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Implementation of the Montreal Protocol

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Montreal, 23-26 June 1992

COUNTRY PROGRAMME: CHILE

SANTIAGO, 25 DE MAYO DE 1992.

Señor
Omar El - Arini
Director
Secretariado del Fondo Multilateral
Interno para la Implementación del Protocolo de Montreal
Montreal, Quebec
Canada

Estimado Sr. El-Arini,

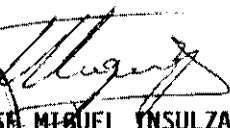
El Ministerio de Relaciones Exteriores, en representación del Gobierno de Chile, tiene el agrado de presentar a su Secretariado el Programa País de Chile para implementar el Protocolo de Montreal. Queremos solicitarle muy especialmente que esta proposición sea considerada en la reunión del Comité Ejecutivo el 25 de junio próximo.

Como partícipe del Protocolo de Montreal operando bajo el párrafo 1 del artículo 5, Chile está comprometido a proteger la franja de ozono estratosférico. Chile ratificó el 8 de marzo de 1990 el Protocolo de Montreal y además accedió a las modificaciones de Londres al Protocolo el 12 de marzo de 1992. Como evidencia de este compromiso, nuestro Gobierno ha preparado un Programa País comprometiéndose para destruir sustancias controladas en un programa acelerado, a más tardar en el año 2006. El programa previsto cubre un período de cuatro años y se espera que el consumo pesado de ODP sea reducido en un 63% en esta primera fase. El presupuesto de este Programa es de US\$1.206 millones. Estamos solicitando esta cantidad al Fondo Multilateral.

Para presentar formalmente este Programa País ante los miembros de su Comité Ejecutivo, asistirá a su reunión un Oficial del Comité Técnico Administrativo de la Comisión Nacional del Medio Ambiente (CONAMA), agencia interministerial designada por el Gobierno para coordinar la ejecución del Programa y controlar el cumplimiento del protocolo.

La segunda fase del Programa debe dirigirse a dos principales metas, que la de 1993-1996 no toca: refrigeración doméstica y Halons en usos esenciales. A este respecto las dificultades tecnológicas nos impiden a la fecha avanzar en este proyecto.

Esperando que este programa tenga una recepción positiva por su Comité Ejecutivo, le saluda atentamente a Ud.



JOSE MIGUEL INSULZA
Embajador
Coordinador Cooperación Internacional
Ministerio de Relaciones Exteriores

**CHILE'S
PROPOSED PROGRAM FOR
IMPLEMENTING THE MONTREAL PROTOCOL**

May 18, 1992

EXECUTIVE SUMMARY

Chile demonstrated its firm commitment to stratospheric ozone layer protection by ratifying the Montreal Protocol on Substances that deplete the ozone layer on March 8, 1990. Later, Chile also acceded to the London Amendments of the Protocol on March 12, 1992. The current document outlines Chile's proposed program to implement the Montreal Protocol.

As Chile is eligible for financial and technical assistance from the Interim Multilateral Fund, this document also presents the request for US\$ 1.206 million to finance the initial four years of the program (1993-96). ODP weighted consumption is expected to be reduced by 63% as a result of the implementation of this first stage of the program. This reduction amounts to 714 metric tons a year.¹

The government of Chile, headed by President Patricio Aylwin, has vigorously backed a series of policy initiatives aimed at achieving a sustainable economic development which prevents environmental deterioration. In line with this commitment to environmental protection, this program proposes to reduce the phaseout date of controlled substances (CS) from the year 2010 to the year 2006, thus declining to 4 years of the 10-year grace period which Chile is permitted as a party operating under Article 5 of the Protocol.

In accordance with the guidelines of the Executive Committee for the preparation of Country Programs, this document describes Chile's consumption of controlled substances and its proposed program to reduce and eliminate its use.

As of 1989, the base year of the Country Study, Chile consumed 1,120 ODP weighted metric tons of CS approximately. Of this total, 21% was consumed in CFC-11; 45% in CFC-

¹ The percentage reduction in consumption is measured with respect to 1989 figures, the base consumption year for which the Country Study was made.

12; and 29% in Halons.² Chile does not produce any of the CS listed in Annex A of the Montreal Protocol so that all consumption requirements are met through imports.

Major end uses of CFC's in Chile have been foams, aerosols, and refrigeration (including air conditioning). Approximately 58% of total CFC-11 consumption was spent in flexible foam production processes. On the other hand 45% of total CFC-12 consumption corresponds to aerosols and 39% to maintenance of existing refrigeration and air conditioning systems. Finally, all consumption of Halons was in fire extinguishing agents. A recent development in Chile has occurred in the aerosol industry which is currently reducing CFC-12 consumption strongly. No complete and reliable breakdown of CS consumption by end use for a year later than 1989 is available however.

Absent the Montreal Protocol, and under the assumption that unconstrained quantities of controlled substances continue to be available from existing sources, CS consumption in Chile is expected to grow at a 5% annual rate. This high annual growth rate is linked to the economic growth perspectives of the country, and to the fact that many final uses of CS can be expected to increase at higher growth rates than income.

This high potential CS's consumption perspectives motivate an early implementation of the Montreal Protocol in Chile in order to avoid larger adjustment costs in the future.

Major targets to be achieved in the first four years of this Country Program are: 1) Complete consolidation of the conversion to hydrocarbon propellants in the aerosol industry, which has already started; 2) Technological conversion to methylene chloride in flexible foam production processes; 3) Introduction of conservation and recycling technologies in the maintenance of existing refrigeration and air conditioning systems; and 4) Conversion to non-halon agents in non essential fire extinguishing applications. The successful achievement of these four major targets plus the achievement of additional minor objectives will give rise to the

² A detailed breakdown of CS consumption in Chile by sources and uses is presented in Tables 2.1 and 2.2 of this document.

63% percentage consumption reduction targeted by this Country Program.

The Chilean government strongly supports a market-oriented approach to economic policy. This economic development strategy has been in place in the country for more than 15 years and is not expected to change. In the environmental area, this general policy framework tends to favor market mechanisms over command-and-control approaches, especially when there is enough time to implement efficient long run solutions to environmental problems, as is the case with the implementation of the Montreal Protocol in Chile today.

Consistent with the current policy framework for environmental protection, the government will avoid the imposition of import tariffs and import quotas. The government also will avoid forcing particular industries to adopt specific technological solutions. Therefore, the government will announce that imports of CS will be banned after the year 2006 except for essential uses, and will rely on the incentives generated by the Action Plan to bring about the interim reductions corresponding to the four major targets mentioned above. Consequently, the Action Plan consists of a package of incentives which is expected to generate the appropriate signals to move private energies towards the achievements of the targets mentioned above.

Five government actions constitute the essence of the Action Plan: 1) the implementation of a Technological Conversion Financing Program (TECFIN); 2) the implementation of an Ozone Seal Program; 3) the implementation of a Public Awareness Program; 4) the implementation of a Sector Specific Training Program; and, 5) the creation of an Ozone Team in the Public Sector.

TECFIN will provide a lump sum subsidy to purchase new alternative technology. The subsidy will be expressed in terms of US\$ per ODP weighted Kg of CS consumption saved over a "reduction" time period.³ The Ozone Seal Program will standardize labels on "ozone friendly" products and services. The Public Awareness Program will promote consumer

³ See section 3.2.1 for more details on the operation of TECFIN and the other government actions.

discrimination in favor of "ozone friendly" products by providing public information through mass media on the various dangers of ozone layer depletion. The Sector Specific Training Program will provide technical guidance to technicians and entrepreneurs on how to shift towards non ozone depleting materials in specific segments of the industry. The Ozone Team will monitor and coordinate the four previous government actions.

The incentives provided by the Action Plan work through demand and supply simultaneously. While TECFIN and the Sector Specific Training Program reduce the costs associated to technological conversion, the Ozone Seal and the Public Awareness Program increase the demand for it.

Exhibit ES-I presents a summary of the different government actions, the target sectors in industry and the associated budget requirements. The major cost items in the budget requirements of this program correspond to TECFIN (44%) and to the Public Awareness Program (30%). A more detailed explanation of these programs follows.

TECFIN, by providing a lump sum subsidy expressed in terms of Kgs of CS saved seeks to achieve three simultaneous objectives. First, since the subsidy is not related to the cost of the new equipment but simply to the Kgs of CS saved, it provides incentives to the private sector to search for the cheapest alternative technology, therefore minimizing conversion costs at any point in time. For this same reason, TECFIN will privilege the conversion in those sectors where technological conversion is relatively cheap, while more expensive conversion cases will tend to be postponed with this system, therefore minimizing conversion costs over time. Finally, TECFIN provides an easy and direct way of monitoring the implementation of the protocol since every dollar spent in this program will have a corresponding amount of CS saved. Finally, it must be said that similar lump-sum-focused subsidy programs are currently operated by the government on other areas of the economy, so that there is institutional experience in this regard.

The Public Awareness Program on the other hand, complemented with the Ozone Seal program, is crucial to provide demand incentives for technological conversion, especially in those cases where TECFIN by itself does not completely cover all conversion costs. Demand effects have been important in Chile in the case of the conversion that started in the aerosol industry. This program is expected to have a very important effect on consumer attitudes, especially given the level of education of the population and the proximity of the country to the Ozone Hole in the Antarctic continent.

The amount of the subsidy proposed in this Country Program is consistent with the consumption reduction targets mentioned previously. Since the proposed Country Program relies on private sector response, the consumption reduction targets are based on expected changes given the size of the subsidy provided and the extent of the public awareness and specific training programs. A detailed summary of expected projects to be performed by the private sector under this Country Program for the 1993-96 period, is presented in Exhibit ES-II. From there it can be verified the crucial importance of the four target sectors mentioned previously.

With respect to the monitoring arrangements of this Country Program, two elements will be useful. On the one hand, the fact that no CS is produced within the country simplifies the control of the evolution of the program, because figures on import records are readily available from the Custom Service Administration. On the other hand, and as mentioned, since a major part of the resources are devoted to TECFIN, and the subsidy is directly expressed in terms of Kgs of CS saved, the amount of the funds spent in that program should provide a direct estimate of the extent of CS consumption reduction. The joint analysis of CS imports and of the resources spent in TECFIN will provide a clear picture of the evolution of this program.

EXHIBIT ES-I
GOVERNMENT ACTIONS

Year(s)	Description	Target Sector	Intended Effect	Cost US\$
1993-96	Technology Conversion Financing Program	Flexible and Rigid Foams, Commercial Refrigeration	Provide a direct economic incentive for each kg of controlled substances reduced	\$ 533,300
1993	Ozone Seal Program	Aerosols, Refrigeration	Develop standard labels for products and services that avoid emissions of controlled substances	\$ 7,000
1993-95	Public Awareness Program	Aerosols, Halons	Further stimulate consumer awareness directing demand to products and services containing the ozone seal. Inform the public about health effects and preventive measures.	\$ 359,600
1993	Sector-Specific Training Program	Sterilants, Refrigeration, Foams, Halons	Provide technical assistance to small firms on methods to minimize emissions and/or use of controlled substances.	\$ 115,200
1993-96	Ozone Team	All	Overall program coordination and monitoring	\$ 191,200

EXHIBIT ES-II

EXPECTED PROJECTS UNDER COUNTRY PROGRAM

Start Year	Type of Project	Project Description	Relevant Government Actions	Annual Tons x ODP Phased-out
1993	1) Aerosol Conversion	Substitution of hydrocarbon propellant for CFC-12 in facilities that have not already made the conversion. This involves equipment conversion and upgrading facilities for safe handling of hydrocarbons.	Ozone Seal Public Awareness Program	219
1993	2) Conversion to Halon Replacements in Non-essential applications	Adoption of alternative fire extinguishing methods in new installations and conservation practices during inspection and refilling of existing systems by service firms.	Ozone Seal Public Awareness Program	97
1993	3) 50% Reduction in CFC in Rigid Insulation Foam	Reduction of CFC-11 consumption in refrigerator foams by increasing the water content. This project involves the modification of five plants, a short production trial, process and product modifications, and quality control and verification tests. Project will also train operators on the new foam processes.	TECFIN Ozone Seal Public Awareness Program	66
1994	4) Sterilants	Conversion to from CFC and ethylene oxide to CO ₂ and ethylene oxide	Sector Specific Training Program	22
1994	5) Solvents (New equipment)	Conversion from CFC-113 and MCF to aqueous cleaning	TECFIN	3

1993	6) Solvents (Existing equipment)	Operator training to minimize solvent losses during metal cleaning operations	Sector Specific Training Program	16
1994	7) Commercial refrigeration (New equipment)	Production of new equipment with HCFCs and Ammonia in order to replace old equipment or equipment needed in new facilities	TECFIN Ozone Seal Public Awareness Program	2.5
1994	8) Conservation and recycling of refrigerants in commercial refrigeration	This project is expected to generate one or two private recycling centers	TECFIN Ozone Seal	105.4
1994	9) Conversion of Flexible Slabstock Polyurethane Foam (investment)	Conversion of flexible slabstock polyurethane foam from CFC-11 to methylene chloride. Involves adding equipment to properly vent the workplace of methylene chloride fumes.	TECFIN Sector Specific Training Program Ozone Seal Public Awareness Program	183

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1. INTRODUCTION

1.1 Purpose

1. A growing concern regarding environmental issues has been developing in Chile during the past few years. Industry, government, and consumers alike are committed to find solutions to problems that can seriously affect the delicate balance between human environment and the sustainability of economic development in the long run. The Chilean Government, headed by President Patricio Aylwin, has been implementing an integral national policy for dealing with the various environmental problems that affect the country (Chile, 1992). In general terms, this national policy seeks to armonize a market-based economic development strategy with the objectives of environmental care and sustainability of development.

2. In the context of this national environmental policy, special importance is given to the position of Chile with respect to international environmental problems, the protection of the stratospheric ozone layer being a crucial one.

3. Chile has been active in the international efforts aimed at protecting the ozone layer. In this regard, Chile signed the Vienna convention of 1985 and later participated in the subsequent negotiations that took place in Montreal, Canada on September 1987. Chile demonstrated its firm commitment to stratospheric ozone layer protection by ratifying the Montreal Protocol on March 8, 1990. On March 12, 1992, Chile acceded to the London Amendments of the Protocol.

4. This document presents the program of activities to be undertaken over the 1993-96 period, which represents the first stage of a process leading to the phaseout of controlled substances by the year 2006. It also records and presents the information and analysis on which this Country Program has been developed.

5. As Chile is eligible for financial and technical assistance from the Interim Multilateral Fund of the Montreal Protocol, this document also presents the request for US\$ 1.206 million to

finance the initial four years of the program. The document also describes the consistency of this Country Program with the general economic policies of the country. The document also outlines the institutional framework within which the Country Program and its corresponding Action Plan will be carried out.

6. Finally, the document presents the basis for monitoring the extent to which the Action Plan will actually be enforced and its effectiveness in reducing the consumption of Controlled Substances (CS) as planned in the Country Program.

1.2 Status

7. The present Country Program was prepared under the leadership of the Technical and Administrative Secretariat (STYA) of the National Commission for the Environment (Comisión Nacional del Medio Ambiente, CONAMA), an interministerial commission presided by the Minister of National Endowments (Ministro de Bienes Nacionales). CONAMA, created by Presidential Decree N. 240 of 1990 (Ministry of National Endowments), is the government body in charge of studying, evaluating and coordinating the different initiatives related to the environment that involve the various branches of the Government. To this end, CONAMA works through the STYA, both in the implementation and proposition of different government actions and programs.¹

8. Most of the background information upon which this document is based - figures on consumption of controlled substances, projections of future consumption levels, and incremental costs associated to the substitution of these substances - was obtained from the Country Study, a document prepared during 1990-91 at the request of the Ministry of National Endowments (Chile, 1991).

¹ For the rest of this document, and unless explicitly stated, CONAMA will always refer to its Technical and Administrative Secretariat of it.

9. A previous version of the present document was presented to government authorities in the Ministry of Finance, Ministry of Economics, and the Ministry for Development Planning (MIDEPLAN). The version presented here is the result of several reflections obtained from these and other Ministries. The corresponding authorities of these Ministries gave a formal approval to this Country Program.

1.3 Assistance Received

10. In the preparation of this document, CONAMA received different types of assistance, which ranged from financial assistance from national and international sources to technical assistance from different experts and organizations. CONAMA also greatly benefitted from consultations with private sector organizations and particular industries and firms involved in the ozone protection issues.

11. Among the Implementing Agencies of the Interim Multilateral Fund, The World Bank contributed with the elaboration of the Country Program and UNEP contributed with important technical information and training, and also supported the preparation of the country study. Also, CONAMA is currently developing various forms of cooperation with UNDP.

12. Other branches of the government which also contributed to the elaboration of this document, or the background Country Study, were the Institute of National Statistics (INE), the Institute for National Norms (INN), the Central Bank, the Ministry of Foreign Affairs, and the National Customs Service (Dirección Nacional de Aduanas).

13. Particular industries and private businesses organizations helped to assess different aspects of the early Country Study and of this Country Program as well. Among them, important help was obtained from the Society for Industrial Development (SOFOFA), from the Commerce

Chamber of Santiago, from the Cosmetic Chamber and from many private firms.² Finally, the Departments of Biology, Geology, and Geophysics of Universidad de Chile also contributed with important scientific and technical information.

2. CURRENT SITUATION

2.1 Current and Forecast Consumption of CSs

2.1.1 Current Consumption

14. Chile does not produce any type of CSs nor does it export any of them. All consumption needs in the country are satisfied through imports from the international market. As of 1989 (the latest year for which this information was recorded) Chile consumed approximately 1,100 metric tons of CS a year. This amounts to approximately 0.09 percent of worldwide consumption of these substances, and approximately 0.073 kg of CS's per capita a year. Table 2.1 presents the information on CS's consumption broken down by type of substance.

15. Many different industries use CFCs, halons, and other ozone depleting chemicals in Chile. These industries include commercial and residential refrigeration, aerosols, sterilization of medical instruments, foams, and halon fire extinguishing agents. Table 2.2 presents a breakdown of consumption according to the different uses of CS in Chile as of 1989.

² Information was made kindly available by Aerosol S.A., Foam Tex, Indura, Degesch Chile, ICI, Basf, F.H. Engels Dupont Representative, Mathiesen, Termotécnica, Oxiquim, Extintores Roma, Co. Tecnoindustrial CTI, Frío Lux, and Tecnoconsult.

Table 2.2

Chile: 1989 Distribution of Consumption of CS by
End Use

Compound	End Use	MT
CFC11	Insulation for Residential Refrigeration (1)	92
	Insulation for Commercial Refrigeration (2)	5
	Molded flexible polyurethane foam	167
	Slabstock flexible polyurethane foam (3)	24
	Rigid polyurethane foam (4)	40
CFC12	Extruded polystyrene foam (5)	16
	Commercial refrigeration (6)	25
	Residential refrigeration	13
	Maintenance refig. and air conditioner	199
	Aerosols (7)	230
	Sterilants (8)	26
CFC113	Solvents	16
CFC114	Refrigeration	1
	Aerosols	1
HALON1211	Extinguishants	28
HALON1301	Extinguishants	8
CCL4	Solvents, dry cleaning, chem. analysis	12
MCF	Solvents, cold cleaner, degreasing	216
	TOTAL (9)	1121

Notes:

(1) 1989 refrigerator production multiplied by 0.85 kg. of CFC-11 used in average size unit.

(2) 1989 production multiplied by 5 kg. of CFC-11 used in average size unit. (3) Each pair of tennis shoes sole uses 0.08 kg CFC11.

(3) Consumption according to imports made by slabstock flexible polyurethane foam manufacturers.

(4) Consumption according to amount of isocyanate imported by rigid polyurethane foam industries.

(5) Consumption according to purchases made by polystyrene foam industrie.

(6) Commercial refrigerations units use an average of 26.3 kgs.

(7) Data reported by Cámara de la Industria Cosmética de Chile S.A.

(8) Data reported by INDURA S.A.

(9) This total uses decimals not shown in the individual compound figures.

Source: Chile 1991.

16. Table 2.2 shows that, as of 1989, the main end uses of CS's were foams, aerosols, and refrigeration (including air conditioning).

17. Although no complete and reliable estimates of CS's consumption for a year later than 1989 are available, two important changes have been taking place since then. First, few Halon imports are taking place since Halon production was drastically reduced by the most important foreign suppliers during the last years. It is interesting to note also that many users are changing their equipments to alternative systems, as they are being informed by Halon importers that Halon using techniques may become obsolete in the medium term. However, in places where expensive equipment needs to be protected against fire (computer systems, telecommunication, shipboard equipments, etc), Halon units continue to be used because they effectively extinguish fire without damaging the equipments. To date, no alternative technology is available for this application.

18. Second, in the domestic aerosol industry a significant shift towards alternative production processes and types of products has also started to take place. Increasing environmental awareness by the consumers has prompted the aerosol industry to offer alternative products.

19. The evolution of halon imports and the aerosol industry case strongly suggest that demand-pull effects have significant importance to reduce CS consumption in Chile. In the case of aerosols, the shift in demand caused by environmental awareness made alternative products profitable from a private perspective. In the case of halon consumption, the expectation that halon equipment may become obsolete in the medium term is providing the necessary incentives to prompt a similar shift.³ The Government Actions proposed in this document will emphasize the importance of demand-pull effects by considering explicitly the implementation of public opinion campaigns.

³ This happened in spite of the fact that currently, a typical non Halon using portable extinguisher costs approximately US\$ 214, which is more expensive than the cost of Halon using equipment of similar characteristics (approximately US\$ 75). Information on halon's reduced availability transferred from private importers to buyers of extinguishers was crucial in this respect.

2.1.2 Consumption Forecasts

20. Absent the Montreal Protocol, and under the assumption that unconstrained quantities of controlled substances continue to be available from existing sources, we expect future consumption of CS to grow at a rate of 5% a year or perhaps slightly higher. Consumption of CS is strongly linked to growth in GDP, and most experts coincide in that Chile may have a GDP growth rate of 5% or more a year during the rest of the decade. Furthermore, in many cases we may expect the income elasticity of CS's to be higher than one since they are used as inputs in the production of goods which for a significant segment of the Chilean population can be considered as "luxury goods" (residential refrigeration and air conditioning for example).

21. Under the scenario described in 20 above, the consumption of CS's in adjusted ODP's metric tons towards the year 2,006 should be around 2,743 metric tons (compare with the adjusted total in Table 2.1), and towards the year 2,010 should be in the order of 3,333 metric tons. These forecasts imply an increase in per capita consumption of 58%, for the whole 1989-2000 period, and of 72%, for the 1989-2010 period. These increases in per capita consumption would be consistent with the cross country evidence showing that per capita consumption is higher in higher income countries.

22. The above forecasts are subject to two possible variations. On one hand, refrigeration required for export purposes (frozen fish for example) may grow at a higher rate than GDP if exports grow at a faster pace than GDP, as it has happened since the late seventies in Chile. On the other hand, however, exporters may face increasing constraints in international markets if they do not change some of their ozone depleting refrigeration technologies, since a growing number of environmentally minded consumers in the importing countries are willing to discriminate against products that damage the global environment. Market mechanisms of this type will probably play an important role in Chile, which has a market and export-oriented economy. The Action Plan proposed here takes into account this particular reality of the Chilean economy.

2.2 Industry Structure

23. As discussed before (17-18), aerosols and extinguisher sectors have already began part of the transformation process towards a reduction in CS consumption. Therefore, important residual target sectors are the refrigeration and foam industry. A more detailed description of the industrial structure in these two subsectors follows.

24. Refrigeration Industry can be divided into commercial and residential refrigeration. Most of residential refrigerators are produced in the country and almost all of them use CFC12. There are two major producers of domestic refrigerators which together supply around 75% of the domestic market. As of 1982, and according to the National Census, a total of 1.5 millions of residential refrigerators were operating in the country. Given the development of the Chilean economy during the 1982-92 period, the total amount of refrigerators in use today should be approximately 2 million.

25. Commercial refrigeration units are primarily supplied by foreign producers with approximately 90% of the traded units every year.

26. The problem with residential refrigerator units is that they cannot be filled with alternative non-ozone depleting fluids unless a major equipment retrofit is done (compressors and piping). Residential refrigerators that do not use CS's are currently being sold at prices approximately 40% higher, and only correspond to expensive units (i.e., large units with ice maker).

27. A major source of ozone depleting substances in the commercial refrigeration comes from the maintenance of existing equipment. As a consequence, there is substantial scope for reducing consumption of CSs by implementing a suitable recycling system. At current prices this is not profitable from a private perspective, but in this respect the Action Plan proposed here is expected to make a difference.

28. The fruit packing refrigeration systems - intensively used by the fruit export industry - are

already using ammonia systems, so that the phasing out problem in this area would not be relevant. Something similar is beginning to happen in the ice and milk industry. However, in the meat industry, CFC's are still widely used to refrigerate meat products.

29. Another area where CS are used is in air conditioning, which although not extensively used in Chile, has been growing rapidly in the last few years.

30. Contrary to the refrigeration industry, the foam market is supplied by a large number of firms. Between 50% and 60% of the market is supplied by small firms using very simple technology. The possibility of decreasing CS consumption here would require changing the mix used to methylene chloride (see 82).

2.3 Institutional Framework

31. According to the existing policy framework that the Government has designed to address the environmental problems that affect the country, CONAMA will be the agency in charge of coordinating and monitoring the Action Plan proposed in this program. A proposed Ozone Team (of 2 professionals plus secretarial assistance) working within CONAMA under the supervision of its Technical and Administrative Secretariat will take the lead role in the implementation of the Action Plan.

32. Simultaneously with CONAMA and its Ozone Team other branches of the Government and the private sector shall be involved in the program. The next few paragraphs briefly describe some of these other institutions and organizations.

33. Private capital market institutions as well as the State Bank are expected to participate in the Technology Conversion Financing Program (TECFIN), through the granting of the complementary loans - at competitive interest rates - to private firms investing in alternative non ozone damaging technology. See section 3.2.1 for detailed description of TECFIN.

34. Private Sealing Firms on the other hand will be in charge of implementing the "Ozone Seal" Program. While the technical requirements to obtain the "Ozone Seal" will be established by the Ozone Team at CONAMA, the actual evaluation of those requirements will be made by the various private firms working in the Seal area. It must be said that due to the export orientation of the country's economy, the Seal Industry has experienced an important growth in the last years.⁴

35. Finally, private technological centers and other centers affiliated to the Universities and Educational Institutions will be in charge of carrying out the Specific Training Program and the Public Awareness Program that are also considered in the Action Plan to be described below. Again, while CONAMA will be in charge of deciding which particular center will carry out a specific training program, the responsibility for actually carrying out the program will fall on institutions that may probably be outside the scope of the public sector.

36. As described in this section, the role of CONAMA - through its Technical and Administrative Secretariat - and its Ozone Team will be primarily to coordinate and monitor the actions performed by other institutions, some of them in the private sector. This role for CONAMA is in agreement with the National Environmental Policy (Chile, 1992), which does not consider an executive role for CONAMA.

⁴ For example, Fundación Chile has successfully introduced the "pesticides-free" seal in the export fruit industry. Fruit exporters pay to Fundación Chile for the chemical analysis and the seal that is given to them if no pesticides residuals are found in the fruits that are directed to the international markets. Private exporters are willing to pay for this seal because it becomes valuable in foreign markets with agrochemical restrictions and/or environmentally minded consumers. Currently a more general National Quality Certification System is being discussed at the interior of the government. Also, an "Environmental Seal" has been proposed by The Chilean Institute for Environmental Recognition (ICRA), a private organization.

2.4 Policy Framework

37. The general policy framework for dealing with environmental problems is summarized in The National Environmental Policy (Chile, 1992). In general terms, the environmental policy of the government seeks to simultaneously achieve a satisfactory economic growth rate together with a proper conservation of the environment, i.e., a sustainable economic development.

38. With respect to economic policies, the government has vigorously backed a market orientation with a minimum degree of market controls and interventions. This general orientation of the economy has important practical consequences for public policy options. With respect to foreign trade restrictions, a general uniform import tariff applies to almost all goods, with only very few exceptions. The government is not supposed to help any particular sector through any sort of trade restriction and import quotas have not been applied in Chile for a long time (more than 15 years). The Chilean Constitution mandates that the introduction of any change in the current trade regime, such as the imposition of a special import tariff or an import quota, requires a special law which must be explicitly approved by the Congress.

39. In almost every economic area, and whenever possible, the government prefers to rely on market resource allocation mechanisms rather than direct government intervention. The bulk of government action is supposed to take place in the income distribution area, the provision of broader opportunities for the poor being a major objective of the government.

40. With respect to the environment, this general policy framework implies that the government, whenever possible, tends to rely on market allocation mechanisms rather than the more direct command-and-control approaches. A good example of this is the recently dictated Fishing Law which includes the possibility of tradable permits. Similar schemes are being considered with respect to the problem of pollution in urban areas as well as congestion. The direct command-and-control approach is seen more as a short run solution to emergency problems that require an immediate response by the government, such as the one-day-without-a-car program implemented in the larger cities of the country to address short term air pollution

and congestion problems.

41. With the major exception of the minning sector, where the government still owns an important number of mines and enterprises (CODELCO), and the infrastructure sector, where the government owns water public facilities and ports, most productive firms are owned by the private sector. This implies that the Action Plan will involve the implementation of incentives and programs designed to induce specific actions by the private industrial sector.

42. The Chilean Constitution includes the right to live in a healthy environment, free of pollution, as one of the basic citizens' rights of the Chilean people. The government is today proposing a "Framework Law for the Environment", which seeks to provide the basic principles for actually enforcing the "environmental rights" assured by the Constitution.

2.5 Government and Industry Responses to the Protocol

43. Chile ratified the Montreal Protocol on March 3, 1990. The next step was to develop a Country Study (Chile, 1991) which served as a background study for the elaboration of this document. If the present Country Program is approved by the Executive Committee of the Interim Multilateral Fund, the Government will quickly proceed to implement the Action Plan proposed here. For the time being, the process of making the Country Study relied on significant help from the private sector - in terms of information and technical opinions - which in turn helped to raise awareness on this issue among private firms. This in turn has prompted a positive response by specific segments of the private industry.

44. The private industry has positively responded to the Montreal Protocol. Specially noticeable has been the response of the Aerosol Industry, which has began to reduce its consumption of CS's. From an economic perspective, this positive response can be explained by two major factors. First, the incremental costs of changing technology in this industry were relatively small (Chile, 1991). Second, given the economic structure of the industry, private firms are benefiting from technology change by introducing a special seal on their products

informing the consumers about the new "ozone friendly" products. In short, the combination of supply incentives on one hand (through low technological conversion costs), and demand incentives on the other (through capturing environmentally minded consumers through the seal) helped to bring about this positive result. The Action Plan proposed in the next section attempts to capture these two basic successful ingredients of the aerosol industry case.⁵

45. On other areas, private industries are willing to adopt alternative technology when it comes to renew old equipment in their firms. Examples of this have been occurred in some supermarket chains and ice making firms.

3. IMPLEMENTING THE PHASE OUT

3.1 Strategy Statement by Government

46. Developing countries that are parties to the Montreal Protocol must phaseout CFCs, halons, and carbon tetrachloride by the year 2010, and methyl chloroform by the year 2015. Chile pledges to phaseout all controlled substances by the year 2006 thus accelerating the elimination of CFCs, halons, and carbon tetrachloride by four years and methyl chloroform by nine years. As an importer of controlled substances and associated technology, a phaseout by the year 2006 in Chile is feasible given the process of development and commercialization of alternative technology underway in industrialized nations and, more important, provided that Chile receives the financial support proposed in this Country Program. Such support is essential to ensure a timely introduction of alternative technology into domestic markets.

47. The Government expects to reduce the consumption of controlled substances by 63% between the 1992-96 period of this Country Program and to reduce the remaining consumption during the 1997-2006 period. This reduction would be achieved by a combination of measures

⁵ See in particular the Technological Conversion Financing Program, and the Ozone Seal Program.

described in detail in the Action Plan (section 3.2). These measures would be consistent with the current policy framework for environmental protection. Thus, the Government will avoid the imposition of import quotas or import tariffs during the transition towards the phaseout of controlled substances. Similarly, and whenever possible, the government will rely on market oriented mechanisms in order to provide the necessary incentives to minimize the overall technological cost of the conversion towards less ozone damaging technology.

48. Therefore, the Government will announce that importation of controlled substances will be banned after the year 2006 except for essential uses⁶ and would rely on the incentives generated by the Action Plan to bring about interim reductions. Such interim reductions would be monitored ex post through import data from the National Customs service (section 3.4 provides a detail description on monitoring arrangements).

49. Another element of the Government strategy is the reduction of "burden costs" associated with the phaseout. According to the Country Study (Chile 1991), the total incremental costs for phasing out controlled substances in Chile fluctuate between US\$ 3.4 and US\$ 5.2 millions, as calculated in the country study.⁷ However, these estimates do not capture the entire set of costs involved. "Burden cost" are administrative and human resources-related costs associated with the actual implementation of the phaseout. Administrative costs include the operational costs to be incurred by the Government in implementing its phaseout policy. These are incremental costs to the Chilean society because these costs would not exist in the absence of the Protocol. Human resource-related costs include retraining costs to ensure proper operation of alternative technologies. For example, although in the solvents sector the incremental costs are relatively low compared to other sectors (e.g., refrigeration), the implementation of alternative technology requires retraining of many operators. Other burden costs include those associated with the waste management of equipment and substance inventory that may result when controlled

⁶ Essential uses include controlled substances needed to service the remaining stock of refrigeration equipment, critical halon applications and other to be defined. Chile will seek the technical advice of the Parties to the Protocol to clearly define these exempted use categories.

⁷ See Exhibit ES-3 in Chile (1991).

substances are phased out.

50. In addition, the incremental costs calculated in the Country Study refer to steady state comparisons between existing equipment that uses the controlled substances and new equipment that uses alternative substances technologies. Costs associated with early retirement of refrigeration and halon equipment in stock that would result from lack of supplies of controlled substances beyond the phaseout date were not included in the calculations.

51. Following EPA's methodology, the country study assumed an annual cost of capital of 2% which for Chile is a low figure. This difference becomes important when the phaseout requires important capital costs in equipment changes. Finally, the incremental costs estimates did not consider the costs of eliminating halon use by the Chilean military.

3.2 Action Plan

52. The Action Plan consists of two elements: (i) a set of government actions that articulate the above strategy and (ii) a series of projects to be undertaken by the private sector in response to the government actions. Each element of the action plan is described below.

3.2.1 Government Actions

53. Five government actions constitute the essence of this Country Program: (1) a Technological Conversion Financing Program (TECFIN), (2) an "Ozone Seal" Program to standardize labels on "ozone friendly" products and services; (3) a Public Awareness Program to inform the public about the threats of ozone depletion and facilitate demand for alternative technologies; (4) a Sector-Specific Training Program; and, (5) the creation of the Ozone Team.

54. The Technological Conversion Financing Program (TECFIN) will provide a subsidy to purchase new alternative technology. The subsidy will be expressed in US\$ per ODP weighted KG of CS saved over a "reduction" period. The reduction period will be the minimum of the

expected useful lifetime of the equipment and the remaining years before 2006. The subsidy will be applicable to every producer who retrofits his equipment or purchases new non ozone depleting systems. Similarly, the subsidy will be applicable to every Kg of equivalent CS recycled. The saved Kgs. will be calculated on a case by case basis by the Ozone Team at CONAMA but will be based on general standards such as those provided in EPA's methodology for incremental cost calculation used in the country study. The amount of the subsidy will be uniform for all potential applicants and will be fixed in such a way that - for many applicants - it will not cover the complete equipment change and refitting cost. The difference between the amount subsidized and the total adjustment cost is expected to be financed either directly by the applicant or through a loan that the applicant may get in the private capital market. The responsibility for deciding the total amount of the subsidy will fall on the Ozone Team at CONAMA, while the screening of potential borrowers - in the case complementary loans are requested - will fall on private capital market institutions.

55. TECFIN has strong complementarity links with the Public Awareness and the Ozone Seal program (see below). While those two programs increase the potential demand for retrofitted and alternative equipments, this program helps to reduce the costs associated to the necessary technological change. Additionally the program has several other advantages. First, it minimizes the conversion cost. Since the subsidy is expressed in Kgs of CS saved and since in many cases it will not finance the complete conversion cost, it will be in the interest of the applicants to search for the cheapest available technology. Second, since it gives a uniform subsidy per kg. of CS's saved, it incentivates the technological conversion of those processes which currently have lowest incremental costs. A delay in the conversion of other processes is economically optimal since over time, less expensive technological alternatives will be developed. Third, since it may involve a screening process by private financial institutions (for the complementary financing), it avoids financing the conversion in firms which may have other financial problems, and so it minimizes the probability of funding an important conversion project in a firm which would default or go bankrupt anyway. TECFIN combined with the Ozone Seal and the Public Awareness campaign fits very well with the general market oriented strategy of the Government with respect to environmental and public policies in general.

Furthermore, similar subsidy programs using lump-sum-payments have been applied in other areas of the economy, hence, the institutional experience in this regard.⁸

56. The Ozone Seal Program will consist on a seal that final consumer products will be allowed to exhibit when ozone depleting substances are absent and if no ozone damage was produced in the manufacturing of the good nor in any part of the production process (including components). The technical requirements for eligibility for the Seal will be specified by the Ozone Team, while the actual evaluation of potential seal carriers will be done by the many private sealing firms currently working in Chile. In turn, these private firms will sell the official seal to potential applicants, previous fulfillment of the requirements established by the Ozone Team. The Ozone Team will be responsible for evaluating the performance of the sealing firms, while they will be responsible for actually providing the seal. In principle, the seal could be given also to consumer shops (like supermarkets and malls not using substances in Annex A or B of the Protocol in their air conditioning and refrigeration systems).

57. The Public Awareness Program will achieve two purposes. On one hand, it will instruct the public on the threats to human health and the environment posed by ozone depletion. In this way, this program will reinforce the Ozone Seal Program by enhancing the segment of environmentally minded consumers and therefore increasing the private profitability associated to having the seal. On the other hand, the Public Awareness Program will provide necessary information to avoid some of the damaging health consequences of UVB rays. The contents and implementation of this program will be the responsibility of the Ozone Team at CONAMA

58. The Public Awareness Program has two projects, one for each of the objectives mentioned above. One project raises public awareness about ozone layer depletion and simultaneously induces consumers to prefer products exhibiting the Ozone Seal. Another, provides guidelines

⁸ A good illustration of this approach pertains to the social and income distribution area. With respect to housing low income for example, the Government does not get directly involved in the construction of houses but this is done by private contractors. People buy later their houses with a subsidy given by the government, and get the difference through a loan obtained in the capital market.

to prevent excessive UVB exposure. These two projects are expected to function very intensively during 1993, and at a slower pace during 1994 and 1995.

59. The Sector Specific Training Program will be focused on providing technical guidance to entrepreneurs and technicians in the private sector on how to shift towards non ozone depleting materials whenever the shift is not costly for them (or can be partially covered by TECFIN). The contents and implementation of these training activities should be proposed and performed by non governmental centers like Technological Centers at the Universities, Engineer Groups, Technical Consultants and others. The Ozone Team at CONAMA will be responsible for selecting the Institution(s) which will be in charge of carrying out the training program(s), after a proper application and qualification process, following the standard rules that public administration in Chile has for these purposes.

60. Three sector specific training projects are considered, one in the flexible foam area, one in the sterilant area and one in solvents. In these three cases, incremental conversion costs are small and many small enterprises exist within this sector (30). The main objective of these training programs is to provide technical guidance with respect to the use of alternative non ozone depleting technologies⁹.

61. With respect to flexible foams, there are a large number of small firms producing flexible foam products and working with very simple technology. The objective of the training courses will be to educate the technicians of these firms in the handling and dosification of alternative substances (e.g., methylene chloride). Three training projects are considered here also.

62. One technical advice seminar will be conducted in the sterilant area and will be focused on technicians and managers of public hospitals.

⁹Currently, there are three technical Assistance Programs sponsored by UNDP to be implemented during 1992 which are complementary to the ones proposed here.

63. In solvents, one training course is considered. The training course will instruct on how to minimize solvent losses during metal cleaning operations.

64. The Ozone Team at CONAMA will be responsible for the evaluation, coordination, and supervision of all Government Actions and their corresponding projects. In addition CONAMA will liaise with other Government agencies and private institutions mentioned in paragraphs (33-35). For the first four years 1993-96 of the program, the Ozone Team is expected to operate with two professionals plus secretary assistance. The responsibilities of the professionals will be as follow:

Professional 1: - To Coordinate Specific Training Programs.

- To Supervise Public Awareness Program
- To Supervise Administrative Tasks of the Ozone Team.
- To Manage Public Relation issues of the Ozone Team and to keep communication with the Protocol's Committee and other Government agencies.
- To propose an action program for the 1996-2000 period.

Professional 2: - To Evaluate potential applicants for teaching specific training courses.

- To Design the Technical Requirements for the Ozone Seal.
- To Determine the eligibility of applicants to TECFIN.
- To Manage the Funds of TECFIN.

65. Professional 1 would be a highly qualified Business Administration Professional while Professional 2 would be a highly qualified Chemical or Mechanical Engineer.

66. The intended effect of each of these programs is to reduce consumption of controlled substances in the various user sectors. Based on the structure of the industry that consumes controlled substances in Chile, current users can be divided into three broad categories. These categories are shown in Table 3.1.

67. As Table 3.1 shows, first there is a highly concentrated segment of the industry for which incremental conversion costs are small or fully recoverable in the short term (Category I). Second, there is a segment which has low conversion costs but is comprised by a large number of small enterprises (category II). Third, there is the segment of the industry which has significant incremental conversion costs (category III).

68. The effect of each program will vary across different types of users. The expected effect of the four programs on each of the above categories is summarized in Table 3.2.

Table 3.1	
Categories of CS's Users	
Categories	Uses and Users
(I) Few Suppliers, Incremental Conversion Costs close to zero	Aerosols, Extinguishants ¹⁰ , Sterilants.
(II) Low Incremental Conversion Costs, many small enterprises.	Flexible foams, Solvents.
(III) Significant Incremental Conversion Costs	Commercial Refrigeration, Rigid Foams.

Table 3.2

Expected Reduction in CS Consumption
due to Government Actions

¹⁰ Except those needed for essential applications.

Category	Relevant Government Action	Reduction in ODP Weighted MT	Reduction as a Percentage of 1989 Consumption	Expected Completion Date
I	Ozone Seal, Public Awareness, Training			
Aerosols		219	19.2	1994
Extinguishers		97	8.5	1994
Sterilants		22	1.9	1995
Subtotal		338	29.6	
II	Ozone Seal, Public Awareness, Training, TECFIN			
Flexible Foams		183	16.0	1996
Solvents		19	1.7	1996
Subtotal		202	17.7	
III	Ozone Seal, Public Awareness, TECFIN,			
Rigid Foam		66	5.8	1996
Comm. Refrig.		108	9.5	1996
Subtotal		174	15.3	
TOTAL		714	62.6	
<u>Assumptions for Percent Reductions:</u> Aerosols: CFC-12 is replaced in all but essential aerosols (5%). Extinguishers: 85% of the Halon 1211 is replaced. Sterilants: 85% of CFC-12 is replaced. Flexible foams: 75% of CFC-11 is replaced. Solvents: 3 MT CFC-113 and MCF switches to alternatives and 40% of remaining consumption is reduced through conservation practices. Rigid Foam: 50% of the 132 MT of CFC-11 used for insulation is reduced. Comm. Refrig.: 85% of the 124 MT used to service existing equipment and 10% of the 25 MT used in production of new equipment is reduced.				

69. As Table 3.2 shows, consumption reductions in Category I will be the result of the Ozone Seal and the Public Awareness Program with smaller reductions due to sector-specific training programs. As mentioned earlier, the aerosol industry has already begun to convert to alternative

technologies. Thus, the Ozone Seal and the Public Education programs will contribute to reinforce this change and to prevent future dumping of surplus CFC containing aerosols into Chile. The programs will act as advertising campaigns to increase the demand for non-CFC aerosols by focusing the existing concern on the effects of ozone depleting on possible consumer choices.

70. Similarly, the Ozone Seal and the Public Awareness programs would encourage further replacement of alternatives to halons in non-essential fire extinguishing applications. Finally, in the sterilants sector a conversion to alternatives would be encouraged by a training program on the use of higher pressure sterilant gases, which were identified in the Country Study as feasible alternatives for Chile.

71. For Category II, a combination of sector specific training and the incentives of the TECFIN will bring about the estimated reductions. The training program will be aimed at assisting a large number of small entrepreneurs in adopting operating practices that minimize emissions of controlled substances and in adopting alternative technologies. The TECFIN would provide a small subsidy for reductions in these sectors.

72. For Category III, the most important effect will come through the TECFIN, since here incremental costs are significant. Here too, Ozone Seal and Public Awareness will help, and perhaps even more than in Category II since in this case the market tends to be more concentrated (especially in Commercial Refrigeration).

73. The shares of consumption exhibited in the third column of Table 3.2 come from Tables 3.1 and 2.2. Observe however that there is a residual consumption share which is not covered by any of the programs representing 37% of total CS consumption (i.e., consumption for maintenance of existing refrigeration equipment, CFC-11 used in rigid polyurethane foam insulation). It is believed that technologies for these applications are at developmental or early commercialization stages and thus it would be economically inefficient to force their introduction into Chile.

74. The phaseout dates shown in column 5 of Table correspond to a preliminary estimation but roughly reflect relative difficulty in achieving reductions in the user categories. The first category, for example, faces the easiest task since conversion has already begun and conversion is cost-effective. The second and third categories face increasingly more difficult tasks.

3.2.2 Private Sector Projects

75. This section describes specific industrial private projects that are expected to result from the five government actions described in 3.2.1. The government actions create the incentives to the private sector for the formulation and implementation of technological conversion projects. It is important to note that the exact nature and number of projects will depend on private sector decisions. The market oriented policy framework described in this Country Program intends to promote private sector responses to the challenge posed by the Montreal Protocol. The examples listed here are believed to be indicative of the type of projects that could be undertaken by the Chilean industry if the set of incentives proposed in this Country Program is implemented.

76. For each possible project, a brief technological description of it is provided and the relevant government actions together with the implied incentives are outlined. It should be noted that in all cases, the incentive coming from the 2006 deadline, with the implied possibility of keeping obsolete equipment, is a strong incentive that applies in all cases, and hence is not specifically mentioned in any of them.

77. **Category I: Aerosols**

Project: Conversion to hydrocarbon propellants

Expected reduction¹¹: 219 MT (all except 5% of all uses)

Project Description: Substitution of hydrocarbon propellant for CFCs in facilities that have not already made the conversion. This involves equipment conversion, the upgrading of safety facilities, and an in-plant training program for safe handling of hydrocarbons.

Relevant Government Actions: Ozone Seal, Public Awareness Program

Incentives: Demand for ozone friendly aerosols brought about by increased consumer awareness. Aerosol manufacturers are expected to seek the standardized Ozone Seal certifying that their products do not contain ozone depleting substances.

78. **Category I: Non-essential fire extinguishing applications**

Project: Conversion to powders, water, and other non-halon agents; conservation methods during refilling.

Expected reduction: 97 MT (all except 15% of all halon-1211 uses)

Project Description: Adoption of alternative fire extinguishing methods in new installations and conservation practices during inspection and refilling of existing systems by service firms.

Relevant Government Actions: Ozone Seal, Public Awareness Program.

Incentives: Increasing public awareness. Ozone Seal on portable units that do not contain halons.

79. **Category I: Sterilants**

Project: Conversion to from CFC and ethylene oxide to CO₂ and ethylene oxide

Expected Reduction: 22 MT (all except 15% - 5 let pressure sensitive medical devices is replaced).

Project Description: Conversion of sterilization chambers in hospitals from CFC-

¹¹ Reductions for all projects are calculated with respect to 1989 consumption data.

12/ethylene oxide mixture to CO₂/Ethylene oxide mixture. The latter gas mixture would operate at higher pressure therefore some equipment retrofit (i.e., seals and piping) is required. Training of nurses loading medical devices to sterilization chambers is required to adapt to new operating conditions, including run time and type of medical devices that resist higher pressures during sterilization.

Relevant Government Actions: Sector Specific Training Program.

Incentives: Training program for hospital personnel.

80. **Category II: Solvents (New Equipment)**

Project: Adoption of Alternative Cleaning Technologies

Expected reduction: 3 MT

Project Description: Purchase of cleaning equipment that does not use CFC-113 or methyl chloroform (e.g., conversion from CFC-113 and MCF to aqueous cleaning) by existing facilities that are replacing old equipment or by new facilities.

Relevant Government Actions: TECFIN.

Incentives: Lump sum subsidy equivalent to the sum of the ODP weighted kgs of CFC-113 or methyl chloroform avoided over the life the equipment times the per kg subsidy.

81. **Category II: Solvents (Existing Equipment)**

Project: Training for Conservation Practices

Expected reduction: 16 MT (40% of all CFC-113 & MCF use).

Project Description: Operator training to minimize solvent losses during metal cleaning operations, including improved methods for solvent unloading, handling of parts to be cleaned, use of tank covers, etc.

Relevant Government Actions: Sector Specific Training Program.

Incentives: Training Program demonstrating the savings associated with the improved handling of solvent cleaning equipment.

82. **Category II: Flexible foams**

Project: Conversion to methylene chloride

Expected Reduction: 183 MT (75 % of CFC-11 used in flexible foams).

Project Description: Conversion of flexible slabstock polyurethane foam from CFC-11 to methylene chloride. Project would add equipment to properly vent the workplace of methylene chloride fumes, and will train plant operators.

Relevant Government Actions: TECFIN, Sector Specific Training Program, Ozone Seal, Public Awareness.

Incentives: TECFIN will help cover the cost of new mixing equipment. Training courses will instruct operators and managers on how to use the alternative foam blowing system. Firms using flexible foam as intermediate products (e.g. bed manufacturers) will require flexible foam suppliers to implement alternative technologies to carry the Ozone Seal on their final products.

83. **Category III: Rigid Foams (Insulation for Domestic and Commercial Refrigeration Equipment produced in Chile)**

Project: 50% Reduction of CFC-11 in Rigid Foams

Expected Reduction: 66 MT

Project Description: Reduce 132 MT of CFC-11 by 50% in rigid polyurethane foam used for insulation in the production of domestic and commercial refrigeration equipment. Project involves reformulating foam system, short production trials, process modifications, and quality control and verification tests. At least five plants are expected to undertake this project.

Relevant Government Actions: TECFIN.

Incentives: Subsidy equivalent to the per kg subsidy times the number of kgs of CFC-11 avoided as a result of the project from the project start date to the year 2006.

84. **Category III: Commercial and Domestic Refrigeration (Maintenance of existing Units)**

Project: Refrigerant Conservation and Recycling

Expected Reduction: 105.4 MT¹²

Relevant Government Programs: TECFIN and Ozone Seal

Incentives: TECFIN will provide a subsidy for recycled refrigerants equivalent to the per Kg subsidy times the number of Kgs recycled. The subsidy is expected to generate one or two private recycling centers among the service firms engaged in equipment maintenance. With the subsidy, these firms would invest in recycling equipment and would purchase contaminated refrigerant from other service technicians (thus creating an incentive for refrigerant conservation). The recycled refrigerant would be used for their own service jobs or would be sold to other service technicians.

85. **Category III: Commercial Refrigeration (New Equipment)**

Project: New equipment with HCFCs and Ammonia

Project Description: Production of new equipment which is used to replace old equipment or equipment needed in new facilities. Depending on the refrigeration application, preference for HCFC-22 and ammonia systems will be encouraged (e.g., air conditioning chillers, cold storage system for food preservation).

Expected Reduction: 2.5 MT¹³

Relevant Government Actions: TECFIN, Ozone Seal, Public Awareness programs

Incentives: Producers of commercial refrigerators and owners of refrigerated food storage facilities will be eligible for a subsidy equivalent to the per kg subsidy times the number of refrigerant kgs avoided over the life of the system, or the period between the project start year and the year 2006, whichever smaller. New equipment that does not use the controlled substances will display the Ozone Seal and will benefit from the Public Awareness campaign.

¹² Assumes that 85% of the annual 124 MT used in refrigeration equipment maintenance can be recovered.

¹³ It is expected that 10% of the 25 MT CFC-12 used in the production of commercial systems will be eliminated.

3.3 Budget

86. Table 3.3 shows a summary of the budget requirements for this Country Program. Annex 1 presents a more detailed explanation of each budget item.

Table 3.3 Total Budget Requirements for Chile's Country Program (US\$)					
Government Action	Cost 1993	Cost 1994	Cost 1995	Cost 1996	Total Cost Program
TECFIN	158,300	126,100	124,800	124,125	533,325
Ozone Seal	7,000	0	0	0	7,000
Public Awareness	227,200	81,000	51,400	-	359,600
Specific Training	115,200	0	0	0	115,200
Ozone Team	47,800	47,800	47,800	47,800	191,200
TOTAL	555,500	254,900	224,000	171,925	

GRAND TOTAL BUDGET REQUIREMENT = US\$ 1,206,000

CUMULATIVE CS CONSUMPTION REDUCTION = 3,120 (780 metric tons per year projected over 1993-1996).

87. A few observations on the proposed budget are relevant. The Ozone Team is assumed to require equal amounts of resources every year. Although in the last year the work of the Team could be expected to be less, the Team will devote resources to prepare for a second phase of the implementation of the Protocol. Such second phase would be reflected in a revision to this Country Program. Also, additional infrastructure resources required by the Ozone Team will be provided by CONAMA, and hence they are not included in the total presented in the table.

3.4 Monitoring Arrangements

88. The Ozone Team through the STYA of CONAMA will be in charge of keeping fluid

communication with the Funders of the Program. Periodical evaluation reports on the performance of this Country Program will be sent to the Assessment Chairs for the Parties to the Montreal Protocol.

89. Two elements should be helpful in monitoring of this Country Program. On one hand, the fact that no CS is produced within the country simplifies the control of the evolution of the program, because figures on import records are readily available from the Custom Service Administration. On the other hand, since a major part of the resources are devoted to TECFIN, and the subsidy is directly expressed in terms of Kgs of CS saved, the amount of the funds spent in that program should provide a direct estimate of the extent of CS consumption reduction. The joint analysis of CS imports and of the resources spent in TECFIN should provide a clearcut picture of the evolution of this program.

REFERENCES

Chile (1991); "Chile: Strategy on Ozone Layer Protection. A Case Study on the Cost of Implementing the Montreal Protocol" Document sponsored by the Ministry of National Endowments of Chile and UNEP.

Chile (1992); "La Política Ambiental del Gobierno de Chile", mimeo, Ministry of Economics of Chile.

ANNEX 1

DETAILED COST ESTIMATES FOR COUNTRY PROGRAM

This Annex presents detailed cost estimates for each government action discussed in the Country Program.

TECFIN

The major cost here corresponds to the cost of the subsidy which will be given to the firms. As explained in the document, the subsidy will be expressed in terms of US\$ per KG of equivalent units of CS's saved over a time period of ten years. The target consumption reductions presented in Table 3.2 assumed a lump sum subsidy of US\$ 0.5 per ODP wheighted Kg saved. These estimates were obtained from the specific project examples discussed in section 3.2.2.

As an illustration, in the Foam sector, a potential project eligible for the subsidy would consist in the replacement of CFC-11 mixture by a Methylene Chloride mixture. This may involve purchasing a mixing tank and adequate ventilation equipment. Total consumption of CFC-11 in flexible foam amounts to 191 MT (Table 2.2). It has been estimated that between 50% and 60% of all this consumption is covered by approximately 50 small enterprises. Therefore, with a subsidy of US\$ 0.5 per Kg of CFC saved, and assuming an average lifetime of the mixing and ventilation equipment of 4 years, the average per-firm subsidy would amount to approximately US\$ 4,600. This is estimated to account for at least 40% of the total cost of this alternative technology. Additional incentives would come through savings in raw material costs, specific training, and, indirectly, the Ozone seal on final products on which flexible foam is used.

A detailed cost breakdown of the TECFIN program for each possible project outlined in section 3.2.2 is presented below.

Estimated Budget Requirements of TECFIN Progra				
Expected Projects	1993	1994	1995	1996
Solvents (new equipment)	9,300	8,600	7,300	6,600
Flexible Foams	57,300	57,300	57,300	57,300
Rigid Foams	31,500	-	-	-
Recycling	52,700	52,700	52,700	52,700
New Equipment	7,500	7,500	7,500	7,500
Total	158,300	126,100	124,800	124,100

The cost of selecting applicants for the subsidy is not included since this is covered by the management costs of the Ozone Team at CONAMA to be discussed below.

OZONE SEAL

The technical requirements necessary to obtain the seal will be determined by the Ozone Team and, therefore, those costs are not included here. Similarly, since the seal will be administered by private firms in Chile, all the costs associated with the seal will be recovered by those firms since they will sell the seal to potential applicants, as it happens today with other seals in the market. Finally, the costs associated to the provision of public information about the seal will be covered by the Public Awareness Program which is addressed below. Therefore, only the design cost of the seal is included here together with a press conference and social event that would take place at the time the Ozone Seal is launched. The total cost for these activities is US\$ 7,000, and the Ozone Seal would be launched during 1993. A breakdown of these costs is as follows:

Design (Including logo)	US\$ 3,000
Press Conference & Social Event	US\$ 4,000
TOTAL COST	US\$ 7,000

PUBLIC AWARENESS PROGRAM

The first Project in this area (Public Awareness Campaign) has a total cost over the 1993-95 period of US\$ 259,600 which is broken down as follows:

	1993	1994	1995
Mass Media Campaign (TV, Newspapers, Magazines, etc.)	143,000	50,000	20,000
Consultant Services ¹⁴	18,000	6,000	6,000
Secretary Assistance	4,200	1,400	1,400
Other Expenses	6,000	2,000	2,000
TOTAL COST	US\$ 171,200	59,000	29,400
TOTAL 1993-95 COST	US\$ 259,600		

The second Public Awareness Project (Health Effects Prevention) requires less mass media communication costs since it is probably easier to induce a modification of attitudes when direct health consequences are at stake. Information bulletins will be provided to physicians, hospitals, schools and superior education centers. The total cost of this program, excluding Professional and Secretariat Assistance which was already charged to the first Public Awareness project, amounts to US\$ 100,000 over the 1993-95 period, and is broken down as follows:

	1993	1994	1995
Communication Materials	50,000	20,000	20,000
Other expenses	6,000	2,000	2,000
TOTAL COST	US\$ 56,000	22,000	22,000
TOTAL 1993-95 COST	US\$ 100,000		

¹⁴The cost of the consultant services includes also tasks to perform for the second public awareness project (Health effects prevention)

SECTOR SPECIFIC TRAINING

The cost of the Technical Advice Seminar to be performed with technicians from public hospitals in Chile has a total cost of US\$ 9,000 which consists of the following items:

External Technical Advice (One expert who teach the Seminar)	US\$ 4,000
Infrastructure to perform the course	US\$ 1,200
Auxiliary Materials (Papers, Photocopies, Audiovisuals, etc)	US\$ 2,500
Rent of Technical Equipment and Materials	US\$ 2,500
TOTAL COST OF SEMINAR	US\$ 9,000

With respect to flexible foams, the cost of each course is estimated at US\$ 19,700 which is broken down as follows:

External Technical Advice (One expert who designs and teaches)	US\$ 8,000
Infrastructure to perform the course	US\$ 1,200
Auxiliary Materials (Papers, Photocopies, Audiovisuals, etc)	US\$ 2,500
Technical Equipment and Materials	US\$ 6,000
Publicity (To announce the course among all firms)	US\$ 2,000
TOTAL COST OF ONE COURSE	US\$ 19,700
TOTAL COST OF THREE COURSES	US\$ 59,100

The Solvent Cleaning Training Project costs US\$ 19,700 and has a similar cost structure as each individual flexible foam training project.

The administration and coordination of these courses and seminars will be the responsibility of the Ozone Team at CONAMA, and hence, the administration costs are not included here as they are considered in the total budget of the Ozone Team.

THE OZONE TEAM

The total cost of the Ozone Team for the first four years of functioning is US\$ 191,200 which is broken down as follows:

Two Professionals	US\$ 163,200
One Secretariat	US\$ 24,000
Two Personal Computers	US\$ 3,000
One Fax Machine	US\$ 1,000
TOTAL BUDGET REQUESTED (1993-96)	US\$ 191,200
Other Infrastructure	US\$ 48,000
TOTAL OZONE TEAM COST	US\$ 239,200

Other Infrastructure cost correspond to office renting plus utilities which will be covered by CONAMA'S budget.