China

Ex-Post Evaluation of Japanese ODA Loan Project

Heilongjiang Songhuajiang River Basin Environmental Improvement Project

External evaluator: Kenji Momota, IC Net Limited

1. Project Description

Project Site

Mudanjiang Sewage Treatment Plant

1.1 Background

Since having adopted the reform and open-door policy in 1978, China has maintained steady economic growth. Meanwhile, however, a rapid progress in industrialization has brought about water pollution in rivers due to increased sewage and wastewater as well as air pollution due to the use of coal. Thus, it had been urgent to cope with these environmental problems.

At the time of appraisal (1998), there were many state-owned large-scale enterprises represented by petrochemical industries in the basin of Songhuajiang River (about 2,308 km in total) flowing from Jilin Province to Heilongjiang Province, and their businesses were thriving. While sewage and wastewater were on the rapid increase with their business expansion, plant equipment to treat them was remained unready, and water pollution became more and more serious. Against such background, reducing pollution sources and construction of sewage systems have become urgent issues in Heilongjiang Province.

1.2 Project Outline

The objective of this project is to improve water and air quality in the basin of Songhuajiang River, Heilongjiang Province, which suffers serious water and air pollution with rapid economic growth, by implementing environmental improvement projects, thereby contributing to the improvement of health and living environment of the local residents.

Approved amount/ Disbursed amount	10,541 million yen / 10,533 million yen

Exchange of Notes Date/ Loan Agreement Signing Date	December, 1998 / December, 1998
Terms and Conditions	Interest Rate: 0.75% Repayment period: 40 years (grace period: 10 years) Conditions for procurement: partially untied
Borrower/ Executing agencies	Guarantors: Government of People's Republic of China/ Government of Heilongjiang People's Government
Final Disbursement Date	July, 2006
Main Contractor	None
Main Consultant	None
Feasibility studies, etc. (if any)	F/S (China Municipal Government Engineering North-East Designing Research Institute), SAPROF (Kyowa Consultants/Technoconsultants)
Related projects (if any)	None

This project consists of group of subprojects, characterized by their objectives as follows:

1) Urban sewage treatment projects to control noncommercial wastewater;
2) Wastewater treatment projects to control large amounts of wastewater from factories;
3) Heat supply subprojects to control air pollution; and
4) Subprojects to cultivate the environmental monitoring ability of the Environmental Protection Department, Heilongjiang.

A report is made on the basis of this classification. The following is a list of the subprojects planned and the responsible parties concerned:

Type	Subproject	Implementing Agency
Type 1: Sewage Treatment Projects		
1-1	Sewage Treatment Project in Mudanjiang City	Mudanjiang Sewage Treatment Plant
1-2	Sewage Treatment Project in Yanshou County	Yanshou Sewage Treatment Plant
1-3	Sewage Treatment Project in Daqing City	Daqing Dongcheng Sewage Treatment Plant
Type 2: Factory Wastewater Treatment Projects		
2-1	Wastewater Treatment Project of Heilongjiang paper factory	Chenming Paper Manufacturing Co., Ltd.
2-2	Water Pollution Control Project by Tonghe Paper Factory	Heilongjiang Tonghe Paper Manufacturing Co., Ltd.

2-3	Wastewater Treatment Project for Harbin Pharmaceutical Factory	Harbin Pharmaceutical Factory
2-4	Wastewater Treatment Project of Daqing Petrochemical Complex	Daqing Petrochemical
2-5	Wastewater Treatment Project for Linyuan Oil Refining Factory	Linyuan Petrochemical
2-6	Wastewater Treatment Project for Xinsanxing Brewery Factory	Xinsanxing Brewery
Type 3: Anti-Air Pollution Projects		
3-1	Heat Supply and effective coal utilization project in Jidong Country	Jidong Thermal Power Station
3-2	Heat Supply Project in Yichun City	Yichung Thermal Power Station
3-3	Heat Supply Project in Mishan City	Mishan Thermal Power Station
Type 4: Monitoring Capacity Enhancement Project		
4-1	Heilongjiang Environmental Monitoring Network Project	Environmental Monitoring Station, Heilongjiang

The objective each of the subprojects is to improve water quality of sewage and wastewater released into Songhuajiang River and its tributary streams. The following map shows where the main streams are located in Heilongjiang, where water samples were collected (Liuyuan and Kulipao), and how far they are located from the project sites:

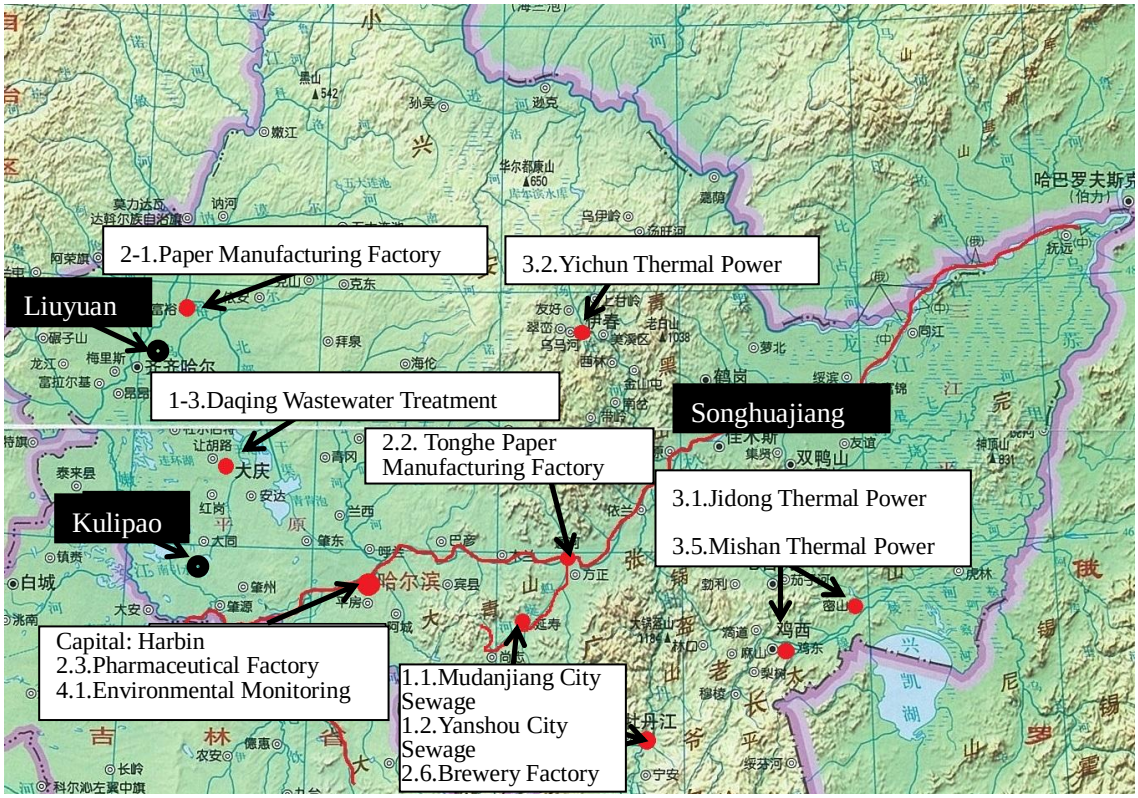

Figure 1 Project Distribution Map[1]

2. Outline of the Evaluation Study

2.1 External Evaluator

Kenji Momota, IC Net Limited

2.2 Duration of Evaluation Study

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

Duration of the Field study: January 23 – 31, 2010 and April 4 – 30, 2010

2.3 Constraints during the Evaluation Study

The objectives of the subprojects were to improve the water quality of Songhuajiang River and its tributary streams. For the ex-post-evaluation, therefore, we tried to collect water quality data at the places where wastewater was released. However, detailed data (Monitoring data at city and municipal level) necessary to verify the direct effect of the subprojects was kept confidential by the decision of the Provincial Government.

For an analysis of the project effectiveness, therefore, data on the water quality collected at national

[1] The two subprojects, 2-4. Wastewater Treatment Project of Daqing Petrochemical Complex and 2.5. Wastewater Treatment Project for Linyuan Oil Refining Factory, were cancelled before the plan was carried out. Therefore, nothing is written on them in this report.

level[2] were used as an alternative. Since some of those monitoring spots are distant from the subproject sites, those data cannot clearly verify the effectiveness of the subproject. In addition, since the rivers and streams are so long and large, there are various factors which could give either positive and negative influences on the water quality (for instance, environmental improvement projects by governments as a favorable factor, and construction of new factories as a source of water pollution as an unfavorable factor). All in all, it was difficult to exactly grasp these factors. In this evaluation, therefore, we adopted the data that presumably have certain relevance with the project. Thus, the evaluation of the project effectiveness is based on certain assumptions. Concerning a few subprojects not currently in operation, available data were very limited.

3. Results of Evaluation (Overall Rating: B)

3.1 Relevance (Rating: a)

3.1.1 Relevance with the Development Plan of China

(1) Development Policy of China at the Time of Appraisal

Taking countermeasures against environmental problems arising in line with economic growth had been important theme in China. The most important tasks adopted in the 9th 5-year plan (1996-2000) were to control sources of water and air pollution and to improve urban environments. At that time, the reform of state-owned enterprises had been in progress, and projects to improve the environment needed to be carried out under better business management. Listed as important areas for water pollution control were three streams and three lakes as well as seven large rivers including Songhuajiang in this project. Measures planned for air pollution control were implementation of countermeasures in energy industries and other designated industries, closure of outdated factories and renewal of production processes.

Following this central government policy, Heilongjiang Government established the 9-5 environment protection plan (1996-2000) and a long-term plan beginning in 2010. The 9-5 plan targeted to reduce the total amount of pollutants to the level of 720,000 tons/year or less of COD[3], 530,000 tons/year or less of dust and 310,000 tons/year or less of sulfur dioxide. This project was carried out as part of the 9-5 plan, and the project was highly prioritized in Heilongjiang Province's environmental policy.

(2) Development Policy of China after Ex-Post-Evaluation

In the 11th 5-year plan of the central government (2006-2010), nine goals are listed up. Among them, environment-related goals are, "Strengthen sustainable growth" and "Improve people's living standard". As monitoring indicators for these goals, the plan addressed 10 percent reduction of

[2] Important spots in the main streams and basins in whole China opened to public by Data Center, Environmental Protection Department, People's Republic of China. Their locations are shown by the ● mark in Fig. 1.

[3] COD = Chemical Oxygen Demand
COD is a value to represent the degree of water pollution. It indicates the amount of oxygen consumed when organisms in water are oxidized with oxidants.

primary pollutants and improvement in the living environments of the local residents. With respect to water pollution, it addressed 10% reduction of COD and other primary pollutants from the level of 2005.

In Heilongjiang Province, goals set in "Songhuajiang River Basin Water Pollution Prevention Plan (2006-2010)" designed by Heilongjiang Government include "save energy," "reduce exhaustion of pollutants," "help ecological industries grow" and "protect ecosystem." Total investment in the environmental field during this period amounts to 21.224 billion yuan (about 300 billion yen).

This project, as one of a series of water and air pollution control projects in Songhuajiang river basin that is still under way, is very important.

3.1.2 Relevance with the Development Needs of China

3.1.2.1 Needs for Improvement of Water Quality in Songhuajiang

Water pollution in Songhuajiang was very serious at the time of appraisal. Out of six main monitoring spots, 62 percent were classified as National Ground Water Quality Standard Class IV and V, which are unfit to drink as the source of water supply. In the basins of Songhuajiang River in Heilongjiang in particular, more than 60 percent of the monitoring spots exceeded National Ground Water Quality Standard IV, that is unfit to drink, with 30 percent of them aggravated to Standard V. Such water pollution was attributable to an increase in industrial waste water and everyday sewage resultant from rapid industrialization and economic growth. Under these circumstances, quick measures were required to keep the source of water supply free from pollution.

3.1.2.2 Relevance of Project Objective and Selection of Subprojects

As discussed above, the project was of strong needs at both policy and project levels. Meanwhile, there were rooms for improvement in terms of: (1) relevance in the definition of project objectives, and (2) relevance in the selection of sub-projects.

(1) Relevance of project objectives definition

There was as a considerable divergence between the scale of the project and its stated objective "to improve water quality of Songhua Rivers, thereby contributing to improved standard of living of the local residents." A more focused project objectives definition would have been necessary.

The project can be understood as a structured "program" consisting of a number of subprojects. Accordingly, relevance of such a project should be evaluated by the criteria of "whether or not the overall objective of the project has been achieved." Documents in the early stages of the project state that the outcome of this project was "water quality improvement of Songhua River" and through its attainment the project sought to "improve the health and living environment of the local residents." If interpreted strictly, this wording means that the objective is "water quality improvement of Songhua River throughout its entire mainstream." This interpretation is

unrealistic, given the size of Songhua River (total length: 2,308km) and the scale of the project under evaluation. For the purpose of this ex-post evaluation, therefore, the true project objective that was intended at the time of project planning was “the improvement of water quality of water systems and rivers downstream of the sub-project locations out of the entire water systems of Songhua River”, and the project outcomes and project impact should consist of the following:

1. Direct effects measurable by the operation and effect indicators of sub-projects
2. Change in the water quality of nearby rivers and water systems to which the wastewater of the sub-project is discharged.

The above two points will be considered as project outcomes and the improvement of living and health environment of the local residents will be considered as the project impact.

Nevertheless, there is still a divergence in the project objectives definition even after the above mentioned restatement and re-definition. Even one of the many tributaries of Songhua River downstream of a sub-project location alone has a length of hundreds of kilometers. It is simply too vast an area to pass reasonable judgment on any effect of the project on the water quality. Little is mentioned in the appraisal documents with respect to specific locations for which the water quality improvement would be intended or the degree of improvement to be pursued.

During the setup of project objectives, greater attention should have been paid to the scale of the project and the numerous factors that have bearing on the water quality. More thought should have been given to define the objective more clearly by, for example, setting direct effects of sub-projects as objectives or designating a focused number of monitoring sections at which more direct effects are likely to emerge, and positioning water quality improvement of the rivers and water systems as an overarching project objective.

(2)Validity of Selection of Subprojects

In this project, a change affecting its achievement arose, as there was cancellation or shutdown of operation after completion in four subprojects. The details on them and the reasons are as follows:

• 1-2: Sewage Treatment Project in YanShou County

This subproject was completed in 2003, but it remained idle until 2006. Now in 2010, the operation is at a standstill again for reconstruction (see 3.3 Effectiveness on detail). The reason may be unsuitability of the technology in cold areas and financial problems.

• 2-2: Wastewater Treatment Project in Tonghe Paper Manufacturing Factory

This subproject was completed in 2003, but the operation was started in 2006. Due to decline in the paper industry business, however, the operation stopped in about two years, and is still at a

standstill now in 2010.

- 2-4: Wastewater Treatment Project in Daqing Petrochemical Plant
- 2-5: Wastewater Treatment Project in Linyuan Oil Refining Plant

These two subprojects were cancelled as Japanese ODA undertakings due to their initial postponement and reduction in scope, which followed a review of production quantity and production items in line with realignment of the industry. As a result, they were executed by domestic fund of the central government.

The main reasons for the unforeseen accidents in these four subprojects are ascribable to changes in economic and market conditions at that time. In China at that time, abrupt changes happened, as represented by privatization of state-owned enterprises. Under such unstable circumstances, however, it is questionable whether or not there was still a necessity for starting subprojects that have uncertain future prospect and are susceptible to market conditions. Before they were taken up as subprojects, more prudent verification should have been made in terms of the future sustainability as a stable business. With regard to 1-2. Sewage Treatment Project in YanShou County, no treatment sufficiently effective to satisfy the national standard could be made. The reason was that a technology of which treatment effect is not so good in cold areas, was adopted.

Although the lessons from above two points should be considered for future ODA projects of similar nature, they are not reflected in the rating of this evaluation because of the following reasons:

- When this project was planned (around 1998), there were no stringent institutional requirements to conduct ex-ante evaluation or to set out relevance indicators and target values.
- A project like this one which consists of a number of sub-projects could be interpreted as a sort of “sector loan.” In-depth appraisal of individual sub-projects was practically impossible.

3.1.3 Relevance with Japan’s ODA Policy

Air pollution abatement and other pollution control as well as natural environment conservation were priority sectors in the Japanese government’s “Country Assistance Policy --- China” that served as the guidelines for Japan’s cooperation programs for China at the time of appraisal of this project. Based on this policy, the environmental sector was positioned as one of the four priority sectors for assistance, and it was decided to promote assistance projects relating to energy efficiency, solid waste recycling, air pollution control such as soot treatment and desulfurization of exhaust and vent gases as well as sewage improvement and other water pollution control. The project under evaluation is thus highly relevant to Japan’s ODA policy.

As a whole, this project has been highly relevant with the country’s development plan, development needs, as well as Japan’s ODA policy, therefore, its relevance is high.

3.2 Efficiency (Rating: b)

3.2.1 Project Output

A number of subprojects are comprised in this project. In general, project outputs were mostly completed as planned, except for the cancelled two subprojects. With respect to Type 1: Urban Sewage Treatment Project and Type 3: Anti-Air Pollution Measure Project, many of the subprojects are expanding/upgrading the equipment to cope with the growing demand of wastewater treatment and heat supply, caused by the growth in the target cities. (See Attachment 1 on the details of the project outputs.)

Fig. 2 1-3. Daqing Wastewater Treatment Plant

Fig. 3 2-3. Harbin Pharmaceutical Factory

3.2.2 Project Inputs

3.2.2.1 Project Period

In consideration of the fact that a number of subprojects are comprised in this project[4], a period (months) required from commencement to completion for each subproject was added up in both of the plan and the achievement for comparative purposes. A ratio in each subproject was expressed as a score of sub-rating, and the entire average score was evaluated as the entire rating. (See Attachment 2 on the details.) Based on this calculation, the average rating point is 1.57 (projects' period is or higher than 50% and less than 80%) or slightly longer than planned.

The main reason for delays in some subprojects was due to procrastinated governmental procedures for approval and for procurement of local currency portion. About 2 subprojects (2-1 and 2-2) which are currently non-operational, we were not able to receive related information from the executing agencies, therefore performance of those subprojects are not reflected in the rating.

[4] In this project consisting of many subprojects, if the period from start to completion is taken as the standard for rating, a long delay in one single project affects the entire rating, possibly resulting in a rating far removed from reality.

3.2.2.2 Project Cost

The actual total project cost of 20,296 million yen (10,533 million yen as ODA loan) was slightly higher (103 percent) than the planned amount of 19,725 million yen (10,541 million yen as ODA loan). There were some subprojects in which the actual cost exceeded the planned cost. From among them, the excess was particularly large (165 percent higher than planned) in 2-1 (paper manufacturing factory) because reaction ponds and precipitation ponds had to be enlarged for a sudden growing demand of wastewater treatment at detailed design stage.

Both the project period and the project cost slightly exceeded the planned period and cost. Therefore, efficiency of the project is fair.

3.3 Effectiveness (Rating: b)

3.3.1 Quantitative Effects

As already described in "3.1 Relevance," an analysis on the effectiveness of this project was made in the following steps:

(1) Analysis of the operation and effect indicators in each of the subprojects;
(2) Analysis of changes in the rivers and streams neighboring the sites in each of the subprojects in the sewage treatment program (Type 1-2); and
(3) Analysis of air pollution conditions in the target cities and county in the anti-air pollution measure program (Type 3).

3.3.1.1 Results from Operation and Effect Indicators

(1) Planned and Actual Effect of the Entire Project

1) Type 1: Urban Sewage Treatment Subprojects/Type 2: Factory Wastewater Treatment Projects

The indicators used in analyzing working conditions of the sewage treatment project (Type 1-2) are the amount of treated wastewater and a population covered as operating indicators, and the reduction of pollutants and the rate of reduction as effectiveness indicators. Indicators collected in this study were, BOD[5], COD and SS[6] that are commonly used for analysis of water pollution. The following table shows a comparison of the sum of reduction of these three pollutants between the original plan and actual performance.

[5] BOD = Biochemical Oxygen Demand
BOD is used as an indicator of water pollution. It is one of the key pollutants of wastewater from factories that is restricted by regulations. It is expressed as the amount of oxygen consumed when microorganisms decompose organisms in water. The larger this value, the heavier the pollution.

[6] SS = Suspended solids
SS is insoluble particle-like substances that are suspended in water. They occur as fine particles deriving from clay minerals, animal and plant planktons and carcasses thereof, and precipitates of organisms and metals deriving from sewage and wastewater.

Table 1 Comparison of Original / Actual of primary indicators in Types 1 & 2

	Plan	Achievement	Achievement rate
Population (10,000 people)	77	76	99%
Amount treated (10,000 tons/day)	32	25	79%
COD (tons/year)	74,530	29,404	39%
BOD (tons/year)	23,760	8,834	37%
SS (tons/year)	21,339	17,971	84%

Note 1: Population can be applied to Type 1 only.

Note 2: 2-3. Pharmaceutical Factories were excluded, as no information was available on the amount of treatment and the amount of COD reduction.

The reduction of COD and BOD was less than 40 percent compared to the original plan. The reason of low achievement was mostly because operation was at a standstill in 1-2. Sewage Treatment Project in YanShou County and 2.2. Wastewater Treatment Project in Tonghe Paper Manufacturing Factory at this stage. Meanwhile, however, in the subprojects of Type 2, the cleaner production brought about good results of reducing the amount of wastewater and the quantity of pollutants released from the factories. Therefore, an exact evaluation cannot be made simply based on the comparison between the plan and the achievement. In fact, the rate of removed pollutants reached 80-90 percent in the subprojects under operation, and thus operation conditions are evaluated highly.

2) Type 3: Anti-Air Pollution Project

The indicators used in analyzing operational status of the subproject in this category (Type 3) are heat supply area and availability factor as operation indicators, and the amount and rate of elimination of pollutants as effectiveness indicators. Indicators collected in this evaluationn were SO_2[7] and TSP[8] that are commonly used for analysis of air pollution. The following table shows a comparison of the sum of reduction of these pollutants between the original plan and the actual achievements:

Table 2 Comparison of Original / Actual of primary indicators in Type 3

Indicators	Plan	Achievement	Achievement rate
Heat supply area (10,000 m^2)	325	442	136%
SO_2 (tons/year)	1,501	1,393	93%
Dusts (tons/year)	6,425	4,335	67%

[7] SO_2 = Sulfur dioxide
SO_2 is one of the main air pollutants that is generated by combustion of fuels such as coal and heavy oil containing sulfur. It causes acid rain.

[8] The word "total suspended particles" is a generic name of all particle-like substances.

Heat supply area was remarkably expanded, and SO_2 was reduced almost as planned. Therefore, this project can be evaluated highly. In each subproject, the demand for heat supply has shown remarkable growth with the city development, and they are expanding the facilities to catch up with the growing demand.

Based on the above results, the overall effectiveness of the project is high, due to the good performance of the operating subprojects. However, performance of subprojects is random, due to the existence of the standstill subprojects. Therefore, the operational status of subprojects as a whole can be evaluated "fair".

(2) Operation Conditions of Subprojects (See Attachment 3 for details)

1) Type 1: Urban Sewage Treatment Projects

Operation conditions are largely as planned in two out of the three subprojects. In 1-2 Sewage Treatment Project in YanShou County, however, operation is at a standstill due to reconstruction. The outline of these subprojects is as follows:

1-1. Sewage Treatment Project in Mudanjiang City

The amount of pollutants is reduced mostly as planned. The demand for the sewage treatment has increased up to 230,000 tons per day with the growth of Mudanjiang City. The present plant is now in full operation, and this city is planning to start the second construction within this year to cope with the increasing demand.

1-2. Sewage Treatment Project in YanShou County

Even after the project was completed, operation remained at a standstill, because sewers were not so widespread and the amount of sewage was not so large, and because operation and administration costs were not financed by the local government. Operation was started in 2006, but was halted again in October 2009, for the reason that the treatment effect did not satisfy the requirement of new national standard revised in 2002. The oxidization pond technology adopted at that time failed to produce expected treatment effects especially in winter, and turned out not to be good enough to satisfy the water quality standards regulated more strictly. At the present stage, reconstruction is in progress for changeover from the oxidization pond method to the CASS method, with the re-opening goal scheduled in October 2010.

1-3. Sewage Treatment Project in Daqing City

The second expansion construction has already been completed. The present total treatment capacity is 150,000 tons per day, and the average treatment amount is 80,000 tons per day. The operation rate of the subprojects covered by ODA loan (the first construction) has reached the

treatment level almost as designed. The rate of the elimination of pollutants is 80-90 percent. Therefore, this project is evaluated highly.

2) Type 2: Factory Wastewater Treatment Projects

Wastewater treatment in the four subprojects in Type 2 (excluding the two cancelled subprojects 2-4 and 2-5) exhibited almost the expected effects. However, 2-2 Wastewater Treatment Project in Tonghe Paper Manufacturing Factory is now at a standstill because the factory shut down the operation. Cleaner production was promoted commonly in all of the subprojects, and as a result the amount of wastewater released during operation became far smaller than originally planned. Accordingly, the treatment amount of wastewater in each plant was reduced. This outcome is a consequence of efforts for an improvement in the water quality, which can be evaluated highly. Excellent treatment effects were obtained to the extent that the rate of the elimination of pollutants in each of the factories reached 90 percent or so. Each of the subprojects is outlined as follows:

2-1.Wastewater Treatment Project in Heilongjiang Paper Manufacturing Factory

Both the amount of wastewater treatment and the amount of pollutants have decreased, as wastewater has been reduced by cleaner production. The amount of COD release in 2009 cleared 100 percent the national standard, and the operation conditions are good.

2-2.Wastewater Treatment Project in Tonghe Paper Manufacturing Factory

Two years after the operation was started, the factory shut down the operation due to unfavorable market conditions. The eliminating effect of pollutants was very good while in operation according to factory workers, but it is difficult to make an evaluation because no information has so far been available on any quantitative data.

2-3. Wastewater Treatment Project in Harbin Pharmaceutical Factory

As a result of having promoted cleaner production in the entire factory, the amount of wastewater was dramatically reduced by half or less, and the amount of pollutants was also dramatically reduced. The reduction rate of the main pollutants is maintained at a level of 90 percent or so, and this project can be evaluated highly.

2-4.Wastewater Treatment Project in Brewery Factory

As a result of having promoted cleaner production in the entire factory, the amount of wastewater was decreased from 8 tons/ton of beer down to 3.5 tons. Consequently, the treatment amount of wastewater was reduced. This project can be evaluated highly with good treatment effects obtained.

3) Type 3: Anti-Air Pollution Project

As described above, the heat supply area remarkably increased, and reduction of SO2 reached the

planned level, therefore overall performance is high. The executing agencies of subprojects are upgrading their equipments, to meet the growing demand of heat supply. Summary of operational status of subprojects are as follows.

3-1. Heat Supply and effective coal utilization project in Jidong Country

The availability factor of the equipment is kept in good condition. Noticeable effects were obtained with the installation of the system. As a result, 180 small boilers and 170 or more chimneys were scrapped, and the consumption of coal was saved by 160,000 tons per year. Equipment is further being reinforced with the growth of Jidong County. The heat supply area is to be expanded up to 2 million m^2 by the end of 2010.

3-2. Heat Supply Project in Yichun City

The availability factor of the equipment is kept in good condition. Noticeable effects were obtained with the installation of the system. As a result, 150 small boilers and 100 or more chimneys were scrapped, and the consumption of coal was saved by 54,500 tons per year. The demand for heat supply is on the increase with the growth of this city, and the current urban heat supply area covers 5 million m^2. There are two heat supply companies in the city. This project is managed by one of them located in the east area. The heat supply area is to be expanded up to 2.4 million m^2 by the end of 2010.

3-3. Heat Supply Project in Mishan City

The availability factor of the equipment is kept in good condition. Noticeable effects were obtained with the installation of the system. New equipment was installed at the end of 2008. The existing equipment is to be used for peak demand.

Fig. 4 3-2 Heat Supply Equipment in Yichun

Fig. 5 Heat Supply Equipment in Jidong

4) Type 4: Monitoring Capacity Enhancement Project

The Environmental Inspection Department, Heilongjiang Province as the executing agency is

responsible for the execution of the environmental regulations, observation of environments and treatment of environmental accidents, and dispatches inspectors to cover all Heilongjiang Province. The equipment was installed for the purpose of reinforcing the capacity of monitoring and inspections at both central and local office, and it displays the expected effect.

In particular, about monitoring of water quality, 70 percent of inspection procedures are done by using of the equipment installed by the project. Its contribution is noteworthy. The incidence of environmental accidents was reduced by 75 percent in 2009 as compared with the preceding year, and denounced enterprises are on the decrease.

Table 3 Activities of Environmental Inspection Department

	2005	2009
Gross number of dispatch	25,000	36,000
Number of on-site inspections	8,996	1,064
Number of denounced enterprises	1,214	904

Source: Environmental Inspection Dept., Heilongjiang

An interview with a staff member of Environmental Inspection Section revealed that awareness to abide by environmental regulations as well as an interest in environmental protection has been enhanced in enterprises and citizens as a result of education and dissemination by this section. In fact, although activities by this section are much more reinforced, the incidence of denounced cases is decreasing. This is considered to be one of the effects brought about by enhanced capacity of this section.

(3) Improvements in Water Quality in Neaby Rivers and Water system

The objective of this project is to improve the water quality of the nearby rivers and water systems through the implementation of the subprojects. The table below shows a list of the rivers and water systems, and monitoring locations presumably related to the subprojects.

In case of 2-2.Harbin Pharmaceutical Factory, however, the target river is Songhuajiang mainstream, and therefore, many other factors are involved in changing the water quality.
It is difficult to precisely identify the degree of the project contribution. Therefore, evaluation was made on a certain presumption. Also some of the subprojects were excluded from the evaluation as no information was provided by Environmental Protection Department.

Table 4 Subprojects and Neighboring Rivers and Streams

	Subprojects	In-flow Rivers and Streams	Name of Data on Samples Collected
1-1	Sewage Treatment Project in Mudanjiang City	Mudanjiang River	No detail confirmed
1-3	Sewage Treatment Project in Mudanjiang City	Kulipao River	Data on water quality of Kulipao
2-1	Wastewater Treatment Project of Heilongjiang paper factory	Songhuajiang main stream	Data on water quality of Liuyuan

1-1. Sewage Treatment Project in Mudan City

No detailed monitoring data on the water quality were available. According to a bulletin on environmental conditions issued by Heilongjiang, the water quality of Mudanjiang was seriously aggravated, with about 20 percent of the total length classified as Class V or less on the national standard in 1999. However, a bulletin in 2008 disclosed that it was improved mostly up to Class III. This subproject covers about 50 percent of the demand for sewage treatment in Mudan. Therefore, the contribution of this subproject to an improvement in the water quality can be evaluated highly.

1-3. Sewage Treatment Project in Daqing City

The water quality of Kulipao River having inflow of the sewage treated by Daqing Sewage Treatment Plant is as shown below. Water pollution remains serious with all the values in excess of the standards. The water quality in entire Daqing City is classified as the worst Class V on the national standard in 2008.

Table 5 Water Quality of Kulipao River (Unit: mg/l)

		COD	**BOD**
	National Standard (Class III)	15 or less	4 or less
2006	**Average**	25.01	3.87
	Excess rate %	87.5	0
2007	**Average**	102	1.6
	Excess rate %	100	0
2008	**Average**	97.6	16.8
	Excess rate %	100	100

Source: Bulletin on environmental conditions issued by Daqing

2-1. Wastewater Treatment Project of Heilongjiang paper factory

Data on the water quality of Liuyuan at the downstream area of this subproject is as shown below.

COD on this spot following the start of operation has shown a downward tendency, maintaining Class II on the national standard. While SS was unstable and fluctuated, the water quality was somewhat improved as a whole.

Table 6 Water Quality of Monitoring Samples in Liuyuan (Unit: mg/l)

Indicators	1999	2007	2008	2009
COD_{Cr}		6.44	4.04	5.52
BOD_5	1.21	1.00	1.00	1.00
SS	57	71	24.78	351.75

Source: Bulletin on environmental conditions issued by Harbin

As seen from the above, there is a wide difference among the subprojects in the water quality of the nearby rivers and water systems. The reason of this discrepancy could be explained from the following aspects:

1) Among nearby rivers, some of them are over-100km-rivers. The subprojects do not cover the entire wastewater which flows into the river. Therefore, no direct effect of subproject can be traced.

2) The table below shows a chronological change in the amounts of sewage and wastewater in Heilongjiang Province. For the past few years, there has been no significant change, almost at a level of about 1.1 billion tons per year. The achievement rate for the national water quality standard rather shows a declining tendency. For instance, the amount of wastewater treated in compliance with the national standard was about 87 percent in 2008 as against about 93 percent in 2001.

Table 7 Change in Amounts of Sewage and Wastewater in Heilongjiang Province

(Unit: 100 million ton)

	Wastewater	Sewage	Total
2001	4.94	6.97	11.91
2006	4.48	7.09	11.57
2007	3.84	7.06	10.9
2008	3.89	7.20	11.09

Source: Almanac on Environmental Statistics in Heilongjiang, 2008

Under the circumstances where the amounts of sewage and treated wastewater remained unchanged in the entire stream, an effect of this subproject should be evaluated not in terms of improvement in the water quality but from the viewpoint of "mitigating aggravation of the water quality." In this subproject, there are a number of external factors that affect an evaluation on account of a gap between the project scale and an improvement in the water quality in the target rivers, and therefore, it is difficult to make precise evaluation. In the meantime, operation of the

subproject is in good condition, and the water quality has been found to be improved, mostly as planned. In other words, should this subproject not have been carried out, water pollution in the rivers would have been more serious. If this subproject is evaluated in terms of mitigating aggravation of water pollution in the rivers, it can be mentioned that certain effects have been obtained.

(4) Urban Air Pollution Conditions

In case of Type 3: Anti-Air Pollution Measure Projects, the objective is to improve air pollution in the target cities and counties.

Table 8 Urban Air Pollutants (2007-2009)

(Unit: mg/m^3)

	Mishan City		Jidong County		Yichun City		National Air Environmental Standard
	Before project	Current	Before project	Current	Before project	Current	
SO2	0.041	0.012	0.059	0.012	0.015	0.011	0.060
NOx	0.033	0.027	n.a	n.a	n.a	0.027	0.050
TSP	0.179	0.148	0.464	0.148	0.270	0.040	0.200

Source: Bulletin on Environmental Conditions in Each City

Note: In Yichun City, as part of data in 2008-2009 was not available, data in 2007 were used.

After the operation was started, an upward tendency was noted in urban areas. Especially in Jidong County, a remarkable improvement was brought about to the extent that the main pollutants were reduced by 70-80 percent as compared with the time of appraisal. The days when the national standard was cleared amounted to 300 days in a year, and this indicates that atmospheric environments in the target urban areas were improved significantly. The subprojects aimed at developing regional heat supply system in urban areas, and this effect must have turned out favorable in the atmospheric environment.

3.3.1.2 Results of Calculations of Internal Rates of Return

Calculations of financial internal rates of return on this project were made for the profit-oriented subprojects, i.e. Type 1: Urban Sewage Treatment Projects and Type 3: Anti-Air Pollution Projects. As to the heat supply subprojects, charges are fixed at a low rate for public benefit and the operation is carried out on the non-profit basis. Therefore, there is almost no significance in figuring out the profit rate by FIRR. Calculations were made for reference purposes to help the executing agency or the government to take necessary steps for further improvement of the project's sustainability and proper tariff standard enough to cover operation and maintenance cost and repayment of ODA loan. The results of calculations are as follows:

Table 9 Calculations of Financial Internal Rate of Return (FIRR)

(1) Financial internal rate of return (FIRR) Mudanjiang Sewage Treatment Plant 6.97% at appraisal Heat Supply and effective coal utilization project in Jidong Country 20.89% at appraisal	Mudanjiang Sewage Treatment Plant 5.247% at ex-post evaluation Heat Supply and effective coal utilization project in Jidong Country 5.12% at ex-post evaluation
(2)Financial benefit Charge for sewage treatment or heat supply tariff	(3)Financial cost 1) Initial investment 2) Expenses for maintenance and administration

Mudanjiang Sewage Treatment Plant has always been in full operation. Although the internal rate of return has become smaller now than at appraisal, a small benefit is kept. Meanwhile, however, in Jidong Heat Supply Project, the internal rate of return has sharply been reduced from the level at appraisal. The reason is that while the cost per unit was 10 yuan at appraisal, the actual cost exceeded 20 yuan due to a rise in the cost of coal.

3.3.2 Qualitative Effects

Details are described in "3.4 Impacts"

Overall, this project has somewhat achieved its objectives, and therefore its effectiveness is fair.

3.4 Impacts

3.4.1 Intended Impacts (Improvement in Health, Welfare and Living Environments)

(1) Improvement in Health, Welfare and Living Environments of Local Residents

The ultimate objective of this project is to improve the health, welfare and living environments of the local residents by means of improving the water quality of the rivers and streams as their water source and improving atmospheric environments over them. It is difficult to set up quantitative indicators in evaluating how the health, welfare and living environments were improved, and it is also difficult to evaluate these items in distinct relevance with an improvement in the water quality and atmospheric environments. In this study, therefore, an interview was made with some local residents as beneficiaries in an attempt to gauge impacts. In a face-to-face question and answer style, a survey was made mainly on how they evaluate change in the water quality in the neighboring rivers and in the air environments and whether or not there was an improvement in their living environment comprising smell and so on. In conducting this survey, a single sampling group was taken from Type 1 and Type 3, respectively, totaling up to 117 people.

Subprojects		Sampling Number
1-1	Sewage Treatment Project in Mudanjiang City	67
3-1	Heat Supply Project in Jidong County	50
	Total	117

1) Sewage Treatment Project (1-1 Sewage Treatment Project in Mudanjiang City)

56 percent of the respondents evaluate that the water quality of Mudanjiang has somewhat been improved as compared with 10 years ago. As noticeable opinions, some of them pointed out that the administration of wastewater from factories has been made better and that sewage treatment plants have been well equipped. As described in "3.3 Effectiveness," the water quality of Mudanjiang has been improved, and such beneficiaries' impression is in conformity with the data. In connection with the fact that the sewage treatment plant is not an attractive existence, there were few opinions appreciating its contribution. In view of the present status that this plant treats about 50 percent of sewage, however, it is considered that their evaluation for the contribution of this project is high.

2) Anti-Air Pollution Measure Project (3-1 Heat Supply Project in Jidong County)

About 60 percent of the respondents answered that the air environment has been aggravated as compared with the 1990's. Noticeable answers were that exhaust smokes from factories and exhaust fumes from automobiles are the main factors. An overall impression is that the air environment has become worse with the economic growth of Jidong County. About 60 percent of the respondents answered that the manifestation of symptoms of pains in eyes, coughing and respiratory diseases has become more frequent than before. As described in 3.3 Effectiveness, air environment has been statistically improved in quality. The present status is actually in for an upward tendency, but such unfavorable answers might be ascribed to their impressions against exhaust fumes from automobiles and their bodily insensitivity to atmospheric change. As the effectiveness of the subprojects could be ascertained, a favorable evaluation could be made from the standpoint of "control of aggravation" of the air environment.

Based on the result above, impacts of the project are evaluated as follows:

1. About 60 percent of the respondents answered that the water quality has become better than before.
2. About 50 percent of the above respondents recognize that the wastewater treatment plants have contributed to an improvement in the water quality. This means that the effectiveness of this project is evaluated favorably by the beneficiaries.
3. Farmers and fishermen notice no dramatic improvement in the relation between the water

quality and their working environments, but evaluate the change somewhat favorably.

4. Although the air environment is statistically in for an upward tendency, many of the respondents do not have favorable feelings. This means that such an improvement has not yet reached the level where people can have bodily sensation.

With the economic growth of Heilongjiang, more and more factories are being constructed, and more and more people are living in this province, and as a result there is increasing demand for the treatment of sewer and wastewater. Under these circumstances, some opinions were expressed to recognize that the water quality has been somewhat improved. This suggests that an effort to improve the water quality made by Heilongjiang Government and by this project has exhibited a certain effect.

3.4.2 Other Impacts

About negative impact which the project might cause, such as noise, odor and sludge, no particular concerns and problems were found during field survey. About sludge produced in the process of wastewater treatment, each project take proper treatment by drying sludge and transporting to disposal plant. About noise and odor, since most of the subprojects are located distant away from living quarters and urban areas, it can be reasonably assumed that no particular concern exists. In the process of carrying out this project, acquisition of the land for construction of the wastewater treatment plants was executed. It was confirmed that such acquisition was made legitimately on the basis of land regulations and urban design regulations, and no particular problem was noted.

It is difficult to precisely evaluate what effect this project has brought about in the living environment as well as the health and welfare of the local people. Meanwhile, numerous opinions evaluated favorably improvement in the water quality in the rivers and the contribution of the wastewater treatment plants. It is considered, therefore, that this project contributed somewhat to mitigating aggravation of the living environment of the local people through improvement in the water quality in Heilongjiang where water pollution is on the increase amidst economic growth and industrialization.

3.5 Sustainability (Rating: a)[9]

Unlike common ODA loan projects, this project consist of group of subprojects, carried out by Heilongjiang Province Environmental Protection Department as the supervisor of the entire project and by the group of executing agencies of respective subprojects.

To meet this nature of the project, we adopted the following approach for the evaluation of sustainability. As the first step, an individual evaluation was conducted on every stakeholder,

[9] Refer to the Attachment 4 on the standard and results of individual rating.

including Environmental Protection Department and each of the executing agencies, and by consolidating individual evaluation, overall evaluation was conducted[10].

With respect to Type 1-2, no particular problems were observed in the operation and maintenance system except for a few subprojects currently standstill, and their sustainability is high. With respect to Type 3 (Anti-Air Pollution Projects), there are some financial problems, but no serious problems that might affect their business were found. Overall, the sustainability of this project can be kept high in the near foreseeable future.

3.5.1 Structural Aspects of Operation and Maintenance

(1) Environmental Protection Department, Heilongjiang (Supervisor)

At the time of ex-post evaluation, it was found that this department is efficiently carrying on the project in good cooperation with the other executing agencies, and that it has the right authorized power and the right personnel in the right places. It has an internal Environment Inspection Section that assumes supervising, executing and inspecting activities based on the environmental protection regulations. The headquarters have 30 staff members, and total 1,400 supervisors are stationed in cities and counties under their command in whole province. The wastewater treatment subprojects are monitored by this department via online monitoring network. All-time automatic monitoring is done at the outlet of each plant.

(2) Subprojects Executing Agencies

Type 1: Urban Sewage Treatment Projects

All three sewage treatment plants are operated by government-owned enterprises under almost common organization structures and under the administration of each municipal sewage treatment company as their parent company. There is no plan for making these subprojects privatize, and no concern about the operation system.

Type 2: Factory Wastewater Treatment Projects

All four subprojects were carried out by private enterprises. Apart from 2-2 Tonghe Paper Manufacturing Factory, the three other subprojects are operated by group companies on the nationwide scale under the well-organized regime. Each of them has an environmental affairs office in its factory, and is ready to operate these subprojects in compliance with environmental regulations

Type 3: Anti-Air Pollution Subprojects

All three subprojects are operated by state-owned enterprises. There is no plan of privatization, and no concern about the operation system. The operation of 3.3 Intensive Heat Supply Subprojects

[10] As there are a number of organizations to be evaluated, the procedure for an evaluation was more simplified than a common ex-post evaluation. Therefore, a survey was conducted on the basis of key focused items only.

in Mishan is entrusted Mishan Dongan Electric Power Co., Ltd. on the basis of five-year contract.

3.5.2 Technical Aspects of Operation and Maintenance

An evaluation was made mainly on the basis of visual check of the equipment, interviews with staff members and confirmation of mechanical inspection records.

(1) Environmental Protection Department, Heilongjiang (Supervisor)

It was confirmed that the personnel having practical ability in carrying out the supervision are placed at the level of the central provincial government. According to the interview to the officer of the Department, however, staff members at the low-end county level, were in shortage, and there were differences in their skill. Thus, a proposal to improve this status was put forward. There was an answer that Environmental Protection Department is making an endeavor to raise its level by dispatching about 350 persons a year for technical training. The Environmental Inspection Section has many opportunities for doing on-the-spot inspections or performing its duties based on the regulations. Therefore, troubles with companies sometimes happen in that inspections are not welcomed or they are rejected. This is one of the tasks to settle for better operation.

(2) Subprojects Executing agencies

For the purpose of evaluation of technical aspects of this project, Chinese experts of environmental protection and improvements joined this evaluation and field survey. An overall evaluation added with their analysis revealed that there is no problem in the equipment used and the skill of the engineers engaged in the subprojects, and that the technical level of operation is high. In interviews conducted at each of the sewage and wastewater treatment plants, the monitoring record of the water quality was found to be under appropriate administration, and the explanation by the respondents was appropriate in terms of the treatment flow and daily routine works. In every sewage and wastewater treatment plant, common unification is worked out in the skills and the technical levels required for operation. Thus, no problem was found. Each of the subprojects is outlined below:

1)Type 1: Urban Sewage Treatment Subprojects

In general, there is no problem. In the 1-2 Yanshou subprojects, however, another different treatment method (CASS) is planned to be adopted. The CASS method itself is already in common use, and the engineers are ready to undergo the technical training. In this sense, there is no concern, but it is necessary to do monitoring at a certain interval for confirmation of operation by the CASS method.

2)Type 2: Factory Wastewater Treatment Subprojects

A positive attitude was seen in a technical improvement at all of the factories with private companies as their parent companies. After operation was started, an effort for further improvement

in wastewater treatment has been continued by each factory.

3)Type 3: Anti-Air Pollution Measure Subprojects

The heat supply equipment is technically fulfilled. The staff engineers are well skilled, and the operation manuals are well equipped. Therefore, there must be no problem in operation.

Fig. 6 3-2. Central Control Office of Mishan Heat Supply

Fig. 7 2-3. Water quality monitoring spot in Harbin Pharmaceutical Factory

3.5.3 Financial Aspects of Operation and Maintenance

(1) Heilongjiang Province Environmental Protection Department (Supervising Agency)

Heilongjiang Province Environmental Protection Department is a supervisor that is not directly involved in the financial sustainability of the subprojects, and therefore it is excluded from evaluation.

(2) Subprojects Implementing Agencies

1) Urban Sewage Treatment Projects

Some of the sewage treatment plants cannot survive only on the charges for sewage treatment, so they are subsidized by the government. All of them answer that the financial budget including the subsidy is reasonable, with their importance as public infrastructures recognized, and in this respect, there is no problem. Regarding the 1-2. Yanshou subproject, no information was available, as the operation is now at a standstill. At the time of starting the subproject, it took long time to acquire the financial support from the local government. It is necessary, therefore, to make sure whether or not this subproject is reasonably backed up by it

2) Factory Wastewater Treatment Subprojects

The subprojects now in operation are administered by the executors which are nationwide large-scale group companies. No detailed financial statements were available, but an answer was

returned to the effect that there was no problem in the financial budget for environmental protection including the subprojects. According to some factory respondents, it is essential for management to have the right personnel placed and to properly use the budget, and such manner leads to stable acquisition of necessary budget.

3) Anti-Air Pollution Measure Subprojects

A problem common to all the subprojects is that operation is made with financial backup of each local government due to gap between price-rising coal and the fixed charge for heat supply. According to the responsible persons in each of the subprojects, the charge is fixed at such a low rate and the cost of coal fluctuates so often that a system of absorbing fluctuations in the cost of coal is required.

3.5.4 Current Status of Operation and Maintenance

(1) The subprojects now in operation can be evaluated favorably in terms of equipment conditions and repair for accidents. Corrosion of equipment occurs in the equipment of some wastewater treatment plants, but since maintenance work is carried out at regular intervals, no particular problem affecting the operation has so far happened.

(2) No problem has been found at this stage in the two subprojects at a standstill, but for prevention of deterioration of the equipment while not in operation, incessant monitoring or guidance by the executing agency is considered necessary. In 2-2 Tonghe Paper Manufacturing Factory, a small number of staff members are kept on duty, and the other workers are required to stand ready at home while not in operation. According to the factory manager interviewed, no particular steps are taken for the maintenance of the equipment.

In general, no major problems have been observed in the operation and maintenance setup from the systematic, technical and financial aspects, therefore sustainability of the project is high.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objective of the project is to improve the water quality and the air environment by constructing sewage and wastewater treatment plants and heat supply system in Heilongjiang seriously affected by water and air pollution. Its importance is very high in this province under the current circumstances where the pollution is becoming more and more serious. It is considered, in the meantime, it is possible there was a better way to set up the project objective and to select subprojects.While a few subprojects are not in operation, the effects as planned were almost accomplished from an overall viewpoint. No particular problem was observed in both of operation and maintenance, and it is expected that proper operation is conducted hereafter.

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

4.2 Recommendations

4.2.1 Recommendations to Executing Agencies

(1) Data and documents on the water quality at the monitoring spots in the neighboring rivers and streams are important in evaluating this project, but they are not available in an orderly way and are not openly disclosed. They are not only necessary for evaluating this project but also useful to the central and local governments in China as well as the donors that support environmental protection projects, as they can be commonly used by them for promotion of environmental improvements. The executing agencies are required to make data and documents complete and open to the public.

(2) No operation is under way in 1-. Sewage Treatment Project in YanShou County and 2-2 Water Pollution Control Project by Tonghe Paper Factory. They showed their intention to reopen the operation, but no distinct schedule has yet been laid out at this stage of the on-the-spot survey. It is considered, therefore, that continued monitoring is required. There is a possibility that the operation of Tonghe Paper Manufacturing Factory is obliged to be at a standstill for the time being, since the paper industry is likely to be influenced by market conditions. The Environmental Protection Department is required to monitor its equipment at certain intervals for maintenance purposes.

(3) The Type 3 subproject (Anti-Air Pollution Measure by Heat Supply) is operated on the basis of the financial backup by each local government on account of price-rising-coal as the raw material and the fixed charge for the heat supply. Unlike sewage and wastewater treatment, raw material cost is incurred by use of coal for the heat supply business. It is desirable for self-support operation to adopt a changeable charge system to absorb the raw cost.

4.2.2 Recommendations to JICA

Nothing in particular.

4.3 Lessons Learned

This project sets up the very big objective of improving the water quality in the basins of Songhuajiang River, Heilongjiang. This objective is too excessive for the real project scale. In appraisal, it is necessary to set targets in a manner that make relevance with the project clear and to make achievements ascertainable. Otherwise, it is difficult to properly grasp the development outcome and to make an adequate evaluation. By the same token, in selecting subprojects, it is necessary to establish criteria focused on relevance to targets and to appraise and examine their adequacy on the basis of the criteria.

Concluded

Comparison of Achievement against Plan

Items	Original	Actual
(1) Outputs Type 1: Urban sewage treatment projects Type 2: Factory wastewater treatment projects Type 3: Anti-air pollution measure Projects Type 4: Project to cultivate monitoring ability	As detailed in Attachment 1.	As detailed in Attachment 1
(2) Period	December, 1998- June, 2001 (31 months)	December,1998- December, 2005 (73 months)
(3) Project cost Foreign currency Local currency Total Japanese ODA loan portion Exchange rate	 10,541 million yen 9,184 million yen (574 million yuan) 19,725 million yen 10,541 million yen 1 yuan = 16.2 yen (As in December, 1998)	 10,533 million yen 9.763 million yen (691 million yuan) 20,296 million yen 10,533 million yen 1 yuan = 14.12 yen (Average for the period of January, 1999 –December, 2003)

Attachment 1 3.2.1 Details on Outputs

Type 1: Urban Sewage Treatment Project Outputs Plan/Achievement

Subprojects		Original	Actual
1-1	Sewage Treatment Project in Mudanjiang City Treatment amount of sewage	100,000 m^3/day	As planned.
1-2	Sewage Treatment Project in Yanshou 1. Treatment amount of sewage 2. Drain	20,000 m^3/day 45km	As planned. 60.8km
1-3	Sewage Treatment Project in Daqing 1. Treatment amount of sewage 2. Drain 3. Pump houses	50,000 m^3/day 19.57km One house newly built. 10 houses for small pumps. 10 houses reformed.	As planned.

Type 2: Factory Wastewater Treatment Project Outputs Plan/Achievement

Subprojects		Original	Actual
2-1	Wastewater Treatment Project of Heilongjiang paper factory Drainage treatment & washing equipment / daily treatment amount	40,000 m^3/day	As planned.
2-2	Water Pollution Control Project by Tonghe Paper Factory Alkaline recovery & drainage treatment / daily treatment amount	20,000 m^3/day	As planned, but now not in operation.
2-3	Wastewater Treatment Project for Harbin Pharmaceutical		

	Factory 1. Improvement in the process of alkaline recovery 2. Improvement in the process of bleaching 3. Drainage treatment equipment	 Equipment to recover green mud established, and the existing cleaner converted. Equipment newly constructed to manufacture chlorine dioxide 25,000m^3/day	As planned.
2-4	Wastewater Treatment Project of Daqing Petrochemical Complex Drainage treatment equipment	 8 places	Cancelled.
2-5	Wastewater Treatment Project for Linyuan Oil Refinary Factory Drainage treatment equipment	 One newly constructed. One improved	Cancelled.
2-6	Drainage treatment plant for brewery factory Drainage treatment equipment Designed treatment amount	 12,500m^3/day	 8,000m^3/day

Type 3: Anti-Air Pollution Measure Subprojects

Subprojects		Original	Actual
3-1	Heat Supply Project in Jidong City 1. Flowing-floor boiler 2. Area covered by heat supply	 3 boilers 713,000 ㎡	 As planned.
3-2	Heat Supply Project in Yichun 1. Flowing-floor boiler 2. Area covered by heat supply	 3 boilers 1,434,000 ㎡	 As planned.

3-3	Heat Supply Project in Mishan 1. Flowing-floor boiler 2. Area covered by heat supply	 2 boilers 1,100,000 ㎡	As planned.

Type 4: Subproject to Cultivate Monitoring Ability

Subproject		Original	Actual
4-1	Heilongjiang Environmental Monitoring Network Project 1. Equipment enlarged in Environmental Science Research Laboratories 2. Equipment enlarged in Environmental Supervisory Station	 Monitors, data processors & cars On-the-spot monitors, recorders, telecommunication kits, data processors, protection tools, etc.	As planned.

Attachment 2 3.2.2.1 Detailed Rating on Project Period (months)

Subprojects		Original	Actual	Difference	Score
Type 1: Urban Sewage Treatment	1-1. Sewage Treatment Project in Mudanjiang City	36	57	158%	1
	1-2. Sewage Treatment Project in Yanshou	27	45	167%	1
	1-3. Sewage Treatment Project in Daqing	18	30	167%	1
Type 2: Factory Wastewater Treatment	2-1. Wastewater Treatment for Heilongjiang Paper Manufacturing Factory	18	Not ascertained.		
	2-2. Wastewater Treatment for Tonghe Paper Manufacturing Factory	15	Not ascertained.		
	2-3. Wastewater Treatment for Harbin Pharmaceutical Factory	27	36	133%	2
	2-6. Wastewater Treatment for Brewery Factory	27	45	167%	1
Type 3: Anti-Air Pollution Measure	3-1. Heat Supply in Jidong	28	38	136%	2
	3-2. Heat Supply in Yichu	36	49	136%	2
	3-3. Heat Supply in Mishan	19	18	95%	3
Type 4: Cultivate Monitoring Ability	4-1. Heilongjiang Environmental Monitoring Network	24	36	150%	1
	Total	275	354	**129%**	**14**
				Average score	**1.57**

<Method of Rating>

1. A comparison is made between the plan and achievements in each subproject to figure out a sub-rating (the subprojects cancelled or not ascertained are 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)

The average was calculated as 1.57 in this project. So, the overall rating was b, being not less than 80 percent.

Attachment 3 3.3.1 Quantitative Effects Individual Operation Indicators on Subprojects Plan/Achievement

(1) Type 1: Main Operation and Effect Indicators on Urban Sewage Treatment Subprojects Plan/Achievement

Subprojects	Original (1998)	Actual (2010)
1-1. Sewage Treatment Project in Mudanjiang City	Treatment amount: 100,000 tons/day Population covered: 280,000 people COD: 10,950 tons/year BOD: 5,840 tons/year SS: 6,570 tons/year	Treatment amount: 100,000 tons/day Population covered: 280,000 people COD: 10,950 tons/year BOD: 5,840 tons/year SS: 6,570 tons/year
1-2. Sewage Treatment in Yanshou	Treatment amount: 20,000 tons/day Population covered: 51,000 people COD: 1,792 tons/year BOD: 960 tons/year SS: 1,088 tons/year	Treatment amount: 6-8,000 tons/day Population covered: 75,000 people Not in operation now. While in operation, no improvement in the water quality was observed to the extent of satisfying the new national standard.
1-3. Sewage Treatment in Daqing	Treatment amount: 50,000 tons/day Population covered: 275,000 people COD: 4,380 tons/year BOD: 2,373 tons/year SS: 3,286 tons/year	Equipment purchased by ODA Treatment amount: 48,000 tons/day Population covered: 400,000 people COD: 5,011 tons/year BOD: 2,592 tons/year SS: 3,110 tons/year

(2) Type 2: Main Operation and Effect Indicators on Factory Wastewater Treatment Subprojects Plan/Achievement

Subprojects	Original (1998)	Actual (2010)
2-1. Wastewater Treatment for Heilongjiang Paper Manufacturing Factory	Wastewater treatment: 40,000 tons/day COD: 15,471 tons/year SS: 6,576 tons/year	Wastewater treatment: 20,000 tons/day COD: 5,531 tons/year BOD: 3,359 tons/year SS* 3,951 tons/year

2-2. Wastewater Treatment for Tonghe Paper Manufacturing Factory	Wastewater treatment: 22,000 tons/day COD: 36,417 tons/year BOD: 11,687 tons/year SS: 1,840 tons/day	Not ascertained, as in no operation.
2-3. Wastewater Treatment for Harbin Pharmaceutical Factory	Wastewater treatment: 25,000 tons/day Reutilization: 10,000 tons/day COD: 16,740 tons/day BOD: 5,947 tons/day SS: 7,972 tons/day	Wastewater treatment: 10,000 tons/day Reutilization: unknown Reduction rate of pollutants: COD: about 92-94% BOD: about 99% SS: about 94-97%
2-6. Wastewater Treatment for Brewery Factory	Wastewater treatment: 12,000 tons/day Circulation efficiency: COD: 5,250 tons/year BOD: 2,900 tons/year SS: 1,980 tons/year	Wastewater treatment amount unknown, but reduced to about 40% as compared with the level at the planning time. Wastewater treatment: 8,000 tons/day Circulation efficiency: COD: 7,912 tons/year BOD: 402 tons/year SS: 4,340 tons/year

(3) Type 3: Anti-Air Pollution Measure Subprojects

Subprojects	Original (1998)	Actual (2010)
3-1.Heat Supply in Jidong	Heat supply area: 713,000 m^2 Population covered: no information available SO_2:1,095 tons/year reduced Particles of soot: 2,079 tons/year reduced	Heat supply area: 1,420,000 m^2 (Achievement rate: 199%) Population covered: 36,000 people SO_2:1,069 tons/year reduced Particles of soot: 2,079 tons/year reduced Soot collecting efficiency: 99.5%

3-2. Heat Supply in Yichun	Heat supply area: 1,434,000 m^2 SO_2: 360 tons/year reduced NOx:: no data available. Particles of soot: n.a Flying ash: n.a	Heat supply area: 1,700,000 m^2 Population covered: 55,000 people SO_2: 149.6 tons/year NOx:: no data available. Particles of soot: 864.9 tons/year Flying ash: 968 tons/year Soot collecting efficiency: 98.2%
3-3Heat Supply in Mishan	Heat supply area: 1,100,000 m^2 SO_2: 141 tons/year reduced NOx:: no data available. Particles of soot: 3,482 tons/year reduced Flying ash: 1,940 tons/year reduced	Heat supply area: 1,300,000 m^2 (Achievement rate: 118%) Population covered: 48,000 families (about 140,000 people) SO_2: 174 tons/year NOx: 118 tons Particles of soot: 1,392 tons/year reduced Flying ash: no data available. Sulfur eliminating efficiency: 63.2% Soot collecting efficiency: 96.7%

Attachment 4 3.5 Sustainability-Rating Results by Subprojects

(1) Criteria for Rating

Supervisory Organization	Criteria
Regime	- Is the regime well-organized and are the personnel well-placed for supervising the subprojects? - Is the supervisory organization in good relationship with the subproject executing organizations for incessant close communication? - Is the monitoring system well-established on the basis of environmental regulations?
Skill	- Are the personnel of Environment Protection Department well-placed and is their skill upgraded to the level to properly supervise the subprojects?
Finance	- Are the above activities financially backed up to a sufficient extent?
Subprojects	Criteria
Regime	- Is the regime well-organized for operation and administration (for decision-making)? - Is there a possibility of being privatized? If so, is there a possibility that the sustainability of the subprojects is affected?
Skill	- Are the personnel kept at an appropriate level for maintenance and operation? - Are the competent personnel having the technical skill for operating equipment well-placed? - Is a technical training system fulfilled for operation and administration? Is any training actually put in practice? - Is the operation manual available? And is it actually utilized? - Are the results of the inspections properly recorded and kept in good conditions?
Finance	- 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 & administration	- 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

		Evaluation	Institutional	Technical	Financial
Supervisor: Environmental Protection Department, Heilongjiang		3	3	3	Out of scope
Urban Sewage Treatment	Mudanjiang	2	3	3	2
	Daqing	3	3	3	3
	Yanshou	2	3	3	2
Factory Wastewater Treatment	Paper Manufacturing Factory	3	3	3	3
	Tonghe Paper	1	1	1	1
	Pharmaceutical Factory	3	3	3	3
	Xuehua Brewery	3	3	3	3
Heat Supply	Yichun	2	3	3	2
	Jidong	2	3	3	2
	Mishan	2	3	3	2
Others	Environmental Monitoring Network	3	3	3	Out of scope
Total		**2.4**			

<Method of Rating>

1. A comparison is made between the plan and achievements in each subproject to figure out a sub-rating (the subprojects cancelled or not ascertained are 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)