

(4) Progress Made on the Recommendations by the Mid-Term Evaluation Team

Recommendations of the Minutes	Main Implementation Actor	Current Achievement Conditions (according to previously obtained briefing papers)	Obstacles confronted in the implementation	Outlook on countermeasures for the obstacles mentioned-on the left
<p>1. Re-start the chemical analysis activities immediately recruit and dispatch a long term expert</p> <p>2. Immediately start technology transfer on all the donated equipment</p> <p>3. Proceed with technology transfer to C/Ps so they are able to conduct chemical analysis work, which used to be outsourced, by themselves.</p>	<p>Project Team (Expert and C/Ps)</p>	<p>(1) Dispatch of the expert (Mr. Kenji Mizutani) on April 2005.</p> <p>2) Technology transfer on donated equipment from April 2005.</p> <p>3) Currently, chemical analysis processing on samples on environmental analysis and wastewater treatment field has become possible.</p>	<p>(1) Due to the illness and sudden return to Japan of expert Mr. Mizutani, parts of the technology transfer is incomplete</p>	<p>(1) The replacement for Mr. Mizutani is being recruited at the moment. It is expected to be dispatched immediately.</p>
<p>2. Recruit the head of Management Affairs</p> <p>1) Recruit a full-time management and finance C/P</p> <p>2) The above mentioned staff should be in charge of the following work:</p> <ul style="list-style-type: none"> Custom clearance of equipment and the purchase of consumable supplies and materials. Coordinate the exchange of information to build a cooperative relationship with the DRNMA, the department of agriculture, the department of health and other related department and the central government's Vice- Minister's office of the Ministry of Mining and Metallurgy, Vice-Minister's office of the Ministry of Sustainable Development and the Environment, as well as COMIBOL (Bolivian Mineral Corporation) and SEGEOATEMIN (National Geologic, Mineral and Mining Engineering Service). Coordinate with the related parties the elaboration of CIMAs future vision towards its future sustainability. 	<p>1) The implementing organizations of the CIMAs Project (DRNMA and UAIF)</p> <p>2) Project Team</p>	<p>1) In early 2006 a new accountant staff was hired, but it changed in April, and later the newly hired staff resigned in October. A new staff has assumed the post.</p> <p>2) Only accounting related work can be carry out.</p>	<p>1) Inexperienced and can only carry out simple accounting. It is not possible for this staff to become the substitute of the expert coordinator for this Project after its completion.</p> <p>2) There is no one in charge of the coordination of the Institutional Development Plan.</p>	<p>1) Introduce in-service training or request the Bolivian side to increase the number of staff or re-assign a staff in charge of management with the suitable capabilities</p> <p>2) Necessary to have input from the Japanese side to supervise the elaboration.</p>
<p>3. Include the Vice-Minister's office of the Ministry of Mining and Metallurgy as</p>	<p>Project Team and JCC Members</p>	<p>(3) In August 2006 the following 4</p>	<p>It is not clear where the responsibility lies.</p>	<p>Discuss among the JCC member the responsible</p>

Recommendations of the Minutes	Main Implementation Actor	Current Achievement Conditions (according to previously obtained briefing papers)	Obstacles confronted in the implementation	Outlook on countermeasures for the obstacles mentioned-on the left ministry.
<p>one of the Project supervising organization.</p>		<p>ministries were part of the supervising organizations: Ministry of Planning and Coordination, Ministry of Water Resources, Ministry of Mining and Metallurgy and the Ministry of Agriculture, Livestock and Rural Development.</p>	<p>The participation of the 4 central government organizations is not sufficient.</p>	
<p>4. Formulation of CIMA's Institutional Development Plan As agreed in the Project Administrative Mission held in March 2004, the related parties should begin talks immediately on CIMA's future vision.</p>	<p>1) CIMA's Director and the Project Team</p>	<p>1) From February to October 2006, the DAF has held 8 meetings. The final results of deliberations were presented to the Governor of the prefecture of Potosi and the director of the UAFT and in October 20th, 2006 the UAFT and the Prefecture of Potosi signed an agreement on the project management by the new organization..</p>	<p>1) Because there was turmoil (increase professors' salaries, improve the quality of adjunct professors, etc) at UTAF in November 13, 2006, the new organization's management meeting could not be held.</p>	<p>1) After the disturbances within the university calms down, restore the meetings immediately.</p>
<p>2) These talks should include not only the DRNMA, UAFT, but also the Vice-Minister's office of the Ministry of Mining and Metallurgy and the private mining producers.</p>	<p>2) Project Team. JICA experts should take the lead in this activity.</p>	<p>2) The following 4 ministries became members: Ministry of Planning and Coordination, Ministry of Water Resources, Ministry of Mining and Metallurgy and the Ministry of Agriculture, Livestock and Rural Development.</p>	<p>2) The regular Project management meetings have not been held because it was not possible to coordinate the time with the 4 ministries.</p>	<p>2) The prefecture of Potosi and the UAFT should take the initiative.</p>
<p>3) To serve as a reference for CIMA's vision, JICA experts and CPS should implement a feasibility study on projections on the demand of service, work plan, institutional and manpower plan and financial plan, as well as through the dispatch of short-term experts, Japan should also support these actions.</p>	<p>1) Expert team from JICA</p>	<p>3) In the 8th JCC, it was proposed to request to JICA the dispatched of short-term experts and senior volunteers for the new organization which is expected to be established in July 2007.</p>		
<p>5. Elaboration of the PDM 2.0</p>	<p>1) Project Team.</p>	<p>1) The activities are being implemented as recommended in the Mid-term Evaluation.</p>	<p>1) No obstacles in particular</p>	<p>1) It is desirable to revise the current PDM and elaborate and introduce a new version for the project management of the new organization after the completion of the Project.</p>
<p>1) Proceed with the activities in line with the PDM 2.0 approved by the JCC and recommended in the Mid-term evaluation.</p>				

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(5) Inputs

The Project inputs are detailed in APPENDIX-III.

6. Evaluation Results

(1) Relevance

Consistency with Bolivia's National Development Policies

At the beginning of the project (June 2002) the 5-year National Development Plan⁷ (1998-2002) of the Banzer Suarez administration had as its fundamental principle the "modernization of Bolivia", setting "the strengthening of the environmental management system" as the environment sector's policy objective supporting the foundations of a stable economic development. Furthermore, the PRSP⁸ which was the fundamental concept for the PGDES⁹ at the time and was adopted in 2001 emphasized the conservation of the environment as a cross-cutting issue supporting the reduction of poverty.

The Evo Morales administration, which came into power in January 2006, announced its PGDES in January 2006. The PGDES aims to "Improve the Living Conditions" of Bolivians based on 4 pillars. Since the strengthening of environmental management capabilities is a universal issue, to support the country's sustainable development, it is possible to interpret that this Project purpose is one of the cross-cutting issue to support this large objective.

Consistency with the administrative functional needs of the government

After the enactment of the Environment Law¹⁰ in April 1992, a legal system pursuing the balance between productivity and environmental conservation was established. This law specifically stipulates regulations towards the mining industry on polluting activities and the role of government organizations. However, then there were no comprehensive improvements on the water contamination of the Pilcomayo River caused by mining wastewater around the Potosi area. As a solution, a) strengthening of the environmental monitoring on pollution, b) strengthening of the environmental chemical analysis technology, c) Development of appropriate wastewater treatment technology development for Potosí, d) Technical recommendation for improvement of mining concentration efficiency, e) strengthening of dissemination

⁷ Each administration in Bolivia is required to formulate the General Economic and Social Development Plan (PGDES for its Spanish acronym)

⁸ Poverty Reduction Strategy Paper

⁹ The General Economic and Social Development Plan

¹⁰ Law No 1333

activities to the related parties and etc. were identified and the project started. Potosí prefecture began to execute the environmental license system and furthermore guided the Potosí Concentrators Association to construct mining tail dams. Thus environmental administrative execution has been strengthened. It can be said that the necessity of the Project that supports enforcement of the mining environmental administrative capacity has risen.

Justification of the project within Bolivia's legal system

Although the above-mentioned policies and administrative functional needs of the government have been consistent with the project from the beginning, the mission, authority, organization, financial resources, etc, of CIMA have not been concretely defined within the administrative law framework. This point makes CIMA's significance of existence ambiguous and contributes as a destabilizing factor in its future sustainability. Under ordinary circumstances, it would have been ideal to start the project after the administrative law framework which CIMA depends on had been established, as well as after consensus within the government had been reached.

Currently, each related organization believes CIMA's mission to be the following. Currently, through the elaboration of the Institutional Development Plan, although the related parties are in the process of building consensus, they share the same views in the following points.¹¹

Provide technological support such as the ones mentioned below for administrative control activities on mining wastewater pollution.

- a) Implementation of mining-related environmental monitoring
- b) Research and development of efficient techniques to reduce wastewater pollution
- c) Provision of technical services on chemical analysis and consulting
- d) Implementation of environmental education and dissemination activities

Name of Related Organizations	Mission	Higher Organization belonging to	Budget Procurement Method	Human Resource Procurement Source
Ministry of Mining and Hydrocarbons	a) Implement water quality monitoring for administrative control. b) Research and development of acid mining wastewater treatment techniques. c) Research alternative solutions for the reduction of environmental burdens	a) Hereafter 2 years and a half will be a transition term, and organizational capacity will be strengthened by the resource provision of the prefecture and U.A.T.F.	a) Under the provisional framework in the transition term, the cost of 170,000 US\$ will be shared by the prefecture and the U.A.T.F. b) Thereafter the following plan	a) Provided by the prefecture and U.A.T.F in the term. b) Thereafter the following plan should be established within the term.

¹¹ According to interviews and the results of questionnaires to the related parties carried out by the evaluation team.

		b) Final institutional framework has not been discussed particularly.	should be established within the term.	ditto
Ministry of Agriculture, livestock and rural development and the environment	a) Implement water quality monitoring for the administrative supervision. b) Provide technical service on the environmental management and chemical analysis.	ditto	ditto	ditto
Ministry of Water Resources	Enforce environmental administration and carry out technology transfer to prevent mining wastewater pollution in Bolivia	ditto	ditto	ditto
Ministry of Planning and Coordination	Develop a technical method to solve the mining wastewater pollution in the Pilcomayo river.	ditto	ditto	ditto
Potosi Prefecture	a) Implement water quality monitoring for administrative supervision. b) contribute to local environmental management administration through provision of technical service on the water, mineral and soil analysis as a certified laboratory. c) research and provide technical alternatives for environmental load reduction, as an institution in the U.A.T.F.	ditto	ditto	ditto
UATF	a) As a governmental organization technically support environmental administration enforcement and policy planning. b) Implement mine environment monitoring. c) Become the certification organization of the ISO14000 series. d) Carry out human resources development through university education.	a) 2 years and a half after the Project ends, CIMA will be operated on the agreement between the prefecture and U.A.T.F. b) Thereafter, CIMA shall be an institution in the U.A.T.F.	ditto	a) Provided by the prefecture and U.A.T.F in the term. b) Thereafter, the staff in CIMA shall belong to the U.A.T.F.

Consistency with the needs of the Inhabitants of the Basin and Mining Polluters

The mid-term evaluation implemented in February 2005, carried out a survey¹² to the inhabitants from downstream of the Pilcomayo Basin and to the Pilcomayo River Protection Committee (Comité Defensa del Rio Pilcomayo), and verified that citizens from 15 municipalities from Potosi Prefecture and 18 municipalities from Chuquisaca Prefecture are conscious that the polluted water from mining wastewater from the Pilcomayo River has negative impacts on health, the economy as well as society and desire measures for pollution control. The terminal evaluation mission visited to the inhabitants and to inhabitants

¹² On January 23, 2005, the study team after interviewing 8 representatives from the Quila Quila Suyu community (which is member of this committee) in the community's office in Sucre conducted the field study.

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in Mondragon village¹³ in Potosí Prefecture, and confirmed that the water quality in the river has been improved by the operation of the tail dams since 2004, further improvement has been desired by them. Currently some NGOs are spreading agriculture and stock farming which are not affected by mining wastewater pollution.¹⁴

Due to an increased again in the international price of minerals recently, the number of concentration plants operating in Potosi has increased from 12 in 2002, to 28 at the time of the mid-term evaluation, and to currently 29,¹⁵ increasing also the amount of tailing. As the result, Potosi's tailing dams which are where the disposal of tailings concentrates has been consecutively getting full. In the future, the social needs for technology dissemination on cost-effective wastewater treatment methods and the reduction of tailings will increase. Furthermore under these circumstances, the improvement of mining productivity as a result of the guidance of the project in the concentrating plants which are one of the mining polluters is drawing attention to this technology which allows for a balance between profits and environmental conservation.¹⁶ Therefore, the Purpose of this project currently meets the needs of the local inhabitants and of the mining polluters.

Consistency with Japan's Aid Policy

In JICA, based on the ODA Charter (adopted by the Cabinet in August 2003), the ODA Mid-Term Plan (adopted by the Cabinet in August 1999), and the results of the Third Consultation Meeting between Japan and Bolivia on Economic Cooperation Policies (June 2006), the Japanese cooperation to Bolivia raises environmental protection as one of the cross-cutting issues in the 3 priority cooperation areas.¹⁷ In this sense, consistency with Japan's ODA policies is ensured.

Usefulness of Japanese Technology, Selection of Schemes and Relevance of the Plan

In addition, the project has established both the system and infrastructure of CIMA, an organization that did not exist before the project, carrying out technology development, and in the future plans to conduct human resources development. For this reason, inputs such as equipment for technology transfer, the dispatch of the experts with knowledge and skills in Japan's pollution control, the training in Japan or in other developed regions in the same field, and a fixed length of time for the implementation of the project are necessary. In this sense, the project is consistent with JICA's technical cooperation advantage.

¹³ It is located approximately 20 km downstream from Potosí City.

¹⁴ Project such as Yanapacuna, CARE, San Juan del Oro

¹⁵ According to the Concentrators' Association at Jan. 2006.

¹⁶ There were requests for supervision from two companies, Lambol and Cozmic, for which the project conducted technical supervision

¹⁷ 1) Personal security, 2) Higher productivity, 3) Support for systems and governance.

(2) Effectiveness

<p>【Project Purpose】 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.</p> <p><Indicators></p> <ol style="list-style-type: none"> 1. Monitoring and analysis of water pollution in Pilcomayo River are implemented. 2. Methodology of the effective concentration and water treatment of mines and concentrators is investigated. 3. The administration sector considers results of the monitoring and research as feedback. 4. Environmental education and publicity on the prevention of the water pollution are promoted.
<p>【Output】</p> <ol style="list-style-type: none"> 1. The organization of the center is established. 2. Facilities and equipment necessary for the activities of the Center are introduced and maintained properly. 3. Environmental chemical analysis technology is acquired by the C/Ps. 4. Environmental research technology is acquired by the C/Ps. 5. Wastewater treatment technology is acquired by the C/Ps. 6. Environment regulation guideline for mining industries in Potosi is proposed. 7. Technology for mineral processing productivity is proposed 8. Public relations and education for environmental conservation targeted Potosí people who works for mining, concentration and the people related to the mining activity are conducted.

Outlook for Achieving the Project Purpose Based on the Validation Results of its Performance

To promote comprehensive improvements on the water contamination of the Pilcomayo river caused by mining wastewater around the Potosi area as indicated in the project Purpose, it is necessary to start the following activities: a) Establish CIMA's foundations, b) Strengthen the environmental information system on pollution, c) Develop technologies on pollution control for the small and medium size mining companies, d) Strengthen environmental policy planning capabilities based on technical information, and e) Promote dissemination activities to related parties. It is expected to achieve each indicator, excluding some part of the chemical analysis field from indicator 1, while it can be said that the above-mentioned activities b), c), d), e) excluding chemical analysis are getting underway. On the other hand, in the above-mentioned a), CIMA continues to be a project unit, and is still establishing its organizational foundation. Therefore, although the project purpose is expected to be achieved with the exception of some parts, from the effectiveness perspective it can be said that some issues remain in the level of achievement of the project purpose due to the achievement of outputs 1 and 3.

【Indicator 1】

This indicator encompasses 2 aspects of the achievement of the objective for the environmental monitoring field and the chemical analysis field within it. The environmental monitoring field's indicator has been accomplished. In 26 sites in the Pilcomayo Basin regular water quality monitoring takes place, then these results are evaluated, and utilizing the pollution map and the hydrological simulation model

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analysis, pollution conditions and forecast are being conducted. The engineers C/Ps have gained these skills through the project's activities, and the environmental monitoring is being managed by themselves. Already, approximately 5 environmental studies per year are commissioned to CIMA from AAPOS¹⁸, the EU, etc.

In the chemical analysis field, the achievement of the related outputs is behind schedule and it is thought to be difficult to achieve the planned project purpose within the project period. However, the expert's assignment period was appropriate for the level of output and the achievement of the project purpose. Technology transfer on metal analysis within the aqueous environmental sample and high density ion analysis within the mineral wastewater sample has almost been completed, being the C/Ps themselves the ones undertaking the analytical work. For example, CIMA's has carried out environmental studies and analysis on the study on wastewater treatment methods. In addition, it has carried out water quality analysis on 7 samples and 42 elements around the sources for public water supply, project which was commissioned by the DRNMA. On the other hand, because technology transfer on part of the heavy metal analysis, wastewater concentration analysis, soil waste analysis, and environment components analysis have not been completed yet, chemical analysis utilizing this technology has not taken place.

[Indicator 2]

This indicator includes the 2 technological fields of technological improvement of the productivity of the concentration plants and wastewater treatment technology. In the field of technological improvement of the productivity of the concentration plants, the transfer of technology has been completed and CIMA has established a framework in which full-fledged technical guidance can be provided to concentrating plants in Potosi. The C/Ps are now able to understand the conditions of the concentration plants, carry out various concentration tests, propose measures to improve productivity, and conduct financial analysis by themselves. With regards to the process of technology transfer, it has conducted technical guidance to 2 concentrating plants in Potosi, and it was verified in the mid-term evaluation study that in the concentration plant Lambol, the recovery rate improved from 83 to 87% and the grade of zinc concentration improved from 50% to 53% respectively. In the terminal evaluation study at Thuru plant, the recovery rate improved from 90 to 95% at most, the grade of zinc concentration improved from 45% to 49%, and the recovery rate of lead improved from 75% to 85% respectively¹⁹. The challenge for the future is to increase the provision of technological guidance to more concentrating plants.

Almost all the technology transfer in the wastewater treatment field has been completed, having acquired data on wastewater treatment technology through iron oxide bacteria technology and continuous neutralization examination equipment which is suited for Potosi's acid mining wastewater. In the future, a method for conceptual design using this data will be summarized and by June 2007 the "Comprehensive Plan on Acid Mining Water Treatment in Potosi" is expected to be completed.

¹⁸ Autonomous Administration for Sanitary Works (Administración Autónoma Para Obras Sanitarias)

¹⁹ According to a series of interview by the study team.

[Indicator 3]

Indicator 3 utilizes the information and technology created by indicators 1 and 2, meaning that it can provide effective recommendations to the environmental administration of Potosi. The environmental monitoring results are being feedback twice a year to the DRNMA. Moreover, the results of other projects are being introduced to Potosi's officials through seminars.²⁰ Furthermore, the project conducted monitoring of the Laguna Pampa tailing dam and when a dangerous structural condition on its embankment was identified, the Project advised to the DRNMA. In response to the advice, the DRANMA executed an administrative guidance to the organization in charge of the operation of the dams. However, since this type of advice becomes possible after the project's technology transfer has been completed, in the future, it is hoped that CIMA provides more effective and more advice and information to Potosi's environmental policies and governmental activities.

[Indicator 4]

It aims to provide accurate information on mining wastewater pollution to regular citizens and a broad stratum of concerned parties and strengthen dissemination activities to promote understanding. These were accomplished through the issue of 2 project activities report, the creation of the website, the publication of pamphlets and CDs for public information, the exhibition of the laboratory, and invitations to groups of local inhabitants to CIMA. The project's and CIMA's overview, results on water quality monitoring, results of the project by field and technical information have been uploaded on the website. Moreover, there have been already two updates of the website. Pamphlets and CD's for public information and dissemination activities were published and distributed to related organizations. Not only do C/Ps now have know-how on how to plan and prepare these materials, but they are able to plan and manage related seminars and even give lectures.

Achievement of the Outputs, Contribution to the Achievement of the Project Purpose

The indicators above were accomplished through the establishment of CIMA (output 1) which until now was a non-existent organization, the installation of the necessary facilities and equipment to carry out activities (output 2 and 3), the implementation of technology transfer (output 3, 4, 5 and 6), and the transferring of appropriate mineral processing productivity technology (output 7). Thus it can be said that the achievement of the Project Purpose is due to the achievement of the outputs. However, CIMA has not gained the legal justification as corporate status nor governmental organization and currently continues to carry out preparatory work. (related to output 1). This means that what the project was aiming for, that is,

²⁰ In 2005 in Argentine, Seminar to exchange information with a JICA project in Chile, from 2002 to 2004 the Japan Chile Partnership Programme (JCPP) Seminar, in October 2006 "the International Seminar on Mining Environment" co-sponsored with the geological society, in November 2006 the "Environmental Administration Seminar" (co-sponsored with Chile AGCI, International Cooperation Agency of the Republic of Chile, CENMA: National Environmental Center, and JICA) etc.

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for CIMA to conduct activities as a reliant organization for the administrative law framework within the environmental administration, has not been accomplished.

(3) Efficiency

Achievement of Outputs and Relation between Inputs and Activities

【Output 1】

Output 1 intends to establish CIMA, an organization that did not exist in Potosi, as a sustainable organization. Since the beginning of the project more than 4 people have been assigned as management staff and more than 9 staff C/Ps receiving technology transfer have been assigned to the project at all times. Especially in the chemical analysis field, after 2003, assistants were assigned and from 2006 the number increased to 5 (indicators 1.1 and 1.2). The monitoring of technology transfer was conducted by field, twice a year, basing its management on the management concept of Plan, Do, See, Action (indicator 1.4). Thus far, the JCC has been held 8 times, and regular exchange of information between the JCC members has been taking place (indicator 1.6). The budget is planned every year and although the prefectural government has done continuous efforts despite facing chronic financial difficulties, by the end of 2005, after 70% of the project period had elapsed, the yearly accumulative plan disbursement was approximately 20% of what was agreed in the R/D, which is approximately 38% of the yearly prefectural government approved accumulative amount. Especially in FY 2003, not only did this amount remained at approximately 8% of the R/D, but also the disbursement period was delayed, which delayed the purchase of chemical analysis equipment and reagents and in addition to the delay in custom procedures of the donated Japanese equipment, technology transfer was delayed (indicator 1.3). With respect to indicator 1.5 regarding the elaboration of CIMA's Institutional Development Plan and Article, after the establishment of the DAF²¹ in April 2005, thus far 8 JCC meetings in total have been held and the first draft of this article has just been elaborated. The following are the main reasons why after 4 and 1/2 years since the project began these 2 documents have not been completed:

- a) It was not planned in the PDM to assign a long term expert and C/Ps with expertise in legal systems and organizational building. Moreover, the input of a short-term expert to compensate this situation was not carried out in a planned manner.
- b) Under these conditions, the Japanese chief advisor, who was the virtual project leader, lived in Sucre, 160 km away from the project site during the first two years due to health related reasons. For this

²¹ Dirección Administrativa de Financiera, DAF

reason, not enough time was secured for these activities, which meant that the virtual start for this activity was delayed until after the mid-term evaluation held in February 2005.

- c) In the mid-term evaluation it was recommended the strengthening of the activities to achieve output 1. However, despite the intensification of activities under the guidance of the second chief advisor to continuously carry out the cooperative work of organizational building from zero, the quality and quantity of inputs and the time left were not sufficient.

【Outputs 2,3,4,5】

These outputs refer to the installation of equipment and the establishment of a maintenance structure for the 3 technological fields and the completion of the planned technology transfer. With regards to the wastewater treatment and the environmental analysis field there was a minor delay in the period of input of the equipment. However, this did not have a pernicious effect on the achievement of the output, and the inputs and the activities are associated to the achievement of each output. With respect to the chemical analysis field, the following are the reasons why the inputs were not installed as planned and have caused the delay of approximately 2 years on the achievement of output 2 and 3:

- a) Since the recruitment at the beginning of the project of a long term-expert that met the requirements was not possible, the expert arrived at his post with an approximately 9 months delay. This resulted in the delay of the elaboration of the equipment procurement list, and ultimately brought about the delay in the start of technology transfer. In addition, limited human resources with both high level of expertise and proficient in Spanish made procurement difficult.
- b) The insufficient disbursement of local costs by the Bolivian side in FY 2003 to purchase consumable supplies and material such as reagents, laboratory glassware, etc, resulted in the delay in technology transfer.
- c) Furthermore, the two long-term experts for the chemical field returned to Japan before the end of their assignments due to health reasons, during which period technology transfer was suspended.
- d) The expansion work for the separation of the pre-processing chamber and the laboratory for the chemical analysis laboratory, as well as the work for the wastewater treatment plant have not been completed.²² Consequently analytical work on environmental components, cyanogens and etc. cannot be carried out.

On the other hand, technology transfer has gotten underway, and now CIMA is able to carry out environmental analysis and heavy metals analysis on some elements for wastewater treatment which used to be outsourced resulting in an increase in efficiency from the cost and time perspective. C/Ps appraised the high level of technical expertise of the experts in each field and complementing with the short-term expert inputs were efficiently used.

²² Construction is expected to be completed by February, 2007. After construction completed, it is necessary to reinstall equipment.

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【Output 6】

This output aims to familiarize the C/Ps with the Japanese administration’s mining pollution control, and provide recommendations within the report to related organizations on environment regulation guidelines suitable to Potosi. Thus far, indicators 6.1 and 6.2 have been accomplished by the short-term expert. At this time, indicator 6.3 still has not been accomplished, but it is planned that in the report and seminar at the end of the project recommendations will be made. However, the assignment of a full-time C/P and the dispatch of a long term expert have not been planned, with the main inputs and activities being carry out by the short-term expert in a total of 4 dispatches equivalent to approximately 5 M/M. At the moment, an expert to carry out this follow-up has not been assigned.

【Output 7】

This output aims to provide technological recommendations such as by improving mining productivity in the concentrating plants, tailing would decrease, and the profits generated could contribute to cope with the cost of environmental measures. This output was achieved due to the activities of the short-term expert who was dispatched 3 times for a total of 9 months and the follow-up activities of the long term expert. The technical effectiveness has also been verified.²³ Dispatching successively the expert with the suitable skills led to the efficient achievement of this output.

【Output 8】

The project’s magazine has been issued on average twice per year (indicator 8.1), dissemination seminars were held a total of 8 times, on average more than twice a year (indicator 8.2), press releases were issued 5 times in total, CIMA’s website was finished (indicator 8.3), and a structure where regular publicity is made has been established. These activities were carried out by the Japanese Coordinator who has extensive experience in JICA’s project-type cooperation and each field’s C/Ps who also were in charge of carrying out these activities. This output was effectively accomplished with a few inputs.

Management and Supervision of the Project

- 1) Regular meetings were held within the project and adequate communication took place between each field’s expert and the C/Ps.
- 2) According to the questionnaire, there was a response that mentioned that because the location of the of the Central government’s organizations member of the JCC are in La Paz and the project site is far away, the participation of some members to manage the project was limited. Moreover, all the 3 related organizations²⁴ with their base in Potosi responded that communication with the JCC member organizations from La Paz was not sufficient, while 2 of the 4 supervising organizations based in La Paz were not able to respond due to a lack of information. It is believed that problems such as information sharing also occurred because of the 3 changes in government since the start of the project which led to

²³ Refer to 【indicator 2】 of effectiveness.

²⁴ The Project Team, Potosi prefecture and U.A.T.F

the changes in the JCC members. Furthermore, since 4 ministries are too many, it is difficult to determinate responsibilities. As are result of this causes, although mayor impacts that affect the activities of the Project have not been identified, in the future, for CIMA to increase its contributions in the environmental administration aspect, the participation of the central government institutions are indispensable.

(4) Impact

Impact on the Overall Goal

The appearance of impact on the achievement of the overall goal of this project is the following: To a certain degree the basis for the provision of technical information, the core generator of impact, already has been established. In the future, it is considered possible for CIMA to contribute to produce the final products, that is, the administration law system and policies, if it consolidates its technical capabilities and its organizational foundations and if it is able to continue to carry out its activities.

With regards to the reduction of the water contamination burden, core countermeasures technology was elaborated in the project, and in some parts impact has been verified. In the future, it will be vital for the related organizations in collaboration with CIMA to expand the technology.

Through CIMA's public information and dissemination activities, mining environment pollution awareness has increased along with a gradual spread of accurate knowledge among Potosí prefecture, university related parties, inhabitants groups on the basin, etc.

Intended Impact	Impact Appearance	Cause and Effect Relation with the Project
1. Strengthening of the government on water pollution control in Potosi.	(1) Both central and Potosí prefectural officials have gained understanding on scientific data on pollution conditions and effective alternatives caused by mining wastewater in Potosi prefecture. (2) Easy access to environmental monitoring data became available when needed. (3) The DRNMA executed administrative guidance to those in charge on the dangerous condition of the Laguna Pampa tailing dam in November, 2006. (4) The DRNMA's motivation on the implementation of environmental administration guidance has increased. (5) As a result of the projects commissioned by EU's APEMIN 2 and AAPOS, CIMA became able to conduct chemical analysis on water sources and now is able to support the administration activities of other government organizations.	(1) (2) Direct effect through the establishment of the project's environmental monitoring system and the provision of information to governmental organizations. (3) Acceptance of the recommendations made to the prefecture based on the results of the tailing dams monitoring implemented through the project. (4) Improvement of awareness and knowledge of prefectural officials through the achievement of the outputs. (5) As a result of the achievement of part of output 4, CIMA gained chemical analysis techniques.

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Intended Impact	Impact Appearance	Cause and Effect Relation with the Project
2. Water contamination burden from mining are reduced.	(1) Although at the beginning of the P/J all the tailing was disposed in the Rivera River, currently it is being disposed at 2 tailing dams in Laguna Pampa. (2) COMIBOL carried out the mine ceiling work in the southern part of Bolivia. (3) Improvement of mining productivity, the recovery rate and concentration on zinc and lead is confirmed. It is assumed that the environmental burden is reducing due to this improvement. (4) In the Pilcomayo River near the Méndez Bridge the density of zinc in the water decreased from 13.5mg/L (August 2003) to 1.1 mg/L (June 2005).	(1) (2) As a result of the project's dissemination activities (related to output 8) mining businesses' awareness on environmental conservation increased and also pressure increased through the observation by inhabitants and the government. (3) As a direct result of project output 7.7 (4) (1)(2)(3) mentioned in the left column are due to the project's direct and indirect effects and the related parties proactive actions.
3. Environmental awareness of local inhabitants increases and attention to mining pollution prevention is given.	(1) By visiting the Project, groups such as community groups, mass media, and university related parties, awareness and motivation to acquire accurate information is increasing among citizens and the university. <ul style="list-style-type: none"> • On June 16, 2005, 60 people from Sucre University visited the project • On April 18, 2006, representatives from Tarija and Chuquisaca together with mass media held a meeting with 23 participants. 	(1) As a result of the public information activities related to project output 8, CIMA's existence and the information it has was known to the citizens.

Address of Countermeasures for the appearance of Impact Agreed in the Mid-Term Evaluation Study

In the project, this challenge is being addressed by each technical field and some impact has appeared. In the chemical analysis field, cooperation with the UATF has contributed to the improvement of the curriculum and the joint organization of practical training. These, are hoped to have profound effects in both human resources development and dissemination to students. Furthermore, the improvement of the environmental analysis field has contributed to the provision of information to the Pilcomayo Committee and other government organizations. CIMA is becoming the core provider of technical information on pollution sources in the Pilcomayo river basin. In the future, by strengthening the coordination between the central government organizations and the business community it is expected that closely contribute to a comprehensive pollution control measures.

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Terminal Evaluation Report

Agreed Matters	Implementation State	Impact Appearance
<p>1. Continue to strengthen the coordination and complementary relationship with Bolivia's side related organizations to establish an administration and legal system where the project's appropriate transferred or developed technology can be utilize.</p>	<p>(1) Informs the DRNMA the environmental monitoring results twice a year, as well as the activities results of each of the project's field.</p>	<p>(1) There are no concrete products on policies and legal system yet, but through the project, the DRNMA and university related parties' awareness on environmental administration strengthening has increased by the CIMA/s provision of scientific data.</p>
	<p>(2) Provides information to the central government through seminars and JCC meetings.</p>	<p>(2) Since Potosi and La Paz are distant, and since contact with the central government was difficult, the impact in the central government has been somewhat difficult to appear. The project is aware that this situation should be improved.</p>
	<p>(3) From 2006 the JCC members increased to the following 4 ministries: Ministry of Panning and Coordination, Ministry of Water Resources, Ministry of Mining and Metallurgy, and Ministry of Agriculture, livestock and Rural Development.</p>	<p>(3) Still no impact has appeared The DRNMA and Ministry of Rural Development, Agriculture and Livestock and Environment has verified that within the environmental administration the existence and the activities of CIMA are important.</p>
<p>2. To promote the impact appearance throughout Bolivia, CIMA should play the role of information and technological network hub on the mining environment between current related organizations as well as with the industrial sector, the government and universities.</p>	<p>(1) In august 2006, the faculty of science, chemistry department and CIMA signed an agreement on the co-sponsoring of student's practical training. In 2007, it is expected to hold two courses for two people twice a year for five months each.</p>	<p>(1) Still no impact has appeared After the implementation this course, it aims to improve their understanding of the students and the level of their research findings.</p>
	<p>(2) Invites UATF to meetings with the related parties.</p>	<p>(2) Since 2006, when updating the mining engineering, ingredients processing, minerals and environmental engineering departments' curriculum, issues that were presented in seminars are being included.</p>
	<p>(3) Regular exchange of information with the Trilateral Commission for the Development of the Riverbed of Pilcomayo takes place and 7 meetings have been held thus far.</p>	<p>(3) Since August 2006, 3 officials from this committee have been posted to work as officers in the DRNMA. The CIMA is providing the committee water quality monitoring data and information about the wastewater treatment technology.</p>
	<p>(4) In 2006 "open laboratories" were held twice, introducing to UATF related parties the equipment and technology of the chemical analysis laboratory.</p>	<p>(4) Still no impact has appeared The relationship of trust built between the university and CIMA was enhanced and it allowed for the subscription of agreement on student's practical training as mentioned in (1).</p>
	<p>(5) In CIMA's Institutional Development Plan the certification of the ISO 17025 on the 6 element will be included and it is planned to obtain certification by almost October 2008.</p>	<p>(5) Still no impact has appeared In the future, it is expected that concrete plans to obtain certification will be included in the Institutional Development Plan.</p>

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Impacts that were not intended at the start of the project

As a result of the public relations activities, CENMA25 in Chile became aware of the existence of CIMA and in 2006 both organizations subscribed a technological agreement memorandum. This can be said to be a meaningful impact since by introducing the perspective of a similar organization from another country, CIMA's environmental analysis techniques would strengthen. There are no negative impacts that were not predicted.

(5) Sustainability

Organizational and Institutional Aspects

Currently, CIMA subsists with the agreement with the UATF (5 year agreement) and with the cooperation from Japan, while the prefecture and the university provide it with human and financial resources. After holding 8 meetings by the DAF²⁶, the Institutional Development Plan: Mid-term Plan and Article which defines CIMA after the completion of the project, has recently finish elaborating the first draft. Through a workshop, the joint evaluation study discussed the relevance of this draft and identified the following problems.

Therefore, it is believed that the challenge for CIMA to secure organizational and institutional sustainability is that by the end of the project, with the support of the Japanese experts the DAF should immediately elaborate a final draft resolving these problems and verifying the execution with both countries. Furthermore, since 4 ministries are too many, it is difficult to determinate responsibilities. As are result of this causes, although mayor impacts that affect the activities of the Project have not been identified, in the future, for CIMA to increase its contributions in the environmental administration aspect, the participation of the central government institutions are indispensable.

Financial Aspect

²⁵ National Center for the Environment

²⁶ Dirección Administrativa de Financiera, DAF

By providing technical service, constant revenues can be gained, which are useful to increase sustainability. In the JCC held on March 2004, SERGEOMIN²⁷ and CIMA agreed to jointly carry out the OBA (Actually it is ISO 17025) certification procedure for the chemical analysis laboratory. However, it is still not certain if CIMA's laboratories can obtain certification by the end of the project due to a blank in the period of activities of the chemical analysis field. Thus far, the breakdown of expenses of the management costs of the project is as indicated in the following graph. Furthermore, for CIMA to maintain its current activities, it is necessary for Bolivia to secure resources of at least approximately US\$ 237,000 per year. To date, Bolivia has disbursed a yearly maximum of US\$211,000, averaging approximately US\$160,000 per year. Furthermore, despite the subscription of the agreement between UATF and Potosi Prefecture for 3 years after the completion of the Project, within the agreement it is planned that the management costs of CIMA's (Mining Environment Research Center of Bolivia) will be approximately US\$170,000, also estimating a lack of US\$ 67,000 without amortize cost of the equipments. Therefore, it is necessary to include in the final version of CIMA's Institutional Development Plan, if it a feasible and realistic financial plan.

Management Expenses for CIMA's Project

Fiscal Year		2002	2003	2004	2005	2006	Projection after the completion of the project
Amount Disbursed by Bolivia (Bs)	BS	362,200	181,100	1,744,000	1,007,290	1,184,992	-
	Bs/US\$	7.7348	8.0096	8.2351	8.05	8.2869	-
	US\$	46,827	22,610	211,776	125,129	142,981	159,962**
Amount Disbursed by Japan(JPY)	Amount Disbursed by Japan (¥ (1000JPY))	6,485	6,485	7,635	7,924	10,655	0
	JPY/US\$	118.54	107.1	103.1	117.868	119.111	-
	US\$	54,707	60,551	74,054	67,228	89,454	76,912**
Sub-total		101,535	83,161	285,831	192,357	232,435	236,874**

*Employment expenses for an engineering consultant was calculated as US\$10,000/Month, ** Average from 2004 to 2006.

Technical Aspect

It can be said that the technical foundation for CIMA has been accomplished since technology transfer and development of adequate technology, excluding the chemical analysis field, which were aimed to be accomplished by end of the project are expected to be completed. However, the building of mechanisms in which to utilize this technology within environmental policies and the legal system remains as a future challenge. Therefore, it is necessary to formulate concrete plans to utilize and disseminate CIMA's

²⁷ At present it is re named as SEGEOTECMIN after a series of organizacional integrations.

environmental analysis technology, wastewater treatment technology and concentration improvement technology.

With regards to the chemical analysis field, it is expected that the amount of inputs of experts will be approximately 67% of what was planned, while technical transfer is approximately 1 year behind schedule. It will be difficult to accomplish what was planned in the almost 4 months that is left before the end of the project, and thus it cannot be said that technical sustainability has been secured. This is mainly attributed to circumstances from the Japanese side by uncontrollable reason and in the future some type of measures to complement the insufficient inputs and activities to complete technology transfer will be necessary.

Amount of Inputs for the chemical analysis long-term expert (Unit : Man X Month)

Fiscal year	2002*	2003	2004	2005	2006	2007	Total
Plan	6	12	12	12	12	6	60
Actual	1	9	9	8	11	—	44
Difference (Actual/Plan)	-5	-3	-3	-4	-1	—	-16 (67 %)

Source : Project's Records

Human Resources Aspect

The management staff in charge of equipment procurement and facilities management at CIMA's has not been assigned since 2004, and only an assistant who mainly assists the Japanese coordinator has been assigned. Furthermore, since both the administrative and management staff repeatedly resigns every year, it brought about disruption on the management even during the implementation of the project. In addition, after the completion of the project the Japanese coordinator who was the center pillar of the management division will leave. Under this structure from the human resources aspect it cannot be said that there is a high level of sustainability in the management division. Therefore, in the future it is necessary to immediately assign an administrative assistant and establish stable working conditions.

Current No. of Administrative Personnel

FY	MS	AA	ST	DR	Total
2002	1	-	1	2	4
2003	1	1	1	2	5
2004	-	1	1	2	4
2005	-	1	1	2	4
2006	-	1	1	2	4

MS: Management Staff, AA: Administrative Assistant, ST: Secretary, DR: Driver

No. of change of the Staff

FY	MS	AA	ST	DR	Total
2002	-	-	-	-	-
2003	1	1	1	1	4
2004	-	1	-	-	1
2005	-	-	-	-	-
2006	-	1	1	2	4
Total	1	3	2	3	9

MS: Management Staff, AA: Administrative Assistant, ST: Secretary, DR: Driver

Regarding the engineers assigned, the assigned number has been stable, and in the last two years everyone has continued to work without resigning. On the other hand, the Project Manager (PM) has changed every time there was a change in government. It goes without saying that the frequent replacement of staff with such responsibilities as the PM brings about disorder in the management of an organization and triggers the drain of technology and knowledge. Therefore, to secure sustainability from the human resources aspect, it is necessary that CIMA acquires independent authority over personnel issues to avoid being influenced from personnel transfer of higher organizations due to changes in government, etc.

Current number of C/Ps

FY	PM	ER	WT	CA	Total
2002	1	3	3	3	10
2003	1	3	3	3(1)	10(1)
2004	1	3	3	2(2)	9(2)
2005	1	3	3	2(3)	9(3)
2006	1	3	3	2(5)	9(5)

PM: Project Manager, EM: Environmental Research, WT: Wastewater Treatment, CA: Chemical Analysis

No. of change of C/Ps

FY	PM	EM	WT	CA	Total
2002	-	-	1	2	3
2003	-	-	-	1	1
2004	1	-	-	1	2
2005	1	-	-	-	1
2006	1	-	-	-(1)	1(1)
Total	3	0	1	4(1)	8(1)

PM: Project Manager, EM: Environmental Research, WT: Wastewater Treatment, CA: Chemical Analysis

7. Conclusion

This project has been started with the project purpose, to establish the basis of an organization CIMA that implements environmental monitoring and studies countermeasures against water pollution caused by the mining industry and then to start its activities.

In recent years, issue about the pollution has been a close-up as well as activation of the mining sector, then consequently the needs for the technical countermeasure has been wormed up among both of the pollutant groups and the victim groups. Under such context, Bolivian local and national authorities related with environmental administration have been enforcing administrative execution to the mining industries, and then the industries follow it and began to implement countermeasures. As a result, water quality in Pilcomayo River has been improved by degrees. In future, an organization that supports administrative execution on the technical aspects is desired in succession. Thus the relevance of the Project is still high.

The 8 Outputs of the Project are being achieved in appropriate level with the efforts by those concerned

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with the project implementation. However, the CIMA is still based on the agreement between U.A.T.F. and the Potosí prefecture, so it is not justified in any Bolivian legal framework. The CIMA is now underway to the establishment of its future institutional framework.

Moreover, in the field of the chemical analysis, as the Inputs and the Activities could not be implemented along the original plan mainly due to some external factors, it is almost impossible that the Project accomplishes planned technical transfer in the field within the Project term. By these two reasons, it cannot be said that the project purpose has been attained completely, and some tasks remain for better effectiveness of the Project.

On the aspect of efficiency, technical transfer in the chemical analysis started behind due to the delay of the procurement on chemical reagents and glass instruments, which had been caused by lack of financial resource on the Bolivian side. Furthermore, the long term experts in the field obliged to go back to Japan halfway by health problem resulted from tough natural condition in Potosí. On the allocation of the Bolivian human resources, frequent changes of the C/Ps and the key persons in the concerning parties due to changes of government had negative influence to management of the Project. Such problems on the efficiency affected also to the effectiveness eventually.

Though any concrete results has not been produced on the administrative and legal framework, the prefecture established structural base for administration guidance based on scientific ground, and the Project motivates the prefecture to execute correct environmental administration and the U.A.T.F. to develop further effective technology in the field.

In addition, the Project supports environmental protection activities by the other projects in the field, public institutions, COMIBOL and etc. through provision of the environmental monitoring data based on the agreements with them. Moreover, Project's activity expands right knowledge in the field among the citizens in the basin and contributes to some improvements of the curriculum in the U.A.T.F. Thus, some intended impacts for Overall Goals have begun to appear. Consequently it will be estimated that the impacts can contribute to produce the final products, related administrative law and policies, if the CIMA can continue and develop its activity.

On the aspect of the sustainability, it is essential that the CIMA is established on the Bolivian legal framework, it secures stable financial capacity and it maintains enough human resources that can achieve appropriate research and development as well as technical service. Such subjects can be enforced through the CIMA accomplishes 2 remaining Outputs mentioned above.

As the Project has some remaining subjects to be achieved thus, it is desirable that collaboration by the both sides is continued. However, some preparation work and worked-out plan shall be necessary for the pre-condition.

Hereafter the recommendation to realize the collaboration is mentioned in the following chapter.

8. Recommendations

After examining the 5 evaluation criteria for this terminal evaluation study, it was concluded that "the Project Purpose was not accomplished". The greatest reason for this was that of the 8 outputs to be produced to accomplish the Project Purpose, there are some issues that need to be resolved for:

Output 1: The organization of the Center is established

Output 3: Environmental chemical analysis technology is acquired by the C/Ps.

Regarding above mentioned Outputs, the Short term Recommendations to be realized by the Project ends, and the Mid and Long Term Recommendations to be realized continuously also thereafter.

(1) Short term Recommendations

(1.1) Items to be realized by the Bolivian side

The below mentioned items are to be accomplished in order that the JICA analyzes possibility of the extension of the follow-up cooperation with CIMA.

1) To get priority among the remaining technical transfer subjects on the chemical analysis field. (By March 5 th, 2007)

Regarding the technical transfer that has not been accomplished including the gas chromatography analytical method, taking into consideration the current needs of Bolivia's environmental analysis field, prioritize the technical transfer that has not been accomplished. The representative of the JCC, Governor of Potosí Prefecture, is to submit the document of the priority to JICA Bolivia Office by March 5th, 2007.

2) To complete renovation of the chemical análisis laboratory. (By March 31st, 2007)

The Project Manager in CIMA should complete renovation of the laboratory to solve all the obstacles on the technical transfer implementation e.g. arrangement of the equipments, procurement of the chemical reagents, operation of treatment system for poisonous disposals and so on. The representative of the JCC, Governor of Potosí Prefecture, is to submit the document of the priority to JICA Bolivia Office by March 31st, 2007.

3) Submission of the Institutional Development Plan (By March 31th, 2007)

Due to a series of the efforts of the Bolivian side, the CBIMA Establishment Agreement²⁸ between Potosí Prefecture and Thomas Frías Autonomous University was concluded and as a result, the first draft of the Institutional Development Plan was elaborated. However, the terminal evaluation team believes that the following points should be included to make the Institutional Development Plan more feasible. Taking these into consideration, the representative of the JCC, Governor of Potosí Prefecture, is to submit a new draft of the Institutional Development Plan to JICA Bolivia Office by March 31 th, 2007 at the latest.

a) Nature and Characteristics of Institution

- ① Mission and role
- ② Legal justification on the Bolivian laws
- ③ Organizational structure
- ④ Period of establishment

b) Financial status of the CIMA;

- ① Financial resources and procurement method for operational cost.
- ② Estimation of the cost
- ③ Financial analysis

c) Human Resources of the CIMA;

- ① Recruitment method

²⁸ It was signed in september 20, 2006 between the Prefecture of Potosi and UATF.

② Human resource promotion and training systems

d) Technical Qualification

- ① Sustaining the Technologies gained through JICA Project
- ② Maximum Utilization of the granted equipment and materials
- ③ Functioning Research and Development
- ④ Rendering Social Services in Environment Field

4) To take action for implementation of the improved Institutional Development Plan (By June 30th, 2007)

Based on the Plan, Bolivian side is immediately to start the new organization and activities of the CIMA with proper assistance by the Japanese Experts. On this term, they should gradually improve the plan if necessary.

5) To maintain all the resources of the current CIMA.

The Bolivian side is continuously to maintain good condition of the equipments and machineries, number and capacity of the human resources con, and scale and quality of the activities.

(1.2) Items to be realized by the Japanese side.

1) Assistance to elaborate the Institutional Development Plan (By March 31st, 2007)

Under the current provision of the Japanese expert team, it is difficult to provide recommendations to analyze, evaluate and improve the content of the Institutional Development Plan of the CIMA, it should be considered the dispatch of a short-term expert as soon as possible to support these activities. Japanese chief advisor is to inform the result to JICA Bolivia Office by March 31st, 2007.

2) Dispatch plan of the JICA Expert who will complete remaining activities.

Regarding the recruitment of an expert for the technical transfer in the chemical Analysis field, which has remaining activities, the chief advisor, JICA Bolivia Office and JICA headquarter should investigate and considerer the dispatch of a Japanese expert or an expert from a third country from Latin American countries, taking into consideration of the period and timing.

(2) Mid- and long-term recommendations (By the end of December, 2009)

After the elaboration of the final version of the Institutional Development Plan, the CIMA should establish the operational principle regarding the following recommendations. They are in order to ensure CIMA's organizational sustainability and effect of the technical transfer by the Project. The recommendations include what are provided by the Project's experts through the actual project management.

(2.1) Enhancement of the partnership with mining sector.

It is declared that Ministry of the Mining and Metallurgy obliges the mining sector to pay environmental consideration in order to issue governmental permission to all the new mining development activities. Under this context, CIMA should intend to enhance the partnership with environmental division in the Bolivian mining authority such as COMIBOL restructured and enlarged by the current Evo Morales administration.

(2.2) Analyze and evaluate market value of CIMA's business.

CIMA should analyze and evaluate conformity with local and social market needs in Potosí prefecture, the whole Bolivia and etc in the Project's 3 technical fields, i.e. chemical analysis, environmental research and wastewater treatment. In order to make sure of the analysis, cost-benefit effect should be clarified in the numerical value on the viewpoint of the national and regional economy.

(2.3) Study to secure operational and project cost for CIMA.

In order to make sure of the operational and project cost, CIMA should concentrate into cost-benefit

analysis for future financial feasibility on all the potential revenue resource by related national ministries and agencies, COMIBOL, Potosi prefecture, U.A.T.F as well as new technical ventures.

(2.4) Efforts to develop organizational capacity of CIMA and reinforce foundation

1). Aim to improve and establish ranking as a chemical analysis laboratory

Given its clear strategy and motivation to strengthen its role as a standard analysis institution, CIMA should in effect reinforce its organizational capacity in stages, for example by earning certification first from Potosi province, then Bolivia and finally international organization

Since CIMA aims to become a reference laboratory in Bolivia, it must obtain ISO17023 accreditation in the future. To do so, it must in addition devise a plan for the preparatory work involved in obtaining such accreditation.

2). Reinforcements to field of general environmental chemical analysis

CIMA is equipped with state-of-the-art environmental analysis equipment for Bolivia, and has great potential for business expansion, including environmental chemical analysis not only examining pollutants from mines as originally intended in the Project, but also those from pollutants affecting quality living conditions. Improvements in local residents' environmental awareness are forcing environmental authorities in Potosi province to reinforce their environmental management capacity as part of the social services offered for living environments.

CIMA is working to diversify its activities in the water pollution prevention field, particularly in water quality analysis, and build on its capacity. Such examples include the following:

- ① Build up its track record with analysis tests;
- ② Contribute to the establishment of standard analytical methods for water in Bolivia;
- ③ Plan for preparation of standard water samples for analysis (domestic wastewater, industrial wastewater, lake water, river water, groundwater, etc.);
- ④ Plan inter-laboratory tests for water analysis;
- ⑤ Devise a plan for environmental monitoring (covering water, soil and the atmosphere);
- ⑥ Participate in plans to carry out round robin tests with countries in South America; and
- ⑦ Provide training in water analysis testing methods and others in coordination with organizations in Argentina, Chile and other countries.

3) Strive for differentiation as a comprehensive chemical analysis organization

CIMA's chemical analysis has served to provide basic data for environmental surveys and wastewater treatment. Accordingly, it has experience and a proven track record in comprehensive chemical analysis, such as sampling, analysis, data compilation and pollution evaluation, in addition to the chemical analysis technology needed to work with test specimens on consignment. As a result, CIMA should consider a strategy that aims to differentiate itself from laboratories that focus exclusively on chemical analysis.

4) Consider business strategies in environmental consultant field

a) Environmental survey field

Growing demand is expected for environmental surveys of catchments basins and regions following on the heels of the new demand for mining development, thanks to the turn for the better in the economic environment for resource development. The results of technology transfer in the environmental survey field should be preserved so that CIMA can work to attract orders for business commissions in the new environmental survey field. In order to keep up its activities as an independent analysis center, CIMA will have to make efforts to improve its management and cost accounting by learning how to prepare estimates and working on its external public relations.

b) Wastewater treatment field

Basic neutralization technology for wastewater treatment, biochemical wastewater treatment technology and productivity enhancing technology applying mineral processing technology have been transferred. These technologies cover a broad range from the conceptual design of wastewater treatment plants, basic design, detailed design and construction. CIMA should consider differentiating itself from the private wastewater treatment industry by offering wastewater treatment consulting for small and medium-sized mines in a tie-up with the chemical analysis field and developing an environmental conservation business utilizing productivity enhancement

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technology. It could also differentiate itself by offering training in wastewater treatment technology.

5) Environmental education field as focal point

CIMA's equipment is held within U.A.T.F's mining department, so it could be used as an education facility for university and corporate personnel in the environmental field. The administrative foundation for CIMA's business should be reinforced, including the effective mutual use of the university's funding and infrastructure.

6) Reinforce CIMA's PR and extension activities

In the agreement to establish CBIMA (Center for Mining and Environmental Research in Bolivia) in September 2006, its role as a mining and environmental center for all of Bolivia was clearly stipulated, and it should aim to expand its activities from Potosi province to other mining provinces. It is important to publicize CIMA's potential in regards to waste water disposal technology, environmental monitoring and chemical analysis, and CIMA should continue to publicize its activities on its web site and issue reports on the center's activities.

It is essential that a long-term policy be devised for CIMA's development in all fields, covering financial, technical and personnel aspects.

CIMA's technical capacity improved due to the implementation of this Project, and one significant aspect of this was the use of equipment introduced through JICA cooperation and the improvement in the individual technical abilities of the small group of counterparts.

Accordingly, in the future counterparts must be retained and their numbers increased, but hiring conditions are instable due to financial difficulties, and the sustainability of the project results are a serious concern. An effective sustainable development plan is an urgent and important issue as it would also stabilize hiring conditions for technology counterparts.

9. Lessons learned

1) Changes in Central and Local Governments Administrations and their impacts on the Project

The Bolivian Central Administrations have been altered four times during the implementation of the CIMA Project. At each time, there were reforms, reshuffles and reorganizations in the supervising Ministries on the Project. These changes might have influenced the administrations of the Potosi Local Government, which is one of the counterpart organizations of the CIMA Project. This might also caused rather frequent replacements and transfers of persons in charge for the Project. Consequently, it can be pointed out that the Project has been suffered from these unforeseen transfers of responsibilities of the counterpart personnel, especially in the operational efficiencies of the Project.

2) The Merit and Demerit of locating the Project management in the premises of the University

Merit :

- ① The Project can utilize infrastructure existing in the University
- ② Main activities of counterpart personnel of the Project take place in the University campus. There is little loss time in carrying out a variety of activities.
- ③ The relationship and the coordination in management between the Potosi Prefecture and the Tomas Frias Autonomous University has been well maintained, which has resulted in establishing the quick and smooth cooperation agreement for setting up the new organization for sustaining the Project activities.

Demerit :

- ① There might be difficulties in maximum utilization of the fruit of the Project, for instance for rendering its social services in environmental administration, if the relationship between the Prefecture and the University is deteriorating for some political reasons.

It was so far proved that the CIMA project had generally enjoyed its academic status in sustaining activities of the technology transfer being safe from the minimum political influence in changes of environmental administration both in the Central and Local administrations.

3) Addressing project's administrative aspects

This project requires technical transfer aspects, primarily the dispatch of experts to provide and use equipment, as well as administrative aspects to ensure that Bolivia's citizens were at the receiving end of the transfer benefits. In meeting the first requirement, a group of technical experts including a chief adviser formed a team efficiently and rationally, but there is a strong chance that it had weaknesses in addressing the administrative aspects. Delays in preparing the sustainable development plan that JICA had requested was deemed to have had a major impact on the achievement of the project goals and installation of the infrastructure for the overall purpose. For this reason, the project team of experts must include more members with an administrative perspective, not just an understanding of technical aspect.

As a result of the addition of the Potosi Province Environmental Agency as a counterpart to meet the administrative requirement, the project will benefit from the strong ties between Potosi province's mayor (the new mayor is a former president of UATF) and UATF, and there are promising signs on the administrative side, such as the allocation of funds to prepare a sustainable development plan.

4) The Site of the Project site and Dispatching Plan of the Experts

The Project site is located in a high altitude of 4,070 meters, and 550 kilometers from La Paz and 160 kilometers from Sucre, where altitude sickness can easily happen and sometimes road blocks due to political disturbances makes access to the site almost impossible. Some of the Japanese experts took urgent treatment and others were forced to return to Japan due to health problems. Under such circumstances, a delay of activities in listing up the equipment and materials followed by the transfer of the technologies has happened.

APPENDIX I - 1 Project Design Matrix (Ver.1.0)

Project Name : Mining Environment Research Center Project

Duration : 2002.7.1~2007.6.30 (5 years)

Target group : The inhabitants of the lower reaches of rivers in Potosi mining area.

Project Area : Potosi Prefecture

Narrative Summary

Objectively Verifiable Indicators

Means of Verification

Important Assumptions

Subject Goal	Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
<p>Administration and technology to decrease water pollution caused by mining industry, which are established in the Center are disseminated to other regions in Bolivia.</p> <p>Overall Goal Water pollution caused by mining industry in Potosi is decrease and prevented.</p> <p>Project Purpose Administration system and technology suitable for Potosi to decrease water pollution caused by mining industry are established.</p>	<p>1. Monitoring plan, mine wastewater treatment master plan are adopted in Potosi environmental administration</p> <p>2. Guideline and technology of the mine wastewater treatment are applied in Potosi mining sector.</p> <p>3. The role of the center is established in Bolivia mining environmental sector.</p>	<p>1. The number of application to the mining environmental administration in Potosi</p> <p>2. The number of inquiry from mining sector</p>	<p>The mining environment policy is not changed drastically.</p> <p>The research result of the center is incorporated in mining environmental administration.</p> <p>The tailing dam is to work properly.</p>	<p>C/Ps continue working for the Center</p>
<p>Output 1. The organization of the Center is established.</p> <p>2. Facilities and equipment necessary for the activities of the Center are introduced and maintained properly.</p> <p>3. Environmental chemical analysis of mining pollution are carried out by the C/Ps.</p> <p>4. Environmental situations in Potosi mining area are researched by the C/Ps and case studies are accumulated.</p> <p>5. Mine-related wastewater treatment technology is developed and carried out by the C/Ps.</p> <p>6. Basic technologies of mineral processing are carried out by the C/Ps.</p> <p>7. Public relations and education for environmental conservation targeted Potosi people who works for mining, concentration, and the people related to the mining activity are conducted</p> <p>Activities See next page</p>	<p>1.1. Counterparts, administrative personnel are arranged continuously within project period.</p> <p>1.2. Local cost is allocated in each quarter of the year without delay.</p> <p>1.3. Regular meeting hold continuously every 3 month with related organization include YMARNDF.</p> <p>1.4. The article of the center and sustainable development plan are draw up within 1 year.</p> <p>2.1. Equipment and test working is done within 3 months after procured.</p> <p>2.2. Maintenance cost for Equipment is allocated without delay.</p> <p>2.3. Manuals are prepared for the equipment within 6 months after installation.</p> <p>2.4. Operation and maintenance of equipment can be done by C/Ps within 1 year after installation.</p> <p>3.1. Knowledge and method of chemical analysis is acquired within 2 years.</p> <p>3.2. Sample of mine-related wastewater are analyzed.</p> <p>4.1. The environmental map of Potosi is made within 3 years.</p> <p>4.2. The water monitoring plan of Potosi is made within 3 years.</p> <p>5.1. The mine waste water master plan (administration, technology) is made within 2 years.</p> <p>5.2. Conceptual plan of wastewater treatment are made within 5 years</p> <p>6.1. Knowledge and method of wastewater treatment is acquired within 2 years.</p> <p>6.2. Guideline for improving mineral productivity is made.</p> <p>7.1. The seminar is held more than one time in each year.</p> <p>7.2. The press release is made more than one time in each year.</p> <p>7.3. Contract research of government and private sector can be undertaken.</p>	<p>1.1. Number of Counterpart</p> <p>1.2. Quarterly report</p> <p>1.3. Regular meeting report</p> <p>1.4. Article of the center, sustainable development plan</p> <p>2.1. Installation, assembling, adjustment report.</p> <p>2.2. Manual, daily report, (maintenance, measure)</p> <p>2.3. Manuals of equipment</p> <p>2.4. Monitoring sheet of technical transfer</p> <p>3.1. Monitoring sheet of technical transfer</p> <p>3.2. Number of report of analysis.</p> <p>4.1. Environmental map</p> <p>4.2. Monitoring plan</p> <p>5.1. Mine wastewater master plan (administration, technology)</p> <p>5.2. Conceptual plan</p> <p>6.1. Monitoring sheet of technical transfer</p> <p>6.2. Guideline of mineral processing</p> <p>7.1. The number of seminar</p> <p>7.2. The number of press release</p> <p>7.3. The number of contract research, Number of examination of P.A. MA</p>	<p>C/Ps continue working for the Center</p> <p>Necessary information is provided by related organization.</p> <p>Customs clearance and transport procedure is not delayed.</p>	<p>C/Ps continue working for the Center</p>
<p>Bolivian Side</p> <p>1. Building and the facilities for the Project, Machinery, Equipment and other materials</p> <p>2. The arrangement of the 10 C/Ps (fulltime) administrative people and others</p> <p>3. Local cost (Transportation for field research and meetings, Allocation of assistance staff for laboratory experiment, field researches, etc., Secretary and drivers, Public relations and educational activities, Workshop and seminar, Consumable, electricity, etc., Expenses for vehicles)</p> <p>Japanese side</p> <p>1. Experts (Long-term experts (Chief advisor, Coordinator, Wastewater Treatment, Environment Research, Chemical Analysis) and Short-term experts)</p> <p>2. C/Ps training in Japan (One or two person(s) yearly, and a couple of weeks to two months).</p> <p>3. Provision of Machinery, Equipment, and Materials (Car, Environmental research equipment, Neutralization Equipment, X-Ray Diffractometer, Atomic Absorption Spectrophotometer, Ion Chromatograph, etc.)</p>	<p>Bolivian Side</p> <p>1. Building and the facilities for the Project, Machinery, Equipment and other materials</p> <p>2. The arrangement of the 10 C/Ps (fulltime) administrative people and others</p> <p>3. Local cost (Transportation for field research and meetings, Allocation of assistance staff for laboratory experiment, field researches, etc., Secretary and drivers, Public relations and educational activities, Workshop and seminar, Consumable, electricity, etc., Expenses for vehicles)</p> <p>Japanese side</p> <p>1. Experts (Long-term experts (Chief advisor, Coordinator, Wastewater Treatment, Environment Research, Chemical Analysis) and Short-term experts)</p> <p>2. C/Ps training in Japan (One or two person(s) yearly, and a couple of weeks to two months).</p> <p>3. Provision of Machinery, Equipment, and Materials (Car, Environmental research equipment, Neutralization Equipment, X-Ray Diffractometer, Atomic Absorption Spectrophotometer, Ion Chromatograph, etc.)</p>	<p>Bolivian Side</p> <p>1. Building and the facilities for the Project, Machinery, Equipment and other materials</p> <p>2. The arrangement of the 10 C/Ps (fulltime) administrative people and others</p> <p>3. Local cost (Transportation for field research and meetings, Allocation of assistance staff for laboratory experiment, field researches, etc., Secretary and drivers, Public relations and educational activities, Workshop and seminar, Consumable, electricity, etc., Expenses for vehicles)</p> <p>Japanese side</p> <p>1. Experts (Long-term experts (Chief advisor, Coordinator, Wastewater Treatment, Environment Research, Chemical Analysis) and Short-term experts)</p> <p>2. C/Ps training in Japan (One or two person(s) yearly, and a couple of weeks to two months).</p> <p>3. Provision of Machinery, Equipment, and Materials (Car, Environmental research equipment, Neutralization Equipment, X-Ray Diffractometer, Atomic Absorption Spectrophotometer, Ion Chromatograph, etc.)</p>	<p>C/Ps continue working for the Center</p> <p>Necessary information is provided by related organization.</p> <p>Customs clearance and transport procedure is not delayed.</p>	<p>Mining industries and inhabitants are cooperative for the investigation activities of the center</p>

Activities

- 1 The establishment of the organization.
 - a. Study and establish organization and institutional arrangement.
 - b. Assign researchers and engineers.
 - c. Secure the budget.
2. The procurement of facilities and equipment.
 - a. Procure equipment and materials.
 - b. Install the equipment
 - c. Learn the equipment operation.
 - d. Carry out the equipment maintenance.
3. An environment chemical analysis is acquired.
 - 1) Basic Technology
 - a. Analysis is done in accordance with the manual.
 - 2) Sample analysis
 - 1) Investigation of current situations
 - a. The analysis of the standard sample. (The confirmation of the precision by the reference materials.
 - b. Investigate the origin of the pollution.
 - c. Analyze the pollution mechanism
 - d. Compare the investigation result with the environmental quality standards.
 - e. Survey the effect of the pollution.
 - 2) Water pollution monitoring plans
 - a. Make monitoring plan
 - b. Examine water quality analysis models.
 - c. Simulate water quality analysis.
4. The environment situation research
 - 1) Investigation of current situations
 - a. Investigate the pollution level.
 - b. Analyze the pollution mechanism
 - c. Compare the investigation result with the environmental quality standards.
 - d. Survey the effect of the pollution.
 - 2) Water pollution monitoring plans
 - a. Make monitoring plan
 - b. Examine water quality analysis models.
 - c. Simulate water quality analysis.
5. Mine wastewater treatment
 - 1) Introduction of mining environment administration
 - a. Best practice environmental management in mining
 - b. Importance of mining pollution prevention administration for sustainable production
 - c. Role of the national and/or local governments(introduction of legal system, inspection, etc.)
 - d. Support by government (introduction of subsidy and financing).
 - e. Measures against the shutdown or abandoned mines (introduction of the law for special measures against metal mining pollution)
 - 2) Introduction of mining pollution prevention technology.
 - a. Overview the basic technology and regulations for mining pollution and preventions in Japan.
 - b. Explain the technology and regulations for the measures against the mining wastewater) → The master plan of the Potosi area is settled on and reviewed every year
 - 3) Master Plan
 - a. Make a master plan (technical and for the measures against the mining wastewater)
 - 4) Development of wastewater treatment
 - a. Overview of the basic technology
 - b. Decide the applicable technology.
 - c. Research and develop the technology.
 - d. Experiment in the laboratory.
 - 5) Plan for introduction of the technology.
 - a. Design the wastewater treatment total system.
 - b. Examine the most suitable treatment condition for each origin of the pollution.
 - c. Estimate cost for the treatment.
 - d. Sum up the environmental impact.
 - e. Examine how to implement the treatment (e.g. participation of national and/or local government, financial measures such as reserve fund subsidy, donation, maintenance system)
 - f. Make the conceptual design of the treatment plant(s) → Concept design toward the worst pollution source.
 6. Basic technologies of mineral processing
 - 1) Measures against tailing and wastewater
 - 2) Environmental chemical analysis
 - 3) Guideline for improving mineral processing productivity to deal with the environmental cost.
 - a. Conduct environmental chemical analysis
 - b. Investigate the process and efficiency of the existing ingenos.
 - c. Grasp the problems of the existing ingenos.
 - d. Examine the measures to improve productivity
 - e. Make and disseminate the guideline
 7. Public relations and education for environmental conservation targeted Potosi people who works for mining, concentration, and the people relate to the mining activity are conducted
 - a. The issue of public information manual.
 - b. Holding of the seminar.
 - c. Press release.

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APPENDIX I-2

PROJECT DESIGN MATRIX (Ver. 2.0)

PDM Ver.2.0: Elaborated by the Mid-Term Evaluation Team and Approved by the JCC on 3rd Feb. 2005.
 Duration: July First 2002 -June 2007 (5years)

Project Name: Mining Environment Research Center Project

Project Area: Potosi Prefecture

Target Group: Environment management in Potosi (CIMA staff, Bureau of Environment in Potosi Prefecture, Mining and Concentrators)

Narrative Summary	Indicators	Verification	External Conditions
<p>Super Goal: Administration and technology to decrease water pollution caused by mining industry, which are established in the CIMA center, are disseminated to observations in Bolivia</p> <p>Overall Goal: In the valley of the PicoMayo River, environmental administrators, mining operators and communities promote the activities for the prevention of the water pollution caused by the mining industry.</p>	<p>1. Administration of water pollution prevention is fortified in Potosi.</p> <p>2. The water pollutants from mining activities are reduced.</p> <p>3. Community people become more environmentally conscious and pay enough attention to the prevention of the mining pollution.</p>	<p>1. Environmental regulations on the mining activity and appropriate administrative instructions towards mining operators.</p> <p>2. Improved concentration recovery rates. Appropriate treatment of mining wastewater and management of mining waste.</p> <p>3. Preferred drinking of clean water to water affected by the mining activity. Increased knowledge on mining pollution. More coverage of the mass communication.</p>	<p>• Bolivian economy is based on Mining industry • Environmental policy of Mining Industry isn't changed • Mining Industry is the most important productive activity in Bolivia.</p>
<p>Project Purpose: 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.</p>	<p>1. Monitoring and analysis of water pollution in PicoMayo River are implemented.</p> <p>2. Methodology of the effective concentration and water treatment of mines and concentrators is investigated.</p> <p>3. The administration sector considers results of the monitoring and research as feedback.</p> <p>4. Environmental education and publicity on the prevention of the water pollution are promoted.</p>	<p>1. Chemical analysis of the mining wastewater, monitoring system on the public river, water pollution mapping, model of simulation of the water pollution.</p> <p>2. Experiments on waste water treatment and optimum treatment.</p> <p>3. Project Monitoring Reports, Periodical Technical Advance Reports, seminars, workshops, periodical meeting with related authorities, mass media coverage</p> <p>4. Seminars and workshops</p>	<p>• C/PS continue working for the Center. • Local costs are disbursed throughout the year without delay.</p>
<p>Outputs 1. The organization of the center is established.</p>	<p>1.1 Administrative personnel are staffed continuously within project periods.</p> <p>1.2 Counterparts (C/P) to be transferred technology are assigned.</p> <p>1.3 Operational Project budget is carried out.</p> <p>1.4 Joint Coordinating Committee hold once a year with VMARNDP and related organizations.</p> <p>1.5 Institutional development plan is drawn out within 4 years.</p> <p>1.6 Monitoring of technical transfer is made continuously.</p>	<p>1.1 Minutes of Administrative staff Meeting on the weekly basis (CIMA Director, Experts Chief Advisor, Coordinator)</p> <p>1.2 "Activities situation chart" to be presented monthly</p> <p>1.3 Budget plan</p> <p>1.4 Minutes of Joint Coordinating Committee</p> <p>1.5 Institutional Developing Plan.</p> <p>1.6 Plan of operations, monitoring sheet for technology transfer, activity report to be sent to JICA</p> <p>2.1 Procurement plan, Equipment investigation</p>	<p>• C/PS continue working for the Center. • Local costs are disbursed throughout the year without delay.</p>
<p>2. Facilities and equipment necessary for the activities of the Center are introduced and</p>	<p>2.1 Facilities and equipment necessary for the activities of the Center are procured without delay.</p>		

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maintained properly.	2.2 Proper operation and maintenance of facilities and equipment is maintained.	2.2 Equipment manual, Maintenance report
3. Environmental chemical analysis technology is acquired by the C/Ps.	3.1 Chemical analysis equipment is installed systematically	3.1 Installed equipment list, installation design, trial-run report
4. Environmental research technology is acquired by the C/Ps.	3.2 Technical basic knowledge for chemical analysis is acquired.	3.2 Items of criteria for wastewater with accurate analysis
	4.1 Environmental situation map in Potosi is developed, within 3 years.	4.1 Area, quantity of water, pollutants, PH, salt content, conduction index, heavy metal content
	4.2 Environmental Monitoring plan of mining wastewater in Potosi is made up, within 3 years.	4.2. Observation system and points, frequency, constituent
	4.3 Hydrological Structure Model is established, within 4 years	4.3. Plate tectonics, water system simulation
	4.4 Environmental monitoring equipment is distilled and its software is properly managed within 5 years.	4.4 Management system of data base for environmental monitoring
5. Wastewater treatment technology is acquired by the C/Ps.	5.1 Batch examination equipment and continuous neutralization examination equipment are installed.	5.1. Installed equipment list, installation design, trial-run report
	5.2 The examination of Batch and Continuous Neutralization data allow to find the optimum condition for waste water treatment, within 5 years.	5.2 Oxidation condition, neutralization condition, heavy metal flocculation condition, PH last condition, sludge density, quantity of these to be accepted according Bolivian environmental rules
	5.3 Iron oxide bacteria technology is acquired.	5.3 bacteria culture, oxidation of mining wastewater by bacteria.
	5.4 Plan for mining acid wastewater treatment is made up within 5 years.	5.4 Water entrance Plan, quantity of treated wastewater, hard water density (heavy metal, PH), Oxidation condition, Neutralization condition, cohesion condition, PH last condition, plan of sludge discharge, plan to discharge decanted water
6 Environment regulation guideline for mining industries in Potosi is proposed.	6.1 Japanese administration for the mining pollution prevention is understood.	6.1 Environmental preservation in the mining industry, Shared responsibility to preserve environment between government and mining industry
	6.2 Outline of technology to prevent mining pollution is understood.	6.2 Technology to close underground water, technology to improve underground water, other technology, strategic technology of tail dam, technology for administrative plan.
	6.3 Activity reports of CIMMA and CPs are submitted to the Potosi Prefecture and supervising/cooperative organizations.	
7 Technology for mineral processing productivity is proposed.	7. Improvement Plan for mineral processing production in order to obtain the environmental protection expenses is made within 3 years.	7. Grind technology, flotation technology, dehydration technology, waste treatment technology, water circulation technology.
8 Public relations and education for environmental conservation targeted Potosi people who works for mining, concentration and the people related to the mining activity are conducted.	8.1 Magazine including technical information is published more than twice a year.	8.1 CIMMA activities, Environment preservation of the mining industry connected to technology and official administration
	8.2 Seminars are carried out more than twice a year	8.2 CIMMA activities, environmental preservation connected to technology and official administration control, Environment preservation of the mining industry in Bolivia.
	8.3 Press release is made more than once a year	8.3 CIMMA activities, outputs

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Activities	Investment	
1.1 Organization and its structure are assigned. 1.2 necessary engineers and researchers are assigned. 1.3. Budget plan is made. 1.4 Joint Committee Coordinating is held regularly. 1.5 Institutional Developing Plan is made up.	Bolivian Side 1. Building and facilities for the Project, machinery, equipment and other materials. 2 The arrangement of 10 counterparts (full time), administrative people and others. 3 Local cost (transportation for field research and meetings) allocation of assistance staff for laboratory experiment, field researches, etc. Secretary and drivers, public relations and educational activities, workshop and seminar, consumable, electricity, etc. Expenses for vehicles)	*C/P continue working for the Center CIMA *Necessary information is provided by related organizations. *Customs clearance and transport procedure are held smoothly.
1.6 Article of CIMMA is elaborated. 1.7 Monitoring of Technological transfer is carried out. 2. INecessary equipment is procured.	Japanese side 1. Experts (Long term experts, (chief advisor, Coordinator, Wastewater Treatment, Environment Research, Chemical Analysis) and short term experts 2. C/P's training in Japan (one or two person(s) yearly, and a couple of weeks to two months. 3. Provision of Machinery, Equipment, and Materials	
2.2 Equipment maintenance and adjustment are taken. 2.3 Facilities installation/renovation is completed.		
3.1 Chemical analysis equipment is set up. 3.2 Technology of the environmental chemical analysis is acquired by Caps.	(1) Environmental research ; car(2), Environmental research equipment etc. (2) Waste water treatment; Neutralization Equipment, Acid bacteria equipment etc.	
3.3 Environmental chemical analysis is carried out. 4.1 Environmental map is elaborated.	(3) Environmental chemical analysis; X-Ray Diffract meter, Atomic Absorption Spectrophotometer, Ion Chromatograph, etc.	
4.2 Hydro-geological structural model is established.		
4.3 Monitoring Plan is elaborated.		
4.4 Environmental data control system is operated.		
5.1 Batch and continuous neutralization equipment are installed		
5.2 Lectures on mining waste water treatment are held		
5.3 Practical laboratory equipping training (batch and continuous neutralization equipment) is held.		
5.4 Acid mining waste water treatment plan in Potosi is elaborated.		
6.1 Japanese administration on mining pollution control is introduced and understood.		
6.2 Outline of pollution prevention technology in mining industry in Japan is introduced and understood.		
6.3 Activity reports of Project and CP's reports are drawn out.		


Preliminary condition

*Research results of the Center are integrated to the mining environmental administration.

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7.1 Technological problem of concentration plants is analyzed.
7.2 Productivity of the concentration process is analyzed.
8..1 Magazine including technical information is published.
8.2 Seminars are carried out.
8.3 Press release is carried out.

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Plan of Operation "Mining Environment Research Center" (Ver. 1.0)

Output	Activities	Person in charge		Schedule					Post project			
		Bolivian side	Japanese side	1st Year	2nd Year	3rd Year	4th Year	5th Year	Short term	Middle term	Long term	
1 The establishment of the organization	a) Study and establish organization and institutional arrangement b) Assign researchers and engineers c) Secure the budget.											
2 The Procurement of facilities and equipment	a) Procure equipment and materials. b) Install the equipment. c) Learn the equipment operation.											
3 Environment Chem. Analysis	1) Basic Technology 2) Sample Analysis 3) Investigation of current situations											
4 The environment situation research	1) Investigation of current situations 2) Survey the effect of the pollution. 3) Make monitoring plan. 4) Water Pollution monitoring plans are made.											
5 Mine wastewater treatment	1) Introduction of mining environment administration 2) Introduction of mining pollution prevention technology 3) Master Plan 4) Development of wastewater treatment 5) Plan for introduction of the technology											
6 Implementation of the plans	a) Best practice environmental management in mining. b) Importance of mining pollution prevention administration for sustainable production. c) Role of the national and/or local government (introduction of legal system, inspection, etc) d) Support by government (introduction of subsidy and financing) e) Measures against the shutdown or abandoned mines a) Overview of the basic technology for mining pollution prevention. b) Explain the technology and regulations for mining pollution and preventions in Japan. c) Make the master plan (technical and for the measures against the mining wastewater). a) Overview of the basic technology. b) Decide the applicable technology. c) Research and develop the technology. d) Experiment in the laboratory. a) Design the wastewater treatment total system. b) Examine the most suitable treatment condition for each origin of the pollution. c) Estimate cost for the treatment. d) Sum up the environmental impact. e) Examine how to implement the treatment. f) Make the conceptual design of the treatment plant(s). g) Construct the plant(s). h) Disseminate the plant(s).											
7 Public information and education toward Potosi mining people	1) Measure against tailing and wastewater 2) Guiding for improving mineral processing productivity to deal with the environmental cost. 3) Implementation of the measures to improve productivity. a) The issue of the public information journal. b) Holding of the seminar. c) Press release											

AUTF: Autonomous University Tomas Frías PP: Potosi Prefecture KMW: The German Development Bank ERE: Environment Research WT: Wastewater Treatment ME: Making Environment Administration CA: Chemical Analysis MP: Mineral Processing

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APPENDIX II-2

Plan of Operation "Mining Environment Research Center" Ver. 2.0

2 Feb. 2005

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Output	Activities	Person in charge		Schedule					Post project			Remarks	
		Bolton side	Japanese side	1st year	2nd year	3rd year	4th year	5th year	Short term	Medium term	Long term		
1 The organization of the center is established.	1.1 Administrative personnel are staffed continuously within project periods.	PI	CA, CO										
	1.2 Consultants (C/P) to be transferred technology are assigned.	PI	CA, CO, LE										
	1.3 Budget plan is made. 1.3 Operational Project budget is carried out.	PI	CA, CO										
	1.4 Joint Coordinating Committee hold once a year with VAMINDP and related organizations.	PI	CA, CO, LE										
	1.5 Institutional development plan is drawn out within 4 years.	PI	CA, CO, LE										
	1.6 Monitoring of technical transfer is made continuously.	PI	CA, CO										
2 Facilities and equipment necessary for the activities of the Center are introduced and maintained properly.	2.1 Facilities and equipment necessary for the activities of the Center are procured without 2.2 Proper operation and maintenance of facilities and equipment is maintained.	PI	CA, CO, LE										
	2.3 Chemical analysis equipment is installed systematically.	PI	CA, CO, LE										
	2.4 Technical basic knowledge for chemical analysis is installed systematically.	PI	CA, CO, LE										
	2.5 Environmental chemical analysis is required by Caps.	PI	CA, CO, LE										
	2.6 Environmental chemical analysis is carried out.	PI	CA, CO, LE										
	2.7 Environmental map is elaborated.	PI	CA, CO, LE										
3 Environmental chemical analysis technology is acquired by the C/Ps.	3.1 Environmental situation map in Poland is developed within 3 years.	PI	CA, CO, LE										
	3.2 Environmental Monitoring plant made up within 3 years.	PI	CA, CO, LE										
	3.3 Hydrological Structure Model is established within 4 years.	PI	CA, CO, LE										
	3.4 Environmental monitoring equipment is distillated and its software is properly managed within 5 years.	PI	CA, CO, LE										
4 Environmental Research technology is acquired by the C/Ps.	4.1 Environmental situation map in Poland is developed within 3 years.	PI	CA, CO, LE										
	4.2 Environmental Monitoring plant made up within 3 years.	PI	CA, CO, LE										
	4.3 Hydrological Structure Model is established within 4 years.	PI	CA, CO, LE										
	4.4 Environmental monitoring equipment is distillated and its software is properly managed within 5 years.	PI	CA, CO, LE										
	4.5 Environmental data control system is operated.	PI	CA, CO, LE										
5 Wastewater treatment technology is acquired by the C/Ps.	5.1 Batch examination equipment and continuous neutralization examination equipment are installed.	PI	CA, CO, LE										
	5.2 The examination of Batch and Continuous Neutralization data allow to find the optimum condition for	PI	CA, CO, LE										
	5.3 Iron oxide bacteria technology is acquired.	PI	CA, CO, LE										
	5.4 Plan for mining acid wastewater treatment is made up within 5 years.	PI	CA, CO, LE										
	5.5 Acid mining waste water treatment plan in Poland is elaborated.	PI	CA, CO, LE										

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Output	Activities	Person in charge		Schedule					Post project		Remarks	
		Bolivia side	Japanese side	1st year	2nd year	3rd year	4th year	5th year	Short term	Mid-term		Long term
6 Environment regulation guideline for mining industries in Potosi is proposed.	6.1 Japanese administration for the mining pollution prevention is understood.		PM	SE, CA								
	6.2 Outline of technology to prevent mining pollution is understood.	(1)	PM	SE, CA								
	6.3 Activity reports of CIM and CPs are submitted to the Potosi Prefecture and supervising/cooperative organizations.	(1)	PM	SE, CA								
7 Technology for mineral processing productivity is proposed.	7.1 Improvement Plan for mineral processing production in order to obtain the environmental	(1)	PM	SE, CA								
	7.2 Technological problem of concentration plants is analyzed.	(2)	PM	SE, CA								
8 Public relations and education for environmental conservation targeted Potosi people who works for mining, concentration and the people related to the mining activity are conducted.	8.1 Magazine including technical information is published more than twice a year.	(1)	PM	SE, CA								
	8.2 Seminars are carried out more than twice a year.	(1)	PM	CA, CO, SE, LE								
	8.3 Press release is made more than once a year.	(1)	PM	CA, CO, LE								

Notemoshos part is responsibility of Bolivian side.

AJPF: PM: CA:Chief Advisor CR:Coordinator LE:Long-term expert SE: Short-term expert ECA:Environmental Chemical Analysis ER:Environmental Research
 WWT:Waste Water Treatment ER-U:Environment Research unit WWT-II:Wastewater Treatment Unit MEA:Mining Environment Administration ECA-U:Environment Chemical Analysis MP:Mineral Processing

File 9

Appendix III Project Inputs

III - 1 Table of Equipments brought by experts of Japan

Modificado 06.07.12 por Mitsuru Tanabe
Name of Project: CIMM

Reference number	Name of equipment English	Model Name	Price	Date of Purchase	Expert Name	Grade of practical use	Remarks
E01	Printer	BJ-S700	¥38,000	02.08.13	Yamamoto	◎	
E02	Personal Computer	PAG 5 X14PME	¥294,400	02.08.13	Yamamoto	◎	
E03	Printer	BJ-S700	¥38,000	02.08.13	Tanabe	◎	
E04	Personal Computer	PAG 5 X14PME	¥294,400	02.08.13	Tanabe	◎	
E05	Printer	BJ-S700	¥38,000	02.08.13	Kawasaki	◎	
E06	Personal Computer	PAG 5 X14PME	¥294,400	02.08.13	Kawasaki	◎	
E07	Personal Computer	PAG 5 X14PME	¥294,400	02.08.28	Usuki	◎	
E08	GPS	GARMIN FG-535	¥120,000	02.08.13	Kawasaki	◎	
E09	Printer	BJM40	¥59,800	02.08.28	Usuki	△	
E10	Digital camera	C-3100	¥52,000	02.08.13	Tanabe	◎	During trouble
E11	Digital camera	C-3100	¥52,000	02.08.13	Yamamoto	Lost	
E12	Video camera	DCR-PC	¥166,000	02.08.28	Usuki	Lost	
E13	Video camera	PVCS	US\$639	05.11.24	Otsuka	Compensation	
E14	Oxygen Generator	IK-501	¥1,000,000	02.10.13	Usuki	◎	
E15	Copier	EP-6001	¥854,000	03.01.25	Usuki	◎	
E16	Current meter	Hiroi 274-4232	¥252,000	03.02.10	Yamada	◎	
E17	GPS	SPORTTRAK	¥39,000	03.02.10	Yamada	◎	
E18	Hammer	Listing	¥95,000	03.02.10	Yamada	◎	
E19	Personal Computer	DICO	US\$6,055	03.05.20	Miyatake	◎	
E20	Personal Computer	DICO	US\$2,814	03.05.23	Miyatake	◎	
E21	Altimeter	TX-22	¥98,000	04.01.15	Ooki	◎	
E22	Piezometer	I-50B	¥98,000	04.01.15	Arai	◎	
E23	Hydrogeologic software	VISUALmodflow pro	¥330,000	04.01.15	Nagao	◎	
E24	Current stabilizer	4000W	US\$3,914	04.04.07	Miyatake	◎	
E25	Current stabilizer	6000W	US\$5,744	04.04.07	Miyatake	◎	
E26	Current stabilizer	4000W	US\$3,914	04.04.07	Miyatake	◎	
E27	Current stabilizer	500W	US\$1,627	04.04.07	Miyatake	◎	
E28	Personal Computer	A20-SP259	US\$1,795	04.04.23	Takasuga	◎	
E29	Hyperbaric chamber	Ganow Bag	¥610,000	02.11.19	Usuki	X	
E30	pH Meter	B-212	¥26,900	04.04.15	Ooki	◎	For emergency use of air pressure

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E31	Chemical- Physical Meter	WGC- 2 4	¥378, 500	04. 04. 15	ooki	◎
E32	Digital Flowmeter	HITROI SYSTEM	¥252, 000	04. 04. 15	ooki	◎
E33	Agitater	RS-2	¥156, 500	04. 08. 15	Kosaka	◎
E34	Scanner and software	Fujitsu F1-5110	¥416, 582	04. 09. 10	Otsuka	◎
E35	Personal Computer	NORABE 1 -Dice	US\$1, 785	04. 09. 18	Otsuka	◎
E36	Scanner and software	Fujitsu F1-5110	¥59, 325	04. 10. 27	Matsuda	◎
E37	Conductimeter	Suikensa AB-7	¥72, 750	05. 01. 24	Mikami	◎
E38	pH meter	D-22S	¥75, 600	05. 04. 18	Mikami	◎
E39	Pure Water	RED240NA	¥520, 000	05. 05. 18	Mikami	◎
E40	Vacuum pump	MP-3	¥98, 000	05. 05. 30	Mizuochi	◎
E41	Windows software	Adobe(GoliveCS)	¥58, 000	05. 05. 30	Otsuka	◎
E42	Compressor	AC0901	¥52, 000	05. 06. 20	Kosaka	◎
E43	Pump	SXWA 1 --23 - VTC	¥192, 000	05. 06. 20	Kosaka	◎
E44	Flowmeter	RM1200-15--B	¥44, 000	05. 06. 20	Kosaka	◎
E45	Microscope	CX41-3200-2	¥610, 000	05. 06. 20	Kosaka	◎
E46	Digital camera	C5060WZ	¥320, 000	05. 06. 20	Kosaka	◎
E47	Incueter	SLI-700C	¥182, 000	05. 06. 20	Kosaka	◎
E48	Photo Meter	SP- 2 0G	¥385, 000	05. 07. 15	Kosaka	◎
E49	pH Meter	p HEP5	¥14, 400	05. 07. 15	Kosaka	◎
E50	Stabilizer	SVC 5 0 0 0 NM	¥110, 000	05. 07. 15	Matsushima	◎
E51	Agitater	MAZELAZ-2100	¥145, 000	05. 07. 15	Kosaka	◎
E52	Windows OS	OS-EX	¥30, 000	05. 08. 23	Arari	◎
E53	pH Meter-	IM-2 2 P	¥136, 000	05. 07. 15	Kosaka	◎
E54	Alumina Mortar	MOCW170	¥81, 000	05. 10. 05	Yasunami	◎
E55	Separator Solution and Gas	ForAA 206-17839	¥66, 150	05. 11. 11	Yamanaka	◎
E56	Multi water quality monitoring sistem	U-21XD-2m	¥352, 000	06. 09. 08	Matsuda	◎
E57	Air Pump	AC901	¥48, 300	06. 06. 23	Kosaka	◎
E58	Gas extract	GV-100S	¥19, 000	06. 06. 23	Kosaka	◎
E59	Noise Meter	SL-1370	¥39, 500	06. 06. 23	Kosaka	◎
E60	Particle Counter	L0-3B	¥268, 000	06. 06. 23	Kosaka	◎
E61	Filter Press	DP-108PT	¥580, 000	06. 06. 23	Kosaka	◎
E62	Air Flow Meter	MAX-100L/min.	¥63, 800	06. 06. 23	Kosaka	◎
E63	Compressor		¥407, 060	06. 06. 23	Kosaka	◎
E64	Parts of Ion Chromatography		¥97, 327	06. 07. 24	Miyake	◎
E65	Accessary of Atomic Absortion		¥29, 810	06. 07. 24	Miyake	◎
E66	Cell for Atomic Absortion		¥57, 200	06. 07. 24	Miyake	◎
E67	Quartz Chube for Atomic Abs.		¥80, 960	06. 07. 24	Miyake	◎
E68	Receptor of Sample for x-Ray Fluorecence		¥59, 400	06. 07. 24	Miyake	◎
E69	Parts of X-Ray Fluorecence		¥23, 100	06. 07. 24	Miyake	◎
E70	Sample Cell for X-Ray Fluorecence		¥44, 000	06. 07. 24	Miyake	◎

Grade of Practical Use
 ◎ Frequently used
 ○ Normally used
 △ Rarely used
 X Sed in necessary

Appendix III Project Inputs

III - 2 Lists of Donated Equipments

Modificado 06.07.12 por Mitsuru Tanabe

Name of Project: CIMA

No	Name of Equipment	Manufacturer	Model Name	Quantity	Price in unit of thousand yenes	Charging Unit	Grade of Practical Use	Remarks
Fiscal Year 2002 (Fiscal Year Heisei14)								
1	Four-wheel drive car	Nissan	Nissan Patrol	2	10.500	A.U	◎	
2	Water and clay sampler	Yoshino Keiryō		2	512	E.I.U	◎	
3	Water quality monitoring system	Horiba	U-21XD-2m	2	1.359	E.I.U	◎	
4	Rain graph	Ota Keiki		1	147	E.I.U	◎	
5	Equipment for continuous	Taiheiyō Kohatsu		1	13.206	R.W.T.U	◎	
6	Equipment for batch test	Horiba	U-21XD-2m	1	2.119	R.W.T.U	◎	
7	X Ray fluorescence	Shimadzu	WDX700	1	12.475	C.A.U	◎	
8	Atomic Absorption	Shimadzu	AA6800	1	12.713	C.A.U	◎	
9	UV-VIS Spectrometry	Hach	DR4000	1	1.180	C.A.U	○	
10	Analytical balance	Sartorius	LA230S	1	400	C.A.U	◎	
11	Pure Water Product	Sartorius	611UV	1	1.578	C.A.U	◎	
12	Draft Waste Treatment	Shimadzu	CBR	1	4.875	C.A.U	◎	
	Aparatur of Ionic Electrode Measure	Fissur	99-50	1	1.739	C.A.U	○	
14	Aparatur of Treatment of Wastewater	Shimadzu	DP-50N	1	5.127	C.A.U	X	
15	Balance	Sartorius	BL610	1	155	C.A.U	◎	
No	Name of Equipment	Manufacturer	Model Name	Quantity	Price in unit of thousand yenes	Charging Unit	Grade of Practical Use	Remarks
Fiscal Year 2003 (Fiscal Year Heisei15)								
1	Atomic Absorption	Shimadzu	AA6800	Set	8.100	C.A.U	◎	05.6.20 arrived
2	Gas Chromatography	Shimadzu	GC17AF	Set	6.900	C.A.U	△	05.6.20 arrived
3	Ion Chromatography	Shimadzu	IC-10A	1	11.000	C.A.U	◎	05.6.20 arrived
4	COD Meter	THERMO ORION	HC-607	1	1.000	C.A.U	△	05.6.20 arrived
5	Shaking Machine for Lixiviation	MIKISEISAKUSYO	SB-364P	1	800	C.A.U	△	05.6.20 arrived
6	Ultrasonic Cleaner	HONDA	WS-600	1	600	C.A.U	○	05.6.20 arrived
7	Oil Content	Nihon Instrument	OIL-20A	1	8.290	C.A.U	△	05.6.20 arrived
8	Centrifuge	KUBOTA	5922	1	1.309	C.A.U	X	05.6.20 arrived
9	Autoclave	ALP Co. LTD	KT-30LD	1	640	C.A.U	△	05.6.20 arrived
10	Data processing system	Hp		Set	12.097	E.I.U	◎	05.6.20 arrived
	Water Analyzer	HACH	CEL-850	1	492	C.A.U	△	05.6.20 arrived
	Water Bath	Asahi Rika kogyo	AR-148	1	650	C.A.U	○	05.6.20 arrived
13	Air Bath	Tokyo Glass	MIR-253	1	480	C.A.U	◎	05.6.20 arrived
14	Aspirator	SIBATA	9972-053WJ-20	1	76	C.A.U	○	05.6.20 arrived
15	Clean Beach	AIRTEC	KVM1304	1	672	C.A.U	○	05.6.20 arrived
16	Incubator	SANYO	SSJ-214	1	180	C.A.U	◎	05.6.20 arrived
17	Air Bath	ISUZU	5096-490-B490	1	80	C.A.U	○	05.6.20 arrived
No	Name of Equipment	Manufacturer	Model Name	Quantity	Price in unit of thousand yenes	Charging Unit	Grade of Practical Use	Remarks
Fiscal Year 2004 (Fiscal Year Heisei16)								
1	pH and ORP meter	Sartorius	PP-50	1	350	C.A.U	◎	05.6.20 arrived
2	Standard Thermometer	Nihon Keiryōki	8734~7709	8	891	C.A.U	X	05.6.20 arrived
3	Instrument of Dissolved Oxygen	IKEMOTO	50-6575E3	1	700	C.A.U	X	05.6.20 arrived
4	Instrument for Kjeldahl	IKEMOTO	50-6575E3	1	160	C.A.U	X	05.6.20 arrived

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No	Name of Equipment	Manufacturer	Model Name	Quantity	Price in unit of thousand yenes	Charging Unit	Grade of Practical Use	Remarks
Fiscal Year 2005 (Fiscal Year Heisei17)								
1	Compressor	Nitto Koki	AC0901	1	52	R. W. T. U	◎	05.6.20 arrived
2	Pump	Takumina	SXWA 1-23-VTC	1	192	R. W. T. U	◎	05.6.20 arrived
3	Flow meter	Koflic	RK1200-15-B	1	44	R. W. T. U	◎	05.6.20 arrived
4	Microscope	Olympus	CX41-3200-2	1	610	R. W. T. U	◎	05.6.20 arrived
5	Digital camera	Olympus	C5060WZ	1	320	R. W. T. U	◎	05.6.20 arrived
6	Incubator	Eyela	SLI-700C	1	182	R. W. T. U	◎	05.6.20 arrived
7	Automatic Mill	Nitto Kagaku	ANM-200DX	1	296	C. A. U	◎	05.6.20 arrived
8	V Type Mixing Machine	Irie Shokai	VK-1	1	277	C. A. U	◎	05.6.20 arrived
9	Sample Divider	Yoshida Seisakusha	1035-10	1	193	C. A. U	◎	05.6.20 arrived
10	Centrifuge	Domestic	H-40F	1	456	C. A. U	△	05.6.20 arrived
11	Color Scanner	Contex	CHAMELEON TX36F	1	1.871	E. I. U	◎	06.3.10 arrived
12	GIS Softwear	ESRI	Arcview9.1	1	792	E. I. U	△	06.3.10 arrived

No	Name of Equipment	Manufacturer	Model Name	Quantity	Price in unit of thousand yenes	Charging Unit	Grade of Practical Use	Remarks
Fiscal Year 2006 (Fiscal Year Heisei18)								
1	Software Statistica	Statsoft	STATISTICA	1	192	E. I. U	◎	06.8.31 arrived
2	Software ArcView 9.1	Fortigate	Fortigate-100A	1	934	E. I. U	◎	06.9.06 arrived
3	Windows XP	Microsoft	Windows Vista	4	277	E. I. U	◎	06.9.07 arrived
4	Automatic Dryer	DRY-CABI	TS-112B	1	54	C. A. U	◎	06.30.03 arrived
5	Desicater	Nikko	RD-300V	2	50	C. A. U	◎	06.30.03 arrived
6	Automatic Dryer	Digital	L-1	1	34	C. A. U	◎	06.30.03 arrived
7	Mecanic Agitator	ASONE	DS-CH25S	1	84	C. A. U	◎	06.30.03 arrived
8	Magnetic Stirrer	Magnetic Stirrer	IS-3C	2	61	C. A. U	◎	06.30.03 arrived
9	Magnetic Stirrer	ADVANTEC	SR311HA	3	194	C. A. U	◎	06.30.03 arrived

Grade of Practical Use

◎ Frequently used
 ○ Normally used
 △ Rarely used
 X Used in necessary

A. U =Administration Unit
 E. I. U=Environmental Investigation Uni
 R. W. T. U=Residual Water Treatment Unit
 C. A. U=Chemical Analysis Unit

APPENDIX III - 3

MANAGEMENT EXPENSES FOR CIMA'S PROJECT
2002 - 2006
 (Bs.)

FISCAL YEAR	BUDGET	EJECUTED	BALANCE	PERCENTAJE
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2002				
TGN	723.000,00	360.800,34	362.199,66	49,90
TOTAL	723.000,00	360.800,34	362.199,66	49,90

2003				
TGN	1.551.988,00	1.370.970,26	181.017,74	88,34
TOTAL	1.551.988,00	1.370.970,26	181.017,74	88,34

2004				
Esp. Resources*	496.770,00	331.978,66	164.791,34	66,83
TGN**	2.125.479,00	545.832,73	1.579.646,27	25,68
TOTAL	2.622.249,00	877.811,39	1.744.437,61	33,48

2005				
Esp. Resources	710.000,00	637.558,86	72.441,14	89,80
TGN	1.532.695,00	369.731,56	1.162.963,44	24,12
TOTAL	2.242.695,00	1.007.290,42	1.235.404,58	44,91

2006				
Esp. Resources	2.242.695,00	1.184.992,00	1.057.703,00	52,84
TOTAL	2.242.695,00	1.184.992,00	1.057.703,00	52,84

* Especifics resources

** National Budget

III- 4 Dispatch of Experts

(1) Experts of Long Term

Nro.	AREA	NAME	QUALIFICATION	UNIT	DURATION OF TIME
1	Leader of Project	Takahisa Yamamoto	Leader of Project	05/07/2002	04/07/2004
2	Current Leader of Project	Tsunekazu Ajiki	Leader of Project	21/11/2004	30/06/2007
3	Current Coordinator	Junichi Usuki	Coordinator of Project	05/07/2002	18/07/2004
4	Coordinator	Makoto Otsuka	Coordinator of Project	22/07/2004	30/06/2007
5	Current Unit of Tratamento of Residual Waters	Mitsuru Tanabe	Expert of Treatment of Waters	05/07/2002	30/06/2007
6	Environmental Investigation	Kiyoshi Kawasaki	Expert of Environmental Investigation	05/07/2002	04/07/2004
7	Environmental Current Inve	Yoichi Matsuda	Expert of Environmental Investigation	08/09/2004	31/03/2007
8	Chemical Analysis	Akira Miyatake	Expert of Chemical Analysis	23/03/2003	18/09/2004
9	Chemical Analysis	Kenji Mikami	Expert of Chemical Analysis	04/04/2005	08/11/2006

(2) Experts of Short Term

Nro.	AREA	NAME	Activity	DURATION OF TIME	
1	Chemical Analysis	Akira Miyatake	Chemical Analysis	09/10/2002	18/10/2002
2	Treatment of Waters	Hisamitsu Ooki	Prosecution of minerals	09/04/2003	08/07/2003
3	Administration and control of contamination by the mining activity	Hajime Ikeda	Preventive technology of non metallic mine	10/03/2003	25/03/2003
4	Administration and control of contamination by the mining activity	Masahide Tsuchiya	Control and prevention of the mining contamination	11/03/2003	25/03/2003
5	Environmental Investigation	Tsuyosi Yamada	Hidrogeology	12/03/2003	09/05/2003
6	Environmental Investigation	Takaaki Nagao	Study of Structural Geology and Soils	08/01/2004	07/03/2004
7	Treatment of Waters	Toshio Ebara, Yos	instalación of teams for neutralization	31/01/2004	22/02/2004
8	Environmental Investigation	Toshia Arai	Construction of Data Base System	07/02/2004	06/04/2004
9	Administration and control of contamination by the mining activity	Kunimitsu Takasug	Preventive Environmental Control	21/03/2004	31/05/2004
10	Treatment of Waters	Hisamitsu Ooki	Prosecution of minerals and economic evaluation	27/03/2004	26/07/2004
11	Environmental Investigation	Takaaki Nagao	Hidrogeological study	10/05/2004	09/07/2004

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12	Treatment of Waters	Kunio Kosaka	Technology in ferro oxididant bacteria	25/10/2004	15/12/2004
13	Chemical Analysis	Kenji Mikami	Ionic Cromatography	17/01/2005	31/01/2005
14	Environmental Investigation	Yukihiro Mizuochi	Improvement of Data of environmental Monitor	18/05/2005	29/07/2005
15	Treatment of Waters	Hisamitsu Ooki	Improvement of prosecution of minerals	21/07/2005	04/09/2005
16	Chemical Analysis	Kikuo Yasumani	Atomic Absorption	28/07/2005	26/08/2005
17	Chemical Analysis	Takeshi Yamanaka	Cromatography of Gases	10/10/2005	
18	Environmental Investigation	Toshia Arai	Improvement of data base system	12/08/2005	17/10/2005
19	Treatment of Waters	Eiji Matsushima	Design of process of the technology of oxidation bacteria	12/10/2005	13/11/2005
20	Treatment of Waters	Kunio Kosaka	Technology in ferro oxididant bacteria	12/10/2005	04/12/2005
21	Chemical Analysis	Eiji Miyake	Fluorescence of X Ray	17/07/2006	15/08/2006
22	Treatment of Waters	Kunio Kosaka	Technology in ferro oxididant bacteria	13/10/2006	22/10/2006
23	Treatment of Waters	Eiji Matsushima	Design of process of the technology of oxidation bacteria	14/09/2006	22/10/2006

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III - 5 Scholarship Training by JICA

No.	Year	Unit	Name	Place	Theme	Duracion of Training		Days
						From	To	
1	2002	UAQ	Ing. Rolando Torres R.	Japan	Environmental Remediation focused in abandoned and closed mines	08/02	04/03	25
2	2002	Director of CIMA	Ing. Noel Mercado R.	Japan	Administration and control of the mining contamination in Japan	13/11	26/11	14
3	2002	UIA	Ing. Franz Mamani Y.	Japan	Administration and control of the mining contamination in Japan	13/11	05/12	23
4	2003	UIA	Ing. Primo Choque	Japan	Study on General Environmental Problem	21/08	18/09	29
5	2003	UIA	Ing. Hernán Ríos	Japan	Study on General Environmental Problem	21/08	18/09	29
6	2003	UIA	Ing. Franz Mamani	Chile	Management of Security and Occupational health, Environment and Quality in the Competitiveness of the Mining Companies	24/11	28/11	5
7	2003	UAQ	Ing. Rolando Torres	Chile	Management of Security and Occupational health, Environment and Quality in the Competitiveness of the Mining Companies	24/11	28/11	5
8	2003	UTARAM	Ing. Fernando Llanos	Japan	Treatment of residual waters	04/11	29/11	26
9	2003	UTARAM	Ing. Jorge Venegas	Japan	Treatment of residual waters	04/11	29/11	26
10	2004	UTARAM	Ing. Fernando Llanos	Chile	Management of Security and Occupational health, Environment and Quality in the	22/11	26/11	5
11	2005	UAQ	Lic. Roxana Graz	Japan	Chemical Analysis	03/03	04/04	33
12	2005	UAQ	Lic. Hugo Arando	Japan	Chemical Analysis	03/03	04/04	33
13	2005	UTARAM	Ing. Osvaldo Yugar	Japan	Treatment of residual waters	03/03	04/04	33
14	2005	Director of CIMA	Ing. Rene Torrejón Porcel	Argentine	Exchange of Technique between the projects CIMA (Bolivia) and CIPCAM and ITA (Argentine)	21/02	24/02	4
15	2005	UIA	Ing. Primo Choque	Argentine	Exchange of Technique between the projects CIMA (Bolivia) and CIPCAM and ITA (Argentine)	21/02	24/02	4
16	2005	UAQ	Egr. Oscar Gonzalo Flores Lozano	Chile	Exchange of advanced technology between the projects CIMA(Bolivia) and FOCIGAM (Chile)	10/11	11/11	2
17	2005	UAQ	Ing. Elder Alain Banda Paredes	Chile	Exchange of advanced technology between the projects CIMA(Bolivia) and FOCIGAM (Chile)	10/02	11/12	2
18	2005	Dean (Faculty of Engineering of Mines)	Ing. Edwin Bejarano M.	Japan	Environment Administration in Japan	02/10	28/10	27
19	2006	Rector of U.A.T.F.	Lic. Juan Francisco Flores Flores	Japan	Environment Administration in Japan	16/10	10/11	26
20	2006	UTARAM	Ing. Osvaldo Yugar	Chile	Political and Environmental Management for Latin America and Caribbean and Chile	20/11	12/12	23
21	2006	Director of CIMA	Lic. Hugo Arando Z.	Chile	Political and Environmental Management for Latin America and Caribbean and Chile	20/11	12/12	23
22	2007	UIA*	Ing. Primo Choque	Argentine	Satellite image Analysis Course of ASTER JICA-SEGEMAR	02/12	02/28	17
23	2007	UAQ*	Ing. Dario Tucupa	Japón	Análisis Químico	02/12	03/06	23

* Planned

Nota

UIA

UTARAM

UAO

: Unit of Environmental Investigation

: Unit of Treatment of Residual Acidic Waters of Mines

: Unit of Chemical Analysis


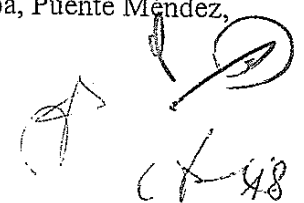




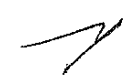

APPENDIX IV - OUTPUT PROJECT CIMA

I. Unit of Administration

1. Project CIMA 2002
Pág. 8, printed 500 books in color
2. Project CIMA 2005
Pág. 8, printed 3000 books in color
3. Project CIMA 2006
Pág. 8, printed 3000 books in color
4. Technical Information 2002 – 2005
Printed 1000 books in color
5. Technical Information 2006
Pág. 103, printed 1000 books in color
6. Activity of CIMA Bolivia – Chile 2006
Pág. 48, printed 500 books in color
7. Memories of XVII Congress Geological Bolivia 2006
Pág. 467, printed 1000 books in color simple
8. Technical Information 2007
Pág. 120, made 1000 books in color
9. Home page CIMA - Spanish y Japanese 2004 at present
3rd. Version

II. Unit of Environment Research

1. Monthly, three monthly, six monthly, yearly information from 2002 to 2006.
 2. Information of physical and chemical characteristic of Laguna Pampa, Puente Méndez, for Government Potosí and COMIBOL.
 3. Presentation of activity, project CIMA – JICA and other institutions
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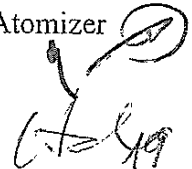
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4. Report of short term experts
 5. Monitoring plan
 6. Environment monitoring manual
 7. Activity of field hydrology environment
 8. Manual of water research
 9. Manual of introduction database system
 10. Manual of using database system
 11. Format for superficial waters monitoring
 12. Others.- Article of investigation

III. Unit of Waste Water Treatment

1. Yearly information in Spanish from 2002 to 2006
2. Report of short term expert (Ing. Ooki)
3. Report of short term expert (Ing. Kosaka)
4. Report of short term expert (Ing. Matsushima)
5. Manual of pilot plant operation
6. Check sheets of pilot plant
7. Presentation of activity, UWWT 2003 – 2004
8. Presentation of neutralization tests, UWWT
9. Report of batch tests
10. Report of continue tests
11. Presentation of UWWT in international seminar at Sucre, October 2006
12. Presentation of UWWT for final evaluatory mission

IV. Unit of Chemical Analysis

Instrument Manual

1. Atomic Absorption Spectrometer
 2. Operation Manual Atomic Absorption Spectrometer “Flame Method”
 3. Operation Manual Atomic Absorption Spectrometer “Hydride Generator Method”
 4. Operation Manual Atomic Absorption Spectrometer “Mercury Vaporizer Method”
 5. Operation Manual Atomic Absorption Spectrophotometer “High Temperature Method”
 6. Operation Manual Atomic Absorption Spectrophotometer “Graphite Furnace Atomizer Method”.
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Ion Chromatograph

- 7. Complete Operation Manual.
- 8. Easy Operation Manual
- 9. Operation Manual UV-VIS Spectrophotometer.
- 10. Easy, General Operation Manual X Rays Fluorescence
- 11. Operation Manual Gas Chromatograph

Operation Manual Water Purifier (ADVANTEC)

- 12. Operation Manual Conductimeter
- 13. Operation Manual Horizontal Shake
- 14. Easy Operation Manual Waste Water Treatment

Internal Method Standard

- 16. Internal Method Standard - Atomic Absorption Spectrophotometry
- 17. Internal Method Standard - "Spectrophotometer UV-VIS" Difenil Carbacida
- 18. Internal Method Standard - UV-VIS Ortofenantrolina
- 19. Internal Method Standard - Volumetric
- 20. Internal Method Standard - Gravimetric

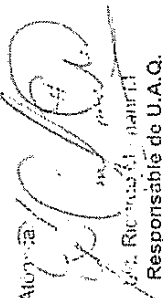
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**REQUERIMIENTO DE CAPACITACION AL PERSONAL
DE LA UNIDAD DE ANALISIS QUIMICO**

ITEM	TIPO DE MUESTRA	PARAMETROS	METODO DE ANALISIS	EQUIPOS	SITUACION ACTUAL (%)	TIEMPO NECESARIO (meses)			
I	Analisis en Minerales	Zn	Volumetrico - Instrumental	A.A.	10	8			
		Pb	Volumetrico - Instrumental	A.A.	5				
		Ag	Gravimetrico - Instrumental	A.A.	5				
		Sn	Volumetrico - Instrumental	A.A.	5				
		Sb	Volumetrico - Instrumental	A.A.	5				
		II	Suelos	N - Total	Kjeldahl		Destilador Kjeldahl	10	4
P - total	Colorimetrico			Espectrofotometro	10				
K	Porcentaje de descomposicion acida				10				
CN	Oxidacion-Ferrita				5				
III	Tratamiento de Aguas de desecho de laboratorio	Hg	Ferrita		10	4			
		EDTA			5				
		CN	Urea-fenil-iodometro	Destilador de UN	5				
		DOO	Volumetrico - Dicromato		10				
IV	Analisis de Vida Ambiental en Aguas	DBO	Winkler - azida de sodio		10	8			
		DO	Winkler - azida de sodio		10				
		DO	Medidor de Oxigeno Disuelto	Ionometro	10				
		Coliformes	Microbiologico	Autoclave	5				
		Grasas y Aceites	Extraccion		5				
		N - Total	Metodo kjeldahl	Destilador Kjeldahl	10				
		P - total	Colorimetrico	Espectrofotometro	10				
		Alcalinidad de Bicarbonato, Carbonatos	Volumetrico		10				
		Acidez total, alcalinidad	Volumetrico		10				
		TOTAL						24	

Patosi, Febrero de 2007

A.A. Absorcion Atómica

 Ricardo M. Aguilar
 Responsable de U.A.Q.


 Director CIMA

APPENDIX II