sections in Subproject Downstream Basin

(Unit: mg/l)

No.	Downstream Section	1997	2000	2005	2008	Target concentration for 2000 at the time of appraisal
1	Jialu River Xihuaxian Dawangzhuang	98	56.6	47.6	33.3	20 or below
2	Shaying River Shenqiuxian Zhidian	57.1	49.9	22.9	22.1	20 or below
3	Huiji River Luyixian Dongsunying	83.2	64.8	45.5	31.3	25 or below
4	Quan River Shenqiuxian Lifen	95.9	49.5	23.4	20.2	20 or below
5	Hong River Xincaibantai	85.1	51.7	19.8	15.6	20 or below
6	Huai River Huaibin Hydrologic Station	23.3	20	17.1	14.2	15 or below

Source: Department of Environmental Protection of Henan Province

3.3.1.3 Results of Calculations of Internal Rates of Return (IRR)

At the time of appraisal, the financial internal rates of return of the 1) Sewage Treatment System Construction Project in Zhengzhou City, 2) Sewage Treatment System Construction Project in Pingdingshan City, and 3) Sewage Treatment System Construction Project in Xuchang City were calculated, with the revenues from sewage disposal and water recycling as profits, and expenses for construction, sewage treatment, maintenance, and taxes, as expenditures. As a result, the rates of return were -2.45~3.03% (project life 30 years), 2.17% (23 years), and 2.1% (22 years), respectively. Of these, negative figures were obtained from the recalculation of the FIRR of both the 1) Sewage Treatment System Construction Project in Zhengzhou City and 3) Sewage Treatment System Construction Project in Xuchang City. This is attributable to the fact that maintenance and management expenses ended up being 1.17 times and 2.35 times more than the initial estimates, respectively. In the 3) Sewage Treatment System Construction Project in Xuchang City, construction expenses and taxes surpassed the initial estimates by a significant margin.

3.3.2 Qualitative Effects

See 3.4.1

In conclusion, this project has somewhat achieved its objectives, therefore its effectiveness is fair.

[24] According to the city/county governments that have jurisdiction over each subproject.

3.4 Impact

3.4.1 Intended Impact (Enhancement of Living Conditions of the Local Residents in the Subproject Downstream Basin)

In this ex-post evaluation survey, we conducted a questionnaire survey among the beneficiaries with the aim being to ascertain how the farmers and residents in the subproject downstream basin recognize the changes in water quality, and how the improvement of water quality changed their living conditions. The subjects of the survey were 125 persons in total: 32 farmers and 28 residents living in the downstream basin of the Heihe River, a confluent of the Nanmagou River into which treated wastewater from the Louhe Pulp and Paper Making Group is discharged, and 33 farmers and 32 residents living in the downstream basin of the Ru River, into which the treated wastewater from the Suiping County Paper Mill is discharged.

(1) Changes in Water Quality

Of the farmers living in the downstream basin of the Heihe River, 97% responded that "water quality improved" from before the implementation of the project, and recognized that the color of the river changed from black to yellowish green. As opposed to the 60% who had merely regarded the river water as useless sewage before project implementation, 69% are now considering use of river water as agricultural water after the project. In the downstream basin of the Ru River, the 88% of the farmers replied that "the water quality improved" from before the implementation of the project, and recognized that the color of the river changed from either black or red to green. Those who answered that they could use the river water after the project for scenic purposes in addition to agricultural water reached 46%. These results indicate that the farmers living in both basins were aware of the improvement in water quality, thereby leading to further utilization of the rivers.

Fig.9 South magou River

Fig.10 Heihe River

(2) Changes in the Agricultural Environment

The main agricultural product of the survey area is wheat, followed by corn and soybeans. Agricultural water is drawn either from groundwater or rivers. In the downstream basin of the Heihe River, 90% responded that the water quality affects the quality/yield of the produce either "to a certain

extent" or "significantly," and 88% said that the yield increased either "somewhat" or "greatly" after the project. The ratios were 64% and 97%, respectively, in the downstream basin of the Ru River. Consequently, a large number of farmers evaluated that the changes in river water quality had a relatively favorable impact on their agricultural earnings.

(3) Changes in Living Conditions

In the downstream basin of the Heihe River, 86% of the residents responded that the changes in the water quality either "brought some advantages" or "brought tremendous advantages" to their life, and 50% noticed an "improvement in the scenery." In the downstream basin of the Ru River, the ratios were 88% and 53%, respectively. Before the implementation of the project, only 40% (Heihe River) and 41% (Ru River) visited the respective rivers for some purposes, whereas the ratios increased to 93% (Heihe River) and 97% (Ru River) after the project. The purposes of their visits also varied, including swimming, walking, fishing, and so forth. In the downstream basin of the Ru River, 50% of the residents responded that the "foul odor has disappeared." This is believed to be because the black fluid discharged from the Suiping County Paper Mill has stopped after the project.

Fig.11 Beneficiary Survey

Fig.12 Ru River

In light of the paucity of the sample number and mixed levels of knowledge and interest in the rivers, the results of this beneficiary survey do not necessarily represent the beneficiaries as a whole. Nevertheless, it is apparent that many of the beneficiaries in the subproject areas recognize an improvement in their agricultural environment and living conditions on account of the improvement in water quality.

3.4.2 Other Impacts

3.4.2.1 Impacts on the Natural Environment

The environmental measures planned in Type 1 were measures against foul odors, noise, and disposal of sludge, a by-product in the sewage treatment process. With regard to foul odors and noise, measures such as an installation of separation spaces including green belts, a ban on housing construction within a radius of 200m from the disposal facilities, and installation of noise/vibration

abatement systems were taken. Initially, the polluted sludge had been scheduled to be used as compost after being dried. However, it was only implemented in the 3) Sewage Treatment System Construction Project in Xuchang City, with the rest being buried in waste disposal sites without being dried or burned. The implementation bodies of each subproject have not indicated any problems pertaining to the current treatment method.

With regard to Type 2, JICA's appraisal document did not specify any environmental mitigation measures. On the basis of planning by the Chinese side, appropriate measures such as measures against foul odors, noise, air pollution, and disposal of solid waste were taken, and no environmental problems have occurred. The activated sludge generated during the sewage treatment process has been reconverted to resources as fertilizers and additives for brick and packing paper, which were either given away for free or sold.

3.4.2.2 Land Acquisition and Resettlement

At the time of appraisal in 1997 and 1998, the resettlement of residents was not planned. With a change in the loan contract in 2002, 8 residents from 2 households became resettlement targets in the 8) XinYang City Sewage Disposal Works Project. According to the implementation body of the subproject, resettlement procedures were processed without incident, and the residents' livelihood was improved after the resettlement. With the exception of the 4) Kaifeng Chemical Fertilizer Plant Waste Water Synthetic Treatment Project and 9) Wastewater Treatment Project for Zhumadian District Chemical General Works, land for project sites measuring a total area of 2551 ha, worth 92.66 million yuan in total, were acquired in 8 subprojects.

Considering the nature of the project, improvement of water quality, impact can only be confirmed in the vicinity of the subproject sites and water discharge locations, and the further one moves away from the discharge locations, the less the impact can be felt. Therefore, since the results of the beneficiary survey substantiated that this project contributed to the improvement of living conditions of the local residents, albeit in a limited area, and there were no other negative impacts, we can conclude that the project has been effective to a certain extent.

3.5 Sustainability (Rating: a) (See Attachment 5)

3.5.1 Structural Aspects of Operation and Maintenance

(1) Executing Agency

At the time of appraisal (1997), the Henan Provincial Government established a liaison office as a management office of Japanese Loan for Environmental Protection Project within which the Planning Committee, Department of Environment Protection, and Foreign Trade and Economy Committee of the province participated. It was decided that the subprojects would be carried out by each implementation body under the supervision of the said liaison office. At the time of ex-post evaluation,

the Foreign Trade and Economy Department of the Development and Reform Committee[25] of the province, functioning as the said liaison office, supervised the operation status of the subprojects. The environmental supervisory organization is the Department of Environment Protection of the province comprising of the Law and Regulation Department, Planning Finance Department, Public Relations and Education Department, and Discipline Inspection Office. It is responsible for the formulation of environmental protection plans, environmental observation and administration. Both organizations are regularly inspect and direct the subprojects, and thus have no systematic problems as the supervisory institutions.

(2) Implementation Bodies of the Subprojects

In many cases, the implementation bodies and organization names have changed since the time of appraisal (See Attachment 6).

At the time of ex-post evaluation, state-owned enterprises, where the state was responsible for 100% of the funds invested, are limited to the 1) Zhongyuan Environment Protection Company Limited, 2) Pingdingshan Sewage Purification Company, and 8) XinYang City Sewage Disposal Limited Liability Company. The majority were reorganized into publicly traded corporations between 2003 and 2008 as an extension of the reform of state-owned companies that had started in the 1990s. The 3) Xhuchang Ruibeiqia Purification Water Business Limited Company and 11) Zhumadian City Sewage Disposal Limited Liability Company were privatized in 2006, thereby constructing a new mechanism for corporate management. The Ruibeiqia Group Corporation, a stockholder of the 3) Xhuchang Ruibeiqia Purification Water Business Limited Company, is a listed enterprise and owns 6 subsidiaries engaged in real estate, mining, waterworks, expressways, hotels, and so forth. One hundred percent of the investment in the 8) Zhumadian City Sewage Disposal Limited Liability Company is from the Zhumadian City Country Business Waterworks Group Corporation, which engages in businesses such as water supply projects and mineral water production. According to the executing agency, both companies are supervised pursuant to the corporation law, and thus have no systematic problems. Incidentally, the 4) Kaifeng Jinkai Chemical Limited Liability Company went bankrupt in December 2009.

3.5.2 Technical Aspects of Operation and Maintenance

(1) Executing Agency

The Department of Environment Protection, an environment supervisory organization, regularly conducts inspections of the operation status of the subproject sites and contaminant discharge volume. The drainage outlets of each subproject are installed with automated 24-hour online monitoring devices belonging to the Environment Agency. Furthermore, the department, along with the province, 9 provincial cities, and environment monitoring stations positioned in all counties, carries out

[25] The name was changed from the Planning Committee after the duties of the Economy and Trade Committee were integrated in 2003.

monitoring, water quality inspection, direction, and supervision every month.

(2) Implementation Bodies of the Subprojects

In all of the implementation bodies whose information was obtained, technical assessment criteria for operation and maintenance have been established, and personnel who fulfill those criteria are stationed. With established training systems for technical improvement, there appears to be no problem with respect to the maintaining of technical levels and acquisition of new skills. According to the executing agency, technical standards in relation to operation and maintenance are high, and management discipline is appropriate. Judging from the operation status to date, it is safe to say that technical abilities are at the proper levels.

3.5.3 Financial Aspects of Operation and Maintenance

(1) Executing Agency

They were not subjected to assessment at this time as they were not directly related to the financial sustainability of the subprojects.

(2) Implementation Bodies of the Subprojects

With regard to the finances in Type 1, it was indicated at the time of appraisal (1997) that the operation and maintenance structure should be reviewed and the fee structure revised since the fee rates for sewage disposal were low, and thus the maintenance and operation cost per unit could not be afforded. The sewage disposal fees[26] in Henan Province were revised in 2004 to the current 0.65 yuan for general households, 1 yuan for commercial establishments, and 0.8 yuan for industrial plants—25~333% higher than at the time of appraisal. The actual operation and maintenance fees per square meter vary from 0.31 to 2.21 yuan depending on the sewage disposal facility and fiscal year, but the periods when the sewage disposal fees fell below the unit price of operation and maintenance were limited to those when the facility operation rate was low. Consequently, as long as equipment is fully operated and 100% of the sewage disposal fees are collected, the current standard poses no problem.

On the other hand, from the perspective of efficient operation management, the administrative structure of the current sewage disposal fees still has some room for improvement. Due to their highly public nature, sewage disposal projects require long-term and stable guarantees by the government. On the basis of this understanding, sewage disposal fees are collected by other proxy organizations and paid to the government, which then allocates from the budget necessary maintenance and operation expenses annually to the sewage disposal facilities. Therefore, the incentive for operation improvement in the sewage disposal facilities tends to be suppressed. In the future, the government is

[26] After the provincial government holds a public hearing participated in by local residents, the city/county governments determine the sewage disposal fees on the basis of the base amounts that set the directed prices; where after the provincial government gives its approval to the pricing.

expected to improve the administrative structure of sewage disposal fees so that the implementation bodies can further advance the streamlining of operation and maintenance tasks, as well as reducing costs. It is also desirable that the implementation bodies make management efforts to diversify its revenues through methods such as cost reduction, sale of recycled water, conversion of sludge into resources and so forth.

Of the 2006-2008 financial indicators (See Attachment 7) of implementation bodies in Type 2, the current ratio is low, suggesting low short-term solvency, but the rest are generally favorable. In the 10) Wuyang yinghe paper Company Limited, the profit ratio of total capital and the net profit to sales ratio were negative in 2008. This is probably due to accruing financial expenses in 2008, when sales fell slightly below 2007 levels that were 112% higher than 2006. Although a questionnaire survey with the said company did not refer to financial problems, thus implying no major financial problems, the executing agency is required to monitor its financial status hereafter as well.

3.5.4 Current Status of Operation and Maintenance

It was confirmed that operation and maintenance is conducted in conformity with the regulations in all operating subprojects. In Type 1 subprojects, backup facilities were installed to ensure that sewage disposal is not affected in case of a breakdown. As mentioned above, measures against sewage during heavy rains in the summer is an issue for disposal facilities adopting the combined sewer system and so feasible remedial plans should be considered.

In Type 2 subprojects, conversion into cleaner production is in progress. At the 5) Henan Yinge Industrial Investment Company Limited, an oxidation ditch and anaerobic equipment were added to the effluent treatment facility, whereby the alkali collection rate exceeded 89%. Moreover, in collaboration with a Japanese corporation, the production of special paper is being attempted using water and energy-saving methodology. The 6) Zhumadian District Baiyun Paper Limited Company passed a cleaner production test carried out by the Department of Environment Protection of Henan Province in 2004, and in 2009, was approved as an energy-saving science technology innovation model enterprise and a water-saving enterprise. The 9) Henan Junhua Development Stock Limited Company acquired the ISO9001 International Quality Management Standard and ISO14001 International Environment Management Standard in succession.

In conclusion, no major problems have been observed in the operation and maintenance system; therefore sustainability of the project is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

In the Huai River Basin Water Quality Improvement Policy, a priority issue for the government, the necessity of the project is particularly high in the Huai River Basin in Henan Province located in the most upstream section of the river. This project aims to contribute to the improvement of water quality by installing wastewater treatment equipment in principal cities and factories, i.e. pollution sources.

Therefore, the relevance with the policy is high. On the other hand, there have been indications that the planning, including the setting of goals and selection of subprojects as a Japanese ODA loan project left something to be desired. Despite the satisfactory achievements of each operating subproject, on account of the inappropriateness of project planning itself (e.g. the loftiness of set goals) the effectiveness of the project as a whole remained fair. Since the operating facilities are being managed and maintained in a proper manner without any structural, technical and financial difficulties, the future sustainability of the project is believed to be secured.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) Since most of the subprojects utilize the combined sewer system in which rainwater and sewage are drained out in the same piping, the sewage volume during heavy rains exceeds the disposal capacity of the treatment facilities. This results in the effluence of untreated wastewater into the rivers. In order to prevent water quality pollution because of this, the government is expected to put further efforts in constructing separate pipe systems to encourage a shift from the combined sewer system to a separate piping system so that sewage disposal facilities can function to the fullest of their capabilities.

(2) In order to facilitate the efficient operation and management of the sewage treatment facilities themselves, the implementation bodies should make efforts to improve the administrative structure of the sewage disposal fees by the government. At the same time, maintenance management of each facility should be streamlined while reducing expenses. In addition, they should strive to diversify their revenue sources in order to increase potential for independence by selling recycled water, converting sludge into resources and other measures.

4.2.2 Recommendations to JICA

None

4.3 Lessons Learned

(1) In this project, despite excellent operation management and manifestation of effects even at the subproject level, since the project objective was proposed to be “water quality improvement in the Huai River Basin in Henan Province,” which was a national-level, long-term and expansive goal, the project fell short of achieving the objective, albeit contributing to the improvement of the water quality to a certain extent. As in this case, when implementing a project comprising of multiple subprojects or one that supports an entire sector, it is important to establish a clear project objective that is appropriate and feasible, with the scope of executable subprojects as a given condition. Since it is impossible to hope for the attainment of the goal without relevant planning, it is requisite to further clarify a path to achieve the goal, and fully consider the expected effects and influence of external

factors. In cases where a loan contract identifies a subproject, structures and mechanisms that can swiftly respond to any replacements at the implementation stage should be in place. Meanwhile, in cases where flexible project planning in which a loan contract does not identify a subproject is required, it is desirable to conduct prudent and flexible operation management that allows adequate adjustment of the subproject at the implementation stage.

(2) This ex-post evaluation failed to clarify the grounds for subproject selection at the time of appraisal. Granted that there were external factors involved such as policies and the market, it cannot be denied that the selection of subprojects was somewhat problematic as proven by the fact that a drainage facility was removed less than 10 years after completion. At appraisal, it is important to select subprojects while taking into full account their relevance, strategy and sustainability as Japanese ODA loan projects. As targets of Japanese ODA loan environmental projects, it is presumed to be more suitable to select subprojects related to infrastructure development that are higher in public nature such as sewage treatment projects, rather than ones that are susceptible to policies and the market.

(3) In these sewage treatment subprojects, construction by yen loans were limited to disposal facilities and sewage trunk lines, whereas the majority of branch line constructions were executed by the local governments. Due to the delay in financing by local governments, the construction of sewage branch lines lagged behind the schedule in some of the subprojects, thus suppressing the rate of facility utilization after their completion. It is expected that combining piping and sewage treatment facilities as an aggregate target of Japanese ODA loans will enhance the facility utilization rate, thereby improving efficiency of the project. This point should be noted in formulating project plans.

Concluded

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs	See Attachment 1	See Attachment 1
2. Project Period	(I)September 1997~December 2000 (40 months) (II) December 1998~December 2001 (49 months)	(I)September 1997~December 2006 (112 months) (II) December 1998~June 2008 (115 months)
3. Project Cost (I) Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate Project Cost (II) Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion Exchange rate **Project Cost (1)＋(2)** Amount paid in Foreign currency Amount paid in Local currency Total Japanese ODA loan portion	(I) 4.945 billion yen 10.881 billion yen (800 million yuan) 15.826 billion yen 4.945 billion yen 1 yuan=13.6 yen (As of February 1997) (II) 7.230 billion yen 9.120 billion yen (570 million yuan) 16.350 billion yen 7.230 billion yen 1 yuan=16 yen (As of May 1998) 12.175 billion yen 20.001 billion yen (1.370 billion yuan) 32.176 billion yen 12.175 billion yen	(I) 3.956 billion yen 10.645 billion yen (763 million yuan) 14.601 billion yen 3.956 billion yen 1 yuan=13.9479 yen (Average of 1999~2004) (II) 6.654 billion yen 8.695 billion yen (623.39 million yuan) 15.349 billion yen 6.654 billion yen 1 yuan=13.9479 yen (Average of 1999~2004) 10.610 billion yen 19.340 billion yen (1.386.58 billion yuan) 29.950 billion yen 10.610 billion yen

Attachment 1 Subproject Outputs

Type 1: Sewage Treatment Subprojects

Subproject Name	Original	Actual
1) Sewage Treatment System Construction Project in Zhengzhou City	(1) Inflow of 400 thousand tons/day (2) 38.9km of sewer culvert laid	Completed almost as scheduled. Later downsized. (1) Inflow 400 of thousand tons/day (2) Sewer culvert: 38.9km
2) Sewage Treatment System Construction Project in Pingdingshan City	(1) Inflow of 150 thousand tons/day (2)52km of sewer culvert laid	Almost as scheduled (1) Inflow of 150 thousand tons/day (2) Sewer culvert: 52km
3) Sewage Treatment System Construction Project in Xuchang City*	(1) Inflow of 80 thousand tons/day (2) Advanced recycled waterprocessing: 20 thousand cubic meters (3) Sewer culvert: 12.15km	(1) Inflow of 80 thousand tons/day(As planned) (2) Advanced recycled waterprocessing: 20 thousand cubic meters (Cancelled) (3) Sewer culvert: 68.33km (Added)
8) XinYang City Sewage Disposal Works Project	(2002 Plan) (1) Inflow of 100 thousand tons/day (2) Relay pumps: 1 location (3) 63km of sewer culvert laid	Almost as planned (1) Inflow 100 thousand tons/day (3) Sewer culvert: 63km
11) Wastewater Treatment Project for Zhumadian District Chemical General Works	(1) Inflow of 100 thousand tons/day (2) Expansion of existing sewer networks. Water intake area: 70% → 75%	Almost as planned (1) Inflow of 100 thousand tons/day (2) Sewer culvert: 8.71km

Type 2: Factory Contaminant Source Treatment Subprojects

Subproject Name	Original	Actual
4) Kaifeng Chemical Fertilizer Plant Waste Water Synthetic Treatment Project	(1) Arsenic drainage treatment (2) Cyanogen drainage treatment (3) High concentration nitric acid drainage treatment (4) Sulfuric acid drainage treatment	Completed almost as planned. Later removed. (1) Arsenic drainage treatment, removed in 2003 (2) Cyanogen drainage treatment, removed in 2004 (3) High concentration nitric acid drainage treatment, removed in 2004 (4) Sulfuric acid drainage treatment, removed in 2008
5) Wastewater Treatment Project for Louhe Pulp and Paper Making Group	(1) Pulp production equipment (34 thousand tons/year) (2) Equipment for environmental measures etc. (Alkali collection, drainage treatment equipment: 25 thousand tons/year)	Almost as planned (1) Pulp production equipment (34 thousand tons/year) (2) Equipment for environmental measures etc. (Alkali collection 36,000 cubic meters/year, drainage treatment equipment: 25 thousand tons/year)

6) Wastewater Treatment Project for Suiping County Paper Mill*	(1) Pulp production equipment: 20 thousand tons/year (2) Equipment for environmental measures etc. (Alkali collection, drainage treatment equipment: 30 thousand tons/day)	(1) Pulp production equipment 34 thousand tons/year (Expanded) (2) Print paper manufacturing equipment: 50 thousand tons/year (Added) (3) Environmental measure equipment (Almost as planned)
9) Wastewater Treatment Project for Zhumadian District Chemical General Works	(1) Ammonia collection equipment: 2100 cubic meters/year (2) Cooling water recycling equipment etc: 8000 cubic meters/hour (3) Drainage treatment equipment:1000 cubic meters/hour	Almost as planned (1) Ammonia collection equipment: 2100 cubic meters/year (2) Cooling water recycling equipment etc: 8000 cubic meters/hour (3) Drainage treatment equipment: 1000 cubic meters/hour
10) Wastewater Treatment Project for Wuyang County Mingyu Salty and Chemical Group Company*	(1) Recycled paper treatment equipment: 36 thousand tons/year (2) Drainage treatment equipment: 30 thousand tons/day (3) White fluid treatment equipment: 6600 tons/day	(1) Recycled paper treatment equipment: 34 thousand tons/year (Almost as planned) (2) Drainage treatment equipment:30 thousand tons/day (Almost as planned) (3) White fluid treatment equipment (Cancelled) (4) Cardboard production equipment: 60 thousand tons/year (Added)

Source: Implementation bodies for individual subprojects.
Note: * subprojects with changes in outputs.

Attachment 2 Subproject Periods

Subproject Name	Original	Actual	Ratio	Evaluation
(I)	September 1997~December 2000 (40 months)	September 1997~December 2006 (112 months)	280%	c
1) Sewage Treatment System Construction Project in Zhengzhou City	September 1997~December 2000 (40 months)	September 1997~December 2003 (76 months)	190%	c
2) Sewage Treatment System Construction Project in Pingdingshan City	September 1997~December 2000 (40 months)	September 1997~June 2003 (70 months)	175%	c
3) Sewage Treatment System Construction Project in Xuchang City	September 1997~December 2000 (40 months)	September 1997~December 2006 (112 months)	280%	c
4) Kaifeng Chemical Fertilizer Plant Waste Water Synthetic Treatment Project	September 1997~December 2000 (40 months)	September 1997~October 1999 (26 months)	65%	a
(II)	December 1998~December 2001 (49 months)	December 1998~June 2008 (115 months)	235%	c
5) Wastewater Treatment Project for Louhe Pulp and Paper Making Group	December 1998~June 2001 (31 months)	December 1998~November 2006 (96 months)	310%	c
6) Wastewater Treatment Project for Suiping County Paper Mill	December 1998 ~June 2001 (31 months)	December 1998~July 2004 (68 months)	219%	c
8) XinYang City Sewage Disposal Works Project	March 2002~December 2003 (22 months)	March 2002~April 2005 (38 months)	173%	c
9) Wastewater Treatment Project for Zhumadian District Chemical General Works	December 1998~December 2000 (25 months)	December 1998~June 2008 (102 months)	408%	c
10) Wastewater Treatment Project for Wuyang County Mingyu Salty and Chemical Group Company	December 1998~October 2000 (23 months)	December 1998~October 2005 (83 months)	361%	c
11) Wastewater Treatment Project for Zhumadian District Chemical General Works	December 1998~December 2001 (37 months)	December 1998~August 2004 (69 months)	186%	c

Source: Implementation bodies for individual subprojects.
Note: The plan for the XinYang City Sewage Disposal Works Project is that at the time of L/A in 2002.
Note: Definition of completion - Approval of completion inspection.

Attachment 3 Main operation and effect indicators of subprojects (Type 1)

Type 1: Sewage Treatment Subprojects

Subproject	Indicators/Original	Actual (2009)
1)Sewage Treatment System Construction Project in Zhengzhou City	Sewage treatment volume: 400 thousand tons/day Treatment population: 1.6 million people COD: 36,000 tons/year BOD: 19,217 tons/year SS: 28,087 tons/year	Sewage treatment volume: 396 thousand tons/day (99%) Treatment population: 1 million people (63%) Facility utilization rate: 99% COD: 57,233 tons/year (159%) BOD: 26,820 tons/year (140%) SS: 43,430 tons/year (155%)
2)Sewage Treatment System Construction Project in Pingdingshan City	Sewage treatment volume: 150 thousand tons/day Treatment population: 650 thousand people COD: 11,500 tons/year BOD: 4,754 tons/year SS: 12,848 tons/year	Sewage treatment volume: 150 thousand tons/day (100%) Treatment population: 720 thousand people (111%) Facility utilization rate: 100% COD: 22,858 tons/year (199%) BOD: 7,068 tons/year (149%) SS: 22,699 tons/year (177%)
3) Sewage Treatment System Construction Project in Xuchang City	Sewage treatment volume: 80 thousand tons/day Treatment population: 387 thousand people COD: 10,000 tons/year BOD: 10,129 tons/year SS: 12,045 tons/year	Sewage treatment volume: 120 thousand tons/day (150%) Treatment population: 490 thousand people (127%) Facility utilization rate: 99.5% COD: 15,768 tons/year (157%) BOD: 8,332 tons/year (82%) SS: 8,322 tons/year (69%)
8) XinYang City Sewage Disposal Works Project	Sewage treatment volume: 100 thousand tons/day Treatment population: 300 thousand people COD: 29,560 tons/year BOD: 5,475 tons/year SS: 6,250 tons/year	Sewage treatment volume: 9.537 thousand tons/day (95%) Treatment population: 28.7 thousand people (96%) Facility utilization rate: 95.37% COD: 8,038 tons/year (27%) BOD: 3,843 tons/year (70%) SS: 4,188 tons/year (67%)
11) Wastewater Treatment Project for Zhumadian District Chemical General Works	Sewage treatment volume: 100 thousand tons/day Treatment population: 17.12 thousand people COD: 11,680 tons/year BOD: 6,250 tons/year SS: 8,030 tons/year	Sewage treatment volume: 80 thousand tons/day (80%) Treatment population: 240 thousand people (140%) Facility utilization rate: 80% COD: 11,200 tons/year (96%) BOD: 4,730 tons/year (76%) SS: 6,100 tons/year (78%)

Source: Implementation bodies for individual subprojects.
Note: Annual elimination quantities for COD, BOD and SS.
Note: Figures in brackets are plan ratios.

Attachment 4 Main operation and effect indicators of subprojects (Type 2)

Type 2: Factory Contaminant Source Treatment Subprojects

Subproject	Indicators/Original	Actual (2009)
4) Kaifeng Chemical Fertilizer Plant Waste Water Synthetic Treatment Project	Arsenic (discharge amount): 1 ton/year Cyanogen(discharge amount): 2.1 tons/year	(2000~2003 only) Arsenic: 18.73 tons/year Cyanogen: 79 tons/year COD: 946.9 tons/year Sulfuric acid: 291.6 tons/year Nitric acid: 525.2 tons/year
5) Wastewater Treatment Project for Louhe Pulp and Paper Making Group	Sewage treatment volume: 30 thousand tons/day COD: 19,831 tons/year BOD: 6,026 tons/year SS: 12,736 tons/year Production-per-unit COD discharge amount: 62.7kg/ton	Sewage treatment volume: 1.21 thousand tons/day (40%) Facility utilization rate: 48.4% COD: 7,217 tons/year (36%) BOD: 1,803 tons/year (30%) SS: 3,698 tons/year (29%) Production-per-unit COD discharge amount: 4.03kg/ton
6) Wastewater Treatment Project for Suiping County Paper Mill	Sewage treatment volume: 30 thousand tons/day COD: 17,690 tons/year BOD: 5,670 tons/year SS: 14,561 tons/year	Sewage treatment volume: 1.8 thousand tons/day (60%) Facility utilization rate: 72% COD: 12,877 tons/year (73%) BOD: 4,087 tons/year (72%) SS: 8,344 tons/year (57%) Production-per-unit COD discharge amount: 60kg/ton (2003) 12.5kg/ton (2009)
7) Wastewater Treatment Project for Feiyafei Paper Industry Company	COD: 45,555 tons/year BOD: 10,900 tons/year SS: 13,527 tons/year	Cancelled
9) Wastewater Treatment Project for Zhumadian District Chemical General Works	Sewage treatment volume: 2.4 thousand tons/day COD: 1,106 tons/year Ammonia nitrogen: 2,289 tons/year SS: 590 tons/year Cyanogen: 3 tons/year Production-per-unit COD discharge amount: 0.1kg/ton	Sewage treatment volume: 2.6 thousand tons/day (108%) Facility utilization rate: 100% COD: 2,452 tons/year (222%) Arsenic (discharge amount): 7.4 tons/year Cyanogen (discharge amount): 0.03 tons/year Production-per-unit COD discharge amount: 0.068kg/t
10) Wastewater Treatment Project for Wuyang County Mingyu Salty and Chemical Group Company	Sewage treatment volume: 30 thousand tons/day COD: 60,243 tons/year BOD: 16,272 tons/year SS: 7,588 tons/year	Sewage treatment volume: 1.320 thousand tons/day (44%) Facility utilization rate: 44% COD: 2,814 tons/year (4.7%) BOD: 937 tons/year (58%) SS: 1,877 tons/year (25%) Production-per-unit COD discharge amount: 25.38kg/ton (2005) 4.76kg/ton (2009)

Source: Implementation bodies for individual subprojects.
Note: Annual elimination quantities for COD, BOD and SS.
Note: Figures in brackets are plan ratios.

Attachment 5 Evaluation of Sustainability

(1) Criteria for Rating

Executing Agency	Criteria
Structural	-Is the regime well-organized and are the personnel well-placed for supervising the subprojects? -Is the executing agency in good relationship with the subproject implementation bodies for incessant close communication? -Is the monitoring system well-established on the basis of environmental regulations?
Technical	-Are the personnel of Environment Protection Department well-placed and is their skill upgraded to the level to properly supervise the subprojects?
Financial	-Are the above activities financially backed up to a sufficient extent?

Subprojects	Criteria
Structural	-Is the regime well-organized for operation and maintenance (for decision-making)? -Is there a possibility of being privatized? If so, is there a possibility that the sustainability of the subprojects is affected?
Technical	-Are the personnel kept at an appropriate level for operation and maintenance? -Are the competent personnel having the technical skill for operating equipment well-placed? -Is a technical training system fulfilled for operation and maintenance? Is any training actually put in practice? -Is the operation manual available? And is it actually utilized? -Are the results of the inspections properly record and kept in good conditions?
Financial	-Are the profit and loss well-balanced? -Is the system to collect charges established in the manner to recover the cost? -In case the project is in deficit operation, is any governmental subsidy given, and is there no problem in carrying on operation from financial aspects?
Maintenance & management	-Is the equipment ready to display its performance? -Is there no problem in maintenance activities, for instance, on the procurement of spare parts? -Is there no problem in having maintenance at regular intervals? -Has there been no problem in troubleshooting?

(2) Rating Results

Supervisory institution and subprojects	Evaluation items				Results	
	Structure	Technique	Finance	Maintenance	Rating	Score
Supervisory institution（EA）：Henan Provincial Governm	a	a	-	-	a	3
1) Sewage Treatment System Construction Project in Zhengzhou City	a	a	a	a	a	3
2) Sewage Treatment System Construction Project in Pingdingshan City	a	a	a	a	a	3
3) Sewage Treatment System Construction Project in Xuchang City	a	a	a	a	a	3
4) Kaifeng Chemical Fertilizer Plant Waste Water Synthetic Treatment Project	Bankruptcy				c	1
5) Wastewater Treatment Project for Louhe Pulp and Paper Making Group	a	a	a	a	a	3
6) Wastewater Treatment Project for Suiping County Paper Mill	a	a	a	a	a	3
8) XinYang City Sewage Disposal Works Project	a	a	a	a	a	3
9) Wastewater Treatment Project for Zhumadian District Chemical General Works	a	a	a	a	a	3
10) Wastewater Treatment Project for Wuyang County Mingyu Salty and Chemical Group Company	a	a	b	a	b	2
11) Wastewater Treatment Project for Zhumadian District Chemical General Works		a	a	a	a	3

Average: 2.7
Overall rating: a

<Method of Rating>
1. A comparison is made between the original and actual in each subproject to figure out a sub-rating (the subproject cancelled is excluded).
2. The average of the total sub-ratings thus obtained is made as an overall rating.
3. Scores below a decimal point are taken up on the following basis:
   a: Not less than 80% (not less than 2.4)
   b: Not less than 50% to less than 80% (not less than 1.5 to less than 2.4)
   c: Less than 50% (less than 1.5)

Attachment 6 Subproject Implementation Bodies

No.	At the time of appraisal	At the time of ex-post evaluation
1)	Zhengzhou City's Wangxinzhuang Wastewater Treatment Plant	Zhongyuan Environmental Protection Company Limited
2)	Pingdingshan Sewage Purification Company	No change
3)	Xhuchang Wastewater Treatment Plant	Xuchang Rebecca Water Industry Company Limited
4)	Kaifeng Chemical Fertilizer Plant	Kaifeng Jinkai Chemical Company Limited
5)	Luo River Yinghe Paper Company Limited	Henan Yinge Industrial Investment Company Limited*
6)	Suiping Country PaperMaking Mill	Zhumadian City Baiyun Paper Company Limited *
8)	Xinyang City Sewage Treatment Company Limited	No change
9)	Zhumadian District Chemical Factory	Henan Junhua Development Company Limited
10)	Wuyang Mingyu Salt Chemical Group Corp Second Papermaking Mill	Wuyang Yinghe Paper Company Limited
11)	Zhumadian City Sewage Treatment Company Limited	Zhumadian City Sewage Treatment Company Limited

* Only the organization name was changed.

Attachment 7 Financial Indicators in Type 2

5) Henan Yinge Industrial Investment Company Limited

	2006	2007	2008
Profit ratio of total capital (%)	6.1%	5.0%	6.2%
Percentage of gross profit on sales (%)	16.9%	17.6%	15.4%
Net income to sales (%)	10.5%	7.4%	8.8%
Tota asset turnover (times)	0.6	0.7	0.7
Current ratio (%)	80.0%	77.8%	98.6%
Equity ratio (%)	31.8%	32.4%	46.8%

Source: Henan Yinge Industrial Investment Company Limited

6) Zhumadian City Baiyun Paper Company Limited

	2006	2007	2008
Profit ratio of total capital (%)	2.4%	2.6%	2.0%
Percentage of gross profit on sales (%)	13.4%	11.2%	9.6%
Net income to sales (%)	3.3%	3.1%	2.9%
Tota asset turnover (times)	0.7	0.8	0.7
Current ratio (%)	67.7%	95.3%	96.3%
Equity ratio (%)	24.1%	25.9%	20.3%

Source: Zhumadian City Baiyun Paper Company Limited

9) Henan junhua development Company Limited

	2006	2007	2008
Profit ratio of total capital (%)	6.1%	7.4%	3.1%
Percentage of gross profit on sales (%)	15.8%	20.6%	10.8%
Net income to sales (%)	7.2%	10.2%	4.8%
Tota asset turnover (times)	0.8	0.7	0.6
Current ratio (%)	51.9%	42.8%	57.0%
Equity ratio (%)	19.6%	36.9%	31.6%

Source: Henan junhua development Company Limited

10) Wuyang yinghe paper Company Limited

	2006	2007	2008
Profit ratio of total capital (%)	1.8%	5.0%	-1.2%
Percentage of gross profit on sales (%)	9.0%	6.4%	9.0%
Net income to sales (%)	3.8%	5.1%	-1.6%
Tota asset turnover (times)	0.5	1.0	0.8
Current ratio (%)	78.6%	153.3%	117.7%
Equity ratio (%)	45.4%	71.5%	56.8%

Source: Wuyang yinghe paper Company Limited