

Plurinational State of Bolivia

Ex-Post Evaluation of Japanese Technical Cooperation Project
“Mining Environment Research Center Project”

External Evaluator: Aya Iimura, KRI International Corp.

0. Summary

The purpose of this project was to enable the Mining Environmental Research Center (Centro de Investigación Minero Ambiental) (hereinafter referred to as “CIMA”) to function as a center that provides support for environmental administration on technical issues in order to strength monitoring activities on water pollution caused by mining operations in Potosi, and at the same time, the implementation basis of research and technology development for the reduction of pollution load is established in CIMA, and these outputs are reflected on Potosi administration. This goal was relevant to the development policy, development needs of the Plurinational State of Bolivia (hereinafter referred to as “Bolivia”) and the ODA policy of Japan from the time of project planning through the time of ex-post evaluation. However, the definition of the “Position and role of CIMA” in environmental administration in the Department of Potosi remained unclear during the planning and implementation of this project and as well as the time of ex-post evaluation. This resulted in CIMA reaching a point that it can be independently operated and managed as a self-reliant growing research center that was part of the original plan. Therefore, the relevance of this project is fair.

In terms of input, the planned project purpose was not achieved due to a delay in the technology transfer and other factors caused by a delay on dispatch of Japanese experts and delay in the procurement of equipment on the Bolivian side, and the period of cooperation was extended for two years. In addition, the project cost exceeded the planned figure by a significant amount due to the extension of the cooperation period. Therefore, the efficiency of this project is low.

Eight outputs were set when this project was planned, but out of these, “establishment of center organization” and “proposal of environmental regulation guidelines” which were indispensable for achieving the project purpose were not achieved at the time of the project completion. Moreover, CIMA is not functioning as a research center that provides scientific support for mining environmental administration in Department of Potosi thought CIMA has archived the technology level that can afford the environmental administration. This is because it has not been defined the position of CIMA. Therefore, the effectiveness and impact of this project are low.

Regarding the sustainability of the outcome in this project, while CIMA attained a certain level of technical and financial capability, there are still administrative problems

related to the positioning of CIMA. Therefore, the sustainability is fair.

Consequently, this project is evaluated to be low.

1. Project Description



Project Location



CIMA Water Quality Chemical Testing Laboratory

1.1 Background

Mining in Bolivia has a long history that dates back to the Spanish colonial era, and it is still one of the major industries in Bolivia. Until the latter 1990s, the only focus was on the development of mining, and there was almost no interest in measures to alleviate pollution due to mining. The development study conducted by the Japan International Cooperation Agency (hereinafter after referred to as “JICA”) entitled “Evaluation Study on the Mining Sector’s Environmental Pollution in the Department of Potosi” implemented in 1997 – 1999 identified that water pollution was extremely serious in the Pilcomayo River.

Under these circumstances, the Government of Bolivia took the recommendations in the above development study into consideration which resulted in the conclusion being reached that CIMA needed to be newly established as a center to conduct studies/research in both the technical and administrative areas to determine the measures to prevent pollution caused by mining in Department of Potosi and the entire country of Bolivia, as well as to disseminate the result of research. The Government of Bolivia made a request for project-type technical cooperation to the Government of Japan, and the “Mining Environment Research Center Project” was implemented starting in July 2002.

1.2 Project Outline

Overall Goal	In the valley of the Pilcomayo River, environmental administrators, mining operators and communities promote the activities for the prevention of the water pollution caused by the mining industry.
Project Objective	Monitoring activities on water pollution caused by mining operations

		in Potosi, the implementation basis of research and technology development for the reduction of pollution control load is established in CIMA, and these outputs are reflected on Potosi administration.
Outputs	Output 1	The organization of the center is established.
	Output 2	Facilities and equipment required for the activities of the center are introduced and maintained properly.
	Output 3	Environmental chemical analysis skill is acquired by the counterparts.
	Output 4	Environmental research skill is acquired by the counterparts.
	Output 5	Wastewater treatment skill is acquired by the counterparts.
	Output 6	Environment regulation guideline for mining industries in Potosi is proposed.
	Output 7	Technology for mineral processing productivity is proposed.
	Output 8	Public relations and education for environmental conservation targeted at Potosi people who work for mining and concentration, and the people related to the mining activity are conducted.
Inputs		<p>Japan Side:</p> <ol style="list-style-type: none"> 1. Experts Dispatched: 35 Long-Term Experts: 9, Short-Term Experts: 26 2. Acceptance of Trainees: 15 (Training of counterparts in Japan) 3. Training in the Third Country: Total of 9 (Training in Chile) 4. Equipment Provided: 115.47 million yen 5. Cost for Work in Bolivia: 50.52 million yen <p>Bolivia Side:</p> <ol style="list-style-type: none"> 1. Deployment of counterparts: 16 (When project completed) 2. Provision of land/laboratory facilities 3. Laboratory building renovation work 4. Development of infrastructure 5. Procurement of reagents, materials and equipment 6. Covering of local costs (counterpart salary): Approximately 84 million yen
Total cost		990 million yen
Period of Cooperation		Main Project Period: July 2002 – June 2007 Extension Period ¹ : July 2007 – June 2009
Implementing Agency		Main Project Period: Natural Resources and Environment Division in the Department of Potosi Extension Period: Departmental Government of Potosi and Autonomous University of Tomás Frías (UATF)
Cooperation Agency in Japan		Japan Mining Engineering Center for International Cooperation
Related Projects		[Technical cooperation] - Development study “Evaluation Study of the Mining Sector’s Pollution of the Environment in Potosi Prefecture” (1997 – 1999) - Individual dispatch of short-term experts (ore processing/waste processing: 2 (2000))

¹ The results of the terminal evaluation implemented in February 2007 confirmed that the activities in the self-reliant growth plan and chemical analysis field and technology transfer have not been completed. Upon receiving the results of this evaluation, the decision was made to extend cooperation for two years from July 2007. Furthermore, in this ex-post evaluation, the “project period” is defined as July 2002 – June 2009, the “main project period” as July 2002 – June 2007 and the “extension period” as July 2007 – June 2009.

	<p>[Projects by Other Agencies]</p> <ul style="list-style-type: none"> - EU “Integrated Management and Master Plan for the Pilcomayo River Basin Project” (2000 – 2010) - World Bank “Small-size Tailing Dams Construction Project” (2002 – 2004) - Deutsche Kreditanstalt für Wiederaufbau (KfW) “San Antonio Project to Construct Sediment Dam for Mineral Ore Waste” (2004 – 2006) - Danish Development Agency (DANIDA) “Danish Cooperation Program in the Environment Sector (PCDSMA)” (2001 – 2006) - EU “Program to Support Sustainable Economic Development in the Impoverished Mine Areas in Western Bolivia II (APEMIN II)” (2004 – 2010)
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1.3 Outline of the Terminal Evaluation

1.3.1 Achievement of Overall Goal

In the terminal evaluation of the main project period in 2007, the judgment was made that if the technical capabilities and implementation structure were strengthened based on the established technical and informative institution at CIMA at the moment, it would be possible to contribute to the final outputs of strengthening the administrative system and policies.

In the terminal evaluation of the extension period in 2009, a concrete manifestation in the administrative system had not been identified. However, it was confirmed that the Departmental Government of Potosi and the Ministry of Mining and Metallurgy, Bolivia had stated to strengthen administrative guidance, and that this project had been participated in the basic design of an acidic mining waste water treatment plant in the Department of Potosi based on environmental monitoring data which was backed up by scientific verification provided by this project. In addition, the judgment was made that technical information developed by this project had been shared between the government and local communities by seminars and other events concerning the prevention of water pollution caused by mining.

1.3.2 Achievement of Project Objective

In the terminal evaluation of the main project period in 2007, although most indicators in the respective fields of environmental surveys, waste water treatment and environmental enlightenment were achieved, and the indicators in the chemical analysis field were not achieved. Furthermore, establishment of CIMA as a self-reliant growing research center which was originally planned to be achieved in four years after the project started was not completed. Accordingly, the judgment is made that the project purpose “was not achieved”.

In the terminal evaluation of the extension period in 2009, the technology transfer by

the dispatch of Japanese experts and training programs in third country during the extension period strengthened the chemical analysis capability of CIMA, and this resulted in achieving a certain level of capacity in the chemical analysis field, environmental survey field, waste water treatment field and environmental enlightenment field. The level of achievement for the respective indicators and an interview survey of persons involved in field studies resulted in the judgment being made that the project purpose “was mostly achieved”.

1.3.3 Recommendations

Terminal Evaluation of Main Project Period (2007)

The following short-term recommendations were made to be implemented by the completion of the project. The recommendations to the Bolivia side were: (1) Prioritizing of technology transfer items in the chemical analysis fields; (2) Completion of chemical analysis laboratory expansion work; (3) Submission of self-reliant growth plan (First version of draft correction); (4) Initiation of self-reliant growth plan; and (5) Maintaining CIMA structure. The recommendations to the Japan (JICA) side were: (1) Review of support system to facilitate preparation of self-reliant growth plan; and (2) Review of expert dispatch plan for technology transfer in the field for which outputs had not been achieved.

Furthermore, the following mid-term/long-term recommendations were made to the Bolivia side for implementation after the project completed: (1) Strengthening of coordination with mining development sector; (2) Analysis/evaluation of market value of work conducted by CIMA; (3) Review of work conducted by CIMA to facilitate to secure budget; and (4) Strengthening capabilities of CIMA organization and strengthening of infrastructure.

Terminal Evaluation of Extension Period (2009)

The following recommendations to be performed by the completion of the project were made for the Department of Potosi, which were: (1) Implementation of procedures related to the establishment of a new CIMA organization; (2) Speeding up execution procedures related to the procurement of materials and equipment; (3) Extension of hiring term of counterpart staff; and (4) Renewal of contracts with technical staff.

The following recommendations to be performed by the completion of the project were made for the Autonomous University of Tomás Frías (hereinafter referred to as “UATF”) which were: (1) Implementation of procedures related to the establishment of a new CIMA organization; and (2) Implementation of laboratory related construction work.

In addition, the following mid-term/long-term recommendation was made to involved

persons (Departmental Government of Potosi and UATF) after the completion of the project, which was: Establishment of new organization (“Bolivian Institute for Mining and Environmental Research”) and establishment of organizational framework. In addition, the following recommendations were proposed that should be implemented on an ongoing basis by the new organization: (1) Implementation of material/equipment procurement; (2) Implementation of analysis by means of self-reliant efforts; and (3) Appropriate management control.

2. Outline of the Evaluation Study

2.1 External Evaluator

Aya Imura, KRI International Corp.

2.2 Duration of Evaluation Study

Duration of the Study: December 2012 – December 2013

Duration of the Field Study: February 18th – March 10th and June 4th – 10th, 2013

2.3 Constraints during the Evaluation Study

The project implementing agencies were the Departmental Government of Potosi during the main project period, and the Departmental Government of Potosi and UATF during the extension period. However, there have been the changes of government and elections of governors and mayors during the project period and post project period, and frequent transfers of personnel in the Departmental Government of Potosi in unexpected moments during the project period and post project period. Therefore, at the moment of the ex-post evaluation, there were not any staff that could verify facts concerning this project in the Departmental Government of Potosi, and relevant information/material was not provided.

Therefore, this ex-post evaluation was basically carried out based on the interview surveys of involved persons at UATF and CIMA, and the review of information /material provided by UATF and CIMA.

3. Results of the Evaluation (Overall Rating: D²)

3.1 Relevance (Rating: ②³)

3.1.1 Relevance to the Development Plan of Bolivia

When this project started, a priority issue in the Five-year Plan of the Government of Bolivia was to achieve sustainable development in order to contribute to the reduction of

² A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

³ ③: High, ②: Fair, ①: Low

poverty. This project matched the development policy of the government of Bolivia due to the fact that its purpose was providing support for sustainable development in the mining sector in the Department of Potosi which is located in the Andean uplands where development lags behind other areas in Bolivia.

In addition, as of the completion of the extension period of the project, “Productive Bolivia” was designated as one of the four important issues in the National Development Plan (2006 – 2010) that was formulated to facilitate “Dignified Bolivia”. The sustainable use of natural resources was included as one of the important issues. A support for environmental management capability designated as a goal of this project matches the National Development Plan of Bolivia, since it provides support for sustainable development.

Therefore, sustainable development and environmental measures for the sustainable usage of natural resources were constantly positioned as priority issues in the National Development Plan of Bolivia. Accordingly, the judgment can be made that the project purpose match the development policy of Bolivia, which was a technical cooperation with the goal of developing technology and establishing research implementation infrastructure in order to reduce water pollution caused by the mining sector which is a major industry in the Department of Potosi, and reflecting these outputs in the administration of Department of Potosi.

3.1.2 Relevance to the Development Needs of Bolivia

Mining has been a major industry in Bolivia since the 16th century. While there has been a focus on the development of mining, measures have not been implemented in the past for the pollution caused by mining. Due to the absence of measures to water pollution caused by mining, there was an incident of international river pollution (Pilcomayo River, headwaters of La Plata River) caused by washout of a tailings dam in 1996, which became an international environmental problem with neighboring countries. In the development study conducted by JICA entitled “Evaluation Study of the Mining Sector’s Pollution of the Environment in Potosi Prefecture” in 1997–1999, it became clear scientifically that water pollution due to mining was extremely serious in the Pilcomayo River. Furthermore, there was not an agency that conducted monitoring/analysis of water pollution caused by mining in or around the Department of Potosi where is a major mining production area in Bolivia.

Based on this background, this project matched the development needs of Bolivia throughout the project period, which started in order to newly establish a “Mining Environmental Research Center” that would conduct studies/research concerning measures to prevent pollution caused by mining in the Department of Potosi and the

entire nation of Bolivia. Therefore, the need for implementation of the project can be judged as high.



Midwater Area of the Pilcomayo River
at Time of Ex-post Evaluation⁴



Ore Processing (Concentration)
in Potosi City

3.1.3 Relevance to Japan's ODA Policy

The ODA priority areas in JICA Country Program for Bolivia when this project started consisted of three areas: (1) Human security; (2) Enhancement of productive capacity; and (3) Improvement of institutions/governance. This project was implemented to provide support for sustainable mining in Bolivia by means of technical cooperation from Japan that has the experience of overcoming water pollution caused by mining, and was expected to make a contribution to “(2) Enhancement of productive capacity”. At the same time, the project matched the Japan's ODA Charter of “Addressing global issues” such as the environment and water issues.

Therefore, the judgment can be made that this project was relevant to the Japan's ODA policy.

3.1.4 Positioning of the Center

This project was designed to establish a mining environment research center that would carry out investigation and research on technology and policy for prevention of mine pollution, and divulgate the results of investigation and research in the Department of Potosi and other mine industry regions in Bolivia. It was expected that this research center would function with a board of directors consisting of the Departmental Government of Potosi and UATF, and a self-reliant growth plan was formulated as an integral part of the activities under this project.

However, a frequent personal replacement had occurred during the project period, and this made difficult for the personal of the Departmental Government of Potosi to

⁴ According to the interviews of residents in the river basin and former counterparts, the river water was lead-colored in the early 2000s due to heavy metals, but currently, the river has returned to its normal reddish brown color.

comprehend the CIMA, and there were not enough discussion on how to take advantage of CIMA. Therefore, the draft law for establishment of this new research institute was not approved by the National Congress and the Presidential Palace during the project period, and it has not been established a new research institute. Under these circumstances, discussions were conducted between the Departmental Government of Potosi and UATF on the operation and management configuration of CIMA, and the decision was made to have CIMA tentatively continue activities as an affiliated organization of UATF.

Due to these circumstances, adequate discussion was not conducted on work to clarify the positioning of the responsibilities/role of CIMA as a new research institute in environmental administration in the Department of Potosi and the Government of Bolivia until the project completion.

Therefore, while this project matched the development policy and development needs of Bolivia, as well as the Japan's ODA policy, the project was closed without any clear definition of CIMA in environmental administration. As a result, CIMA has not been functioning as a research institute that provides technical support for environmental administration from the time the project completed until ex-post evaluation, which was a purpose of this project. Accordingly, the relevance of this project is fair.

3.2 Effectiveness/Impact⁵ (Rating: ①)

3.2.1 Project Outputs

3.2.1.1 Project Output

1) Output 1: The organization of the center is established.

Achievement of *Output 1* is “inadequate”.

The technical system at CIMA which consists of the personnel and equipment which allow it to perform research on environmental surveys, water quality analysis and waste water treatment was established for the most part by the time the project completed. However, the project completed without achieving the project object which was that CIMA serve the role/function as a center to reflect the results of monitoring and research in the environmental administration in the Department of Potosi.

- The counterparts which received technology transfers were allocated from both the Departmental Government of Potosi and UATF. Due to the impact of changes of government and other factors, various personal replacements were occurred in the Departmental Government of Potosi, which interfered with the technology transfer. In addition, the frequent personal replacement obstructed a continuous discussion on establishment of CIMA.

⁵ Sub-rating for effectiveness is to be put with consideration of Impact.

- On the other hand, since the same counterparts from UATF maintained during the project period, technology transfer was conducted in a smooth and effective manner.
- The CIMA self-reliant growth plan which was scheduled to be formulated during the project main period was formulated during the extension period. However, while the formulated self-reliant growth plan conducted analysis on technical aspects, appropriate review concerning organizational and institutional aspects to reflect the outputs from CIMA in the administration of the Department of Potosi was not conducted.
- The Joint Coordination Committee (JCC)⁶ which was made up of members from the Ministry of Mining and Metallurgy, Ministry of Rural Development, Agriculture and Livestock and the Environment (at that time), Ministry of Water Resources and the Vice-Ministry of Public Investment and External Financing, held discussions more than one time per year for a total of 16 times during the project period on a new CIMA which functions with a self-reliant growth. However, a conclusion was not reached on the concrete policies and methods, etc. to achieve establishment of a new CIMA.

2) Output 2: Facilities and equipment required for the activities of the Center are introduced and maintained properly.

Output 2 was “achieved for the most part”.

There was a maximum delay of two years from the original plan in the procurement of the facilities and equipment required for CIMA activities, but the facilities and equipment required for the self-reliant growth of CIMA was completed by the time the project extension period completed.

- The facilities and equipment required for CIMA to function as a center that performs environmental surveys, chemical analysis and waste water treatment were procured until the project completion though there were some delay.
- Operation and maintenance manuals for the procured facilities and equipment were prepared during the project period, and the counterparts had been performing maintenance and management in an appropriate manner.

3) Output 3: Environmental chemical analysis skill is acquired by the counterparts.

Output 3 was “achieved”.

The counterparts in the chemical analysis field received technical transfer from the

⁶ JCC is the abbreviation of Joint Coordination Committee, which conducted discussion, review and approval of important issues related to the project.

Japanese experts, and learned techniques and other procedures for metal analysis of aqueous environmental samples, high concentration and low concentration ion analysis, heavy metal analysis, test wastewater treatment analysis, soil waste analysis and analysis of living environment items. When the project completed, the counterparts that had received the technology transfer had reached the level that they could provide instruction to colleagues and students.

In addition, technology transfer using the main analysis equipment (atomic absorption analysis, ion chromatograph, fluorescent X-ray analysis, UV/visible detector) was completed by the time the project completed, and the counterparts reached a level that they could independently perform analysis.

Technology transfer consisted of the following items:

- Chemical analysis: 69 items
- Analysis of wastewater standard items: 23 items (All discharge standards in Bolivia)
- Heavy metal analysis of minerals and tailings, rare metal analysis: 8 items
- Heavy metals in soil (leached): 9 items
- Total nitrogen/soil (content): 6 items
- Analysis of cyanide in mine wastewater: Free cyanide, total cyanide
- Wastewater treatment
- Water quality analysis: COD, BOD, DO etc.
- Microbiological analysis: Coliform bacteria

4) Output 4: Environmental research skill is acquired by the counterparts.

Output 4 was “achieved”.

During the main project period, the counterparts learned environmental survey techniques from the Japanese experts that mainly consisted of river water quality surveys, and only they reached a level that they could conduct specimen sampling and analysis independently by the time the project completed. During the extension period, hot spring water, drinking water sources and other general environmental water were added to mine wastewater as the target of environmental surveys.

- A biannual environmental monitoring system was established that consisted of 26 points in the Pilcomayo River basin, and the counterpart staff reached a level that they could independently perform specimen sampling and analysis. The results of monitoring were presented in the seminars and reports.
- A hydraulic structure model was established, and the results of simulation were managed with Geographic Information System (GIS) software.

5) Output 5: Wastewater treatment skill is acquired by the C/Ps.

Output 5 was “achieved”.

The counterparts utilized the mining wastewater treatment pilot plant, and reached a level that they could independently conduct research concerning mining wastewater treatment.

- Throughout the project period and extending to the time of the ex-post evaluation, studies (conceptual design, detailed planning) have been subcontracted to CIMA for the construction of an acidic wastewater treatment plant in Colquechaca City in the northern part of the Department of Potosi. The experience and skills acquired in this project have been utilized.
- The counterparts have performed operation and maintenance of the pilot plant (batch testing machine, continuous deacidification test equipment) themselves in accordance with the manuals prepared during the project.

6) Output 6: Environment regulation guideline for mining industries in Potosi is proposed.

Achievement of *Output 6* was “inadequate”.

During this project period, recommendations for mining environmental administration guidelines in the Department of Potosi were not prepared by CIMA. In periodic reports on project activities from CIMA, although it was stated that technical proposals were shared with the Environmental Direction in Departmental Government of Potosi and other parties, they were not utilized as specific administrative guidelines.

- While the counterparts learned administrative policies in Japan to prevent pollution caused by mining and technology that is used to prevent mine pollution through training in Japan and other efforts, the counterparts did not reach a level that they could reflect the knowledge acquired in the administration of Department of Potosi, due to the fact that a diverse range of laws are required for mine pollution prevention administration, and the range of mine pollution prevention technology is too extensive.
- Transfer of specific technology transfer related to the formulation of mining environmental administration guidelines was not planned as a project activity.

7) Output 7: Technology for mineral processing productivity is proposed.

Output 7 was “achieved”.

Measures to improve ore processing developed during this project were introduced to approximately 40 ore concentrators in Potosi city.

- Regarding technology transfer to boost ore processing productivity in order to

cope with environmental costs, technology transfer was performed by dispatching short-term experts three times.

- During the extension period, ongoing attempts were made to improve ore concentration using the ore flotation and other such methods.

8) Output 8: Public relations and education for environmental conservation targeted at Potosi people who work for mining and concentration, and the people related to the mining activity are conducted.

Output 8 was “achieved for the most part”.

Public relations and education to facilitate environmental conservation that included technology to enhance the productivity of ore processing were implemented during the project period. Relevant central government agencies, the Departmental Government of Potosi, mining sector in the Department of Potosi, universities and municipal government were the target of public relations and education activities. However, activities for the communities of the Pilcomayo River basin were limited.

- Public relations publications contained technical information were published.
 - 2004: 500 CDs for enlightenment activities
 - 2005: 500 CDs of website ver. 1 produced, 100 copies of Technical Information magazine No. 1 printed
 - 2006: 100 copies of Technical Information magazine No. 2
 - 2007: 100 copies of Technical Information magazine No. 3
 - 2009: Technical Information magazine No. 4
- A total of 15 seminars were held during the project period.
 - Introduction of CIMA facilities, results of environmental surveys, introduction of wastewater treatment technology, research results in chemical analysis field.
 - There was a particularly large amount of activities during 2008, which were: a seminar on cyanide wastewater for the ore processing business union; a presentation of a wastewater treatment plant for the Bolivian Mineral Corporation; the presentations on technical topics; TV record on CIMA activities; a mine wastewater treatment and monitoring training seminar with the University of Oklahoma (the United States); a technical seminar concerning water quality in Potosi; and etc.
- A project website was established that disclosed project activities and environmental technical information.
- The counterparts released environmental information and water quality data that they acquired themselves to television stations and local papers.

Therefore, of the eight outputs that were established for this project, the judgment can be made that the key to achievement of project purpose consisting of establishment of the center organization (*Output 1*) and reflection in administration (*Output 6*) were not adequately achieved as of the completion of the project although the outputs in the field of technology transfer concerning studies and research were achieved for the most part.

3.2.1.2 Achievement of Project Objective

The project purpose was “Monitoring activities on water pollution caused by mining operations in Potosi, the implementation basis of research and technology for the pollution control is established in CIMA, and these outputs are reflected on Potosi administration”.

1) Indicator 1: Monitoring and analysis of water pollution in the Pilcomayo River are implemented.

Indicator 1 was “achieved”.

A monitoring system for the Pilcomayo River did not exist before this project started, but through this project, CIMA established a system to implement monitoring of water pollution and chemical analysis of water quality in the Pilcomayo River basin. The counterparts learned basic techniques from the Japanese experts for monitoring of water pollution of the Pilcomayo River and analysis, and reached a level that they could perform sampling, various types of analysis and management of monitoring data themselves.

2) Indicator 2: Methodology of the effective concentration and water treatment of mines and concentrators is investigated.

Indicator 2 was “achieved”.

Regarding improvement of ore processing technology, the technology transfer resulted in the counterparts independently obtaining a grasp of the current status of ore processing facilities, the capability to perform various ore processing tests, making proposals on measures to increase ore processing productivity, and the capability to perform financial analysis.

Regarding the treatment of seepage water from mines and ore processing wastewater, the technical transfer on wastewater treatment tests and bacteria oxidation tests were conducted. Moreover, the required data was obtained, an overview design and other materials were prepared. CIMA explained the results of research concerning treatment

procedures for acidic water discharged from mines and wastewater from ore processing to mining operators and conducted technology transfer. In addition, CIMA implemented design of a mine acidic water treatment plant and environmental monitoring in the Colquechaca City in the northern part of Department of Potosi.

3) Indicator 3: The administration sector considers results of the monitoring and research as feedback.

Achievement of *indicator 3* was judged to be “inadequate”.

Feedback of the results of monitoring, analysis and research was performed by CIMA twice a year to the Departmental Government of Potosi during the project period. In addition, the results of CIMA activities were introduced to various institutions including national and departmental level government agencies at meetings and seminars so that the information could be shared.

However, the monitoring results fed back such as the ore processing technology and acidic water/wastewater treatment technology described in *Indicator 2* were not utilized in the administrative guidelines in the Department of Potosi. In other words, while the Departmental Government of Potosi appears to be receiving information from CIMA, it did not result in voluntary behavior by the Environment Direction in the departmental government.

4) Indicator 4: Environmental enlightenment and publicity on the prevention of the water pollution are promoted.

Achievement of *indicator 4* was judged to be “inadequate”.

CIMA carried out education and public relations through seminars and magazine distributed to mining operators and Pilcomayo basin population. However, the contents of those activities focused on technical and academic themes which were useful for mining operators and universities and were difficult to understand for the local community, while “Community people become more environmentally conscious and pay enough attention to the prevention of the mining pollution” was established as one of the indicators of the overall goal of this project.

Furthermore, the problem of water pollution in the Pilcomayo River was the focus of global attention during this project period, and other donors and NGOs implemented similar activities. According to interviews of previous counterparts at the ex-post evaluation, NGOs were the main actors who implemented enlightenment and public relations activities at the river basin community level.

In conclusion, the judgment can be made that the project objective of “Monitoring

activities on water pollution caused by mining operators in Potosi, the implementation of basis of research and technology for the pollution control is established in CIMA” was achieved by the time the project completed.

However, due to the fact that “these outputs are reflected on Potosi administration” was not achieved and it is an extremely important part for the manifestation of the effectiveness of this project, the judgment can be made that the achievement status of the project objective was “inadequate”.

It should be mentioned that the frequent personal replacement of the Departmental Government of Potosi gave serious negative impact on the achievement of project objective.

3.2.2 Impact

3.2.2.1 Achievement of Overall Goal

The overall goal of this project was “In the valley of the Pilcomayo River, environmental administrators, mining operators and communities promote the activities for the prevention of the water pollution caused by the mining industry”.

1) Indicator 1: Administration of water pollution prevention is fortified in Potosi.

Achievement of *indicator 1* which is the most important to determine the achievement status of the overall goal is judged to be “inadequate”.

After the project completed, CIMA started to be operated under a system that was different from the self-reliant growth plan formulated during the project period, which aimed an envisioned joint operation by the Departmental Government of Potosi and UATF. Rather than being operated under the Departmental Government of Potosi, CIMA is now being operated as an organization of the UATF. At the same time, due to the impact of changes of government and other factors, there were repeated changes in personnel from the departmental government, resulting in a low level of coordination between the Departmental Government of Potosi and UATF.

This resulted in the Departmental Government of Potosi not utilizing CIMA which has enough capacity as a technical support center for mining environmental administration, and specific actions have not been taken to prevent water pollution caused by mining. In addition, the Departmental Government of Potosi is not implementing enlightenment and public relations activities targeted at the local community concerning the prevention of health hazards caused by water pollution.

Accordingly, administration to prevent water pollution cannot be considered to have been “strengthened” by this project.

2) Indicator 2: The water pollutants from mining activities are reduced.

Indicator 2 is judged as “not having been achieved” in the manner envisioned for the project.

According to the results of water quality monitoring implemented on an ongoing basis from the project period by CIMA, its staff confirmed that the chemical water pollution load has been reduced, although the specific figures have not been disclosed.

The project aimed originally to reduce water pollution by enforcement of environmental administration. However, regarding the approach to reduce water pollution load at the mining operator level, the original goal of facilitating guidance by the government to mining operators, coping with the cost of environmental measures to boost ore processing technology, and treatment measures for acidic water from mines have not been implemented. According to the interview of CIMA staff, the main factor that reduced the contamination of water was a physical measure, construction of tailing dam⁷.

Furthermore, according to the results of a beneficiary survey⁸ of the final beneficiaries of this project who are the residents of the Pilcomayo River basin, 65 of 73 respondents indicated that the perception of community of water pollution of the Pilcomayo River is still “Extremely polluted” or “Polluted”. A visible change observed by the local community has not been archived though it is confirmed the reduction of contamination chemically.

⁷ The status of water pollution of the Pilcomayo River was chemically clarified as a contributing factor to the reduction of water pollution load by the (1) JICA development study (“Evaluation Study of the Mining Sector’s Pollution of the Environment in Potosi Prefecture” 1997 – 1999) which was the predecessor for this project. The necessity of urgently implementing physical measures was outlined (construction of tailings dam) and specific proposals for candidate sites for tailings dams were made. Based on the proposals in (1), (2) the Laguna Pampa I Tailings Dam (pond) was constructed in 2004, and the Laguna Pampa II Tailings Dam (pond) was constructed in 2006 by the Autonomous Administration for Sanitary Works and Mining Operators Union (union of 36 small to medium scale ore processors) in the Potosi city. The Laguna Pampa I Tailings Dam was full half a year after usage began, and the Laguna Pampa II Tailings Dam was full two years after usage began, and could no longer be used. (3) In 2007, the San Antonio Tailing Dam was constructed by the Mining Operators Union. At the time of ex-post evaluation, the 36 ore processors in the City of Potosi were using this tailings dam to discharge all ore processing wastewater. (4) As of June 2013, since the San Antonio Tailings Dam will be full in slightly over a year and can no longer be used, the Mining Operators Union is conducting a survey for the construction of a new tailings dam.

⁸ The beneficiary survey was conducted for five days between February 18–22, 2013 in four villages in the Pilcomayo River basin in the Department of Potosi (Betanzos-Yamparuez-Yotala in meandering area of river, and Colquechaca-Oreo-Soroma, Tasapampa-Thuerto and Viñapampa-Sotomayor-Tacobamba). The plan called for the collection of 100 samples, but in addition to access to the villages being made difficult by the rainy season, some residents were concerned about the results of the survey being used and did not want to respond since the problem of river pollution has not been solved, resulting in only 77 responses being obtained. Furthermore, the population along the Pilcomayo River basin in the Potosi and the Department of Chuquisaca is slightly over 500 (Accurate data are not available. Figures provided by CIMA staff. Population of largest village in basin [Sotomayor] is approximately 200.).

Table 1 Result of Beneficiary Survey: 1

Water Quality of the Pilcomayo River (Status in 2002/2009 → Current Status)	Change in Perception	No. of Respondents
Extremely polluted → Extremely polluted	No	11 (15.1%)
Polluted → Polluted	No	18 (24.7%)
Extremely polluted → Polluted	Yes	36 (49.2%)
Polluted → Not very polluted	Yes	3 (4.1%)
Polluted → Not polluted	No	1 (1.4%)
Not polluted → Not polluted	No	1 (1.4%)
No response	-	3 (4.1%)
Total		73 (100.0%)

Source: Results of beneficiary survey at time of ex-post evaluation

3) Indicator 3: Community people become more environmentally conscious and pay enough attention to the prevention of the mining pollution.

Indicator 3 is judged to be “not having been achieved”.

The fact that the subcontracting of water quality chemical analysis to CIMA financed by municipal governments in the Pilcomayo River basin since 2009 has been increased can be judged as a manifestation of increasing consciousness of the prevention of pollution caused by mining in the local administrations and among residents.

In addition, according to the results of the beneficiary survey, the observation can be made that consciousness of the prevention of health hazards caused by water pollution has increased compared to when the project started.

Table 2 Result of Beneficiary Survey: 2

Change in Consciousness of Environment Compared to 2002	No. of Respondents
1) Currently more interested in prevention of health hazards caused by water pollution	57 (78.1%)
2) Currently have lower level of interest in prevention of health hazards caused by water pollution	2 (2.7%)
3) Level of consciousness has not changed	11 (15.1%)
4) No response	3 (4.1%)
Total	73 (100.0%)

Source: Results of beneficiary survey at time of ex-post evaluation

However, the judgment cannot be made that this project had a direct impact on enhancing environmental consciousness among the river basin residents because education activities for river basin residents were limited under this project, while during the implementation period of this project, many projects concerning enlightenment activities by other donors and local NGOs were implemented at the same time in parallel. Moreover, the public relations and enlightenment activities have not

been implemented by CIMA or the Departmental Government of Potosi after the project completed.

3.2.2.2 Other Impacts

1) Impact on the Natural Environment

A negative impact on the natural environment by this project has not been manifested.

2) Resettlement and Land Acquisition

There has been no resettlement of residents or land acquisition under this project.

Therefore, regarding manifestation of impacts, any specific actions have not been manifested at the planned administrative level, among mining operators that received administrative guidance, or at the community level due to actions by the government.

Regarding the project objective, while monitoring of the Pilcomayo River was strengthened and the implementation infrastructure for technology development and research to reduce pollution load was established, these outputs were not reflected in the administration of the Departmental Government of Potosi. In addition, regarding the overall goal, the impact concerning specific actions at the administrative, mining operator and community level to prevent water pollution caused by mining have not been manifested. The frequent personal replacements gave serious negative impact on the definition of the position and role of CIMA, and the effectiveness and impact of the project.

In conclusion, the effectiveness of this project is low.

3.3 Efficiency (Rating: ①)

3.3.1 Inputs

The planned input for this project and results are outlined in the table below.

Table 3 Inputs to Project

Inputs	Plan	Actual Performance (At end of project)
Japan Side Inputs		
(1) Experts	<ul style="list-style-type: none"> • 5 long-term experts • About 20 short-term experts 	<ul style="list-style-type: none"> • 9 long-term experts • 26 short-term experts
(2) Trainees received	Two trainees per year	Total of 15 trainees
(3) Third Country Training	Not specified	Total of 9 trainees

Inputs	Plan	Actual Performance (At end of project)
(4) Equipment	Approx. 120 million yen	Approx. 115 million yen
Total Project Cost	Total 520 million yen	Total 990 million yen
Bolivia Side Inputs		
(1) Counterparts	11 persons	14 persons
(2) Provision of Facilities	Existing facilities renovated and used	Land/facilities provided, laboratory building improvement work, infrastructure
(3) Project Operating Expenses	Approx. 160 million yen	Approx. 83 million yen
(4) Other	None	Procurement of reagents, materials and equipment

Source: Information provided by JICA

3.3.1.1 Elements of Inputs

(1) Dispatch of Experts

During the main project period, four long-term experts were dispatched in the fields of chief advisor, chemical analysis and environmental surveys, and 22 short-term experts were dispatched in the fields of environmental policies, chemical analysis, environmental surveys, wastewater treatment, and improvement of ore processing skills. As a result of the need to replace experts due to difficulty in adapting to the high altitude and delay of the dispatch of experts, the selection of equipment for chemical analysis delayed resulting in a delay in the transfer of technology in this field.

During the extension period, four short-term experts were dispatched in the fields of chemical analysis and self-reliant growth planning.

There was a concentrated dispatch of short-term experts in the chemical analysis field in which activities had been delayed in particular, and it is considered that the quality and timing of dispatch of experts during the extension period were both appropriate due to the fact that the transfer of the planned technology was completed.

(2) Acceptance of Trainees

A total of 15 trainees were sent to Japan. Trainings focused on the themes that could only be learned in Japan (mainly Japanese administration to prevent pollution caused by mines, technology to prevent pollution caused by mines). However, it was difficult for the trainees to use the knowledge and technologies learned in Japan in the practical operations, due to the diverse range of fields and differences in the environmental administration systems in Japan and Bolivia.

A total of nine trainees were sent to a third country for training (Chile) during the main project period and extension period. They participated in training on analysis of harmful components in solid specimens (mineral ore, tailings, and soil), analysis of water samples, cyanide analysis, and environmental administration seminar. In particular, since the analysis of harmful components in solid specimens was not a field to receive Japanese expert dispatch, CIMA learned the technology during training programs in the third country.

(3) Provision of Equipment

Delays in the dispatch of Japanese experts and delays in procurement procedures on the Bolivia side caused a delay in activities concerning the chemical analysis field. Furthermore, although the type and quality of equipment were appropriate for the most part, equipment did not function correctly due to the high altitude (Potosi is at an altitude of approximately 4,000m).

3.3.1.2 Project Cost

With respect to the planned project cost of 520 million yen, the actual project cost amounted to 990 million yen, exceeding the plan by a large amount (190% of plan). The reason of this exceed was that the project objective was not achieved as originally planned, resulting in the project period being extended for two years, and this caused an increase in various expenses due to the dispatch of more experts and acceptance of more trainees.

3.3.1.3 Period of Cooperation

With respect to the planned cooperation period of 60 months, the actual cooperation period was 84 months, exceeding the plan by a significant period (140% of plan). The reason the cooperation period exceeded was a delay in the dispatch of experts by Japan side and delay in the procurement of equipment on the Bolivia side. Because of those circumstances, transfer technology had not been completed in the established project period.

In the circumstances, the efficiency of this project is low since the amount of project cost and cooperation period both significantly exceeded the planned values.

3.4 Sustainability (Rating: ②)

3.4.1 Related Policy towards the Project

There have not been any changes in mining and environmental policies in Bolivia or

the Department of Potosi from the project planning, during the project period or as of ex-post evaluation. In the mining sector development plan of the Ministry of Mining and Metallurgy in the central government, “Reducing Environmental Load” continues to be positioned as an important issue. The Departmental Government of Potosi also continues to position “Prevention and Management of Environmental Pollution” as an important issue in its departmental development plan.

However, the fact that the responsibilities and role of CIMA have not been clearly positioned in the above stated policy system, and a policy system to support CIMA activities do not exist represented an impediment to securing the sustainability of CIMA.

Accordingly, the judgment can be made that the sustainability in terms of the policy system is low.

3.4.2 Institutional and Operational Aspects of the Implementing Agency

The Departmental Government of Potosi and UATF made efforts to establish a new CIMA after the project completed based on the self-reliant growth plan that was formulated during this project for a new CIMA. However, coordination/agreement between the Departmental Government of Potosi and UATF, and the central government (Ministry of Mining and Metallurgy, Ministry of Water Resources, Ministry of Development Planning, and the Presidential Palace) could not be/reached on the identification of the responsible organization and other details required for establishing a new CIMA, and a new CIMA had not been established as of the ex-post evaluation.

As a result of these circumstances, discussions were conducted between the governor of the Department of Potosi and the president of UATF in May 2010 after the project completed that CIMA kept its name and started to be administrated by the UATF, taking into consideration the location of research facilities and equipment (within the Faculty of Mining Engineering at UATF) and the difficulty to allocate staffs continually from the departmental government side. Since then, CIMA has implemented a service system that provides services for environmental monitoring, chemical analysis of water quality, and the wastewater treatment plant with a budget allocated from UATF. A clear policy has not been put forth at CIMA, UATF, the departmental government and other organizations as to whether or not CIMA will continue in the future as a research organization of UATF, or whether it will be reorganized as a new organization capable of self-reliant growth that was an objective of this project.

Accordingly, the judgment is made that the sustainability of the implementing agency in terms of the implementation system is fair.

3.4.3 Technical Aspects of the Implementing Agency

After the project completed, CIMA has been conducting environmental survey and water quality analysis utilizing the technologies acquired during the project not only in the Basin of Pilcomayo River but also out of this basin.

- The Environment Division of the Departmental Government of Chuquisaca located downstream on the Pilcomayo River and the CIMA have been jointly implementing continued monitoring of water quality in the Pilcomayo River (twice a year in dry season and rainy season since 2010).
- CIMA has been carrying out a study at level of TESA (Technical, economical, social and environmental analysis) for Colquechaca Municipality. The project is called Integrate management of the Basin of Colquechaca mine. This basin is not a part of Pilcomayo River.
- Since 2009, municipalities inside and outside of the Department of Potosi and mining operators have subcontracted water quality analysis work (Water quality analysis of river water, well water and wastewater from ore processors and mines. Refer to Table 4 for the results of subcontracted work.)

Table 4 Record of Subcontracting Work Performed by CIMA

Client Breakdown	Municipality/ AAOPS ^{*1}	University Student ^{*2}	Mining Operator	Private Company Contracted by Mining Operator	Other	Total
2010 ^{*3}	2	0	4	2	5	13
2011	5	6	18	15	41	85
2012	19	9	8	14	34	84
2013 ^{*4}	5	3	0	1	10	19

Source: CIMA Activity Reports in 2010, 2011 and 2012, interviews of CIMA staff

*1: Potosi Waterworks Authority

*2: Use of chemical analysis laboratory to prepare scientific papers, etc.

*3: Between September – December 2010

*4: Between January – June 6, 2013

Due to the fact that CIMA has increased the number of requests to perform subcontracting of chemical analysis as shown in the table above, CIMA's technical level has been achieved at the level that can obtain certification as an officially certified center for chemical analysis of water quality. In addition, UATF made the decision in May 2013 to allocate the budget required for the procedures for approval of CIMA as a chemical analysis research institute.

Furthermore, the need for mineral ore analysis in the mining sector has increased in recent years, and in response to these needs, CIMA has been making efforts to enhance the level of skills, such as all of the chemical analysis laboratory three staff voluntarily attending training concerning usage procedure of equipment that has been procured from

equipment suppliers.

Regarding the field of mine wastewater treatment, design of an acidic water treatment plant for the Colquechaca City in the northern part of the Department of Potosi and water quality monitoring which were started during the project period have been performed on an ongoing basis after the project completed, and a portion of the skills and knowledge researched during this project is being utilized.

In addition, while basic data on environmental surveys in the mining sector in the Department of Potosi and the surrounding area was almost non-existent before this project started, environmental survey data has been accumulated by CIMA, UATF and the Departmental Government of Potosi through the project. It is expected that these data will be utilized in the future for mining environmental policies, the formulation/implementation of plans for environmental conservation projects and mining sector projects, as well as for environmental monitoring in the Department of Potosi.

Accordingly, the judgment is made that this project has a high level of sustainability in terms of technical capability at CIMA.

3.4.4 Financial Aspects of the Implementing Agency

In the self-reliant growth plan for a new CIMA formulated during this project, it was considered that a new CIMA will be operated and managed based on profits generated by service providing.

However, CIMA has continued to receive a budget allocation from UATF after the project completed as a research center under the jurisdiction of UATF. Accordingly, operation and management based on self-reliant profitability formulated under this project has not been achieved for now.

On the other hand, it is expected that CIMA will be approved as an officially certified research institute for chemical analysis of water quality in the near future, and efforts are being made to build a self-reliant operation and management structure by strengthening/expanding profit-making work in preparation for self-reliant profitability after approval obtained.

The financial status of CIMA since August 2009 is shown in Table 5. Income is derived from the provision of services (90% or more is from chemical analysis, and the remainder is from the collection of samples and measurement of noise).

Table 5 Actual of CIMA's Budget / Income / Expenditure Figures

Year	Budget ^{*1}	Income	Expenditure
2009 ^{*2}	N/A	51,323	N/A
2010	1,906,953	9,174	1,320,552
2011	2,044,176	54,044	1,025,457
2012	1,027,140	104,944	817,103
2013	Expected to be 1,000,000 or more	N/A	N/A

Source: Materials provided by UATF Planning Office

*1: Amount provided (Excluding 2013)

*2: August and after

Note 1: Since CIMA staff salaries are directly paid from the UATF, they are not included in the budget in the table.

Note 2: Unit is Bs. (Dec. 2009 1Bs=¥12.432, Dec. 2010 1Bs=¥12.252, Dec. 2011 1Bs=¥11.321, Dec. 2012 1Bs=¥12.012, Jun. 2013 1Bs=¥14.742)

Accordingly, CIMA has not achieved self-reliant growing operation and management since the project completed until this ex-post evaluation, but CIMA shows signs of improvement in the operation and management status of the center in preparation for self-reliant profitability in the future. Therefore, the sustainability of the financial status of CIMA is judged to be fair.

CIMA has secured sustainability in terms of the skills for chemical analysis concerning water samples and solid samples as well as environmental surveys, and the sustainability of its financial status is fair. However, due to the fact that the positioning and role of CIMA as a research institute have not been clarified, there are still issues with respect to the policy aspect. Accordingly, the sustainability of the project effects is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The purpose of this project was to enable the Mining Environmental Research Center (Centro de Investigación Minero Ambiental) (hereinafter referred to as "CIMA") to function as a center that provides support for environmental administration on technical issues in order to strength monitoring activities on water pollution caused by mining operations in Potosi, and the at the same time, the implementation basis of research and technology development for the reduction of pollution load is established in CIMA, and these outputs are reflected on Potosi administration. This goal was relevant to the development policy, development needs of the Plurinational State of Bolivia (hereinafter referred to as "Bolivia") and the ODA policy of Japan from the time of project planning through the time of ex-post evaluation. However, the definition of the "Position and role of CIMA" in environmental administration in the Department of Potosi remained unclear during the planning and implementation of this project and as well as the time of ex-post

evaluation. This resulted in CIMA reaching a point that it can be independently operated and managed as a self-reliant growing research center that was part of the original plan. Therefore, the relevance of this project is fair.

In terms of input, the planned project purpose was not achieved due to a delay in the technology transfer and other factors caused by a delay on dispatch of Japanese experts and delay in the procurement of equipment on the Bolivian side, and the period of cooperation was extended for two years. In addition, the project cost exceeded the planned figure by a significant amount due to the extension of the cooperation period. Therefore, the efficiency of this project is low.

Eight outputs were set when this project was planned, but out of these, “Establishment of center organization” and “Proposal of environmental regulation guidelines” which were indispensable for achieving the project purpose were not achieved at the time of the project completion. Moreover, CIMA is not functioning as a research center that provides scientific support for mining environmental administration in the Department of Potosi though CIMA has archived the technology level that can afford the environmental administration. This is because it has not been defined the position of CIMA. Therefore, the effectiveness and impact of this project are low.

Regarding the sustainability of the outcome in this project, while CIMA attained a certain level of technical and financial capability, there are still administrative problems related to the positioning of CIMA. Therefore, the sustainability is fair.

Consequently, this project is evaluated to be low.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

(1) Approval as Chemical Laboratory

In order to secure a position as an officially certified research institute that can perform chemical analysis of water quality, CIMA has been proceeding with qualification procedures to become a chemical laboratory since January 2013. It is recommended that CIMA will obtain approval as soon as possible.

(2) Clarification of Responsibilities/Role of CIMA and Proactive Utilization

In order to develop a system in which CIMA can be effectively used as a research institute to implement measures to deal with pollution caused by mining in Bolivia, it is essential that the central government, the Departmental Government of Potosi and UATF review, share and clarify the future positioning of the responsibilities/role of CIMA (whether it remains as a center under UATF or it strives to become incorporated, namely, a new research institute, etc.).

In addition, once CIMA has received approval as an officially certified center for chemical analysis, it is recommended that CIMA being proactively utilized as a technical support center for environmental administration by the Departmental Government of Potosi.

4.2.2 Recommendations to JICA

None in particular.

4.3 Lessons Learned

(1) Clarification of Policy Positioning at the Executing Agency

This project was implemented without the responsibilities/role of CIMA being clearly positioned in the national policy of Bolivia or policy of the Department of Potosi from the time the project was planned until the project completed. As a result, vulnerabilities in the policies/organization/system on the Bolivia side with respect to CIMA interfered with the implementation of the project plan.

Therefore, when newly establishing an official research institute like CIMA in a technical cooperation project, it is essential to ensure that the project be started after the responsibilities/role of the said official organization clearly positioned in the policy of the counterpart government.

(2) Project Formation considering Government Policy/Organization System

When the detailed plan for this project was formulated, the administrative policy and legal system in Bolivia for the cooperation field for this project (environment) were in the process of development. In addition, the project was implemented without adequate discussion of improving administrative guidance on pollution caused by mining, which was the project purpose. As a result, there was not a basis for reflecting the outputs of this project in the administration of the Department of Potosi, and since the conditions were not at the stage of forming the mechanism, manifestation of the project purpose was not achieved until current point of time after the project completed.

When a technical cooperation project are planned for cooperation fields which the administrative policy and organization system are not mature, it is necessary to adequately review the potential for achieving the project purpose at the time of the detailed planning for the project.

In addition, when implementing a technical cooperation project when the administrative policy and organization/system of the counterpart government have as yet to be developed, it is essential to include all activities for enhancing the administrative capacity and improving the organizational system of the counterpart government into a

PDM.

(3) Adequate Provision of Equipment for Geographical/Climate Conditions of Project Area

One equipment provided for this project in the Andean uplands where the altitude exceeded 4,000 meters did not functional normally, since the atmospheric pressure was too low.

Therefore, it is essential that the geographical and climate conditions of the project area should be taken into consideration.