Plurinational State of Bolivia

Ex-Post Evaluation of Japanese Grant Aid Project

"Project for Development of Potable Water, San Juan River System in Potosí"

External Evaluator: Hajime Sonoda, Global Group 21 Japan, Inc.

0. Summary

The Project was implemented with the aim of realizing continual supply of safe water in sufficient quantity to residents of the service area of the San Juan River System serving the western half of Potosí by means of constructing a new WTP and rehabilitating the existing water intake and conduction pipeline, thereby contributing to improvement of the sanitation and living environment of the project area. At the time of both the ex-ante evaluation and ex-post evaluation, the Project was found to be highly relevant to the development policy and development needs of Bolivia and also to Japan's ODA policy at the time of the ex-ante evaluation. Therefore, the relevance of the Project is high. The planned outputs were achieved and both the project cost and project period were within the plan. As such, the efficiency of project implementation is high. The construction of conduction pipeline protection facilities has reduced the water cuts caused by damage to the conduction pipeline and the treatment of the raw water at the new WTP has eliminated water cuts due to raw water with high turbidity. The water quality standards, including the turbidity standard, have been met by the supplied water even in the rainy season when the turbidity of the raw water is high, achieving the supply of clean water throughout the year. The improvement of the water quality has increased convenience in using water on the part of users. Therefore, the effectiveness as well as impacts of the Project are high. AAPOS (Autonomous Administration of Sanitary Works Potosí) has maintained its profitable operation and does not face any financial problems. While the maintenance of the WTP poses no problems, there is some concern in regard to the security arrangements at the water intake. In regard to the maintenance of the conduction pipeline, adequate maintenance had been lacking because of the fact that the knowhow transferred under the Soft Component have not been fully utilised. Therefore, the sustainability of the Project is fair. In the light of the above, the Project is evaluated as highly satisfactory.

1. Project Description

Location Map

Rio San Juan Water Treatment Plant

1.1 Background

In 2009, the Government of the Plurinational State of Bolivia (hereinafter simply referred to as "Bolivia") had the National Basic Sanitation Plan (2000 - 2010) which focused on improvement of the water supply and sewerage facilities with the target of improving the national coverage of water supply to 90% by 2010.

The city of Potosí (with a population of approximately 150,000 in 2008) is the capital of the Potosí Department which is located in the mountainous southwest corner of Bolivia with a mean elevation of 4,000 m. The Potosí Department is one of the poorest areas of the country. In the city of Potosí, AAPOS is in charge of the provision of water services. The water distribution system in Potosí consists of two distribution systems which serve their respective areas. In the case of the Kali Kali System, a water supply system, including a water treatment plant (hereinafter simply referred to as "WTP") with a treatment capacity of 150 litres/sec, was completed with a loan of KfW Development Bank in 2008. In contrast, as there was no WTP serving the San Juan River System, untreated water from San Juan River was supplied. The use of untreated river water meant the occasional suspension of the supply due to a high level of turbidity after rain or the distribution of high turbidity water. Meanwhile, the 51 km long conduction pipeline from San Juan River to Potosí was liable to prolonged water cuts due to scouring of the foundations, falling rocks and other reasons as it was laid on unstable ground together with the absence of proper rainwater drainage along the route. Furthermore, neither the dirt removal facility nor air valve functioned properly, necessitating their urgent rehabilitation.

Under these circumstances, the Government of Bolivia made a request to the Government of Japan for the provision of grant aid for improvement of the water supply and sewerage facilities in the San Juan River System. In response, the Japan International Cooperation Agency (JICA) conducted the Basic Design Study in 2009 and implemented the Project from 2009 to 2011.

1.2 Project Outline

The objective of the Project was to realize continual supply of clean water in sufficient quantity for the citizens of Potosí in Bolivia by means of the construction of a new WTP and the rehabilitation of the water intake and conduction pipeline, thereby contributing to improvement of the sanitation and living environment in the project area.

Grant Limit/Actual Grant Amount	1,316 million yen/1,316 million yen
Exchange of Notes Date/Grant Agreement Date	October, 2009/October, 2009
Implementing Agency	Autonomous Administration of Sanitary Works Potosí (AAPOS)
Project Completion Date	November, 2011
Main Contractor	Hazama Corporation
Main Consultant	Tokyo Engineering Consultants Co., Ltd.
Basic Design Study	October, 2008

Detailed Design Study	November, 2009
Related Project	KfW Development Bank "Drinking Water Supply, Potosí"

2. Outline of the Evaluation Study

2.1 External Evaluator

Hajime Sonoda (Global Group 21 Japan)

2.2 Duration of the Evaluation Study

The ex-post evaluation study for the project was conducted over the following period.

Duration of the Study : September, 2014 to July, 2015
Duration of the Field Survey: 28th October to 9th November, 2014, and
12th to 14th April, 2015

3. Results of Evaluation (Overall Rating: A[1])

3.1 Relevance (Rating: ③[2])

3.1.1 Relevance to Development Policies of Bolivia

As already mentioned in "1.1 Background", at the time of the ex-ante evaluation, the Government of Bolivia emphasised improvement of the water supply and sewerage services. The Basic Sanitation Sector Development Plan (2011 - 2015) which was in force at the time of this ex-post evaluation upholds the notion that access to water supply and sanitation services is a basic human right. While stressing the role to be played by the public sector, this Plan adopts a target access rate to water supply of 90% (95% in urban areas and 80% in rural areas), focusing on improvement of the water supply and sewerage facilities. As such, the Project is highly relevant to the development policies of Bolivia at the time of both the ex-ante evaluation and ex-post evaluation.

3.1.2 Relevance to Development Needs of Bolivia

As already mentioned in "1.1 Background", the construction of a new WTP and improvement of the conduction pipeline for the San Juan River System in Potosí at the time of the ex-ante evaluation were urgently required. In subsequent years, the population increase of Potosí was much higher than estimated in the preliminary study because of the development of local mines. As a result, the water supply in 2014 of 300 - 340 litres/sec was well below the demand of some 500 litres/sec, worsening the water shortage. Therefore, AAPOS started examinations on securing new water sources and

1 A: Very High, B: High; C: Moderate; D: Low
2 ③: High; ② Fair; ①: Low

construction of new water treatment facility[3]. Accordingly, there is a strong need for stable water supply using the facilities constructed or improved under the Project even at the time of this ex-post evaluation. As such, the Project is highly relevant to the development needs of Bolivia at the time of both the ex-ante evaluation and ex-post evaluation.

3.1.3 Relevance to Japan's ODA Policies

The Project falls under "Water and Sanitation" in "Social Development" which is one of the priority sectors identified by Japan's Country Assistance Program for Bolivia (2009) and is relevant to Japan's ODA policies.

This project is highly relevant to the country's development plan and development needs as well as Japan's ODA policy. Therefore its relevance is high.

3.2 Efficiency (Rating: ③)

3.2.1 Project Outputs

The following outputs were planned under the Project.

- Construction of a WTP : Rapid filtration system with a production capacity of 150 litres/sec.
- Rehabilitation of the conduction pipeline : Rehabilitation of the water intake along San Juan River, protection work for the conduction pipeline at 28 sites, rehabilitation of dirt removal facility and air valve at 39 sites.
- Soft component : Transfer of knowhow relating to the maintenance of the WTP and conduction pipeline

The above outputs were produced almost as planned. The only change from the Basic Design was strengthening of the metal mesh work which was incidental to the slope protection work at some sections of the conduction pipeline. This change was necessary because of the ground conditions and its impacts on the construction period and project cost were minimal. The field visit by the present evaluator did not find any special problems regarding the planning and construction of the various facilities under the Project. According to AAPOS, the facility plan for the Project was adequate and the quality of the work was sufficiently high.

[3] The Strategic Development Plan (2010 - 2014) of AAPOS calls for (i) education of residents to be much more aware of water use and environmental conservation and also to improve the corporate image of AAPOS, (ii) strengthening of the organizational system, skills and finance through collaboration with related organizations and (iii) introduction of new information technologies (accounting information service system for customers, customer database and telemetric flow meters, etc.)

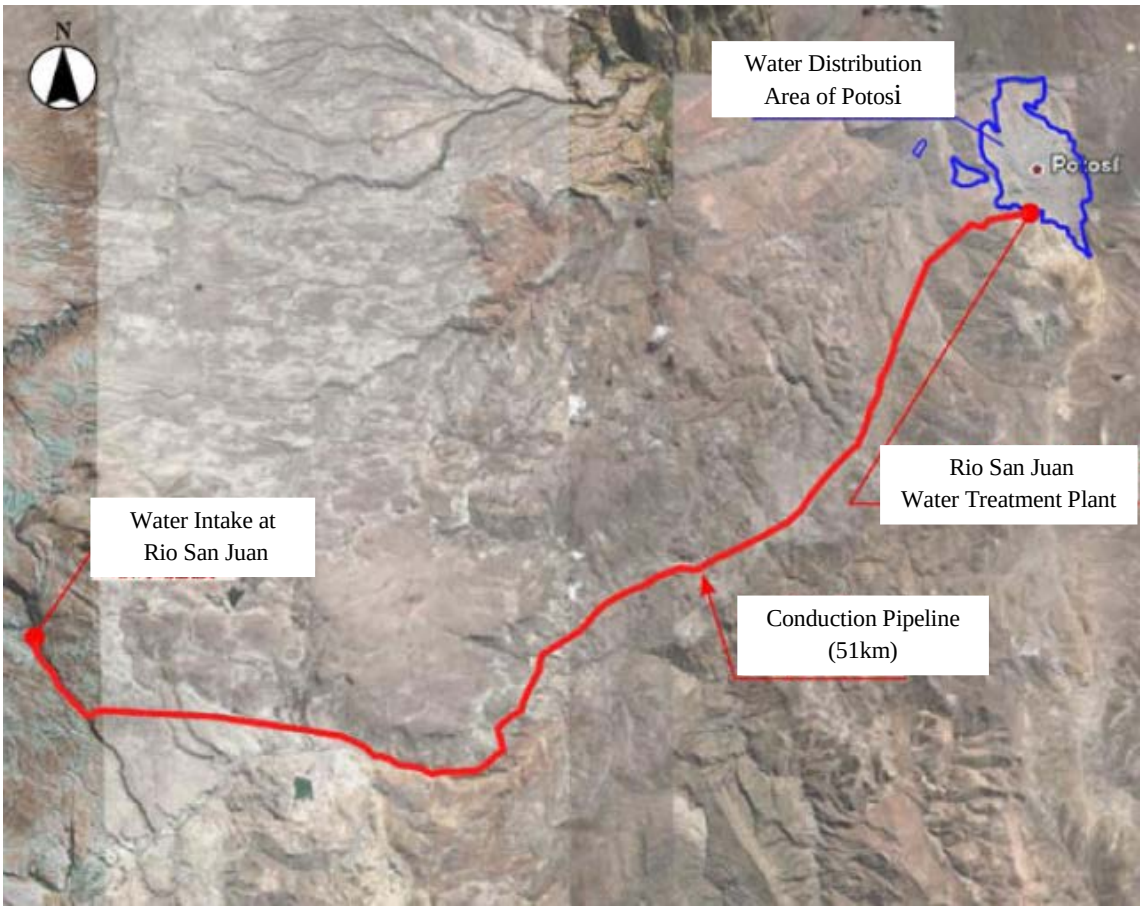

Figure. 1 Water Supply Facilities in Potosí

3.2.2 Project Inputs

3.2.2.1 Project Cost

The planned and actual project costs are shown in Table 1. The project cost was lower than planned as the actual cost was 93% of the planned cost.

Table 1 Planned and Actual Project Costs

	Planned	Actual
Japanese portion	1,340 million yen	1,247 million yen
Bolivian portion	3 million yen	2 million yen
Total	1,343 million yen	1,249 million yen

Sources: documents provided by JICA, AAPOS

3.2.2.2 Project Period

The planned project period was two years and four months (28 months) from the date of the signing of the Exchange of Notes. The actual project period was shorter than planned, as it was two years and two months (26 months, 93% of the planned period) from the signing of the E/N in October, 2009 to completion in November, 2011.

Both the project cost and project period were within the plan. Therefore, the efficiency of the Project is high.

3.3 Effectiveness[4] (Rating: ③)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

3.3.1.1 Reduction of Water Cuts

The Project aimed at reducing the frequency of water cuts due to the high level of water turbidity or damage to the conduction pipeline and envisaged that no water cuts would occur due to these reasons once the Project was completed. In the post-project period, there have been no water cuts due to high turbidity water or maintenance works of water distribution facility and the risk of water cut due to an accident has been reduced. Accordingly, this objective was mostly achieved.

(1) Water Cuts Due to High Turbidity Water

Prior to the Project, high turbidity water caused water cuts for 27 days a year.[5] No water cuts due to high turbidity of raw water have been recorded in the post-project period as the turbidity of the supplied water has met the relevant standard throughout the year.

(2) Water Cuts Due to Breakage of Conduction Pipeline

According to AAPOS, before the Project, the conduction pipeline for the San Juan River System suffered damage by natural phenomena such as land slide and rock fall one or two times per year. Man-made damages such as damages by road works also happened almost once a year.

In the three year post-project period, there were no damages caused by natural phenomena, because the conduction pipeline has been adequately protected by the Project[6].

Before the Project, vehicle access to the water intake was impossible because of slope failure along the access road. The renewed protection of the conduction pipeline as well as the access road under the Project has enabled vehicle access to the water intake throughout the year. Therefore, it is judged that the risk of water cut due to troubles at the water intake has been significantly reduced, as prompt action could be taken when a problem occurs.

(3) Water Cuts due to Maintenance Work at Water Distribution Facilities

Maintenance of the water intake (cleaning of the settling basin) must be conducted approximately once a month during the rainy season and approximately once every three months during the dry season. Before the Project, it was necessary to suspend water intake operation for eight hours each time. After the Project, however, operation continues during maintenance work as a bypass pipeline is now available. The San Juan Reservoir required cleaning works every three months before the Project as the

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4 The effectiveness is rated in consideration of not only the effects but also the impacts.

5 The interview with AAPOS as part of this ex-post evaluation found that high turbidity water was supplied in the pre-project period as it was unless the turbidity was extremely high. The criteria to suspend water supply could not be clarified.

6 On the other hand, there was one man-made accident in 2011 which caused a water cut for eight hours.

water turbidity was very high and mud accumulated quickly. In the post-project period, such maintenance works has not been required. Based on these facts, it is reasonable to conclude that the frequency of water cuts due to maintenance work has been much reduced[7].

Water Intake

Slope Protection for the Access Road to Water Intake

3.3.1.2 Increased Coverage Rate of Clean Water Supply

The Project aimed at increasing the coverage rate of clean water supply by means of water treatment and adopted the target of increasing the clean water supply rate to Potosí to 94.5% in 2011.

At the time of the ex-ante evaluation, the access rate to water supply in Potosí was 81%. However, the coverage of safe water supply was even lower at 54% because of the lack of water treatment of San Juan River System. After the Project, the coverage rate of safe water supply is estimated to have increased to some 96% in October, 2014.[8]

The water quality has much improved, especially in terms of turbidity. The number of days when the turbidity of the raw water exceeded the relevant water quality standard in Bolivia of 5 NTU was five days in 2013 and 20 days in 2014.[9] There have been no occasions of the turbidity of the treated water exceeding 5 NTU (Fig. 2). Water quality inspection in 2013 found that all of the water quality standards were met at both the WTP and the distribution network and no coliform bacilli were found.[10] The

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7 The beneficiary survey found that water cuts due to work involving the water distribution network, etc. still occur 2.6 times a year on average, affecting the water supply for five days in total.

8 The number of service pipe connections in the San Juan River System in October, 2014 stands at 17,783, accounting for 52.3% of all service pipe connections in Potosí. The size of population benefiting from this system, which covers the western half of the city, is estimated to be approximately 93,000.

9 At the time of the ex-ante evaluation, the number of days when the turbidity of the raw water exceeded 5 NTU was 131 days a year even though the actual measurement data at the existing WTP indicated that the number of such days was much lower. The level of turbidity is strongly affected by rain. According to rainfall data collected at Potosí Airport, the rainfall level during the second half (March and April) of the rainy season in 2013 and 2014 was significantly lower than that of an average year, resulting in much fewer days of high turbidity raw water in these years. NTU (Nephelometric Turbidity Unit) is a unit for turbidity.

10 Water quality inspection is conducted on a daily basis at the WTP.

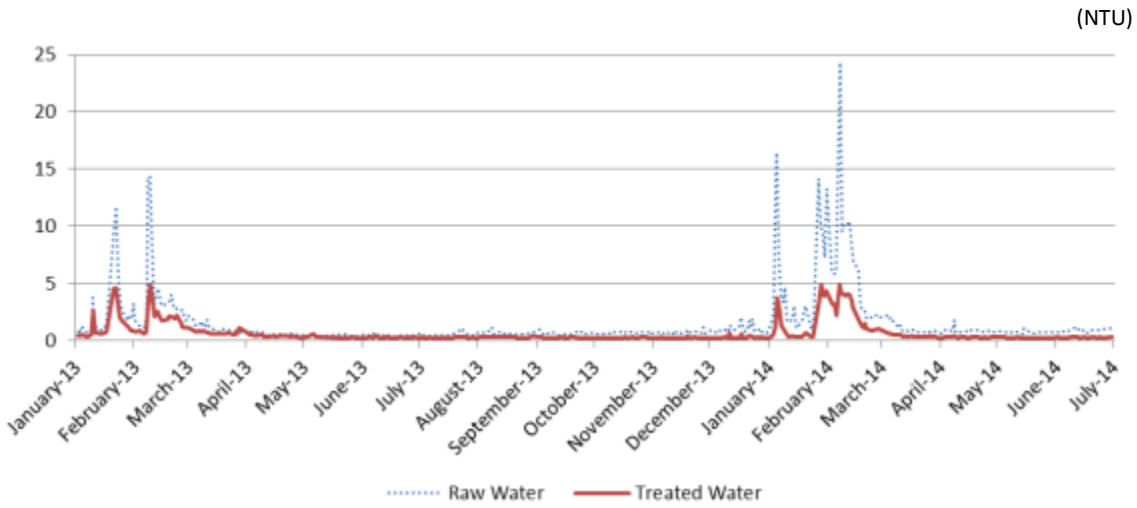
beneficiary survey with 116 households living in the benefitted area[11] found that 66% of the surveyed households believe that the water quality improved after the Project.

Table 2 Planned and Actual Performance of Operation and Effect Indicators

	Baseline	Target	Actual
	2009	2011	2011- 2014
	Year of Ex-Ante Evaluation	Year of Project Completion	0 - 3 Years After Project Completion
Operation Indicators			
Annual number of water cut days due to high turbidity	27 days/year (2006)	0 days/year	0 days/year (2011 - 2014)
Annual number of water cut days due to damages of conduction pipeline by natural phenomena	1 - 2 times/year (number of days of water cut is unknown)	0 days/year	0 days/year (2011 - 2014)
Effect Indicator			
Safe water access rate (access to treated water)	54%	94.5%	96% (2014)

Sources: documents provided by JICA, AAPOS

Note: Prior to the implementation of the Project, the probably maximum number of water cut days was estimated to be 193.9 days a year (at the time of the ex-ante evaluation). Here, the number of actual water cut days is listed in the table.



Source; elaboration by the evaluator based on the data provided by AAPOS

Figure 2 Turbidity of Raw Water and Treated Water of the San Juan Water Treatment Plant

[11] An interview survey using a questionnaire was conducted with 116 benefiting households as part of this ex-post evaluation.

3.3.2 Qualitative Effects

3.3.2.1 Number of Beneficiaries

The San Juan River System which was the target water distribution system of the Project covers the western half of the municipal area of Potosí and the size of the benefiting population was originally estimated to be approximately 73,000 in 2011. In reality, however, based on the number of connections it is estimated that some 93,000 people were receiving water in this service area in October, 2014. The actual number of beneficiaries in 2011 was approximately 80,000 which already exceeded the original estimate. This increase of the city's population beyond the estimated figure at the time of the ex-ante evaluation was caused by the development of mining in the vicinity of Potosí and other reasons.

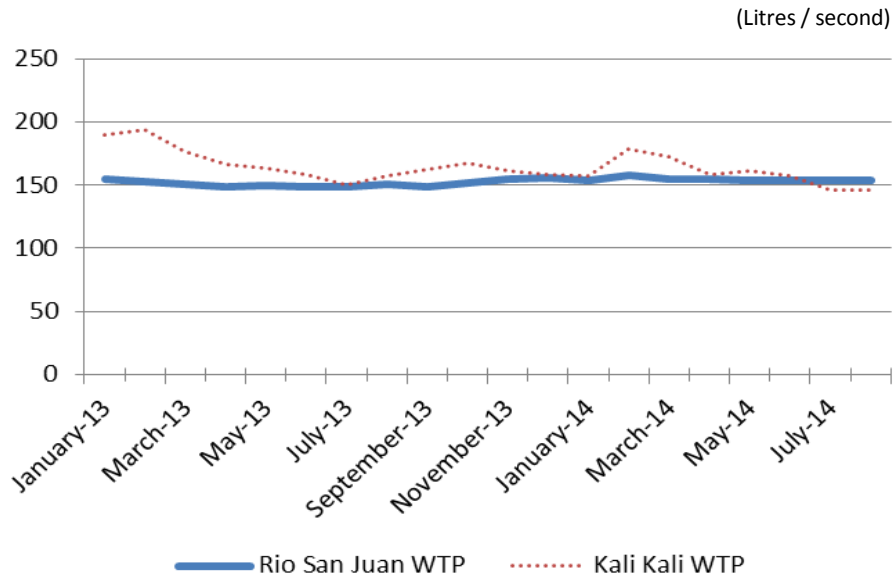
3.3.2.2 Increase of Water Production

The water production rate of the San Juan River System before the Project was approximately 130 litres/sec. As the Project enabled the adequate removal of dirt from the conduction pipeline, boosting the effective capacity of this pipeline, the water production volume in the post-project period has been steady at approximately 150 litres/sec (115% of the pre-project figure) which is the maximum volume which the conduction pipeline and the new WTP can handle. The combined water production volume in Potosí, including that of the Kali Kali System, is approximately 300 litres/sec.

The estimated water consumption rate of ordinary households in Potosí was 128 litres/person-day in 2010 and 115 litres/person-day in 2013, showing a declining trend. While this trend can be basically attributed to an increased number of connections (households) without a matching increase of the water supply, the progress of water meter installation to encourage water-saving is also a likely contributory factor.[12] The beneficiary survey found that only a small proportion of households located in the city centre received 24 hour water supply (three out of 116 households surveyed) and that the average water supply hours are seven hours a day. 48% of the households surveyed did in fact report that the water supply hours had decreased compared to the pre-project period, indicating a worsening of the water supply situation due to population increase.

Even though the increase of the volume of water production due to the Project has been rather modest, the water supply situation would have been much worse without the Project. As such, it is fair to say that the Project has had a positive effect in terms of improving the water supply situation in Potosí.

[12] The water meter installation rate increased from 83% in 2010 to 87% in October, 2014.



(Source; elaboration by the evaluator based on the data provided by AAPOS)

Figure 3 Historical Changes of Water Production Volume in Potosí

The dirt removal facility

Operation of the dirt removal facility

3.4 Impacts

3.4.1 Intended Impacts

The Project identified its higher goal of improving the living environment for the citizens of Potosí and the indirect effect of lowering the risk of contracting water-borne diseases.

According to the results of the beneficiary survey with the 116 households living in the target are of the Project, 55% of households found that there had been major positive changes in regard to water supply in the post-project period while 33% of households also found that there had been some positive changes. In short, nearly 90% of the households surveyed acknowledged positive impacts of the

Project and most of these impacts were related to improvement of the water quality [13]. Many respondents mentioned that before the Project, the turbid water in the rainy season in particular was unpleasant, especially when it smelled bad and small insects were found in the water. Most households, therefore, found it necessary to boil the supplied water before using it or attached a cloth bag to the tap to filter the water. The ratio of households using these measures has been dramatically reduced today and the level of convenience concerning water was improved greatly. When the survey of beneficiaries was implemented, 74% of beneficiaries responded that they were happy with the water supply service provided by AAPOS.

Cloth filter that was used until some years ago

Table 3 Water Treatment in Household

	Before the Project (2009)	After the Project (2014)
Boil before use	79%	34%
Use a cloth filter	92%	9%

Source; Beneficiary survey

16% of the surveyed households were found to have at least one family member who has suffered from diarrhoea in the past year and there is no confirmation that the occurrence of diarrhoea has fallen in the post-project period. It is difficult to demonstrate the cause and effect relationship with the Project, however, data from the Ministry of Health shows that infant mortalities caused by diarrhoea in Potosí have declined since 2009.

3.4.2 Other Impacts

The Project was certified as a project with minor environmental impact (classified in the second least environmental impact category out of four categories) [14]. An environmental permit for the Project was obtained from the competent departmental authority in October, 2008 and it was ruled that an Environmental Impact Assessment (EIA) would not be required. In this ex-post evaluation, no special impacts on the natural environment were found through the field visit.

The Project did not involve the resettlement of local residents. The land use rights for the new WTP site were obtained without difficulty based on an agreement with the neighbouring community.

[13] 73% of the households responded that water quality has been improved since 5 years.

[14] The environmental category is established according to the size of environmental impact of public projects in Bolivia. In categories 1 and 2, which have a large environmental impact, it is necessary to implement an environmental impact survey either in general or for specific fields.

In summary, the Project aimed at achieving "the continual supply of clean water in sufficient quantity" by means of reducing the frequency of water cuts caused by high turbidity water and damage to the conduction pipeline while ensuring the supply of safe, clean water through the adequate treatment of raw water. Such objectives are judged to have been successfully achieved. In addition, the improved water quality has eliminated the feeling of unpleasantness regarding the supplied water among its users and increased convenience related to water. The Project has largely achieved its objectives and, therefore, the effectiveness and impacts of the Project are high.

3.5 Sustainability (Rating: ②)

3.5.1 Institutional Aspect of Operation and Maintenance

AAPOS has 148 full-time and 17 part-time employees and the operation and maintenance of the WTP and conduction pipeline are handled by the Production Unit and the Treatment and Laboratory Unit of the Technical Department.

The WTP is run without any problems by a director, two operators (one is a live-in operator), water quality inspector and driver. At present, the WTP does not have a security guard but AAPOS has independently erected fencing around the WTP since the completion of the Project as a residential area has been formed nearby. It is planned to install a lighting system in 2015 to strengthen the security arrangements for the WTP.

For the routine operation of the water intake, a local resident has been employed as a caretaker. Because of the remote location of this water intake, a radio is used for communication. As one person is insufficient to 24 hours/day monitoring, some incidents have occurred, including the illegal entry of someone to the facility site to operate the valve. It is difficult to double the number of caretakers because of the remoteness of the site and some concern remains regarding the security of the site. AAPOS is examining methods such as establishing gates or lookout posts in order to limit entry to the access roads leading to intakes, improving the method of communication with intakes and so on.

The conduction pipeline is inspected as well as maintained annually and staff members of other departments are enlisted for this work to boost the number of workers involved.

In summary, there are some minor issues concerning the operation and maintenance setup in the Project.

3.5.2 Technical Aspect of Operation and Maintenance

AAPOS has been operating two WTPs, one of which was constructed under the Project, without any problems. As it is proceeding with the introduction of a remote monitoring and operating system for the reservoirs and also with the acquisition of an international certification of quality management, it is fair to say that it meets certain technical standards.

In regard to the new WTP, a maintenance plan was prepared based on the operation manual provided under the soft component of the Project and its operation and maintenance system appears to be appropriate, posing no specific problems. Of the 10 staff members trained on operation and

maintenance of WTP under the Soft Component of the Project, only one has so far left AAPOS. As it is essential at this WTP to regulate the amount of flocculent to be injected depending on the turbidity of the raw water, a flocculent injection rate corresponding to the turbidity of the raw water has been established based on past operational experience to ensure an appropriate amount of injected flocculent.

The dirt removal facility and air valve of the conduction pipeline are operated twice a year (before and after the rainy season) while regular inspection for preventive maintenance is conducted once a year. One problem found is that although more than half of the staff members which underwent training under the Soft Component are still working for AAPOS, none of them are involved in the regular inspection of the conduction pipeline. This means that the technical know-how which they learned, including the use of the conduction pipeline monitoring manual, was not being properly utilised (Refer "3.5.4 Current Status of Operation and Maintenance"). Responding to comments made by the evaluator in the first field survey (October-November 2014), AAPOS mobilized the two employees who had received training in November 2014 and had remained in AAPOS and implemented an inspection of the conduction pipeline using the check sheet that had been used in the training. It intends to conduct further inspections when the rainy season ends in May 2015.

In short, while the operation and maintenance of the new WTP do not pose any problems, the practice of the preventive maintenance of the conduction pipeline has not been properly established due to the non-use of the positive outcomes of the Soft Component. Therefore, some minor problems have been observed in terms of Technical Aspect of Operation and Maintenance.

3.5.3 Financial Aspect of Operation and Maintenance

Interviews with staff members of AAPOS found that there has been sufficient budgetary appropriation for the employment of the necessary personnel to operate and maintain the WTP and to procure agents and other consumables as well as the necessary equipment, etc.

AAPOS returned a profit in 2011 through 2013. The operating profit ratio has been in the range of 19 ~ 26% for the past three years, suggesting a high level of profitability. The current ratio has exceeded 250% for the past three years and the capital-to-asset ratio has been 65% or higher, indicating sound financial operation.

Table 4　Business Income and Expenditure of AAPOS

(Unit: 1,000BOB)

	2011	2012	2013
Income	18,620	24,846	24,427
- Water Supply	18,550	24,647	24,236
- Sewerage, etc.	70	199	191
Expenditure	14,637	20,157	19,574
Balance	3,983	4,689	4,853

Source; AAPOS

Income from the sale of water for industrial use accounts for some 40% of the total income (in 2013), shoring up the financial health of AAPOS. As it is difficult to increase the water charge for domestic water supply because of strong resistance on the part of residents, the rate has been unchanged since 2000. Meanwhile, the unit price of water for industrial use is set at 6 – 7 times higher than that for domestic use. The water meter installation rate in Potosí increased from 78% in October, 2008 to 87% in October, 2014. According to AAPOS, the background for this increase was that the installation of a water meter became a statutory obligation, making it easier to procure such meters throughout the country. The water charge collection rate improved from 74% in 2010 to 81% in 2013. This improvement is believed to have been achieved by the conscious business efforts of AAPOS, including (i) the strict enforcement of a policy of suspending water supply to water users who have failed to pay the water charge for three months and (ii) an increase of the water charge payment points.

As described above, the necessary budget for the operation and maintenance of the facilities, etc. introduced under the Project has been secured and no specific problems are currently observed in regard to the financial aspect of AAPOS.

3.5.4 Current Status of Operation and Maintenance

A defect inspection conducted in 2012 found that all of the facilities were operating normally and that there was no case requiring repair work. The field visit conducted in 2014 as part of the ex-post evaluation confirmed the appropriate maintenance of the WTP and water intake, both of which were found to be adequately functioning.

Scouring of foundations around the protection work of the conduction

During this field visit, however, scouring of the basis of some of the conduction pipeline protection facilities by flowing water was discovered. This is a result of a lack of adequate preventive maintenance. It is necessary to urgently deal with this situation as further scouring could damage the conduction pipeline.

Some minor problems have been observed in terms of the institutional and technical aspects of maintenance. The sustainability of the project effects is, therefore, fair.

4 Conclusions, Lessons Learned and Recommendations

4.1 Conclusions

The Project was implemented with the aim of realizing continual supply of safe water in sufficient quantity to residents of the service area of the San Juan River System serving the western half of Potosí by means of constructing a new WTP and rehabilitating the existing water intake and conduction pipeline, thereby contributing to improvement of the sanitation and living environment of the project

area. At the time of both the ex-ante evaluation and ex-post evaluation, the Project was found to be highly relevant to the development policy and development needs of Bolivia and also to Japan's ODA policy at the time of the ex-ante evaluation. Therefore, the relevance of the Project is high. The planned outputs were achieved and both the project cost and project period were within the plan. As such, the efficiency of project implementation is high. The construction of conduction pipeline protection facilities has reduced the water cuts caused by damage to the conduction pipeline and the treatment of the raw water at the new WTP has eliminated water cuts due to raw water with high turbidity. The water quality standards, including the turbidity standard, have been met by the supplied water even in the rainy season when the turbidity of the raw water is high, achieving the supply of clean water throughout the year. The improvement of the water quality has increased convenience in using water on the part of users. Therefore, the effectiveness as well as impacts of the Project are high. AAPOS has maintained its profitable operation and does not face any financial problems. While the maintenance of the WTP poses no problems, there is some concern in regard to the security arrangements at the water intake. In regard to the maintenance of the conduction pipeline, adequate maintenance had been lacking because of the fact that the knowhow transferred under the Soft Component have not been fully utilised. Therefore, the sustainability of the Project is fair. In the light of the above, the Project is evaluated as highly satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

AAPOS should implement the following measures concerning the maintenance of the water intake and conduction pipeline so that water supply in the San Juan River System can continue without disruption.

- As the security arrangements at the water intake require strengthening, the relevant possible measures should be examined, including the deployment of an additional caretaker, restriction of entry to the access road, erection of protective fencing at the water intake, and introduction of a reliable communication system.

- In regard to the preventive maintenance of the conduction pipeline protection facilities, the maintenance system should be rebuilt, focusing on those staff members who underwent training for the transfer of skills under the soft component of the Project. On that basis, the total inspection of these facilities (scouring of foundations around the protection work, etc.) from the view point of preventive maintenance should be conducted as soon as possible so that the necessary protective measures can be employed before the arrival of the next rainy season.

4.2.2 Recommendations to the JICA

The possibility of providing technical assistance through the dispatch of an expert and other means should be examined in relation to establish the practice of preventive maintenance of the conduction pipeline by AAPOS.

4.3 Lessons Learned

Importance of Follow-Up for the Soft Component for Preventive Maintenance

As the necessity for preventive maintenance is generally not easily recognised, a short training session may fail to sufficiently teach the relevant skills or ensure the proper application of the skills learned. Accordingly, it is very important to secure a long period for practical training when the transfer of preventive maintenance-related skills is intended. In the case of a soft component of a grant aid project where it is difficult to secure a sufficiently long practical training period, it is essential to check the state of utilisation, etc. of such skills at the time of defect inspection or any other opportunity after project completion so that additional technical assistance by means of the dispatch of an expert can be conducted if necessary.