

JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)

NATIONAL COMMISSION FOR THE ENVIRONMENT(CONAMA)

THE REPUBLIC OF CHILE

**THE MASTER PLAN STUDY
ON
INDUSTRIAL SOLID WASTE MANAGEMENT
IN
THE METROPOLITAN REGION
OF
THE REPUBLIC OF CHILE**

**FINAL REPORT
VOLUME III
ANNEX**

MARCH 1996

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**KOKUSAI KOGYO Co., Ltd.
EX. Corporation**

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JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)

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THE REPUBLIC OF CHILE

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VOLUME III
ANNEX**

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MARCH 1996

**KOKUSAI KOGYO Co., Ltd.
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**THE MASTER PLAN STUDY
OF
INDUSTRIAL SOLID WASTE MANAGEMENT
IN
THE METROPOLITAN REGION**

LIST OF VOLUMES

VOLUME I	EXECUTIVE SUMMARY
VOLUME I(S)	EXECUTIVE SUMMARY (Spanish Version)
VOLUME I(D)	EXECUTIVE SUMMARY FOR PUBLIC DISTRIBUTION (Spanish Version)
VOLUME II	MAIN REPORT
VOLUME II(S)	MAIN REPORT (Spanish Version)
VOLUME III	ANNEX
	A Minutes of Meetings
	B Profile of the Study Area
	C Factories' Survey
	D Medical Institutions' Survey
	E Public Opinion Survey
	F Survey on Private SWM Enterprises
	G Other Field Surveys
	H Present Industrial, Medical and Municipal SWM
	I Industrial and Medical SW Generation
	J Investigation and Initial Environmental Evaluation of Candidate Sites for Hazardous Waste Disposal
	K Examination of an Optimum Technical System for ISWM Master Plan
	L Examination of an Optimum Institutional System for ISWM Master Plan
	M Examination of an Optimum System for Medical SWM Master Plan
VOLUME IV	DATA BOOK

This is the ANNEX.

ANNEX A

MINUTES OF MEETINGS

CONTENTS

Page:

A.1	Scope of Work, August 25, 1994	A-1
A.2	Minutes of Meeting, August 25, 1994	A-12
A.3	Minutes of Meeting for IC/R, January 31, 1995	A-21
A.4	Minutes of Meeting for PR/R, March 15, 1995	A-29
A.5	Minutes of Meeting for IT/R, August 24, 1995	A-33
A.6	Minutes of Meeting for DF/R, December 7, 1995	A-39

ANNEX A MINUTES OF MEETINGS

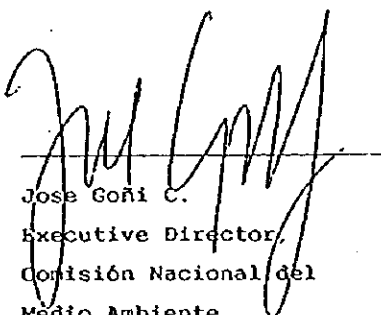
A.1 Scope of Work, August 25, 1994

SCOPE OF WORK
FOR
THE MASTER PLAN STUDY
ON
INDUSTRIAL SOLID WASTE MANAGEMENT IN THE METROPOLITAN REGION
IN
THE REPUBLIC OF CHILE

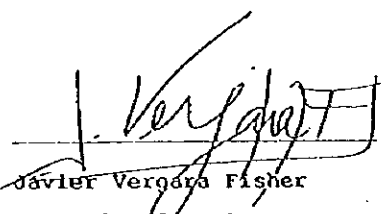
AGREED UPON BETWEEN

COMISION NACIONAL DEL MEDIO AMBIENTE,
COMISION ESPECIAL DE DESCONTAMINACION DE LA REGION METROPOLITANA
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

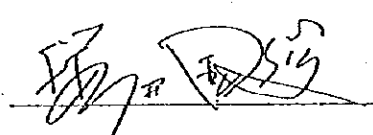
Santiago, 25 August, 1994



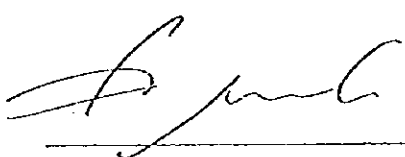
Jose Goni C.
Executive Director,
Comisión Nacional del
Medio Ambiente



Javier Vergara Fisher
Executive Secretary,
Comisión Especial de
Descontaminación de la
Región Metropolitana



Kunitoshi Sakurai
Leader,
Preparatory Study Team,
Japan International
Cooperation Agency



Carlos Fuensalida C.
Executive Director,
Agencia de Cooperación
Internacional
for witness

I . INTRODUCTION

In response to the request of the Government of Republic of Chile (hereinafter referred to as "the Government of Chile"), the Government of Japan decided to implement the Master Plan Study on Industrial Solid Waste Management in the Metropolitan Region in the Republic of Chile (hereinafter referred to as "the Study") in accordance with the Agreement on Technical Cooperation between the Government of Chile and the Government of Japan signed on July 28, 1978 (hereinafter referred to as "the Agreement").

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of the technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned of the Government of Chile.

The present document sets forth the Scope of Work with regard to the Study.

II . OBJECTIVES OF THE STUDY

The objectives of the Study are :

1. to formulate a master plan for the proper management of industrial and medical waste in the Metropolitan Region with the target year of 2010 as well as an action plan for aspects that need immediate improvement, taking integrated environmental protection and waste minimization into consideration, and
2. to identify priority projects for feasibility studies.

III . THE STUDY AREA

The Study Area shall cover the Metropolitan Region shown by the map attached as the Annex I .

74

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IV. SCOPE OF THE STUDY

In order to achieve the objectives mentioned above, the Study shall cover the followings :

1. Collection of relevant data and information, review of previous studies and reconnaissance
 - [Basic data of the Study Area]
 - a. Social and economic conditions and statistics
 - b. Data on natural conditions such as climate, topography, geology, etc.
 - c. Population, population density and land use
 - d. Surface and ground water use
 - [Institutional Aspects]
 - e. Legislative and institutional aspects of environmental protection
 - [Policy Aspects]
 - f. Urban planning in the Metropolitan Region
 - g. Industrial development policy in the region
 - h. Environmental protection policy for the region
 - i. People's awareness on environmental protection
 - [Technical Aspects]
 - j. Classification system of industries
 - k. Inventory of factories
 - l. Inventory of air-pollution and water-pollution control facilities
 - m. Existing studies and on-going projects related to the Study
 - [Present Condition related to the Study]
 - n. Present condition of municipal solid waste management
 - o. Present condition of industrial and medical solid waste management
 - p. Other related data and information
2. Field surveys and analysis of their results
 - a. Survey on the condition of actual land use
 - b. Survey of actual condition of industrial and medical waste management according to the flow from generation to final disposal
 - c. Sample survey of actual industrial waste generation by selected factories reporting under the declaration system
 - d. Sample survey on actual medical waste generation by selected hospitals
 - e. Investigation on the possible behavior of generators

- f. Estimation of current amount of industrial and medical waste and its composition
 - g. Examination of capability of possible private contractors of solid waste management
 - h. Investigation of option areas for the installation of treatment and final disposal facilities
 - i. Others
3. Evaluation of present conditions and identification of problems related to industrial and medical solid waste management
4. Projection of trends in industrial and medical solid waste generation (amount and composition) in relation with the following aspects ;
- a. Economic and industrial development
 - b. Social and urban development
 - c. Reinforcement of other pollution control measures
5. Formulation of the Master Plan
- (1) Determination of planning framework
 - (2) Determination of basic policies, goals, targets and strategies
 - (3) Examination from technical aspects
 - a. Examination of appropriate treatment and final disposal method for each type of waste
 - b. Examination of technical standards for treatment and final disposal
 - c. Examination of number/size of treatment and final disposal facilities
 - d. Preliminary environmental evaluation of option areas for construction of treatment and final disposal facilities
 - e. Examination of collection and transportation systems
 - f. Examination of measures for waste minimization including source reduction, separation and recycling
 - g. Preparation the technical alternatives (technical packages)
- 57
- ✓ 123 2

- (4) Examination from economic and financial aspects
 - a. Evaluation of economic cost and benefit of the packages
 - b. Estimation of capital and recurrent costs of the packages
 - c. Calculation of level of user charge for the packages
 - d. Confirmation of willingness to pay for the packages
- (5) Examination from institutional aspects
 - a. Comparative study of institutional alternatives
 - b. Examination of legal system development
 - Conceptual framework of solid waste management law
 - Definition of industrial and medical wastes
 - Clarification of responsibilities of parties concerned
 - c. Strengthening of public institution for industrial and medical waste management
 - d. Examination of Environmental Impact Assessment (EIA) system, environmental monitoring system and environmental information system
 - e. Articulation of environmental management policies and procedures for air, water and solid wastes
 - f. Articulation of industrial development, trade policies, urban development policies and environmental management policies
- (6) Examination from social aspects
 - a. Examination of NIMBY syndrome in municipal solid waste management
 - b. Measures to get neighboring consensus for the acquisition of sites for industrial waste management facilities
- (7) Proposal of the best technical package through economic, financial, environmental, institutional and social examination
- (8) Master Plan
 - a. Technical plan
 - b. Institutional plan
 - c. Financial plan
 - d. Implementation plan
- (9) Formulation of the action plan for immediate improvement

- (10) Identification of priority project(s)
- (11) Implementation of Initial Environmental Examination (IEE) for the priority project(s)
- (12) Recommendations

V. STUDY SCHEDULE

The Study shall be conducted according to the tentative schedule attached as the Annex II.

VI. REPORTS

JICA shall prepare and submit the following reports in English to the Government of Chile.

1. Inception Report

Thirty (30) copies within one (1) month after the commencement of the Study.

2. Progress Report

Thirty (30) copies within three (3) months after the commencement of the Study.

3. Interim Report

Thirty (30) copies within eight (8) months after the commencement of the Study.

4. Draft Final Report

Thirty (30) copies within ten (10) months after the commencement of the Study. The Government of Chile will submit its comments on the report to JICA within thirty (30) days after receipt of the Draft Final Report.

74

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5. Final Report

Fifty (50) copies within forty-five (45) days after receipt of the comments on the Draft Final Report.

VII. UNDERTAKING OF THE GOVERNMENT OF CHILE

1. The Government of Chile shall accord privileges, exemptions, and other benefits to the Japanese study team (hereinafter referred to as "the Team") in accordance with the Agreement.
2. To facilitate smooth conduct of the Study, the Government of Chile shall take necessary measures ;
 - a. to ensure the safety of the Study team in Chile,
 - b. to permit the members of the Team to enter, leave and sojourn in Chile for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees,
 - c. to exempt the members of the Team from income taxes, duties, and other charges on equipment, machinery and other materials brought into Chile for the conduct of the Study,
 - d. to exempt the members of the Team from income tax and other charges of any kind imposed on or in connection with any emoluments or allowances paid to the members of the Team for their services in connection with the implementation of the Study,
 - e. to provide necessary facilities to the Team for remittance as well as utilization of the funds introduced into Chile from Japan in connection with the implementation of the Study,
 - f. to secure permission for entry into private properties or restricted areas for the conduct of the Study,
 - g. to secure permission for the Team to take all data and documents

(including maps and photographs) related to the Study out of Chile to Japan,

- h. to provide medical services as needed. Its expenses will be chargeable to members of the Team.
3. The Government of Chile shall bear claims, if any arises against members of the Team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arises from gross negligence or willful misconduct on the part of the members of the Team.
4. "Comisión Nacional del Medio Ambiente" (hereinafter referred to as "CONAMA") and "Comisión Especial de Descontaminación de la Región Metropolitana" (hereinafter referred to as "CEDRM"), shall act as the counterpart agencies to the Team and also as the coordinating bodies in relation with other governmental and non-governmental organizations concerned for the smooth implementation of the Study.
5. CONAMA and CEDRM shall, at their own expenses, provide the Team with the followings, in cooperation with other organizations concerned:
 - a. available data and information related to the Study,
 - b. counterpart personnel,
 - c. suitable office space with necessary equipment in Santiago,
 - d. credentials or identification cards.

VII. UNDERTAKING OF JICA

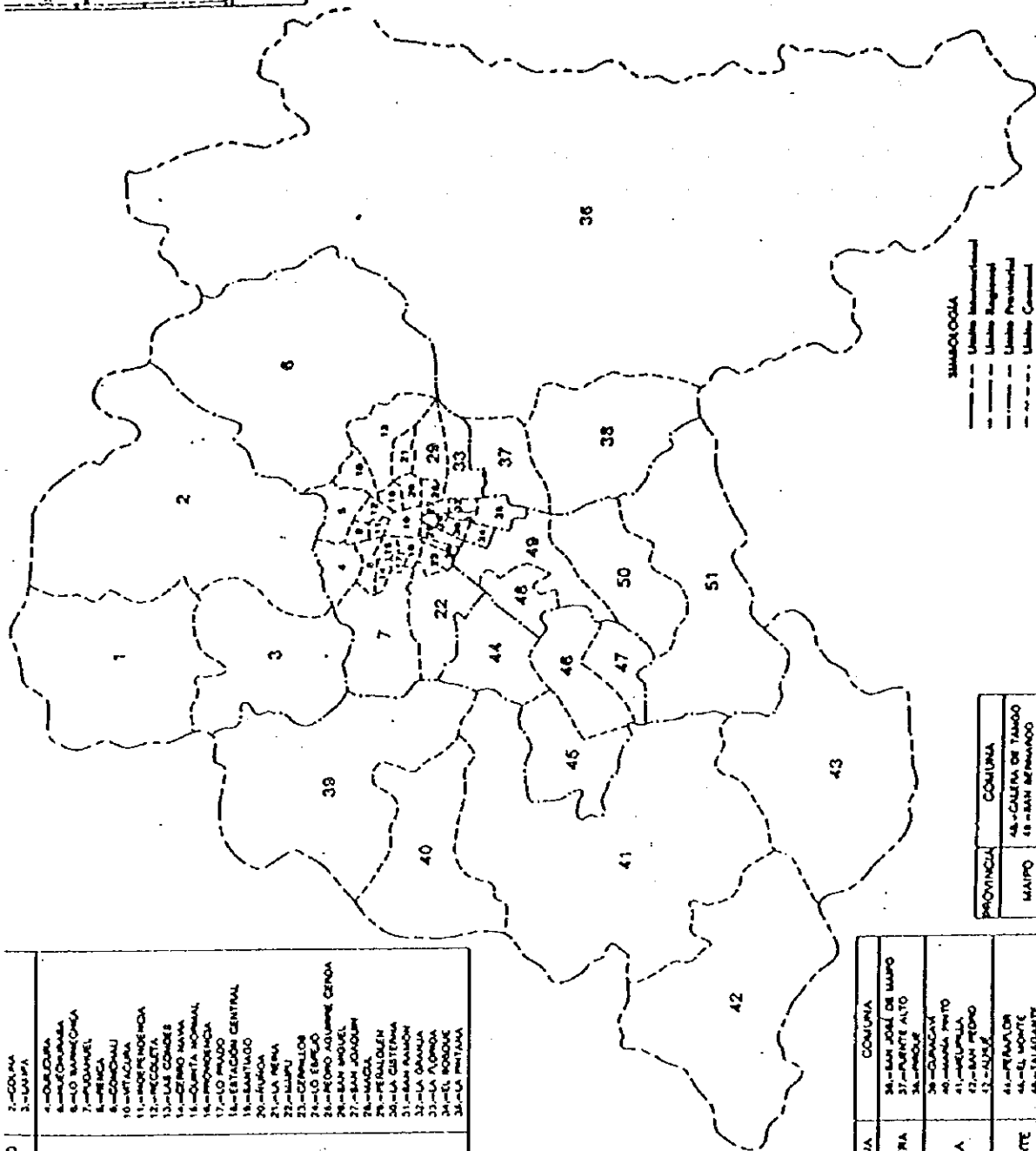
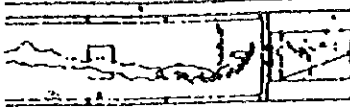
For the implementation of the Study, JICA shall take the following measures:

1. to dispatch, at its own expense, the Team to the Republic of Chile,
2. to pursue technology transfer to Chile counterpart personnel in the course of the Study.

IX. OTHERS

JICA, CONAMA, CEDRM and AGCI shall consult with each other in respect of any matter that may arise from or in connection with the Study.

ANNEX I



--- Límite Internacional
 --- Límite Regional
 --- Límite Provincial
 --- Límite Comunal
 NOTA: Las comunas limitantes
 a las comunas

Escala 1:900,000

CHACABUCCO	2-COLINA 3-LUPATA
	4-OLIVERA 5-OLIVERA 6-OLIVERA 7-OLIVERA 8-OLIVERA 9-OLIVERA 10-OLIVERA 11-OLIVERA 12-OLIVERA 13-OLIVERA 14-OLIVERA 15-OLIVERA 16-OLIVERA 17-OLIVERA 18-OLIVERA 19-OLIVERA 20-OLIVERA 21-OLIVERA 22-OLIVERA 23-OLIVERA 24-OLIVERA 25-OLIVERA 26-OLIVERA 27-OLIVERA 28-OLIVERA 29-OLIVERA 30-OLIVERA 31-OLIVERA 32-OLIVERA 33-OLIVERA 34-OLIVERA 35-OLIVERA

SANTIAGO

PROVINCIA	COMUNA
CONCEPCION	36-SAN JOSE DE MUPO 37-PUNTE ALTO 38-MUPO
MELIPILLA	39-CORONADO 40-MUPO 41-MELIPILLA 42-SAN PEDRO 43-MUPO
TALCAHUE	44-PAJON 45-MUPO 46-TALCAHUE 47-MUPO

PROVINCIA	COMUNA
MAIPO	48-COLINA DE MUPO 49-SAN PEDRO 50-MUPO 51-PANDE

Annex II

TENTATIVE SCHEDULE

MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13
WORK IN THE REPUBLIC OF CHILE													
WORK IN JAPAN													
REPORT	Δ	IC/R	Δ	P/R	Δ	IT/R	Δ	DF/R	Δ	○	F/R		

REMARKS: IC/R : Inception Report
P/R : Progress Report
II/R : Interim Report
DF/R : Draft Final Report
F/R : Final Report

○ : comments from Chilean side

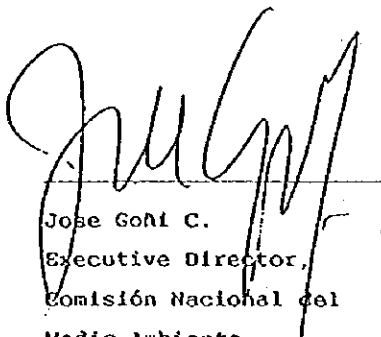
A.2 Minutes of Meeting, August 25, 1994

MINUTES OF MEETING
FOR
THE MASTER PLAN STUDY
ON
INDUSTRIAL SOLID WASTE MANAGEMENT IN THE METROPOLITAN REGION
IN
THE REPUBLIC OF CHILE

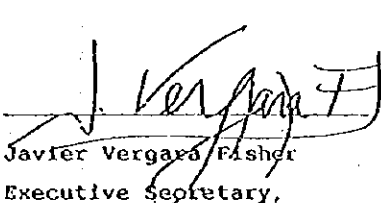
AGREED UPON BETWEEN

COMISION NACIONAL DEL MEDIO AMBIENTE,
COMISION ESPECIAL DE DESCONTAMINACION DE LA REGION METROPOLITANA
AND
JAPAN INTERNATIONAL COOPERATION AGENCY

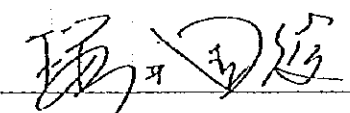
Santiago, 25 August, 1994



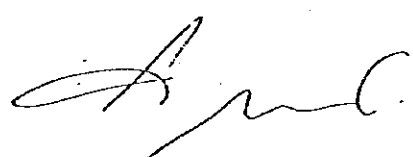
Jose Goni C.
Executive Director,
Comisión Nacional del
Medio Ambiente



Javier Vergara Fisher
Executive Secretary,
Comisión Especial de
Descontaminación de la
Región Metropolitana



Kunitoshi Sakurai
Leader,
Preparatory Study Team,
Japan International
Cooperation Agency



Carlos Fuensalida C.
Executive Director,
Agencia de Cooperación
Internacional
for witness

In response to the request of the Government of the Republic of Chile, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Study Team headed by Dr. Kunitoshi SAKURAI (hereinafter referred to as "the Team") to Chile from August 16 to 25, 1994, to discuss the Scope of Work for the Master Plan Study on Industrial Solid Waste Management in the Metropolitan Region in the Republic of Chile (hereinafter referred to as "the Study").

The Team carried out the field surveys of the areas to be covered by the Study, and a series of discussions with officials of Comisión Nacional del Medio Ambiente (hereinafter referred to as "CONAMA"), Comisión Especial de Descontaminación de la Región Metropolitana (hereinafter referred to as "CEDRM"), and other organizations related to the Study. The list of those who attended these discussion meetings is shown in the Annex I. Both sides agreed on the Scope of Work for the Study.

This document sets forth the main items discussed.

1. Both sides agreed to change the name of the Study from "Management Plan for Industrial Solid Waste Treatment Systems in the Región Metropolitana (Santiago)" to "Master Plan Study on Industrial Solid Waste Management in the Metropolitan Region". This change has been made based on the mutual understanding that the Study would focus not only on industrial solid waste treatment, but also on waste minimization as well as integrated environmental management of air, water and solid waste.

2. Both sides confirmed that CONAMA by itself would act as a counterpart agency, because CEDRM, another counterpart agency at present, would be incorporated into CONAMA from January 1995.

3. Chilean side agreed to organize a steering committee, which will be responsible for overall supervision of the Study and decision making on policy matter related to the Study. The steering committee will consist of the

representatives of the institutions listed in the Annex II .

4. Both sides agreed that the target year of the Study shall be 2010, and that the Study would formulate the framework of the future industrial and medical solid waste management taking into account the socio-economic trends and reinforcement of environmental protection policies, and putting emphasis on the formulation of an action plan for the short term at the same time.

5. Both sides agreed that the content of industrial solid waste to be studied will not include construction waste and agricultural waste.

6. Both sides agreed upon the basic policy of the Study concerning the following points ;

- (1) The Study would be carried out as the joint study of the study team to be dispatched by JICA and its Chilean counterpart.
 - (2) As for the projection of trends in industrial and medical solid waste generation, it would be important to determine the framework of the socio-economic conditions based on industrial and urban development policies of Chilean Government.
 - (3) Appropriate management measures of solid waste would be examined for the waste projected by above-mentioned item (2). It would be also necessary to consider measures for waste minimization including source reduction, separation and recycling. At the same time, quantity of solid waste is expected to increase according to the reinforcement of air pollution and water pollution control. It would, therefore, be necessary to take the importance of integrated environmental management into consideration in the process of master plan formulation.
 - (4) Both technical aspects and institutional and management aspects will be dealt in the Study with the same weight. In addition, procedures to get neighboring consensus for treatment and final disposal facilities would be worked out.
 - (5) In order to get the best result within a short term, existing information and studies would be used to the maximum including the
- KS JST

information collected through the declaration system.

- (6) The study team will examine technical standards for treatment and final disposal of industrial solid waste. It is very important for them to be applied in a stepwise manner. Although technical standards would cover all sort of industrial solid wastes, the scope of enforcement by Chilean Government would be limited to hazardous industrial and medical wastes for the time being.
- (7) Examination of institutional aspects for industrial and medical solid waste management should be carried out taking into account the Chilean Government's policy which stresses the role of private sector for the construction and operation of facilities. This examination should be carried out concerning the regulatory framework to be respected by private enterprises which would construct and operate such facilities.
- (8) As for the acquisition of sites for industrial and medical waste management facilities, it is important for the study team and its counterpart to work out practical procedures to get neighboring consensus.
- (9) The Study will be conducted in cooperation with the national environmental center project.

7. The Study should take into account the rapid development taking place in Chile in the field of environmental policies in order to incorporate the new reality which may occur into the Master Plan.

8. The Chilean side emphasized that the role of the government is to guide and assist the private sector in the management of industrial and medical solid wastes and that the selection of construction sites of facilities, acquisition of neighboring consensus for the construction, EIA for the projects, and the construction and operation of those facilities are to be carried out by the private sector. Therefore the study team is expected to work out through the Study the draft laws, regulations and guidelines which would be useful for the governmental guidance and assistance of the above-mentioned activities to be developed by the private sector. In that

sense, a feasibility study (F/S) might not be requested to the Government of Japan as the follow-up of the Study except that Chilean Government changes the above-mentioned policies. The Team responded that policies of Chilean Government would be respected in the course of the Study.

The Team explained that the following conditions should be fulfilled by Chilean Government if it intends to submit the official request for F/S to Japanese Government through the change of its policies ;

- (1) To establish a governmental mechanism for the implementation of the master plan.
- (2) To approve officially and put into practice the procedures to get neighboring consensus which would be established through the Study.
- (3) To acquire neighboring consensus for option areas to be selected by the Study concerning the following points ;
 - (i) appropriateness as options
 - (ii) basic design of facilities
 - (iii) procedures to select the best option
 - (iv) implementation of topographic, geological and hydrological surveys and environmental study

9. Both sides agreed that the environmental impact assessment (EIA) of the project would be carried out in the stage of feasibility study based on the Chilean legislation. Therefore, the IEE (Initial Environmental Examination) for the priority project(s) mentioned in paragraph IV 5.(11) of the Scope of Work is considered as a voluntary examination. As for the scope of EIA, it will be discussed and agreed upon through the IEE.

10. Chilean side requested the acceptance of counterpart personnel(s) to Japan for training and the Team answered that it would convey the request to JICA Headquarters.

11. Chilean side requested to prepare Inception Report (10 copies), Summary of Interim Report (10 copies), Main and Summary of Draft Final Report (10 copies) and Final Report (30 copies) in Spanish. The Team agreed with the request.

12. The Team requested Chilean side to assign the appropriate counterpart personnel and Chilean side answered that the personnel shown in Annex III will work as the counterpart.

13. The Team requested Chilean side to provide appropriate number of vehicles with drivers for the smooth implementation of the Study. Chilean side responded, however, that it would be difficult to provide those vehicles because of the budget constraint. The Team, taking those situation into consideration, mentioned that JICA would prepare necessary transport facilities.

14. The Team requested Chilean side to provide a suitable office space to the study team equipped with, among others, a photocopy machine. Chilean side answered that an office fully equipped with telephone, facsimile and furniture would be prepared. However, it is very difficult to provide a photocopy machine because of budget constraint. The Team mentioned that JICA would hire it locally.

15. Taking the importance of the Study into consideration, Chilean side requested the Team to hold a technical seminar on the occasion of Draft Final Report consultation. The Team answered that it would convey the request to JICA Headquarters.

JS KS [Signature]

Annex I

List of Attendants

1. COMISION NACIONAL DEL MEDIO AMBIENTE (CONAMA)

Jose Goñi C. Executive Director
Genaro Rodríguez F. Officer

2. COMISION ESPECIAL DE DESCONTAMINACION DE LA REGION METROPOLITANA (CEDRM)

Javier Vergara Fisher Executive Secretary
Luis Herman González Coordinator of Solid Waste
Joost Meyer Chemical Engineer

3. AGENCIA DE COOPERACION INTERNACIONAL (AGCI)

Carlos Fuensalida C. Executive Director
Raul Vergara M. Program Coordinator
Ivan Mertens G. Officer, Sector Department
Enrique O'Farrill J. Program Officer

4. MINISTERIO DE SALUD

Julio C. Monreal Urrutia Department Chief, Environmental Program
Gonzalo Aguilar Engineer, Program of Potable Water, Waste Water and
Solid Waste

5. SERVICIO DE SALUD DEL AMBIENTE REGION METROPOLITANA (SESMA)

Mauricio Ilabaca Marileo Director
Alejandro Cofre Chief of PROCEFF
Antonio Saldias Engineer of Solid Waste of PROCEFF
Cecilia Godoy G. Engineer, Sub-Program of Solid Waste

6. UNIVERSITY OF CHILE

José Arellano V. Professor

7. JICA EXPERT

Kenichi Tanaka JICA Expert, CONAMA
Mitsuo Oba JICA Expert, AGCI

8. JICA PREPARATORY STUDY TEAM

Kunitoshi Sakurai Professor, University of Tokyo
Jiro Eiho Section Chief, Hyogo Prefectural Government Office
Masaaki Kato Officer, JICA
Shinji Nambo Senior Economist, Engineering Consulting Firms
Association
Hideki Wada Senior Planner, OSTRAND Corporation
Atsuko Yoshikawa Interpreter, Japan International Cooperation Center

Annex II

Steering Committee Member Institutions

1. Ministry of Health

2. Comisión Nacional del Medio Ambiente (CONAMA)

3. Comisión Especial de Descontaminación de la Región Metropolitana (CEDRM)

Chilean Counterpart

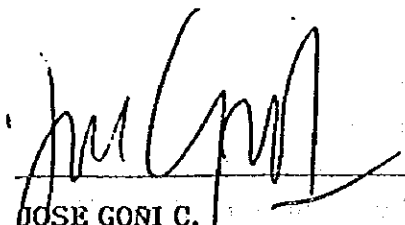
1. One engineer for coordination (part time)
2. One engineer (full time)
3. Team of 6-8 persons consisting of specialists from the following institutions (part time) ;
 - Ministry of Health
 - Ministry of Planning
 - Comisión Nacional del Medio Ambiente (CONAMA)
 - Comisión Especial de Descontaminación de la Región Metropolitana (CEDRM)
 - Superintendent of Sanitary Services

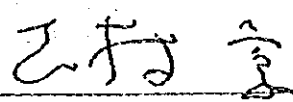
A.3 Minutes of meeting for IC/R, January 31, 1995

**MINUTES OF MEETING
FOR
INCEPTION REPORT
OF
THE MASTER PLAN STUDY
ON
INDUSTRIAL SOLID WASTE MANAGEMENT IN THE METROPOLITAN REGION
IN
THE REPUBLIC OF CHILE**

**AGREED UPON BETWEEN
COMISION NACIONAL DEL MEDIO AMBIENTE
AND
JICA STUDY TEAM**

**JANUARY 31, 1995
SANTIAGO, CHILE**


JOSE GONI C.
EXECUTIVE DIRECTOR,
COMISION NACIONAL DEL
MEDIO AMBIENTE


SUSUMU SHIMURA
LEADER OF THE STUDY TEAM,
JAPAN INTERNATIONAL COOPERATION
AGENCY

MINUTES OF MEETING FOR INCEPTION REPORT
OF THE MASTER PLAN STUDY ON INDUSTRIAL SOLID WASTE MANAGEMENT
IN THE METROPOLITAN REGION IN THE REPUBLIC OF CHILE

1. INTRODUCTION

- 1.1 The Study Team has submitted thirty (30) copies in English and ten (10) copies in Spanish of the Inception Report to the Government of Chile. Consequently a series of meetings were held from 24th to 27th January 1995 in Chile to discuss the report submitted. A list of officials attending in the above meetings is given in the Appendix 1.

2. ISSUES AND DECISIONS

- 2.1 Various issues were discussed and clarifications on the Inception Report were made. Subsequently, consensus between the Chilean side and JICA Study Team was attained through the meetings. Issues discussed, clarifications and consensus are outlined in the following paragraphs.
- 2.2 Since reports of Spanish version are more convenient for the actual use of the Study reports than English version for the Chilean officers concerned in the Study, the Chilean side requested that the numbers of copies of DF/R and F/R should be changed as follows:

For DF/R

- | | | |
|---|-------------------------|-----------|
| - | Main Report in English: | 10 copies |
| - | Main Report in Spanish: | 30 copies |
| - | Summary in English: | 10 copies |
| - | Summary in Spanish: | 30 copies |

For F/R

- | | | |
|---|-------------------------|-----------|
| - | Main Report in English: | 10 copies |
| - | Main Report in Spanish: | 70 copies |
| - | Summary in English: | 10 copies |
| - | Summary in Spanish: | 70 copies |

The Study Team replied that they will convey the request to the JICA headquarters.

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2.3 The Study Team requested the Chilean side to provide the following data for the smooth conduct of the Study:

- I. basic data of whole industries in the Study area (such as list of factories and number of employees, products, sales amount, etc. of each factory); and
- II. basic data of private contractors of municipal SWM and transportation of ISW (such as list of companies and capital, number of employees, annual turnover of each companies).

The Chilean side replied they will do their best.

2.4 Regarding estimation of the present ISW generation, the Study Team clarified that if the above-mentioned data (Item I) is not available for individual factories, the estimation shall be done based on total figures for each category of industry.

2.5 The Chilean side requested that since only 25 % of factories in the study area declare their waste generation according to the manifest system and there must be many factories who produce hazardous wastes among the remaining 75 %, the factories not reporting under the declaration system should be included in the list of factories subject to the sample survey of actual ISW generation.

The Study Team replied that they accepted the request, however the number of sampling factories will be determined after the examination of the previous studies considering the following aspects:

- availability of JICA experts and counterpart personnel for the sample survey;
- available time and period for the survey; and
- basic data of factories to be obtained by the Chilean side.

2.6 The Chilean side requested the Study Team to provide an English version of Japanese legislation regarding ISWM.

The Study Team approved it.

2.7 The Study Team requested the Chilean side to select option areas for intermediate treatment and final disposal facilities to be investigated by the Team at around June to July 1995.

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The Chilean side agreed that the criteria for selection of option areas shall be set up in collaboration of both Chilean side and the Study Team and succeedingly the Chilean side shall select the option areas to be studied by the Team based on that criteria.

- 2.8 The Chilean side requested that the examination of technical standards for final disposal should include safety control and measures after the closure of a landfill.

The Study Team approved the request.

- 2.9 The Study Team clarified that IEE (Initial Environmental Examination) for the priority project(s) shall be carried out by referring not only the Guideline of Environmental Consideration for JICA Development Study but also the Chilean EIA system which is currently reviewed by Chilean authorities.

- 2.10 Since a study on medical waste generation has been finalized in December 1994, the Chilean side requested that the sample survey of actual medical waste generation should be conducted in order to review and supplement the study. onzaloudy Team confirmed the request.

- 2.11 Both the Chilean side and the Study Team agreed that the target citizens and area for the Public Opinion Survey shall be selected from the following groups:

- Environmental NGOs
- University students
- Governmental officers and politicians
- people nearby the present municipal landfills (Lo Errazuriz, Cerros de Renca and Lepanto) according to the distance from the landfills
- people nearby candidate municipal landfills (Batuco, Runge, etc.)

- 2.12 The Study Team informed that JICA is going to purchase a four-wheel drive vehicle for the smooth implementation of the Study according to the item 13 of the Minutes of Meeting signed on 25 August 1994. The Team requested the Chilean side to assist in tax exemption procedure for the vehicle.

The Chilean side accepted the request.

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2.13 The Chilean side clarified that the COREMA of the Metropolitan Region shall be the executing office of the Study.

2.14 The Chilean side informed that members of counterpart personnel are listed as follows:

- I. One engineer for coordination (part time):
Joost Meljer
- II. One engineer (full time):
One engineer shall be appointed on or before 15th of February 1995.
- III. Team of 6-8 persons consisting of specialists from the following institutions (part time)
 - Ministry of Health: Gonzalo Aguilar M.
Cecilia Godoy
Fernando Sepulveda
 - Ministry of Planning: to be appointed on or before 15th of February 1995.
 - CONAMA: Luis Herman G.
 - COREMA of the Metropolitan Region: Gianni López
 - Superintendent of Sanitary Services: to be appointed on or before 15th of February 1995.

2.15 The Chilean side informed that members of the Steering Committee are listed as follows:

- I. José Goñi C. (CONAMA)
- II. Javier Vergara F. (COREMA of the Metropolitan Region)
- III. Mauricio Ilabaca M. (Ministry of Health)
Julio C. Monreal U. (Ministry of Health)

2.16 The Chilean side requested that a Spanish version summary of the Progress Report (P/R) shall be prepared.

The JICA Study Team replied they will prepare Spanish version of P/R only the section regarding evaluation of the present industrial/medical SWM due to very limited time schedule.

2.17 The Chilean side requested the Study Team to refer a draft standard for hazardous waste management to be prepared by the Ministry of Health in March 1995.

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The Study Team accepted it.

3. CONCLUSION

- 3.1 With the above clarifications and modifications, the Inception Report was approved by the Chilean side.

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LIST OF OFFICIALS ATTENDING THE MEETINGS

<Chilean Side>

1. COMISION NACIONAL DEL MEDIO AMBIENTE (CONAMA)

José Goñi C.	Executive Director
Gonzalo Cubillos P.	Sub-Director
Luis C. Contreras	Jefe de Gabinete
Luis Herman G.	Ingeniero Civil

2. COMISION REGIONAL DEL MEDIO AMBIENTE, REGION METROPOLITANA

Javier Vergara F.	Regional Director
Joost Meijer	Ingeniero Coodlnador Proyectos Internacional

3. GERENCIA DE COOPERACION INTERNACIONAL (AGCI)

Raul Vergara M.	Program Coodlnator
Ivan Mertens G.	Officer, Sector Department

4. MINISTERIO DE SALUD

Julio C. Monreal U.	Jefe Departamento Programas Sobre Ambiente
Gonzalo Aguilar M.	Departamento Programas Sobre Ambiente
Antonio Saldías A.	Ingeniero Civil, Servicio de Salud Metropolitana del Ambiente (PROCEFF)
Fernando Sepulveda	Ingeniero de Ejecclón, Servicio de Salud Metropolitana del Ambiente (PROCEFF)

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<Japanese Side>

1. JICA STUDY TEAM

Susumu SHIMURA

Leader, JICA Study Team

José ARELLANO V.

Member, JICA Study Team

Tadaya YAMAMOTO

Member, JICA Study Team

Ferran MACIPE C.

Administrative Coordinator, JICA Study Team

2. JICA ADVISORY COMMITTEE

Kunitoshi SAKURAI

Professor of Urban Engineering, University of Tokyo

Motoyuki UEGAKI

Officer, JICA

3. JICA EXPERT

Kenichi TANAKA

JICA Expert, Comisión Nacional de Medio Ambiente

Mitsuo OBA

JICA Expert, AGCI

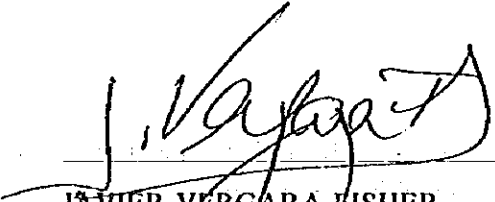
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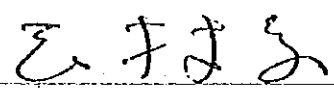
A.4 Minutes of Meeting for PR/R, March 15, 1995

**MINUTES OF MEETING
FOR
PROGRESS REPORT
OF
THE MASTER PLAN STUDY
ON
INDUSTRIAL SOLID WASTE MANAGEMENT IN THE METROPOLITAN REGION
IN
THE REPUBLIC OF CHILE**

**AGREED UPON BETWEEN
COMISION NACIONAL DEL MEDIO AMBIENTE
AND
JICA STUDY TEAM**

**MARCH 15, 1995
SANTIAGO, CHILE**


JAVIER VERGARA FISHER
DIRECTOR REGIONAL,
DIRECCION REGION METROPOLITANA,
COMISION NACIONAL DEL
MEDIO AMBIENTE


SUSUMU SHIMURA
LEADER OF THE STUDY TEAM,
JAPAN INTERNATIONAL
COOPERATION AGENCY

MINUTES OF MEETING FOR PROGRESS REPORT
OF THE MASTER PLAN STUDY ON INDUSTRIAL SOLID WASTE MANAGEMENT
IN THE METROPOLITAN REGION IN THE REPUBLIC OF CHILE

1. INTRODUCTION

- 1.1 The Study Team has submitted thirty (30) copies of the Progress Report (P/R) to the Government of Chile. Consequently a series of meetings were held from 10th to 14th March 1995 in Chile to discuss the report submitted. A list of officials attending in the above meetings is given in the Appendix 1.

2. ISSUES AND DECISIONS

- 2.1 Various issues were discussed and clarifications on the Progress Report were made. Subsequently, consensus between the Chilean side and JICA Study Team was attained through the meetings. Issues discussed, clarifications and consensus are outlined in the following paragraphs.

- 2.2 The Chilean side requested the Study Team that the waste classification being applied to the Study shall be compatible to the one which SESMA-PROCEFF is going to adopt.

The Study Team clarified that they examined the compatibility of the waste classification and prepared the Table 6.4.3a and Annex 7 in the P/R and that a recommendation on the classification of industrial waste will be made in the 2nd Study Work in Chile through the discussion with the Chilean side.

- 2.3 The Chilean side requested the Study Team that the waste classification being applied to the Study shall be compatible to the one which the Ministry of Health is going to adopt for hazardous wastes.

The Team confirmed the request.

- 2.4 The Chilean side requested the Study Team to check or estimate sludge generation from the sewage treatment plant which will be constructed in the near future.

The Team replied they will conduct the work if necessary data are provided.

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- 2.5 The Chilean side requested the Study Team to review the present land use regulation regarding location and construction of waste management facilities in the Metropolitan Region, referring the regulations in Japan, Denmark and Brazil.

The Team approved the request.

- 2.6 The Chilean side requested the Study Team to examine causes of illegal dumping, including deposal fee gap between industrial and municipal solid wastes applied in Cerros de Renca landfill.

The Team approved the request.

- 2.7 The Chilean side requested the Study Team to examine whether hazardous materials are disposed in the municipal landfills or not.

The Study Team replied that they will check the water quality data observed at the Lo Errazuriz Disposal Site.

- 2.8 The Study Team informed that they prepared criteria for selection of option areas for intermediate treatment and final disposal facilities to be investigated by the Team at around June to July 1995, and requested the Chilean side to select the areas by June 1995.

The Chilean side approved the request.

- 2.9 The Chilean side requested the Study Team to conduct a preliminary investigation such as soil and environmental investigations, etc..

The Study Team replied that they will convey the request to the JICA headquarters. The Study Team requested the Chilean side to guarantee the investigation of the selected sites.

The Chilean side agreed with the conditions of the agreement of the owner(s) of the sites.

3. CONCLUSION

- 3.1 With the above clarifications and modifications, the Progress Report was approved by the Chilean side.

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APPENDIX I

LIST OF OFFICIALS ATTENDING THE MEETINGS

<Chilean Side>

1. COMISION NACIONAL DEL MEDIO AMBIENTE (CONAMA):

Gonzálo CUBILLOS P.	Sub-Director
Patricia MATUS	Jefe Unidad de Descontaminación

2. COMISION NACIONAL DEL MEDIO AMBIENTE, REGION METROPOLITANA:

Javier VERGARA F.	Director Regional
Joost MEIJER	Ingeniero Coordinador Proyectos Internacional
Gonzálo VELASQUEZ	Manejo de Residuos
Gustavo MALDONADO	Manejo de Residuos
Christian SANTANA	Ingeniero Fuentes Moviles

3. MINISTRY OF HEALTH:

Ricardo SAN MARTIN	Jefe Departamento Técnico, Servicio de Salud Metropolitana del Ambiente (SESMA)
Gonzalo AGUILAR M.	Departamento Programa sobre el Ambiente
Cecilia GODOY	Jefe Sub-Programa Residuos Sólidos
Fernando SEPULVEDA	Ingeniero de Ejecución, Servicio de Salud Metropolitana del Ambiente (SESMA-PROCEFF)

4. SUPERINTENDENCIA DE SERVICIO SANITARIOS:

Nora CABRERA	Ingeniero de la Sección Residuos Industriales Líquidos
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<Japanese Side>

1. JICA STUDY TEAM

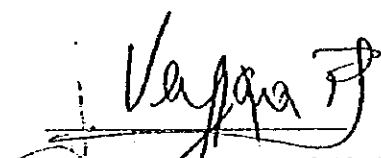
Susumu SHIMURA	Leader, JICA Study Team
Koichi HIRAMATSU	Member, JICA Study Team
José ARELLANO V.	Member, JICA Study Team
Nils KRISTENSEN	Member, JICA Study Team
Tadaya YAMAMOTO	Member, JICA Study Team
Ferran MACIPE C.	Administrative Coordinator, JICA Study Team

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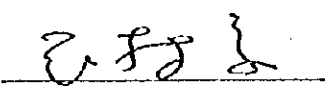
MINUTES OF MEETING
FOR
INTERIM REPORT
OF
THE MASTER PLAN STUDY
ON
INDUSTRIAL SOLID WASTE MANAGEMENT
IN
THE METROPOLITAN REGION
OF
THE REPUBLIC OF CHILE

AGREED UPON BETWEEN
COMISION NACIONAL DE MEDIO AMBIENTE
AND
THE JICA STUDY TEAM

AUGUST 24, 1995
SANTIAGO, CHILE



MR. JAVIER VERGARA
DIRECTOR REGIONAL
COMISION NACIONAL
DE MEDIO AMBIENTE



MR. SUSUMU SHIMURA
LEADER OF THE STUDY TEAM,
JAPAN INTERNATIONAL
COOPERATION AGENCY

**MINUTES OF MEETING FOR THE INTERIM REPORT
OF THE MASTER PLAN STUDY ON INDUSTRIAL SOLID WASTE MANAGEMENT
IN THE METROPOLITAN REGION OF SANTIAGO, REPUBLIC OF CHILE**

1. INTRODUCTION

The Study Team submitted thirty (30) copies of the Interim Report in English and ten (10) copies of the summary in Spanish, to the Government of Chile. Consequently, a series of meetings were held from August 18th to August 23rd in Chile to discuss the report submitted. A list of officials attending the above meetings is given in the Appendix 1.

2. ISSUES AND DECISIONS

2.1 Issues, Clarifications and Consensus

Various issues were discussed and clarifications on the Interim Report were made. Subsequently, an appropriate consensus was reached during the meetings. These issues, clarifications and consensus are outlined in the following paragraphs.

2.2 Comments on the Regulations for the Sanitary Management of Hazardous Solid Waste (First Working Draft)

The Chilean side requested that the Study Team should comment on the specific technical standards and other issues which are not presently covered and need to be addressed by the Regulation. The Team was requested to present recommendations that establish the time frame for updating and improving the Regulation in a step-wise manner.

The Team accepted the request.

2.3 Legislative Aspects regarding Goals

The Chilean side pointed out that most of the legal provisions mentioned in this item are

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already existing and that no need exists for the further drafting of laws. The Study Team acknowledged such comments and invited the Chilean side to a joint effort for checking which of the legal aspects included in the main report of this IT/R are in fact already existing.

The Study Team proposed that "the right to issue license over operators" be given to the authorities in addition to "the right to issue permit of facilities", as is the case in Japan. The Chilean side requested the Study Team to provide the specific criteria under which operators of ISWM facilities in Japan are evaluated to be suited for receiving such permission.

As for the "promotion and incentive subsidization," the Chilean side requested that the Team provides an expanded justification for the need to adopt such policies. The Team was requested to examine promotion tools suitable for the Metropolitan Region based on international experience on this issue and considering the Chilean policy on "promotion and incentive subsidization".

The Team accepted both requests.

2.4 Table 4.2a of Targets

The Chilean side requested that this table be completed by adding one row presenting the ISW generation amount in respective phases. The Study Team accepted the request.

2.5 Table 4.2b of Targets

The delay in the fulfillment of Target 1 ("Construction of appropriate facilities...") until Phase 2 is deemed to be unrealistic by the Chilean side. Given the rapid changes observed in the ISWM market, the Chilean side requested that compliance with Target 1 is brought back to Phase 1 (i.e. 1996-1997). In relation with this, given the adjusted earlier appearance of disposal/treatment facilities, it is further requested that specific criteria are provided for evaluating the construction of such facilities proposed by the private sector.

The adjustment of Target 1 also implies an adjustment in Target 3, as the disposal of HW kept in storage is related to the availability of appropriate facilities.

Furthermore, the Chilean side points out that the fulfillment of Targets 3 and 4 should take place gradually, in accordance with the enforcement capacity of the authorities. This should

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be noted in the table by using a symbol that conveys such gradual enforcement.

The Team agreed to take all three comments into account for the formulation of the Master Plan to be prepared in Japan.

The Chilean side also requested that the Team examines the implications of in-factory storage for the industries. The Team agreed to provide such examination regarding in-factory storage, but pointed out that no cost estimation may be provided, as it varies widely depending on several factors.

2.6 (5) "Higher level of ISWM..." in Table 4.3a

The Chilean side expressed that "higher targets" and "HW minimization" cannot be obtained through "laws". The Team agreed with the observation and accepted to revise this item so as to correct the inappropriate use of the word "laws".

The Chilean side has the opinion that the establishment of a qualification system for managers in charge of in-factory ISWM may be of difficult implementation in Chile. However, without prejudice of this comment, the Chilean side requests to obtain the content of the qualification program required in Japan for managers in charge of in-factory ISWM.

The Team took note of their opinion and request.

2.7 Other Requirements of Strategy

The Chilean side informed that the improvement of the EIA/DIA system regarding a clear borderline definition that establishes which procedure (EIA or DIA) is to be cleared by each project is currently being drafted. The Study Team acknowledged this information which was not previously provided.

2.8 Feasibility Study

The Team explained that if a F/S was to be carried out, it could not be included in the present Master Plan Study, but an additional request to the Japanese government was needed. It was also reminded that, as specified in the M/M agreed upon between the Chilean and Japanese

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governments on August 25th 1994, certain conditions must be fulfilled by the Chilean government before an official request is submitted. These are:

- (1) To establish a governmental mechanism for the implementation of the Master Plan.
- (2) To approve officially and put into practice the procedures to get neighborhood consensus which would be established through the Study.
- (3) To acquire neighborhood consensus for option areas to be selected by the Study concerning the following points:
 - (i) appropriateness as options
 - (ii) basic design of facilities
 - (iii) procedures to select the best option
 - (iv) implementation of topographic, geological and hydrological surveys and environmental study.

The Chilean side replied that it is still their intention to leave Industrial SMW activities in the hands of the private sector. Regarding Medical SWM, however, the Chilean side is not yet determined on the policies to be followed and may be interested in applying for a F/S to the Japanese government.

2.9 Comments on Interim Report

All comments by the Chilean side to the Interim Report must be submitted by September 18th if they are to be considered by the Team for the formulation of the Master Plan.

2.10 Industrial/Medical SWM Seminar

The Chilean side and the Study Team agreed upon the 6th and 7th of December 1995 for carrying out the Industrial/Medical SWM seminar. The Chilean side committed itself to provide by September 30th a list of persons to be invited.

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Appendix 1

List of Attendants

I. Chilean Side

a. CONAMA

- . Alejandro Cofré (Technical Director)
- . Maritza Jadrijevic (Professional at Decontamination Unit)

b. CONAMA, Metropolitan Region

- . Javier Vergara (Regional Director)
- . Joost Meijer (Coordination Engineer)
- . Marina Hermosilla (Engineer EIA/DIA)
- . Dominique Hervé (Lawyer)

c. Ministry of Health

- . Gonzalo Aguilar (Environmental Sanitation Program)

d. SESMA

- . Ricardo San Martín (Chief of Technical Department)

e. SESMA-PROCEFF

- . Marta Zamudio (Chief of Fixed Sources Program)

II. Study Team

- . Susumu Shimura (Team Leader)
- . Satoshi Sugimoto (Team Member)
- . Tadayama Yamamoto (Team Member)
- . Jose Arellano (Team Member)
- . Ferran Macipe (Team Member)

III. JICA Advisory Committee

- . Kunitoshi Sakurai (Chairman of JICA Advisory Committee)
- . Shigeo Ishida (Member of JICA Advisory Committee)

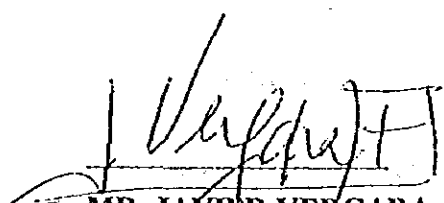
IV. JICA Chile Office

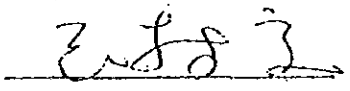
- . Norio Mitomo (Asistente Representante)

**MINUTES OF MEETING
FOR
DRAFT FINAL REPORT
OF
THE MASTER PLAN STUDY
ON
INDUSTRIAL SOLID WASTE MANAGEMENT
IN
THE METROPOLITAN REGION
OF
THE REPUBLIC OF CHILE**

**AGREED UPON BETWEEN
COMISION NACIONAL DE MEDIO AMBIENTE
AND
THE JICA STUDY TEAM**

**DECEMBER 7, 1995
SANTIAGO, CHILE**


**MR. JAVIER VERGARA
DIRECTOR REGIONAL
COMISION NACIONAL
DEL MEDIO AMBIENTE**


**MR. SUSUMU SHIMURA
LEADER OF THE STUDY TEAM,
JAPAN INTERNATIONAL
COOPERATION AGENCY**

**MINUTES OF MEETING FOR THE DRAFT FINAL REPORT
OF THE MASTER PLAN STUDY ON INDUSTRIAL SOLID WASTE MANAGEMENT
IN THE METROPOLITAN REGION OF SANTIAGO, REPUBLIC OF CHILE**

1. INTRODUCTION

The Study Team submitted the following number of copies of the Draft Final Report to the Government of Chile:

- Executive Summary in Spanish: 30 copies
- Executive Summary in English: 10 copies
- Main Report in Spanish: 30 copies
- Main Report in English: 10 copies
- Annexes in English: 5 copies
- Data Book in English: 3 copies

Consequently, a series of meetings were held on December 4th and 5th in Chile to discuss the report submitted. A list of officials attending the above meetings is given in the Appendix 1.

2. ISSUES AND DECISIONS

2.1 Issues, Clarifications and Consensus

Various issues were discussed and clarifications on the Draft Final Report were made. Subsequently, an appropriate consensus was reached during the meetings. These issues, clarifications and consensus are outlined in the following paragraphs.

2.2 Projection of Sludge Generation from On-site Waste Water Treatment Facilities

The Study Team informed the Chilean Side that the projection of sludge generated from on-site waste water treatment facilities does not include the sludge resulting from the removal of dissolved inorganic substances through physical-chemical treatment.

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The Chilean Side acknowledged the clarification by the Team.

2.3 Water Content for Sludge

The Chilean Side requested that, based on the Japanese experience, the Team provide recommendations on the water content for sludge which should be considered acceptable for final disposal purposes, as well as the technological and financial limitations for attaining those water content levels. The Chilean Side further requested that the Team illustrate how the total generation amount would vary with the mentioned water content levels and that the need for on-site dehydration is accordingly emphasized.

The Team agreed to examine the Japanese standards on this matter and provide the pertinent recommendations and recalculations.

2.4 Table 4.1.2c: Summary of ISW Generation in 2010

The Chilean Side solicited that a foot-note specifies that the Table does not include the sludge generated from sewerage treatment plants since EMOS, as operator of the plants, pledges to give appropriate treatment and final disposal to said sludge.

The Team agreed to include the foot-note.

2.5 Integration in NAFTA

As the process of Chile's integration in NAFTA has been delayed, the Chilean Side requested that all mentions to "integration in NAFTA" should be changed to "integration in the world market".

The Team agreed to make such modification.

2.6 Selection of Candidate Sites for IEE

The Chilean Side emphasized that the candidate sites subject to the IEE had been selected under the criteria of household waste disposal, even though the evaluation by the Team was carried out based on the suitability for HW disposal. The Chilean Side requested that such facts be more clearly specified in the F/R.

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The Team accepted the request.

2.7 Closure of SWM Facilities

The Chilean Side requested that the contents of the technical standards for closure of SWM facilities include the frequency and length into the future of the monitoring to be carried out.

The Team agreed to include such information in the F/R.

2.8 Incineration at Cement Plants

In view of the possibility that incineration of some residues be carried out at existing cement plants, the Chilean Side requested that the Team provide information regarding the processes used by such plants in Japan and Brazil, as well as the types and amounts of wastes that may be acceptable for this treatment method.

The Team agreed to provide such information.

2.9 Table 4.7c: SWM Costs in 2010

The Chilean Side requested that the table also include the expected costs in case dehydration takes place at the origin, so that a comparison can be made.

The Team accepted to modify the table accordingly.

2.10 Examination of Executive Bodies

The Chilean Side pointed out that PROCEFF is not an informal sub-program, but was in fact formally established in 1994.

The Team acknowledged the remark.

2.11 Examination of Institutional System for Medical SWM

The Chilean Side objected to the fact that no additional human resources will be needed for the enforcement of the Medical SWM Master Plan and requested that two additional

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professionals to be hired within the Basic Sanitation Program should be recommended under the human resources requirements.

The Team accepted the request and informed that will provide the qualification requirements for the additional staff.

2.12 Obligation of Treatment before Discharge

The Chilean Side solicited that this item make reference not only to discharge into the sewerage, but also into all other water courses.

The Team accepted to make the corresponding modification.

2.13 Analytical Laboratories and Capacity

The Chilean Side requested that the role of the Instituto de Salud Pública (Public Health Institute) be reinforced throughout the Study with regard to its use as "reference laboratory" and with regard to the need of coordination with the CENMA project.

The Team accepted the request

2.14 Data Base to be Established

The Chilean Side pointed out that the establishment of a data base through information collection should be developed simultaneously with the corresponding norms and regulations that require such information, and requested that this is specified in the report.

The Team agreed to the request.

2.15 Problems with the Present ISWM

The Chilean Side requested that the Team's statement reading "as long as the ISW which are received at municipal landfills are non hazardous, no problems are envisaged from the technical point of view" should specify that this is only true "as long as they are subject to special handling within the landfill".

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The Team agreed to make the requested modification.

2.16 Follow up by CENMA Project

The Chilean Side requested that the Team help to clarify the priorities with regard to the work to be developed by the JICA experts of CENMA in relation to the activities of the Master Plan.

The Team accepted the request.

2.17 Comments on Draft Final Report

The Team requested that all comments by the Chilean side to the Draft Final Report should be submitted to the JICA office in Santiago by January 10th if they are to be considered by the Team for the preparation of the Final Report.

The Chilean Side agreed to the request.

2.18 Vehicle Used for the Study

The Chilean Side requested that the vehicle used for the Study, whose specifications are listed below, should be handed over to them in order to carry out further investigation by the Chilean Side:

- . Brand Name: Mitsubishi
- . Type of Vehicle: Jeep
- . Model: Montero
- . Color: Green
- . Patent Code: NL 5972-6
- . Engine Number: YQ-6584

The Team answered that it would convey the request to the JICA headquarters.

2.19 Publication of the Final Report

The Chilean Side requested not to disclose the information in relation with the candidate sites

for one year.

The Team answered that it would convey the request to the JICA headquarters.

3. CONCLUSION

With the above clarifications and modifications the Draft Final Report was approved by the Chilean Side.

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JICA

Appendix 1

List of Attendants

I. Chilean Side

a. CONAMA, Metropolitan Region

- . Javier Vergara (Regional Director)
- . Joost Meijer (Coordination Engineer)
- . Dominique Hervé (Lawyer)

b. Ministry of Health

- . Gonzalo Aguilar (Environmental Sanitation Program)

c. SESMA-PROCEFF

- . Marta Zamudio (Chief of Fixed Sources Program)

II. Study Team

- . Susumu Shimura (Team Leader)
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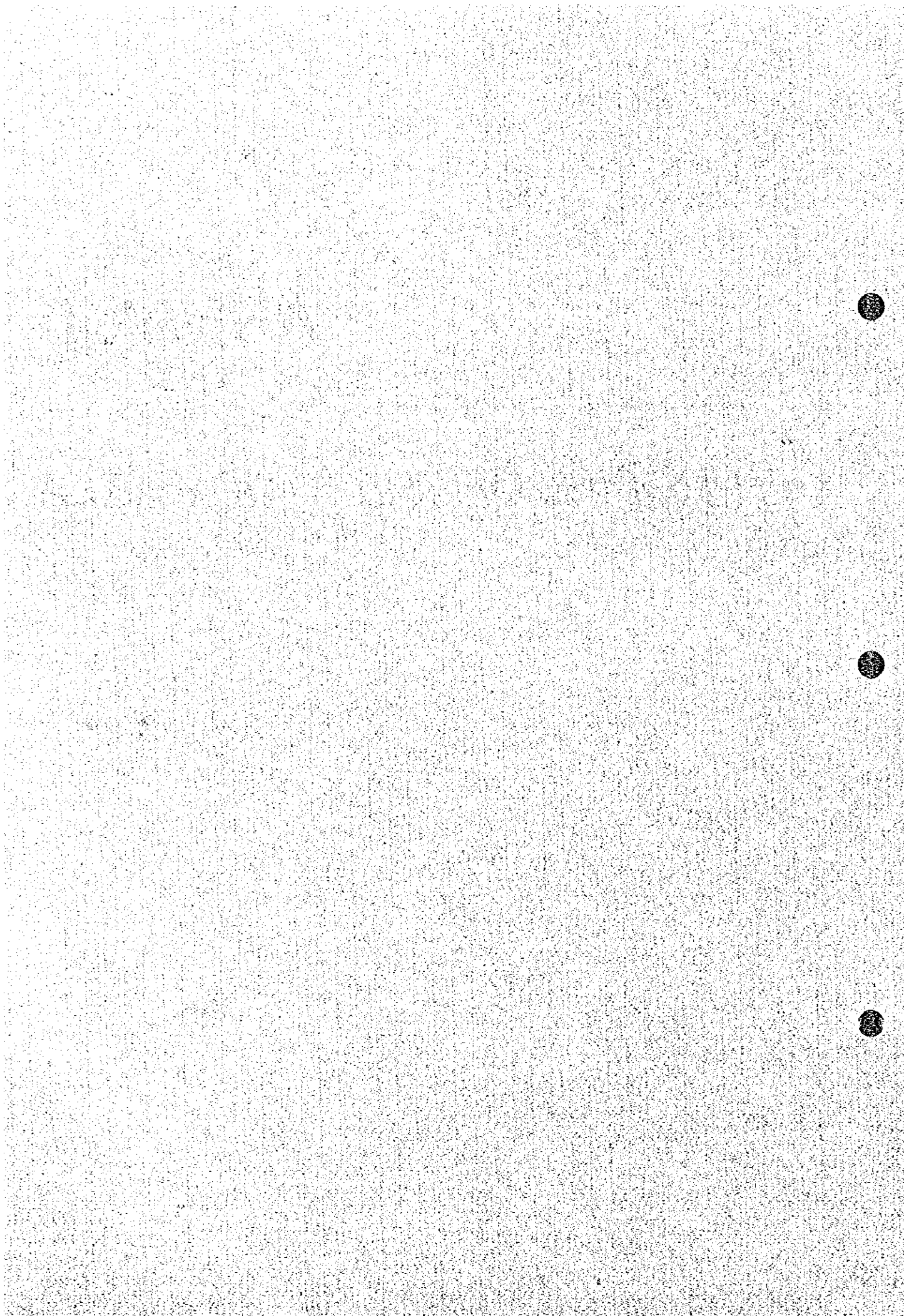
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ANNEX B

PROFILE OF THE STUDY AREA



CONTENTS

	Page:
B.1 Natural Conditions	B-1
B.1.1 Geography	B-1
B.1.2 Climate	B-2
B.2 Socio-Economic Conditions	B-2
B.2.1 Population	B-2
B.2.2 Labor force	B-4
B.2.3 Health	B-5
B.2.4 Economy	B-6
B.2.5 Investment	B-8
B.3 Urban Structure	B-10
B.4 Environmental Sanitation	B-12
B.4.1 Water Sources, Quality and Use	B-12
B.4.2 Waste Water	B-17
B.4.3 Air Pollution in the Metropolitan Region	B-25
B.5 Industries	B-30
B.5.1 Characteristics of the Industries in the Study Area	B-30
B.5.2 Location of Industries	B-33

LIST OF TABLES

	Page:
Table B.2.1a Distribution of Population by Province in MRS	B-3
Table B.2.1b Population projection of MRS based on the two existing studies	B-3
Table B.2.2a Number of Employees in the MRS and National Total	B-4
Table B.2.2b Annual Change of Unemployment in MRS (1990-1993)	B-4
Table B.2.2c Percentage Distribution of Work Force by Sector	B-5
Table B.2.3a Number and Density of Hospital Beds by Regions (1992)	B-6
Table B.2.4a Regional GDP of MRS and National GDP	B-7
Table B.2.4b Annual Growth of GDP in MRS and National Total	B-7
Table B.2.4c Change of Sectoral GDP in the MRS	B-8
Table B.2.5a Sectoral Investment in the MRS and National Total	B-9
Table B.2.5b Planned Private Investment in MRS, Santiago and Chile Total	B-9
Table B.3a Urban Population Change by Classified Area	B-10
Table B.4.1a Drinking Water Coverage in the Metropolitan Region	B-16

Table B.4.2a	Sewerage Coverage in the Metropolitan Region	B-18
Table B.4.2b	Input of Contaminants into the Maipo Basin	B-19
Table B.4.2c	Input of Contaminants Elements into the Maipo Basin	B-20
Table B.4.2d	Parameters which Constitute Quality Requirements for Irrigation Water according to Chilean Norm NCh 1333	B-21
Table B.4.2e	Water Quality Requirements for Recreation without Direct Contact ...	B-22
Table B.4.2f	Water Quality Requirements for Recreation with Direct Contact	B-22
Table B.4.2g	Maximum limits for industrial liquid waste discharges into the public system of waste water collection	B-24
Table B.4.3a	Average Annual Contribution (%) of Main Groups of Atmospheric Contamination Sources	B-26
Table B.4.3b	Atmospheric Contamination: Global Emissions of Atmospheric Pollutants in the Metropolitan Region in 1990	B-27
Table B.4.3c	Primary and Secondary Air Quality Standards	B-28
Table B.4.3d	Emission Standards for Specific Stationary Sources	B-29
Table B.5.1a	Regional GDP by Sector (1985-1990)	B-30
Table B.5.1b	Distribution of Industrial Establishments and Employees in MR	B-31
Table B.5.1c	Distribution of Manufacturing Industries in accordance with the Potentiality of Generating Hazardous ISW	B-32
Table B.5.1d	Distribution of Gas Stations, Laundries/Dry Cleaners and Power Station	B-33
Table B.5.2a	Location of Industries by Province in the MR	B-37
Table B.5.2b	Location of Industries by Comuna in Santiago Province	B-39

LIST OF FIGURES

		Page:
Figure B.3a	Land Use Plan for the Metropolitan Region	B-11
Figure B.5.2a	Distribution of Industries Located in the MR	B-36
Figure B.5.2b	Distribution of Industries Located in Santiago Province	B-38

ANNEX B PROFILE OF THE STUDY AREA

B.1 Natural Conditions

The salient features of the study area are summarized as follows:

- basin-like topography which affects air pollution and localization of a final disposal site;
- less precipitation is advantageous towards the treatment of leachate by circulation. On the contrary it derives importance of water resources for irrigation in the summer; and
- a rich river water which is represented by the flow rate of the Rio Maipo, i.e. 150 m³/sec in summer and 500 m³/sec in winter.

B.1.1 Geography

a. Location and land area

Chile is located at latitude between 17°30' and 56°32' south and longitude between 66°30' and 75°40' west. It is a very long and narrow country with a length of about 4,270 km from north to south, a width of 180 km from east to west and a land area of 757,000 km².

The Metropolitan Region of Santiago (hereinafter referred as MRS) is situated at latitude between 32°55' and 34°19' south and longitude between 69°46' and 71°43' west with a length of about 150 km from north to south, a width of 160 km from east to west and a land area of 15,300 km².

b. Geographical and administrative regions

The country is divided into 13 Regions geographically and administratively from the boundary with Peru to the south. Other than the Metropolitan Region of Santiago, the regions are often referred to by number rather than name.

c. Topography

The long and narrow land consists of three parts, namely western slopes of the Andes Mountains including Mt. Aconcagua (6,960 m) to the east, coastal mountains which run parallel with the Andes Mountains to the west, and central plains in the center. In the north, the Tarapaca and Atacama deserts which are dry high lands with almost no rainfall, are located. The coastal mountains, ranging from the point of latitude 26° to 42° south which reaches Puerto Montt, include hilly districts of 1,000 to 2,000 meters in height. The central plains situated inland of the coastal mountains are fertile areas at a height of less than 200 meters.

The MRS (Study Area) is located at the central plain.

B.1.2 Climate

As for the climate in Chile, there is a large difference due to the long and narrow land. The land is divided into the following four areas by climate.

- desert area
- mediterranean climate area
- forest area
- grass-covered plain area

The MRS is in the Mediterranean climate area. The average annual precipitation and temperature of the Region are 330 mm (300 mm in the north and 600 mm in the south) and 15°C respectively. The potential annual evapotranspiration varies between 1,700 - 1,800 mm in the north and 1,350 - 1,600 in the south and west.

B.2 Socio-Economic Conditions

B.2.1 Population

The population of the Metropolitan Regions of Santiago (MRS) is approximately 5.26 million according to the latest population census conducted in 1992. It covers approximately 40% of the Chilean total population of about 13 million. In the Province of Santiago, which is one of the largest metropolitan city in the Latin American countries, the population is 4.3 million or 80 % of the MRS's population.

The density of population is as much as about 2,155 persons per square kilometer. The provincial distribution of population in the Metropolitan Region is shown in Table B.2.1a.

Table B.2.1a Distribution of Population by Province in MRS

Province	Total Area * ¹ (km ²)	Population * ² (thousand)	Density (psn./km ²)
Santiago	2,000	4,311	2,155
Chacabuco	1,800	91	51
Cordillera	5,500	278	50
Maipo	1,200	293	244
Melipilla	4,300	119	29
Talagante	800	167	21
Total/Avg.	15,600	5,258	Avg. 370.1

Note: *¹ The total area given above is the approximate figure.

*² Population data is based on 1992 Census in Chile.

Source: SERPLAC (Secretaria Regional Ministerio de Planificacion y Coordinacion Region Metropolitana), 1994.

Regarding the projection of future population in the MRS, there are two studies, both of which are based on the Census in 1992. Table B.2.1b compares the projected population estimated by these two studies.

Table B.2.1b Population projection of MRS based on the two existing studies

Origin of Projection	Population in 2000	Population in 2010
INE's estimation * ¹	6.1 million	6.9 million
Mideplan * ²	5.8 million	6.6 million

Note: *¹ INE (National Institute of Statistics).

*² Mideplan is formulated by the Regional Secretariat of the Ministry of Planning and Coordination for the Metropolitan Regions.

B.2.2 Labor force

The labor force in the MRS reached about 2.2 million or 42 % of the national total in 1994. Of the labor force in the MRS, 86% are employed in the Province of Santiago.

Table B.2.2a Number of Employees in the MRS and National Total

Year	MRS	National Total	MRS/Total
1990	1,938.6	4,675.7	41.5%
1991	1,928.0	4,739.5	40.7%
1992	2,004.9	4,863.5	41.2%
1993	2,154.3	5,112.4	42.1%
1994 *1	2,218.8	5,210.4	42.6%

Note: *1 The number only covers preliminary results based on the first quarterly data (January to April) of the year 1994.

Source: National Institute of Statistics (INE) and National Survey on Employment (ENE)

Although unemployment in the MRS is estimated to be as much as about 87.6 thousand in 1993, the unemployment rate has decreased from 7.1 to 4.5 % by the increasing employment as indicated in the Table B.2.2b.

Table B.2.2b Annual Change of Unemployment in MRS (1990-1993)

Year	Metropolitan Region		National Total	
	Number (thousand)	%	Number (thousand)	%
1990	125.2	6.5	281.3	6.0
1991	141.5	7.3	305.7	6.5
1992	98.5	4.9	237.1	4.9
1993	87.6	4.1	238.2	4.7

Source: INE and ENE.

The table below shows the distribution of work force by economic sector in the MRS and the national total. There are three major economic sectors absorbing a large number of work force namely, manufacturing, commercial, and service sectors. In

terms of employment, the role of primary industry such as agriculture, fishing, and mining is relatively low in comparison with its role at the national level. Particularly, the role of manufacturing seems to be important in the MRS.

Table B.2.2c Percentage Distribution of Work Force by Sector

Sector	Metropolitan Region	National Total
Agriculture & fishing	4.0%	16.6%
Mining	0.3%	1.8%
Manufacturing industry	23.3%	16.9%
Electricity, gas and water	0.6%	0.6%
Construction	8.8%	8.0%
Commercial	20.3%	18.3%
Transport, storage and communication	6.5%	7.2%
Financial services	8.4%	5.5%
Public, social and personal services	27.7%	25.2%

Source: Mideplan. 1994

B.2.3 Health

The Mortality rate in the MRS is 4.5 per 1000 people, which is the lowest among the regions in Chile. The infant mortality shows, on the other hand, a much higher rate of 12.8 per 1,000 births in 1992 though it has been gradually decreasing in recent years.

Regarding the conditions of medical facilities, the MRS has the best among the regions in terms of the number of hospital beds, doctors, pharmacists and other medical service facilities and experts. However, due to the concentration of a large number of population, availability of these facilities is relatively low as with other regions. (See Table B.2.3a).

Table B.2.3a Number and Density of Hospital Beds by Regions (1992)

Regions	Number of Beds	Density (person/ bed)
Region I	806	463
Region II	1,010	392
Region III	479	423
Region IV	1,045	475
Region V	4,176	344
Region VI	1,512	438
Region VII	2,171	401
Region VIII	4,274	400
Region IX	2,290	353
Region X	2,811	335
Region XI	291	283
Region XII	567	292
MRS	10,744	508
Total	32,176	Avg. 393

Source: Ministry of Health.

B.2.4 Economy

As the economic center of the Republic of Chile, the MRS leads the steady growth of national economy. As indicated in the table below, the regional gross domestic products of MRS covers about 47% of the Chilean GDP in the year 1992.

The economic growth rate of MRS has been kept higher than that of national economy. The average annual growth rate between 1984 and 1992 reaches approximately 8% per annum.

Table B.2.4a Regional GDP of MRS and National GDP

Year	MRS (million ps. 1986)	National Total (million ps. 1986)	MRS/National (%)
1985	1,204,464	2,868,406	42.06%
1986	1,298,403	3,025,304	42.92%
1987	1,403,961	3,203,197	43.83%
1988	1,497,188	3,426,979	43.69%
1989	1,660,442	3,734,438	44.46%
1990	1,736,198	3,846,846	45.13%
1991	1,853,863	4,073,292	45.51%
1992	2,080,761	4,452,973	46.73%

Source: The Central Bank of Chile.

Table B.2.4b Annual Growth of GDP in MRS and National Total

Year	Metropolitan Regions	National Total
1986	7.6%	5.6%
1987	8.1%	6.6%
1988	6.6%	7.3%
1989	10.9%	10.2%
1990	4.6%	3.0%
1991	6.8%	6.1%
1992	12.2%	10.3%

Source: The Central Bank of Chile.

Regarding the GDP by sector in the MRS, there are three major sectors covering a large portion of the regional GDP, namely manufacturing, commercial, and financial service sectors as found in the Table B.2.4c. As in the case of employment, the role of primary industry is relatively low in the MRS.

Table B.2.4c Change of Sectoral GDP in the MRS

unit: million ps.

Sector	1986	1987	1988	1989	1990
Agriculture	42,263	44,069	48,468	52,695	59,033
Fishery	96	91	108	138	180
Mining	11,001	11,372	14,149	14,514	15,259
Manufacturing industry	279,354	306,302	328,805	365,232	372,129
Electricity, gas, and water	23,395	24,109	24,158	27,046	28,066
Construction	60,512	68,896	80,741	89,542	95,255
Commercial	353,384	395,109	413,486	479,365	504,758
Transport and communication	107,819	118,054	128,808	145,056	155,765
Financial services	334,473	360,953	388,665	436,109	450,856
Real estate services	97,078	98,279	99,900	101,831	104,491
Personal services	163,327	170,167	179,042	186,188	190,781
Public administration	61,218	60,513	60,347	60,697	62,359
Banks' input	-197,644	-209,659	-228,456	-253,823	-260,652
Total	1,294,013	1,448,255	1,538,221	1,704,590	1,778,280

Source: SOFOFA

B.2.5 Investment

Trend of investment is one of the key factor of economy, especially for a country in the middle of socio-economic development such as Chile. Particularly, private sector investment is an important element of sustaining the free market policy in this country.

Table B.2.5a shows the sectoral investment in MRS in 1993. A large amount of investment was placed in urban infrastructure development, such as transport, public works, and telecommunication. The investment in industrial sector reached 328.4 million ps.

Table B.2.5a Sectoral Investment in the MRS and National Total

unit: million ps.

Sector	MRS	National total	Ratio to Total
Industry	328.4	3,170.9	10.4%
Mining	16.0	2,077.2	0.8%
Private energy	234.5	1,354.2	17.3%
Telecommunication	365.2	1,847.0	19.8%
Tourism	39.9	521.6	7.6%
Commerce	106.5	310.7	34.3%
Private Services	109.0	403.2	27.0%
Private Transport & infrastructure	350.0	1,181.2	29.6%
State-owned Enterprise	0.0	1,899.2	0.0%
Public Energy	0.0	105.0	0.0%
Transport & Public Works	432.2	765.6	56.5%
Total	1,981.7	13,635.8	14.5%

Source: SOFOFA (1994)

The table below indicates the planned private sector investment in the MRS, the Province of Santiago, and the national total. The detailed private investment projects in the MRS are provided in Appendix 1.

Table B.2.5b Planned Private Investment in MRS, Santiago and Chile Total

unit: US\$ million

	1994	1995	1996	1997	1998
Metropolitan Region other than Santiago Province	20.8	30.1	12.5	7.5	0.0
Santiago Province	97.0	125.6	32.5	2.1	0.3
MRS	117.8	155.7	45.0	9.6	0.3
National Total	487.4	798.2	433.5	271.8	355.0
Ratio to National Total	24.2%	19.5%	10.4%	3.5%	0.1%

Source: SOFOFA

B.3 Urban Structure

Due to rapid economic growth, urbanization in the MRS has been expanding up to outside the boundary of Santiago Province. This expanding urban area is called "Gran Santiago (Greater Santiago)" which covers the Province of Santiago and some parts of surrounding provinces. A report from the MIDEPLAN pointed out that urban population is recently increasing especially around the area of urbanization boundary.

The table below indicates the population change in Greater Santiago by area classified in accordance with a certain distance from the urban center of Santiago. We can find out that the further from the center, the more the population has increased.

Table B.3a Urban Population Change by Classified Area

	Population (millions)		Annual growth
	1982	1992	
Central Santiago	0.23	0.20	-1.40%
Primary Circle	1.35	1.29	-0.43%
Secondary Circle	1.03	1.14	1.02%
Tertiary Circle	1.33	2.05	4.40%
Remaining Comunas	0.37	0.48	2.64%

Source: MIDEPLAN, 1994.

To optimize the trend of urbanization in the MRS, the MIDEPLAN (Regional Secretariat of Planification and Coordination Ministry for the Metropolitan Region) formulated a land use regulation plan in 1994. The land use plan designated the area for some specific land use such as for industry, housing and so forth. It also set up urbanization boundary to control the urban development activities. The land use plan is illustrated in Figure B.3a.

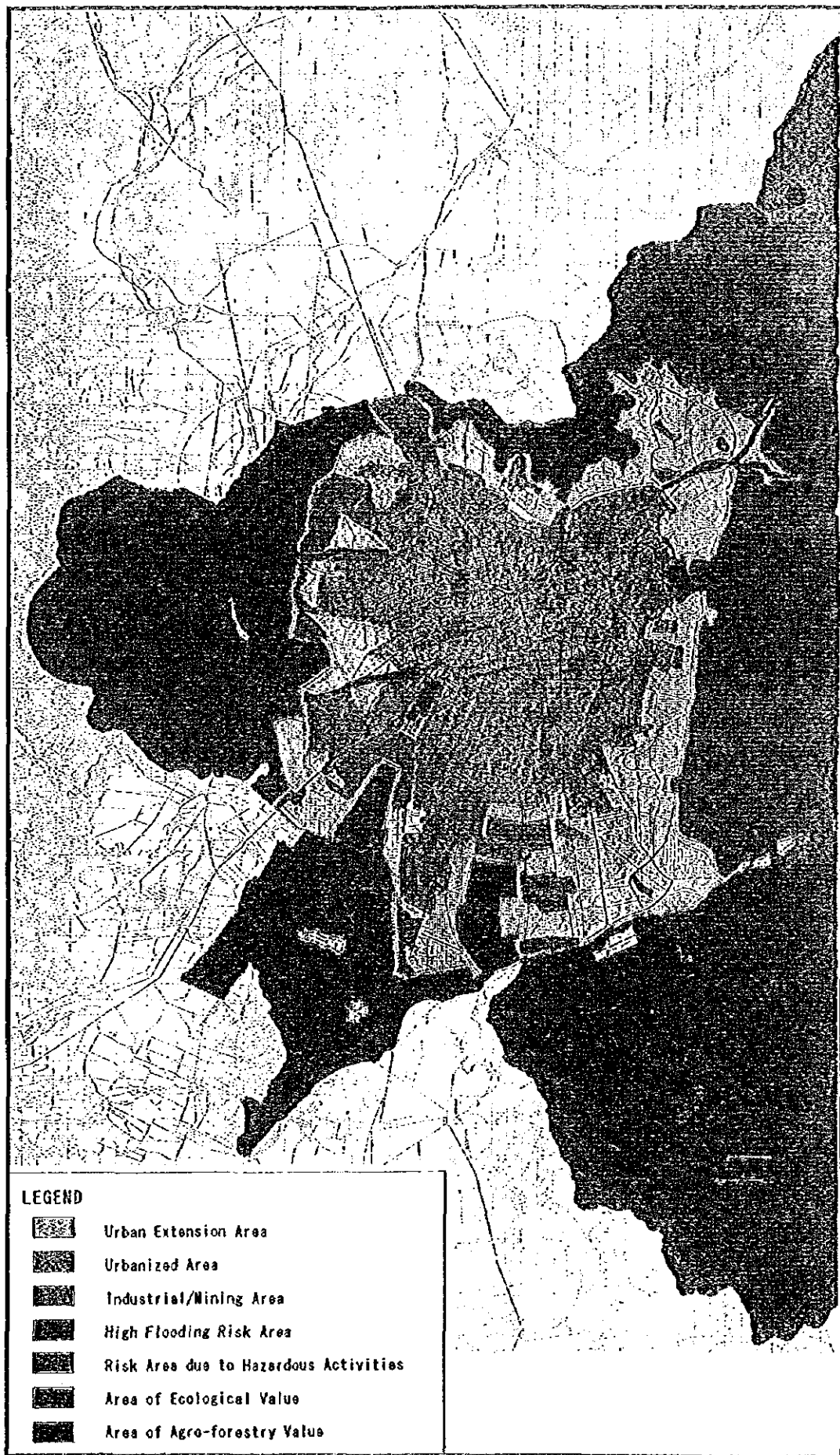


Figure B.3a Land Use Plan for the Metropolitan Region



B.4 Environmental Sanitation

B.4.1 Water Sources, Quality and Use

a. Sources

The water used for domestic, municipal and industrial purposes in the Metropolitan Region is supplied by surface and underground sources. The regional hydrographic system is constituted by the Maipo river basin which, with a surface of 15,400 km², is one of the most extensive in the country. This river drains the whole territory of the region by means of its main tributaries: the Volcán, Yeso, Colorado and Mapocho rivers, and the Angostura and Puangue brooks. Their water supply is by rainfall during autumn and winter and through snow thawing during spring and summer.

b. Quality

In general, the region's water is of a good physical and chemical quality. At many sources the water is too hard, but this feature does not render it unfit for drinking; in such cases, both industries and hospitals must subject it to softening processes according to their requirements.

Most surface water of the basin downstream of Santiago shows the effects of the discharge of untreated sewage, both domestic and industrial, from the city.

In the western sector of Santiago Province the ground water contains nitrate as a result of the constant use of Santiago's sewage water for the irrigation of that area. The amount of nitrate present does not exceed the requirements established for this parameter by the Chilean norm NCh 409/1 for Drinking Water Quality. The parameters which constitute quality requirements for drinking water according to the Chilean standards NCh 409/1 are described below.

ba. Physical Requirements

Turbidity, true color, smell, taste.

bb. Chemical Requirements

Item	mg/liter
ammonia	0.25
arsenic	0.05
cadmium	0.01
cyanide	0.20
chloride*	250
copper*	1.0
phenol compounds	0.002
hexavalent chromium	0.05
detergent	0.50
fluoride	1.5
iron*	0.3
magnesium	125
manganese*	0.10
mercury	0.001
nitrate*	10
nitrite	1.0
Lead	0.05
filterable solid waste*	1000
selenium	0.01
sulphate*	250
zinc*	5.0

Note: * For these substances the Ministry of Health may accept greater quantities than those specified in NCh 409/1.

bc. Radioactive Requirements

Item	pCi/ liter
strontium 90	10.00
radium 226	3.00
total beta activity	1000
total alpha activity	15.00

Note: pCi: pico curie

bd. Bacteriological Requirements

- germs of the coliform group: 5/100 ml
- micro-organisms of fecal origin: absent

be. Requirements for Disinfection

Residual chlorine: 0.20 mg/liter

bf. Requirements for Pesticides

Item	µg/liter
Trichloromethane	100
DDT	1
Deptachlor	0.1
2,4 D	100
Clordano	0.3
Lindano	3
Metoxidor	30
Hexachlorine benzene	0.01
Dieldrin	0.03
Endrin	0.2
Fenoprop	10
Toxafeno	5

c. Uses of Water Resources

Apart from its use for agricultural irrigation, water is used mainly for domestic and industrial activities.

When it is to be used for domestic activities, water from surface sources normally undergoes treatment in order to fulfill the turbidity and disinfection requirements. In case of its being used for industrial activities, other specific treatments might be necessary.

As for ground water, when used for domestic purposes it is only disinfected; for industrial purposes it undergoes specific treatments if and when necessary.

Approximately 99.4% of the urban population and 85% of the rural population of the Metropolitan Region enjoy a good drinking water supply service.

Table B.4.1a below shows the drinking water coverage per enterprise or service in the Metropolitan Region.

Table B.4.1a Drinking Water Coverage in the Metropolitan Region

ENTERPRISE	SERVICE AREA	Population	DRINKING WATER		
			*	**	***
EMOS S.A.	Greater Santiago * ¹	4,186,394	889,030	4,184,907	100.0%
	Curacavi	10,900	2,561	10,184	93.4%
	Isla de Maipo	8,000	1,580	5,811	72.6%
	Melipilla, Pomaire	46,000	11,670	39,706	86.3%
	Til-til	4,700	808	4,006	85.2%
	Talagante	36,700	8,792	36,084	98.3%
	Peñaflor, Malloco, P. Hurtado	72,700	13,859	66,685	91.7%
	El Monte, El Paico	16,800	3,125	14,894	88.7%
	Buin, V. Paine, Maipo Linderos	37,900	7,495	35,004	92.4%
	Paine	10,300	3,136	10,044	97.5%
	Pirque	1,500	335	1,358	90.5%
	S. Jose de Maipo and Others	8,000	1,850	7,167	89.6%
	Calera de Tango	4,300	1,471	3,719	86.5%
EMOS TOTAL		4,444,194	945,712	4,419,569	99.4%
Empresa A.P. Lo Castillo	Las Condes* ² , Vitacura, Lo Bamechea	260,000	50,559	260,000	100.0%
A.P. Manquehue	Santa Maria de Manquehue	7,000	1,431	7,000	100.0%
E.A.P. Villa Los Dominicos	Las Condes* ² , L. Dominicos	8,000	1,825	8,000	100.0%
Serv. Mun. A.P. y Aic. Maipu	Maipu, Cerrillos, E. Central * ²	420,000	93,587	417,759	99.5%
Cossobo	Stgo. Rem. San Borja	12,000	3,044	12,000	100.0%
Servicomunal S.A.	Colina and Esmeralda	37,000	7,497	35,922	97.1%
	Lampa	7,000	1,181	5,777	82.5%
TOTAL		5,195,194	1,104,836	5,166,027	99.4%

Note: Estimated Status as of 31/12/93 (Superintendency of Sanitary Services)

* Number of service connections to the main.

** Population (Number of inhabitants receiving supply).

*** Approximate percentage covered.

*¹ Includes SANTIAGO Province plus S. BERNARDO and PUENTE ALTO Communes, excepting other communes listed under other Enterprises.

*² Indicates that the Enterprise partially takes in the respective commune.

The population distribution among the Enterprises has been adjusted in relation to the previous report on the basis of new information, such as the census data for 1992 (Populations per Región Metropolitana comuna), and the relative number of service connections to the mains in relation to the total in the Comuna.

B.4.2 Waste Water

a. Sewerage Coverage

A sewerage service is available for 96.1% of the urban population of the Metropolitan Region, allowing the disposal of both domestic and industrial waste water, which is discharged into surface water courses. In the case of Santiago city, 61% of sewer-conducted waste water is discharged into the Zanjón de la Aguada, 37% into the Mapocho river, and 2% into the Maipo river.

Table B.4.2a displays the coverage, per Enterprise and service, of the sewerage system as of 31/12/93.

Table B.4.2a Sewerage Coverage in the Metropolitan Region

COMPANY	SERVICE	Population	SEWERAGE		
			*	**	***
EMOS S.A.	Gran Santiago *1	4,186,394	875,467	4,121,071	98.4%
	Curacavi	10,900	2,001	7,957	73.0%
	Isla de Maipo	8,000	0	0	0.0%
	Melipilla, Pomaire	46,000	10,350	35,214	76.6%
	Til-til	4,700	0	0	0.0%
	Talagante	36,700	7,529	30,828	84.0%
	Peñaflor, Malloco, P. Hurtado	72,700	10,626	51,129	70.3%
	El Monte, El Paico	16,800	1,965	9,365	55.7%
	Buin, V. Paine, Maipo, Linderos	37,900	4,260	19,896	52.5%
	Paine	10,300	2,063	6,607	64.1%
	Pirque	1,500	0	0	0.0%
	S. Jose de Maipo and Other	8,000	649	2,514	31.4%
	Calera de Tango	4,300	102	258	6.0%
	Total EMOS:	4,444,194	915,012	4,284,839	96.4%
Empresa A.P. Lo Castillo	Las Condes *2, Vitacura, Lo Barnechea	260,000	48,807	247,611	95.2%
A.P. Manquehue	Santa Maria de Manquehue	7,000	1,357	7,000	100.0%
E.A.P. Villa Los Dominicos	Las Condes *2, L. Dominicos	8,000	1,487	6,638	83.0%
Serv. Mun A.P. y Alc. Maipo	Maipo, Cerrillos, E. Central *2	420,000	82,130	411,360	97.9%
Cossbo	Stgo. Rem. San Borja	12,000	(Sewerage Ran by EMOS)		
Servicomunal S.A.	Colina and Esmeralda	37,000	6,366	33,886	91.6%
	Lampa	7,000	0	0	0.0%
	TOTAL	5,195,194	1,055,159	4,991,334	96.1%

Source: Department of Regulation and Control, Superintendency of Sanitary Services.

Notes: * Number of connections.

** Number of inhabitants covered.

*** Percentage of coverage.

*1 Includes SANTIAGO Province plus S. BERNARDO and PUENTE ALTO Communes, excepting other communes listed under other Enterprises.

*2 Indicates that the Enterprise partially takes in the respective commune.

Treatment of waste water in the Metropolitan Region is at an experimental stage. Between 2 and 3% of the domestic sewage produced is processed in treatment plants, most of which are stabilization lagoons. With a few very recent exceptions, industries undertake almost no treatment. SESMA has approved treatment plant projects for approximately 30 industries, several of which are in operation.

b. Input of Contaminants into the Maipo Basin

Tables B.4.2b and B.4.2c below show the values of contaminating substances received by the Maipo basin.

Table B.4.2b Input of Contaminants into the Maipo Basin

Items	Ton/Month
BOD ₅	4,239
Suspended Solids	2,489

Source: Annex Superintendency of Sanitary Services Report 1990-1993

Table B.4.2c Input of Contaminants Elements into the Maipo Basin

ELEMENT	kg/day
Copper	600.9
Iron	967.7
Manganese	296.2
Cobalt	3.8
Cadmium	3.9
Chrome	205.4
Molybdenum	337.0
Lead	22.5
Silver	8.7
Nickel	27.4
Zinc	47.4
Arsenic	3.3
Detergents	35.8
Sulphides	0.1
Phenols	3.2
Fluoride	0.01
Hydrocarbide	16.1
Sulphites	44.5
Magnesium	173.0
Cyanide	0.003
Silicon	1,002.4
Calcium	4,911.8
Boron	0.5
Titanium	88.8

Source: Base Project Study for the Definition of a Water Contamination Control Program
(Intendencia of the Metropolitan Region. SERPLAC. ARA/SEEBLA/CONSECOL Consortium. January 1989)

c. Water Quality Requirements for Irrigation Water

Norm NCh 1333 from 1987 establishes quality requirements for different uses of water, setting the maximum values allowed for several parameters that are considered basic. Tables B.4.2d, B.4.2e and B.4.2f show some of those values.

Table B.4.2d Parameters which Constitute Quality Requirements for Irrigation Water according to Chilean Norm NCh 1333

Parameters	mg/l
pH	5.5 - 9.0
Aluminum (Al)	5.00
Arsenic (As)	0.10
Barium (Ba)	4.00
Beryllium (Be)	0.10
Boron (B)	0.75
Cadmium (Cd)	0.01
Cyanide (CN)	0.20
Chloride (Cl)	200.00
Cobalt (Co)	0.05
Copper (Cu)	0.20
Chromium (Cr)	0.10
Fluoride (F)	1.00
Iron (Fe)	5.00
Lithium (Li)	2.50
Lithium (Citrus) (Li)	0.075
Manganese (Mn)	0.20
Mercury (Hg)	0.001
Molybdenum (Mo)	0.01
Nickel (Ni)	0.20
Silver (Ag)	0.20
Lead (Pb)	5.00
Selenium (Se)	0.02
Percentage Sodium (% Na)	35.00
Sulphate (SO ₄)	250.00
Vanadium (V)	0.10
Zinc (Zn)	2.00

d. Water Quality Requirements for Recreation

Water intended for recreation without direct contact must fulfill the requirements shown in Table B.4.2e.

Table B.4.2e Water Quality Requirements for Recreation without Direct Contact

CHARACTERISTIC	REQUIREMENTS
a) Visible floating solids and non natural foams	Absent
b) Floating oils and fats mg/l, maximum *	5
c) Emulsified oils and fats mg/l, maximum *	10
d) Substances producing unpleasant smell or taste	Absent

Note: * These values may be modified if determined by the competent authority.

Water intended for recreation with direct contact (swimming, diving, water skiing) must, at least, fulfill the requirements shown in Table B.4.2f.

Table B.4.2f Water Quality Requirements for Recreation with Direct Contact

ITEM	REQUIREMENTS
pH	6.5 to 8.3 except when natural conditions of water show different values; in any case should be 5.0 to 9.0.
Maximum temperature	30 °C
Transparency	Visualizing Secchi disc at depth of 1.2 meter
Visible floating solids and non natural foams	Absent
Floating oils and fats, maximum	5 mg/l
Emulsified oils and fats, maximum *	10 mg/l
Maximum color *	100, absence of artificial colorings
Maximum turbidity * (Silicium Scale Units)	50
Maximum fecal coliforms/100 ml *	1,000
Substances producing unpleasant smell/savor	Absence

Note: * These values may be modified if determined by the competent authority

e. Water Quality Requirements for Sewage

Norm NCh 2280 (draft) will establish the features to be fulfilled by industrial liquid waste which are discharged by industrial establishments directly into public systems of waste water collection. Table B.4.2g shows maximum limits for industrial liquid waste discharges into public system of waste water collection.

Table B.4.2g Maximum limits for industrial liquid waste discharges into the public system of waste water collection*¹

Feature	Unit	Exp.	Requirements
PH	unit		5.5 to 9.0
temperature	°C		35
suspended solids	mg/L	S.S	300
sedimentables solids	ml/L.1h		20
oils and greases	mg/L		150
hydrocarbons	mg/L		20
BOD ₅ * ² * ³	mg/L	BOD ₅	300
Arsenic	mg/L	As	0.5
Cadmium	mg/L	Cd	0.5
Cyanide	mg/L	CN	1
Copper	mg/L	Cu	3
Total chromium	mg/L	Cr	3.5
Hexavalent chromium	mg/L	Cr ⁶	0.5
Phosphorus	mg/L	P	10
Mercury	mg/L	Hg	0.02
Nickel	mg/L	Ni	4
Nitrogen	mg/L	N	80
Lead	mg/L	Pb	1
Sulphate (dissolved)	mg/L	SO ₄	1000 * ⁴
Sulphide	mg/L	S ⁻	5
Zinc	mg/L	Zn	5
Detergents	mg/L	SAAM	20
Trichloromethane	mg/L		0.5
Phenolic compounds	mg/L	Fenoles	0.5
Color			At certain intensity that cannot produce negative effects in the treatment methods of the plants.

- Note: *¹ Concentrations refer to total values for each component
*² BOD₅: biochemical demand of oxygen 5 days later and at 20 °C
*³ The discharge of higher values may be requested to the provider, in which case he will define the maximum acceptable level according the treatment capacity of his plant.
*⁴ Concentrations of between 1,000 and 1,500 mg/l will be accepted if the following conditions are met:
- a) pH = 8-9
 - b) waste temperature (°C) < temperature of recipient waste water.

B.4.3 Air Pollution in the Metropolitan Region

The anticyclone conditions predominant during most of the year in Chile's central zone cause low wind velocity, turbulence and frequency in the Metropolitan Region. In the city of Santiago, the situation becomes critical in the winter months due to a thermic inversion layer and to a relatively small amount of rainfall; these conditions result in an extremely bad dispersion and diffusion of the pollutants emitted into the atmosphere through the diverse activities of the city.

Due to this situation, the city of Santiago shows levels of air pollution which are unusually high for its emission levels. Air pollution in Santiago may generally be differentiated into contamination produced by gas and that produced by particulate matter.

According to the information available from the measurements of the MACAM (Sistema de Medicion Automatizada de Contaminantes Atmosfericos y Variables Meteorologicas) monitoring network and the semi-automatic sequential monitors of SESMA, as well as from the diverse studies and projects of recent years, the following pollutants in Santiago reach levels which exceed the air quality norms:

- carbon monoxide (CO), between April and September;
- photochemical oxidizers expressed as ozone (O_3), during the summer months;
- total suspended particles (TSP), during the winter months;
- breathable fractions (PM_{10}) (particulate matter whose aerodynamic diameter is inferior or equal to ten micrometers), during the winter months.

During the autumn and winter months breathable particles greatly exceed the air quality norms, occasionally reaching levels that endanger human health. Particle level 500, defined as dangerous, has been surpassed during certain periods of unfavorable climate. For this reason, first priority has been given to this pollutant for the reduction of contamination levels.

Table B.4.3a shows the contribution to air pollution of Santiago that can be attributed to the different types of emission sources.

Table B.4.3a Average Annual Contribution (%) of Main Groups of Atmospheric Contamination Sources

Source	Emission Contribution *1					Contribution to PM ₁₀ Inmission *2 *3
	CO	NOx	VOC*4	SOx	PM ₁₀	
	%	%	%	%	%	
Industry	10	8	29	82	20	6
Gasoline Vehicles	79	59	44	9	5	6
Diesel Vehicles	2	31	4	4	19	71
Residencies and others	9	2	23	5	7	2
Natural dust	-	-	-	-	49	15
TOTAL	100	100	100	100	100	100

Note: *1 Source: Universe of atmospheric contamination sources and actual inventory of emissions for Santiago (Intendencia Region Metropolitana/Cade-Idepe, 1989).

*2 Physical/Chemical characterization of particulate matter (SESMA/Universidad de Chile, 1985).

*3 Inmission measures the particles inhaled by people.

*4 Volatile Organic Compound

The total emissions of pollutants in the Metropolitan Region in 1990 were estimated at 575,494 tons. Table B.4.3b shows the values for each pollutant.

Table B.4.3b Atmospheric Contamination: Global Emissions of Atmospheric Pollutants in the Metropolitan Region in 1990

SOURCES	POLLUTANTS (TON/YEAR)						
	TPS	SO _x	NO _x	CO	VOC* ¹	PAH* ²	Aldehyde
External Combustion Boilers, Ovens	7,030	45,748	5,334	10,569	3,114	16	331
Internal Combustion Mobile Sources	5,470	6,181	23,435	367,695	28,184	16	-
Industrial Processes	4,510	13,885	64	1,650	7,890	-	-
Garbage Burning and Fires	440	26	160	2,380	850	-	-
Losses through Evaporation	0	0	0	0	6,566	-	-
Dust in Streets (paved and dirt)	33,950	0	0	0	0	-	-
ANNUAL TOTAL	51,400	65,840	28,993	382,294	46,604	32	331

Source: Atmospheric Contamination of Santiago, Present Status and Solutions, Hugo Sandoval L. et al., 1993.

Note: *1: Volatile Organic Compound

*2: Polycyclic Aromatic Hydrocarbons; substances determined in the total particles in suspension (TPS).

Tables B.4.3c and B.4.3d display the primary and secondary air quality norms and the emission norms for specific stationary sources. The first table shows concentration values which should not be exceeded within a given period of time in the atmosphere; the second establishes values aimed at regulating the emission of particulate matter from specific stationary sources in the Metropolitan Region.

Table B.4.3c Primary and Secondary Air Quality Standards

POLLUTANTS	1 hour	8 hours	24 hours	1 year
Primary Standards				
CO	35 ppm * ¹	9 ppm * ¹	-	80 µg/m ³
SO ₂	-	-	365 µg/m ³ * ¹	-
O ₃	160 µg/m ³ * ¹	-	-	-
NO ₂	-	-	100 µg/m ³	-
TPS	-	-	260 µg/m ³ * ¹	75 µg/m ³ * ²
PM ₁₀	-	-	150 µg/m ³ * ³	-
Secondary Standards				
SO ₂	700 µg/m ³ * ⁴	-	-	-

Note: *¹ Arithmetical mean concentration for 1, 8, 24 hours or one year, this value should not be exceeded more than once a year.

*² Annual geometric mean concentration

*³ Daily arithmetical mean concentration

*⁴ In order to establish this secondary standard, Decree 185 divided the national territory in two areas. This value corresponds to the standard for the Metropolitan Region. Given that it is a secondary standard, qualified urban and industrial areas are excluded as such.

Table B.4.3d Emission Standards for Specific Stationary Sources

DEADLINE	EXISTING *2	DEADLINE	NEW *3
By 31.12.92	Max Concentration of TPS *4: 112 mg/m ³	By 31.12.93	Compensation of 25% of its emissions
By 31.12.97	Max Emission/day=flow(m ³ /h) 0.000056(kg/m ³) 24 (h/day) *5	By 31.12.94	Compensation of 50% of its emissions *6
	Max Concentration TPS *3: 112 mg/m ³ of a 75%	By 31.12.95	Compensation of its emissions
		By 31.12.96	Compensation of 0% of its emissions

- Note: *1 Source: Supreme Decree (SD) number 4 of the Ministry of Health.
- *2 Those installed or with authorization for installation on 02.03.92.
- *3 Those installed or with authorization for installation (may a completely new process or the enlargement of existing source installations), requested after 02.03.93, and will be authorized only if they compensate their emissions of particles according to the table and subject to a maximum concentration of 112 mg/m³N.
- *4 Measured by isokinetic, under standard conditions of full capacity.
- *5 The flow must be measured at full capacity, under standard conditions, adjusted depending on air excess (SD 32 and 322); for all sources an operating period of 24 daily hours is considered. It must be noted that in the case of new specific sources an emission maximum is not established for 24 hours, but rather they must compensate the emissions according to their own emissions formula, that is: $E = C_p \cdot Q_g \cdot t_o$, where C_p is the concentration of particles and must be lower than 112 mg/m³; Q_g is the volume flow of emitted gases; and t_o is the operating period.
- *6 From the conjunction of these two provisions, it is concluded that the maximum allowed emission of particles for the existing specific sources, is the result of this equation: Maximum Emission per day=Flow (m³/h)0.000112(kg/m³)*24 h, as long as the difference in emissions between this equation and the following equation is compensated: MaxE/day=Flow(m³/h)0.000056(kg/m³)*24 h.

B.5 Industries

B.5.1 Characteristics of the Industries in the Study Area

a. Contribution of Industrial Sector to the Regional GDP in MR

As shown in Table B.5.1a, commercial industry gained the most GDP of more than 500 billion pesos which covered about 25% of the regional GDP in MR. Manufacturing industry, on the other hand, was the third largest industry which produced 372 billion pesos covering about 18% of the regional GDP. The average annual growth rate of manufacturing industry during 1985-1990 was about 8%.

Table B.5.1a Regional GDP by Sector (1985-1990)

Sectors	1985	1986	1987	1988	1989***	1990***
Agriculture & Silviculture	40,120	42,263	44,069	48,468	52,695	59,033
Fishery	71	96	91	108	138	180
Mining	11,511	11,001	11,372	14,149	14,514	15,259
Manufacturing Industry	248,671	279,354	306,302	328,805	365,232	372,129
Electricity, Gas and Water	23,198	23,395	24,109	24,158	27,046	28,066
Construction	54,840	60,512	68,896	80,741	89,542	95,255
Commercial*	331,191	353,384	395,109	413,486	479,365	504,758
Transport & Communication	99,314	107,819	118,054	128,808	145,056	155,765
Financial Service	308,404	334,473	360,953	388,665	436,109	450,856
Housing & Real Estate	95,875	97,078	98,279	99,900	101,831	104,491
Personal Service**	152,512	163,327	170,167	179,042	186,188	190,781
Public Administration	58,793	61,218	60,513	60,347	60,697	62,359
Bank Imputations (-)	-181,856	-197,644	-209,659	-228,456	-253,823	-260,652
Total	1,242,644	1,336,546	1,448,254	1,538,221	1,704,590	1,778,280

Source: Mideplan

* including restaurants and hotels.

** including education, health and other services.

*** Provisional figures.

b. Distribution of Industries in View of Waste Types Generated

There are a number of sources of ISW generation in MR, that are represented by manufacturing industry as well as other industries such as electricity supply industry,

gasoline filling stations and laundries/dry cleaners.

Based on the INE's data, there are approximately 3,300 establishments of manufacturing industry and they have totally about 273 thousand employees in MR. Table B.5.1b shows the distribution of industrial establishments and employees by type of manufacturing industry.

Table B.5.1b Distribution of Industrial Establishments and Employees in MR

Type of Industry	No. of Establishments	No. of Employees
Food, Beverage and Tobacco (31-)	686	52,790
Textile, Garment and Leather Products (32-)	906	75,090
Wood and Wooden Products (33-)	175	10,190
Paper & pulp, printing, publishing and photoengraving (34-)	215	20,660
Chemical, plastic, rubber, and oil/coal products (35-)	490	41,915
Potteries, ceramic, glass and other non-metallic mineral products (36-)	117	13,650
Iron & steel and basic metal	41	6,385
Metal and machinery products	613	49,455
Other manufacturing	53	2,620
Total	3,296	272,755

Note : The figures in parenthesis indicate the first 2 digits of industry code in accordance with the ISIC.

Source: INE

Most of the manufacturing industry in MR is processing-oriented especially those which generate organic industrial wastes such as food, textile & garment, wooden products and paper manufacturing industries. On the other hand, basic industrial material production industry such as basic chemical industry and iron & steel industry is less dominant in MR.

Viewing from the hazardousness of waste generated, the number of establishments potentially generating hazardous wastes occupies about 50% (1,654 establishments) of the total establishments of manufacturing industry in MR. Among the above establishments, 818 are identified as those which have high potential of generating hazardous wastes. The detail of industrial distribution in accordance with the potentiality of generating hazardous wastes in MR is given in Table B.5.1c.

Table B.5.1c Distribution of Manufacturing Industries in accordance with the Potentiality of Generating Hazardous ISW

Category	CITU	Industrial Category	Total Nos. Industries	Total Nos. Employees
Highly Potential Industries	351	Manufacture of industrial chemical products	45	1,920
	352	Manufacture of other chemical products	167	18,205
	354	Oil and coal products	13	1,335
	356	Other non-classified plastic products	214	15,805
	371	Iron and steel industries	25	4,050
	372	Basic metal industries	16	2,335
	381	Manufacture of metal products except machinery & equipment	338	26,160
Total Potential Industries				
Potential Industries	3211	Textile processing and materials manufacturing	818	69,810
	3231	Leather tanning and finishing	168	19,445
	3232	Fur dressing, dyeing and other fur and skin articles	23	1,870
	3319	Other non-classified wooden products	1	15
	341	Paper, printing and publishing industries	17	770
	3420	Printing, photoengraving, publishing and the likes	63	9,495
	355	Manufacture of rubber products	152	11,165
	362	Glass and glass products	51	4,650
	3699	Other non-metallic mineral products	12	2,115
	382	Manufacture of machinery except electrical	21	1,185
	383	Manufacture of electrical machinery	128	10,145
	384	Manufacture of transport equipment	55	4,755
	385	Manufacture of science, measuring, controlling equipment (incl. lens)	71	7,315
Less Potential Industries	390	Other manufacturing industries	21	1,080
			53	2,620
			836	76,625
	311	Food manufacturing	596	40,550
	312	Other food manufacturing	54	4,505
	313	Beverage industries	33	7,570
	314	Cigarettes, cigars and tobacco	3	165
Total Potential Industries	3212 - 3219	Textile industries	202	13,040
	322	Garment industries	343	25,050
	3233	Leather products (exc. footwear)	26	1,160
	324	Leather footwear	143	14,510
	3311 - 3315	Wood and cork industry	70	3,745
	332	Furniture, fixture and the likes	88	5,675
	361	Potteries and ceramic products	21	3,535
	3691 - 3696	Manufacture of non-metallic mineral products	63	6,815
			1,642	126,320
Total Less Potential Industries				
Grand Total				
			3,296	272,755

Besides the manufacturing industries, this Study took three additional sources of ISW generation, namely gasoline filling stations, laundries/dry cleaners, and electricity supply industry as they may generate considerable amount of ISW and/or hazardous wastes that should not be ignored in view of formulating the proper master plan of ISW management in 2010. Based on the type of waste generated, the Study categorized gasoline filling stations and laundries/dry cleaners as potential industries of generating hazardous wastes while classifying electricity supply industry as less potential one. The present distribution of the above industries are given in Table B.5.1d.

Table B.5.1d Distribution of Gas Stations, Laundries/Dry Cleaners and Power Station

Category	ISIC	Industrial Category	No. of Establishme nt	No. of Employees
Potential industries	625	Gasoline filling station	66	4,170
	952	Laundries and dry cleaners	42	3,480
Less potential industry	410	Electricity supply industry	1	75

Source: INE

B.5.2 Location of Industries

a. Introduction

To identify the current geographical distribution of industries in the Metropolitan Region of Santiago (MR), the Study collected the data from the three sources i.e. the National Institute for Statistics (INE), data base of the Stationary Emission Source Control Program (PROCEFF), and the EWTs RISNOR Study (The study on Diagnosis and Identification of Technologies and Strategies for the Management of Solid Industrial Non-Hazardous Waste in the Metropolitan Region, which was conducted by a domestic private consultant Electrowatt Ingenieros Consultores S.A.). The specification of data for each source are as follows.

aa. Data from INE

The Study obtained from INE the data of location of factories for each type of industry in accordance with the International Standard for Industrial Category (ISIC). The data

covered all the manufacturing industries which is categorized within the ISIC Code from 3111 to 3909 in the MR. In addition, as the industries potentially generating hazardous wastes, the location of electricity supply industry (generation, transmission and distribution), laundries and dry cleaners, and gasoline filling stations were also collected. According to the data, there are 1,534 factories of manufacturing industries in the MR and 1,356 factories are located in the Province of Santiago.

ab. Data from PROCEFF

A data base was established in the office of the PROCEFF for the control system of ISW (CDSI system or Declaration System) through the D&M's RISPEL Study. At present, 509 factories in total are reporting under the declaration system and the address of 421 factories of them is put into the data base. The Study use this data base for cross-examining the addresses of factories given in the INE's data.

ac. Data from the EWI's RISNOR Study

The EWI's RISNOR Study conducted an interview survey to 300 factories in the MRS. The addresses of 265 factories are identified and categorized. However, the categorization of location is not in accordance with the 6 provinces of the MRS.

After cross-examining the data from the three sources above, the Study found that the location data of INE was reliable enough to identify provincial distribution of factories in the MRS. Therefore, the analysis of provincial distribution of factory in the MRS is carried out on the basis of the INE's data.

In addition, the Study clarifies the distribution of factories by each comuna in Santiago Province in order to further specify the conditions of the factories' concentration in Santiago Province. However, because the location data of factories at comuna level was not sufficiently provided in the INE's data, the analysis was carried out based on the location data of PROCEFF combined with the location data obtained from the factory survey done by the Study Team.

b. Overview of Industrial Location in MR

The current industrial location in MR is characterized by its concentration in Santiago Province, where around 90% of the factories in MR are located as shown in Figure B.5.2a. Regarding the type of industry located, food manufacturing industry (17.5%) is the most prevalent in MR followed by garment (10.0%) and metal products (9.9%) manufacturing industries. In terms of hazardousness of the generated wastes, about

50% of the total factories (1,762 factories) are categorized as potential industries of generating hazardous wastes including highly potential ones. Detailed distribution of factories by each province is given in Table B.5.2a.

c. Industrial Location in Santiago Province

From the data obtained from the PROCEFF's data base, high concentrations of factories are found in Comuna Santiago and its neighboring comunas such as Macul, Cerillos, Renca, and so forth. In addition, the industrial area is recently expanding to other comunas e.g. Quilicura, Maipu, Conchali etc. due to the relocation of factories to the newly developed sites outside Comuna Santiago. The distribution of industries in Santiago Province is illustrated in Figure B.5.2b and Table B.5.2b.

SANTIAGO METROPOLITAN REGION

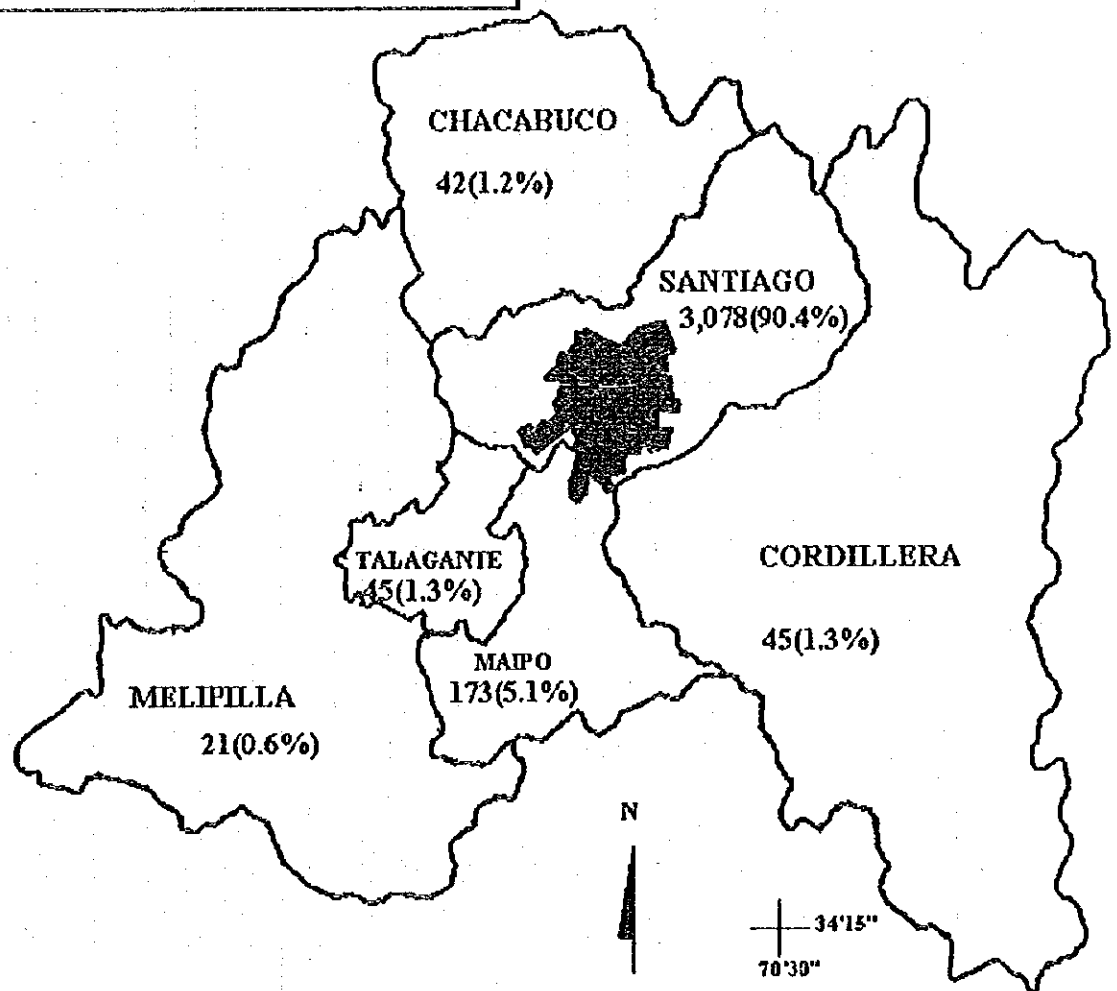
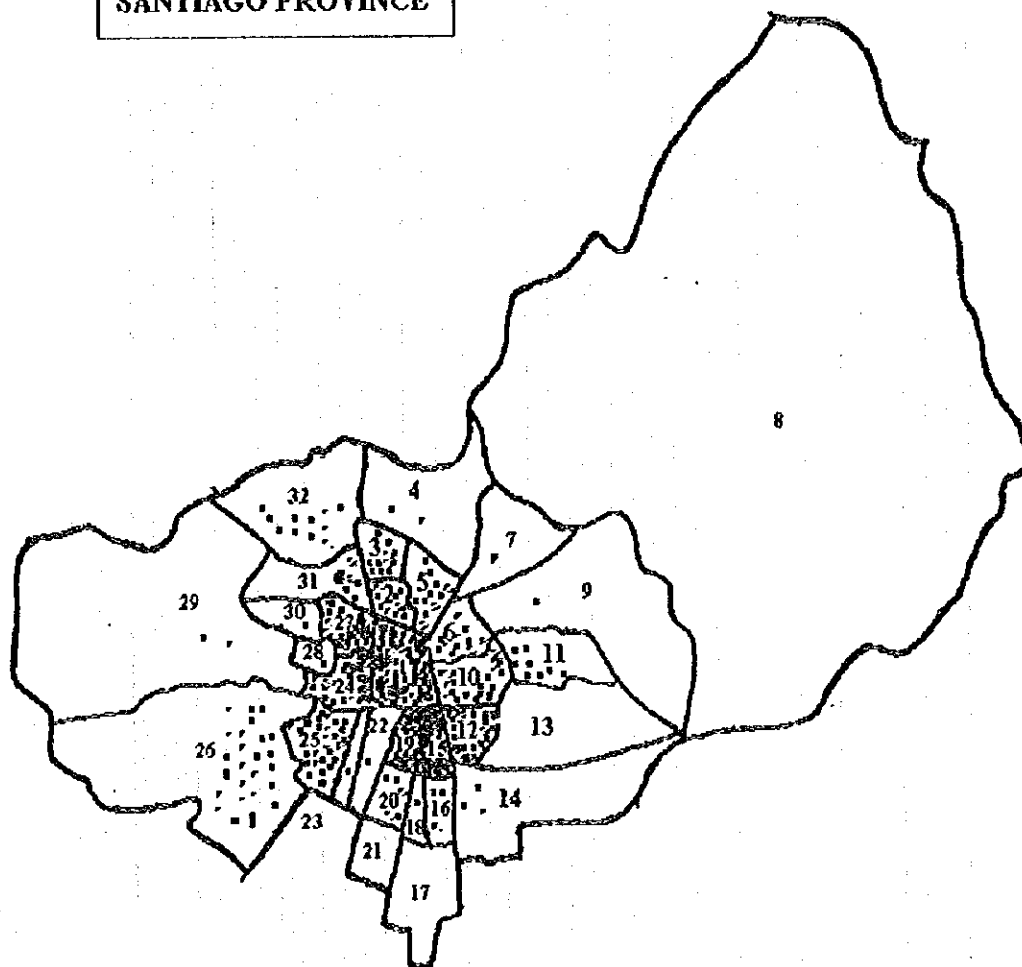


Figure B.5.2a Distribution of Industries Located in the MR

Table B.5.2a Location of Industries by Province in the MR.

Category	CITU	Industrial Category	PROVINCE							TOTAL	%
			Santiago	Chacabuco	Cordillera	Maipo	Melipilla	Talagante			
Highly Potential Industries	351	Manufacture of industrial chemical products	36	1	0	6	0	2	45	1.3%	
	352	Manufacture of other chemical products	158	3	0	5	0	1	167	4.9%	
	354	Oil and coal products	9	2	1	1	0	0	13	0.4%	
	356	Other non-classified plastic products	198	1	3	11	0	1	214	6.3%	
	371	Iron and steel industries	20	0	0	5	0	0	25	0.7%	
	372	Basic metal industries	15	0	0	1	0	0	16	0.5%	
	381	Manufacture of metal products except machinery & equipment	315	1	2	19	1	0	338	9.9%	
			751	8	6	48	1	4	818	24.0%	
Total Potential Industries	3211	Textile processing and materials manufacturing	165	1	1	1	0	0	168	4.9%	
	3231	Leather tanning and finishing	21	0	0	2	0	0	23	0.7%	
	3232	Fur dressing, dyeing and other fur and skin articles	1	0	0	0	0	0	1	0.0%	
	3319	Other non-classified wooden products	15	1	0	1	0	0	17	0.5%	
	341	Paper, printing and publishing industries	53	1	2	4	0	3	63	1.9%	
	3420	Printing, photoengraving, publishing and the likes	150	0	0	2	0	0	152	4.5%	
	355	Manufacture of rubber products	45	1	1	4	0	0	51	1.5%	
	362	Glass and glass products	11	0	0	0	0	1	12	0.4%	
	3699	Other non-metallic mineral products	19	0	1	1	0	0	21	0.6%	
	382	Manufacture of machinery except electrical	116	0	0	6	0	6	128	3.8%	
	383	Manufacture of electrical machinery	52	0	0	2	0	1	55	1.6%	
	384	Manufacture of transport equipment	64	0	0	6	0	1	71	2.1%	
	385	Manufacture of science, measuring, controlling equipment(inc.lens)	20	0	0	1	0	0	21	0.6%	
	390	Other manufacturing industries	51	0	1	1	0	0	53	1.6%	
	625	Gasoline filling station	52	2	5	4	3	0	66	1.9%	
	952	Laundries and dry cleaners	42	0	0	0	0	0	42	1.2%	
			877	6	11	35	3	12	944	27.7%	
Less Potential Industries	311	Food manufacturing	486	12	16	55	12	15	596	17.5%	
	312	Other food manufacturing	47	0	0	2	1	4	54	1.6%	
	313	Beverage industries	23	0	1	4	0	5	33	1.0%	
	314	Cigarettes, cigars and tobacco	3	0	0	0	0	0	3	0.1%	
	3212 - 3219	Textile industries	197	0	1	4	0	0	202	5.9%	
	322	Garment industries	342	0	1	0	0	0	343	10.1%	
	3223	Leather products (exc.footweats)	26	0	0	0	0	0	26	0.8%	
	324	Leather footwears	132	1	0	5	2	3	143	4.2%	
	3311 - 3315	Wood and cork industry	56	3	1	7	1	2	70	2.1%	
	332	Furniture, fixture and the likes	81	1	0	6	0	0	88	2.6%	
	361	Potteries and ceramic products	20	1	0	0	0	0	21	0.6%	
	3691 - 3696	Manufacture of non-metallic mineral products	37	10	8	7	1	0	63	1.9%	
			1,450	28	28	90	17	29	1,642	48.2%	
			3,078	42	45	173	21	45	3,404	100.0%	
		90.4%	1.2%	1.3%	5.1%	0.6%	1.3%	100.0%			

SANTIAGO PROVINCE



1 Santiago	8 Lo Bernechea	15 San Joaquin	21 El Bosque	27 Quinta Normal
2 Independencia	9 Las Condes	16 La Granja	22 P Aguire Cerda	28 Lo Prado
3 Conchali	10 Nunoa	17 La Pintana	23 Lo Espejo	29 Pudahuel
4 Huechuraba	11 La Reina	18 San Ramon	24 Est. Central	30 Cerro Navia
5 Recoleta	12 Macul	19 San Miguel	25 Cerrillos	31 Renca
6 Providencia	13 Peralolen	20 La Cisterna	26 Maipu	32 Quilicura
7 Vitacura	14 La Florida			

Figure B.5.2b Distribution of Industries Located in Santiago Province

Table B.5.2b Location of Industries by Comuna in Santiago Province

Category	CIIU A	COMUNA																															TOTAL	%
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
Highly Potential Industries	351	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	352	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	354	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	356	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	371	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	372	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	381	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	382	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Potential Industries	3211	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3221	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3232	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3319	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	341	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3428	10	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	355	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	362	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3699	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	382	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	385	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	625	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	752	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	752	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	311	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	312	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	313	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3212 - 3219	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	322	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3233	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	324	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3311 - 3315	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	332	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	361	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	625	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Low Potential Ind.	36	21	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	94	9	11	2	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
TOTAL		24.5%	2.3%	2.5%	0.5%	2.9%	2.8%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%

Notes: 1 Santiago 7 Vitacura 13 Pudahuel 19 San Miguel 25 Cerrillos 31 Renca
 2 Independencia 8 Lo Barnechea 14 La Florida 20 La Cisterna 26 Mapu 32 Quilicura
 3 Conchalí 9 Las Condes 15 San Joaquín 21 El Bosque 27 Quinta Normal
 4 Huechuraba 10 Nunoa 16 La Granja 22 P. Aguirre Cerda 28 Lo Prado
 5 Recoleta 11 La Reina 17 La Pintana 23 Lo Espejo 29 Pudahuel
 6 Providencia 12 Macul 18 San Ramón 24 Estación Central 30 Cerro Navia

Appendix 1 : List of investment project in industrial sector in the Metropolitan Region of Santiago

1. Food and beverages

Project Name	Project Description	Total Invest. (US\$ mil)	Invest. Period
Factory expansion	Increase in installed capacity of the bottling plant. Increase production of tomato paste and juice. Increase production of mineral water and natural juice.	100.0	1993-1997
Production increase	50% increase of the present capacity of the two possessed plants. New facility for grain storage, purchase of new machinery, packing automation and general improvements.	25.0	1992-96
Bakery plant	New bakery plant. With 36,000m ² . It will promote "Ideal" and "Cena" trade marks. Located on Portezuelo de Quilicura site.	25.0	1994-95
Waste water treatment	Construction of 7 plants for industrial effluents treatment along the country.	12.0	1992-94
Factory expansion	Development plan for the vineyard. It will be assigned for technology, increasing the large vineyard surface and restructuring the present one.	6.5	1992-98
Factory improvement	Improvement on the firm in an export oriented way. Specialized plant producing fine wines.	4.0	1994-97
Agroindustrial complex	A variety of extruded and final products will be developed for the salmon, poultry, swine, and milk industry, with the latest technological advances. Located at the kilometer NÚ 50 of the Pan-American Highway with 3,000 constructed m ² and with a capacity for 4000 metric tons of final products.	3.0	1993-94
Food processing plant	Food processing plant for supplying domestic stores and other countries of the region.	1.0	1994-95
	Investment total		

2. Textiles, Clothing and Leather Industry

Project Name	Project Description	Total Invest. (US\$ mil)	Invest. Period
Labels	Modernization of facilities and production increase. For 1994, production expected to reach 3 million meters of labels monthly (50 million units)	6.0	1993-94
Clothing	Clothes factory located in Quilicura with installed capacity to produce 3,000 jeans per day. Equipped with the latest technology. It will employ 70 people.	4.5	1993-96
Factory modernization and expansion	Modernization of the factories for increasing productivity and development of the chain store.	3.0	1994-95
	Investment total		

3. Paper Manufacturing and Related Products

Project Name	Project Description	Total Invest. (US\$ mil)	Invest. Period
Paper factory	New plant to produce tissue paper with a production of 30,000TPA. It will produce roll tissue and paper towels. 300 people expected to work there. Located near Talagante.	60.0	1994-95
Paper factory expansion	Expansion of the plant to produce 14,000 tons per year of paper. Located in Puente Alto.	35.0	1993-94
Cardboard and paper factory improvement	Modernization of the offset printing plant combining high technology machinery and productivity. Located in the industrial sector in the vicinity of the North Pan-American Highway. Conversion capacity for 20,000 ton per year of cardboard and for 3,000 ton per year of paper to produce containers and labels.	10.0	1993-94
Corrugated board factory	Corrugated board packing plant of high resistance. Total investment of US\$ 32 million.	8.0	1994-1995 (1st stage)
Printing plant	New printing plant located in Quilicura on a 8,000 m ² site.	2.5	1993-94
	Investment total		

4. Chemicals Manufacturing

Project Name	Project Description	Total Invest. (US\$ mil)	Invest. Period
Oxygen, nitrogen, and argon plant	New plant located in the northern part of Santiago. It will produce 260 tons of liquid oxygen, nitrogen, and argon of high purity per day.	25.0	1993-95
Chemical waste treatment plant	Total investment. Technological readjustment environmentally oriented. Waste water treatment plant to recycle waters polluted by chemicals processed. New polyester and acrylic dispersion plants. Expansion and simplification of the Aislapol Plant; infrastructure of offices in Santiago.	31.4	1991-94
Paints & coating plants	Industrial paints plant, a proportion of which would be assigned to the domestic market. Located on Americo Vespucio Avenue, El Salto; with a present capacity of 300,000 gallons per year. In the coating area, it will be possible to have 1,500 projection products for surfaces.	15.0	1992-94
Plastic containers plant	New plant for plastic and flexible containers. Located in Quilicura. It plans to double the sales amount of the firm.	10.0	1994-95
Polyurethane plant	Processing of polyurethane products used in the mining, cement and cellulose industry. Facilities and a new polyurethane plant to be constructed. Location: Quilicura.	5.0	1992-97
Paints production plant	Construction of a new paints plant located in Quilicura.	4.0	1994-95
Laboratories development	New pharmaceutical plant. Six levels building that will comply with the international standard to produce medical drugs with the highest technology.	3.0	1993-94
Factory expansion	Expansion of the plant for drug production.	1.5	1993-94
	Investment total		

5. Non-Metallic Mineral Industry

Project Name	Project Description	Total Invest. (US\$ mil)	Invest. Period
Plain crystal plant	New plant with a capacity of 100,000 ton per year, it will have a furnace of highest technology. It will produce 3 times more.	60.0	1994-96
Glassware plant	Construction of a new furnace for production; with a capacity of 50,000 per year. The company will increase its production by 30%.	30.0	1992-95
Aerated concrete plant	Construction of a plant with jobs for 100 people. Aerated concrete that replaces reinforced concrete, bricks, and asbestos.	28.0	1994-96
Cement factory expansion	Increase in its cement production capacity; it grows from 1.3 million to 1.5 million	26.0	1993-94
Bricks plant	New plant that produces pressed bricks. Located in Huechuraba; it will produce 7,000 tons per year. It implies a production increase by 41%.	11.0	1993-94
	Investment total		

6. Basic Metal Working Industries

Project Name	Project Description	Total Invest. (US\$ mil)	Invest. Period
Expansion of steelworks	Modernization and expansion of the plant facilities; it will make possible to increase its production from 30 to 70 tons of steel per year. Expansion of the electric steelworks and rolling plant is considered; also a shipping unit in Colina.	13.0	1992-94
Molybdenum plant	To process molybdenum coming from Los Bronces mine.	11.0	1993-94
Expansion of steelworks	It will make possible to increase in production capacity by 50% and to meet the market demand.	3.2	1992-95
	Investment total		

7. Metal Products Manufacturing

Project Name	Project Description	Total Invest. (US\$ mil)	Invest. Period
Aluminum containers plant	New plant for aluminum containers for beer and soda. Production: 450 million unit per year. Located in Santiago.	40.0	1993-95
Aluminum containers plant	Production of aluminum cans and lids. Its technology and production capacity will make possible to supply the domestic market and to export.	32.0	1993-94
Aluminum profiles plant	New plant for aluminum profiles. Located in Lo Espejo. Production: 15 tons per year. It will make possible to double its present production. It will have a surface of 72,000 m ²	18.0	1994-95
Modernization and expansion of aluminum containers plant	Modernization and expansion of the installed capacity. It will have 15,000m ² in a ecologically oriented plant located in Quilicura. It will increase its present production by 50%.	16.0	1994-95
Shopping carts manufacturing plant	Production of shopping carts. Location: Quilicura. Building site: 18,000m ² . Land built cover: 10,000m ² . 250,000 shopping carts produced per year.	10.0	1994-95
Laminated plates factory expansion	Expansion of the plates division, located in Lo Espejo. It will double its present production. Aluminum and copper plates rolling.	6.0	1993-94
Investment total			

8. Mining

Project Name	Project Description	Total Invest. (US\$ mil)	Invest. Period
Copper Mining	The project considers to extract the tailings from the mine called Los Bronces. They will be processed then in a plant located in Colina.	74.0	1993-94
Investment total			

9. Private Energy

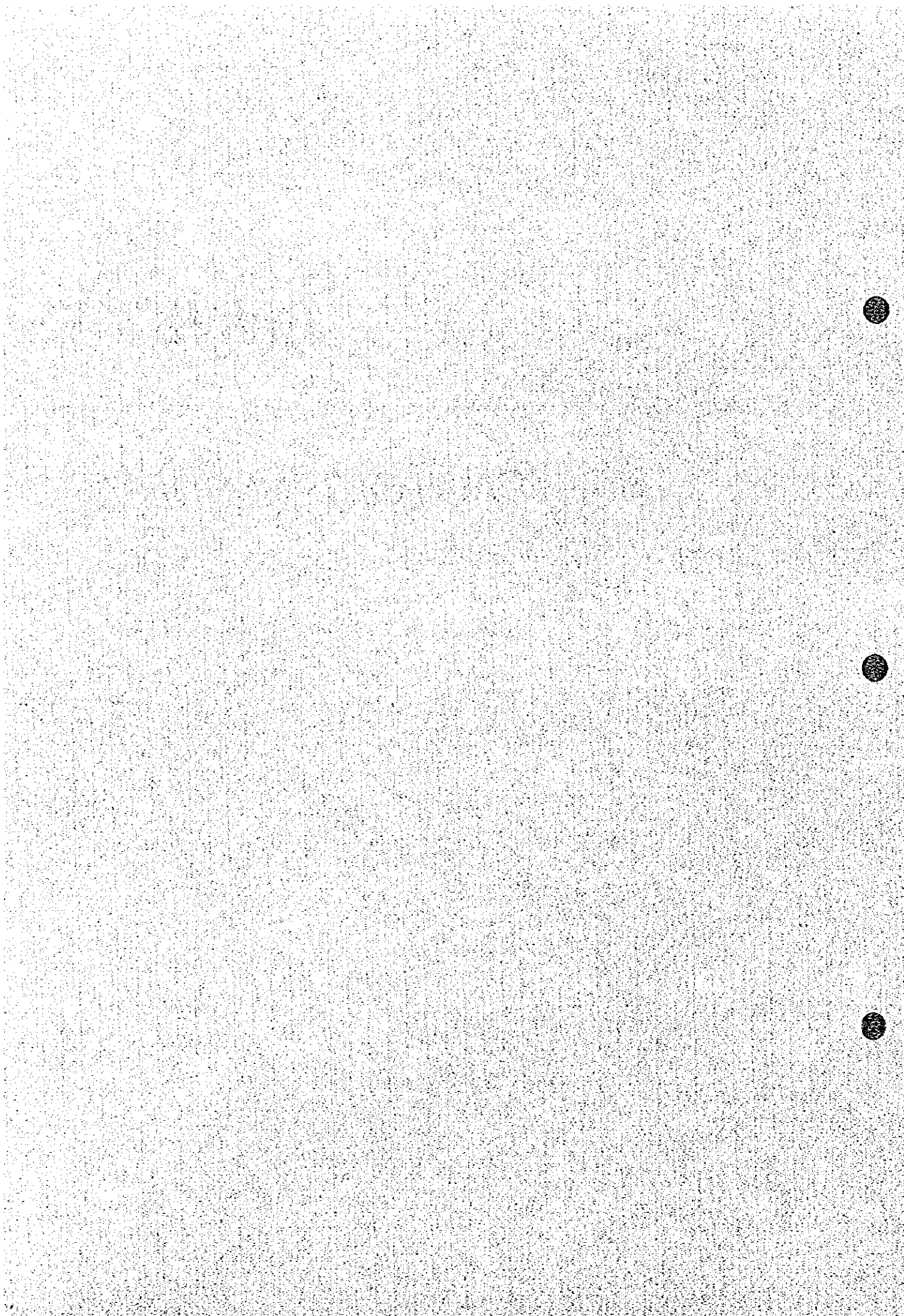
Project Name	Project Description	Total Invest. (US\$ mil)	Invest. Period
Power supply substations	Total investment 31 units will be incorporated to the total number of power transformers. 37,000 new users will be added. 70 to 75 new feeders will be made; mainly 12,000V.; approximately 1,200 km of new networks. A new substation, in the centre of Santiago, expected for 1995; it will guarantee a supply for the next 10 years. substations: 220/110 KW, 400MVA. South Sector in 1995, East Sector in 1998, West Sector in 2001. Development of 3 new works of the same kind, 110/12 KV and at least 2 of 110/23KV.	325	1992-99
Power supply increase	Expansion of the electric system of the south area of the Metropolitan Region. It will include Curacavi, Isla de Maipo, Talagante and Penaflores.	17.0	1992-96
	Investment Total		

10. Industrial park

Project Name	Project Description	Total Invest. (US\$ mil)	Invest. Period
Industrial park	Will hold over 1000 small- and medium-sized enterprises. With a surface of 120 ha. 25,000 people approximately employed directly.	10.0	1993-96
	Investment Total		

ANNEX C

FACTORIES' SURVEY



CONTENTS

		Page:
C.1	Background	C-1
C.2	Scope of Industries for the Study	C-3
C.3	Classification of Wastes for the Study	C-8
C.4	Selection of Factories for the Survey	C-16
C.4.1	Selection Criteria	C-16
C.4.2	Principles for incorporating EWI's investigations	C-26
C.4.3	Selection of Factories	C-31
C.5	Outcome and Findings of the Factories' Survey	C-45
C.5.1	Outcome	C-45
C.5.2	Findings	C-90

LIST OF TABLES

		Page:
Table C.2a	Classification of Industries	C-4
Table C.3a	ISW Classification (24 Categories) Used for Factories' Survey	C-13
Table C.3b	Matrix-table of Waste Classification for the Factories' Survey	C-15
Table C.4.1a	List of Manufacturing Company With 10 or More Employee by INE ..	C-18
Table C.4.1b	Total Employees in the MRS for the Companies with 10 or More Employees by INE	C-19
Table C.4.1c	Possible Hazardous and Liquid Wastes according to Categories of Industries in the EWI Study	C-22
Table C.4.1d	High Potential Industries of Generating Hazardous Wastes	C-25
Table C.4.2a	Factories Surveyed by EWI Study and Number of Their Employees by Scale of Factories	C-27
Table C.4.2b	HW Generation in 265 Factories Surveyed by EWI's RISNOR Study ..	C-28
Table C.4.2c	Liquid Waste Generation Surveyed by the EWI's RISNOR Study	C-29
Table C.4.2d	ISW Generation by EWI's RISNOR Study	C-30
Table C.5.1a	List of Factories Surveyed	C-50
Table C.5.1b	Effective Samples for Each Items	C-51
Table C.5.1c	General Data of Factories Surveyed No.1	C-53
Table C.5.1d	General Data of Factories Surveyed No.2	C-54
Table C.5.1e	Location of Factories Surveyed in Province	C-55
Table C.5.1f	Location of Factories Surveyed in Santiago Province	C-57

Table C.5.1g	Use of Raw Material by Category of Industries	C-60
Table C.5.1h	Present and Planned Rates of Pollution Control Facilities	C-64
Table C.5.1i	Demand of Water and Energy	C-67
Table C.5.1j	Treatment Methods On-site by 24 ISW Categories (Amount obtained) .	C-70
Table C.5.1k	Treatment Methods On-site by 24 ISW Categories (Rate obtained) ...	C-71
Table C.5.1l	Treatment Methods On-site by Industrial Category (Amount obtained)	C-72
Table C.5.1m	Treatment Methods On-site by Industrial Category (Rate obtained) ...	C-73
Table C.5.1n	Disposal Methods On-site by 24 ISW Categories (Amount obtained) ..	C-74
Table C.5.1o	Disposal Methods On-Site by 24 ISW Categories (Rate obtained)	C-75
Table C.5.1p	Disposal Methods On-site by Industrial Category (Amount obtained) ...	C-76
Table C.5.1q	Disposal Methods On-Site Surveyed by Industrial Category (Rate obtained)	C-77

LIST OF FIGURES

	Page:
Figure C.5.1a	Location of Factories Surveyed in Province C-56
Figure C.5.1b	Location of Factories Surveyed in Santiago Province C-58
Figure C.5.1c	Use of Raw Materials C-61
Figure C.5.1d	Production Process C-63
Figure C.5.1e	Existing and Planned Pollution Control Facilities C-65

ANNEX C FACTORIES' SURVEY

C.1 Background

a. Objectives of the Factory Survey

The objectives of the survey are:

- i. to identify the present generation and disposal of ISW on-site in order to formulate a Master Plan in 2010 and a short term improvement plan;
- ii. to understand the actual conditions of the following aspects of ISW generating factories:
 - generation, management and reutilization of wastes for the formulation of wastes disposal and minimization plan ; and
 - environmental management system in factories including their waste management (i.e. production process, installation of pollution control facilities, water/energy demands, etc.) ; and
- iii. to gain an insight into the possible behavior and consciousness on environmental protection of generators.

b. Applicable Data and Information from Previous Studies

As for among previous studies which are directly related to status-quo of generation and control/disposal of industrial solid waste at factories, "Design and Implementation of a Control System of Hazardous Solid Waste Management (March 1994)" by Dames & Moore (hereinafter called D&M's RISPEL study) and "Diagnosis and Identification of Technologies and Strategies for the Management of Solid Industrial Non-Hazardous Waste in the Metropolitan Region (draft-final report, December 1994)" by EWI (hereinafter called EWI's RISNOR study) were available. Information from the manifest system, which currently PROCEFF is operating for major factories, is also available. Furthermore, "Action Plan Proposal for the Elimination of Illegal Dumping Sites and the Recovery of Affected Areas in the Metropolitan Region (final report, September, 1994) by EWI also provides information regarding the control of ISW. After reviewal of those previous studies and information, the following issues were revealed.

ba. D&M's RISPEL study

The Dames & Moore's study, paying attention to HW (Hazardous Waste) and was intended for building computer system in determination of those HW based upon the criteria of US-EPA. Although its outcome has been incorporated into the manifest system, study regarding identification and understanding of factories' status-quo of generation and control/disposal of industrial solid waste is not conducted.

bb. EWI's RISNOR study

The EWI's RISNOR study carried out significant observations of factories' status-quo with regard to generation and control/disposal of industrial solid waste through surveys of production process, output/input, etc. of 265 numbers of factories in the MR (Metropolitan Region). However, the outcome of this study is incomplete for analyzing the status-quo in view of the following points:

- Basically the study was intended for the management of "non-HW", identification and understanding of the status-quo of "hazardous" and/or "liquid" waste was not attempted.
- 265 surveyed factories comprise small and medium industries (i.e. about half of the factories have less than 50 employees and factories with less than 100 employees counts for about 80% of the total). Furthermore, the surveys only concentrated on food processing, timber and textile industries.

bc. Data obtained by the manifest system

Although some useful information in relation to generated amount of "HW" and "non-HW" and its transportation and disposal are available from the Manifest System, they were not obtained through direct interviews to factories with regard to generation and disposal. Meanwhile, the SESMA-PROCEFF is at a stage whereby the classification of ISW is to be altered to that proposed by EWI. Since information regarding HW is scarce, data of the manifest system is useless for analyzing the status-quo of generation and control/disposal of HW.

C.2 Scope of Industries for the Study

a. Bases for Discussion

According to the S/W (Scope of the Work) the wastes to be studied in this study shall cover industrial and medical solid wastes; construction and agricultural wastes were excluded from the study. However, the composition of ISWs was not clearly defined.

On the other hand, target factories mentioned in the S/W for factory surveys are those reporting under the present declaration system, although the S/W was amended to include some factories not reporting following the M/M on IC/R.

b. Criteria of Scoping of Industries for the Study

There is no clear definition and/or regulations to distinguish industrial and municipal solid wastes in the current SWM within the Metropolitan Region. The following criteria were, therefore, set up through the discussion with Chilean counterpart personnel for scoping of industries for the Study.

- I. Scope of industries for this Master Plan Study shall be, in principal, those industries in the list which is presently supervised and managed by SESMA-PROCEFF through the manifest system (Act 5081).
- ii. However, any industry which is expected to considerably count for total quantity of waste to be generated and/or magnitude of hazardousness of waste to be generated at present and/or in future (related to the enforcement of pollution regulations) should be included in the scope of the Study.

c. Finalization of Scope of Industries

Based on the above criteria, the following industries were included for the study following the discussion with the counterpart personnel:

- manufacturing industries (CIU code 31111 to 39099);
- mining industries (CIU code 21001 to 29090);
- electricity generators (CIU code 41011);
- fuel stations (CIU code 62536); and

- fuel stations (CIU code 62536); and
- laundries and dry cleaners (CIU code 95201).

The list of the industries for the Study is prepared in the Table below.

Table C.2a Classification of Industries

CIU Code	Classification of Industries for the Study	CIU Code	Classification of Industries for the Study
	MINING, OILING AND QUARRYING	31164	Processing of dry seeds from leguminous plants
21001	Coal mining	31171	Manufacture of bread and other bakery products (it excludes bakeries)
22001	Crude petroleum and natural gas production	31172	Manufacture of biscuits
23011	Iron ore mining	31193	Cakes
23031	Large scale copper mining	31174	Manufacture of spaghetti, macaroni and other pastas
23032	Medium scale copper mining	31181	Sugar factories and refineries
23033	Small scale copper mining	31191	Manufacture of cocoa and chocolate powder
23041	Other metallic materials: lead, zinc, mercury, silver, manganese, etc	31192	All types of sugar confectionery
29011	Stone, clay and sand extraction	31211	Condiments, mustard, vinegar
29014	Limestone and plaster extraction	31212	Starch and its products
29021	Chemical and fertilizer mineral mining	31213	Manufacture of natural ice
29022	Phosphate and nitrate minerals	31214	Yeast
29031	Salt mining, including crushing, screening and refining	31215	Processing of tea leaves
29090	Mining and quarrying not elsewhere classified	31216	Coffee roasting and milling
	MANUFACTURING INDUSTRIES	31219	Food industries not elsewhere classifies
		31221	Manufacture of prepared animal fees
	FOOD MANUFACTURING		BEVERAGE INDUSTRIES
31111	Cattle slaughtering	31311	Distilling of ethyl alcohol
31112	Refrigerators related with the preservation of all types of meat	31312	Distilling, rectifying of alcoholic liquors (bottling, not involving the blending is classified in group 61323)
31113	Bird slaughtering	31321	Manufacture of wines (bottling not involving the blending is classified in group 61323)
3115	Manufacture of cold meats, sausage, causing and canned meats	31322	Manufacture of ciders and other fermented beverages, except malt liquors
31121	Manufacture of creamery, processed butter, natural and processed cheese and yogurt	31331	Manufacture of malt, beer and malt liquors
31122	Manufacture of condensed, powdered and processed milk	31341	Manufacture of non-alcoholic beverages and carbonated mineral waters and bottling of natural spring and mineral waters
31123	Manufacture of ice cream, sherbets and other desserts		TOBACCO INDUSTRIES
31132	Processing and canning of fruits and vegetables (including juices)		
31133	Sweets, jams and jellies	31401	Manufacture of cigarettes and cigars
31134	Canned soups, concentrated broths and other dehydrated foods	31402	Manufacture of other tobacco products
31141	Canning, preserving and processing of fish, crustacea and other similar foods		
31151	Manufacture of vegetable oils and fats and subproducts		
31152	Manufacture of no edible animal oils and fats		
31153	Extraction of fish and other marine animal oils		
31154	Production of fish flower		
31161	Grain mills and others		
31163	Manufacturing of cereal foods		

CIU Code	Classification of Industries for the Study	CIU Code	Classification of Industries for the Study
	TEXTILE INDUSTRIES		WOOD AND CORK INDUSTRY
32111	Spinning	33111	Sawmills, planing and other wood processing mills
32112	Weaving (excluding wool clothing which are classified in 32131 and 32132)	33112	Slanted, pressed and alomated wood
32113	Industrial dry-cleaners and finishing of textiles	33113	Manufacture of doors, windows and door frames
32114	Printing	33114	Wooden building materials
32117	Manufacture of other textile products not elsewhere classified	33115	Prefabricated wooden houses
32121	Manufacture of curtains, draperies and blankets	33121	Manufacture of wooden and cane containers
32122	Manufacture of bedspreads, pillow cloths and table cloths	33193	Manufacture of wooden and cork products not elsewhere classified
32124	Manufacture of textile bags and canvas products	33201	Manufacture of furniture and fixtures, except primarily of metal (including upholstery)
32126	Stitching, pleating and tucking mills for the trade	33204	Manufacture of window and door screens and shades
32131	Manufacture of socks and stockings		PAPER, PRINTING AND PUBLISHING INDUSTRIES
32132	Manufacture and finishing of knitted products	34111	Manufacture of pulp from wood
32141	Manufacture of carpets and rugs	34112	Manufacture of paper and paperboard
32151	Manufacture of rope, cable, cordage, nets and related products	34121	Manufacture of containers and boxes of paper and paperboard
32191	Manufacture of textiles not elsewhere classified	34191	Manufacture of pulp, paper and paperboard articles not elsewhere classified
	MANUFACTURE OF WEARING APPAREL	34201	Printing and bookbinding
32201	Manufacture of wearing apparel	34202	Photoengraving and lithographing
32202	Manufacture of hats, gloves and other wearing accessories	34203	Manufacture of printed cards, envelopes and paper, calendars, directories, labels
32204	Manufacture of leather clothing	34204	Publishing
32205	Manufacture of fur clothing	34205	Photocopies and other printing related services
32206	Manufacture of raincoats, dress coats and other coats		MANUFACTURE OF INDUSTRIAL CHEMICAL PRODUCTS
32207	Manufacture of uniforms and accessories	35111	Manufacture of basic industrial organic and inorganic chemicals (including synthetic potassium nitrate)
	LEATHER INDUSTRY	35121	Manufacture of fertilizers
32311	Tanneries and leather finishing	35122	Manufacture of pesticides, insecticides, fungicides and herbicides
32321	Fur dressing and dyeing industries	35131	Manufacture of synthetic resins
32322	Manufacture of fur and skin rugs and mats and other fur and skin articles not elsewhere classified	35132	Manufacture for plastic materials
32331	Manufacture of luggage, handbags, pocketbooks, cigarette and coin purses	35133	Manufacture of man-made fibers except glass
32332	Manufacture of saddlery, harnesses and whips		
32333	Manufacture of similar products not elsewhere classified		
32401	Manufacture of leather footwear and boots		
32402	Manufacture of footwear with fabric and other materials except wood, vulcanized or molded rubber and plastic		

CIU Code	Classification of Industries for the Study	CIU Code	Classification of Industries for the Study
	MANUFACTURE OF OTHER CHEMICAL PRODUCTS	36203	Other glass products not elsewhere classified
35211	Manufacture of paints, varnishes, lacquers, enamels and japans	36204	Windshields and car glasses
35212	Manufacture of allied products	36911	Manufacture of bricks
35221	Manufacture of drugs and medicines	36914	Manufacture of lattices and thin walls
35222	Pharmaceutical preparations for veterinary use	36915	Manufacture of refractory materials
35231	Manufacture of soap, detergents and shampoos	36921	Manufacture of cement, lime and plaster
35232	Manufacture of perfumes, cosmetics, lotions. Tooth paste and other toilet preparations	36991	Manufacture of non-metallic mineral products not elsewhere classified (including floor tiles and coatings)
35291	Manufacture of waxes		BASIC METAL INDUSTRIES
35292	Manufacture of disinfectants and deodorants	37101	Manufacture of primary iron and steel products
35293	Manufacture of explosives and ammunition	37102	Rolling and other basic iron and steel industries
35294	Manufacture of adhesives, glues, sizes and cements	37201	Manufacture of primary non-ferrous metal products
35295	Manufacture of candles		MANUFACTURE OF METAL PRODUCTS EXCEPT MACHINERY AND EQUIPMENT
35296	Manufacture of inks	38111	Manufacture of cutlery
35299	Manufacture of other chemical products not elsewhere classified	38112	Manufacture of hand tools and general hardware
	MANUFACTURE OF PRODUCTS FROM PETROLEUM AND COAL	38121	Manufacture of furniture and fixtures primarily of metal
35301	Petroleum refineries	38131	Manufacture of metal structures and tanks
35401	Manufacture of asphalt paving and roofing materials	38133	Manufacture of metal shanties, doors and windows
35402	Manufacture of fuel briquettes and other products from petroleum and coal	38134	Prefabricated metal structures
	MANUFACTURE OF RUBBER PRODUCTS	38135	Assembly and installation of prefabricated components
35511	Manufacture of tires and tubes or rims	38191	Timework (including sheet-metal cans)
35512	Retreading of tires	38192	Metal stampings and screw machine products
35591	Manufacture of rubber products not elsewhere classified	38194	Manufacture of bolts, nails, staples, wires
35601	Manufacture of plastic products not elsewhere classified	38195	Manufacture of enameled iron and metal sanitary ware and plumbers' brass goods
	MANUFACTURE OF NON-METALLIC MINERAL PRODUCTS, EXCEPT PRODUCTS FROM PETROLEUM	38196	Enameling, varnishing, lacquering, galvanizing, plating and polishing of metal products
36101	Manufacture of potteries	38197	Manufacture of metal products not elsewhere classified
36103	Tiles (except floor tiles and coatings which go into 36991)		
36104	Other clay, earthenware and chinaware products		
36201	Manufacture of glass and glass fibers		
36202	Manufacture of mirrors and crystal glass		

CIIU Code	Classification of Industries for the Study	CIIU Code	Classification of Industries for the Study
	MANUFACTURE OF MACHINERY EXCEPT ELECTRICAL	38332	Manufacture of ironers, fans, vacuum cleaners and floor waxers and other electrical appliances and housewares
38211	Manufacture and repair of steam and gas engines, turbines and machines	38391	Manufacture of snap switches, conductor connectors, bells, boards, fuses, resistances.
38221	Manufacture and repair of agricultural and livestock machinery and equipment, for use in processes such as mixing, seeding, harvesting and fertilizing; also included are farm tractors and ploughs and irrigation, mowing, drilling, spraying and milking machines	38392	Manufacture of light bulbs, electric tubes, electric lights, electric batteries, flashlights
38231	Manufacture and repair of wood-working and metal-working equipment, such lathes, boring, milling, grinding, shearing and shaping machines	38393	Manufacture of lamps
38241	Manufacture and repair of food machinery	38394	Manufacture of electrical supplies not elsewhere classified
38242	Manufacture and repair of textile and chemical industry machinery		MANUFACTURE OF TRANSPORT EQUIPMENT
38244	Manufacture and repair of printing-trade machinery and equipment	38411	Shipyards and boatyards
38247	Manufacture and repair of construction machinery and equipment	38412	Manufacture for marine engines and ship parts
38251	Manufacture and repair of office machine and equipment (including weighing machines, dynamometer, etc.)	38421	Building, repair and rebuilding of railroad machinery and equipment
38252	Manufacture and repair of computing machinery and equipment	38431	Manufacture and assembly of motor vehicles
38291	Manufacture and repair of machinery and equipment not elsewhere classified	38432	Manufacture of motor vehicle parts and accessories, such as engines, brakes, clutches, axles, gears, transmissions, wheels and frames
	MANUFACTURE OF ELECTRICAL MACHINERY, APPARATUS, APPLIANCES AND SUPPLIES	38434	Alteration of engines
38311	Manufacture and repair of electric motors	38441	Manufacture of motorcycles and bicycles and specialized components
38312	Manufacture and repair of generators, transformers, switch gear and switch board apparatus, rectifiers and other electrical transmission and distribution equipment	38451	Manufacture and repair of airplanes and specialized components
38314	Manufacture and repair of electrical welding apparatus	38491	Manufacture of transport equipment not elsewhere classified
38315	Manufacture and repair of other electrical industrial apparatus		MANUFACTURE OF PROFESSIONAL AND SCIENTIFIC, AND MEASURING AND CONTROLLING EQUIPMENT NOT ELSEWHERE CLASSIFIED, AND OF PHOTOGRAPHIC AND OPTICAL GOODS
38321	Manufacture of radio and television receiving sets	38511	Manufacture of professional and scientific, and measurement and controlling equipment, not elsewhere classified
38322	Manufacture of sound reproducing and recording equipment	38512	Production of surgical, medical and dental equipment, instruments and supplies and of orthopedic and prosthetic appliances
38323	Manufacture of gramophone records, and prerecorded magnetic tapes	38521	Manufacture of optical instruments
38324	Manufacture of communication equipment and apparatus	38522	Manufacture of photographic goods
38325	Manufacture of parts and supplies for radio, television and others in this group	38523	Manufacture of lenses and ophthalmic goods
38326	Manufacture of radiographic, fluoroscopic and other X-ray apparatus and tubes	38531	Manufacture of watches and clocks and their parts
38331	Manufacture of ovens, heating pads, hot plates, broilers, roasters, toasters and electric food mixers		