# ANEXO 3

## LISTA DE PERSONAL INVOLUCRADO EN EL PROYECTO

## ANEXO 3-1

Lista de las Principales Autoridades Chilenas Entrevistadas (del 17 de abril al 12 de mayo de 1995)

**Ministerio Secretaria General de la Presidencia**

| | |
|---|---|
| ANGEL FLISFISCH FERNANDEZ | Subsecretario |

A G C I

| | |
|---|---|
| ENRIQUE SOLER GARRIDO | Exective Director |
| RAUL VERGARA MENESES | Jefe Departamento Cooperacion Horizontal |
| IVAN MERTENS GALLE | Coordinador, Deapartamento de Sectores |
| ENRIQUE O'FARRILL J. | Oficial de Programas |
| OHBA Mistuo | Experto de JICA |

C O N A M A

| | |
|---|---|
| ALEJANDRO COFRE | Director Tecnico |
| LUIS CONTRERAS | Project Coordinator, Biologist |
| CARLOS SALAMANCA | Unidad de E. I. A. |
| MARIE-CLAUDE PLOMER BADIZ | Dpto. Judrico |
| MARCELO HISSLDO CERSS | Dpto. Administracion |
| TITO VILLAR CAMPBELL | Jefe Depto. Computacion |
| ANDRES BENITEZ VEGA | Sistema Nacional de Informacion Ambiente, Geografo |
| REINALDO AVILES | Asesor de Apoyo Sistema Nacional de Infomacion Ambiente |
| JOOST MEIJER | Ing. Quimico, Region Metropolitana |

**COREMA-RM**

| | |
|---|---|
| ROXANA SANGUINETI C. | Coordinadora de Proyectos |
| PEDRO PABLO OYOLA | Consejero, Univ. de Estocolmo |

**Universidad de Chile**

| | |
|---|---|
| JUAN ESCUDERO ORTUZAR | Coordinador del Proyecto, Profesor Asociado, Departmento de Ingenieria Industrial |
| ANDRES VERGARA PRIETO | Subdirector, Direccion de Planificacion |
| PABLO ULRIKSEN | Associate Profesor, Dep. de geofisica |
| JOSE RUTLLANT | Pronostico Potencial de Cont. Atmosf. |
| ANA MARIA SANCHA F. | Profesor Asociado, Departmento de Ingeniera Civil |
| JOSE HERNANDEZ | Profesor Asociado |
| MARGARITA PRENDEZ | Profesor Titular, Fac. Cs Quimicas y Farmaceuticas |
| HERMANN A. MUHLHAUSER | Consultor en Problemas Ambientales |

| | |
|---|---|
| JOSE ARELLANO VAGANAY | Profesor,<br>Departamento de Ingenieria Civil,<br>Seccion Ingenieria Sanitaria |
| EDUARDO SCHALSCHA B. | Catedratico (CENMA) |
| OCTAVIO ESPINZA COLLYER | Grupo Estrategico ATM,<br>Direccion de Informatica |
| RODOLFO LEIVA | Ing. Civil Electronico |

S E S M A

| | |
|---|---|
| MAURICIO ILABACA MARILEO | Director |

**Programa Vigilancia Calidad del Aire**

| | |
|---|---|
| IGNACIO OLAETA UNDABARRENA | Encargado red MACAM |
| YOLANDA SILVA | Coordinadora de Campo |
| EDITH BALCARCE | Laboratorista |
| XIMENA ROSSI | Laboratorista |

**PROCEFF**

| | |
|---|---|
| MARTA ZAMUDIO ARANEDA | Jafe PROCEFF, |
| M. ANGELICA ARELLANO | Organizacion y Evaluacion |
| CLAUDIO RABUCO | Operation Boss |

I N T E C

| | |
|---|---|
| CLAUDIO SIMIAN | Investigader |
| LUIS GUARDAMAGNA S. | Ingentiero Civil Mecanico |

D M C

| | |
|---|---|
| HECTOR MUNOZ MORALES | Meteorologo |

E M O S

| | |
|---|---|
| ALEJANDRO GRILLI DF | Recorsosy Dereckos de Aguas |
| ANA HANRIQUEZ | Ing. Civil Quimico |
| HUMBERTO FLIAS | |
| MARIA JOSEFINA BOLELLI | Gerente de Operaciones |
| ANA MANDIQUEZ | |

**Superintendencia de Servicio Sanitario**

| | |
|---|---|
| RICARDO CIESTI | Ingeniero Quimico |

E M E R E S

| | |
|---|---|
| XIMENA ALEGRIA OLIVOS | Gerente de Operaciones |

**Embajada del Japon**

| | |
|---|---|
| SUGINO Akira | Ambassador Extraordinary and Plenipotentiary |
| KATO | Primero Secretario |
| SHINDO Kanchiko | Segundo Secretario |

**J I C A office**

| | |
|---|---|
| TABUSE Shozo | Representante Residente |
| TAKAHASHI Michiyuki | Sub Representante |
| ISHIHARA Hiroshi | Oficial |
| YAMADA Mami | Asistente Representante |

**C I N C A T E L**

| | |
|---|---|
| SEIICHI SAMUEL ISHII | Jefe de Expertos Japoneses del Proyecto JICA/INACAP |
| KASUHIRO SUZUKI | Coordinador del Proyecto JICA/INACAP |

**I N D I C**

| | |
|---|---|
| PAR IVARSSON | Senior Systems Analyst, System Design and Development |
| LARS GIDHAGEN | |

## ANEXO 3-2

Lista de las Principales Autoridades Chilenas Entrevistadas (del 27 de julio al 4 de agosto de 1995)

| | |
|---|---|
| **A G C I** | |
| ENRIQUE SOLER GARRIDO | Exective Director |
| RAUL VERGARA MENESES | Jefe Departamento Cooperacion Horizontal |
| IVAN MERTENS GALLE | Coordinador, Medio Ambiente |
| ENRIQUE O'FARRILL J. | Oficial de Programas |
| EDUWRDO BUSGUETS | Jefe Departamento Cooperacion Bilateral y Multilateral |
| VIRGINIA MUNOZ LOPEZ | Coordinadora de Programas, Departamento de Cooperacion Bilateral y Multilateral |
| OBA Mitsuo | Experto de JICA |
| **C O N A M A** | |
| VIVIANNE BLANLOT | Executive Director |
| NELLA MARCHETTI P. | Coordinadora Proyect CENMA, Direccion Tecnica |
| HECTOR OLIVO | Coordinador Comunicacions y Particip. |
| ALEJANDRO COFRE | Director Tecnico |
| CARLOS SALAMANCA | Unidad de E. I. A. |
| CARLOS PINO | External Affairs Dpt. |
| TITO VILLAR CAMPBELL | Jefe Depto. Computacion |
| **COREMA-RM** | |
| ROXANA SANGUINETI C. | Coordinadora de Proyectos |
| PEDRO PABLO OYOLA | Consejero, Univ. de Estocolmo |
| **Universidad de Chile** | |
| JAIME LAVADOS | Rector |
| JUAN ESCUDERO ORTUZAR | Coordinador del Proyecto, Profesor Asociado, Departmento de Ingenieria Industrial |
| ANDRES VERGARA PRIETO | Subdirector, Direccion de Planificacion |
| PABLO ULRIKSEN | Associate Profesor, Dep. de geofisica |
| MARGARITA PRENDEZ | Profesor Titular, Fac. Cs Quimicas y Farmaceuticas |
| JOSE ARELLANO VAGANAY | Profesor, Departamento de Ingenieria Civil, Seccion Ingenieria Sanitaria |
| EDUARDO SCHALSCHA B. | Catedratico (CENMA) |
| JULIO dela FUERTE | Asesor Tecnico Equipos Laboratorio |
| HERMANN A. MUHCHAUSER | Professor, |

| | |
|---|---|
| FERNANDO VALENZUELA L. | Consultor Responsable Laboratorios |
| BENIGNO ROCA ISOLA | Proyectos Interiores Sanitarios |

**S E S M A**

| | |
|---|---|
| RICARDO SAN MARTIN CORREA | Jefe Departamento Tecnico |

**Programa Vigilancia Calidad del Aire**

| | |
|---|---|
| IGNACIO OLAETA UNDABARRENA | Encargado red MACAM |

**PROCEFF**

| | |
|---|---|
| MARTA ZAMUDIO ARANEDA | Jafe PROCEFF, |
| CECILIA FERNALDT | Encargada de la Unidad de Auditoria |

**D M C**

| | |
|---|---|
| HECTOR MUNOZ MORALES | Sub-director Climatorocia |
| HORACIO PENA R. | Meteorologo |

**M O P**

| | |
|---|---|
| ULISES RETAMAL C. | Asesoria Minsterial |
| JAVIER OSORIO SEPULVEDA | Jefe Unidad Tecnica Medio Ambiente, Subsecretaria de Obras Publicas |

**D G A**

| | |
|---|---|
| MONICA PARDO P. | Depto. de Conservacion y Proteccion de los Recursos Hidricos |

**E M O S**

| | |
|---|---|
| ALEJANDRO GRILLI DF | Recorsosy Dereckos de Aguas |

**ELECTRICIDAD AMPLIFICACION**

| | |
|---|---|
| LEONARDO CONTRERAS M. | |
| ANDRES CONTRERAS W. | |

**Embajada del Japon**

| | |
|---|---|
| SUGINO Akira | Ambassador Extraordinary and Plenipotentiary |
| SHINDO Kanehiko | Segundo Secretario |

**J I C A office**

| | |
|---|---|
| TABUSE Shozo | Representante Residente |
| OTSUKI Kiyotaka | Jefe Depto. Proyectos |
| MITOMO Norio | |
| TANAKA Kazuko | Coordinadora de JICA Proyecto "CENMA" |

# ANEXO 4

# MINUTES

THE MINUTES OF THE DISCUSSIONS
ON
THE BASIC DESIGN STUDY
ON
THE PROJECT FOR THE EQUIPMENT SUPPLY
AT
THE NATIONAL CENTER FOR THE ENVIRONMENT
IN
THE REPUBLIC OF CHILE

In response to the request from the Government of Chile, the Government of Japan decided to conduct a Basic Design Study on the Project for the Equipment Supply at the National Center for the Environment (hereinafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency (herein after referred to as "JICA").

The JICA sent to the Republic of Chile the Basic Design Study Team (herein after referred to as "the Team"), which is headed by Mr. Hiromi CHIHARA, Senior Development Specialist, Institute for International Cooperation, JICA, and is scheduled to stay in the country from April 17 to May 12, 1995.

The team held discussions with the officials concerned of Chile and conducted a field survey at the study area.

In the course of the discussions and field survey, both parties have confirmed the main items described on the attached sheets. The team will proceed with further works and prepare the Basic Design Study Report.

Santiago, May 2 1995

MR. HIROMI CHIHARA
Leader,
Basic Design Study Team,
JICA

MR. JAIME LAVADOS
Rector,
UNIVERSITY OF CHILE

MR. JOSE GONI C.
Executive Director,
National Commission
for the Environment
(CONAMA), CHILE

Witnessed by:
MR. ENRIQUE SOLER G.
Executive Director,
International Cooperation Agency
(AGCI), CHILE

# ATTACHMENT

1. Objective of the Project

The objective of the Project is to support the activities of the National Center for the Environment (hereinafter referred to as "the CENMA") by means of procuring the equipment and materials being necessary for the proper operation of the CENMA.

2. Project Area

| | |
|---|---|
| Center | : La Reina, Santiago City, |
| Meteorological Stations | : Santiago City and Juan Fernandez Island, |
| Air/Water Pollution Monitoring Stations | : Santiago City. |

3. Responsible and Executing Organizations

(1) The responsible organization for the Project is the National Commission for the Environment (CONAMA).

(2) CONAMA, under specific contracts, will entrust the equipment to CENMA and the relevant authorities who will warrantee its continuous operation and maintenance, and provide CENMA with the generated information.

(3) The Chilean side explained the current status of CENMA as follows:

The bylaws and organization of CENMA, as a non-profit corporation, have been agreed between CONAMA and the University of Chile, and are in process of submission to the Ministry of Justice of Chile. This final approval could be obtained by the end of June 1995.

A Framework Agreement will be signed jointly by CONAMA, University of Chile and CENMA, as soon as the legal status of CENMA is established.

4. The Japan's Grant Aid System

(1) After discussion with the Team, the Government of Chile understood the system of the Japan's General Grant Aid, which is outlined in ANNEX-I.

(2) On condition that the Grant Aid Assistance by the Government of Japan is extended to the Project, the Government of Chile will take necessary measures as described in ANNEX-II for a smooth implementation of the Project.

5. Items Requested by the Government of Chile

After discussions with the Team, the items shown in ANNEX III were finally requested by the Government of Chile. Each item of the equipment and materials has been rated in order of priority considering the following factors:

- affinity with the activities of CENMA
- costs of operation and maintenance
- any specific technical/administrative reason

The rating has been "tentatively" made by classifying each item as follows:

| | |
|---|---|
| Category A | : Requested with Top priority |
| Category B | : Requested with 2nd priority, |
| Category C | : Requested with 3rd priority |

However, the final components of the Project will be decided after further studies.

6. Schedule of the Basic Design Study

(1) The consultants will remain in Chile and proceed with the further study until May 12th.

(2) Based on the minutes of discussions and further studies, JICA will prepare the Draft Basic Design Report and dispatch another mission in July, 1995.

(3) In case that the contents of the Draft Basic Design Report are accepted by the Government of Chile, JICA will complete the Final Report for submission to the Government of Chile. It is safely expected that such a submission would be due by the end of September, 1995.

7. Discussions

7.1 Waste water treatment (WWT) facilities

(1) The WWT facilities will be located at CENMA, adjacent to the laboratory buildings. For the proposed space, refer to ANNEX-IV-1 which shows the conceptual layout of the related facilities.

(2) For the basis of design such as process flow diagram, types of equipment, etc., refer to the technical discussions confirmed separately.

(3) For the assignment of responsibilities regarding the construction of the facilities, refer to ANNEX-IV-2.

7.2 Information system

(1) The information system will basically serve to process the data and information to be generated and collected both at CENMA and the other organizations relevant to the Project. For the detailed design features including the arrangement of hardware in the system and the associating software, refer to the technical discussions confirmed separately.

(2) For the assignment of responsibilities regarding the establishment of the information system, refer to ANNEX-V.

7.3 Air pollution monitoring and meteorological survey equipment

(1) The Chilean side is requested to assign the appropriate site for each station before the end of May, 1995.

(2) Concerning replacement of the equipment at the existing air monitoring stations, further investigation is needed by the Team in relation to current conditions of each instrument.

(3) Concerning the equipment for the meteorological stations, the Chilean side requested the equipment should be selected considering its compatiblity with those of the existing stations.

(4) Concerning the radiosonde station to be set up at Juan Fernandez Island, further investigation should be done in particular as to the additional equipment and materials which may differ depending on the site to be selected for the station main equipment.

(5) Regarding setting up of the air pollution monitoring and meteorological stations, all civil and structural works including design, supply of construction materials and preparation of foundation and installation of the equipment will be borne by the Chilean side.

Supervision during installation, test operation and initial training for operation will be covered by the Grant Aid.

7.4 Water quality assessment

(1) One (1) automatic monitoring station will be located near the intake of the river water of the Vizcachas filtration plant.

(2) To accommodate the monitoring equipment, one (1) small house with air condition, the basic design of which will be specified by the Draft Basic Design Report, will be supplied by the Chilean side.

The connections to/from equipment such as for electricity, telephone lines and city water, if necessary, will be borne by the Chilean side.

(3) Regarding setting up of the water monitoring station at the site, all civil and structural works including design, supply of construction materials and preparation of foundation/base will be borne by the Chilean side.

The installation of the equipment and supervision during installation, test operation and initial training for the operation will be covered by the Grant Aid.

For other details, refer to the discussions confirmed separately.

8. Taxes and duties of equipment

Equipment, and vehicles procured under the Grant Aid will be treated as tax free. All other costs, including IVA, if it is imposed, will be borne by the Chilean side.

ANNEX-I

## Japan's Grant Aid

1. Japan's Grant Aid Procedures

The Japan's Grant Aid Program is executed through the following procedures.

(1) Application ( Request made by a recipient country)
Study ( Basic Design Study conducted by JICA )
Appraisal & Approval ( Appraisal by the Government of Japan and Approval by Cabinet.)
Implementation ( The Notes exchanged between the Government of Japan and the recipient country.)

(2) At the First step, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affirs) to determine whether or not it is eligible for Grant Aid.

If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

At the second step, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

At the third step, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

At the fourth step, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Government of Japan and the recipient country.

2. Basic Design Study

(1) Content of the study

The aim of the Basic Design Study (hereinafter referred to as "the Study") conducted by JICA on a requested project (hereinafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

i) Confirmation of the background, objectives, and benefits of the requested Project and also institutional capacity of agencies concerned of the

recipient country necessary for the Project's implimentation.

2) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid scheme from a technical ,social and economic point of view.

3) Confirmation of items agreed on by both parties concerning the basic concept of the Project.

4) Preparation of a basic design of the Project

5) Estimatation of costs of the Project

The contents of the original request are not necessarily approved in their initial form as the contents of the grant aid project.The basic design of the Project is confirmed considering the guidelines of Japan's Grant Aid scheme.

The Government of Japan requests the Government of recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project.Therefore,the implementation of the Project is confirmed by all relevant organization of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Study,JICA uses (a)registered consultant firm(s).JICA selects (a)firm(s) based on proposals submitted by interested firms.The firm(s) selected carry(ies) out Basic Design Study and write(s) a report,based upon terms of reference set by JICA.

The consulting firm(s) used for the Study is (are) recommended by JICA to the recipient country to also work on Project's implimentation after the Exchange of Notes, in order to maintain technical consistency and also avoid any undue delay in implementation should the selection process be repeated.

3. Japan's Grant Aid Scheme

(1) What is Grant Aid ?

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities,equipment and services ( engineering services and transportation of the products,etc) for economic and social development of the country under principals in accordance with the relevant laws and regulations of Japan.Grant Aid is not supplied through the donation of materials as such.

(2) Exchange of Note (E/N)

The Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objective of the project, Period of execution , conditions and amount of the Grant Aid ,etc., are confirmed.

(3) "The period of the Grant" means the one fiscal year which the Cabinet approves the Project for . Within the fiscal year, all procedures such as Exchange of Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and financial payment to them must be completed.
Hoever in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the grant aid can be further extended for a maximum of one fiscal year at most by mutual agreement betweeen the two Governments.

(4) The Grant is used properly and exclusively for the purchase of products.
Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.
When the two Governments deem it necessary, grant aid may be used for the purchase of the products or services of a third country.
However the prime contractors, namely, consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanse nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

(5) Necessity of the " Verification ".
The government of the recipient country or its designated authority will conclude contracts in Japanese yen with Japanese nationals.
Those contracts shall be veified by the Government of Japan. The "verification" is deemed necessary to secure accountability to Japanese taxpayers.

(6) Undertaking required of the Government of recipient country.
In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

1) To secure land necessary for the sites of the Project and clear, level and reclaim the land prior to commencement of the construction.
2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the site.
3) To secure buildings prior to the procurement in case the installation of the equipment.

4) To ensure all the expenses and prompt execution for unloading , customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.

5) To exempt Japanese nationals from customs duties , internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.

6) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therin for the performance of their work.

(7) "Proper Use"

The recipient country is required to maintain amd use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

(8) " Re-Export "

The products purchased under the Grant should not be re-exported from the recipient country.

(9) Banking Arrangement ( B/A )

1) The government of the recipient country or its designated authority should open an account in the name of Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank") The Government of Japan will execute the Grant Aid by making payments in Japanese Yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the verified contracts.

2) The payment will ~~be~~ made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the government of the recipient country or its designated authority.

ANNEX-II

## NECESSARY MEASURES TO BE TAKEN BY GOVERNMENT OF CHILE IN CASE JAPAN'S GRANT AID IS EXTENDED.

1. To provide data and information necessary for the Project.

2. To secure land necessary for the sites of the Project.

3. To clear, level and reclaim the land prior to the installation of the equipment.

4. To bear the commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

5. To ensure prompt customs clearance and internal transportation therein of the products purchased under the Grant Aid.

6. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Chile with respect to the supply of the products and services under the verified contracts.

7. To provide Japanese nationals, whose services may be required in connection with supply of products and services under the verified contracts, such facilities as may be necessary for their entry into Chile and stay therein for the performance of their work.

8. To assign as scheduled necessary staff and to ensure the budget necessary for the proper operation and maintenance of the equipment.

9. To use the equipment properly and effectively for the purpose of the Project.

10. To bear all the expenses other than those covered by the Grant Aid necessary for the execution of the Project.

ANNEX III ITEMS REQUESTED FOR THE CENMA PROJECT
UNDER THE GRANT AID SCHEME

Equipment for the Information System (1)

| Description | Quantity | Priority |
|---|---|---|
| 1. MAIN LOCAL NETWORK<br>For technological development and applications | | A |
| 1. Work Station Network Server<br>Network operational control; share database administration; communication with other external networks | 1 | |
| 2. Work Station for Monitoring Stations<br>Automatic data reception from monitoring network stations (air quality, meteorological, water quality), with communication equipment, telephone line and modem | 1 | |
| 3. Cellular phones with solar cells panel and batteries for meteorological stations<br>Cellular - data logger interface | 1 | |
| 4. Software (acquisition / validation / information display) | 1 | |
| 5. 486 PC or higher Data Input | 1 | |
| 6. Scanner<br>Manual data entry (digitalization and printed documents transfer) | 1 | |
| 7. Work Station Image & Map Input | 1 | |
| 8. Digitizer Table<br>Maps and graphics documents entry | 1 | |
| 9. Work Station Data Base Server<br>Database file system (meteorology, air quality, water quality, solid residues, geographic information, others)<br>2.4 G Bytes hard disk | 1 | |
| 10. Work Station Meteorology & Air Quality Modelling<br>20 M FLOPS, 2.4 G Bytes hard disk | 1 | |
| 11. X Terminal | 2 | *1 |
| 12. Tape Drive Unit (Hexa byte) | 1 | |
| 13. Work Station GIS<br>Geographic information service development<br>(With big resolution monitor) | 1 | |
| 14. 486 PC or higher Data Processing<br>For data processing and other project equipments | 4 | *1 |
| (continue) | | |

*1 Numbers of the equipment may be reduced after evaluation.

Equipment for the Information System (2)

| Description | Quantity | Priority |
|---|---|---|
| 15. CD-ROM Unit<br>Lecture of available information on CD-ROM (environmental databases, bibliography, images. etc.) | 1 | |
| 16. Removable hard disk unit (Read / Write optic disk or similar)<br>Information backup on magnetic media; network support | 1 | |
| 17. Laser printers<br>Network printer service | 2 | |
| 18. Plotter<br>Map printer (connected to one PC or WS) | 1 | |
| 2. REGIONAL LOCATED COMPUTATIONAL EQUIPMENT<br>For environmental information development system | | B |
| 1. 486 PC or higher<br>(Communication through modem with CENMA network) | 1 | |
| 3. CONAMA AND COREMA-RM LOCATED EQUIPMENT | | A |
| 1. Basic Work Station | 2 | |
| 4. MACAM NETWORK SUPPORT | | A |
| 1. Work Station with communication equipment | 1 | |
| 2. X Terminal or PC | 4 | *1 |
| 3. Software | 1 | |
| 4. Laser printer | 1 | |
| 5. SOFTWARE | | A |
| 1. Database administration (10 users) | 10 | |
| 2. Programming language, T, Pascal, C, FORTRAN (4 users) | 4 | |
| 3. Network administration and communications (1 user) | 1 | |
| 4. Graphic software (4 users) | 4 | |
| 5. Software for scanner and writing recognition (texts) and photographs handling (1 user) | 1 | |
| 6. Geographic information service (3 users) | 3 | |
| 7. Word-processor and spread-sheets (20 users) | 20 | *1 |

*1 Numbers of the equipment may be reduced after evaluation.

Assessment and Monitoring Field Equipment (1)

| Description | Quantity | Priority |
|---|---|---|
| **6. METEOROLOGICAL NETWORK FOR AIR POLLUTION IN THE METROPOLITAN REGION** | | A |
| 1. Full meteorological stations; | 5 | |
| 1-1 Sensors for wind, temperature, humidity, solar radiation, pressure, rainfall | | |
| 1-2 Data-logger for data processing and storage in solid state memory | | |
| 1-3 Battery and solar panel power supply | | |
| 1-4 Modem to connect by telephone (normal line or cellular) to CENMA computer | | |
| 2. Simple meteorological stations; | 5 | |
| 2-1 Sensors for wind, temperature and humidity Others features similar to full meteorological stations | | |
| 3. Atmospheric sounding system for boundary-layer measurements, using captive balloons and sonde (to be used in or near Santiago city) Complete system includes ground station, captive balloons, captive sondes, winch and consumable goods, includes one automatic theodolite for balloon tracking | 1 | |
| 4. Balloons, sondes, hydrogen gas, nocturnal lights, etc. for 300 free ascents. | 300 | (C) |
| 5. Acoustic sounder, Doppler type, with RASS for continuous measurements of wind and temperature vertical profiles (to be installed in or near Santiago city). | 1 | |
| 6. Complete radiosonde station for upper air measurements (to be installed in Juan Fernandez Island) | 1 | *2 |
| 7. Unit parts | | |
| 7-1. Baloons, sonde, gas, etc for 350 soundings. | 350 | |
| 7-2. Baloons, sonde, gas, etc for 650 soundings. | 650 | (C) |
| **7. AIR POLLUTION BY STATIONARY SOURCES** | | A |
| 1. Complete isokinetic samplers to measure particulate matter in ducts | 1<br>1 | <br>(B) |
| 2. "In situ" particle size distribution measurement equipment for ducts | 1<br>1 | <br>(B) |
| 3. Full rack to monitor gases: CO, CO2, O2, SO2, NOx and Ox | 2<br>1 | <br>(C) |

*2 One(1) set of wind direction and velocity sensor will be included. The power supply required for operation of the equipment will be secured by the Chilean side.

Assessment and Monitoring Field Equipment (2)

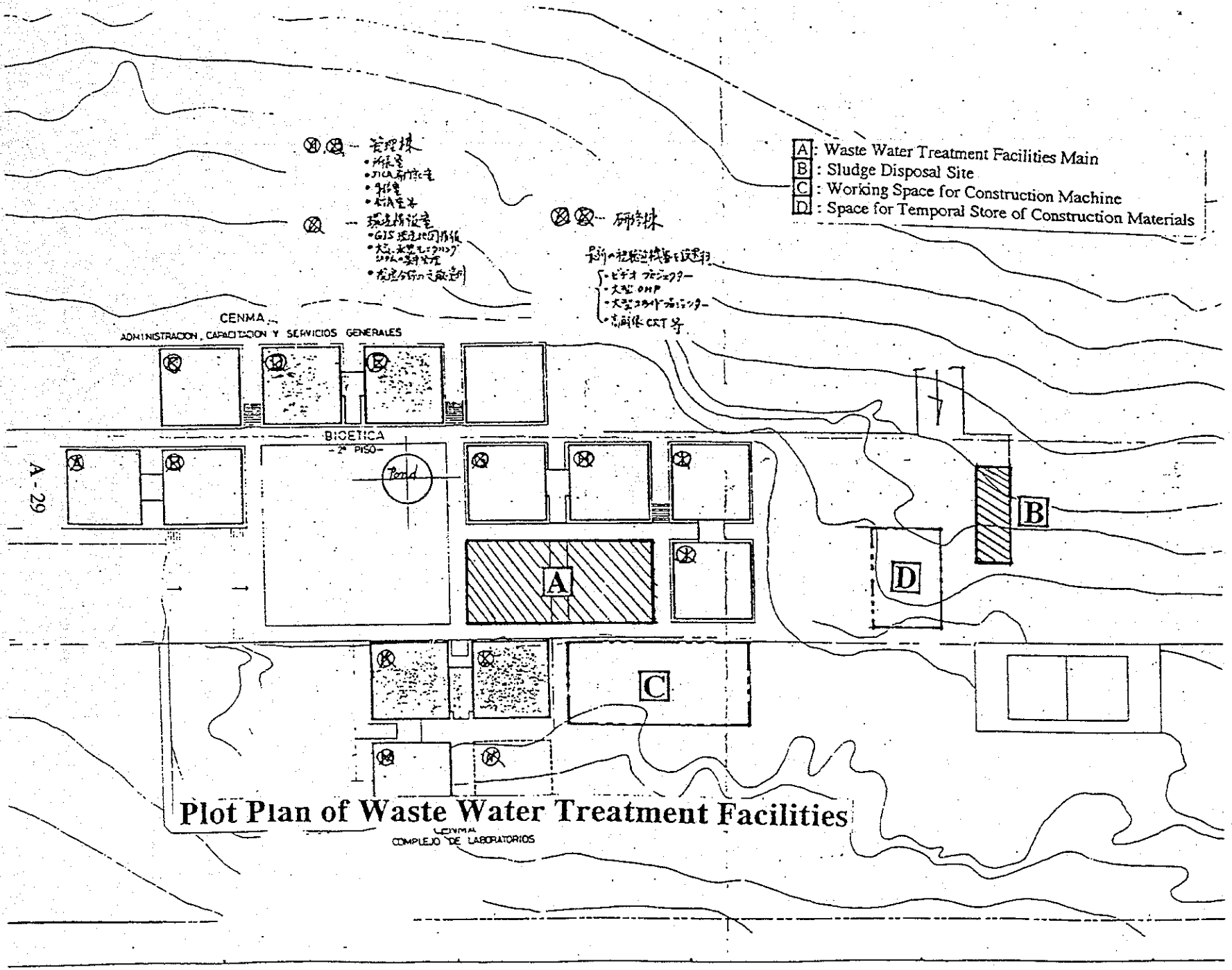
| Description | Quantity | Priority |
|---|---|---|
| 8. MONITORING NETWORK FOR AIR POLLUTION | | A |
| 1. Stationary stations for gases and particles to complement existing network in Santiago<br>Each network should have: | 3 | |
| 1-1 Instrument cabin, able to accommodate monitors, auxiliary equipment, gas bottle storage area, computer and work site, internal electric connections, internal temperature regulation, facilities to take particles and gases sampler, doors opening control and alarm system for cabin protection | | |
| 1-2 Gases and particle samplers system | | |
| 1-3 Continuous monitor of SO2 | | |
| 1-4 Continuous monitor of NO-NO2-NOx | | |
| 1-5 Continuous monitor of CO | | |
| 1-6 Continuous monitor of O3 | | |
| 1-7 Continuous monitor of organic gaseous compounds (NMHC-THC) | | |
| 1-8 Continuous monitor of particles (PM10), TEOM type | | |
| 1-9 Multiple gases calibrator | | |
| 1-10 Cylinders of zero gas and standard gas | | |
| 1-11 Meteorological equipment for wind, temp. and humidity measure | | |
| 1-12 Control and automatic data collection (datalogger processor type) | | |
| 1-13 PC for programming data entry, display, capture and transmission of information | | |
| 1-14 Spair parts for three years continuous operation | | |
| 2. Non stationary (transportable) gases and particles stations for evaluations on specific sites<br>Similar characteristics of stationary station, placed on rolling-cabins, to be hauled by a motor vehicle | 1<br>1 | (B) |
| 3. Replacement of obsolescent equipment, existing MACAM stations<br>Complete sets of monitors and complementary equipment similar to the fixed stations | 5 | |
| 9. AIR QUALITY MONITORS & EQUIPMENT FOR SPECIAL SAMPLES | | A |
| 1. Continuous PM10 monitor (TEOM) with enclosure | 2 | |
| 2. Continuous PM10 monitor (TEOM) with enclosure, participle sampler for chemical analysis and data transmission | 2 | |
| (continue) | | |

Assessment and Monitoring Field Equipment (3)

| Description | Quantity | Priority |
|---|---|---|
| 3. High volume sampler (PM10) | 3 | |
| 4. Dicotomic PM10, PM5 sampler | 4 | |
| 5. Cyclonic sampler of low flux for particles lower than 7 $\mu$m | 1 | |
| 6. Continuous monitor for PM10 with cyclonic pre-separator for particles higher than 10 $\mu$m, with filter for those lower than 10 $\mu$m | 1 | (B) |
| 7. Eight step cascade impactor for PM3, personal | 1<br>1 | <br>(B) |
| 8. Personal PM10 ( 4 to 10 lts. 0.001 per min.), with stop at 2.5 $\mu$m, allowed by filter regulation | 2 | (B) |
| 9. Continuous monitors for SO2, NOx (NO, NO2), CO, O3, non-methane total hydrocarbons, H2S, formaldehyde and benzene and toluene (one each) | 8 | |
| 10. COMPLEMENTARY EQUIPMENT FOR STATION SERVICING | | A |
| 1. Digital oscilloscope | 1 | |
| 2. Portable current and voltage recorder | 1 | |
| 3. Voltage and current portable calibrator | 1 | |
| 4. Complete tester (i.e. Fluke 97 ) | 1 | |
| 5. Power supply (i.e. Kenwood ) | 1 | |
| 6. Instrumentation tools and handcase | 2 | |
| 7. Ozone photometer, primary (i.e. Monitor Labs 9811) | 1 | |
| 8. Ozone photometer, transfer standard (i.e. Monitor Labs 9811 ) | 1 | (C) |
| 11. WATER QUALITY ASSESSMENT | | A |
| 1. pH/mV meter (portable) | 3 | |
| 2. Turbidity meter (portable) | 2 | |
| 3. Conductance meter (portable) | 3 | |
| 4. Dissolved oxygen/temperature meter (portable) | 3 | |
| 5. Water analysis test kits | 2 | |
| 6. Portable sampling pumps | 2 | |
| 7. Composite sampler | 8 | |
| 8-1. Automatic monitoring stations water quality (basic parameters) | 1 | |
| 8-2. Automatic monitoring stations water quality (basic parameters) | 1 | (B) |
| 12. TELEMATIC WATER SYSTEM | | A |
| 1. Telematic water system | 1 | |

Vehicles and Residues Treatment Plants

| Description | Quantity | Priority |
|---|---|---|
| 13. VEHICLES | | |
| 1. Vehicle for Executive Direction | 1 | C |
| 2. Minibus for 8 persons (Central Units) | 1 | B |
| 3. Pick-up, double cabin, 4WD (Central Units) | 1 | C |
| 4. Pick-up, double cabin, 4WD (Monitor stations) | 1 | A |
| | 1 | B |
| | 1 | C |
| 5. Pick-up, double cabin, 4WD (Laboratories) | 1 | C |
| 6. Utilitarian vehicle, coordination support | 1 | B |
| | 1 | C |
| 7. Mini-track with lift | 1 | A |
| 14. RESIDUES TREATMENT PLANTS | | |
| 1. Waste water treatment facilities | 1 | A |




**Plot Plan of Waste Water Treatment Facilities**

ANNEX-IV-2

## Demarcation of Construction Work Implementation for Waste Water Treatment Facilities

| No. | Items | Covered by Japanese grant | Covered by Chile side | Remarks |
|---|---|---|---|---|
| 1 | Designing | | | |
| | Basic planning of the facilities | * | | |
| | Detail design for mechanical equipment | * | | |
| | Detail design for pipings | * | | |
| | Detail design for electrical equipment and instruments | * | | |
| | Input data and information for civil and architectural works | * | | |
| | Site and underground condition survey | | * | |
| | Detail design & tender documents for civil and architectural works | | * | |
| 2 | Mechanical works | | | |
| | Supply of equipment and materials | * | | |
| | Field fabrication and installation of equipment and materials | * | | |
| | Paintings at site | * | | |
| | Site inspection | * | | |
| 3 | Piping works | | | |
| | Supply of piping materials including pipe stanchion/supports | * | | |
| | Field piping work within the WWT site | * | | |
| | Waste water piping outside the WWT site such as: | | * | |
| | Waste water inlet pipes, | | | |
| | Treated discharge pipes to water course, | | | |
| | Water supply pipes. | | | |
| 4 | Electrical and instrument works | | | |
| | Supply of equipment and materials within the WWT site | * | | |
| | Installation of electrical and instrument equipment within the site | * | | |
| | Field cabling work within the WWT site | * | | |
| | Electrical distribution line to the site and transformer, if any | | * | |
| | Telephone system | | * | |
| 5 | Civil and architectural works | | | |
| | Clear, level and reclaim the WWT site | | * | |
| | All field works including supply of materials and equipment for: | | * | |
| | Concrete-made tanks, | | | |
| | Buildings | | | |
| | Concrete foundations | | | |
| | Gate and fence | | | |
| | Road including the temporary road for construction work | | | |
| | Drainage | | | |
| | Furniture | | | |
| 6 | Start-up operation | * | | |
| 7 | Supervision during site works | * | | |
| 8 | Training for operators | * | | |

Remark : (1) The special items in the waste water facilities are listed on this table.
Other general items are demarcated in accordance with JICA's general terms.
(2) The WWT site stand for the area to be defined around the waste water treatment facilities.

ANNEX－V

# Demarcation of Development for Information System

| No | Items | To be coverd by Grant Aid | To be covered by Chile side |
|---|---|---|---|
| | **CENMA, Information Center** | | |
| 1 | To provide facilities for the information center | | |
| | a. OA furniture | | * |
| | b. Air conditioner | | * |
| 2 | To provide electricity / telephone lines | | * |
| 3 | Establishment of a local area network (LAN) in the Center | | |
| | a. Preparation of LAN cables, bridge, hub, etc. | * | |
| | b. Construction and installation | | * |
| 4 | Data telemetry unit and software for data collection from meteorological stations | * | |
| 5 | Data transmission software except for data collections (communication with external organizations) | | * |
| 6 | Preparation of softwares | | |
| | a. Basic and packaging softs for program developing. | * | |
| | b. Development of application soft for various fields | | * |
| | c. Design and building up of various kind of databases | | * |
| | **MACAM and Other Sites** | | |
| 1 | To provide facilities (e.g. OA furniture and air conditioner | | * |
| 2 | To provide electricity / telephone lines | | * |
| 3 | Data telemetry unit and software for data collection from air monitoring stations | * | |

**THE MINUTES OF THE DISCUSSIONS**
**ON**
**THE BASIC DESIGN STUDY**
**ON**
**THE PROJECT FOR THE EQUIPMENT SUPPLY**
**AT**
**THE NATIONAL CENTER FOR THE ENVIRONMENT**
**IN**
**THE REPUBLIC OF CHILE**

**(EXPLANATION ON DRAFT REPORT OF BASIC DESIGN STUDY)**

In April 1995, the Japan International Cooperation Agency (JICA), dispatched the Basic Design Study Team to the Republic of Chile on the Project for the Equipment Supply at the National Center for the Environment (hereinafter referred to as "the Project"), and through discussions, field surveys and technical examinations in Japan, JICA has prepared the Draft Report of Basic Design Study of the Project.

In order to explain and to consult with the Government of the Republic of Chile on the content of the Draft Report of Basic Design Study, JICA sent to the Republic of Chile a study team (hereinafter referred to as "the Team"), which is headed by Mr. Hiromi CHIHARA, Senior Development Specialist of JICA, from July 27 to August 4, 1995.

As a result of the discussions between the Team and officials concerned of the Government of the Republic of Chile, both parties confirmed the main items as described on the attached sheets.

Santiago, August 4, 1995

Mr. HIROMI CHIHARA
Leader,
Basic Design Study
Team,
JICA

Mr. JAIME LAVADOS
Rector,
University of Chile,
CHILE

Ms. VIVIANNE BLANLOT
Executive Director
National Commission
for the Environment,
(CONAMA), CHILE

Witnessed by:

Mr. ENRIQUE SOLER
Executive Director,
International Cooperation Agency,
(AGCI), CHILE

## ATTACHMENT

1. Contents of the Draft Report of Basic Design Study of the Project

The Government of the Republic of Chile has agreed and accepted in principle the content of the draft report of Basic Design Study of the Project proposed by the Team. However, the final number and technical specifications of each equipment for the Project will be formally decided in Japan.

2. The Japan's Grant Aid System

(1) The Government of the Republic of Chile understood the Japan's grant aid system which was explained by the Team.

(2) Under the condition that the Grant Aid Assistance by the Government of Japan is extended to the Project, the Government of the Republic of Chile will take the necessary measures as described in ANNEX-I, for the smooth implementation of the Project.

3. Schedule of the Basic Design Study

JICA will complete the final report of the Basic Design Study of the Project as result of the discussions confirmed herein, and send it to the Government of Chile around October, 1995.

4. Other Issues

4.1 Legal establishment of CENMA (National Center for the Environment)

The Chilean side explained the current status of the establishment of CENMA with procedures and schedule as follows:

As of July 28th, all the necessary administrative and legal procedures within the University of Chile, and successively within CONAMA, have been completed for it's submission to the Ministry of Justice. However, for reasons of the inter-ministerial administrative procedures yet to be followed, another 30 to 40 days will be needed before the final approval is obtained from the Ministry of Justice. So that CENMA will be legally established by the ministerial decree or ordinance of the Ministry of Justice before September 15th, 1995, and accordingly, the establishment of CENMA will be announced in the official gazette. A copy of this decree or ordinance will be forwarded to the JICA office in Santiago.

In the meantime, "the Technical Unit", tentatively organized within the University of Chile, will practically proceed with the necessary tasks to be done by CENMA, such as soliciting the bids for the renovation of the CENMA building.

4.2 Schedule of the renovation of the CENMA buildings and the other civil and buildings works

(1) The Chilean side explained that the detailed design for renovation of the CENMA buildings has been almost completed and already delivered to the potential local contractors, who were invited to the site from July 31st on.

The Chilean side ensured that the renovation works would be commenced in mid August, completing without delay the administration buildings and laboratory buildings in March, 1996.

(2) The Team emphasized that, under the condition that the Grant Aid Assistance by the Government of Japan is extended to the Project, the civil and building works will be completed, being ready for the installation of the waste water treatment equipment by mid October, 1996, so that the system will be operationally tested and handed over to the Chilean side by February, 1997. Accordingly, the Chilean side compromised to meet these target dates.

The Team stressed that the above target dates of the handing over of all the grant aid items must be closely observed, since all the grant aid procedures for the Project should be administered with the relevant authorities by the end of March, 1997, namely within the 1996 Japanese fiscal year.

Further, the Team stated that the civil and building works for installation of the other equipment, such as air monitoring stations, automatic water monitoring station, should be completed in time at each site designed of the Project.

Special attention will be given by the Japanese side in order to give priority to the provision as soon as possible of the air monitoring equipment.

4.3 The budget and staff allocation to CENMA and to the other relevant institutions

The Chilean side confirmed the following:

The budget necessary for initiating activities of CENMA has already been secured by CONAMA under the 1995 fiscal year budget. The staffing of CENMA will start progressively from September on, approximately. Further, a local consultancy will be employed from October to December 1995, in order, among others, to establish the operational procedures and administrative mechanism of CENMA.

The budget necessary after fiscal year 1996 for the operation and equipment maintenance of CENMA and other relevant institutions, shall also be secured by CONAMA, as the governmental representative responsible for the Project.

The Team proposed an estimated staff and budget necessary for the Project (as shown in ANNEX-II), for consideration of the Chilean side.

4.4 The agreement between CONAMA and the other relevant institutions

Through mutual letters of understanding, which will be signed by the end of September 1995, CONAMA will entrust the equipment to CENMA and to the other relevant institutions, who, by their part, will guarantee it's continuous operation and maintenance, and provide CENMA with the generated information.

These agreements will cover at least the following points:

* to specify the role and responsibility of CONAMA and each of the relevant institutions
* to secure yearly budgets for operation and maintenance of the equipment
* to secure access to the data and information required for the activities of CONAMA and CENMA.

4.5 Technical discussions

(1) The splitting of the work responsibility between the Japanese and the Chilean sides was clarified and defined generally for both the initial investment and operation/maintenance of the equipment necessary for the Project.

(2) The Chilean side confirmed that by the end of September, 1995, the letter of consent of the land-owner or the Municipality for the use of the space and land for the Project, such as for air pollution monitoring and meteorological stations, would be obtained. A copy of this letter should be submitted to JICA office.

(3) The Chilean side noticed that, due to general slack in work activities during the Chilean vacation time, from December to January, the intensive work should better be scheduled to avoid this period.

The Japanese side will consider this situation, in such cases as the installation and delivery of the equipment.

(4) The detailed design for the renovation of infrastructure for the information system, such as the allocation of the equipment to each room, is yet to be completed by the Chilean side.

(5) The Japanese side recommended that the information network, specially LAN and WAN, should be managed under a single responsibility organized within CENMA, for their proper functioning.

(6) The Chilean side reiterated their desire that the equipment necessary for the analysis of water quality be provided for supervision of water pollution possibly caused by industrial activities upstream the Mapocho river. Since an automatic water monitoring system is either not existent or not technically compatible to the purpose of DGA-MOP, 10 sets of automatic samplers and 3 sets of water quality

sensors instead, may better be specified.

After a joint visit to the sites, in order to investigate the necessity and the type of this equipment, the Japanese side requested the Chilean side (DGA-MOP) to prepare the necessary technical data and information for submission to JICA office by August 11th, 1995.

The final decision regarding the above will be made in Japan, based on the information received, and will inform back to the Chilean side by the end of August, 1995.

(7) The Chilean side requested the Team to study the possible inclusion of an additional vehicle (minibus for 8 to 12 persons) for extension, training, field visits and research purposes of CENMA.

**ANNEX-I**

**NECESSARY MEASURES TO BE TAKEN BY THE GOVERNMENT OF THE REPUBLIC OF CHILE UNDER THE CONDITION THAT THE JAPAN'S GRANT AID IS EXTENDED**

1. To provide the Japanese side with the data and information necessary for the implementation of the Project.

2. To complete the civil and building works of CENMA and for the other relevant institutions, prior to the installation of the equipment purchased under the grant aid system (see attachment 4.2).

3. To provide facilities for distribution of electricity, water supply and drainage and other facilities for the execution of the Project.

4. To secure land and space necessary for the installation of the equipment and provide enough space for storage yard for the equipment.

5. To clear, level and reclaim the land prior to the installation of the equipment.

6. To bear the commissions of the Authorization to Pay (A/P) and the commission of banking services to the authorized foreign exchange bank in Japan, based upon the Banking Arrangement (B/A).

7. To ensure prompt unloading and custom clearance at the port of disembarkation in the Republic of Chile, and internal transportation therein of the products purchased under the grant aid.

8. To accord Japanese nationals, whose services may be required in connection with the supply of the products and services under the verified contracts, such facilities as may be necessary for their entry into the Republic of Chile and stay therein for the performance of their work.

9. Within the framework of the Agreement on Technical Cooperation between the Government of Japan and the Government of the Republic of Chile of 1978 and also of the Exchange of Notes of the Project to be signed by the two Governments, to exempt Japanese nationals involved in the Project from custom duties, internal taxes including the aggregated value tax (AVT) and other fiscal levies, which may be imposed in the Republic of Chile with respect to the supply of products (vehicles, equipment and materials) and the services under the verified contracts. Or to bear these taxes if they are imposed.

10. To assign necessary staff as scheduled and to ensure the necessary budget for the proper operation and maintenance of the equipment purchased under the grant aid (see attachment 4.3).

11. To use the equipment properly and effectively for the purpose of the Project.

12. To bear all the expenses other than those to be borne by the grant aid, necessary for the execution of the Project.

13. To destinate efforts and resources in order to promote and divulgate among the regional and national community the activities and results of the Project, mentioning the valuable and important technical and financial cooperation received from the Japanese Government.

# ESTIMATED STAFF BUDGET NECESSARY FOR THE PROJECT



| Institutions | Equipment | Code | Initial expenses (US$) | Operation & Maintenance | |
|---|---|---|---|---|---|
| | | | | Number of personnel | Maintenance cost (US$/year) |
| SESMA (MACAM) | Automatic Air Pollution Monitoring | H, I | Site preparation<br>Base 3.000<br>Telephone 2.100 | 13<br>(actual + 5) | **355.000 Total**<br>50.000 (1)<br>100.000 (2)<br>40.000 (3)<br>25.000 (4)<br>50.000 (5)<br>90.000 (6) |
| SESMA (MACAM) | MACAM support equipment | D | – – | – – | **19.300 Total**<br>6.000 (1)<br>6.300 (2)<br>7.000 (3) |
| Department of Meteorology, CHILE | Upper layer measurements (in Juan Fernández Is.) | F3 | Total 15.535<br>Office repairing, Warehouse, Power line | +1 | **68.000 Total**<br>12.000 (1)<br>56.143 (2), (incl. Sonde)<br>35.000 (6) |
| EMOS (Operation Management) | Automatic Water Monitoring Station | K | Total 60.000<br>Building work, Piping work Cabling | 2<br>(actual +0.2) | **29.400 Total**<br>4.800 (1)<br>18.000 (2)<br>6.600 (3)<br>40.000 (6) |
| SESMA – PROCEFF | Stationary source measurement | G | – – | 1 | 8.400 (1)<br>3.500 (2)<br>12.000 (6) |
| CENMA (Operation of Monitoring Stations) | Meteorological observation on the ground | F1 | Fence 11.000 | 1 | 8.400 (1)<br>10.000 (6) |
| CENMA (Operation of Monitoring Stations) | Boundary-layer measurement | F2 | Warehouse 10.000<br>Shelter for acoustic sounder 10.000 | 2 | **99.560 Total**<br>11.000 (1) for study<br>6.560 (2) cost only<br>400 (3)<br>11.600 (4)<br>70.000 (6)<br>20.000 Sonde |

(1) : Personnel expenses
(2) : Spare parts and consumable cost
(3) : Electric, telecommunication and water
(4) : Vehicle and office charge
(5) : Comission and insurance charge
(6) : Depreciation and replacement fund

| Institutions | Equipment | Code | Initial expenses (US$) | Operation & Maintenance | |
|---|---|---|---|---|---|
| | | | | Number of personnel | Maintenance cost (US$/year) |
| CENMA (Air Laboratory) | Workplace and special environment samplers | J | – – | 2 | 10.000 (2)<br>20.000 (6) |
| CENMA (Liquid Laboratory) | Water quality meter | K | – – | 2 | 10.000 (6) |
| CENMA (Planning and Information Unit) | Information system equipment for CENMA Information Center | A,E | Telephone line 2.150<br>Optic fiber connection 20.000 | 2 | **203.000 Total**<br>72.000 (1)<br>22.000 (2)<br>11.000 (3) (*)<br>48.000 (5)<br>50.000 (6) |
| CENMA | Waste water treatment | M | 144.200<br>Civil and construction work | 4 (actual 1.6) | **72.300 Total**<br>33.500 (1)<br>3.800 (2)<br>1.200 (3)<br>33.800 (6) |
| CENMA | Vehicles | L | 36.000 | 4 | 15.000 (4) |
| CONAMA | Information equipments for CONAMA | B, C | 1.460<br>Telephone line | – – | **8.100 Total**<br>5.600 (3)<br>2.500 (5) |
| COREMA – RM | Information equipments for COREMA – RM | B, C | 490<br>Telephone line | – – | **3.100 Total**<br>1.900 (3)<br>1.200 (5) |

(*) Does not include communication costs between automatic remote monitoring station and CENMA, and operational costs of ATM network.

(1) : Personnel expenses
(2) : Spare parts and consumable cost
(3) : Electric, telecommunication and water
(4) : Vehicle and office charge
(5) : Comission and insurance charge
(6) : Depreciation and replacement fund

# ANEXO 5

## CUADRO COMPARATIVO DE LISTA SOLICITADA Y EL BORRADOR DEL DISENO BASICO

# Comparison of Equipment and Machinery in Basic Design and Chilean Request

| Chilean Request in Minutes of Meeting | | | | Basic Design | | | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Item | Description | Q'ty | Priority | Code No. | Description | Q'ty | Evaluation | |
| 1 | **MAIN LOCAL NETWORK**<br>For technological development and applications | | A | A | **MAIN LOCAL NETWORK**<br>For technological development and applications | | | |
| 1. | Work Station Network Server<br>Network operational control: share database administration: communication with other external networks | 1 | | A-1 | Personal Computer (Network Server) | 1 | × | PC for network server is deleted, because function of network management is covered by the other workstations. |
| 2. | Work Station for Monitoring Stations<br>Automatic data reception from monitoring network stations (air quality, meteorological, water quality), with communication equipment, telephone line and modem | 1 | | A-2<br>A-3 | Workstation (Monitoring Stations)<br>Modem | 1<br>1 | ○<br>○ | |
| 3. | Cellular phones with solar cells panel and batteries for meteorological stations<br>Cellular - data logger interface | 1 | | | → Included in F1-1 | | | These items are included in F1-1 as accessories of meteorological monitoring station. |
| 4. | Software (acquisition / validation / information display) | 1 | | A-4 | Software (Air & Meteorological Monitoring) | 1 | ○ | Software of water quality monitoring is included in K-4. |
| 5. | 486 PC or higher Data Input | 1 | | A-6 | Personal Computer (Data Input) | 1 | ○ | |
| 6. | Scanner<br>Manual data entry (digitalization and printed documents transfer) | 1 | | A-7 | Image Scanner | 1 | ○ | |
| 7. | Work Station Image & Map Input | 1 | | A-8 | Workstation (Image & Map Input) | 1 | ○ | |
| 8. | Digitizer Table<br>Maps and graphics documents entry | 1 | | A-9 | Digitizer (for WS) | 1 | ○ | |
| 9. | Work Station Data Base Server<br>Database file system (meteorology, air quality, water quality, solid residues, geographic information, others)<br>2.4 G Bytes hard disk | 1 | | A-10 | Workstation (Data Base Server) | 1 | ○ | CD-ROM unit is included. |
| 10. | Work Station Meteorology & Air Quality Modelling<br>20 M FLOPS, 2.4 G Bytes hard disk | 1 | | A-11 | Workstation (Meteorology & Air Quality Modelling) | 1 | ○ | Essential item for a simulationmodelling by Project-type Technical Cooperation of Japan. |
| 11. | X Terminal | 2 | *1 | A-12 | X terminal | 2 | ○ | X Terminals are required as several officers and experts will use the function of A-11 item. |
| 12. | Tape Drive Unit (Hexa byte) | 1 | | A-13 | Tape drive unit | 1 | ○ | |

*1) ; Numbers of the equipment may be reduced after evaluation

| Chilean Request in Minutes of Meeting | | | | Basic Design | | | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Item | Description | Q'ty | Priority | Code No. | Description | Q'ty | Evaluation | |
| 13. | Work Station GIS<br>Geographic information service development<br>(With big resolution monitor) | 1 | | A-14 | Workstation (GIS) | 1 | ○ | |
| 14. | 486 PC or higher Data Processing<br>For data processing and other project equipments | 4 | *1 | A-15 | Personal Computer (Data Processing) | 4 | ○ | Four PCs are estimated to be used simultaneously as the terminal by visitors. |
| 15. | CD-ROM Unit<br>Lecture of available information on CD-ROM<br>(environmental databases, bibliography, images, etc.) | 1 | | | → Included in A-10 | | | As optional accessory of A-10 (Workstation) |
| 16. | Removable hard disk unit (Read / Write optic disk or similar)<br>Information backup on magnetic media: network support | 1 | | A-16 | MO disk unit | 1 | ○ | |
| 17. | Laser printers<br>Network printer service | 2 | | A-17 | Laser printer | 2 | ○ | |
| 18. | Plotter<br>Map printer (connected to one PC or WS) | 1 | | A-18 | Plotter | 1 | ○ | |
| | | | | A-19 | Personal Computer (Regional Use) | 6 | × | The objective is not clear, and effectiveness is thought to be small. |
| | | | | A-20 | UPS | 6 | ○ | In view of reliability of electricity conditions in Chile (voltage fluctuation and black out), UPS is added to the selected equipment to prevent data destruction or break down. |
| 2. | **REGIONAL LOCATED COMPUTATIONAL EQUIPMENT**<br>For environmental information development system | | | | | | | |
| 1. | 486 PC or higher<br>(Communication through modem with CENMA network) | 1 | B | | → A-19 | | | |
| | | | | B | **TELECOMMUNICATION EQUIPMENT** | | | Equivalent to No.12 group (Telematic water system) in the attaching list of M/M. |
| | | | | B-1 | Router ATM | 1 | ○ | |
| | | | | B-2 | Ether Switch | 1 | ○ | |
| | | | | B-3 | Router (for CONAMA) | 1 | ○ | |
| | | | | B-4 | Router (for COREMA, SESMA) | 2 | ○ | |
| | | | | B-5 | PC LAN Board | 13 | ○ | |
| | | | | B-6 | HUB | 2 | ○ | |
| | | | | B-7 | 10BASE-T cable | 1 | ○ | |

*1) ; Numbers of the equipment may be reduced after evaluation

| Chilean Request in Minutes of Meeting | | | | Basic Design | | | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Item | Description | Q'ty | Priority | Code No. | Description | Q'ty | Evaluation | |
| 3. | CONAMA AND COREMA-RM LOCATED EQUIPMENT | | | C | CONAMA AND COREMA-RM LOCATED EQUIPMENT | | | |
| 1. | Basic Work Station | 2 | A | C-1 | Personal Computer (CONAMA & COREMA-RM) | 2 | ○ | |
| | | | | C-2 | UPS | 2 | ○ | In view of reliability of electricity conditions in Chile (voltage fluctuation and black out), UPS is added to the selected equipment to prevent data destruction or break down. |
| 4. | MACAM NETWORK SUPPORT | | A | D | MACAM NETWORK SUPPORT EQUIPMENT | | | |
| 1. | Work Station with communication equipment | 1 | | D-1 | Workstation | 1 | ○ | |
| | | | | D-2 | Modem | 1 | ○ | |
| 2. | X Terminal or PC | 4 | *1 | D-3 | Personal Computer (for MACAM network) | 3 | ○ | Three PCs are required as the terminal for data processing. |
| | | | | | | 1 | × | |
| 3. | Software | 1 | | D-4 | Software (Air monitoring) | 1 | ○ | |
| 4. | Laser printer | 1 | | D-5 | Laser printer | 1 | ○ | |
| | | | | D-6 | UPS | 1 | ○ | In view of reliability of electricity conditions in Chile (voltage fluctuation and black out), UPS is added to the selected equipment to prevent data destruction or break down. |
| 5. | SOFTWARE | | A | E | SOFTWARE | | | |
| 1. | Database administration | 10 | | E-1 | Database administration (10 users) | 1 | ○ | One set for ten users. |
| | | | | E-2 | Database administration (for PC) | 1 | ○ | Required for workstation as well as for PC. |
| 2. | Programming language, T, Pascal, C, FORTRAN | 4 | | E-3 | Programming language, Pascal | 1 | ○ | Changed request |
| | | | | E-4 | Programming language C | 1 | ○ | Changed request |
| | | | | E-5 | Programming language FORTRAN | 1 | ○ | Changed request |
| 3. | Network administration and communications (1 user) | 1 | | | | | | Withdraw request. |
| 4. | Graphic software | 4 | | | | | | Withdraw request. |
| 5. | Software for scanner and writing recognition (texts) and photographs handling (1 user) | 1 | | E-6 | Software for scanner and OCR | 1 | ○ | |
| | | | | E-7 | Software for Photographs handling | 1 | ○ | |
| 6. | Geographic information service | 3 | | E-8 | Geographic Information System | 1 | ○ | One set for three users. |
| 7. | Word-processor and spread-sheets | 20 | *1 | E-9 | Word-processor and Spreads-sheets | 1 | ○ | Purchase of license. One set for 20 users. |

*1) ; Numbers of the equipment may be reduced after evaluation

| Chilean Request in Minutes of Meeting | | | | Basic Design | | | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Item | Description | Q'ty | Priority | Code No. | Description | Q'ty | Evaluation | |
| 6. | **METEOROLOGICAL NETWORK FOR AIR POLLUTION IN THE METROPOLITAN REGION** | | A | | | | | |
| 1.<br>1-1<br>1-2<br>1-3<br>1-4 | Full meteorological stations:<br>Sensors for wind, temperature, humidity, solar radiation, pressure, rainfall<br>Data-logger for data processing and storage in solid state memory<br>Battery and solar panel power supply<br>Modem to connect by telephone (normal line or cellular) to CENMA computer | 5 | | F1<br>F1-1a | **METEOROLOGICAL NETWORK IN THE METROPOLITAN REGION**<br>Full meteorological station | 5 | ○ | To strength the meteorological network in Santiago and collect data for development of meteorological models. |
| | | | | F1-1b | Ultra Violet sensor | 2 | ○ | To get a parameter of photo-chemical reaction for simulation model |
| 2.<br>2-1 | Simple meteorological stations:<br>Sensors for wind, temperature and humidity<br>Others features similar to full meteorological stations | 5 | | F1-2 | Simple meteorological station | 5 | ○ | The same components as F1-1 except the type of sensors. |
| 3. | Atmospheric sounding system for boundary-layer measurements, using captive balloons and sonde (to be used in or near Santiago city)<br>Complete system includes ground station, captive balloons, captive sondes, winch and consumable goods, includes one automatic theodolite for balloon tracking | 1 | | F2<br>F2-1.<br>F2-2a | **BOUNDARY-LAYER MEASUREMENTS**<br>Complete captive sonde station<br>Complete radiosonde station for lower layer | <br>1<br>1 | <br>○<br>○ | For increasing the accuracy of temperature profile. To fill a temperature data measured by wind profiler (F2-3). |
| 4. | Balloons, sondes, hydrogen gas, nocturnal lights, etc. for 300 free ascents. | 300 | (C) | F2-2b | Balloon and sonde | 300 | ○ | To reduce Chilean burden. |
| 5. | Acoustic sounder, Doppler type, with RASS for continuous measurements of wind and temperature vertical profiles, (to be installed in or near Santiago City). | 1 | | F2-3 | Boundary layer profiler (with RASS) | 1 | ○ | Vertical profiles of wind and temperature are continuously measured to be beneficial for the development of meteorological model. |
| 6. | Complete radiosonde station for upper air measurements (to be installed in Juan Fernandez Island)<br>include wind direction and velocity sensor | 1 | | F3<br>F3-1a | **UPPER AIR MEASUREMENTS IN JUAN FERNANDEZ ISLAND**<br>Complete radiosonde station for upper layer<br>(→F3-3 へ) | 1 | ○ | Higher priority is given for the forecasting of air pollution event prior 24 to 48 hours and for the global weather numerical prediction. |
| 7.<br>7-1.<br>7-2. | Unit parts<br>Balloons, sonde, gas, etc. for 350 soundings.<br>Balloons, sonde, gas, etc. for 650 soundings. | <br>350<br>650 | <br>(C) | F3-1b | Balloon and sonde | 350<br>650 | ○<br>× | Limited for one year use because of degrading nature of material. |
| | | | | F3-2 | Hydrogen generator (GIP) | | ○ | Non - electrolysis and elemental metal type generator is recommendable for balloons. |
| | | | | F3-3 | Meteorological equipment (Juan Fernandez Island) | | ○ | For prevention of collision of balloon, measurement of wind direction and speed is essential. |

| Chilean Request in Minutes of Meeting | | | | Basic Design | | | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Item | Description | Q'ty | Priority | Code No. | Description | Q'ty | Evaluation | |
| 7. | AIR POLLUTION BY STATIONARY SOURCES | | A | G | STATIONARY SOURCE MEASUREMENTS | | | |
| 1. | Complete isokinetic samplers to measure particulate matter in ducts | 1<br>1 | (B) | G-1<br>G-3 | Manual type isokinetic sampler<br>Automatic isokinetic sampler | 1<br>1 | ○<br>○ | Both manual and automatic type samplers are recommendable. |
| 2. | "In situ" particle size distribution measurement equipment for ducts | 1<br>1 | (B) | G-2 | Particle size distribution measurement equipment | 2 | ○ | Attachment for G-1 and G-3. |
| 3. | Full rack to monitor gases: CO, CO2, O2, SO2, NOx and Ox | 2<br>1 | (C) | G-4<br>G-5 | Gas monitor (Hand-held)<br>Flue gas analyzer (Portable) | 1<br>1 | ○<br>○ | Two ranks of properties are selected for components in flue gas. |
| | | | | G-6 | Organic vapor meter | 1 | × | Deleted as objective components to be measured is not clear for the exhaust from wood burning. |
| 8. | MONITORING NETWORK FOR AIR POLLUTION | | A | H | MONITORING NETWORK FOR AIR POLLUTION | | | |
| 1. | Stationary stations for gases and particles to complement existing network in Santiago | 3 | | H1 | Stationary stations for gases and particles | | | |
| | Each network should have: | | | H1-1 | Instrument cabin for stationary station | 3 | ○ | |
| 1-1 | Instrument cabin, able to accommodate monitors, auxiliary equipment, gas bottle storage area, computer and work site, internal electric connections, internal temperature regulation, facilities to take particles and gases sampler, doors opening control and alarm system for cabin protection | | | H1-2<br>H1-3<br>H1-4<br>H1-5<br>H1-6<br>H1-7<br>H1-8<br>H1-9<br>H1-10<br>H1-11<br>H1-12 | Continuous monitor of SO2<br>Continuous monitor of NO-NO2-NOx<br>Continuous monitor of CO<br>Continuous monitor of O3<br>Continuous monitor of NMHC-THC<br>Continuous monitor of PM10<br>Multiple gases calibrator<br>Zero gas generator<br>Standard gas cylinder and regulator<br>Meteorological equipment<br>Data acquisition and transmission system | 3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3<br>3 | ○<br>○<br>○<br>○<br>○<br>○<br>○<br>○<br>○<br>○<br>○ | |
| 1-2 | Gases and particle samplers system | | | | | | | |
| 1-3 | Continuous monitor of SO2 | | | | | | | |
| 1-4 | Continuous monitor of NO-NO2-NOx | | | | | | | |
| 1-5 | Continuous monitor of CO | | | | | | | |
| 1-6 | Continuous monitor of O3 | | | | | | | |
| 1-7 | Continuous monitor of organic gaseous compounds (NMHC-THC) | | | | | | | |
| 1-8 | Continuous monitor of particles (PM10), TEOM type | | | | | | | |
| 1-9 | Multiple gases calibrator | | | | | | | |
| 1-10 | Cylinders of zero gas and standard gas | | | | | | | |
| 1-11 | Meteorological equipment for wind, temp. and humidity measure | | | | | | | |
| 1-12 | Control and automatic data collection (datalogger processor type) | | | | | | | |
| 1-13 | PC for programming data entry, display, capture and transmission of information | | | H1-13 | UPS | 3 | ○ | Countermeasure for electric power conditions. |
| 1-14 | Spar parts for three years continuous operation | | | | | | | |

| Chilean Request in Minutes of Meeting | | | | Basic Design | | | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Item | Description | Q'ty | Priority | Code No. | Description | Q'ty | Evaluation | |
| 2. | Non stationary (transportable) gases and particles stations for evaluations on specific sites Similar characteristics of stationary station, placed on rolling-cabins, to be hauled by a motor vehicle | 1<br>1 | (B) | H2 | Non stationary (mobile) stations for gases and particles (same as H1. item except cabin) | | | The diffusion of pollutants in Santiago area is in complex nature. Wide spread measurement by mobile (transportable) station is essential. |
| | | | | H2-1 | Non stationary (transportable) instrument cabin | 2 | ○ | |
| | | | | H2-2 | Continuous monitor of SO2 (same as H1-2) | 2 | ○ | |
| | | | | H2-3 | Continuous monitor of NO-NO2-NOx (same as H1-3) | 2 | ○ | |
| | | | | H2-4 | Continuous monitor of CO (same as H1-4) | 2 | ○ | |
| | | | | H2-5 | Continuous monitor of O3 (same as H1-5) | 2 | ○ | |
| | | | | H2-6 | Continuous monitor of NMHC-THC (same as H1-6) | 2 | ○ | |
| | | | | H2-7 | Continuous monitor of PM10 (same as H1-7) | 2 | ○ | |
| | | | | H2-8 | Multiple gases calibrator (same as H1-8) | 2 | ○ | |
| | | | | H2-9 | Zero gas generator (same as H1-9) | 2 | ○ | |
| | | | | H2-10 | Standard gas cylinder and regulator (same as H1-10) | 2 | ○ | |
| | | | | H2-11 | Meteorological equipment (same as H1-11) | 2 | ○ | |
| | | | | H2-12 | Data acquisition and transmission system | 2 | ○ | |
| | | | | H2-13 | UPS+AVR | 2 | ○ | At long distance from power supply. |
| 3. | Replacement of obsolescent equipment, existing MACAM stations Complete sets of monitors and complementary equipment similar to the fixed stations | 5 | | H3 | Replacement of obsolescent equipment, existing MACAM | | | |
| | | | | H3-1 | Rack / Gas piping / Exhaust equipment | 5 | ○ | |
| | | | | H3-2 | Continuous monitor of SO2 (same as H1-2) | 4 | ○ | Existing 1 monitor are already replaced. |
| | | | | H3-3 | Continuous monitor of NO-NO2-NOx (same as H1-3) | 4 | ○ | Existing 1 monitor are already replaced. |
| | | | | H3-4 | Continuous monitor of CO (same as H1-4) | 1 | ○ | Existing 4 monitors are already replaced. |
| | | | | H3-5 | Continuous monitor of O3 (same as H1-5) | 5 | ○ | |
| | | | | H3-6 | Continuous monitor of NMHC-THC (same as H1-6) | 5 | ○ | |
| | | | | H3-7a | Continuous monitor of PM10 (same as H1-7) | 3 | ○ | Existing 2 monitors are already replaced. |
| | | | | H3-7b | Particle sampler for chemical analysis | 1 | ○ | One SPM sampling attachment for chemical analysis is recommendable. |
| | | | | H3-8 | Multiple gases calibrator (same as H1-8) | 5 | ○ | |
| | | | | H3-9 | Zero gas generator (same as H1-9) | 5 | ○ | |
| | | | | H3-10 | Standard gas cylinder and regulator (same as H1-10) | 5 | ○ | |
| | | | | H3-11 | Meteorological equipment (same as H1-11) | 5 | ○ | |
| | | | | H3-12 | Data acquisition and transmission system (same as H1- | 5 | ○ | |
| | | | | H3-13 | UPS (same as H1-13) | 5 | ○ | |
| 9. | **AIR QUALITY MONITORS & EQUIPMENT FOR SPECIAL SAMPLES** | | A | J | **AIR QUALITY MONITORS & EQUIPMENT FOR SPECIAL SAMPLES** | | | |
| 1. | Continuous PM10 monitor (TEOM) with enclosure | 2 | | J-1 | PM10 monitor | 2 | ○ | |
| 2. | Continuous PM10 monitor (TEOM) with enclosure, particle sampler for chemical analysis and data transmission | 2 | | J-2 | PM10 monitor with additional sampler | 2 | ○ | |
| 3. | High volume sampler (PM10) | 3 | | J-3 | High volume sampler (PM10) | 3 | ○ | |
| 4. | Dicotomic PM10, PM5 sampler | 4 | | J-4 | Dichotomous sampler of PM 10 / 2.5 | 2 | ○ | |
| | | | | J-5 | Dichotomous sampler of PM 5 2.5 | 2 | ○ | |
| 5. | Cyclonic sampler of low flux for particles lower than 7 $\mu$m | 1 | | J-6 | Cyclone low volume sampler (PM7) | 1 | × | Production of supplier is discontinued, and other samplers (J-4, J-5) can substitute. |

| Chilean Request in Minutes of Meeting | | | | Basic Design | | | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Item | Description | Q'ty | Priority | Code No. | Description | Q'ty | Evaluation | |
| 6. | Continuous monitor for PM10 with cyclonic pre-separator for particles higher than 10 $\mu$m, with filter for those lower than 10 $\mu$m | 1 | (B) | J-7 | Continuous aerosol monitor for PM10 | 1 | ○ | Continuous measurement and recording of aerosol is essential. |
| 7. | Eight step cascade impactor for PM3, personal | 1<br>1 | (B) | J-8 | Personal cascade impactor | 2 | ○ | For assessment of respirable dust for working people. |
| 8. | Personal PM10 ( 4 to 10 lts. 0.001 per min.), with stop at 2.5 $\mu$m, allowed by filter regulation | 2 | (B) | J-9 | Personal aerosol monitor | 2 | ○ | For assessment of high concentration in a working place for respirable dust. |
| 9. | Continuous monitors for SO2, NOx (NO, NO2), CO, O3, non-methane total hydrocarbons, H2S, formaldehyde and benzene and toluene (one each) | 8 | | J-10 | Portable gas analyzer | 1 | ○ | Consist of 8 continuous monitors. There is not adequate monitor of benzene and toluene corresponding to the satisfactory to the request. |
| 10 | **COMPLEMENTARY EQUIPMENT FOR STATION SERVICING** | | A | I | **COMPLEMENTARY EQUIPMENT FOR STATION SERVICING** | | | Content of the request is greatly modified. |
| 1. | Digital oscilloscope | 1 | | | | | | |
| 2. | Portable current and voltage recorder | 1 | | | | | | |
| 3. | Voltage and current portable calibrator | 1 | | I-6 | Voltage and current portable calibrator | 1 | ○ | |
| 4. | Complete tester (i.e. Fluke 97 ) | 1 | | | | | | |
| 5. | Power supply (i.e. Kenwood ) | 1 | | I-7 | Regulated power supply | 1 | ○ | |
| 6. | Instrumentation tools and handcase | 2 | | I-8 | Tool kit and handcase | 2 | ○ | |
| | | | | I-1 | Analytical Balance | 1 | ○ | |
| | | | | I-2 | Desiccator | 1 | ○ | |
| | | | | I-3 | On-line UPS | 1 | ○ | |
| | | | | I-4 | Split-type Air Conditioner | 1 | × | All facilities and equipment with the buildings, will be bound by Chilean side. |
| | | | | I-5 | Ultrasonic Cleaner | 1 | ○ | |
| | | | | I-9 | Flow calibrator | 1 | ○ | |
| | | | | I-10 | 10 point gas divider | 1 | ○ | |
| | | | | I-11 | 486 PC or higher | 2 | × | Portable PC in monitoring station can substitute |
| 7. | Ozone photometer, primary(i.e. Monitor Labs 9811) | 1 | | I-12 | Ozone analyzer ( transfer standard ) (same as H-1-5) | 1 | ○ | |
| 8. | Ozone photometer, transfer standard(i.e. Monitor Labs 9811 ) | 1 | (C) | | | 1 | × | Because the calibrator for all kind of gases are supplied in H1-8, one ozone analyzer becomes to be no need. |
| 11 | **WATER QUALITY ASSESSMENT** | | A | K | **WATER QUALITY ASSESSMENT** | | | |
| 1. | pH/mV meter (portable) | 3 | | K-1 | Portable water quality sensor system | 3 | ○ | 4 measuring items are included in one system. |
| 2. | Turbidity meter (portable) | 2 | | | →Included in K-1 | | | |
| 3. | Conductance meter (portable) | 3 | | | →Included in K-1 | | | |
| 4. | Dissolved oxygen/temperature meter (portable) | 3 | | | →Included in K-1 | | | |
| 5. | Water analysis test kits | 2 | | K-2 | Portable water analysis kit | 2 | ○ | |
| 6. | Portable sampling pumps | 2 | | K-3 | Portable sampling pump | 10 | ○ | It was confirmed to be the same items. |
| 7. | Composite sampler | 8 | | | →Included in K-3 | | | |
| 8-1. | Automatic monitoring stations water quality (basic parameters) | 1 | | K-4 | Water monitoring station | 1 | ○ | One monitoring station is considered to be adequate from the point view for the maintenance and operation. |
| 8-2. | Automatic monitoring stations water quality (basic parameters) | 1 | (B) | | | 1 | × | |
| | | | | K-5 | Portable water quality sensor system | 3 | ○ | Additional supplement of metal analysis equipment in water source sample. |
| | | | | K-6 | Portable sampling pump | 10 | ○ | |

| Chilean Request in Minutes of Meeting | | | | Basic Design | | | | Remarks |
|---|---|---|---|---|---|---|---|---|
| Item | Description | Q'ty | Priority | Code No. | Description | Q'ty | Evaluation | |
| 12 | **TELEMATIC WATER SYSTEM** | | A | | →To group B (Equipment of telemeter system for water monitoring is included in K-4) | | | |
| 1. | Telematic water system | 1 | | | | | | |
| 13 | **VEHICLES** | | | L | **VEHICLES** | | | |
| 1. | Vehicle for Executive Direction | 1 | C | L-1 | Vehicle for executive direction | 1 | × | It is out of grand aid program. |
| 2. | Minibus for 8 persons (Central Units) | 1 | B | L-2 | Mini-bus for 8 persons (Central units) | 1 | ○ | It was requested the self-effort of Chilean side, but is revived again by the necessity of CENMA activity. |
| 3. | Pick-up double cabin, 4WD (Central Units) | 1 | C | L-3 | Pick-up double cabin, 4WD (Central units) | 1 | × | It is requested the self-effort of Chilean side. |
| 4. | Pick-up, double cabin, 4WD (Monitor station) | 1 | A | L-4 | Pick-up, double cabin, 4WD (Monitor station) | 1 | ○ | To use the going round in the monitoring activity. |
| | | 1 | B | | | 2 | × | |
| | | 1 | C | | | | | |
| 5. | Pick-up, double cabin, 4WD (Laboratories) | 1 | C | L-5 | Pick-up, double cabin, 4WD (Laboratories) | 1 | × | It is requested the self-effort of Chilean side. |
| 6. | Utilitarian vehicle, coordination support | 1 | B | L-6 | Vehicle for utility (coordination support) | 2 | × | It is requested the self-effort of Chilean side. |
| | | 1 | C | | | | | |
| 7. | Mini-track with lift | 1 | A | L-7 | Mini-track with lift | 1 | ○ | To transport a heavy equipment for the measurement in a field survey. |
| 14 | **RESIDUES TREATMENT PLANT** | | | M | **WASTE WATER TREATMENT SYSTEM** | | | |
| 1. | Waste water treatment facilities | 1 | A | M-1 | Waste water treatment system | 1 | ○ | It is considered as NO.1 model plant in Chile. |

# ANEXO 6

## CALCULO APROXIMADO DE LOS GASTOS ASUMIDOS POR LA REPUBLICA DE CHILE Y DEL COSTE DE MANTENIMIENTO

## Anexo 6-1 Cálculo aproximado de los gastos asumidos por la República de Chile

(1) Estación de medición automática de contaminación atmosférica:

Dado que para la instalación de la estación de MACAM se requieren de la construcción de fundación y algunas obras de líneas telefónicas, se estiman los gastos indicados a continuación:

- Construcción de fundación: US$ 1,000 × 3 = 3,000
- Obra de líneas telefónicas: US$ 2,100
  (Una base, 8 líneas públicas y 2 líneas celular)

(2) Estación de meteorológica:

Aparte del coste de allanamiento deberán prever el gasto para instalación de vallas y contrato de las líneas celular.

- Instalación de vallas: US$ 1,000 × 10 = 10,000
- Flete de camiones: US$ 100 × 10 = 1,000
- Contrato de línea celular: US$ 150 × 10 = 1,500

Además, necesitarán unos 10,000 dólares para la instalación para lanzamiento de globo sonda y otro 10,000 dólares para instalación de azotea para perfilador de capa delimitador.

(3) Estación meteorológica de atmósfera superior:

Los costes asumidos por parte de Chile para las instalaciones de la estación meteorológica de atmósfera superior en la isla Juan Fernández son:

| | | |
|---|---|---|
| • Reparación de oficina y su interior: | US$ | 3,027 |
| • Instalación para lanzamiento de globo: | US$ | 7,895 |
| • Almacén de Gas hidrógeno: | US$ | 1,316 |
| • Gasto, trabajadores (60 días): | US$ | 1,278 |
| Gasto, Técnicos (7 días): | US$ | 255 |
| Gasto de viaje: | US$ | 974 |
| • Transporte de material, etc: | US$ | 790 |
| | US$ | 15,535 |

(4) Estación de medición automática de calidad de agua:

Los costes asumidos por parte de Chile, según el cálculo realizado por EMOS, alcanza unos 60,000 dólares.

| | | |
|---|---|---|
| • Pozo de muestreo y tendido de tubería de agua potable: | US$ | 13,463 |
| • Caseta de los equipos de monitoreo: | US$ | 19,380 |
| • Sistema de alimentación de agua: | US$ | 4,923 |
| • Sistema de alimentación eléctrica: | US$ | 1,808 |
| • Tendido de cables para sala de vigilancia: | US$ | 18,237 |
| • Tendido de cables telefónicos: | US$ | 750 |
| | US$ | 58,561 |

(5) Sistema informático:

Está previsto solo el coste de tendido de cable para este sistema. El coste de instalación de los aireacondicionadores y obra de interior pertenece al coste global de la construcción.

Tampoco está incluido aquí el coste para implantación de Software por renovación del sistema SESMA.

| | | | |
|---|---|---|---|
| Conexión de fibra óptica: | | US$ | 20,000 |
| Cableado | CENMA | US$ | 2,150 |
| | CONAMA | US$ | 1,460 |
| | COREMA | US$ | 490 |

(6) Obras relacionadas al sistema de tratamiento de agua residual

Los costes asumidos por parte de Chile para los trabajos de obra civil , etc en la construcción de este sistema de tratamiento de agua residual son:

| | | |
|---|---|---|
| • Construcción de sala de operación: | US$ | 32,000 |
| • Obra de la instalación de tratamiento de residuos: | US$ | 50,000 |
| • Obra de deposito de agua de concreto: | US$ | 43,200 |
| • Obra civil para equipo de tratamiento biológico: | US$ | 15,000 |
| • Obra civil de la torre de vigilancia: | US$ | 4,000 |
| Suma | US$ | 144,200 |

## Anexo 6-2 Cálculo aproximado del coste de mantenimiento

(1) Mantenimiento de la estación de medición automática de contaminación atmosférica:

EL coste anual de mantenimiento de esta estación es:

| | |
|---|---|
| • Personal: | US$ 50,000 |
| • Consumibles y recambios: | US$ 100,000 |
| • Electricidad: | US$ 36,000 |
| • Teléfono y comunicación:<br>(12 veces/día × 2 minutos/conferencia × 10 líneas) | US$ 4,000 |
| • Vehículo: | US$ 25,000 |
| • Seguro: | US$ 50,000 |
| | US$ 265,000 |

Aparte de lo anterior, 90,000 dólares para renovación de los equipos.

(2) Los equipos meteorológicos:

CENMA asumirá su responsabilidad con el personal y coste para mantenimiento de los equipos.

Para el mantenimiento de los equipos meteorológicos superficiales no necesita mucho presupuesto. Dado que un técnico asignado para revisión bisemanal y mantenimiento general que se hace una vez al año, será suficiente prever US$ 8,400 para él.

Mantenimiento de los medidores de la atmósfera delimitada se encarga también el CENMA.

Aunque por el momento no está decidido el proyecto de estudio, será razonable el coste siguiente en el que abarcan investigación con la sonda inferior (en invierno durante 3.5 meses) y con globo (2 semanas en invierno):

① Investigación con la sonda de atmósfera inferior

Durante 3.5 meses en invierno y en total 150 veces de investigación (en el plan preliminar está previsto 1 vez al día y al día siguiente 2 veces)

| | | |
|---|---|---|
| • Personal: | US$ | 7,000 |
| • Consumibles: | US$ | 4,260 |
| • Teléfono: | US$ | 300 |
| • Viaje: | US$ | 4,000 |
| • Vehículos: | US$ | 4,500 |
| SUMA | US$ | 20,060 |

② Investigación con el globo.

Durante 2 semanas en invierno y varias veces al día.

| | | |
|---|---|---|
| • Personal (4 operarios): | US$ | 4,000 |
| • Consumibles: | US$ | 2,300 |
| • Teléfono: | US$ | 100 |
| • Viaje: | US$ | 1,600 |
| • Vehículos: | US$ | 1,500 |
| SUMA | US$ | 9,500 |

Para continuar manteniendo el proyecto de compra, necesitarán anualmente 20,000 dólares por concepto de compra de sondas.

(3) Los equipos meteorológicos de atmósfera superior (Isla Juan Fernández):

La Dirección General de Meteorología se encarga del coste de mantenimiento de los equipos meteorológicos de atmósfera superior. Teniendo en cuan el caso de la Isla Pascua se establece el siguiente presupuesto:

| | | | |
|---|---|---|---|
| • Personal (aumento de 1 operario): | | US$ | 12,000 |
| • Consumibles y recambios (sonda): | | US$ | 56,000 |
| Detalle | Globo aprox. | US$ | 3,650 |
| | Sonda de radio | US$ | 36,500 |
| | Generación de hidrógeno | US$ | 14,000 |
| | Papel de registro | US$ | 253 |
| | Viaje (5 días) | US$ | 161 |
| | Flete | US$ | 1,316 |
| | Repuestos | US$ | 263 |

(4) Estación de medición automática de calidad de agua:

Para mantener en buen estado de la estación se requiere de 2 mantenimientos a la semana, cada uno de aproximadamente medio día. Por lo que el coste de mantenimiento se calcula de siguiente manera, incluyendo el gasto personal de 4 días al mes (=0.2/mes).

| | | |
|---|---|---|
| • Personal US$2,000/mes/persona × 0.2 × 12 meses: | US$ | 4,800 |
| • Recambios: | US$ | 10,000 |
| • Consumibles: | US$ | 8,000 |
| • Electricidad: | US$ | 6,000 |
| • Comunicación US$50/mes × 12 meses: | US$ | 600 |
| SUMA | US$ | 29,400 |

(5) Sistema informático:

Donde se requiere del régimen informático es CENMA y SESMA que estarán dotado del sistema informático.

Dado que el nuevo centro informático de CENMA puede estar lleno de usuarios, es preciso dejar aclarado el régimen de mantenimiento y control de los equipos informáticos. Los encargados de este centro deben tener suficiente conocimiento técnico. Especialmente debe haber un especialista de red de comunicación, puesto que estarán funcionando varios equipos de comunicación tales como LAN, WAN, etc. Este especialista podrá dedicar no solo las gestiones de este centro sino también de otro sitio.

Dado que en el Plan CENMA está previsto 4 empleados de la Unidad de planificación e información, es recomendable para mejor control y mantenimiento, 2 empleados (*), aparte de un jefe y otro especialista de predicción de contaminación, sean especialista del sistema.

| | | |
|---|---|---|
| (Jefe: especialista de planificación | US$ | 24,000/año) |
| ○Especialista informática: | US$ | 18,000/año |
| ○Ayudante de información: | US$ | 12,000/año |
| (Especialista de predicción contam. | US$ | 18,000/año) |
| Gasto personal de sistema | US$ | 30,000/año |

Aparte del gasto personal el coste de cada sitio se estima de siguiente manera. Para las instalaciones existentes se ha hecho el cálculo aproximado de la implantación del sistema informático, y la parte que corresponde a SESMA está incluida al coste de mantenimiento de la estación de medición automática de contaminación atmosférica.

(Unidad:US$/año)

| | Consumibles | Comunicación | Electricidad | Mantenimiento de equipos | Total |
|---|---|---|---|---|---|
| CENMA | 22,000 | 9,860 | 1,360 | 47,970 | 81,190 |
| CONAMA | | 5,550 | 30 | 2,450 | 8,030 |
| COREMA-RM | | 1,850 | 30 | 1,170 | 3,050 |

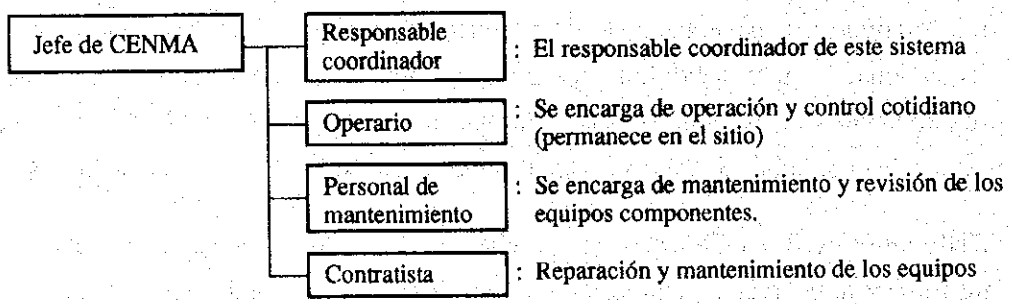
Dado que vida útil de los equipos informáticos es de 5 a 10 años, deberán prever el fondo para renovarlos.

(6) Sistema de tratamiento de agua residual

① Régimen del control de operación:

Los empleados de CENMA se encargan de la operación y control diario de este sistema. Algunos trabajos de mantenimiento y de reparación serán ejecutados por medio de los contratistas.

Se propone la Organigramas de control operativo:




② Gasto personal para el control de operación:

Se indica el cálculo aproximado del gasto personal. Este monto deberá incluir en el presupuesto de explotación de CENMA.

Responsable coordinador (1): con 20% de disponibilidad anual para este sistema

20 millones de peso/año × 20/100 = 4 millones de peso/año

Operario (1): 8 horas al día 7 millones de peso/año

Personal de mantenimiento (1 de cada): con 20% de disponibilidad anual para este sistema

3.5 millones de peso/año × 2 × 0.2 1.4 millones de peso/año

Total gasto personal 12.4 millones de peso/año
(≒US$33,500/año)

③ Gastos operativos:

La disponibilidad del sistema consiste en 365 días por 24 horas para el equipo de tratamiento biológico, 260 días por 8 horas para el resto. En base este premisa se ha hecho el cálculo aproximado.

- Gasto de energía eléctrica (380V, 50Hz, trifásico)
  65kwh × 260 días × 25 pesos/kwh = 423 mil pesos (≒US$1,100)
- Gasto de agua (agua de red)
  1.0$m^3$/d × 260 días × 100 pesos/$m^3$ = 26 mil pesos (≒US$70)
- Gasto de productos químicos: Total 1,404 mil pesos (≒US$3,800)

  Acido sulfúrico (95%)
  1.5 l/día × 260 días × 320 pesos/l = 125 mil pesos/año

  Sosa Cáustica (50%)
  6.0 l/día × 260 días × 990 pesos/l = 608 mil pesos/año

  Cloruro férrico (40%)
  8.0 l/día × 260 días × 300 pesos/l = 624 mil pesos/año

  Coagulante de macromoléculas. (polvo de anion)
  0.4 kg/día × 260 días × 1500 pesos/kg = 16 mil pesos/año

  Sosa de ácido hipocloroso (cloro útil de 12%)
  0.6 l/día × 260 días × 200 pesos/l = 31 mil pesos/año
- Mantenimiento y reparación: Total 12,500 mil pesos (≒US$33,800)

Aunque el coste de mantenimiento y reparación de un sistema varían por su disponibilidad y antigüedad, alcanza, generalmente se queda alrededor de 2 - 5% del precio del mismo. Este vez se ha hecho el cálculo aproximado con el factor de 3%.