3. Minutes of Meeting (M/M)

MINUTES OF MEETING
BETWEEN THE JAPANESE PROJECT DESIGN TEAM
AND THE AUTHORITIES CONCERNED OF THE GOVERNMENT
OF THE REPUBLIC OF CHILE
ON THE JAPANESE TECHNICAL COOPERATION FOR THE PROJECT FOR STRENGTHENING INSTITUTIONAL CAPACITY OF MINING ENVIRONMENTAL MANAGEMENT

The Japanese Project Design Team (hereinafter referred to as "the Team") organized by Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Mr. Kazuo Tanigawa, visited the Republic of Chile from January 7 to January 11, 2002 for the purpose of working out the details of the technical cooperation program concerning the Project for Strengthening Institutional Capacity of Mining Environmental Management in the Republic of Chile.

During its stay in the Republic of Chile, the Team exchanged views and had a series of discussions on the Project with the authorities concerned of the Government of the Republic of Chile (hereinafter referred to as "the Chilean side").

As a result of the discussions, both sides reached common understandings concerning the matters referred to the documents attached hereto.

Santiago, January 11, 2002

Kazuo Tanigawa
Leader
Japan International Cooperation Agency
Japan

Ricardo Troncoso San Martin
National Director
National Service of Geology and Mining
(SERNAGEOMIN)
Republic of Chile

witnessed by Carol Pinto-Agüero B
for Executive Director
International Cooperation Agency (AGCI)
Republic of Chile

THE ATTACHED DOCUMENT

1. Name of the Project

Project For Strengthening Institutional Capacity of Mining Environmental Management.

2. Implementing Agency of the Project

SERNAGEOMIN should bear overall responsibility for implementation of the Project under the supervision of MM.

The Chilean Government organization chart is shown in ANNEX 1. The respective organization charts of MM and SERNAGEOMIN are shown in ANNEX 2 and ANNEX 3.

3. Administration of the Project

The undersecretary of MM, as the Project Director, will bear overall responsibility for the administration of the Project.

The director of SERNAGEOMIN, as Deputy Project Director, will assist the Project Director for the managerial and technical matters of the Project. However, the director will take overall responsibility for the Project implementation as stated in the former M/M dated August 24, 2001.

The director of the Department of Engineering and Environment Management (DIGA), as the Project Manager will be responsible for the managerial and technical matters of the Project.

The provisional organization chart of the Project is shown in ANNEX 4.

4. Duration of the Project

The duration of the technical cooperation for the Project by the Government of Japan will be five (5) years from the date agreed by both sides in the Record of Discussions (hereinafter referred to as "R/D") to be concluded between JICA and the Chilean side.

The tentative schedule of implementation (hereinafter referred to as "TSI") is shown in ANNEX 5.

5. Site of the Project

The main center of the Project will be in Santiago.
The address is as follows:

SERNAGEOMIN Laboratory at Tiltil 1993.
The location map of the site of the project is as shown in ANNEX 6.

6. Fields of Technology Transfer

(1) Data Compilation Technology for Suspended and Abandoned Mines
(2) Mine Closure Technology
(3) Mine Pollution Control Technology
(4) Mine Inspector Training

7. Project Design Matrix

Project Design Matrix is shown in ANNEX 7.

(1) As for activities No 8, there was made a comment from the Chilean side to revise the sentence as "to give technical advice on EIA in SERNAGEOMIN". The reason is that EIA is conducted based on an administrative national system under Chilean laws and regulations in all the economical sectors managed by CONAMA. SERNAGEOMIN is a member of the technical committee stated in the environmental law.

(2) The Chilean side pointed out that as for the Indicator No 8, there should be needed some clarification about the "situation of EIA". The team agreed to revise the phrase to be more explainable after the Project started in close consultation between SERNAGEOMIN and Japanese expert team.

8. Plan of Operations (PO)

The Project will be implemented along with Plan of Operations (PO) of the Project. The tentative PO is shown in ANNEX 8.

9. Methodology of the Technology Transfer

It has been formally agreed that practical exercises will be implemented at four (4) model sites, Antofagasta (the second region), Copiapo (the third region), Santiago (Metropolitan area) and Concepcion (the eighth region) because of the difference of climate, geographical features and scale of mines.

10. Measures to be taken by the Government of Japan

(1) Dispatch of Japanese Experts

(Long-term experts)

1) Chief Advisor (5 years)
2) Project Coordinator (5 years)
3) Environmental Investigator (5 years)
4) Mining Safety and Environmental Expert (5 years)
5) Chemical Analyst (2 years)

(Short-term experts)

Short-term experts will be dispatched in the related fields of technology transfer including Information Analysis in accordance with necessity.

The Chilean side requested that the Information Analyst would be dispatched for the minimum of two (2) months within the first year of the Project after the explanation and decision of items of investigation and at least twice during the Project.

The Team explained the difficulty of the recruit of the short-term expert as Information Analyst, but promised to make all possible efforts.

The request form for dispatch of Japanese experts should be submitted in Form A1 to the Government of Japan by the Chilean side at least two (2) months prior to their scheduled arrival in the Republic of Chile.

(2) Training of Chilean Counterpart Personnel in Japan

One (1) to three (3) Chilean counterpart personnel will be accepted for training

in Japan each year.

The application form for the training program in Japan should be submitted in Form A2A3 to the Government of Japan by the Chilean side at least two (2) months prior to their scheduled arrival in Japan.

(3) Provision of Machinery and Equipment

The Chilean side requested the Japanese side to provide the machinery and equipment and other materials according to priority as listed in ANNEX 9. Concerning GC-MS, it is hardly provided when the project starts, because of the budgetary constraint within the Japanese fiscal year 2002. Its possibility of provision, however, will be continually discussed during the project implementation considering its actual needs of the equipment.

The Team explained and the Chilean side agreed that the responsibility and the costs necessary for domestic transport, installation and maintenance of the machinery, equipment and etc. should be borne by the Chilean side.

The Team also explained that the Japanese Government, taking into account of its budgetary condition, would finally decide the provision of machinery and equipment.

The request form for provision of machinery and equipment should be submitted in Form A4 to the Government of Japan by the Chilean side immediately after R/D is signed.

11. Measures to be taken by the Government of the Republic of Chile

(1) Budget Allocation

Necessary amount of local costs that is indispensable for smooth implementation of the Project will be borne by the Chilean side. The local cost borne by the Chilean side is shown in ANNEX 10. The both sides confirmed that the SERNAGEOMIN would ensure the budget of the Project until year 2006.

(2) Buildings and Facilities for the Project

The buildings and facilities necessary for implementation of the Project will be prepared and the necessary renovation of the facilities for the Project will be completed by the Chilean side until June 15, 2002.

The layout of the Project Facilities is shown in ANNEX 11 and Renovation Items for Japanese Expert's Office is shown in ANNEX 12.

(3) Machinery, Equipment and Materials

The Chilean side will supply machinery, equipment, instrument, reagent and any other materials necessary for implementation of the Project other than those provided by the Government of Japan.

(4) Long-term Assignment of Counterpart

Project Director, Deputy Project Director, Project Manager, and the appropriate number of full-time technical counterpart personnel will be assigned before the start of the Project.

The tentative allocation plan of counterpart personnel proposed by the Chilean side is shown in ANNEX 13.

(5) Privileges, Exemptions and Benefits to the Japanese Experts

In accordance with the provisions of Articles V and VI of the Agreement on the Technical Cooperation between the Government of Japan and the Government of the Republic of Chile, effective as of December 2, 1978 (hereinafter referred to as "the Agreement"), the Government of the Republic of Chile will grant Chilean privileges, exemptions and benefits to the Japanese experts and their families.

(6) Sustainability of the Project

The Chilean side will take necessary measures to ensure that the self-reliant operation of the Project will be sustained during and after the period of the Japanese technical cooperation, through the full and active involvement in the Project of all related authorities, beneficiary groups and institutions so that the technologies and knowledge acquired by the Counterpart personnel through the Project should ultimately contribute to the economic and social development of the Republic of Chile.

12. Project Cycle Management

(1) Application of Project Cycle Management Method

Project planning, monitoring and evaluating method entitled Project Cycle Management (hereinafter referred to as "PCM") will be applied to the Project to monitor and evaluate the level of achievement and enhance the communication for its smooth implementation.

(2) Project Design Matrix

Project Design Matrix (hereinafter referred to as "PDM") ought to be designed at the planning stage of the Project, as a framework clarifying the multi-level chain of cause-to-effect such as input to output, output to project purpose, and project purpose to overall goal.

The both sides confirmed the following:

1. The first version of PDM will be finalized and attached to the Minutes of Discussions of the Project Design Team.
2. The Counterpart and the Japanese experts should examine the indicators in the planning stage of the Project, which is scheduled in the first year of the cooperation period, so that the indicators and/or targets for the project purpose and outputs should be as objectively verifiable as possible.
3. PDM should continue to be reviewed and revised if necessary, with further discussion between both sides.

(3) Monitoring

1. Based on PDM, regular monitoring on the achievement of the Project should be implemented primarily by the Counterpart and the Japanese experts, in order to grasp the progress and the achievement of the Project and to modify the plan if necessary.
2. Within the first six (6) months after the start of the Project, the monitoring system should be established by the Counterpart and the Japanese experts, and every six (6) months thereafter, monitoring should be done and the result should be distributed to the organizations and/or personnel connected with the Project.

13. The Joint Coordinating Committee of the Project

The joint coordinating committee will be established and held at least once a year. Its tentative functions and composition are described in ANNEX 14.

The both sides agreed that this committee will be formed by five organizations; AGCI, CONAMA, JICA, MM, and SERNAGEOMIN.

14. Joint Evaluation of the Project

Evaluation of the Project will be conducted jointly by JICA and the Chilean side, approximately in the middle and during the last six (6) months of the cooperation term, in order to examine the level of achievement of the Project.

Furthermore, both sides agreed to use the methodology of evaluation, especially, the Five (5) Basic Evaluation Components as shown in ANNEX 15.

15. Others

(1) Common language used in written document of the Project is English.
(2) List of attendance is shown in ANNEX 16.
(3) Project Document is shown in ANNEX 17.

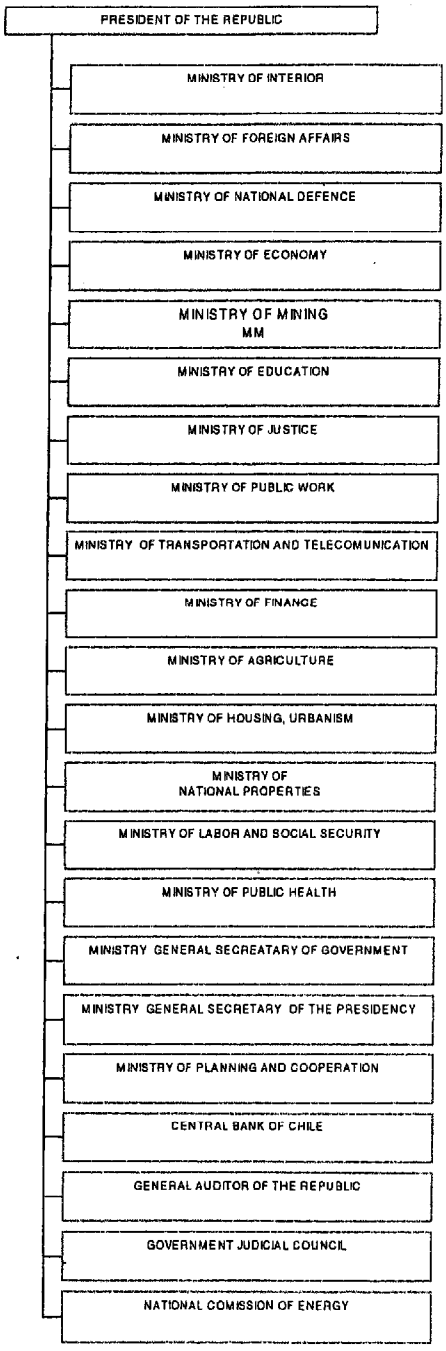
List of Abbreviations

AGCI	Chilean International Cooperation Agency (Agencia de Cooperacion Internacional de Chile)
CONAMA	National Commission for the Environment (Comision Nacional del Medio Ambiente)
DIGA	Department of Engineering and Environment Management (Departamento de Ingenieria y Gestion Ambiental)
JICA	Japan International Cooperation Agency
MM	Ministry of Mining (Ministerio de Mineria)
SERNAGEOMIN	National Service of Geology and Mining (Servicio Nacional de Geologia y Mineria)

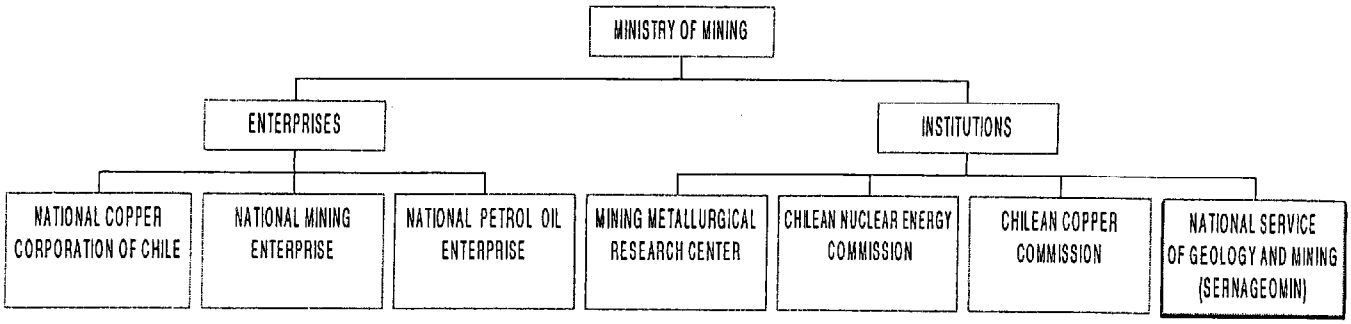
ANNEX LIST

ANNEX 1

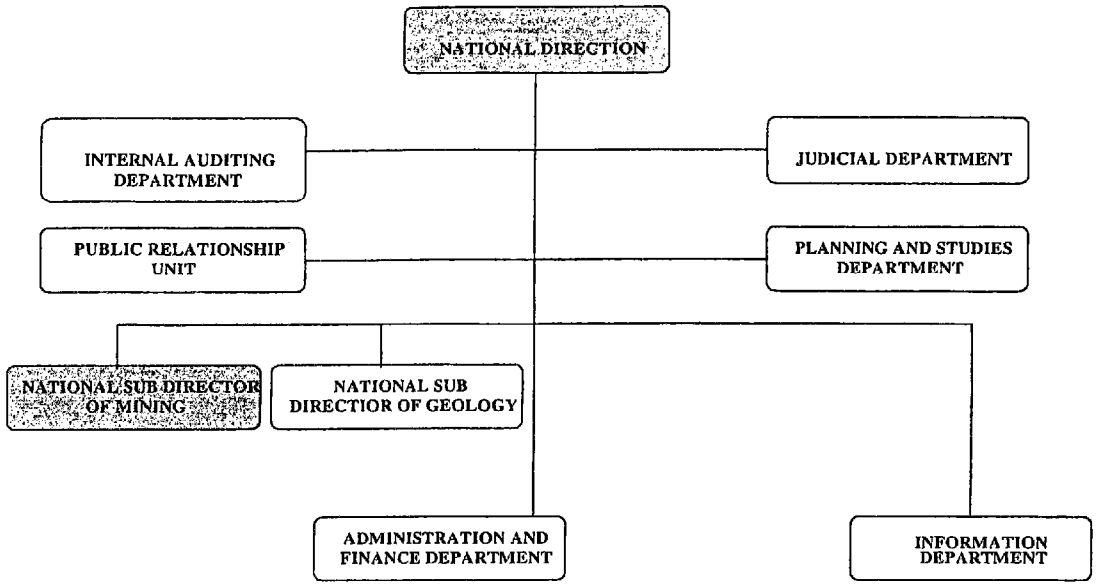
CHILEAN GOVERNMENT ORGANIZATION CHART

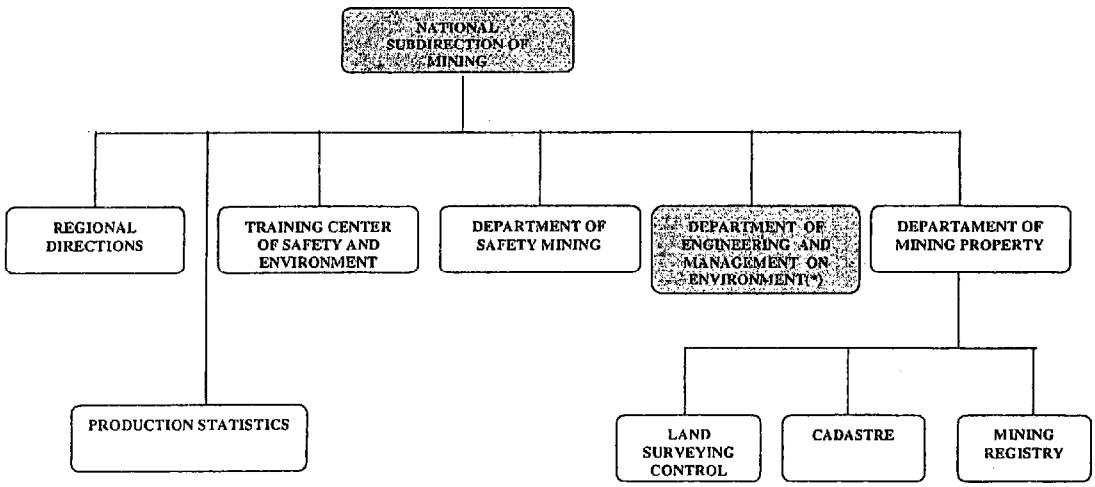


ORGANIZATION CHART OF MM



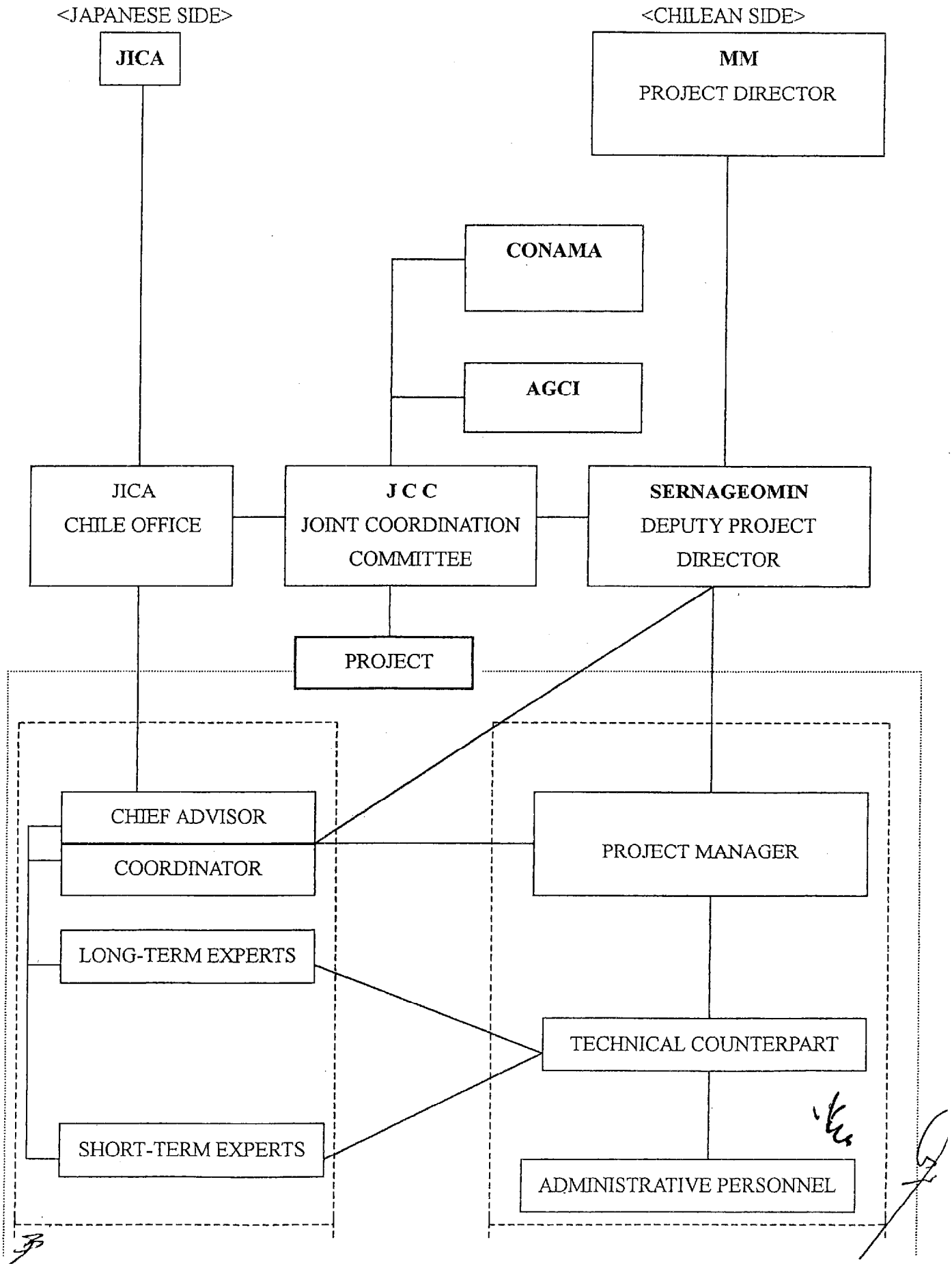
ORGANIZATION CHART OF SERNAGEOMIN ANNEX 3





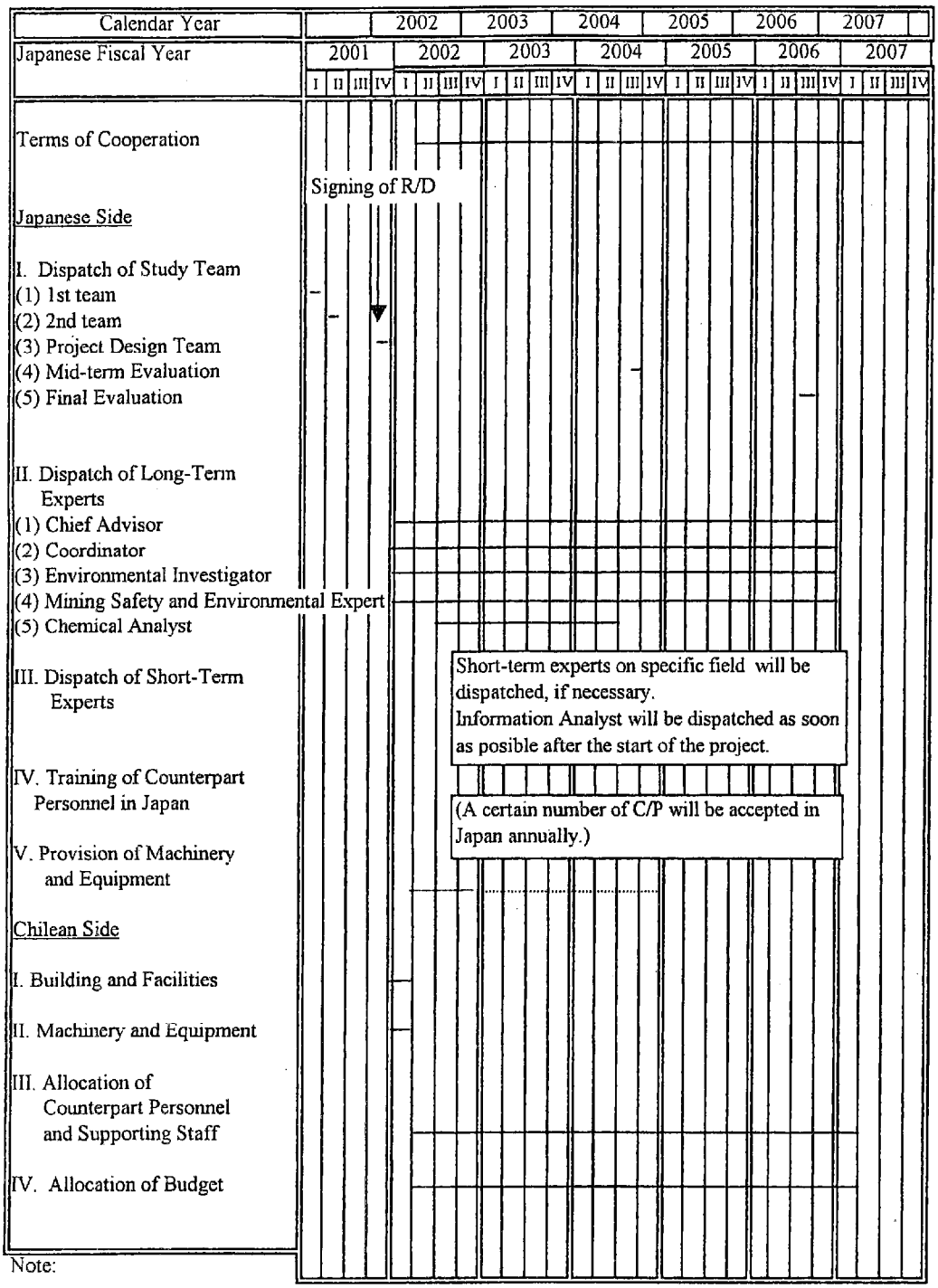
(*) From this Department will depend the Regional Environment Units

Provisional Organization Chart of the Project



ANNEX 5

Tentative Schedule of Implementation (TSI)



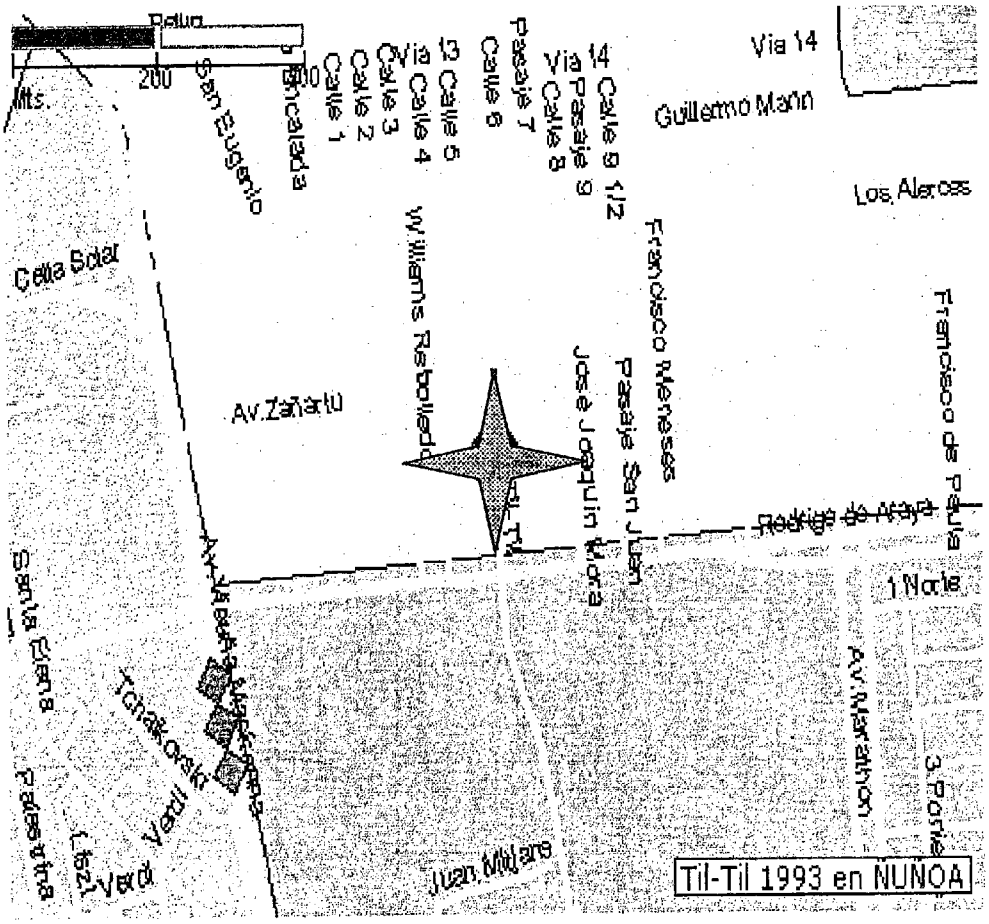
Note:

1.Japanese fiscal year starts in April and ends in March.

2.This schedule is subject to change in accordance with the progress of the Project.

ANNEX 6

TIL TIL LABORATORY



Project Design Matrix (PDM)

Project Design Matrix (PDM) for Strengthening Institutional Capacity of Mining Environmental Management in the Republic of Chile

Implementing Agency (Japanese side): JICA
Implementing Agency (Chilean side): SERNAGEOMIN
Duration : 2002～2007 (5years)
Target Group : SERNAGEOMIN
Target Area : 4 model areas(Antofagasta, Copiapo, Santiago, Concepcion)
Produced by Japanese side, approved by Chilean side
Date of Draft: January 2002

Narrative Summary	Indicator	Means of Verification	Assumption
Overall Goal The Chilean Government prevents mining pollution caused by closed and abandoned mines. SERNAGEOMIN gives technical guidance concerning the measures to closing mines. SERNAGEOMIN compiles a database on Chilean mines.	1.Situation on the measures of prevention for mining pollution. 2-1. Situation on the technical activities 2-2. Situation on the monitoring and evaluation 3. Completion of database (Environmental map)	1.Records on the measure of SERNAGEOMIN and lecture. 2.Report of guidance, monitoring and evaluation. 3. Records on the database (Environmental map)	a. The Government and Mining Industry will sustain the mining promotion policy.
Project Purpose SERNAGEOMIN adds the following two functions to its administrative duties: 1.SERNAGEOMIN grasps the situation surrounding operating, closed, and abandoned mines, including information on potential impact through compilation of a database. 2.SERNAGEOMIN has the capacity to plan for minimizing and monitoring environmental damage.	1-1.Inspectors of SERNAGEOMIN grasp the realities of operating, closed, and abandoned mines in each region. 1-2.Situation on the intensive information 2. The C/P.'s technical level is enhanced to the level that the C/P can monitor and evaluate by themselves	1-1.Report of investigation 1-2.Records of Data 2. Records of monitoring and evaluation	a. The positive policy on the Miriing problem will be carried out.
Outputs 1. Various initial inputs are completed. 2. Basic knowledge regarding prevention for Mining pollution is disseminated among inspectors in SERNAGEOMIN. 3. Necessary investigation skills for closed and abandoned mines are strengthened in SERNAGEOMIN. 4. SERNAGEOMIN has an improved database system for investigation results. 5. SERNAGEOMIN develops technical measures for closing mines. 6. SERNAGEOMIN strengthens its examination skills for mining pollution. 7. SERNAGEOMIN develops the capacity to plan pollution protection. 8. SERNAGEOMIN strengthens its capacity for assessing environmental impact. 9. SERNAGEOMIN improves its chemical analysis and its skills in maintaining the equipment. 10.SERNAGEOMIN obtains data analysis technology and results evaluation technology.	1-1. Situation of Personnel and budget allocation 1-2. State of maintenance of the equipment. 2. Progress of lecture and participation 3. Situation of lecture at model sites 4. Number of data 5. Situation of lecture at model sites 6. Situation of lecture at model sites 7. Situation of lecture at model sites 8. Situation of EIA 9-1. State of maintenance of equipment. 9-2. State of operation and usage of the equipment. 10.Guidance and Situation of analysis and evaluation on Data.	1-1. Overall personnel allocation chart・Budget plan and actual records on Budget 1-2. Records on Maintenance and Management of the equipment. 2. Records of lecture and participation 3. Records of lecture and participation at model sites 4. Chart of Data. 5. Records of lecture and participation at model sites 6. Records of lecture and participation at model sites 7. Records of lecture and participation at model sites 8. Records on EIA 9-1. Records on maintenance and management of the equipment. 9-2. Manual of the operation and maintenance of the equipment. 10. Records on analysis and evaluation on Data.	a. C/P will be allocated in each specific field appropriately b. C/P will continue to work for mining industry and accumulate experience c. MM will support the activities of SERNAGEOMIN d. The operational cost for the project will be assured appropriately

Activities	Inputs		
	The Japanese Side	The Chilean Side	
1. To allocate necessary counterparts and administrative personnel as planned. 2. To present Japanese Mining Law and Regulations concerned with prevention for mining pollution as well as examination and research methods for mining pollution. 3. To give instruction in investigative skills for each basic factor, such as tailing dams, as well as on the extent of risks in model closed and abandoned mine sites. 4. To prepare the establishment of an improved database system into which investigation results from each mine site will be registered. 5. To give instruction in technical measures to be prepared for each basic factor for future closing of the model operating mines. 6. To give instruction in examination skills for mining pollution in each basic factor for the model operating mines. 7. To give instruction in skills for making anti-pollution schedules for future mine closings as well as cost estimations for future closings of model operating mines. 8. To give technical advice on EIA in SERNAGEOMIN. 9. To give instruction in skills for chemical analysis, and to improve maintenance skills, highly accurate calibration skills, and sampling (including preparation) skills. 10. To establish data analysis and evaluation technology for chemical analysis results.	1. Expert (1) Long-term experts Chief Advisor 5years Coordinator 5years Environmental Investigator 5years Mining Safety and Environmental Expert 5years Chemical Analyst 2years (2) Short-term experts will be dispatched in accordance with necessity (Information Analyst will be dispatched as soon as possible after project started.) 2. Provision of the Equipment 3. C/P Training 1~3 per year	1 Personnel Project Director Deputy Project Director Project Manager C/P 39 persons 2 Building/ Facilities Project site Installation of the Machinery and Equipment provisioned by the Japanese side 3 Equipment and Materials Necessary Equipment and Materials without provision of the equipment by the Japanese side Maintenance 4 Local cost Operational Cost for the Project	a. C/P will continue to work for SERNAGEOMIN b. The positive participation to the project will be acquired c. Equipment will be delivered smoothly without much delay due to custom clearance and transportation
			Pre-condition a. Cooperation between SERNAGEOMIN and regional offices will be maintained appropriately b. Building, facilities and equipment can be used c. Related data and information of SERNAGEOMIN will be available

PLAN OF OPERATIONS FOR STRENGTHENING INSTITUTIONAL CAPACITY OF MINING ENVIRONMENTAL MANAGEMENT IN REPUBLIC OF CHILE

Objective	Outputs	Activities	Personnel in Charge		Year of the Project				
			C/P	Japanese Expert	1st year	2nd year	3rd year	4th year	5th year
1. SERNAGEOMIN grasps the situation surrounding operating, closed and abandoned mines, including information on potential impact through compilation of a database. 2.The SERNAGEOMIN has the capacity to plan for minimizing and monitoring environmental damage.	1.Various initial inputs are completed.	Allocation of necessary components.	All Personnels	All Personnel					
	2.Basic knowledge regarding prevention for mining pollution is generalized to inspectors in the SERNAGEOMIN.								
		1 Showing Japanese Mining Law and its Regulations		M.S.E. Expert					
		2 Showing examining and researching methods for pollution.		M.S.E. Expert/E.Investigator					
	3.Necessary investigation skills for closed and abandoned mines are strengthened in the SERNAGEOMIN.								
		1 Tailings Dams (instruction of investigation skills and risk analysis)		Environmental Investigator					
		2 Mining waste (instruction of investigation skills and risk analysis)		Environmental Investigator					
		3 Open Pits (instruction of investigation skills and risk analysis)		Environmental Investigator					
		4 Underground mines including their entrances (instruction of investigation skills & risk analysis)		Environmental Investigator					
		5 Dust (instruction of investigation skills and risk analysis)		Environmental Investigator					
		6 Wastewater from underground mines(instruction of investigation skills and risk analysis)		Environmental Investigator					
		7 Final check of technical transfer (instruction of investigation skills and risk analysis)		Environmental Investigator					
	4. The SERNAGEOMIN has an improved database system for the investigation result.								
		1 Design and improvement of data format		Information Analyst(Short)					
		2 Adjusting and regulating the software		Information Analyst(Short)					
	5.The SERNAGEOMIN has technical measures for mine closing.								
		1 Control of tailings dams		E.Investigator/M.S.E.Expert					
		2 Protection from mining waste		E.Investigator/M.S.E.Expert					
		3 Reclamation of open pits		E.Investigator/M.S.E.Expert					
		4 Plugging entrances of tunnels		E.Investigator/M.S.E.Expert					
		5 Protection from blown dust		E.Investigator/M.S.E.Expert					
		6 Treatment of wastewater		E.Investigator/M.S.E.Expert					
		7 Final check of technical transfer		E.Investigator/M.S.E.Expert					
	6.The SERNAGEOMIN strengthens its examining skills for mining pollution								
		1 Tailings dams (instruction of examining skills)		M.S.E. Expert					
		2 Mining waste (instruction of examining skills)		M.S.E.Expert					
		3 Dust (instruction of examining skills)		M.S.E.Expert					
		4 Wastewater from underground mines (instruction of examining skills)		M.S.E.Expert					
		5 Final check of technical transfer (instruction of examining skills)		M.S.E.Expert					
	7.The SERNAGEOMIN has a capacity for planning pollution protection.								
		1 Making an anti-pollution schedule for future mine closing.		E.Investigator/M.S.E.Expert					
		2 Cost estimation of works for mine closing.		E.Investigator/M.S.E.Expert					
	8.The SERNAGEOMIN strengthens its capacity for assessing an environmental impact.								
		1 Giving technical advice on EIA in SERNAGEOMIN.		E.Investigator/M.S.E.Expert					
	9.The SERNAGEOMIN strengthens its chemical analysis and maintenance skills of the equipment.								
		1 Instructing basis of chemical analysis.		Chemical Analyst					
		2 Fixing chemical analysis equipments and instructing its maintenance.		Chemical Analyst					
		3 Instructing calibration skills with high accuracy.		Chemical Analyst					
		4 Instructing sampling skills including preparation of sampling.		Chemical Analyst					
	10.The SERNAGEOMIN has a data analysis technology and result evaluation technology.								
		1 Instructing data analysis for chemical analisis result.		E.Investigator/C.Analyst					
		2 Instructing evaluation skills for chemical analysis result.		E.Investigator/C.Analyst					

N.B. E.Investigator: Environmental Investigator M.S.E. Expert:Mining Safety and Environmental Expert C.Analyst:Chemical Analyst

ANNEX 8

チリ鉱害防止指導体制強化プロジェクト

BASIC INFORMATION （基礎情報）						PROCURED IN CHILE
No.	EQUIPMENT (ENGLISH)	EQUIPMENT (JAPANESE) 機材名（日本語）	MANUFACTURER (REFERENCE) メーカー名	MODEL 型式/品番	MAIN SPECIFICATION/ REMARK 仕様	Q'TY 数量
	<A. SITE EQUIPMENT>					
1	GPS Unit	GPSユニット	Magellan	GPS-330	Handy Type Accuracy : 3－5m	4
2	Distance Meter	距離計	Bushnell		Optical Type	4
3	Gas Detector	ガス検知器			Parameter : O2、CO2 and etc.	4
4	Digital Video Camera	デジタルビデオカメラ	SONY		Video Format : Mini DV Color System : NTSC	4
5	All Terrain Track	機材運搬車	TOYOTA or NISSAN	－	4WD Double Cabin Pickup Type	2
6	Mobile Computer	モバイルコンピューター				4
7	Altimeter	高度計	THOMMEN			4
8	Measuring Tape	測距テープ				4
9	Compass	方位計				4
10	O2 Mask	酸素マスク				4
11	Radio Transmitter	通信機セット	Kenwood			4
12	Rescue Set	救急セット				4
13	Multi Monitoring System	マルチパラメーター水質分析器			Parameter : pH、 Conductivity、Temp.、DO	4
14	Colorimetric Analysis Spectrophotometer	比色分析分光光度計セット	HACH	DR／890	Number of Test Parameter : 90	4
15	Hand Auger	採土器（ハンドオーガー）				4
16	EKMANE Dredge	エクマン式採泥器				1
17	Air/Dust Sampler	エアー／ダストサンプラー				2
18	Bailer (Manual Type)	採水器（手動式）				2
19	Weather Station	屋外気象観測装置（ウェザーステーション）				1
20	Well Level Detector	井戸水位計測器				2
	<B. COMPUTER SYSTEM>					
1	Server	サーバー	IBM	IBM RS/6000	OS : AIX 5 HDD : 36.4GB Stowage Unit : Installed	1
2	Client Computer	クライアントコンピューター	COMPAQ	ARMADA E500	Notebook Type OS : Windows NT	8
3	Software	ソフトウェア	Microsoft	MS Visual Basic		8
4	Software	ソフトウェア	Microsoft	MS Office 2000		8
5	Software	ソフトウェア	ESRI	ESRI ARC View	8 Licenses	1
6	Software	ソフトウェア	ESRI	ESRI ARC Info	2 Licenses	1
7	Software	ソフトウェア	ORACLE	Oracle 9	License pack only	1
8	Software	ソフトウェア	Macromedia	Macromedia Fireworks		1
9	UPS	UPS	APC	Smart-UPS2200		2
10	Backup Apparatus	バックアップ装置	IOMEGA	ZIP 100MB		2
11	Training Cost for each soft ware (No. 1. 6. 7. 8)	トレーニング費用	－	－		1
	<C. LABORATORY EQUIPMENT AND INSTRUMENTS>					
1	ICP-MS	ICP-MS	Thermo Elemental, Varian or PerkinElmer		Mass Spectrometer : Quadrupole Type	1
2	Mercury Analyzer	水銀測定装置	LECO or Milestone			1
3	Water Purifier System	純水製造装置	Millipore		Water Distillation & Pure Water Production System with Softener	1
4	Total Organic Carbon Analyzer	全有機体炭素計	Shimadzu	TOC-5000A	Sample : Soil and Liquid	1
5	Atomic Absorption Spectrophotometer	原子吸光分光光度計	PerkinElmer	Aanalyst 700		1
6	Water Sample Refrigerator	保冷庫			Capacity : 500L	1
7	High Speed Centrif	高速遠心分離機			Max. speed : 13300rpm Capacity : 1－100mL	1
8	Oven	乾燥器			Max. Temp. : 280℃ Capacity : 80L	1
9	Muffle Furnace	マッフル炉			Max. Temp. : 1000℃ Capacity : 30－50L	1
10	Mantle Heater	マントルヒーター			Capacity : 1000mL	6
11	Rotary Evaporator	ロータリーエバポレーター			Temperature : 30－110℃ Capacity : 500－1000mL	1
12	Shaker	恒温振盪機			Temp. : 38－220℃	1
13	VORTEX Shaker	卓上振盪機	Thermolyne	VORTEX	Touch type	2

BASIC INFORMATION （基礎情報）						PROCURED IN CHILE
No.	EQUIPMENT (ENGLISH)	EQUIPMENT (JAPANESE) 機材名（日本語）	MANUFACTURER (REFERENCE) ﾒｰｶｰ名	MODEL 型式/品番	MAIN SPECIFICATION/ REMARK 仕様	Q'TY 数量
14	Magnetic Stiller	電磁撹拌機			4 Position Type	1
15	Ultrasonic Washer	超音波洗浄器			Capacity : 1L	1
16	Homogenizer	撹拌器			Sample Volume : 5～100mL	1
17	Electric Balance	電子天秤	Mettler Toledo		Readability : Less than 10μg	1
18	Electric Balance	電子天秤	Mettler Toledo		Capacity : 0.01g～1kg	1
19	Vacuum Pump	真空ﾎﾟﾝﾌﾟ			For Filtration of Water	1
20	Micro Pipette	ﾏｲｸﾛﾋﾟﾍﾟｯﾄ	Eppendolf		Capacity : 10～100μL	3
21	Micro Pipette	ﾏｲｸﾛﾋﾟﾍﾟｯﾄ	Eppendolf		Capacity : 100～1000μL	3
22	Diaphragm Pump	ﾀﾞｲｱﾌﾗﾑﾎﾟﾝﾌﾟ				1
23	Digital Velocity M	ﾃﾞｼﾞﾀﾙ流速計				1
24	Program Timer	ﾌﾟﾛｸﾞﾗﾑﾀｲﾏｰ				3
25	Kjeldahl distilling Apparatus	ｹﾙﾀﾞｰﾙ式蒸留器				2
26	Glassware Washer	ｶﾞﾗｽ器具洗浄機	Labconco		With Dryer	1
27	Burette	ﾋﾞｭｰﾚｯﾄ			Capacity : 10mL	6
28	Burette	ﾋﾞｭｰﾚｯﾄ			Capacity : 30mL	3
29	Burette	ﾋﾞｭｰﾚｯﾄ			Capacity : 5mL	3
30	Cart for Laborator	実験室用ｶｰﾄ				2
31	Multi Tester	ﾃｽﾀｰ			Parameter : V(DC／AC) 、A (DC／AC) 、Ω、etc.	1
32	Crusible	白金るつぼ（ふた付）			Capacity : 10mL	1
33	Reagent Shelf	試薬棚			For Reagent	1
34	Hot Plate	ﾎｯﾄﾌﾟﾚｰﾄ				2
35	Blance Table	天秤台	Shimadzu			1
36	Heavy Metal Eliminator	重金属廃液処理装置				1
37	Adapter	アダプター				2
	<D. CROP MANAGEMENT EQUIPMENT>					
1	Video Projector	ﾋﾞﾃﾞｵﾌﾟﾛｼﾞｪｸﾀｰ（携帯用）	EPSON			2
2	Screen	ｽｸﾘｰﾝ				2

	GC-MS	GC-MS	Varian or Agelent Technology			1

Concerning GC-MS, it is hardly provided when the project starts, because of budgetary constraint within the Japanese fiscal year 2002. Its possibility of provision will be discussed during the project implementation considering its actual needs of the equipment as well as budget availability.

The SERNAGEOMIN pointed out that training was included with item 1.6.7.8 as stated in the former M/M dated August 24, 2001. Then the team agreed to modify the expression as "item 1.6.7.8 with training"

ANNEX 10

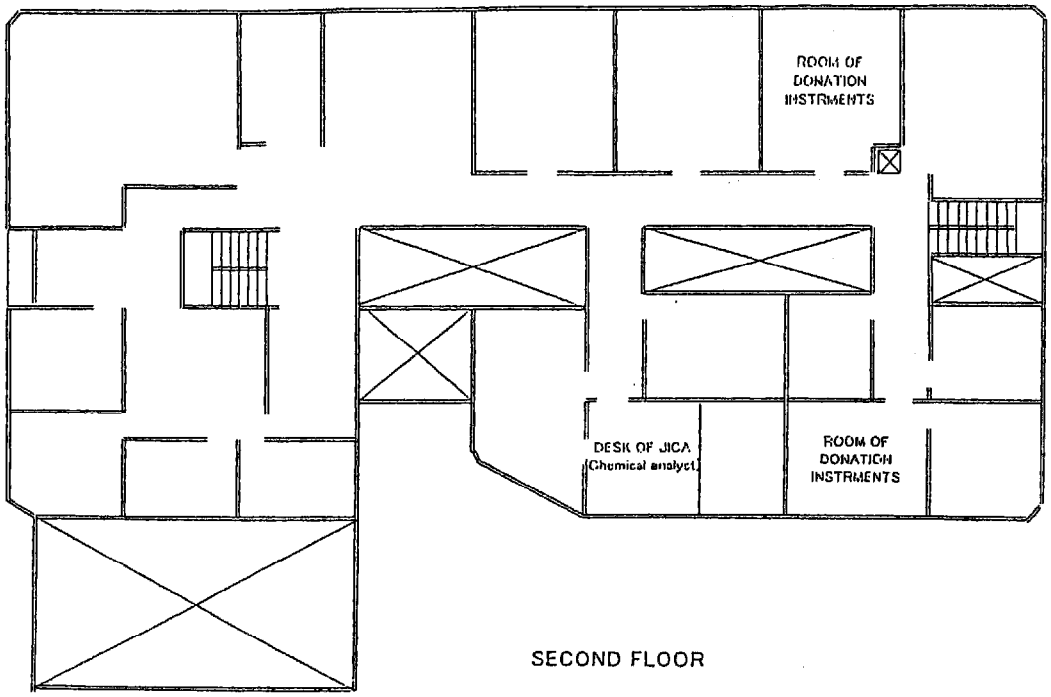
Local Cost borne by the Chilean side

ESTIMATED LOCAL COST
M$ (Thousand pesos)

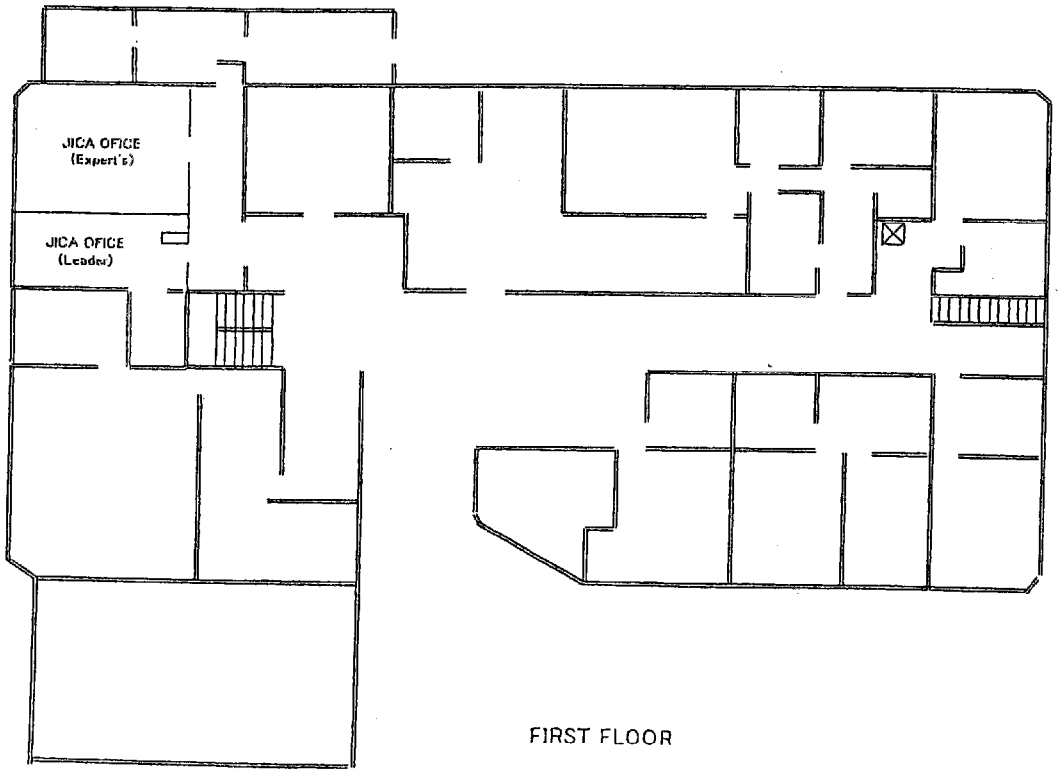
YEAR	2000	2001	2002	2003	2004	2005	2006	TOTAL
PERSONNEL EXPENSES								
PERSONNEL INCOME	25.250	75.720	75.720	75.720	75.720	75.720	75.720	479.570
WAGES FOR HONORARY STAFF	74.944	66.741	74.944	74.944	74.944	UNKNOWN	UNKNOWN	366.517
TRAVEL EXPENSES	6.061	8.000	9.000	10.000	8.000	5.000	5.000	51.061
SUB- TOTAL	106.255	150.461	159.664	160.664	158.664	80.720	80.720	897.148
OPERATION EXPENSES								
TRAVEL TICKETS, FUEL, OIL AND LUBRICANTS	3.000	3.500	5.000	5.500	6.300	3.500	3.500	30.300
CURRENT MATERIALS	1.134	1.500	2.034	1.734	1.735	700	700	9.537
MAINTENANCE AND REPAIR	0	700	1.000	1.000	1.000	500	500	4.700
SUB-TOTAL	4.134	5.700	8.034	8.234	9.035	4.700	4.700	44,537
MINOR FACILITIES	2.000							2.000
SUB-TOTAL	2.000	0	0	0	0	0	0	2.000
TOTAL	112.389	156.161	167.698	168.898	167.699	85.420	85.420	943.685

Note:

The budget required for the personnel and operational costs of years 2005 and 2006 will be allocated.



SECOND FLOOR



FIRST FLOOR

RENOVATION ITEMS
FOR JAPANESE EXPERT'S OFFICE

1. ITEMS TO BE PURCHASED BY JICA

Telephonic Plant
- Upgrading Telephonic Plant Card
- Telephone Set

Furniture and others
- Desks
- Chairs
- Gas stove (1 unit)
- Air Conditioning Equipment (1 unit)

2. ITEMS TO BE COVERED BY SERNAGEOMIN

Bathroom repairs

Electric installation and computation
- Distribution Hub
- Miscellaneus (electric installation, lights, Computation, etc.)

Several renovations
- Change of glasses and others
- Carpeting
- Painting
- Manpower cost
- Aluminum door and mark

ANNEX 13

Allocation Plan of Chilean Counterpart Personnel

REGION	PERSONNEL	CATEGORY	PROFFESION	PART. %
I Region	Luis Guerra Godoy - DR	Plant	Civil Engineer	10
	Alberto Bernal Rojas	Contract	Operation Engineer	10
	Eduardo Vega Donoso	Contract	Operation Engineer	20
II Region	Eugenio Lisboa Carvajal - DR	Plant	Civil Engineer	10
	Rolando Duarte Verdugo	Contract	Civil Engineer	10
	René Palma Tapia	Contract	Operation Engineer	10
	Luis Gaete Alvarado	Contract	Operation Engineer	20
III Region	Anton Hraste Carrasco - DR	Plant	Civil Engineer	10
	Jorge Guerra Jefe del Centro Capacitación	Plant	Civil Engineer	40
	Carlos Flores Licuimi	Plant	Civil Engineer	10
	Patricia Veragua Bordoli	Plant	Operation Engineer	10
	Claudio Aguirre Vergara	Contract	Operation Engineer	10
	Giglia Robledo Magnata	Contract	Civil Engineer	40
	Elizabeth Cortés Casanova	Contract	Operation Engineer	40
	Guido Montuschi	Contract	Chemical Laboratorist	40
	Nibaldo González	Plant	Operation Engineer	30
IV Region	Gabriel González Pinto - DR	Plant	Operation Engineer	10
	Oscar Toyo Díaz	Contract	Operation Engineer	10
	Juan Contreras Jiménez	Plant	Operation Engineer	10
	Vinka Rakela Aranza	Contract	Civil Engineer	20
V Region	Pedro Almonacid Colin - DR	Plant	Civil Engineer	10
	Gabriel Barraza	Plant	Civil Engineer	10
	Melquiceder González Barra	Contract	Civil Engineer	10
	Carlos Arias Moreno	Plant	Civil Engineer	20
VIII Region	Patricio Leiva - DR	Plant	Operation Engineer	10
	Héctor Contreras Naranjo	Plant	Operation Engineer	10
	Hugo Constanzo Hermosilla	Contract	Operation Engineer	20
Metropolitan Region	Exequiel Yanes Chief Department	Plant	Civil Engineer	10
	Osvaldo Vicencio	Contract	Civil Engineer	10
	Krugger Montalbán Jefe Depto. DIGA	Plant	Civil Engineer	40
	Cecilia Adasme A.	Contract	Operation Engineer	20
	Nelson Ramírez M	Honor	Civil Engineer	20
	Luis Villena S.	Honor	Geologist	20
	René Rojas SM.	Contract	Civil Engineer	80
	Paula Cornejo	Plant	Geologist	10
	Felipe Llona R.	Contract	Mr. Physic	20
	Aida Acevedo L.	Plant	Chemical Dr.	20
	Luis Lara	Plant	Civil Engineer	20
	Gonzalo Palet	Contract	Math. and Com. Lic.	40

DR : *Regional Directors*
DIGA : *Engineering and Environment Management Department*

Annex 14

Joint Coordinating Committee

1. Functions
    1. To set the Annual Plan of Operations (APO) of the Project in line with the Tentative Schedule of Implementation (TSI) formulated under the framework of the Record of Discussions.
    2. To coordinate necessary actions to be taken by both sides.
    3. To review the overall progress of the TSI as well as the achievement of APO.
    4. To exchange views on major issues arising from or in connection with the Project.

2. Compositions
    1. Chairperson (Project Director)
       Undersecretary of MM

    2. Members

(The Chilean side)
    1) Representatives from MM
    2) Representatives from AGCI
    3) Representatives from CONAMA
    4) Director of SERNAGEOMIN (Deputy Project Director)
    5) Project Manager
    6) Project Members nominated by SERNAGEOMIN
    7) Other Personnel nominated by the Chairperson

(The Japanese side)
    1) Chief Advisor
    2) Coordinator
    3) Experts nominated by the Chief Advisor
    4) Representatives from JICA Chile Office
    5) Personnel concerned with the project to be dispatched by JICA

    3. Observers
    1) Officials of the Japanese Embassy in the Republic of Chile
    2) Other personnel accepted by JICA

3. Opening of the Committee Meeting

The Joint Coordinating Committee will be held at least twice a year in the first year, and once a year thereafter and whenever a necessity arises.

Annex 15

Five (5) Basic Evaluation Components

1. The Five Basic Components

The five basic components defined by JICA as mentioned below are in line with those used for evaluation work by DAC (Development Assistance Committee, OECD) and other international assistance organizations. Introduction of these components has enabled a consistent, well-balanced evaluation, which minimizes evaluator biases. Further, it allows us to share results, knowledge and lessons with other aid organizations, since we are using common components and discussing issues with them from the same viewpoints.

(1) Efficiency

Evaluate the method, producers, term, and cost of the project with a view to productivity.

(2) Effectiveness

Evaluate the result in comparison with the goals (or revised goals) defined at the initial or intermediate stage, and evaluate the attributes (factors and conditions) of the result.

(3) Impact

Evaluate the positive and negative effects of the project, extent of the effect and beneficiaries.

(4) Relevance

Perform a preliminary evaluation as to whether the needs in the country have been correctly identified, and whether the design is consistent with the national and/or master plan.

(5) Sustainability

Evaluate the autonomy and sustainability of the project after the termination of cooperation, from the perspectives of preparation, management, economy, finance and technology.

2. Relation between the Five Basic Components and the PDM

The five components are used for the evaluation and the selection of a project. These components are directly connected to the elements of the PDM as shown in the following Page.

(1) Efficiency

The component "efficiency" is a measure to qualitatively and quantitatively compares all resources (input) to the results (output) of the project in order to evaluate the economic efficiency of conversion from input to output.

(2) Effectiveness

The component " effectiveness" is a measure to evaluate whether the project purpose has been achieved or not, to evaluate how much the output contributed to the achievement of the project purpose, or to evaluate whether or not the characteristics of the output were as expected.

(3) Impact

The component "impact " refers to evaluation of foreseeable or unforeseeable as well as favorable or adverse effects that a project has on society. To evaluate impact, both the overall goal and the project purpose should be refereed to in the beginning of the evaluation. Evaluation with this component can lead to confirmation as to whether or not the overall goal has been obtained. Evaluation with this component requires comprehensive survey in many cases.

(4) Relevance

The components "relevance" is comprehensive evaluation of whether or not the project meets the overall goal, the politics of both the donor and recipient, local needs and given priority levels. This is used to decide whether the project should be continued, reformulated or terminated.

(5) Sustainability

The component "sustainability" is comprehensive evaluation of how long the favorable effects of the project can continue after the project has been terminated. Evaluation with this component is required for decisions on how long local resources should continue to be used for the project, and to evaluate the importance the country receiving the assistance attaches to the project. According to the OECD (1989), "sustainability" is a component to be used as the final test of the success of a development project.

All five components are essential for all projects or programs. The five components give necessary information to the decision-maker so that he/she can decide how to approach the next step. Since each of the five components build on the intervention strategy, they also lay the foundation for standardization in monitoring and information handling within and among organizations and agencies.

In practice, each of the five components should also contain project-specific information.

ANNEX 16

List of Attendance

1. Japanese Side

(Members of the Team)

Kazuo Tanigawa	Leader
Takashi Yamashita	Mining Safety and Environmental Expert
Susumu Nagae	Environmental Investigator
Etsuko Ide	Cooperation Planning

(JICA Expert)

Shozo Sawaya	

(JICA Chile Office)

Tetsuhiro Ueno	Assistant Resident Representative
Tazuko Ichinohe	Staff

2. Chilean Side

(AGCI)

Carol Pinto-Aguero B	for Executive Director
Ivan Mertens Galle	Technological Transfer and Environmental Coordinator

(MM)

Jacqueline Saintard Vera	Undersecretary of Mining
Maria de la Luz Vasquez M	Chief, Environmental Unit
Guillermo Toro Avendano	Environmental Unit Project Coordinator

(SERNAGEOMIN)

Ricardo Troncoso SM.	National Director
Luis Sougarret S.	National Sub director of Mining
Jose Bruna U.	Chief, Planning Department
Miguel Rodriguez T.	Engineer, Planning Department
Krugger Montalban A.	Chief, DIGA
Rene Rojas SM.	Engineer, DIGA
Luis Lara Plaza	Chief, Information Department
Paula Cornejo P.	Chief, Tiltil Laboratory
Felipe Llona R.	Chief, Chemical Laboratory

ANNEX 17

The Project for Strengthening Institutional Capacity of Mining Environmental Management

PROJECT DOCUMENT

January 2002

JAPAN INTERNATIONAL COOPERATION AGENCY

The Project for Strengthening Institutional Capacity of Mining Environmental Management

Table of Contents

Abbreviations

MM	:	Ministry of Mining (CHILE)
NAFTA	:	North American Free Trade Agreement
APEC	:	Asia and Pacific Economic Conference
GDP	:	Gross Domestic Product
FOB	:	Free on Board
CODELCO	:	Chilean National Corporation of Copper (Corporacion Nacional del Cobre de Chile)
ENAMI	:	National Mining Enterprise (CHILE) (Empresa Nacional de Mineria)
ENAP	:	National Petroleum Enterprise (CHILE) (Empresa Nacional del Petroleo)
SERNAGEOMIN	:	National Service for Geology and Mining (CHILE) (Servicio Nacional de Geologia y Mineria)
COCHILCO	:	Chilean Commission of Copper (Comision Chileana del Cobre)
CCHEN	:	Chilean Commission of Nuclear Energy (Comision Chileana de Energia Nuclear)
CONAMA	:	National Commission for Environment (CHILE) (Comision Nacional del Medio Ambiente)

SONAMI	:	National Society for Mining (CHILE) (Sociedad Nacional de Mineria)
JICA	:	Japan International Cooperation Agency
GIS	:	Geographic Information System
TNTMIPS	:	a software for GIS
ARCINFO	:	a software for GIS
MAPINFO	:	a soft ware for GIS
METI	:	Ministry of Economy, Trade and Industry
GPS	:	Global Positioning System
DIGA	:	Department of Engineering and Environment Management (Departamento de Ingenieria y Gestion Ambiental)
COREMA	:	Regional Commission for Environment (CHILE) (Comision Regional del Medio Ambiente)
AGCI	:	Agency for International Cooperation (CHILE) (Agencia de Cooperacion Internacional)
PDM	:	Project Design Matrix
PO	:	Plan of Operation
MMAJ	:	Metal Mining Agency of Japan
JMEC	:	Japan Mining Engineering Center for International Cooperation

note : Abbreviations are in the order of appearance in the document

1. Introduction

The Republic of Chile is the largest copper producer in the world and the biggest supplier of copper and molybdenum to Japan. Chile has increased steadily its metal copper production up to 4.38 million tons in the last 10 years. Both countries have a mutually close relation.

There are many closed and abandoned mines in Chile. However the present Mine Safety Law has no regulations concerning the responsibility to restore closed and abandoned mines. These mines have been left unreclaimed and their actual conditions are not understood. The possibility of environmental impacts is a concern. The draft bill of a "Mines Closure Law" was presented in January 2001 to the Ministry of Mining (MM) to be enacted around 2004. The mine-closing problems will begin to be solved considering the environment.

Under these circumstances, improvement of technology for the National Service for Geology and Mining (SERNAGEOMIN) is urgently needed. The Chilean government requested the Japanese government a project-type technical cooperation "Institutional Strengthening in Mining Environment" in October 2000.

2. Background Information

1) Socioeconomic Condition

a) General Information

The Republic of Chile is located on the western coast of the South American continent. Mountains occupy 80% of its long and narrow territory —4,330 km from north to south including the Antarctic territory and 175 km on an average from east to west— lying between the Andes on the east and Southern Pacific Ocean on the west. The northern part of the country is a subtropical and desert area producing copper and nitrate, the central part is a warm and mild agricultural area and the southern part is a cool forest with lakes and marshes. The capital of the country is Santiago. (See the front page of the report.)

The estimated population in 1999 is 15.02 million with 75% Spanish origin, 20% other European origin and 5% native people. The continental area of Chile is 756,626 km^2, which is about double the area of Japan. The official language is Spanish. The form of government is a constitutional republic system. The leader of the country is President Ricardo Lagos who has a 6-year term. The national assembly is a bicameral system with 48 senators and 120 representatives. The military government lost a national vote of confidence in 1988 and a civilian government replaced it in 1990. Democratization has advanced steadily.

Its basic policy is a multilateral economic diplomacy. Chile started the formal negotiation of NAFTA in 1994, concluded the MERCOSUR free trade agreement in 1996 and participated formally in APEC in 1994. Chile resolved its border disputes with Argentina and Peru in 1999, and now enjoys an intimate relationship with them.

President Lagos admires Asia, especially Japan.

b) Economic Information

Chile was not classified as a poor country at the beginning of the 20th century by benefit of its mineral resources. Chile had a strong influence in world business but always suffered from economic instability. Before the military government, all past governments adopted a national industrial policy in order to diversify its mining dominated economy, but all their efforts were in vain.

The Pinochet Government (1973 ~ 1990) began promoting privatization of national companies, changed to a policy of private sector initiated market economy development and emphasized especially agricultural development. As a result of his efforts, the mining sector has decreased in recent years and Chile has succeeded in industrial diversification. But the Chilean constitution did not disappear completely meaning that the domestic economy has been influenced by international business. The importance of the mining sector in the Chilean economy is still great. For example, the mining sector represents about 40% of total exports.

Chilean average economic growth was about 4% in 1960 to 1970, decreased to –2% in 1970 to 1975 by sudden nationalization and oil crisis, expanded up to 8% by privatization and booming world business in 1976 to 1981, dropped to –14.1% and –0.7% by debt crisis initiated in Mexico in 1982 and 1983, improved up to 6.9% by market- initiated and free economic policy in 1983 to 1998, slow downed to –1.1% by the Asian economic crisis, and estimated to recover to 5.5~6.0% in 2000.

The present Chilean major industries are mining, commerce, agriculture and processing of agricultural products. The GDP is US$ 67.5 billion (US$ 4,493 per capita) and economic growth is –1.1% with a 9.7% unemployment rate as of 1998. Gross exports amount to US$ 15.6 billion and gross imports total to US$ 14 billion. Major export products are copper, processed foods and timber.

The Chile economy has grown satisfactorily under the military and civilian governments, and realized the most stable social and economic development in Latin America.

Table 1 shows the major statistics of the Chilean economy in recent years.

Table 1 Main Statistics of Chilean Economy

Item	unit	1992	1993	1994	1995	1996	1997	1998	1999
GDP growth rate	%	12.3	7.0	5.7	10.6	7.4	7.4	3.4	-1.1
growth rate of mining	%	-1.4	-0.2	8.9	9.3	15.8	7.9	4.1	16.9
GDP	million $	41,833	44,492	50,941	65,178	68,613	75,340	72,809	67,469
GDP per capita	$	2,976	3,131	3,481	4,412	4,599	5,003	4,912	4,493
WPI	%	8.9	6.7	7.8	8.2	3.1	1.9	0.3	13.5
CPI	%	12.7	12.2	8.9	8.2	6.6	6.0	4.7	2.3
unemployment rate	%	6.7	6.5	7.8	7.4	6.5	6.1	6.2	9.7
IPI	%	N.D.	6.6	2.5	5.8	2.4	4.0	-1.1	-1.3
trade balance	million $	N.D.	-1,670	103	676	-1,948	-2,999	-3,949	472
exports (FOB)	million $	10,007	9,199	11,604	16,024	15,405	16,663	14,830	15,616
imports (FOB)	million $	N.D.	10,869	11,501	15,348	17,353	19,662	18,779	15,144
trade balance	million $	N.D.	619	969	1,893	1,546	1,520	1,071	1,724
exports to Japan	million $	1,707	1,502	1,976	2,906	2,496	2,574	2,066	2,360
imports from Japan	million $	N.D.	883	1,007	1,013	950	1,054	995	636
foreign debt	million $	18,242	19,186	21,478	21,736	22,979	26,701	31,691	34,167
exchange rate	peso/$	363	404	420	397	412	419	460	509

【Legend】 WPI: wholesale price index CPI: consumer price index IPI: industrial production index

Source: Central Bank, National Institute for Statistics and Census, the Ministry of Finance

2) Description of the sector

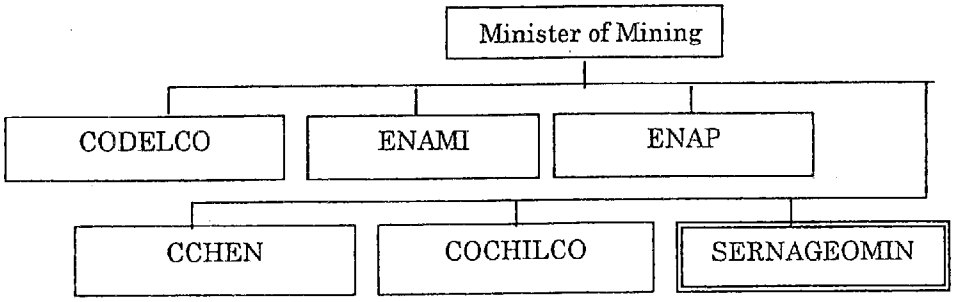
a) Mining

Chile boasts itself as the world's largest copper producer, and is widely known for the production of molybdenum, gold, lithium carbonate and nitrate. Chile is the biggest supplier of copper and molybdenum to Japan.

The Chilean government controls its mining industry through six organizations. The six organizations are Chilean National Corporation of Copper (CODELCO), National Mining Enterprise (ENAMI), National Petroleum Enterprise (ENAP), National Service for Geology and Mining (SERNAGEOMIN), Chilean Commission of Copper (COCHILCO) and Chilean Commission of Nuclear Energy (CCHEN).

Figure 1 shows the organization chart of the Ministry of Mining.

Figure 1 Organization Chart of the MM



The 1990's growth of metal copper production was 174% of the 1980's. The total output amounted to 4.38 million tons in 1999 that is 35% of the total world production. Maximum total sales amount was US$ 6.8 billion in 1997 owing to the international copper price. Table 2 shows mining production data for 10 years.

Table 2 Chilean Mining Production Data for 10 Years

Metal	Item	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Copper	output (1000 t)	1,588	1,814	1,932	2,055	2,220	2,489	3,116	3,392	3,687	4,383
	% of world output	17.7	19.9	20.5	21.7	23.2	24.5	28.1	29.5	30.0	35.4
	sales (million $)	3,834	3,692	3,815	3,333	4,447	6,371	5,956	6,843	5,292	6,025
	price (¢/lb)	121	106	104	87	105	133	104	103	75	71
Molybdenum	output (t)	13,830	14,434	14,840	14,899	16,028	17,686	17,415	21,339	25,297	27,309
	sales (million $)	87	72	73	67	128	244	128	91	77	121
	price (¢/lb)	2.85	2.39	2.21	2.33	4.69	7.90	3.78	4.30	3.41	2.65
Gold	output (kg)	27,503	28,879	34,473	33,638	38,786	44,585	53,174	49,459	44,980	48,069
	sales (million $)	372	344	432	336	430	592	636	493	324	334
	price (¢/lb)	384	362	344	360	384	384	388	331	294	279
Silver	output (t)	655	676	1,025	970	983	1,041	1,047	1,091	1,340	1,381
Zinc	output (t)	25,146	30,998	29,730	29,435	31,038	35,403	36,004	33,934	15,943	32,263
	sales (million $)	18	14	13	7	9	12	12	12	6	7
	price (¢/lb)	69	51	56	44	45	47	47	60	47	49
Lead	output (t)	1,120	1,050	298	344	1,008	944	1,374	1,264	337	608

Source: Statistics of copper and other minerals by COCHILCO

In the 1990's, the production of CODELCO increased to 1.5 million tons from 1.2 million tons of copper, but private mines increased its production to 2.88 million tons from 0.39 million tons. Therefore, CODELCO' s share of copper production decreased.

The investment in the mining sector during the 1990's totaled US$ 12.3 billion and was 36.1% of Chile's total investment. In 1998, the investment in mining peaked and was 46% of Chile's total investment. Table 3 shows mining economic statistics.

Table 3 Mining Economic Statistics in Chile

Item	unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
growth of mining industry	%	0.9	12.4	−1.4	−0.2	8.9	9.3	15.8	7.9	4.1	16.9
mining share of GDP	%	8.9	9.3	8.2	7.6	7.9	7.8	8.4	8.4	8.5	10.0
exports of copper	million $	4,086	3,802	4,104	3,456	4,818	6,991	6,227	7,380	5,829	6,410
% in total exports	%	48.4	42.0	40.5	37.0	40.4	43.2	40.6	43.7	38.6	39.8
foreign invest. in mining	million $	797	440	568	884	1,757	1,711	999	1,706	2,393	1,221
% of total invest.	%	60.6	44.8	56.9	51.0	69.7	56.3	20.7	32.6	40.1	13.4
mine workers	people	76,843	77,920	74,913	68,104	65,635	62,721	59,354	56,354	49,477	N.D.
% of total workers	%	1.72	1.72	1.54	1.33	1.28	1.21	1.13	1.05	0.91	N.D.
metal mine workers	people	59,746	61,445	61,135	57,364	55,327	52,947	51,057	46,964	41,097	N.D.
copper mine workers	people	46,248	47,408	46,537	43,158	41,064	40,176	39,912	38,062	34,824	N.D.

Source: Statistics of copper and other minerals by COCHILCO

Japanese enterprises have begun participating in capital investment of large-scale copper mine development since the 1980's. Japan Escondida Co. invested in the Escondida Mine in 1985, Sumitomo Group (Sumitomo Metal Mining Co. and Sumitomo Corp.) invested 20% of the total capital of the La Candelaria Mine in 1992, Mitsui Group (Mitsui Mining & Smelting Co. and Mitsui & Co.) invested 12.5% of the total capital of the Collahuasi Mine in 1996, Japanese enterprises alliance (Nippon Mining & Metal Co., Mitsubishi Materials Corp. and Marubeni Corp.) invested 40% of the total capital of the Los Pelambres Mine in 1998. Copper concentrate from these mines contributes to a stable supply of copper to Japan. The Atacama Mine, Nittetsu Mining Co. has 60% share, is presently preparing ore production, and Mitsubishi Group (Mitsubishi Materials Corp. and Mitsubishi Corp.) received an initial order of anti-pollution sulfuric acid factory construction for the El Teniente Refinery.

Japanese enterprises are steadily increasing its participation in the Chilean mining industry.

b) Environment

Cars have increased dramatically with the improvement of the quality of life in Chile. Air pollution from exhaust gas has become very serious. In addition, water quality has worsened from an inadequate sewerage system. Therefore environmental problems have influenced people's health in the Santiago Metropolitan area. Under these circumstances, the Basic Environment Law was established in 1994.

The mining sector was not exempt from the increase of environmental regulations. The CODELCO and ENAMI were forced to heavily invest in the environmental field with the stricter regulations in the 1990's. The CODELCO has invested US$ 727 million for the environment that was about 25% of its total investment.

The General Director of National Commission for Environment (CONAMA) and National Society for Mining (SONAMI) appreciates that foreign companies, investors of large-scale mines, have resolved environmental problems under their own criteria. He recognizes that the problem is small mines that don't have the funds nor technology to protect the environment.

The present Mining Law has no regulations regarding restoration of closed and abandoned mines, waste-disposal areas and tailings dams. Many closed and abandoned mines were not reclaimed and their present condition is not understood. There are potential pollution problems. Several major mine pollution cases that

occurred recently are described below;

①Chanaral Bay, RegionⅢ, was filled with the tailings from Potrerillos and El Salvador mines via the River Salado. A community sued in 1989, and forced CODELCO, El Salvador Division, to construct a tailings dam in 1990.

②In a pellet plant and charging dock in Huasco, RegionⅢ, dust pollution affected olive plantations and inhabitants. A community sued in August 1992, the Justice Supreme Court stopped the contamination from the pellet plant and ordered compensation for damage to the olives and sea life.

③In Punitaqui, RegionⅣ, an earthquake damaged several tailings dams in 1997.

④In Copiapo, RegionⅢ, a old tailings dam was flooded and seven people were killed, and an Army truck was affected during the rescue operation in June 12 , 1997.

⑤In Copiapo, RegionⅢ, the Amolanas tailings dam was collapsed by a swelled river. Leaked tailings caused the Lautaro water dam contamination in 2000.

⑥In Calama, RegionⅡ, an acid solution leakage occurred at the El Abra Mine in 1998.

⑦In CODELCO's Andina Division, Region Ⅴ, the Canoes tailings dam was destroyed by a flood and soil contamination occurred from the tailings in 2000.

⑧In Arica, Region Ⅰ, a community demanded the Choquelimpie Mine management to clean up the mining site.

⑨In iron mineral charge and storage area in Coquimbo, RegionⅣ, some pollution occurred in the Guayacan Bay.

⑩In Region Metropolitan, the community has complained about potential risk of the El Bronce tailings dam belonging to the Mine Disputada de las Condes.

3) Host country strategy

Many government regulations related to mining have been passed since the 1990's. The Basic Environment Law was legislated and CONAMA was established in 1994. President Lagos, elected in January 2000, attaches great importance to the environment and appointed Ms. Adriana Hoffman, a former NGO member, as a General Director of CONAMA. He clearly stated any industrial economic development would not be permitted at the expense of the environment.

The Economy, Energy and Mine Minister Jose de Gregorio acknowledged that the environmental criteria of the present law are not sufficient, and stated that some control is urgently needed on the closing of mines and treatment of harmful solid waste and acid water.

The draft bill of the "Mines Closure Law" was presented to the MM on January

2001, and the draft bill was already sent to all related authorities.

4) Prior or ongoing assistance

① Training Center on Mining Safety and Environment Project of JICA and SERNAGEOMIN– July 1, 1994～June 30, 1999

② Dispatch of an expert (mine environment administration) to SERNAGEOMIN from JICA : Mr. Shozo Sawaya – Oct.1, 1999～Sep.30, 2001

③German Geological Survey and SERNAGEOMIN investigated the socio-economical impact of small mines in the Copiapo River basin, determined the environmental impact of the mining industry in RegionIII and developed a geoenvironmental diagnosis in the River Loa basin during 1994 to 1999.

3. Problems to be addressed and current situation

1) Institutional framework for the sub-sector

a) CONAMA

The CONAMA was established in 1994 as an institution to coordinate the environmental administration. Before 1994, the environmental administration was carried out independently by each ministry, but it has been adjusted by CONAMA.

At present, CONAMA consists of a general director and four technical departments – environment impact assessment, removal of contamination, planning and criterion, and natural resources and environment economy– with legal, citizen participation and administration departments.

b) Legal framework

The legal framework is as below. Several important laws have been established since 1992.

① Regulation for construction of tailings dam and its operation (1970)

② Regulation for mine safety (1986)

③ Regulation for factory activity generating sulfurous acid gas, dust and arsenic. (1992)

④ Regulation for neutralization and discharge of industrial waste

⑤ Basic environment law (1994)

⑥ Regulation for procedure and steps to plan the protection and elimination of contamination (1995)

⑦ Regulation for promulgation of environmental and exhaust standards (1997)

⑧ Regulation for environment impact assessment (1997)

⑨ Standards for arsenic exhaust to the atmosphere (1999)

Before 1990, the "Regulation for construction of tailings dam" and "Regulation for mine safety" were applied to the mines. At present more influential laws are the "Regulation for environment impact assessment", "Regulation for factory activity" as well as "Standard for arsenic exhaust" which impose strict regulations on Chilean smelter's exhaust. These laws forced CODELCO and ENAMI to make a large investment. The "Regulation for environment impact assessment" imposes environmental impact assessments for ministries in charge of environmental administration before starting the projects. It includes exploration, development, mineral dressing, tailings and slag in the mining sector.

At present, other laws are under study impacting the mining industry.

c) Countermeasures for abandoned mines

In 1999, the MM appointed COCHILCO as the coordinator to prepare a draft bill for regulations on mines closure. The COCHILCO immediately settled on a committee consisting of administration institutes including SERNAGEOMIN and private companies. They have been studying the solution from the viewpoints of law, finance, technology and citizen participation. A new draft bill was presented to the MM on January 2001. However it needs more time before establishment for national deliberation and modification of the draft bill between related industries and ministries, especially on financial affairs.

2) Problems to be addressed and current situation

The SERNAGEOMIN is expected to be a technical counterpart, but lacks technology and experience for environmental countermeasures concerning closed and abandoned mines as well as gathering information on the present situation of the mines.

Present Chilean mines statistics are shown in Table 4 from Regions I to V;

Table 4 Chilean Mines Statistics

Region	A		B		C	
	No. of C. & A.	No. of W.	No. of C. & A.	No. of W.	No. of C. & A.	No. of W.
I	unknown	4	unknown	1	unknown	8
II	unknown	9	unknown	9	unknown	80
III	unknown	1	unknown	7	unknown	199
IV	unknown	11	unknown	19	unknown	267
V	unknown	4	more than 3	7	more than 83	56
total	unknown	29	more than 3	43	more than 83	610

note: A : mine whose total workers are more than 400.

B : mine whose total workers are 80 to 400.

C : mine whose total workers are less than 80.

No. Of C. & A. : number of closed or abandoned mines

No. Of W. : number of working mines

SERNAGEOMIN published two volumes (Region Ⅰ & Ⅱ、Region Ⅲ & Ⅳ) of mine site lists showing working mines and major closed or abandoned mines. Two volumes were made by the Information Department in Santiago that collected reports prepared by the Department of Mine Safety and Department of Mining Property. Location data are stored in the GIS system and plotted on maps. It also has items such as identification, name of enterprise, category, name of site, type of operation, main products, situation (working/closed) and name of county.

These lists are available to the public. The adopted GIS system is TNTMIPS that can do satellite-image processing. The TNTMIPS is compatible with ARCINFO and MAPINFO.

From the viewpoint of closed mines database proposed in the project, actual mine site lists have several problems as follows;

① There are some deviations in details and importance of description owing to the person in charge or region.

② Present location depends on GPS. Mine sites have latitude and longitude locations shown on the map, but more detailed information is needed to grasp and monitor the situation.

③ Relation between mine site and hydrologic system is not clear.

④ There is no information regarding potential risk and environmental impact.

Present lists were not prepared for environmental countermeasures, but mine safety is mainly concerned with fatal accidents or control of mining property. Therefore, it is important to improve its content for environmental measures.

On the other hand, let us consider the present training of mine inspectors belonging to SERNAGEOMIN. Thirteen mine inspectors are posted throughout the country. There are one to three people in Regions Ⅰ to Ⅴ, Ⅷ and Metropolitan area. The inspectors examine each mine one to two times per year. In case of Region Ⅲ, three inspectors examine approximately 350 mines including large and small mines every year. Two inspectors go to the field 2 weeks per month, and another inspector 1 week per month. They inspect 14～15 mines per week around Copiapo, and one～two mines per week at the Andes Mountains site.

A mine inspector must be an A-class person (5 years experience and graduate

specialized in mining based on Mine Safety Law) and needs national qualification after SERNAGEOMIN training. Safety Inspector Training Course demands 300 hours for total lectures and content of lectures is as follows;

① Legal framework (Safety Law, Statistics)
② Control of Risk in Mining Operations (Risk in Mining, Handling of Explosives)
③ Control of Working Environment (Environmental Problems, Occupational Disease, Tailings Dam of Mines)
④ Countermeasure for Emergency (Action for Emergency, Rescue Party)
⑤ Inspection for Risk Protection (Work Process, Action for Risk during Operation)

Basic difference between Japan and Chile in the inspector training, is the retraining system to improve the inspector's capacity after obtaining the qualification. There is no retraining system for inspectors in Chile.

Moreover, the lecture of the present training is carried out mainly for risk protection on working mines and lacks information on mine pollution. There is no lecture concerning actions for closed or abandoned mines, the main theme of the project. Consequently, their level of knowledge and technology for this theme is assumed to be comparatively low.

3) Relation with Japan's aid policy

Chile is the biggest supplier of copper and molybdenum to Japan. Mine development friendly to the environment will contribute to insure a stable supply of these metals.

Environmental protection is one of four important fields in JICA aid.

Japanese aid to Chile is shown as follows;

a) Soft Loan 30.0 billion yen (total amount of 1998)
b) Grant Aid 8.6 billion yen (total amount of 1998)
c) Technical Cooperation Result 28.3 billion yen (total amount of 1998)

Major donor countries are Japan (43%)、France (34%)、Germany (17%) .
Japan is the largest donor to Chile.

unknown at present. Past mine pollution occurred from abandoned mines. The both sides recognize the next two points after frank discussion;

(1)It is useful to make a database on the potential risk for the collapse of tailings dams, surface water contamination and underground water contamination.

(2)The draft bill of "closing mines" forces private mining companies to pay for possible pollution of their working mines that will close in the future. But the Chilean government must pay for environmental protection for abandoned mines without owners in order to show a national policy, so mine pollution countermeasure activity is meaningful as a government to government cooperation.

The Chilean side intends to include closed and abandoned mines in the database.

The both sides reached agreement on four model sites for technology transfer of the project, considering Chilean geological and climatic conditions and characteristics of the mines. Four sites are as follows;

The first site is located in Antogafasta, RegionⅡ, where is a dry desert zone with many large-scaled mines and little population. The second site is located in Copiapo, RegionⅢ, where is a dry and limited agricultural zone with many small- and medium-scaled mines and also closed and abandoned mines. The third site is located in Santiago, Region Metropolitan, where it has a Mediterranean climate and is an agricultural and stock farming zone with a high population. The fourth site is in a forest zone with heavy rainfall in Concepcion, RegionⅧ.

Almost all mining pollution cases may be used by the arrangement of appropriate four sites. There are various conditions like underground and open pit mines, dry and wet area, and densely to under populated areas. It is possible to select various pollution problems and carry out a complete technology transfer including investigation and countermeasures for abandoned mines as well as operating mines.

If the database would be established regarding environmental risk including risk evaluation, it would be useful to make a reasonable plan for countermeasures to obtain a high priority abandoned mine site, techniques and the cost of reclamation.

In the compilation of the database, there are alternatives. One is to add more data to the published Atlas, and another is to prepare a completely new map. Selection of an alternative is based on the relation between the GIS system and other data. It will be more efficient to utilize existing data as much as possible. For this survey, information experts from two countries are necessary for a short

4. Project strategy

1) Project strategy

a) Request from the Chilean side

SERNAGEOMIN requests technology transfer as follows in the original;

①Operating, closed and abandoned mine sites data compilation

- To check and allowable information and construction (analysis and design of Mining Passive Administration Software－SIPAM), and renew and upgrade hardware and software.
- To check the E-400 Form, for Mining Sites Cadastre. To look for real case applications.
- To locate the different sites and installations, using GPS instruments or others. It is required to have equipped vehicles to go to sectors without enabled roads.
- Data Input to Dates Base in site, in digital form (Laptop or other digital portable device).
- Sample taking. Samplers, sample preparation and classification, submiting of samples to Laboratory.
- Chemical Analysis: Laboratory analysis, result interpretations, etc.
- Risk Evaluation: Risk parameter definition for each abandoned installation, considering the different methodological and geological conditions existing in the different Regions.

②Mine Closure Technology

- Engineering and closure works on mining sites. Application of surface covering, construction of contention walls, perimeter channels, etc.
- Acid drainage of mines, acid waters generation in: Tailing Dam, Steriles Deposits, Lixiviation Piles, Lixiviation Gravel Deposits.
- Monitoring technics.
- Costs estimation criteria for site closure works.
- Information systems handling related with the matters.

③ Closed and abandoned mine sites contamination control

- Air, soil, surface and underground water monitoring planning.
- Long term contamination risk evaluation.

④ Training

- Mine sites closure technology

- Data compilation, analysis and statistics
- Environmental supervision
- Geographical information systems
- Web data handling

⑤ Equipment and instruments requested to Japan
- Site instruments
- Site equipments
- Training equipment
- Computational equipment
- Laboratory equipments and instruments

b) Strategy developed by discussions of both countries

①Project strategy concerning closed and abandoned mines

Most main mines are in the desert zone to the north of Santiago. Any surface water problem like acid water is thought to have not occurred in the closed and abandoned mines. Heavy rainfalls occur every 5 to 8 years in northern Regions. Floods on areas of no vegetation due to the desert zone, sometimes cause downstream hydrogeological pollution from the tailings dam.

Airborne dust from the dry surface and risk of collapse by earthquake are the impacts of the tailings dam to the environment in the short term, and underground water contamination risk in the long term. If any risk appears, its countermeasure will be very difficult. Therefore, it is important to grasp the present situation of closed and abandoned mines, and evaluate the environmental impact to minimize the potential risk.

In Concepcion to the south of Santiago, there are many abandoned coal mines stopped mining 20 to 100 years ago have potential risks. In the Coronel district, for inhabitants, especially children may fall down the many raises and shafts of the underground mines. At present, many raises are being filled with excavated materials without any detailed survey. Present work is simply filling. This is an inefficient measure for the long term. Measures for large shafts more than 160 meters deep and 5 meters in diameter should be designed based on engineering calculations. In the Lota district, some houses receive damage from sinking and destruction caused by a surface subsidence above the large-scaled mined out areas. Habitants escaped from their houses to safe places. Detailed surveys and exact measures should be carried out urgently.

The draft bill of "Mines Closure Law" provides measures of closing procedures for operating mines but does not target abandoned mines whose owners are

term.

②Projects strategy related to the "Mines Closure Law"

The "Mines Closure Law" and its regulations need to be fixed in the near future, and its establishment needs technical support.

There is a "Fund for Protection of Mine Pollution" for working mines in Japan. By this system, the director of mine safety orders enterprises to save money for necessary countermeasures for the mine closure. It is highly evaluated as an advanced system in the world because mine owners do the pollution-protection works for closing their mines during their operation. Chile intends to build basically the same system as Japan but using a different pooling money method. Application of this system requires the evaluation of probable environmental risks, countermeasures and its cost estimation. The Japanese Ministry of Economy, Trade and Industry (METI) possesses this system.

Efficient technology transfer is carried out by both office and field work.

③Project strategy related to inspector training

Chilean inspectors will be requested to improve their supervising skill in the environment, mine pollution field, and knowledge and technology according to "Mines Closure Law".

It is possible to accomplish "Strengthening in Mining Environmental Aspects" by instruction to Chilean inspectors on Japanese knowledge and technology for tailings dam, drainage from mine site, mine safety inspection including some skills for open pit mines.

In establishment of the "Mines Closure Law", the increase of inspectors will be needed owing to the increase of SERNAGEOMIN work. Top management of SERNAGEOMIN stated that the number of inspectors would increase for the establishment of the new law just as number had increased for the establishment of the Basic Environmental Law in 1994. If the technology taken from Japanese experts by the inspectors will be transferred to new inspectors, the result of the project is expected to be more effective.

Both sides discussed and reached agreement on the contents of the cooperation described below based on the above mentioned items;

① Collecting data on closed and abandoned mines, understanding their present situation and compiling a database at the four model sites.
② Planning of mine-closing countermeasures, cost estimation and environmental impact assessment for operating mines at the four model sites.
③ Technical instruction of examining mine pollution for operating mines at the

four model sites.

④ Improvement of chemical analysis to grasp the pollution impact quantitatively.

The both sides also agreed on the details of the project described in "b) Outputs" of "5.Project design" in this Project Document.

2) Implementation structure

a) Counterpart Organization

SERNAGEOMIN should bear the overall responsibility for implementation of the project under the supervision of the MM. The undersecretary of MM, as the project director, will bear overall responsibility for the administration and management of the project. The director of SERNAGEOMIN, as the deputy project director, will assist the project director for managerial and technical matters of the project. The chief of the Department of Engineering and Environment Management (DIGA), as the project manager, will be responsible for the managerial and technical matters.

SERNAGEOMIN was founded by the consolidation of the National Geological Survey and Governmental Mining Institute on November 26, 1980. Its major function is divided into the geology and mining sectors. The mining sector permits mining activity and inspects mine safety.

The provisional organization chart of SERNAGEOMIN is shown in Figure 2; Number of total personnel is 298, types of occupation are listed Table 5;

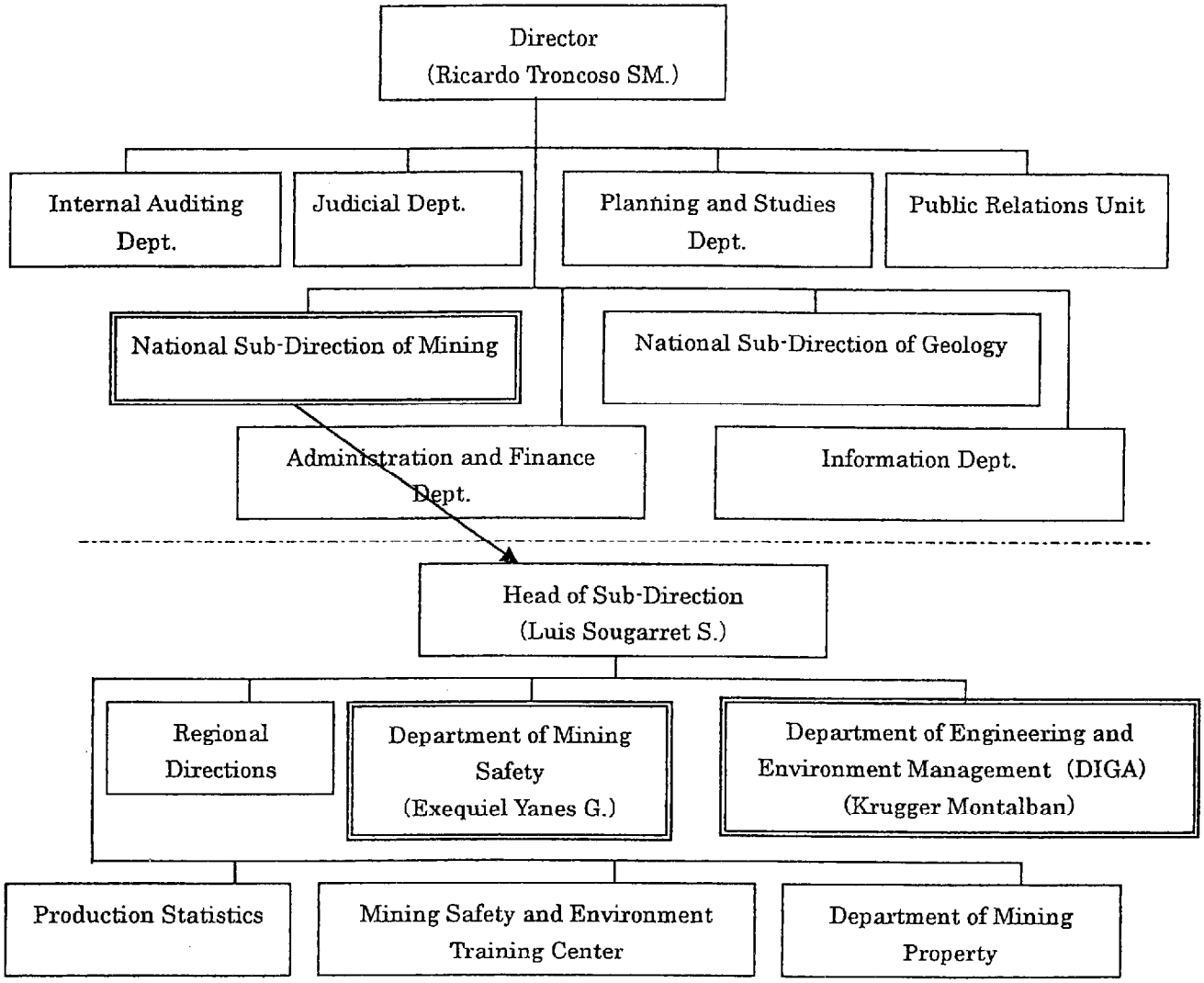
Table 5 Types of Occupation in SERNAGEOMIN

Executives	18
Engineers	168
Administrative staffs	87
Others	25
Total	298

Table 6 shows details of personnel according to employment terms;

According to an Administration regulation (Estatuto Administrativo) , public-sector worker consists of fixed personnel (planta) and contracted personnel (contrata). Contratas are employed by public application and dismissed on December 31st. at the maximum, without 30 days notification before the expiration of the contract. Contratas are guaranteed by public welfare according to the administration regulation. If extraordinary work like the projects promoted by a foreign country

Figure 2 The Organization Chart of SERNAGEOMIN



Occurs, an auxiliary person (honorario) as a supplementary worker can be employed. The honorario is contracted individually out of the administration regulation and not guaranteed social security by the government.

Table 6 Details of Personnel of SERNAGEOMIN

Planta	123
Contrata	102
Honorario	73
Total	298

The area allocation for SERNAGEOMIN in the country is shown on Table 7. The Mining Safety and DIGA in Branch Region V controls Regions V, VI and Metropolis, while Branch Region VIII controls Regions VIII and VII.

Table 7 Area Allocation for SERNAGEOMIN

Headquarters (Santiago)	198
Branch Region I	10
Branch Region II (Antofagasta)	12
Branch Region III (Copiapo)	23
Branch Region IV	11
Branch Region V	10
Branch Region VIII (Concepcion)	7
Branch Volcano (RegionIX)	9
Branch Puerto Varas(RegionX)	18
Total	298

The total staff allocation including branch offices for "Department of Mining Safety" and "DIGA" in SERNAGEOMIN is 32, shown in Table 8;

Table 8 Staff Allocation for Mining Safety and DIGA

Regional Director	6
Chief of DIGA	1
Chief of Mining and Safety	1
Engineer of DIGA	11
Chief of the Training Center	1
Mine Inspector	12
Total	32

b) Budget allocation

4.256 billion pesos (as of 2001)

Breakdown of Expenditure

- Personnel Expenses 2.266 billion pesos
- Goods Expenses 0.723 billion pesos
- Substitutive Expenses 0.261 billion pesos
- Area Investment 1.005 billion pesos
- Others 0.002 billion pesos

c) Institutional arrangements

① Function, authority and requests

SERNAGEOMIN advises CONAMA and COREMA from technical viewpoints

concerning infrastructure and plans for mining projects. All mining projects must be recognized by SERNAGEOMIN under the present environmental criteria. SERNAGEOMIN is the only authority to inspect ongoing mining projects from the viewpoints of mine safety and health.

② Regulation for mine safety

SERNAGEOMIN is responsible for the enforcement of the regulations for mine safety. SERNAGEOMIN authorizes qualifications for specialists to protect against risks in safety supervision and mining operation, and determines the necessary experience and required subjects. SERNAGEOMIN has the authority to inspect any place at the mining sites and mining installations. Mining companies must give mine workers safety instructions according to the risk level. They record names of qualified workers, instruction materials, instructors and names of instruction organizations, and present it to SERNAGEOMIN, if required. Stripped waste, leached tailings and other materials must be collected and disposed according to the plan approved by the director of SERNAGEOMIN. In the case of acid leaching using cyanide and other harmful materials, mine directors must have approvals from the director of SERNAGEOMIN on their operating procedure for their facilities, and control and disposal method of their waste, for either liquids or solids.

③ Construction and operating regulation for tailings dam

SERNAGEOMIN has exclusive authority to regulate construction, operation and usage of tailings dams from the viewpoint of mine safety. The SERNAGEOMIN has exclusive authority to enforce the standards in the Mine Safety Law to be observed by users of tailings dams.

d) Organization Management

As SERNAGEOMIN is a technical organization specializing in mining and earth science that is a fundamental area in the development of mines, it has comparative advantages to supervise the closing and abandoning of the mines.

When the "Mines Closure Law" will become effective in future, it seems reasonable for SERNAGEOMIN to be the responsible organization for the new law. SERNAGEOMIN itself clearly states that it will be responsible for preparing the draft regulations accompanying the draft bill of "Mines Closure Law" in its legislation process. Therefore it is very natural for SERNAGEOMIN to be a

counterpart of the project.

e) Allocation of counterparts

The Counterparts are Regional Directors, Chief of DIGA, Chief of Mining Safety, engineers of DIGA, chemical analysts of the laboratories, information engineers, Chief of Safety and Environment Training Center and the mine inspectors. Total number of counterparts is 39 members as shown in Table 10.

f) Past achievements

SERNAGEOMIN and JICA have successfully developed the Project "Training Center on Mining Safety and Environment" at Copiapo in 1995 to 1999. The overall goal of the project is to contribute to the improvement of mine safety and pollution in the metal and non-metal mining industries by establishing a permanent training institution. To attain this goal, buildings and facilities were constructed by the Chilean side, and necessary equipment and a series of technical transfers were given by the Japanese side.

SERNAGEOMIN understands well the meaning and procedure of Project-Type Technical Cooperation system of JICA and is an appropriate as a counterpart of the project.

3) Coordination arrangements

a) CONAMA

- Name (English) National Commission for Environment
  (Spanish) Comision Nacional del Medio Ambiente
- Constituent members

  Board of directors consists of 13 ministers — the Minister of Presidential Office, Foreign Minister, Defense Minister, Minister for Economic Promotion Reconstruction, Education Minister, Minister for Public Enterprise, Minister for Health and Welfare, Minister for Houses and Cities, Agriculture Minister, Mining Minister, Minister for Traffic and Communication, and Minister for National Property.
- Consulting Committee gives the board of CONAMA advice for referred matters.
- Control of Regional Commission for Environment (COREMA)
- Secretariat (62 members including a general director except 13 directors of COREMA)
- Main responsibilities

- Adjustment of environmental administration
- Maintenance for environment impact assessment system
- Adjustment of settlement for environmental and exhaust criteria
- Determination of achievement program for environmental criteria

b) AGCI

- Name (English) Agency for International Cooperation
  (Spanish) Agencia de Cooperacion Intérnacional
- Main functions
  - a subsidiary organization of the Ministry of Foreign Affairs in charge of international cooperation works.
  - a contact on the Chilean side for the project

c) Joint Coordinating Committee

- Constituent members
  AGCI, CONAMA, JICA, MM, SERNAGEOMIN.
  Its tentative composition chart is shown in ANNEX 8.
- Main functions
  - The committee will be established and meet at least once a year to discuss on the progress on the project.
  - The committee will evaluate the level of achievement of the project objective by means of the PDM method approximately in the middle and during last six months of the cooperation term.

4) Sustainability

a) Institutionalization

The draft bill of "Mines Closure Law" had been advanced by COCHILCO as a coordinator with participation of organizations related to mining safety and environment since 1999. The draft was presented to MM on January 2001, and MM is charge of legislative proceeding. In that process, additional questions are asked to organizations related to the environment and mining safety. Generally it takes about 2 to 4 years to establish a new law, and the "Mines Closure Law" is estimated to become effective around 2004.

b) Foresight of sustainability

In the establishment of the "Mines Closure Law", an increase of inspectors is

necessary due to the increase of SERNAGEOMIN work. Top management of SERNAGEOMIN stated that the number of inspectors would increase at the establishment of the new law just as inspectors had increased at the establishment of the Basic Environmental Law in 1994. If the technology taken from Japanese experts by the inspectors will be transferred to new inspectors, the result of the project is expected to be more effective.

5) Special consideration

The establishment of the Closing Mine Law is considered to be very influential for the smooth running of the project. There is a possibility that important advice from Japanese past experiences for technical problems on closing mines will be given during the national assembly's discussion of this law.

5. Project design

1) Overall Goal

The Chilean Government shall prevent mining pollution caused by closed and abandoned mines.

SERNAGEOMIN shall supervise and direct Chilean mines according to the regulations of the Mines Closure Law.

SERNAGEOMIN shall compile a database on Chilean mines.

2) Project objective, Outputs, Activity Project Purpose

a) Project objective

SERNAGEOMIN shall add the following two functions to its administrative duties:

1. SERNAGEOMIN shall grasp the situation surrounding operating, closed, and abandoned mines, including information on potential impact through compilation of a database.
2. SERNAGEOMIN shall have the capacity to plan for minimizing and monitoring environmental damage.

b) Outputs

1. Various initial inputs are completed.
2. Basic knowledge regarding mining pollution is disseminated among inspectors in SERNAGEOMIN.
3. Necessary investigation skills for closed and abandoned mines are strengthened in

SERNAGEOMIN.

4. SERNAGEOMIN has an improved database system for investigation results.
5. SERNAGEOMIN develops technical measures for closing mines.
6. SERNAGEOMIN strengthens its examination skills for mining pollution.
7. SERNAGEOMIN develops the capacity to plan pollution protection.
8. SERNAGEOMIN strengthens its capacity for assessing environmental impact.
9. SERNAGEOMIN improves its chemical analysis equipment and its skills in maintaining the equipment.
10. SERNAGEOMIN obtains data analysis technology and results evaluation technology.

c) Activity

1. To allocate necessary counterparts and administrative personnel as planned.
2. To present Japanese Mining Law and Regulations concerned with mining pollution as well as examination and research methods for mining pollution.
3. To give instruction in investigative skills for each basic factor, such as tailings dams, as well as on the extent of risks in model closed and abandoned mine sites.
4. To prepare the establishment of an improved database system into which investigation results from each mine site will be registered.
5. To give instruction in technical measures to be prepared for each basic factor for future closing of the model operating mines.
6. To give instruction in examination skills for mining pollution in each basic factor for the model operating mines.
7. To give instruction in skills for making anti-pollution schedules for future mine closings as well as cost estimations for future closings of model operating mines.
8. To review EIA reports in SERNAGEOMIN and to give technical advice on improvement of the EIA system.
9. To repair chemical analysis equipment, and to improve maintenance skills, highly accurate calibration skills, and sampling (including preparation) skills.
10. To establish data analysis and evaluation technology for chemical analysis results.

3) Inputs

a) Inputs from the Japanese side

①Long-term experts (five members)

- Chief advisor (5 years)
- Project Coordinator (5 years)

- Environmental investigator (5 years)
- Mining safety and environmental expert (5 years)
- Chemical analyst (2 years)

②Short-term experts

Short –term experts will be dispatched in the related field of technology transfer including information analysis in accordance with its needs. The Chilean side requested the information analyst be dispatched for at least two months as soon as possible after deciding investigation items. The expert will be dispatched more than two times during the project. The Japanese side promised to make all possible efforts.

The request using Form A1 for the dispatch of Japanese experts should be submitted to the Government of Japan by the Chilean side at least two months prior to the scheduled arrival in the Republic of Chile.

③Provision of machinery and equipment

The Chilean side requested the Japanese side to provide machinery and equipment and other materials according to its priorities as listed in Annex 5.

The Japanese side explained and the Chilean side agreed that the responsibility and costs necessary for domestic transport, installation and maintenance of the machinery, equipment and etc. should be borne by the Chilean side.

The Japanese side also explained that the Japanese Government taking into account of its budgetary condition and would make the final decision on the provision of machinery and equipment.

The request form (Form A4) for the provision machinery and equipment should be submitted to the Government of Japan by the Chilean side immediately after the R/D is signed.

④Training of Chilean counterparts in Japan

One to three Chilean counterparts will be accepted for training in Japan each year. Necessary training should be carried out according to the progress of the project.

The application form, Form A2 and A3, for the training program in Japan should be submitted to the Government of Japan by the Chilean side at least two

months prior to the scheduled arrival in Japan.

b) Inputs from the recipient country

① Budget for domestic expense and building and facility for the project

a. Budget for domestic expense

Necessary amount of local costs that is indispensable for the smooth implementation of the project will be borne by the Chilean side. The Chilean side will supply machinery, equipment, instrument and any other materials necessary for implementation of the project except those provided by the Government of Japan. The local cost list borne by the Chilean side is shown on Table 9. Both sides confirmed that the SERNAGEOMIN would ensure the budget and local cost for the project by 2006.

Table 9 Budget for Domestic Expense in Chile (1,000 pesos)

Item	2002	2003	2004	2005	2006	Total
Labor cost	159,664	160,664	158,664	—	—	478,992
Operation cost	8,034	8,234	9,035	—	—	25,303
Initial cost	0	0	0	0	0	0
Total	167,698	168,898	167,699	—	—	504,295

NB: Total in the Table does not include the 2005 and 2006 budgets.

b. Building and facilities for the project

Building and facilities necessary for the implementation of the project will be prepared and the necessary renovation of the facilities will be completed by the Chilean side.

A main office for the project is prepared in a laboratory of the SERNAGEOMIN located in Tiltil 1993, Santiago. A tentative lay out of the office is shown in Figure 3.

Practical exercises for the technical transfer will be implemented at four model sites, which are Antofagasta (the second region), Copiapo (the third region), Santiago (Metropolitan area) and Concepcion (the eighth region).

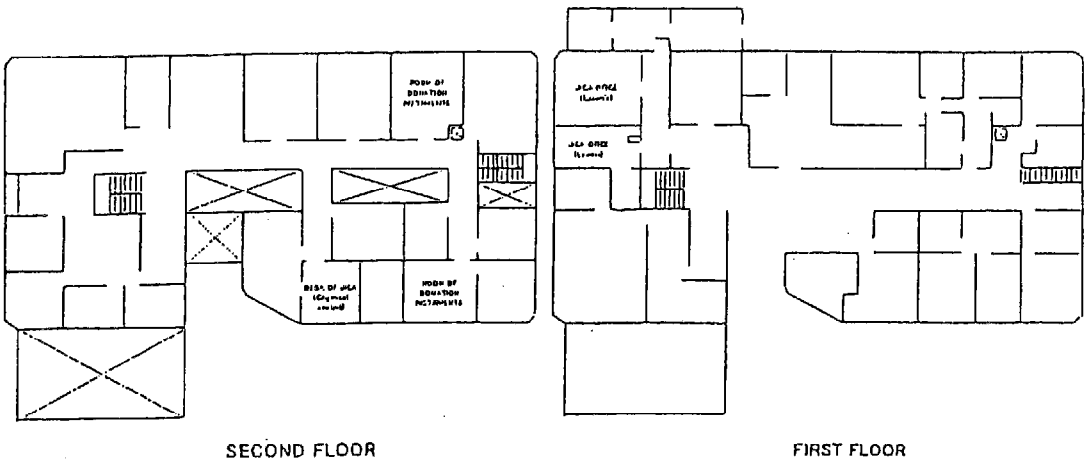


Figure 3 Tentative Layout of Main Office for the Project

②Allocation of the counterpart

A project director, deputy project director, project manager and an appropriate number of technical counterparts will be assigned before the start of the project.

③ Privileges, exemptions and benefits to the Japanese experts

In accordance with the provision of the Article V and VI of the Agreement on the technical cooperation between the Governments of Republic of Chile and Japan, effective as of December 2, 1978, the Chilean government will grant Chilean privileges, exemptions and benefits to the Japanese experts and their families.

c) Mutual agreement matters

① Common language

Common language used in the written document of the project is English.

② Application of Project Cycle Management Method

Project planning, monitoring and evaluating method entitled "Project Cycle Management" will be applied to the project to monitor and evaluate the level of achievement and enhance the communication for its smooth implementation.

③ PDM

Project Design Matrix ought to be designed at a planning stage of the project,

as a framework clarifying a multi-level chain of cause-to-effect such as input to output, output to project purpose, and project purpose to overall goal.

4) Important assumption and risk analysis

As there is no regulation on the restoration for closed and abandoned mines, the draft bill of the "Mines Closure Law" is just being prepared in MM. The legal regulations including restoration for closed mines have a significant influence for the smooth management of the project.

The SERNAGEOMIN has the same opinion. In case an approval of "Mines Closure Law" in the Congress will be delayed more than expected, it intends to utilize the Government Ordinances No.30 , No.72 or other ordinances to settle regulations for the mine closing.

5) Prior obligation and prerequisites

The preconditions in this project are that "SERNAGEOMIN collaborates with JICA in the project implementation and the Chilean Government secures the necessary budget and human resources for the project implementation". These preconditions must be fulfilled before the project is initiated. If these conditions are not met, the project should not be initiated.

6. Project justification

1) Public interest and fairness of the project

Many government regulations related to mining have been passed since the 1990's. President Lagos, elected in January 2000, attaches a great importance to the environment and clearly stated any industrial economic development would not be permitted at the expense of the environment. The Mine Minister acknowledged that the environmental criteria of the present law are not sufficient, and stated that some control is urgently needed on the closing of mines and treatment of harmful solid waste and acid water. At present, Chile is a nation eager to solve their environmental problems.

This project is very reasonable, considering that the mining industry seriously impacts the environment, many closed and abandoned mines were not reclaimed and their present condition is not understood.

Moreover, Chile is the largest copper producer. The mining industry occupies a large role in the Chilean economy. It is a big base for its economic development that contributes to the well-being of the Chilean people. It is very important to properly

solve the environmental problems for the sound development of the Chilean mining industry. This project contributes to these points and has broad public benefits.

2) Accuracy of technology

The background of the cooperation request for Japan is a establishment of the "Mines Closure Law", and its legal preparation is ongoing in MM. The regulations attached to the new law are necessary and its establishment must be followed by technical enforcement. But SERNAGEOMIN does not have the technical know-how for mine closure, and needs international cooperation in realizing the necessary measures.

Most mines are in the desert zone north of Santiago. Heavy rain falls occur every per 5 to 8 years in Regions III and IV, that cause floods in areas of no vegetation due to the desert zone. The floods sometimes cause downstream hydro geological pollution from the tailings dam.

Airborne dust from the dry surface and risk of collapse by earthquake are the impacts of the tailings dam to the environment in the short term, and underground water contamination risk in the long term. If any risk appears, its countermeasure will be very difficult. Therefore, it is important to grasp the present situation of closed and abandoned mines, and evaluate the environmental impact to minimize the potential risk.

In Region VIII to the south of Santiago, there are many abandoned coal mines that pose present potential risks. For example, in the Coronel district, for inhabitants, especially children may fall down the many raises and shafts of the underground mines. In the Lota district, some houses receive damage from sinking and destruction caused by a surface subsidence above the large-scaled mined out area. Detailed surveys and exact measures should be carried out urgently.

There is no detailed information regarding closed and abandoned mines. The present action for problems of abandoned mines is carried out after the occurrence of some troubles. If the database would be established regarding environmental risk including risk evaluation, it would be useful for making a reasonable plan for countermeasures on a high priority abandoned mine site, and determining the techniques and cost of reclamation.

The present training for inspectors is carried out mainly for risk protection at working mines and lacks information on mine pollution. There is no training concerning actions for closed or abandoned mines that is the main theme of the project. Consequently, improvement of their supervising skill in the field of environment and pollution, and knowledge and technology concerning actions for closing mines are needed to make immediate measures for abandoned mines

problems. Japanese experts have the knowledge and technology for tailings dam, drainage from mine site, mine safety inspection including some skills for open pit mines. If Japanese experts based on their experience, give Chilean inspectors appropriate advice for actions regarding closing mines, the project "Institutional Strengthening in Mining Environmental Aspects" is very beneficial to Chile.

3) Reasons for assistance from JICA

There is a "Fund for Protection of Mine Pollution" for working mines after closing mines in Japan. In this system, the Director of Mine Safety Division of METI orders mining companies to save money for necessary countermeasures after mine closure. It is highly evaluated as an advanced system in the world because the mine owners prepare by themselves the mine pollution protection after mine closure. Chile intends to build basically the same system as Japanese but using a different pooling money method. Application of this system requires the evaluation of probable environmental risks, countermeasures and its cost estimation. METI possesses this system. Under this situation, this cooperation project is very meaningful.

For past 30 years, Japan has carried out various pollution measures for closed and abandoned mines through private companies, the Metal Mining Agency of Japan (MMAJ) and Mine Safety Division of METI based on the Japanese "Mine Safety Law" and "Mineral Mining Pollution Measures Law". MMAJ and Japan Mining Engineering Center for International Cooperation (JMEC) have much experience and highly specific knowledge in this field. The MMAJ made a compilation of a database utilizing information for closed and abandoned mines in Japan. That was prepared by Mine Safety Inspection Division of METI. The locations of mines are shown on the supplementary map of the original table. The operation types, environmental impact factors, and its measures for protection are included in the database, which has emphasis on the searching function.

The training for mine inspectors in Japan is divided into two courses, as follows;

① General Course

This course is for people who want to become inspectors. It consists of 2 weeks of basic lessons and 2 weeks of field exercise for learning basic knowledge and technology. Also, some legal investigation lessons are included, because Japanese inspectors have the power of a policeman in the mine.

② Special Course

This 1-week course is for upgrading inspectors who need higher specific knowledge and technology. It has various subjects as follows;

- legal training (necessary skills for policeman)
- training for accidents (study of cause and measures for accident)
- training for dust (study of pneumoconiosis and measuring dust)

・training for smoke and drainage from mines (analysis and treatment)
・other training according to objectives

This training has been carried out changing its content in accordance with the organization's needs by referring to mines accidents and considering the difficulty of the training for improving the capacity in the mine safety administration. It has achieved a good result in the mine safety administration.

4) Expected effects of the project

a) Effect for the development policy framework

Chile is a leading mining country in the world. There are many mines including closed and abandoned mines all over the country. The mining industry occupies an important role in the country.

The environmental impact of the mining industry is, however, greater than any other industry, because its operations are destructive to nature. The Chilean government has attached great importance to the environment. There are regulations on working mines regarding environmental protection including mining safety, but there is no regulation regarding to closed and abandoned mines. Scientific evaluation of the environmental impact for closed and abandoned mines through a survey of its actual state should assist the environmental policy in Chile. According to the environmental impact of abandoned mines, a new legal system may be necessary.

b) Effect for the institutional framework

After establishment of the "Mines Closure Law", SERNAGEOMIN is expected to be legally responsible as an administrational organization. The top management of SERNAGEOMIN stated that the number of the inspectors would increase for the establishment of the new law according to the increase of the work of SERNAGEOMIN. The increase of inspectors may build up the institutional framework of mine pollution in SERNAGEOMIN.

c) Effect for the socio-economy

① Description of the beneficiaries

People affected by the mines and inhabitants around the mines.

② Number of the beneficiaries

・Direct beneficiaries of transferred technology:

39 Engineers and Inspectors of SERNAGEOMIN.

・Direct beneficial group and its number

Inhabitants suffering from environmental impact of abandoned mines.
Number is unknown.

・ Beneficial group after accomplishing the above object and its number
About 50,000 workers related to mineral resources development,

③ Content of the Benefit
Prevention of mine pollution

d) Effects from the technical standpoint

① Number of counterparts
39 engineers and inspectors of SERNAGEOMIN

② Contents of the technology to be transferred

a. Basic knowledge regarding mining pollution
b. Investigation skills for closed and abandoned mines
c. Improved database system for the investigation result
d. Technical measures for mine closing
e. Examining skills for mining pollution
f. Technology for planning pollution protection
g. Technology for assessing environmental impact
h. Technology for chemical analysis and maintenance skills of equipment
I. Technology for data analysis and result evaluation

e) Economical benefits

This is the environmental project, so it is hard to estimate the economic benefits. However, in order to remit the 1% preferential tariff from exported copper to the United States, Chile must explain to the United States that there is no dumping regarding copper production showing they give sufficient consideration of the environment and proper labor laws. This project may help this situation. Moreover, the sustainable development of mining, which is main industry in Chile, is possible by prevention of probable accidents and disease from mine pollution. Under these circumstances, some reasonable economic impacts are expected in the long term.

5) Overall Project justification

Chile is the largest copper producer in the world. The mining industry occupies a big role in its industries and foundation of economic development, which contributes largely to the well being of its people. On the contrary, the abandoned mines have been left unreclaimed and their actual conditions are not understood. So its

environmental burden is estimated to be large. It is important for the Chilean mining industry to deal properly with the environmental problems for its future sound development. Therefore, the project will contribute to this goal, and has broad public benefits.

There are no measures against the environmental risk of the closed and abandoned mines, because there is no detailed information regarding them. The present action for problems of abandoned mines is carried out after the occurrence of some troubles. If a database including risk evaluation would be compiled, priority sites, methods and cost estimations could be determined. It would make a large contribution for making reasonable measures. The technical transfer of closing mines and pollution control would decrease the environmental risk.

In the training of Chilean inspectors for abandoned mines pollution, inspection skills in the environmental and anti-pollution fields, and knowledge and technology concerning "action for closing mines" are needed. "Project on the Institutional Strengthening in the Mining Environmental Aspects" is expected to be accomplished by Japanese inspectors' appropriate instruction regarding "tailings dam", "drainage from mines" and some "new mine safety skills for open pit" based on their long experience.

"Fund for Protection of Mine pollution", which is highly evaluated as an advanced system in the world, was adopted at the working mines in Japan. Chile intends to build basically the same system as Japan, but using a different pooling money method. Application of the fund needs knowledge of evaluation for probable environmental risk and estimation for countermeasure cost that METI of Japan has sufficient knowledge and experience. Therefore, this cooperation is very meaningful.

This project is appropriate considering the serious situation of environmental problems in the Chilean mining industry, and Japanese long experience and accumulation of technology in the environmental field.

7. Annex

・TOR (Terms of Reference) for long-term experts

TOR for Japanese Long-Term Experts

ANNEX

Division in charge: Second technical cooperation div.

Country : Chile

No.	Related ministry	Instruction issue (Down: English / Upper: Spanish)	C/P organization/Place	Result of Study	No. of Experts	Years
	METI	The Institutional Strengthening in Mining Environmental Aspects el Fortalecimiento Institucional de Aspects Anbientals de Mineria	SERNAGEOMIN Capital: Santiago		6	5.0

Time for Despatch	● Dispatch time from		● Dispatch time until		NOTE
	month	in the month	month	in the month	
	Apr. 2002	first 10 days	Dec. 2002	first 10 days	

Background

The Republic of Chile is the largest copper producer in the world and biggest supplier of copper and molybdenum to Japan. Chile has increased steadily its copper production up to 4.38 million tons of metal base in the last 10 years. Both counties have a mutually close relation.

There are many closed and abandoned mines in Chile. However the present Mine Safety Law has no regulations concerning the responsibility to restore closed and abandoned mines. These mines have been left unreclaimed and their actual conditions are not understood. The possibility of environmental impacts is a concern. The draft "Closing Mines Law" was presented in January 2001 to the Ministry of Mining to be legislated around 2004. The mine-closing problems will begin to be solved considering the environment.

Under these circumstances, the improvement of technology for the Chilean Government is urgently needed.

Object of the Dispatch

The SERNAGEOMIN shall add two functions in its mining safety administration, as follows;

① The SERNAGEOMIN shall grasp the situation of operating, closed and abandoned mines including potential environmental impact information by compilation of a database.

②The SERNAGEOMIN shall have the capacity of planning to limit and monitor environmental damage.

Expected Output

① Both countries will complete the initial inputs for the project.
② Basic knowledge spreads out to inspectors regarding mine pollution in the SERNAGEOMIN.
③ Necessary investigation skills for closed and abandoned mines are strengthened in the SERNAGEOMIN.
④ The SERNAGEOMIN has an improved database system from the investigation result.
⑤ The SERNAGEOMIN has technical measures for mines closing.
⑥ The SERNAGEOMIN strengthens its examining skills for mine pollution.
⑦ The SERNAGEOMIN has a capacity for planning pollution protection measures.
⑧ The SERNAGEOMIN strengthens its capacity for assessing the environmental impact.
⑨ The SERNAGEOMIN upgrades its chemical analysis equipment and maintenance skills of the equipment.
⑩ The SERNAGEOMIN has data analysis technology and data evaluation technology.

Activity

①To allocate necessary counterparts and administrative personnel as planned.
②To explain Japanese Mining Law and Regulations concerning mine pollutions as well as examining and investigations method for the mine pollution.
③To instruct investigation skills in each basic factor and extent of its risk in model closed mines sites.
④To establish an improved database system to input the investigation results at each model mine site.
⑤To instruct technical measures to be prepared in each basic factor for future closing of model operating mines.
⑥To instruct investigating skills for mine pollution in each basic factor at model operating mines.
⑦To instruct to make an anti-pollution schedule for closing and cost estimation for model operating mines.
⑧To give technical advice on EIA in SERNAGEOMIN.
⑨To fix chemical analysis equipment, and improve maintenance, sampling and calibration skills with high accuracy.
⑩To establish data analysis and evaluation technology for chemical analysis results.

Qualifications

Age limit	None			Experience	More than 10 years
Academic Career	○ Ph.D. ○ M.S. ◎ B.S. ○ etc.			Other Qualifications	None
Language	1st.	English	required	Language ability level	○a ◎ b ○c ○d
	2nd.	Spanish	desirable		○a ○ b ○c ◎d
	Note				
Other necessary experience					