

**Ex-Post Monitoring Report of Japanese ODA  
Loan Projects 2010  
(The Philippines, India, Argentina, Colombia, Ghana)**

**January 2012**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

**PEGASUS ENGINEERING CORPORATION**

**INGEROSEC CORPORATION**

## Preface

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

This volume shows the results of the ex-post monitoring for ODA Loan projects that were mainly completed seven years ago and was given ex-post evaluation five years ago. The ex-post monitoring was entrusted to external evaluators to review the projects' effectiveness, impact, and sustainability, to follow up the recommendations made in the ex-post evaluation, and to make further recommendations for future sustainability.

The lessons and recommendations drawn from these monitorings will be shared with JICA's stakeholders in order to apply to the planning and implementation of similar ODA projects in the future.

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

January 2012  
Masato Watanabe  
Vice President  
Japan International Cooperation Agency (JICA)

## Disclaimer

This volume of monitorings, the English translation of the original Japanese version, shows the results of objective ex-post monitorings made by external evaluators. The views and recommendations herein do not necessarily reflect the official views and opinions of JICA.

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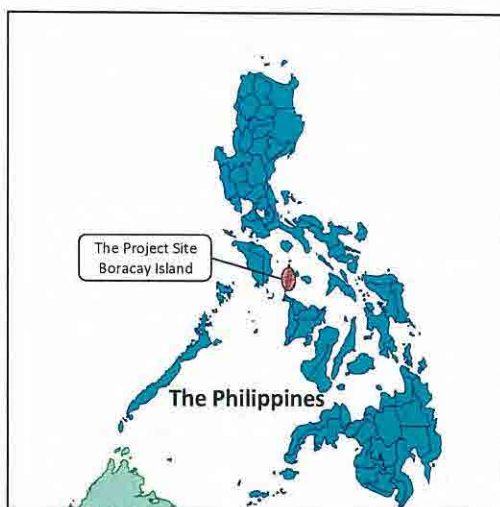
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Ex-Post Monitoring of Completed ODA Loan Project  
Republic of the Philippines

Boracay Environmental Infrastructure Project

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**1. Project Description**



**Location of the Project Site**



**Nabaoy Intake Plant**

**1.1 Project Objective**

The objective of this project is to address the water shortages, pollution of groundwater and the sea by sewage water, and the increase in the amount of waste generated by developing the facilities of water supply, sewage, and solid waste disposal, and thereby contribute to conserving the natural environment along with promoting the development of tourism on Boracay Island in Western Visayas.

**1.2 Outline of the Loan Agreement**

Approved Amount/ Disbursed Amount	1,352 million yen/1,350.5million yen
Loan Agreement Signing Date/final Disbursement Date	August, 1995/December, 2002
Ex-post Evaluation	Fiscal Year 2005
Executing Agency	Philippine Tourism Authority (hereinafter referred to as "PTA." The agency was reorganized as the Tourism Infrastructure and Enterprise Zone Authority (TIEZA) upon passage of R.A. 9593 or The Tourism Act of 2009)

Main Contractor	Nippon Steel Corporation (Japan), PHESCO (The Philippines)
Main Consultant	Consultants for Engineering (The Philippines) / Science and Technology Inc. (The Philippines) / Engineering and Development Corp. of the Philippines (EDCOP, The Philippines) / Nippon Jogesuido Sekkei Co, Ltd. (Japan)

### 1.3 Background of Ex-post Monitoring

Boracay Island in the Western Visayas is one of the foremost tourism promotion spots based on use of the sea resources in the Philippines. The number of international tourists to the island increased rapidly from the late 1980s to the early 1990s. On the other hand, due to economic revitalization, there were concerns over adverse effects on the environment: water shortages caused by population growth, contamination of groundwater and ocean by sewage discharge, and increased amount of waste. Therefore, conservation of the natural environment while sustainably promoting tourism development of the island became a matter of priority. Against this background, infrastructure development projects such as facilities of water supply, sewage and solid waste disposal were implemented by JICA.

In the ex-post evaluation, while it was confirmed that the results were generally expressed in the volume of water supply, the number of individual connections, etc., the following issues were raised:

- 1) The collection rate of sewer service charge is low. Since the articles of association for the water supply and sewage services had not been established in Boracay Water and Sewage System (hereinafter referred to as "BWSS"), the measures to increase the collection ratio and to tackle on non-payment were not defined.
- 2) The quantity of sewage treated exceeded the treatment capacity of the sewage treatment plant (STP).
- 3) A Part of the waste disposal facility was used for drying sludge, discharged from the BWSS's STP, but the remaining part was not used.

Therefore, this project was selected for ex-post monitoring and reviewed under each criterion with the findings from the field survey and other research activities with a final conclusion being drawn.

## **2. Outline of the Monitoring Study**

### **2.1 Duration of Monitoring Study**

Duration of the Study: March 2011 – January 2012

Duration of the Field Study: 1 – 14, August, 2011

### **2.2 Constraints during the Monitoring Study**

The evaluation team distributed the questionnaires to the Tourism Infrastructure and Enterprise Zone Authority (hereinafter referred to as “TIEZA”) and Boracay Island Water Company (hereinafter referred to as “BIWC”) to obtain information/data. However, there were data gaps in the information provided by TIEZA due to the limited information available to them at that time (i.e. data regarding tourism trends, GDP on the island, etc.). In addition, as no meeting was held with the Local Government Unit (hereinafter referred to as “LGU”), there is a lack of information regarding the solid waste disposal facilities. In order to recover this lack of information, the survey by JICA (2010) after the ex-post evaluation, meetings with relevant organizations such as BIWC, etc., and existing materials by the Department of Tourism were used.

## **3. Monitoring Results**

### **3.1 Effectiveness**

#### **3.1.1 Quantitative Effects**

In January 2010, TIEZA (PTA at the time) and Manila Water Company Inc. (hereinafter referred to as “MWCI”) established BIWC as a public-private partnership as part of a water supply and sewage systems development and expansion project. Until then, BWSS, a PTA unit had been operating water supply and sewage services on Boracay Island. Associated with this, Operation and management of water supply and sewage systems on the island were transferred from BWSS to BIWC. BIWC was capitalized at 300 million pesos, of which 80% was financed by MWCI and 20% by TIEZA. BIWC commenced the project for development and expansion of water supply and sewage systems under a 25-year concession contract.

#### **(1) Water supply system**

As part of the above-mentioned project, BIWC is expanding and upgrading the water distribution facilities in order to ensure stable water supply on the island. As Table 1 shows, all the indices (e.g. population served by water supply, number of connections, etc.,) exceed the planned values and the values at the time of the ex-post evaluation.

Table 1: Indicators for Water Supply Services

	Planned	Ex-post evaluation (2005)	Ex-post monitoring	
			(2010)	(2011)
Population, served water supply (number of people)	16,284	14,431	25,590	29,192
Connection to water supply (number of connections)	-	2,075	4,049	4,409
Water supply volume (m <sup>3</sup> /day)	3,600	3,600	8,451	8,902
Service ratio of facility (%)	77	60	79.7	84.0
NRW (%)	-	18	33.6	23.6

Source: BIWC

Along with the increase in population served by water supply, the availability of 24-hour water supply increased from 60% in 2009 to 90% in 2010 in one year since its establishment. According to JICA's survey in 2010, the water distribution pipes were not installed in the northern hilly area, but in this ex-post monitoring it was confirmed that expansion of the distribution pipes to this area has been completed by March 2011. As the delivery of water to this area became possible, the population served by the water supply has increased. Also, according to BIWC, the water pressure was increased from 15psi<sup>1</sup> to 30psi between 2010 and 2011, which has improved the efficiency of the water supply.

In addition, it was confirmed that BIWC has taken the following measures to decrease the NRW ratio. In order to reduce leaks, BIWC has carried out renewal of water distribution pipes and laying further water distribution pipes from 2010 onwards. Moreover, since its establishment in 2010, BIWC have adopted the method of operating water supply business recommended by the International Water Association, of which their parent organization MWCI is a member, to improve their service delivery. They are also improving their customer care by speeding up response to water leaks, etc., in accordance with the customer care standards of MWCI. As a result of these initiatives, the NRW ratio has reduced from 37% in 2009, to 33.6% in 2010, and to 23.6% in 2011.

## (2) Sewage system

The quantity of sewage flowing into the sewage treatment plant (STP) at the time of the ex-post evaluation was 4,500m<sup>3</sup>/day, which was more than double the design capacity (2,200m<sup>3</sup>/day), resulting in incomplete treatment. This was caused by the rapid increase in the population and the fact that the water supplied by other water supply companies

<sup>1</sup> psi (pounds per square inch) is a unit for indicating pressure.

flowed into the sewage pipes of the implementing authority at the time, namely BWSS, which brought about an excess in the quantity to be treated.

Indicators for sewage treatment services (e.g. population covered by sewage service, the quantity of sewage treated, and etc.) are shown in Table 2. The average quantity of inflow at the time of the ex-post monitoring was 4,500m<sup>3</sup>/day, and the maximum inflow during the rainy season was 6,500m<sup>3</sup>/day. Through the expansion project, currently being implemented by BIWC, the upgraded STP has its capacity 2.5 times higher, from 2,600m<sup>3</sup>/day (2005) to 6,500m<sup>3</sup>/day (2011). Thus it can be said that the problem of excessive treatment raised at the time of the ex-post evaluation has been resolved. The number of connections to the sewage system has increased from 657 (2005) to 761 (2011). Of these connections, the number of business connections has increased from 359 (2005) to 657 (2011), of which the number of connections for large-scale businesses such as hotels etc. is 426 (2011), an increase of 19% from the 359 connections in 2005<sup>2</sup>. Also, it was confirmed that the increase in the population served by the sewage treatment system has increased about 9 times.

Overview of STP



Table 2: Indicators for Sewage Treatment Services

	Planned	Ex-post evaluation (2005)	Ex-post monitoring	
			(2010)	(2011)
Population covered by sewage system (number of people)	16,284	3,328	25,590	29,192
Volume of sewage treated (m <sup>3</sup> /day)	524,240	566,725	3,334	3,553
Capacity of the STP (m <sup>3</sup> /day)	2,600	2,600	2,200	6,500
Collection rate of sewerage tariff (%)	-	60	87.6	87.7
Connection to sewerage system (number of connections)	-	657 (residential: 298, commercial : 359)	712 (residential: 99, commercial : 603)	761 (residential: 104, commercial : 657)

Source: BIWC

<sup>2</sup> According to BIWC, “domestic connection” was re-defined in the 2006 system of charges. Prior to this, small-scale accommodation facilities and small-scale private shops or restaurants were classified as domestic connections in addition to normal households, and only large-scale commercial facilities were classified as “business connections”. From 2006 onwards, small-scale accommodation facilities and small-scale private shops or restaurants have also been classified as business connections.



In the interview with BIWC, it was confirmed that the sewage charges are calculated based on the amount of water used<sup>3</sup>. However, since some customers use water supplied by other private suppliers apart from BIWC<sup>4</sup>, it is not possible to grasp the exact amount of water consumption<sup>5</sup>. Therefore, in order to secure charge collection, by assigning staff responsible for each area, BIWC conducts individual home visit to explain on service charge. Through this initiative, the collection ratio has improved from 60% (2005) to 87.7% (2011).

#### 3.1.1.1 Internal Rates of Return (IRR)

The economic internal rate of return (EIRR) in the ex-post evaluation was 7.66%, which is a reduction from the 18.57% at the time of examination, due to currency rate fluctuations such as a 10% drop in the dollar relative to the peso. Also, the financial internal rate of return (FIRR) was 10.02%, which is about the same as that at the time of examination. In this survey, since documents regarding costs and benefit were not available, FIRR and EIRR have not been calculated.

#### 3.1.2 Qualitative Effects

As a result of the water supply and sewage systems development and expansion project started in 2010 by TIEZA (PTA at the time) and MWCI, the facilities, processes, as well as equipment of the water supply and sewage systems have been upgraded and/or improved. This has contributed to the quantitative results as described above.

Details of the main upgrades are as follows:

##### (1) Water supply facilities

- Installation of additional generators at intake facilities and booster pump stations
- Installation of various pumps and motors as well as fuel storage tanks
- Extension of water transmission pipeline from Manoc-Manoc Barangay to Yapak Barangay (8.5km) and extension of distribution pipeline (8.5km).

##### (2) Sewage facilities

- Upgrade of STP's capacity (2,600m<sup>3</sup>/day→6,500m<sup>3</sup>/day)
- Installation of primary and secondary lines, and etc. (9,576 lm)

From the above, as a result of the water supply and sewage systems development

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<sup>3</sup> BIWC's sewage charge is calculated as follows: "water supply volume×70%×15 peso" for individual households, "water supply volume×70%×20 peso" for commercial entities.

<sup>4</sup> e.g. Boracay Tubi System

<sup>5</sup> In this case, the sewage charge is "the number of rooms/toilets × 0.6m<sup>3</sup> × days" for hotels.

and expansion project by the private-public partnership of TIEZA and MWCI, the connections to water and sewage service have increased. The indicators for effectiveness exceed values in the initial plan as well as at the time of the ex-post evaluation. Thus it can be concluded that sufficient results have been achieved.

## 3.2 Impact

### 3.2.1 Improvement in natural environment

As a result of the upgrading of the equipment in 2010, the sewage treatment capacity has expanded, and the problem of excessive treatment at the STP raised by the ex-post evaluation has been resolved. The water quality of the discharged water is shown in Table 3, which shows a great improvement in 2011, with BOD, COD, and TSS all satisfying the environmental standards of the Philippine Department of Environmental and Natural Resources (DENR). The reason for the increase in COD values from 2006 onwards, after the ex-post evaluation, is considered to be due to the reproduction of plankton etc. as a result of the discharge of untreated sewage water because of the excessive treatment at the STP.

Table 3: Quality of Discharged Water

	DENR Standard values	Ex-post evaluation (2005)	Ex-post monitoring					
			(2006)	(2007)	(2008)	(2009)	(2010)	(2011)
BOD	30	32	118	156	204	171	118	26
COD	60	72	144	308	283	235	189	42
TDS	1,000	994	-	-	-	-	-	-
TSS <sup>6</sup>	70	-	174	184	187	215	130	32

Source: JICA Survey Report (2010) and BIWC

According to the JICA survey (2010) after the ex-post evaluation, the problem of bad odors from the sludge drying beds in a part of the solid waste disposal facility was raised. In the present ex-post monitoring, the use of this facility has ceased, and a new sludge treatment and dewatering equipment has been installed within the site of the BIWC office. It has been confirmed that the emission of bad odors at the remained site of the disposal facility have improved. As the dried sludge discharged from the newly

<sup>6</sup> TSS refers to the total suspended solids. This is an index that indicates lack of clarity due to mud or sand. TDS refers to the total dried solids, which indicates the concentration of impurities dissolved in the water. Since this is an index that is applicable to water quality testing of drinking water, it is not appropriate as an index indicating the water quality at the location where wastewater is discharged. Thus BIWC does not currently use TDS as an index for measurement of water quality.

installed sludge treatment and dewatering equipment is used as land improvement material by the local residents, no effect on the surrounding environment can be seen.

Also, in the ex-post evaluation, it was pointed out that the remaining part of the solid waste disposal facility was not being used, but it was confirmed that they were investigating its use as a recycling facility. In an interview survey with TIEZA during this ex-post monitoring, it was stated that there were discussions with the LGU ongoing at present, but no specific plan has been decided. According to the survey carried out in 2011 by Technologie Transfer Zentrum (TTZ), a research institute affiliated with Bremen University in Germany, waste that cannot be processed on Boracay Island is transported to a sanitary landfill at Barangay Kabulihan, Panay Island, about 1km from Boracay, where the waste is treated. According to the TTZ survey, at present the treatment capacity of the waste treatment facility exceeds the demand, but the facility has been designed with the objective of treating waste discharged within the island, so as long as measures such as waste reduction are not taken, there is a concern that eventually there will be waste in excess to be treated.

### 3.2.2 Effect of Tourism Development on the Local Economy

After the ex-post evaluation, the number of visitors has increased continuously at a constant percentage rate, and in 2010 the number of visitors (overseas and domestic) was 779,666, a 66% increase compared with the year 2000. The rate of increase in overseas visitors was 73%, and the rate of increase in domestic visitors was 60%, increasing at an average annual rate of 16% and 10% respectively. In particular, from January to June this year, there was a significant increase of 26.3% compared with the same period of last year (503,203 visitors), and by 2016 the number of visitors is estimated to reach 1 million.

Associated with the increase in numbers of visitors, the tourist revenue has also increased. At the time of the ex-post evaluation in 2005, the tourist revenue was 140 million US dollars, but in 2010 it reached 14,332 million pesos (about 300 million US dollars). Also, tourist revenue in the period from January to June 2011 increased by about 20% compared with the same period in the previous year, which was the largest rate of increase in the past 10 years. As can be seen from these facts, tourist revenue is increasing significantly as a result of promotion by the tourism industry<sup>7</sup>.

In addition, in recent years, a company affiliated with an Overseas Chinese plutocracy has been carrying out a large-scale tourist development project on Boracay Island, which is likely to create 3,000 new jobs on the island and attract 350,000 tourists

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<sup>7</sup> The official statistics on the tourism revenue, the share of the tourism sector to the regional GDP, and the employment ratio in the sector were not provided from TIEZA. Therefore, internet site such as Manila Bulletin Net, etc., was referred for data on the tourist revenue.

every year. As a result, in the next 3 years, the GDP per person on the island is likely to be more than double from about 40,000 pesos per person in 2011 to 90,000 pesos<sup>8</sup>.

Although it is difficult to say that the expansion of economic activities on the island based on tourism is the result of this project alone, it is considered that the safe and stable supply of water as a result of the expansion and development of the water supply and sewage works has produced a certain level of effect. Also, the improvement of the water quality of the discharged water plays a role in ocean conservation which is a tourist resource.

### 3.2.3 Improvement in Living and Sanitary Environment

Interviews were held with stakeholders such as BIWC, local residents (4 households), and operators of tourist hotels (3 persons) regarding this project and the water supply and sewage systems development and expansion project currently being implemented. All respondents replied that there were no problems with water quality, taste, smell, water pressure, etc., and that “the local residents and hotel employees use the water as safe drinking water”. Also, as there were no reports of water-related illnesses, it is considered that there are no problems with the sanitary environment.

### 3.2.4 Other impacts

In the interviews with TIEZA, it was noted that the compensation to those affected by the construction has been properly implemented, and thus there are no problems concerning relocation and land acquisition.

Regarding the issue of the effect on the natural environment that was raised at the time of the ex-post evaluation, from the above, this survey has confirmed that the water quality of the location where the water is discharged has been improved as a result of improving the sewage treatment plants. Also, it has been confirmed that the emission of bad odors at the place where sludge was dried within the solid waste disposal facility have been improved, as a result of the installation of a new sludge processing and dewatering equipment within the site of the BIWC office.

Also, since it was confirmed in this ex-post monitoring that the effect on the economy of the island of tourist development was large, and this project protects important tourism resources, it is considered that the project has had a positive impact on the economy of the island by enabling the stable supply of safe purified water.

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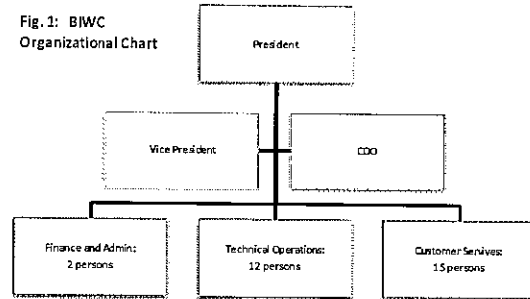
<sup>8</sup> From Business Inquirer homepage (<http://business.inquirer.net>) and Boracay Business Center homepage (<http://www.boracayinfo.com/info.htm>).

### 3.3 Sustainability

#### 3.3.1 Structural Aspects of Operation and Maintenance

MWCI, the parent company of BIWC, is a private water supply company formed within the Ayala Group, a local conglomerate. MWCI is one of the largest-scale company in Asia, and currently employs 1,808 persons. The main capital of BIWC has been contributed by Ayala Corporation (43%), public works expense (44.5%), Mitsubishi Corporation (7%), IFC (5.2%), and so forth.

Fig. 1: BIWC Organizational Chart



The number of employees of BIWC is 32 at present (of which 12 are in operation-related departments, and 15 in customer-related departments), and 90% (72 employees) of the staff of BWSS have continued to work as a contract base in each departments for BIWC. Also, 5 persons including management have been seconded from MWCI, which creates a system where know-how can be easily provided from MWCI for business operation. BIWC operates its facilities and responds to customers on a 24-hour system, but according to the employees there are no staff shortages in the system. From the above, it is considered that there are no problems in the operation and maintenance management system.

#### 3.3.2 Technical Aspects of Operation and Maintenance

BIWC has acquired its business operation and facility maintenance methods from MWCI. Also, training is frequently carried out utilizing the know-how of MWCI with the objective of improving the capabilities of the employees. Last year, trainings were carried out covering the fields such as financial accounting and charge collection, procurement, project management (water quality and maintenance management), etc., in addition to OJT. Also, a training (*i.e.* corporate accounting (taxation) training) was jointly held with the Philippine Institute of Certified Public Accountants (PICPA). Since the training was held on both managerial and technical aspects, there are no matters of concern regarding the skills of BIWC.

#### 3.3.3 Financial Aspects of Operation and Maintenance

The current financial data provided by BIWC is shown in the table 4. The liquidity ratio is as high as 93.2%. On the other hand, the capital adequacy ratio remains at 26.9%, which means public and private funds represent a large portion of total assets of BIWC, established joint venture, based on a concession contract launched in 2010.

In addition, the BIWC financial data shows that 11% of total cost and expenses in 2010 was used for repairs and maintenance, as well as 8% of total cost and expenses in a month of December 2009. Therefore, BIWC has been financing the cost of minimal repairs and maintenance needed for proper operation and maintenance.

Moreover, according to BIWC, of the total budget of 1.6 billion pesos for the water supply and sewage systems development and expansion project, the budget for expansion for the coming 5 years has already been secured.

A part of the budget is funded through the Development Bank of Philippines (DBP) under a yen loan project, the “Environmental Development Project”, currently being undertaken by JICA.

Table 4: BIWCI Financial Conditions

	2010
Total Assets	1,201,894,295
Current Assets	171,494,020
Fixed Assets	1,030,400,625
Current Liability	184,031,133
Capital	323,103,218
Sales	148,834,890
Recurring Expenses	69,152,493
Depreciation Expense	35,220,935
Net Surplus / Deficit	8,174,449
Liquidity Ratio (%)	93.2%
Capital Adequacy Ratio (%)	26.9%
Return On Asset (%)	0.7%
Total Assets Turnover	12.4%
Net Profit to Sales	5.5%

出典: BIWCI

### 3.3.4 Current Status of Operation and Maintenance

Operation and maintenance of the facilities is carried out based on the operation and maintenance methods of MWCI. As a result of a site survey at each facility, it was found that all facilities operate on a 24-hour system, and checks on the status of operation of the facilities and water quality are carried out every hour. Thus no particular problems for maintenance were seen.

Regarding the customer service, based on BIWC’s own customer response criteria, a 24-hour response hotline is provided and there are internal rules for responding in a short time to complaints etc., to increase the customer satisfaction. (For example, for a burst water pipe, response must be within 2 hours, and the repair completed within 8 hours, and etc.) According to the simple interviews with 4 resident households that were some customers of BIWC, they showed a very high level of satisfaction with the current customer service of BIWC.

Upgraded equipment in facilities  
Bolabog Pumping Station



Pinaungon Pumping Station



From the above, no particular problem regarding sustainability from the viewpoint of maintenance was seen in terms of the structural aspects, technical aspects, and financial aspects.

## **4. Conclusion, Lessons Learned and Recommendations**

### **4.1 Conclusion**

In January 2010, BIWC was established as a joint venture between TIEZA and MWCI, and based on a 25-year concession contract, they commenced a water supply and sewage systems development and expansion project, with the aim of strengthening the function of the facilities established in this project. This has performed well, and in the ex-post monitoring, the values of all the indices such as population served by water supply, number of connections, etc., exceeded the values in the initial plan and values at the time of the ex-post evaluation. In addition, it was confirmed that in 1 year from its establishment, the availability of 24-hour water supply has increased from 60% to 90%. Also, BIWC operates business based on the operation and maintenance methods of their parent company MWCI, and no problems were seen in terms of operation and maintenance. Sewage service charge is calculated based on the amount of water consumption. For those customers, using water from other private supplier apart from BIWC, the amount cannot be calculated correctly. Therefore, in order to increase the collection ratio, BIWC staff visit individual households for service charge collection. As a result of this effort, the collection ratio has improved since the ex-post evaluation. In the survey conducted by JICA in 2010 after the ex-post evaluation, it was pointed out that a part of the solid waste disposal facility, which was used for sludge drying beds, was generating bad odors. However, in the present ex-post monitoring, it was found that the use of this facility has stopped, and a new sludge processing and dewatering equipment has been installed within the site of the BIWC office. There is a plan to construct a trauma center at the former site of the disposal facility/sludge drying bed area. It was, likewise, confirmed that there are no more complaints about the emission of bad odors in the vicinity.

Also, concerning the unused part of the solid waste disposal facility, TIEZA and LGU are currently investigating its use as a recycling facility with the initiatives of TIEZA. It is estimated that amount of waste will increase in the future, which may facilitate more effective use of the facility.

### **4.2 Recommendations**

None

### **4.3 Lessons Learned**

None

End

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Project Outputs		
Water supply system		
1) Intake facilities	<ul style="list-style-type: none"> <li>Installation of infiltration wells at 16 locations along the Nabaoy River</li> </ul>	<ul style="list-style-type: none"> <li>Intake plants and intake pump condensed into one location</li> </ul>
2) Water treatment facilities	<ul style="list-style-type: none"> <li>Water treatment plant: capacity of 4,000m<sup>3</sup>/day</li> <li>Chlorination facilities</li> </ul>	<ul style="list-style-type: none"> <li>Water treatment plant: capacity of 12,000m<sup>3</sup>/day</li> <li>Equipment procurement: chlorination facilities, set of generators, electricity supply facilities, water meters</li> </ul>
3) Transmission facilities	<ul style="list-style-type: none"> <li>Transmission pipelines: extension of 6,500lm, inner diameter of 250mm, PVC</li> <li>Submarine pipeline crossing: extension of 1,000lm, inner diameter of 250mm</li> </ul>	<ul style="list-style-type: none"> <li>Transmission pipelines: extension of 1,945lm, inner diameter of 200mm, PVC</li> <li>Submarine pipeline crossing: extension of 960lm, inner diameter of 250mm, PVC</li> </ul>
4) Distribution facilities	<ul style="list-style-type: none"> <li>Distribution pipelines: extension of 16.7km, inner diameter of 75-300mm</li> <li>Ground reservoirs: capacity of 2,600m<sup>3</sup> (Brgy. Manoc-Manoc), capacity of 100m<sup>3</sup> (Brgy. Yapak)</li> </ul>	<ul style="list-style-type: none"> <li>Distribution pipelines: extension of 29.07km, inner diameter of 50-400mm</li> <li>Ground reservoirs: capacity of 2,000m<sup>3</sup> (Brgy. Manoc-Manoc), capacity of 550m<sup>3</sup> (Brgy. Yapak)</li> </ul>
5) Booster pump stations	<ul style="list-style-type: none"> <li>Two stations: in the vicinity of the water treatment plant, and Brgy. Balabag</li> </ul>	<ul style="list-style-type: none"> <li>As planned.</li> </ul>
6) Water supply equipment	<ul style="list-style-type: none"> <li>1,900 service connections (1,500 residential, 400</li> </ul>	<ul style="list-style-type: none"> <li>Service connections (717 residential, 188</li> </ul>



	commercial)	commercial)
Sewage system		
1) Sanitation (installation of toilets)	<ul style="list-style-type: none"> <li>3 communal toilets with septic tanks, 402 simplified pour flush toilets</li> </ul>	<ul style="list-style-type: none"> <li>3 public toilets, 115 simplified pour flush toilets</li> </ul>
2) Sewer pipelines	<ul style="list-style-type: none"> <li>Sewer collection pipelines: extension of 16km, diameter of 150mm, extension of 5,425m, diameter of 300mm</li> <li>3 pump facilities</li> </ul>	<ul style="list-style-type: none"> <li>Sewer collection pipelines: extension of 185.051m, diameter of 350mm (primary sewage collection), extension of 1,492.01m diameter of 250mm (primary sewage collection), extension of 5,9751m, diameter of 200mm (secondary), extension of 2,5551m, diameter of 200mm (secondary), extension of 8841m, diameter of 100mm (project directly managed by PTA: primary sewage collection)</li> <li>One pump facility, 7 lift facilities</li> </ul>
3) Sewage treatment plant	<ul style="list-style-type: none"> <li>Installation of sewage treatment plant (2.5ha): anaerobic pond, maturation pond, chlorination pond, facultative pond, regulating pond</li> <li>Discharge conduit: extension of 1,000m, inner diameter of 300mm</li> </ul>	<ul style="list-style-type: none"> <li>Installation of sewage treatment plant (oxidation ditch, etc.,)</li> </ul>
Solid waste disposal		
	<ul style="list-style-type: none"> <li>Landfill site (2.4ha) and attendant equipment</li> </ul>	<ul style="list-style-type: none"> <li>Landfill site (1.3ha) (drying area for sewage sludge) and attendant equipment</li> </ul>
Consulting services	<ul style="list-style-type: none"> <li>Foreign: 50M/M</li> <li>Local: 181M/M</li> </ul>	<ul style="list-style-type: none"> <li>Foreign: 50M/M</li> <li>Local: 181M/M</li> </ul>

2. Project Period	August 1995 – September 2000 (62 months)	August 1995 – March 2003 (92 months)
3. Project Cost		
Total	1,803 million yen	1,961 million yen
Japanese ODA loan portion	1,352 million yen	1,350.5 million yen

**EX-post Monitoring for ODA Loan Project**  
**“Urban Water Supply and Sanitation improvement program”**

External Evaluator: Koichi Ishii  
Pegasus Engineering Corporation

**1. Project Description**



Locations of the Project



Filtration Plant in Hyderabad

**1.1 Project Objective**

This project’s objective is to improve the water supply and public health services in India’s small- to medium-sized cities by extending long-term, low-interest loans via financial institutions to public service providers, thereby contributing to the improvement of living standards of people and develop infrastructure for industry.

**1.2 Outline of the Loan Agreement**

Loan Amount / Disbursed Amount	8,670 million yen / 8,670 million yen
Date of Loan Agreement / Final Disbursement Date	January 1996 / March 2001
Implementation of Ex-post Evaluation	Fiscal year 2006
Executing Agency	HUDCO

**1.3 Background of Ex-post Monitoring**

Water supply and sewerage services and solid waste disposal facilities are basic public services. However, in the latter half of the 1990s, many regions in India still lacked an adequate water supply, even in densely populated urban areas. Taking the rapid national urbanization into consideration, it

was considered that considerable funding would be needed to promote those services.

Thus, in support of these Indian government policies, this project aimed to provide funds to HUDCO and 26 sub-projects were implemented.

According to the ex-post evaluation performed in 2005, in terms of the achievement of goals<sup>1</sup> concerning effectiveness in each sub-project, while eight of the 26 sub-projects had achieved the project purpose by more than 80%, 13 sub-projects were only deemed as having achieved less than 50% of the project purpose, which meant average achievement ranging from around 60 to 70%. Sustainability has been problematic, particularly in terms of organizational and financial aspects, as well as a lack of adequate technical experts, which affected the project outcome.

The project was evaluated as low-achieving in terms of effectiveness in response to problems observed in organizational and financial aspects of the executing agency regarding its sustainability. Therefore, this project was selected for ex-post monitoring and reviewed under each criterion with the findings from the field survey and other research activities with a final conclusion being drawn.

## **2: Outline of the Monitoring Study**

### **2.1 Duration of Monitoring Study**

Duration of the Study: March 2011 – January 2012

Duration of Field Study: 3-15 July, 2011

### **2.2 Constraints during the Monitoring Study**

The project was implemented through HUDCO by providing long-term loan assistance for the execution of 26 sub-projects (19 water supply and seven sewerage sub-projects), in 23 cities/towns. 16 sub-projects (including two sewerage projects), for which responses to the questionnaire were received, were selected as target sub-projects for ex-post monitoring, field surveys of which were performed on five sub-projects (including two sewerage sub-projects).

## **3: Monitoring Results**

### **3.1 Effectiveness**

A profile of all individual projects and the result of the effectiveness evaluation during the ex-post monitoring as compared to those of the ex-post evaluation are summarized as follows:

The analysis of achievement of the goals for fourteen (14) water supply projects indicated that thirteen (13) of the fourteen (14) projects had achieved more than 50% of their targeted goals and only one (1) project achieved 50% or fewer of its goals.

Similarly, analysis of the achievement of the goals of two (2) sewerage projects indicated that one (1) of the two (2) sub-projects had reached 80% or more of its target goals while the other sub-project

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<sup>1</sup> Based on the final reports on each sub-project and the impact investigation reports (on some of the sub-projects), the achievement of project effects was comprehensively judged with the available data concerning the quantity of water supply, amount of sewerage disposed of, the number of individual water connections and the coverage rate, in comparison with the updated project effects reported with the project plan for the loan appraisal.

had achieved 50 to 80% of the goals.

Most of the 16 sub-projects (including two sewerage projects) for which responses to the questionnaire were received achieved the planned value on the appraisal, hence the effectiveness of these projects was considered high.

HUDCO provided the necessary technical and administrative support to the project executing agencies in the process from the appraisal stage to the completion of construction, the effectiveness of which was obvious.

Table 1: Outline and Degree of Completion of Sub- Projects  
Evaluation Results for Effectiveness

N O	City	Population (2005) (Million people)	State	Project type	Effectiveness	
					Ex-post evaluation	Monitoring
1	Bangalore	5.16	Karnataka	Sewerage system (new)	△	-
2	Chennai	4.37	Tamilnadu	Sewerage system (expansion)	○	-
3	Surat	2.93	Gujarat	Sewerage system (expansion)	◎	-
4	Jaipur	2.78	Rajasthan	Sewerage system (expansion)	△	-
5	Amritsar	1.1	Punjab	Sewerage system (expansion)	△	△
6	Jodhpur	0.93	Rajasthan	Sewerage system (expansion)	△	-
7	Tirupati	0.25	Andhra Pradesh	Sewerage system (new)	○	○
8	Ahmedabad	3.8	Gujarat	Water supply increase and waterworks (expansion)	◎	◎
9	Hyderabad	3.62	Andhra Pradesh	Stabilization of water supply and water distribution	◎	◎
10	Hyderabad	3.62	Andhra Pradesh	Stabilization of water supply	◎	◎
11	Indore	1.85	Madhya Pradesh	Stabilization of water supply	◎	-
12	Amritsar	1.1	Punjab	Water supply increase and waterworks (expansion)	△	△
13	Tirupati	0.25	Andhra Pradesh	Water supply increase and waterworks	○	○
14	Ramagundam	0.24	Andhra Pradesh	Waterworks (new)	△	○
15	Vizianagaram	0.18	Andhra Pradesh	Water supply increase and waterworks (expansion)	△	○
16	Mahbubnagar	0.14	Andhra Pradesh	Water supply increase and waterworks (expansion)	△	○
17	Chickmagalur	0.12	Karnataka	Water supply increase and waterworks (expansion)	◎	-
18	Coimbatore	0.1	Tamilnadu	Waterworks (expansion)	◎	-
19	Siddiopet	0.06	Andhra Pradesh	Water supply increase and waterworks (expansion)	△	○
20	Wanparty	0.05	Andhra Pradesh	Water supply increase and waterworks (expansion)	△	○
21	Golaghat	0.05	Assam	Water supply increase and waterworks (expansion)	△	-
22	Chalakydy	0.05	Kerala	Water supply increase and waterworks (expansion)	○	○
23	Pratapgarh	0.05	Rajasthan	Water supply increase and waterworks	◎	◎
24	Kandukur	0.05	Andhra Pradesh	Waterworks (new)	△	○
25	Sadasivapet	0.04	Andhra Pradesh	Water supply increase and waterworks (expansion)	○	○
26	Bagevadi	0.03	Karnataka	Water supply increase and waterworks (expansion)	△	-

Note (1) Based on the final reports on each sub-project and the impact investigation reports (on some of the sub-projects), the achievement of project effects were comprehensively judged with the available data concerning the quantity of water supply, amount of sewerage disposed of, the number of individual water connections and the coverage rate, in a comparison of the updated project effects reported with the project plan on the loan appraisal. The details are reported in the following sections. Further data to show the arguments is attached to the end of this project report.

□: 80% or more, ○: 50% - 80%, △: Less than 50%

Note (2) Concerning projects such as Hyderabad and Ahmedabad, for which the amount of supply water was considerably increased due to collaboration with other projects, the effects brought by the Japanese ODA loan project were only evaluated.

### 3.1.1 Quantitative effectiveness

#### (1) Effectiveness and achievement of the objectives of the water supply projects

Most of the 14 water supply sub-projects for which responses to the questionnaire were received

achieved the planned values in the appraisal and were hence considered highly effective.

In order to ascertain the effectiveness direction (increase/decrease), the average increase/decrease in the quantity of water supply, coverage of water connections, population of water supply and number of water connections as operation and effect indicators were compared to those of the ex-post evaluation (The base value in 2005 was considered to be 100%).

All the values of the four operation and effect indicators mentioned above exceeded those of the ex-post evaluation, particularly the quantity of water supply and number of water connections.

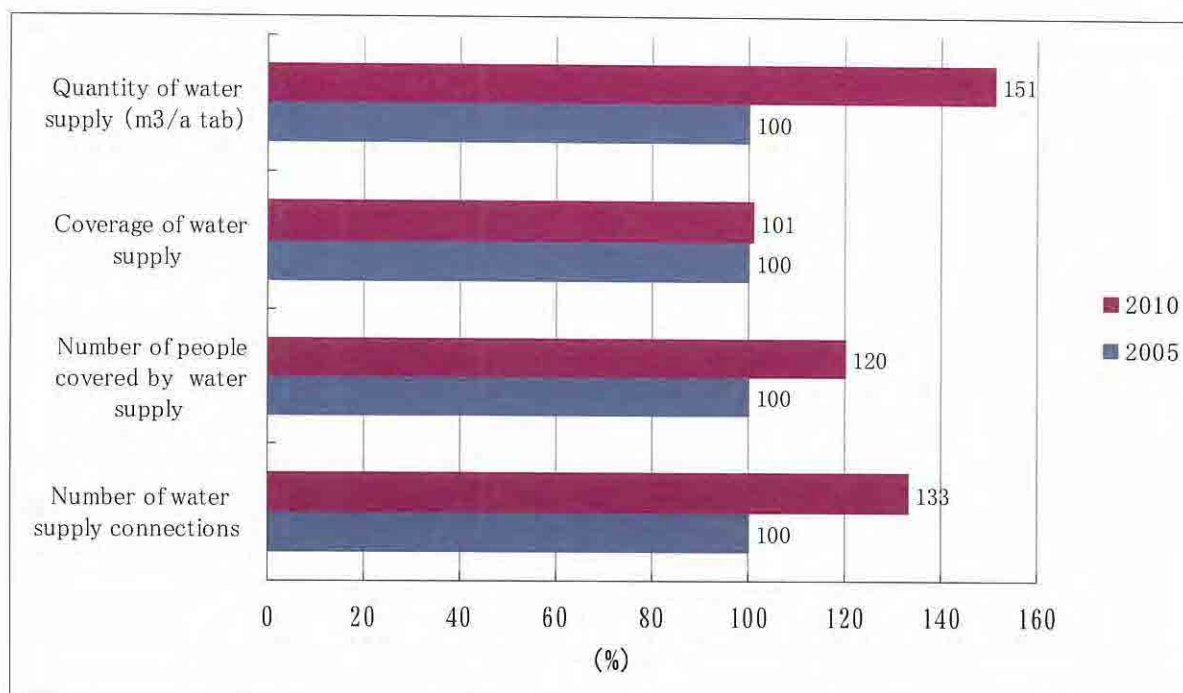


Figure 1: Rate of increase on indicators (average values for 14 water supply projects)

Each sub-project sought to increase the number of water supply connections while decreasing the number of public water connections. The number of public water connections decreased from 17,561 (2005) to 16,701 (2010), a reduction of about 5%, in the 14 sub-projects for which responses to the questionnaires were received. Users of public water connections are generally poor, who generally use such water for drinking purposes, making it difficult to reduce the number of public water connections.

The following project effects were reported in five cities of the 14 water supply sub-projects which were provided with loan assistance:

- In these five cities, 393,000 people obtained water tabs following the ex-post evaluation and an increased number of people had access to water supply.
- In these five cities, the daily water supply capacity increased to 278,000m<sup>3</sup>/day. For a total of 5.7 million people living in these cities, the daily water supply capacity per person more than doubled from the pre-project average of 41L to a post-project level of 90L.
- In Hyderabad, thanks to improvements in water pressure and stabilization of the water volume through the other regions, the water supply was stabilized.

The achievement level for the objectives of water supply projects was analyzed by comparing the plan and actual results in the latest performance reports (2010). 13 of the 14 projects reached 50% or more of their target and one project achieved 50% or less of its target (See Table 1). As of the ex-post evaluation, there were seven projects whose achievement levels were 50% or less. In Andhra Pradesh State, however, all ten projects achieved the planned value.

The main reason for the unsatisfactory level of achievement in some of the sub-projects was a lack of funds and the fact that the facility was not constructed as planned.

As regards the water quality in 14 water supply projects for which responses to the questionnaire were received, it was within the national average level.

## (2) Effectiveness and achievement of the sewerage project objectives

The sewerage projects targeted by the ex-post monitoring were Amritsar in Punjab Province (No. 5)<sup>2</sup> and Tirupati in Andhra Pradesh Province (No. 7)<sup>3</sup>.

The achievement level of the sewerage project objectives was analyzed by comparing the plan and actual results in the latest performance reports (2010). One of the two projects (Tirupati) reached 80% or more of its target, while the other project (Amritsar) achieved 50 to 80% of its target. The major reason for the unsatisfactory achievement level was the lack of planned funding and provisional suspension of the loan, although the condition of the loan for the sewerage project involved constructing a sewerage plant. Eventually its loan resumed subject to the construction of the plant.

The difficulty of development in local areas where settlements are scattered results in low coverage of sewerage network services.

The sewerage treatment plant in Tirupati drains water for industry and agriculture but no quality problems are reported. Recently, there have been plans to use part of the water drained from the plant in the private sector as cooling water following tertiary treatment.

The achievement level of the sewerage project objectives is shown in Table 3 Service level benchmarking.

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<sup>2</sup> Projects to expand the network of sewerage, solid waste disposal plants is only for the plan.

<sup>3</sup> The new construction of sewerage networks and construction of solid waste disposal plants.



Table 2: Actual value of sewerage projects

Name of indicators	Planned Value (national standard)	Actual Value in 2010	
		Amritsar	Tirupati
Population targeted	-	1,217,000	104,000
Sewerage coverage	100%	50%	63%
Quality of disposed water	BOD100/TSS150 (for agricultural use)	BOD210/TSS340	BOD44/TSS120

### 3.1.2 Qualitative Effects

There was a certain aspect of effectiveness achieved by the project at the time of the ex-post evaluation. Based on interviews<sup>4</sup>, the following changes were experienced in residents' living standards upon completion of the project and it was found that the project effectiveness continued to the ex-post monitoring:

- Individual water tabs became widespread and the continuity and quantity of water supply were stabilized.
- Thanks to newly constructed water tabs, water availability increased and the water quality also improved.
- Water supply projects became widespread and the time required to obtain water was reduced.
- Connections with sewerage considerably improved the hygienic environment and decreased malodors and the number of mosquitoes, also ensuring a very clean environment in the area.

### 3.1.3 Issues concerning improvement in effectiveness

Approaches taken to improve effectiveness for each sub-project following the ex-post evaluation were as follows:

- Improvement of water quality, increase of the continuity of water supply and redressal of customer complaints were inducted into the planned indicators as measures to improve public services at State and civic level, and for facility and institutional improvement through central government schemes such as JNNURM.

Data collection, the establishment of systems and improvement of data accuracy have been adopted as approaches to service level benchmarking. However, the actual data on data processing and analysis of the planned value are some issues that remain outstanding.

<sup>4</sup> Interview with water and sewerage agencies in each state and some of the beneficiaries in Tirupati selected at random.

Table 3: Service level benchmarking

National Level Benchmarks			
Water Supply projects		Sewerage projects	
Coverage of water supply connections	100%	Coverage of toilets	100%
Per capita supply of water	135lpcd	Coverage of sewerage network services	100%
Extent of metering of water connections	100%	Collection efficiency of the sewerage network	100%
Extent of non-revenue water	20%	Adequacy of sewerage treatment capacity	100%
Continuity of water supplied	24 hours	Quality of sewerage treatment	100%
Quality of water supplied	100%	Extent of reuse and recycling of sewerage	20%
Efficiency in redressal of customer complaints	80%	Efficiency in redressal of customer complaints	80%
Cost recovery in water supply services	100%	Extent of cost recovery in sewerage management	100%
Efficiency in collection of water supply-related charges	90%	Efficiency in collection of sewerage charges	90%

Source: Ministry of Urban Development 2010

- For each sub-project, widespread publicity and consumer awareness activities were implemented in order to increase the number of individual water connections. The standard of services improved with better water quality and time expansion of the water supply.
- During the facility construction, HUDCO gave training, such as supervision of works and quality control, to transfer their techniques to State Municipal Corporations, State Water supply and Sewerage Boards who were provided with loan assistance.
- HUDCO, moreover, offered an NGO support program to the borrower, covering 15% of the operating cost and 0.25% of the loan amount, usable for human resource development.

As the result of these interventions, most of the 16 sub-projects (14 water supply projects and two sewage projects) for which responses to the questionnaire were received achieved the planned value of operation and effect indicators, hence the effectiveness were improved following the ex-post evaluation.

### 3.2 Impact

#### 3.2.1 Improvements in living standards

According to the report from HUDCO, during the ex-post evaluation, improvements in living standards were identified in each of the cities where individual projects had been implemented. The Sub-Projects had various impacts, including increased water consumption, decreased supply-related costs (including time costs for drawing water), improved hygiene habits (coinciding with increased water consumption and improved public health facilities), a healthier environment in residential areas,

and lower incidence of water-borne diseases.

Based on interviews<sup>5</sup> with each entity and beneficiaries during the ex-post monitoring, similar impacts concerning the hygienic environment were noticed throughout the areas by implementing the project in various habitats.



Public water tap in Tirupati

### 3.2.2 Improvement of the industrial infrastructure

A significant contribution to the improvement of industrial infrastructure was observed during the ex-post evaluation in some of the targeted cities. For example, in Hyderabad the project-funded development of the water supply system contributed significantly to the IT Industrial Urban Development promoted by the city.

No such impacts were found in targeted cities during the ex-post monitoring.

### 3.2.3 Other positive and negative impacts (Impacts on the natural environment)

The very poor hygiene environment in certain areas lacking adequate sewerage systems at the time of ex-post evaluation was found to have improved.

State government and entities are responsible for environmental monitoring on sub-project implementation, so no monitoring is performed by HUDCO. The following examples were observed during the monitoring:

- There was drawdown of the groundwater level caused by excessive pumping of groundwater and depletion of water resources. However there are no current problems in Hyderabad city as groundwater dependence is presumed to have decreased due to the water supply being brought by upstream water resources to the surface level.
- The sub-project in Amritsar shows potentially negative environmental effects since the ex-post evaluation showed increased malodor and a decline in water quality. The proposed sewerage treatment plant<sup>6</sup> could not take off; meaning water not treated to effluent standard was drained into water channels. To tackle these issues, improvement measures were taken. For example, the construction of two sewerage treatment plants will be funded by Japanese ODA loans.

According to the results of the questionnaire and field survey, positive impacts were found in the

<sup>5</sup> Interview with water and sewerage agencies in each state and some of the beneficiaries in Tirupati selected at random

<sup>6</sup> There were plans to construct a self-funded disposal plan in Amritsar and a sewerage system funded by loans from HUDCO, but Amritsar city was unable to provide the funds and the solid waste disposal plan was shelved.

respective sub-project even following the ex-post evaluation, while measures to mitigate negative impacts have been taken.

### **3.3 Sustainability**

#### **3.3.1 Sustainability of the sub-project**

##### **3.3.1.1 Structural Aspects of Operation and Maintenance**

Generally speaking, many water and sewerage public corporations in large cities had numerous capable employees and well-established systems of management, operation and maintenance for each of the sub-projects but the water and sewerage services departments of smaller cities were organizationally poorly equipped in this regard.

During the ex-post monitoring, HUDCO has established a training system<sup>7</sup> for concerned staff of the State governments to ensure a strong relationship and cooperation between HUDCO and State governments. No problems were reported in terms of the organizational aspect, such as the number of staff in each entity involved in the operation and maintenance of facilities.

Thus overall, the structural aspects of operation and maintenance following the ex-post evaluation have been improved.

##### **3.3.1.2 Technical Aspects of Operation and Maintenance**

Small- to-medium-sized cities lacked technicians for water supply and sewerage services during the ex-post evaluation and this issue remains unresolved.

During ex-post monitoring, it was found that HUDCO has been implementing a policy of providing training/technical support to staff in each entity pending completion of the facility as an approach to improve the competencies of the concerned staff of executing agencies.

Based on the annual report(s) of HUDCO, it was found that following staff training in executing agencies in the Human Settlement Management Institute (HSMI), the capacity of the agencies for administrative duties and the operation and maintenance of newly constructed facilities had improved.

In a project approved by the State government, the Economic Internal Rate of Return (EIRR) was calculated during planning of the water supply and sewerage projects, while analysis of users' ability and willingness to pay<sup>8</sup> makes it a more realistic approach for the project plan formulation.

##### **3.3.1.3 Financial Aspects of Operation and Maintenance**

During the ex-post evaluation, the financial sustainability of each entity was deemed inadequate.

In most states, the user charges for both water supply and sewerage are not recovered in full, except big cities like Hyderabad, and this gap is made up through collections from taxes including house tax. A structure where operation and maintenance costs are fully covered by collection fees is

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<sup>7</sup> The training provides for the planning, construction and operation and maintenance concerning the construction of facilities for staff in water entities.

<sup>8</sup> Based on interviews with residents, the current water fee is 100Rs/household and the ling pay is assumed to be around Rs200.

necessary.

The facility in Tirupati normally runs smoothly and without financial strain because the expenses paid towards operation and maintenance are covered as planned. However, part of the expenses is covered by house and other taxes as mentioned above.

Table 4 Expenses for Operation and Maintenance in Tirupati (unit: lacs)

Expense for operation and maintenance		2005	2006	2007	2008	2009	2010
Sewerage	Planned value	26.00	27.00	29.00	31.00	33.00	35.00
	Actual value	25.20	25.98	26.80	29.20	31.43	33.56
Water Supply	Planned value	375.00	95.00	425.00	468.00	468.00	468.00
	Actual value	370.00	390.00	420.00	460.00	460.00	470.20

Source: Response of the questionnaire

### 3.3.1.4 Current Status of Operation and Maintenance

During the site visits to Amritsar, Tirupati and Hyderabad, it was observed that operation and maintenance were being reasonably implemented in terms of the availability of requisite staff and fund allocation. Based on responses to the questionnaire, the collection rate for water and sewerage fees was between 75 and 98%, averaging up to 90%. For proper operation and maintenance, however, the collection fees remained insufficient.



Sewerage facility in Amritsar



Water supply facility in Hyderabad

### 3.3.2 Sustainability of HUDCO as an implementing agency

#### 3.3.2.1 Structural Aspects of Operation and Maintenance

Basically State governments<sup>9</sup> are responsible for the formulation and planning of the projects. HUDCO's role was to review the project plans in terms of the technical and financial perspectives at the time of appraisal. The current HUDCO guidelines suggest that both an adequate scale of operation

<sup>9</sup> Mainly public health engineering departments in state government and urban development department.

and fee structure as well as designing a more realistic project plan for sustainable operations should be taken into consideration during the appraisal.

From the time of appraisal up to the project implementation, HUDCO provides the necessary guidance and expert advice, in terms of both technical and financial aspects, as well as the project analysis by referring to the guideline. To date, it has accordingly reinforced the impact on project implementation.

In the following organization chart, the departments involved in this project consist of Water Supply, Sewerage/Drainage of Utility Infrastructure, and Infrastructure Finance.

However, HUDCO does not monitor the quality (effectiveness and sustainability) of each sub-project as all loans are guaranteed by State governments, meaning there is seemingly no risk for HUDCO in terms of repayments of both principal and interest.

Other investment-and-financing organizations in India meanwhile, such as the power sector, are also responsible for the project from the time of appraisal to project completion, whereupon the monitoring function is transferred to the executing agency.

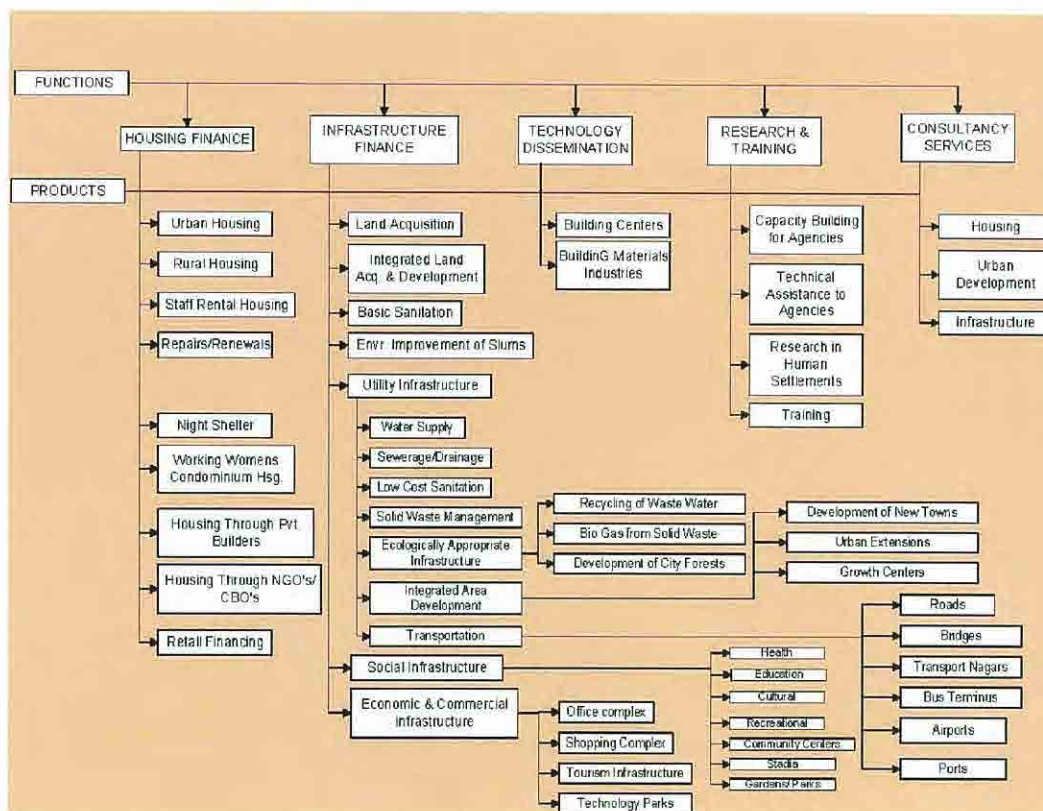


Figure 2: Organization chart in HUDCO

Source: HUDCO annual report

### 3.3.2.2 Technical Aspects of Operation and Maintenance

According to HUDCO's annual report, the quality of staff's evaluation and the ability of supervision on project implementation have improved by enhancing the training facilities, programs, and guidelines of HUDCO.

The Human Settlement Management Institute, a HUDCO training agency, provides training in order to improve the ability of water supply entities in terms of formulating business plans, procurement procedures, and monitoring the operation and maintenance for constructed facilities.

A manual was also newly created to review the demand prediction method as was earmarked at the ex-post evaluation. The manual section concerning the evaluation of the water supply and sewerage business aims to increase prediction accuracy by using actual values for the last 3 years as well as forming an evaluation team with experts from regional offices to collaborate with the same in obtaining and analyzing field data.

### 3.3.2.3 Financial Aspects of Operation and Maintenance

HUDCO came up to standard as a national financial institution on the ex-post evaluation. We verified the financial conditions, including the annual loan amount and pre-tax profit through the annual report following the ex-post evaluation.

According to the report, more advantageous funds under the JNNURM (a project for national urban development) program have been provided since 2005; hence the loan amount from HUDCO has decreased. However, the loan amount sanctioned has been increasing with strengthening infrastructure demands and previously peaked in F.Y. 2010. Furthermore, the capital adequacy ratio reached 9.6% in F.Y. 2010.

Although the ex-post evaluation showed the financial situation has declined temporarily, the business performance has gradually recovered and expanded.

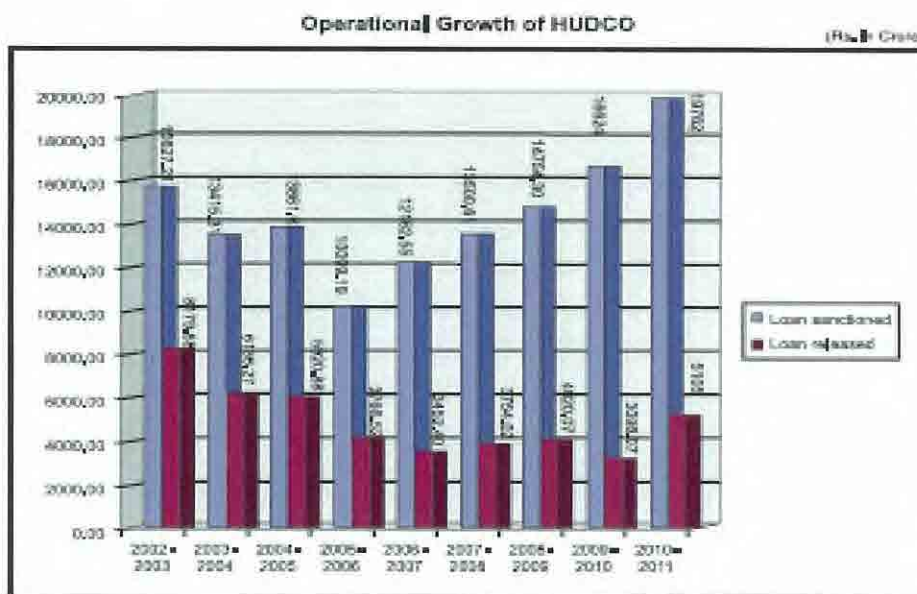


Figure 3: Shift of the loan amounts in HUDCO

Source: HUDCO financial report

### 3.3.3 Sustainability of Two Step Loans (TSL)

As regards the repayment of loans following the ex-post evaluation, it was confirmed that the full

amount of all 26 sub-loans had been repaid as of 31 March, 2011.

However, swap costs designed to avoid exchange risk have been mounting and the revolving fund account has remained below zero, hence no refinancing has resumed since the ex-post evaluation.

During the ex-post evaluation, new funding to contribute to the sustainability of TSL was considered but did not eventually transpire, due to institutional problems, such as the fact that funding in local currency was not admitted.

Finally, as mentioned above, based on responses to the questionnaire, structural aspects of operation and maintenance for the water supply and sewerage improvement project appear to have improved when compared to those of the ex-post evaluation.

#### **4. Conclusion, Lessons Learned and Recommendations**

##### **4.1 Conclusion**

The achievement of project objective was approximately 60 - 70% at the time of the ex-post evaluation, though the project made a certain impact and its effectiveness was hence deemed fair.

Responses to the questionnaire were received from 16 of the 26 sub-projects, including two sewerage projects where the field survey was implemented. Most of these 16 sub-projects achieved the target indicators, hence the effectiveness of this project is deemed high.

Under this ex-post monitoring, HUDCO provided the necessary guidance to the executing agencies, both technical and administrative, throughout the entire course of project implementation, right from the stage of project appraisal to project construction. HUDCO, however, did not carry out any regular monitoring of the project upon completion of the project construction. Monitoring is supposed to be implemented by each of the executing agencies of the relevant sub-project.

Based on responses from executing agencies and the field survey, no crucial problem emerged in terms of Operation and Maintenance and structural aspects.

##### **4.2 Recommendations**

None.

##### **4.3 Lessons Learned**

None.



## Appendix: Achievement of Outputs

### Comparison of Major Plan and Actual achievement

Items	Plan	Actual achievement
1. Outputs	<p>Disbursement of a total of 8,670 million yen in loans to 60-70 water supply, sewerage and solid waste disposal projects in small- to medium-sized cities.</p> <p>(Overall scheme)</p> <p>1. Target projects: Water supply projects, sewerage and drainage projects, and solid waste disposal projects in urban areas (construction, expansion and rehabilitation)</p> <p>2. End users: Organizations responsible for providing water supply, sewerage and solid waste disposal services as defined in HUDCO guidelines</p> <p>3. Loan terms Interest: [ JBIC interest rate +government warranty + swap rate + 5% HUDCO margin] or the normal HUDCO lending rate, whichever is lowest Repayment period: Maximum of 15 years Loan amount: 500 million rupees, with individual loans of 40-50 million rupees Loan ratio: Up to 100% of HUDCO's loan ceiling Security/guarantees: State government guarantees, bank guarantees and property etc.</p>	<p>90% of the total loan target of 8,670 million yen was disbursed to 26 projects in 23 cities. Nineteen projects related to water supply facilities, and seven were for sewerage systems.</p> <p>(Overall scheme)</p> <p>1. As planned. However, no funds were disbursed for solid waste disposal projects.</p> <p>2. As planned.</p> <p>3. Essentially as planned. Interest: A drop in market interest rates pushed HUDCO's normal lending rate down, thus this was adopted as the "lower" of the two. Repayment period: 8-15 years (average: 13 years) Loan amount: 12-461 million rupees / loan (average rupees 148 million) Loan ratio: 50 - 100% (average: 75%) Security/guarantees: all loans guaranteed by the state government</p>
2. Project periods	January 1996 to December 2001	January 1996 to March 2001
3. Project Cost		
Amount paid in Foreign currency	8,670 million yen	8,670 million yen
Amount paid in Local currency	None	None
Total	8,670 million yen	8,670 million yen
Japanese ODA loan portion	8,670 million yen	8,670 million yen

Major data in sub-projects

Evaluation number	SUB-PROJECT			Number of water supply connections (unit)	People covered by water supply (people)	Coverage of water supply (%)	Quantity of water supply (m <sup>3</sup> /a tab)
Andhra							
9	Hyderabad	Stabilization of water supply and water distribution	2010	728,000	4,510,000	95%	332,000
10			2005	478,000	3,800,000	70%	176,000
			TARGET				
24	Kandukur	Waterworks (new)	2010	56,000	56,187	70%	80,000
			2005	40,000	40,323	50%	15,000
			TARGET				
16	Mahbubnagar	Water supply increase and waterworks (expansion)	2010	140,930	177,000	76%	18,184
			2005	108,170	143,000	56%	18,184
			TARGET				
14	Ramagundam	Waterworks (new)	2010	236,000	236,000	66%	21,700
			2005	236,000	236,000	48%	21,700
			TARGET				
19	Sadasivapet	Water supply increase and waterworks (expansion)	2010	45,000	300,000	67%	5,000
			2005	37,000	200,000	55%	5,000
			TARGET				
25	Siddipet	Water supply increase and waterworks (expansion)	2010	80,000	60,000	75%	6,500
			2005	62,000	40,000	66%	6,500
			TARGET				
13	Tirupati(WATER)	Water supply increase and waterworks	2010	20,985	29,500	60%	34,500
			2005	8,699	18,000	35%	34,500
			TARGET				
15	Vizianagaram	Water supply increase and waterworks (expansion)	2010	140,000	163,000	93%	17,000
			2005	110,000	133,000	76%	17,000
			TARGET				
20	Wanparty	Water supply increase and waterworks (expansion)	2010	75,000	55,000	78%	7,000
			2005	50,000	30,000	65%	4,000
			TARGET				
Gujarat							
8	Ahmedabad	Water supply increase and waterworks (expansion)	2010	54,400	60,500	78%	71,500
			2005	33,000	37,500	65%	
			TARGET				
Kerala							
22	Chalakydy	Water supply increase and waterworks (expansion)	2010	4,179	58,166	97%	7,250
			2005	3,175	52,683	92%	7,150
			TARGET				
Punjab							
12	Amritsar (water supply)	Water supply increase and waterworks (expansion)	2010	1,039	1,217	85%	223,000
			2005	1,027	1,100	73%	169,000
			TARGET				

## Project for Improvement of the Hygienic Environment of the Reconquista River Basin

External Evaluator: Pegasus Engineering Corporation

Mr. Koichi Ishii

### 1. Project Description



Project Area



Pump Station No. 9

#### 1.1 Project Objective

The objective of this project was to strive to perform flood control by upgrading rivers and improving drainage in the Reconquista River Basin, as well as to enhance its water quality by the development of sewage treatment facilities and the strengthening of systems like wastewater management, thereby contributing to mitigating flood damage and to improving the hygienic environment of the residents in the region.

#### 1.2 Outline of the Loan Agreement

Approved Amount/ Disbursed Amount	8,150 million yen/4,725 million yen
Loan Agreement Signing Date/Final Disbursement Date	March, 1995/August, 2002
Ex-post Evaluation	FY2005
Executing Agency	Reconquista River Valley Administration Committee (COMIREC)

Main Contractor	Dragados y Obras Portuarias S.A., Pagliettini S.A., Impregilo SpA, Cartelline S.A., Codi S.A., Eleprint S.A.
Main Consultant	Black & Veatch International Company-Franklin Consultora S.A Electrosistemas S.A.S

### 1.3 Background of Ex-post Monitoring

The local industrialization policies of the 1940s and 1950s, promoted the development of general industry alone. These policies prioritized the development of industrial infrastructure, while neglecting the development of social infrastructure in the Reconquista River Basin. Adequate supply of basic services such as water supply, sewage, and medical care services were neglected. Flooding was frequent in much of the basin area during the summer rainy season when the water level of the rivers rose. During the winter, seasonal southeast winds with rainfall contributed to flooding in the lower area of the Reconquista River Basin causing considerable damage to local infrastructure. This project was implemented to improve the rivers, the drainage flow, and the overall local sanitary environment.

Argentina's economic and debt crisis forced JBIC to suspend loan disbursements, which in turn forced construction of the sewage treatment facilities to be terminated. Hence, in the ex-post evaluation, it was pointed out that the effectiveness of the project was curtailed in terms of river purification. A decline in river water quality was observed in FY2005, and there is a need to monitor the water quality of the river. Following the completion of the project, it was noted that the agency in charge of maintenance and operations was not functioning properly. Recommendations made to the executing agency stated "the need to prioritize the construction of sewage treatment plants as soon as the country's economic crisis ended, to strengthen the operating system of the maintenance agency, and to quantify the project's effectiveness in the region."

Therefore, based on the above issues concerning project effectiveness and sustainability that were observed during the ex-post evaluation, this project was selected for ex-post monitoring and reviewed under each criterion with the findings from the field survey and other research activities with a final conclusion being drawn.

## 2. Outline of the Monitoring Study

### 2.1 Duration of the Monitoring Study

Duration of the Study: March 2011 to January 2012

Duration of the Field Study: June 22, 2011 to July 2, 2011

### 2.2 Constraints during the Monitoring Study

COMIREC is the management organization in charge of environmental improvements of the Reconquista River, but with limited governmental authority. Due to its limited authority, COMIREC has been having serious organizational problems. In addition, there were limits to the information that was obtained including the answers to the questionnaire about the segment where input was terminated by the Japan International Cooperation Agency (JICA).

### 3. Monitoring Results

#### 3.1 Effectiveness

##### 3.1.1 Quantitative Effect

Before the project was implemented (1994), the rivers in the Reconquista Basin maintained their natural course; dredging was carried out in very limited areas along the rivers. In addition to a small change in elevation that existed between the upstream and downstream areas, the ground surface was covered with permeable low concrete and asphalt as urbanization progressed within the basin. As a result, a major portion of the rainwater that poured into the basin was not absorbed by the soil, and most, if not all of the rainwater runoff went into the rivers increasing their water level. This caused the rivers to overflow and inundate the land nearby. Flooding occurred frequently especially during the summer rainy season.

During the winter, seasonal winds with rain from the southeast also contributed to the rise in the water level of Lujan River, Reconquista River, and La Plata River. The lower area of the Reconquista River Basin was constantly flooded causing extensive flood damage.

During the great flood of 1985, 18.6% of the entire basin area or 119.8km<sup>2</sup> was submerged, of which 28.4% consisted of residential areas. Some 305,500 people (12.3% of the total population in the basin) suffered flood damages, of which 71,000 were forced to evacuate and 28,000 lost their homes.

At the time of the appraisal, benefits such as a decrease in the number of deaths and injuries caused by floods, an improved living environment for the basin residents, an improvement in regional economic activities due to the mitigated risk of floods, and the reclamation and efficient utilization of land ruined by flooding were listed as the expected results of this project.

The ex-post evaluation confirmed that damage caused by floods has not increased since 2001. Ex-post monitoring also confirmed improvement in the sanitary conditions of residents, an improved local economy, and recovery and effective use of wasteland.

The water volume, water level and meteorological data of the 10 pump stations constructed in the project are monitored 24 hours from the 9<sup>th</sup> pump station. Monitoring data showed that the water level and flow rate has remained constant since the project's completion. The operating procedures of the pump station are set according to a manual, and the gates are operated to maintain a water level of 1.7 to 1.8m within the reservoir, with regularly held monthly inspections. The operating system to handle the floods that occurs an average of 2 to 3 times a year is in place.

In the project, the average estimated flood frequency of the Reconquista River is based on the

annual number of floods recorded during the last 50 years, and the useful lifespan of the pump station is estimated at 10 years. The number of floods exceeding these estimates has not been recorded since 2005. Any rise in water level that could potentially provoke a flood event has been adequately controlled by the pump stations.

Before the Project, floods occurred frequently in much of the area when the amount of water increased during the summer rainy season. Furthermore, seasonal southeasterly winds with rainfall in the winter caused flood damage in the lower area of the Reconquista River Basin.

According to COMIREC, the population residing in the newly developed residential area created by the project increased by more than 60% in contrast to the population before the project was implemented. The provincial government created a hazard map to help local residents become aware of flood risk areas and it is conducting a flood prevention and awareness campaign directed at the residents.

During the field survey study, it was observed that flood damage had not occurred in the project areas since the project was completed in 2001. Under this project, riparian works were conducted on the Reconquista River and its tributaries; and channels were created, the width of the river was expanded, and drainage improvements were achieved with the use of drainage pump facilities. All of these enhancements contributed to building a good monitoring system for controlling and reducing the risk of large-scale flooding.

### 3.1.2 Qualitative Effect

At the time of the evaluation, measures to reduce flood-induced overflows of septic tanks and to mitigate groundwater contamination were listed as examples of the project's effectiveness (including impact) in addition to a decrease in infectious diseases caused by contaminated water, an improvement in water quality, and the elimination of bad odors due to pollution.

Four sewage disposal plants, which were not constructed at the time of the ex-post evaluation, were completed by ENOHSA (National Institution for the Execution of Environmental Development Projects). Of the four plants, two are currently working and the other two will be completed in 2011.

The local water authority, ADA, is in charge of enforcing local industrial wastewater standards, and periodically monitoring the water quality of the Reconquista River. Based on the latest data that was obtained, ADA has collected fines from approximately 100 factories (prime meat, dairy products, lumber, garments, and processed drinking water among others) that violated the ADA Industrial Waste and Water Quality Standards<sup>1</sup>.

But, despite ADA's enforcement of industrial waste standards, the water quality of the

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<sup>1</sup> Dissolved oxygen: over 1mg/l, BOD: 70mg/l or below, pH: between 6.5 and 8.5, Total suspended solid: 0, Cadmium: less than 9.5µg/l, Chromium: less than 170.0µg/l, Mercury: less than 8.9µg/l, Lead: less than 70µg/l, Zinc: less than 250.0µg/l

Reconquista River has continued to decline since 2005. Deterioration of the BOD<sup>2</sup> average value of 29mg/ℓ in 2007 in contrast to 23mg/ℓ in 2005, and the detection of heavy metal (mercury) in the water observed in 2008 and 2011 were reported to the ADA and the local government. Fish were found to exist near the disposal plant during direct observations of the main stream and there was no stench. However, in the other subsidiary streams, fish were not found and there was some stench of the water.

Despite the installation of sewage disposal plants, there was no remarkable improvement in the water quality of the river. This appears to be because (1) two of the four wastewater treatment plants are scheduled to go into operation later, (2) the sewage network remains undeveloped, (3) the river water continues to be contaminated by the discharge of agricultural and industrial chemicals, and (4) an excessive regulatory approach has been adopted for industrial wastewater.

### 3.1.3 Re-calculation of the Economic Internal Rates of Return (EIRR)

The positive impact of the project included increased appreciation of the land along the river basin. Land value increased as the frequency of the floods and its adverse effects on social infrastructure, local residents, and industries located in the Reconquista River Basin, and on local transportation became controlled. The executing agency confirmed that if the project's positive impact was economic progress in the region, then the Economic Internal Rate of Return (EIRR) was estimated to be about between 12.7% and 14.2%.

The executing agency did not re-calculate the EIRR, and data for re-calculation were not available at the time of the monitoring study.

It was concluded at the time of the ex-post evaluation that JICA's financed flood control facilities located downstream of the Reconquista River are being operated and maintained properly, and no flood damage has occurred after the project was completed. However, the river purification effort has not achieved its objectives as yet, since only half of the sewage disposal plants constructed by ENOHSa are currently in operation.

## 3.2 Impact

### 3.2.1 Intended Impact

Based on the questionnaire responses and interviews<sup>3</sup> of local residents, the Project's flood damage mitigation measures increased the land value downstream of the Reconquista River, which

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<sup>2</sup> Biochemical Oxygen Demand (BOD) is an index that indicates the level of contamination due to organic matter in river water. It represents the amount of oxygen that is consumed when organic matter in the water is oxidized by microorganisms during a fixed time at a fixed temperature. The higher the numerical figure, the greater the amount of organic matter and the greater the contamination

<sup>3</sup> A few local people residing in the project area were selected at random by the local government office for interviews.

was land previously classified as a flood risk area. According to COMIREC, the improved price of this land has made it competitive with the surrounding land. Land prices were estimated to be about 6,000 pesos maximum (approximately 11,028 yen) /m<sup>2</sup>. Another effect of the project was an increase in the local population. The total local population recorded in 1991 was 2,510,000, 3,730,000 in 2001 and 4,120,000 in 2010.

However, the increase in the land value of the Project site can also be attributed to the country's unstable inflation rate, which was 40.95% (2002) and 11% (2011)<sup>4</sup>, and the recent surge in national land price (8.01%, 2007)<sup>5</sup>, which suggests that the rise in land value and the increase in population within the Project area may not be solely due to the Project's implementation.

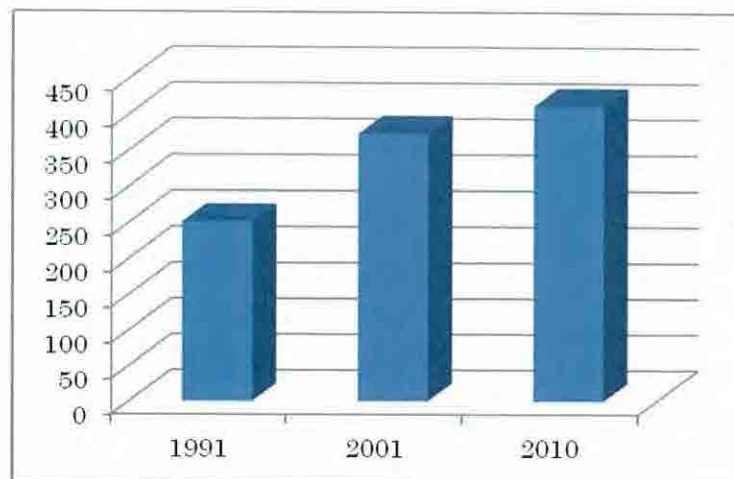


Fig. 1 Increase in the Local Population within the Project Region (unit: 1000 people)

Source: Responses to the Questionnaires from COMIREC

It has also been confirmed in interviews with local residents (see footnote #3) that domestic labor for women has been reduced. Housewives pump substantially less muddy water out of their houses due to the decrease in floods.

### 3.2.2 Other Impact

A sustainable environmental improvement program for the Reconquista valley has been implemented since 2005 to alleviate water pollution of the Reconquista River. This program is sponsored by the Inter-American Development Bank (IDB), and the estimated cost of this project, if implemented, will be 250 million dollars. The program consists among other inputs, enhancement of the existing drain pipe network, expanding the Hurlingham disposal plant, improvements to the

<sup>4</sup> World economy, statistics [http://ecodb.net/country/AR/imf\\_inflation.html](http://ecodb.net/country/AR/imf_inflation.html)

<sup>5</sup> Articles in Clarin.com



current waste disposal system, and establishing a Water Quality Monitoring Institution. Of these inputs, the Water Quality Monitoring Institution was completed during the ex-post evaluation, while improvements to the existing drain pipe network and expansion of the Hurlingham disposal plant will start in 2013.

### 3.2.3 Land acquisition and Relocation of Residents

According to the COMIREC responses to the questionnaire on living conditions after relocation, the ex-post evaluation of the project also included assessment of the living conditions of the relocated families since land acquisition by the project was kept to a minimum. Alternative land was provided for relocated households to alleviate any problems or inconvenience caused by mandatory relocation. The total number of households that were relocated was 22 instead of 44 as initially planned.

The project's positive impact was confirmed by the growth in the local population and the increase in the price of land in an area previously classified as a high-risk flood area. Living conditions have improved in part because of the construction of pump stations.

But, as stated earlier, the increase in land price and population may not be exclusively due to the project.

## 3.3 Sustainability

### 3.3.1 Structural Aspects of Operations and Maintenance

The Organismo Provincial para el Desarrollo Sostenible (OPDS) is supervised directly by the Governor of the Buenos Aires Province, and it decides the region's (including the Reconquista River) environmental conservation policies. COMIREC, which is supervised by the OPDS, was established in 2001 as the operation and maintenance agency of this project as well as the agency for integrated management and water quality conservation in the Reconquista Valley, which is an essential part of the Integrated Valley Management Plan. Since 2008, COMIREC has gradually taken over the operation and maintenance of the facilities managed by the Water Department of the Buenos Aires provincial government. However, during the ex-post evaluation, COMIREC was no longer functioning and UNIREC was in charge of the supervision and control of the facilities. Due to organizational changes in 2002, UNIREC was no longer under the direct supervision of the Governor, and it was delegated to the Ministry of Public Works of the Province of Buenos Aires. With this change, UNIREC lost its status as an independent authority and organization. As of 2008, UNIREC's functions have gradually been transferred to COMIREC.



Fig.

Fig. 2 Organizational Chart of COMIREC

Source: Programa de Manejo Urbano Ambiental Sostenible de la Cuenca del Río Reconquista, IDB

The Drainage and Water Department, the Ministry of Infrastructure, and the provincial government consigned the private corporation, Ilubaires S.A. to operate and maintain the 10 pumping stations constructed under this project. The contracted amount totaled 20 million pesos that was distributed during the course of three years starting in 2008. Thereafter, starting in 2012, COMIREC will take over the maintenance and operations in lieu of the provincial government.

The integrated controls of the ninth pump station are usually operated by a staff of six members. The operations and maintenance of the other pump stations are monitored and supervised from this station. An additional eight people are assigned during the flood season. Government retirees assist the private corporation (Ilubaires S.A.) in the operation and maintenance of the stations. The local government cooperates with Ilubaires by posting monitoring data on their website.

AySA (the agency in charge of the city suburbs and about 90% of its capital is held by the government) and ABSA (agency in charge of the city water) are responsible for the operation and maintenance of the sewage treatment facilities shown in the Table 1. Currently there is a plan<sup>6</sup> to expand the existing sewer system at four facilities. This expansion will be funded by loans from IDB and the World Bank.

<sup>6</sup> "The Sustainable Environmental Improvement Program of the Reconquista Valley" is planned by IDB at a cost of 250 million dollars since 2005. The objectives of the project are to improve the existing drain pipe network, and to expand the Hurlingham disposal plant by 2013.

Table 1 Operation and Maintenance Organization at Each Main Plant

Plant Name	Pumping Station	Urban-areas Sewage Plant	Suburban Area Water Plant
Organization	Ilubaires S.A.	AySA	ABSA
Type of Organization	Private	Government Funded	Local Government Funded
Employees	1,000	5,000	1,000
Number of Engineers	800	3,500	800
Number of Sewage Engineers	-	1,500	400

### 3.3.2 Technical Aspects of Operations and Maintenance

Ten pumping stations are currently in operation, and the main control and monitoring center is located at the ninth station. Maintenance activities are performed regularly every three months. The garbage removal machine at each pumping station has also been replaced.

According to the private corporation, Ilubaires S.A, in charge of the stations operations and maintenance, the monitoring system for all ten stations has been improved since 2008. Former provincial government employees are in charge of the training program for plant operators, and an operations manual has also been prepared.

Training of staff members at the disposal plants is mainly OJT carried out by AySA and ABSA, the companies that are in charge of the operation and maintenance of the sewage plants. The current chief engineer of the plant has 22 years of experience. The water quality inspection procedures are based on the quality standards of these companies, which are more stringent than provincial government water quality regulations.



Photo 1 Monitoring the Pump Facilities



Photo 2 Facility Chart of the Sewage Disposal Plant

### 3.3.3 Financial Aspects of Operations and Maintenance

The FY2009 maintenance and operating budget of the pump stations was US\$8.17 million, of which US\$3.24 million were allocated for electricity, security and replacement expenses. The private company, Ilubaires S.A., was consigned the task of maintenance and operations. After the project was completed, the budget required to maintain and operate the pump stations and sewage disposal plants constructed under the project was allocated. In addition, a manual for mobilizing staff members and carrying out pump operations during both normal and flood periods has been prepared and the placement of relevant personnel have been adequately implemented. Presently, two sewage plants have been in operation for only several years since their completion, and the other two facilities will be in operation in 2011. As a result, much of the budget is taken up by repair and supply costs.

Table 2 Operation and Maintenance Cost of the COMIREC Pumping Stations

(unit: 1000 pesos)

	2006	2007	2008	2009	2010
Budgeted amount	2,420	2,710	10,092	9,512	18,633
Actual amount	2,000	2,223	2,569	11,377	13,778

Source: COMIREC Response to the Questionnaire

### 3.3.4 Current Status of Operations and Maintenance

AySA and ABSA are in charge of the operations and maintenance of the four sewage disposal plants. The local government-contracted corporation, Ilubaires, is in charge of the maintenance and operations of the pumping stations and carries out regular maintenance work once every three months.

The operational conditions of the two sewage disposal plants out of the four that are in operation and the maintenance of the pumping stations were confirmed through visual observations (at pumping stations 6 to 10), and the monitoring activity, periodic inspections, garbage removal, etc. were adequately implemented.

According to the COMIREC responses to the questionnaires, the Taurita Bridge, which spans over a narrow area of the Reconquista River, was listed as one of the reconstruction works planned by the IBD. Expansion and reconstruction of Taurita Bridge are scheduled to take place in 2012 to 2013.

Table 3 Overview of Newly Constructed Sewage Disposal Plants

Map Number	Name of Sewage Disposal Plant	Capacity	Operator	Present Condition
1	San Miguel	1000 m <sup>3</sup> /h	ABSA	Operational since 2008
2	Hurlingham	1500 m <sup>3</sup> /h	AySA	Operational since 2007
3	Catonas	-	ABSA	To be completed in 2011
4	Agustin Ferri	-	ABSA	To be completed in 2011

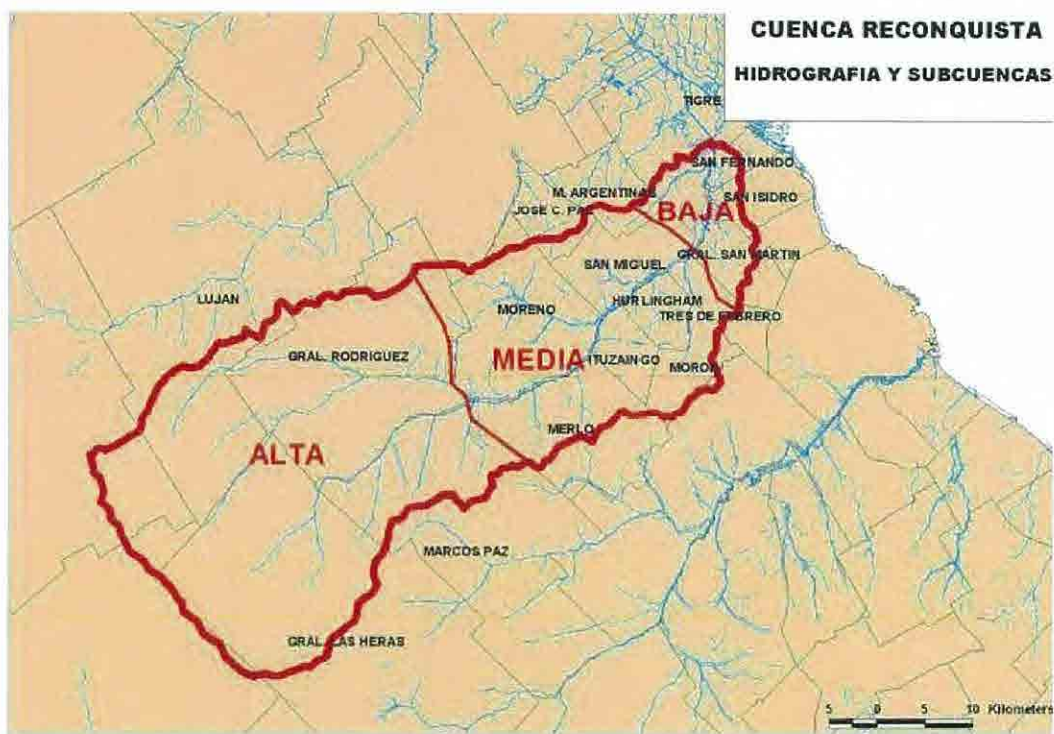


Fig. 5 Locations of the Sewage Disposal Plants

Source: Programa de Manejo Urbano Ambiental Sostenible de la Cuenca Del Rio Reconquista, IDB



Photo 3 Hurlingham Disposal Plant



Photo 4 San Miguel Disposal Plant

Table 4 Overview of Operations and Maintenance

Name of Facility	Pumping Stations	Hurlingham	San Miguel
Operator	COMIREC	AySA	ABSA
Capacity	97.5 m <sup>3</sup> / second	1500 m <sup>3</sup> /h	1000 m <sup>3</sup> /h
Area Population	305,000	178,000	100,000
Number of Employees	Six to eight	16 to 17	7
Annual Maintenance and Operations Cost	20 million pesos/3 years	20 million pesos	-

The operations and maintenance activities of the JICA funded flood control facilities along the Reconquista River are adequately implemented, and there have been no significant flood-related damages since the project was completed.

Although the sewage plant construction targeted for JICA financing was terminated during the course of the project, these plants were ultimately built by the central government. But, the surrounding sewage pipe network has not been built. IDB continues to support the development of integrated environmental improvements of the Reconquista River.



Photo 5 The Taurita Bridge



Photo 6 Pumping Station O&M Sign

## 4. Conclusion, Lessons Learned and Recommendations

### 4.1 Conclusion

The operation and maintenance of the JICA financed flood control facilities along Reconquista River have been adequately implemented, and no flood-related damage has been reported after the project was completed. The surrounding land is developing into residential areas. Starting in 2012, COMIREC will take over maintenance and operations in lieu of the provincial government, however, its operational functions have not been fully established.

Although four sewage disposal facilities aimed at river purification were constructed despite JICA's termination of financial assistance, the sewage network remains undeveloped. IDB also continues to support the project in the areas of plant expansion and network improvement.

### 4.2 Recommendations

Although COMIREC is in charge of coordinating environmental improvements of the Reconquista River, it does not have the administrative authority to enforce these improvements. This organizational weakness is a substantial challenge to the sustainable operation and maintenance of the facilities constructed in the Project.

In the future, it will be necessary to establish a strong operation and maintenance organization in coordination with the provincial government and other relevant organizations. To achieve this, dispatching human resources, technology transfer, and other enhancement measures from the provincial government to COMIREC need to be implemented.

### 4.3 Lessons Learned

None

End

Comparison of the Main Project Plan and Performance

<p>[JICA]</p> <p>(1) River improvement</p> <p>1) Improve discharge channels</p> <ul style="list-style-type: none"> <li>· Lengthened by about 7km</li> <li>· Excavation and dredging 1,350,000m<sup>3</sup></li> <li>· Embankments/levees 170,000m<sup>3</sup></li> </ul> <p>(2) Drainage Improvements</p> <p>1) Construct backwater drainage pump stations</p> <ul style="list-style-type: none"> <li>· 10 pump stations (total capacity of 97.5m<sup>3</sup>/s, electrical capacity of 5,075kW, 30 units)</li> <li>· Power distribution facility (extended by 22.9km)</li> </ul> <p>(3) Hygienic projects and planning</p> <p>1) Installation of sewage treatment plants</p> <p>Sewage treatment plants that were not constructed.</p> <p>2) Sludge treatment</p> <ul style="list-style-type: none"> <li>· Total amount of disposed excavated and dredged soil 685,000m</li> </ul>	<p>[IDB]</p> <p>(1) River Improvement</p> <p>1) Distributaries dams (divergence point and drainage ditch) as planned</p> <p>2) Improve Reconquista main trunk stream as planned</p> <p>3) Improve tributaries as planned</p> <p>4) Embankments along the Las Tunas River as planned</p> <p>5) Construction of bridges and other infrastructure</p> <ul style="list-style-type: none"> <li>· 13 bridges were renovated, 9 bridges and 6 pedestrian bridges were reinforced</li> <li>· 1 electrical wire tower and 1 gas pipe line were relocated</li> </ul> <p>(2) Drainage Improvements</p> <p>1) Improvement of drainage channels (surrounding the pump stations) as planned</p> <p>(3) Sanitary projects and planning</p> <p>1) Supplemental environmental plans</p> <ul style="list-style-type: none"> <li>· Plan to control industrial wastewater → implementation completed</li> <li>· Comprehensive management plan for the basin → partially implemented</li> <li>· Social action plan → implementation completed</li> <li>· Development of flood relief regions → implementation completed</li> <li>· Development of a network for monitoring water levels, water volume, and water quality → not implemented</li> </ul>
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