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Executive Committee of the
Interim Multilateral Fund for the
Implementation of the Montreal Protocol

Sixth Meeting
Montreal, 27-28 February 1992

MEXICO COUNTRY PROGRAMME

This document consists of:

- a) Evaluation Sheet prepared by The Fund Secretariat
- b) Letter of transmittal from the Government of Mexico
- c) Country Programme Cover Sheet
- d) The country programme (revised).

MEXICO'S COUNTRY PROGRAMME EVALUATION SHEET

Mexico's Country Programme¹ is submitted to the Sixth Meeting of the Executive Committee as document UNEP/OzL.Pro/Ex/Com/6/5. Comments provided by the Committee during its fifth meeting as well as further comments from the Fund Secretariat were taken into account by the government of Mexico in preparing this revised version.

The document was revised in accordance with "Guidelines of Country Programme Preparation (UNEP/OzL.Pro/Ex/Com/5/5/Rev.2). It consists of:

- Letter of transmittal from the Secretary of Foreign Affairs.
- Country Programme Cover Sheet (page 2).
- Executive summary (page 8).
- Introduction (page 10).
- Review of production and consumption of the controlled substances (page 11).
- Review of activities already undertaken (page 20).
- Institutional framework governing controlled substances (page 22).
- Policy framework governing controlled substances (page 23).
- Roles in implementing the phase-out strategy (page 23).
- Action plan and timetable for implementation (page 25).
- Budget (page 31).
- SEDUE's Ozone Protection Unit (as Appendix A, page 37).
- Description of investment projects (as Appendix B, page 40).

In 1989, Mexico consumed 10,136 ODP-weighted tons of controlled substances. The total consumption till phase-out date (2010 for Article 5 countries) is estimated to be of 332,000 ODP-weighted tons; however, the Government of Mexico has pledged to accelerate its phase-out schedule to match those of industrialized countries, avoiding an additional consumption of 190,500 ODP-weighted tons of controlled substances between the years 2000 and 2010.

To achieve this goal, Mexico proposes an action plan for the next three years with specific project proposals, which will be managed by the SEDUE's ozone protection unit². The key objective of both the action plan and the project proposals is to ensure an expeditious and cost-effective phase-out of controlled substances. The Government of Mexico will measure its performance in fulfilling this goal by monitoring progress against interim phase-out dates.

The estimated cost to Mexico for completely phasing-out the consumption of controlled substances range from \$ 64.4 million (for a likely growth-likely cost scenario) to \$ 118.7 million (for a high growth-high cost scenario), for a 2010 phase-out.

¹. This document is a result of bilateral co-operation between the Governments of Mexico (SEDUE) and USA (US/EPA).

² The United States is providing bilateral funding to cover the first three years of the unit's budget.

The budget for projects that will be implemented through the end of 1994 is estimated at approximately \$ 8.5 millions. In late 1993, the Government of Mexico will present a progress report in order to determine the need for requesting the additional \$ 4 million for another set of projects. The following table present the cost and estimated ODP phased-out of the proposed projects:

Project	Cost (US \$)	ODP saved	\$/ODP
Centralized CFC recycling	1,100,000	8,250	133
Expanded MACs recycling	500,000	600	833
MACs compressor plant	950,000	3,250	292
Chiller purge, recycle	1,125,000	580	1,940
Low-CFC foam insulation	500,000	750	667
Polystyrene foam conversion	600,000	1,000	600
Centralized CFC113, MCF recycling	500,000	450	1,111
Plant conversion, electronic industry	1,850,000	6,000	308
Halon conservation, training, recycling	750,000	600	1,250
TOTAL	7,875,000	21,480	367

RECOMMENDATION

The Fund Secretariat is satisfied with the content and format of this document, and recommends it for approval by the Executive Committee at this meeting.

It should be noted that since most of the project proposals identified by the government of Mexico are over US \$500,000, individual project documentation should be submitted to the Executive Committee for its consideration and approval (this has been communicated from the Secretariat to the government of Mexico).

Tlatelolco, D.F., febrero 3 de 1992.

Estimado Sr. El-Arini,

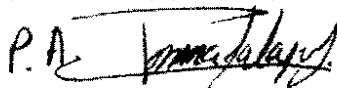
A través de este conducto tengo el agrado de presentar a usted el segundo borrador del Programa Mexicano de actividades que la Secretaría de Desarrollo Urbano y Ecología de este país ha elaborado con objeto de que sea sometido a consideración del Comité Ejecutivo del Fondo Multilateral del Protocolo de Montreal a su digno cargo.

Este Programa Mexicano fue preparado de acuerdo a las indicaciones de la Secretaría y el Comité Ejecutivo del Fondo Multilateral del Protocolo, con objeto de definir el compromiso de México para cumplir con el Protocolo y recibir la asistencia financiera necesaria para ello.

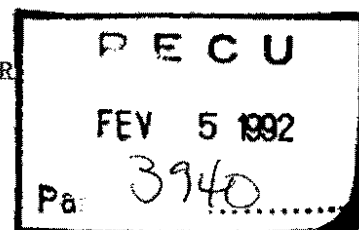
Como se manifiesta en este Programa Mexicano, SEDUE continuará trabajando en el cumplimiento del Protocolo de Montreal. Con los fondos aprobados hasta ahora para México por el Comité Ejecutivo y los Estados Unidos, SEDUE puede comenzar el desarrollo del Programa durante el periodo 1992-93. Según progrese la implementación del Protocolo en México, nuevas acciones y Presupuestos serán sometidos al Comité Ejecutivo para su aprobación.

Aprovecho la oportunidad, para reiterar a usted las seguridades de mi más atenta y distinguida consideración.

EL COORDINADOR

P.A. 

LIC. VICTOR LICHTINGER



Dr. Omar el-Arini
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**MEXICO'S COUNTRY PROGRAM
FOR ELIMINATING SUBSTANCES
CONTROLLED UNDER THE MONTREAL PROTOCOL**

Second Draft

Sixth Meeting of the Executive Committee of
the Multilateral Fund under the Montreal Protocol

February 27-28, 1992

COUNTRY PROGRAM COVER SHEET

Country: Mexico

Date Received:

Lead National Agency: Secretariat for Urban Development
and Environment (SEDUE)

Period Covered by
the Country Program: 1992-1994

Implementing Agencies: World Bank, UNDP, UNEP

1. Phase-out Schedule

Substances	Current Consumption (tons x ODP) in 1989 ^a (year)	Planned total consumption till phaseout (tons x ODP)		Planned year of phaseout	
		Article 5 Schedule	Accelerated Schedule	Article 5 Schedule	Accelerated Schedule
CFC-11	2100 x 1.0 = 2100	66,000	28,500	2010	2000
CFC-12	5580 x 1.0 = 5580	175,000	76,000	2010	2000
CFC-113	400 x 0.8 = 320	10,000	4,500	2010	2000
Halon 1211	200 x 3.0 = 600	24,000	9,500	2010	2000
Halon 1301	60 x 10.0 = 600	26,000	10,000	2010	2000
Carbon Tetrachloride	-- ^b	--	--	--	--
Methyl Chloroform	9,360 x 0.1 = 936	31,000	13,000	2015	2005
Total	10,136	332,000	141,500		

^a More recent figures are not available for all substances except CFC-11 and CFC-12. Production data for CFC-11 and CFC-12 is reported below:

	1990	1991 (est.)
CFC-11	2,742	2,695
CFC-12	7,415	7,286

^b Used as feedstock; consumption is therefore not controlled under the Protocol.

COUNTRY PROGRAM COVER SHEET (Continued)

2. Government Action Program^c

Year(s)	Description of Action	Sector (if any)	Intended Effect
1992	Define a timetable for interim reductions and final phaseout date	All	Set measurable goals for phaseout
1992	Adapt existing procedures for restricting imports and production controls of controlled substances	All	Determine mechanism for allocating production and import quotas
1992	Design a procedure for monitoring progress in import and production reductions and reporting to Protocol Secretariat	All	Measure progress in meeting phaseout targets and reporting compliance
1992-93	Design and implement a computer tracking system for monitoring compliance of approximately 50 importers, 2 producers, and various consumers of controlled substances	All	Monitor reduction in controlled substances
1991-94	Update existing agreements and negotiate additional agreements with industry in support of the above reduction targets	All	Accelerate reduction of demand for the controlled substances
1992-94	Coordinate institutional arrangements for the transfer of funds from the Montreal Protocol Multilateral Fund	All	Ensure implementation of ozone protection projects
1992-94	Define an initial three-year workplan (which can be updated and extended periodically) for the SEDUE's ozone protection unit focussing on timely implementation and monitoring of investment projects	All	Provide necessary institutional support for CFC phaseout
1991-92	Support implementation of technical projects already approved by the Executive Committee as included in the 1991 Work Program of the World Bank; - CFC-12 MACs recycling demonstration project - Aerosol safety and training program	MACs Aerosols	Demonstrate technology to reduce CFC-12 emissions Ensure safe manufacturing of non-CFC aerosols
1991-93	Participate in international fora and contribute to UNEP technical assessments	All	Facilitate technology transfer

^c The incremental costs of implementing the actions summarized in the government action program are estimated to be US\$350,000. These costs are covered by the three year operational budget of SEDUE's ozone protection unit (see Appendix A).

COUNTRY PROGRAM COVER SHEET (Continued)

3. Project Summary

Start Year	Type of Project	Project Description	Project Cost (US Dollars) ^d	Participation of Implementing Agencies	Tons x ODP Phased-out ^e
1991 ^f	1) Mobile air conditioning (MAC) demonstration project (pre-investment, training)	Demonstration of six MAC recycling machines at MAC's servicing sites in Mexico City, on-site training, workshop preparation, translation and distribution of technical manuals, standards, and public education brochure.	75,000	World Bank	35
1991 ^f	2) Elimination of CFC aerosol-propellants and manufacturing safety program (training)	Workshop on safe elimination technology in aerosol sector. Review of existing safety equipment and operating practices in 48 aerosol plants in Mexico. In-plant training. Distribution of education materials among other Latin American countries.	105,000	World Bank	765 ^g
1991 ^h	3) SEDUE's ozone protection unit (management support)	Assisting in implementation of SEDUE's ozone protection program supporting the identification, implementation, and monitoring of projects and negotiation of voluntary agreements. Liaison with implementing agencies and other Latin American countries to promote both technical cooperation and information exchange.	350,000	World Bank, UNDP, UNEP	n/a ⁱ
1993	4) Centralized CFC recycling and material handling system (investment/training)	The system will serve refrigerant distributors, service shops for industrial and household air conditioners, MACs, hotels, supermarkets, restaurants, and refineries. The CYDSA company, the holding company that owns Quimobásicos, has qualified technicians, know-how, and a network of distributors. The project will mainly involve recycling CFCs sold by Quimobásicos and will provide training for a comprehensive recycling program.	1,100,000	World Bank, UNDP	8,250 ^j

^d In US dollars. Project cost is the incremental cost.

^e This column contains the cumulative ODP-weighted metric tons that would be phased out from the project start year to the end of the project's effectiveness. For investment projects, this period considers the useful life of equipment purchased (e.g. 5 years for MAC recycling machines) and the timing of the introduction of other substitutes (e.g., HCFC blends for domestic refrigeration insulation). For training programs, this column shows reductions estimated as a fixed percent of annual consumption.

^f Approved by the Executive Committee and processed by the World Bank.

^g This project provides the necessary technical information for remaining CFC-using aerosol manufacturers to switch to alternatives. Further investment may be required.

^h The United States is providing bilateral funding to cover the first three years of the unit's budget.

ⁱ Not applicable.

^j Preliminary figure.

COUNTRY PROGRAM COVER SHEET (Continued)

3. Project Summary (Continued)

Start Year	Type of Project	Project Description	Project Cost (US Dollars)	Participation of Implementing Agencies	Tons x ODP Phased-out
1993	5) Support for expanded use of recycling in mobile air conditioning (MAC) (investment/training)	This project is a follow-up of the demonstration project. This project would involve over 100 service shops from around the country. Each service shop would receive on-site training and a recycling machine.	500,000	World Bank, UNDP	600 ^l
1994	6) Engineering and retrofit of MACs compressor plant (investment)	Project will modify compressor plant to make units that can utilize HFC-134a	950,000	World Bank	3,250 ^k
1993	7) Chiller purge/recycle devices and conversion (investment/training)	This project will reduce CFC-11 emissions from centrifugal chillers through improved diagnostic, maintenance, and servicing techniques, controlled purge/recovery operation, and refrigerant recycling. This will include the establishment of a training program for certifying service technicians, and the installation of purge units in selected chiller units.	1,250,000	World Bank, UNDP	580 ^l
1993	8) Low-CFC foam insulation (investment/training)	This project will introduce low-CFC foam in 3 refrigerator manufacturing facilities using standard equipment only requiring modification to individual factory specifications. The goal of the project to reduce CFC foam insulation while providing equivalent properties and satisfying structural integrity and other performance criteria.	500,000	World Bank, UNDP	750 ^l

^k This project contributes indirectly to the complete phaseout of CFC-12 in the MAC sector. Further investment in this sector will likely be required to facilitate the introduction of alternative refrigerants suitable for MACs.

^l Preliminary; applicable to centrifugal chillers only.

COUNTRY PROGRAM COVER SHEET (Continued)

3. Project Summary (Continued)

Start Year	Type of Project	Project Description	Project Cost (US Dollars)	Participation of Implementing Agencies	Tons x ODP Phased-out
1993	9) Polystyrene foam conversion from CFC to HCFC (investment)	This project involves the use of HCFC-22, as a replacement for CFC-12, and the modification and retrofitting of facilities used in the expanding polystyrene foam utilized in food packaging. Modification of the extrusion system, replacement of pumps to feed HCFC-22 to process, and other changes to facilities will be required.	600,000	World Bank	1,000 ^l
1994	10) Centralized CFC-113 and methyl chloroform recycling (investment)	This project involves the installation of an off-site recycling facility in the Coahuila, Nuevo Leon and Tamaulipas area, and a storage and transfer facility in Ciudad Juarez/Chihuahua. Technical personnel already trained could be transferred to the new facility, and the already available equipment would allow the facility to be in operation in a few months. The Ciudad Juarez/Chihuahua transfer facility will serve numerous small generators.	500,000	World Bank	450 ^l
1993	11) Training and plant conversion in the electronic industry (investment/training)	This project involves assisting the maquiladora electronic industries along the U.S. - Mexico border reduce and eliminate their use of CFC-113 and methyl chloroform solvents. The project involves training workshops and investment in substitute technologies.	1,850,000	World Bank, UNDP	6,000 ^l
1993	12) Halon conservation training, banking, recycling, and substitution (training)	This project will reduce Halon-1211 use where it is not essential and will develop a network for Halon-1211 recycling.	750,000	UNDP	600 ^l
TOTAL			8,530,000 ^m		22,280 ^l

^m Of this total, \$180,000 has been approved for the first two projects on this exhibit; \$4 million was also approved for projects during the Fifth Meeting of the Executive Committee in November, 1991. These funds are sufficient for the implementation of the program during 1992 and 1993. The remaining \$4 million for projects will be requested from the Fund in a subsequent revision of this Country Program.

January, 1992

Secretariat of the Interim Multilateral Fund
for the Implementation of the Montreal Protocol
1800 McGill College Avenue
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Montreal, Quebec
Canada H3A 3J6

For the attention of: Dr. Omar El-Arini, Chief Officer

The Secretariat for Urban Development and Ecology (SEDUE) would like to submit the second draft of the Mexico's Country Program for activities to be supported by the Montreal Protocol Interim Multilateral Fund. This second draft was prepared based on comments received by SEDUE on a first draft discussed during the Fifth Meeting of the Executive Committee in November, 1991.

As a Party to the Protocol operating under paragraph 1 of Article 5, Mexico is committed to protecting the stratospheric ozone layer. Mexico was the first country to ratify the Montreal Protocol, and has signed voluntary agreements with industry groups in which users and producers have pledged to reduce and eliminate their consumption and emissions of controlled substances. Moreover, Mexico has pledged to phase out controlled substances as fast as industrialized nations. Projects to reduce and eliminate consumption of controlled substances have been identified and two of them have already been approved and are being processed for funding. A mechanism for transferring funds from the Multilateral Fund for these and other ozone protection projects is being established.

As evidenced in this country program, SEDUE will continue to monitor Mexico's compliance with the Protocol. With the funds approved for Mexico to date by the Executive Committee and the United States, SEDUE can fully initiate implementation of this program during 1992-93. As implementation of the Protocol in Mexico evolves, new actions plans and budgets will be submitted to the Executive Committee for approval.

Sincerely

SEDUE

EXECUTIVE SUMMARY

This country program presents the strategy and action plan for implementing the Montreal Protocol in Mexico over the next three years. The specific objectives of the country program are as follows:

- (1) to summarize the consumption patterns of controlled substances in Mexico, and to state their intended phaseout schedule;
- (2) to outline the government and industry activities already undertaken, and the action plan to ensure compliance with the Protocol in an accelerated phaseout schedule; and
- (3) to propose a timetable and budget for activities to be supported by the Multilateral Fund.

Of the substances controlled by the Protocol, Mexico produces CFC-11, CFC-12, and carbon tetrachloride. Other controlled substances, such as CFC-113, CFC-114, Halon 1211, Halon 1302 and carbon tetrachloride are imported. The most recent data indicate that Mexico annually imports approximately 260 metric tons of halons and 9,000 tons of methyl chloroform. Mexico also imports carbon tetrachloride, which is used entirely in the manufacture of CFC-11 and CFC-12.

To date, Mexico has made substantial progress in complying with the Protocol. Starting in 1985, SEDUE (Secretaría de Desarrollo Urbano y Ecología) began successfully negotiating voluntary agreements with industry groups to reduce production and emissions of controlled substances. In addition, in May 1991, SEDUE created a special unit to assume comprehensive responsibility for Montreal Protocol related activities. The responsibilities of SEDUE's ozone protection unit include managing projects approved by the Executive Committee, interacting with implementing agencies and assisting them in designing suitable work programs for Mexico, promoting public awareness of ozone issues, identifying Mexican technical experts to assist in Montreal Protocol implementation in other Latin American Countries, and monitoring compliance of voluntary agreements.

In addition to the existing voluntary agreements and technical support, Mexico will (1) develop additional voluntary agreements to cover all end uses, and (2) announce specific targets for reducing consumption of controlled substances. For this purpose, a system for monitoring the production and imports

**** Mexico Country Program ****

of controlled substances will be necessary. The Government of Mexico is analyzing various options for the design of a monitoring system, including the possibility of using market mechanisms.

SEDUE, through its ozone protection unit, will lead Montreal Protocol implementation activities in Mexico. The Government of Mexico will also work closely on ozone protection projects with the three implementing agencies of the Interim Multilateral Fund. The World Bank is supporting SEDUE in identifying a mechanism for receiving assistance from the Interim Multilateral Fund in a timely manner. The World Bank will also support project preparation and implementation efforts, help analyze various control and monitoring options, including a marketable permits system, and finance cost effective ozone protection projects. In addition, UNDP will assist Mexico in designing and implementing training and demonstration activities in major end use sectors, including commercial refrigeration and foams. Mexico will also work with UNEP to facilitate information dissemination regarding replacement technology for controlled substances to other Spanish speaking countries.

The implementing agencies support the Government of Mexico's commitment to accelerating the phaseout of controlled substances. Mexico will pursue the same phaseout schedule as other developed countries, and in so doing, will save an additional 190,500 ODP-weighted tons of controlled substances. These large savings must be factored into any evaluation of the cost effectiveness of Mexico's action plan.

The total budget for ozone protection activities through the end of 1994 amounts to US\$8.5 million. Of this total, US\$4 million has already been approved by the Executive Committee for a set of projects to be implemented in 1992-1993. In addition, requests for US\$180,000 to fund aerosols safety projects and a MACs recycling demonstration, are being processed for disbursement this year. Furthermore, the United States has already pledged US\$350,000 for three years the operation of SEDUE's ozone protection unit. The remaining US\$4 million for projects identified in this country program will be requested from the Montreal Protocol in late 1993 depending on the progress achieved in using funds for the first set of projects.

**** Mexico Country Program ****

1. INTRODUCTION

This country program presents the strategy and action plan for implementing the Montreal Protocol in Mexico over the next three years. The specific objectives of the country program are as follows:

- (1) to summarize the consumption pattern of controlled substances in Mexico, and to state their intended phaseout schedule;
- (2) to outline the government and industry activities already undertaken, and the action plan to ensure compliance with the Protocol in an accelerated phaseout schedule; and
- (3) to propose a timetable and budget for activities for the next several years to be supported by the Multilateral Fund.

The country program has been prepared with the participation and cooperation of several parties, including Mexico's Secretariat for Urban Development and Ecology (SEDUE), the Secretariat of the Montreal Protocol Interim Multilateral Fund, and the United States Environmental Protection Agency (USEPA). A first draft of this country program, which included a budget of US\$9.8 million¹, was reviewed by the Executive Committee of the Multilateral Fund during its fifth meeting in November 1991. This document incorporates the suggestions and recommendations announced at that meeting.

During the meeting, the Executive Committee approved US\$4 million for projects included in the first draft of Mexico's Country Program. This amount is expected to include investment projects, pre-feasibility studies, project preparation activities and post-evaluations, all of which may require the use of external experts. Thus, the Government of Mexico revised its funding proposal for the SEDUE's ozone protection unit and adjusted the three-year budget for the unit from US\$1.5 million to US\$350,000 with the understanding that the Implementing Agencies of the Interim Multilateral Fund will provide assistance in project preparation, information awareness, and technical training. The United States has offered to cover the US\$350,000 required for the unit's operations over the next three years as part of its contribution to the Multilateral Fund. With the

¹ Of this US\$9.8 million, US\$1.5 million corresponded to the budget for SEDUE's ozone protection unit and the remaining funds were for ozone protection investment projects.

**** Mexico Country Program ****

funds committed for Mexico to date (US\$180,000 for the two initial projects, \$4 million for projects and US\$350,000 for SEDUE's ozone protection unit), many of the activities described in this country program can be undertaken during 1992-93. Mexico intends to revise this country program as these activities are implemented and the funds are depleted.

2. REVIEW OF PRODUCTION AND CONSUMPTION OF THE CONTROLLED SUBSTANCES

CFCs

Production

Total CFC production (which consists entirely of CFC-11 and CFC-12) in Mexico was estimated at 9,465 metric tons for 1989 and 10,158 metric tons in 1990. The preliminary figure for 1991 production is 9,982 metric tons. CFC-115 is neither produced nor imported. Exhibit 1 shows historical production figures for CFC-11 and CFC-12.

DuPont and Quimobásicos produce CFC-11 and CFC-12 in three facilities. Two plants owned by Quimobásicos are located in Monterrey, Nuevo Leon, and have a production capacity of approximately 14,000 metric tons. A third plant owned by DuPont is located in Mexico City's metropolitan area and has a production capacity of 4,000 to 7,000 metric tons per year. Present production is 35% of the capacity of these plants.

Although the age of the CFC facilities is not reported, industry sources indicated that these investments have been fully amortized and that production costs and output prices are comparable to international levels. When production of CFC-11 and CFC-12 is phased out, the facilities can be adjusted to produce HCFC-22. Such a shift results in approximately 50% reduction in the production capacity of the plants. According to industry sources, the switch from CFC-11 and CFC-12 to HCFC-22 does not require additional capital investment, only changes in operating conditions. No new investment is required, but the cost of chemical inputs is not the same. No CFC-producing facilities are under construction.

Imports and Exports

In 1988, Mexico imported 400.3 metric tons of CFC-113 and 44.3 metric tons of CFC-114. Mexico does not produce or import CFC-115. CFC-11 and CFC-12 supply is for domestic consumption; however, approximately 1,800 tons were exported to the United States and Latin America in 1989. No export data for 1990 and 1991 is available, thus, domestic consumption for these years is unknown.

**** Mexico Country Program ****

Exhibit 1

Estimates of CFC-11 and CFC-12 Production in Metric Tons^h

<u>Year-</u>	<u>Domestic Consumption</u>	<u>Export</u>	<u>Total Production</u>
1984	6,245	-	6,245
1985	7,155	-	7,155
1986	7,305	-	7,305
1987	7,530	925	8,455
1988	7,202	923	8,185
1989	7,684	1,781	9,465
1990	n/a	n/a	10,158
1991	n/a	n/a	9,982 ⁱ

n/a = not available

^h ODP weighted. (ODP for CFC-11 and CFC-12 = 1).

ⁱ Estimate

Source: SEDUE

Some information is currently available on imports and exports of products manufactured with or containing the controlled substances. Most of the raw materials needed to produce foam products are domestically produced with the exception of 4,4'-methylene di-isocyanate (MDI). Imports of finished foams amount to a small quantity of flexible foam and about 40% of the rigid foam volume consumed in Mexico, which includes all rigid foam products contained in manufactured products (e.g., refrigerators). A relatively small portion of foam production is exported (primarily to the U.S.) as construction panels and refrigeration equipment. Most of the aerosols consumed in Mexico are domestically produced except for a few specialty products. Little, if any, are exported.

Consumption by End-Use

The distribution of total CFC consumption in Mexico by type of CFC and by use is shown in Exhibit 2.

Exhibit 3 shows the distributions of consumption by use for CFC-11 and CFC-12. CFC-114 is used exclusively in the commercial and industrial refrigeration sector, and CFC-113 is used exclusively in electronics cleaning.

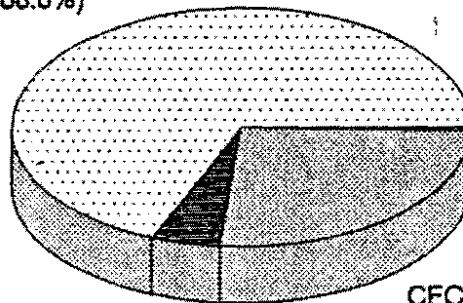
**** Mexico Country Program ****

Exhibit 2

Mexico: Distribution of CFC Consumption

(Based on Actual Tons Consumed in 1989)

CFC-12 5,578 tons (68.6%)



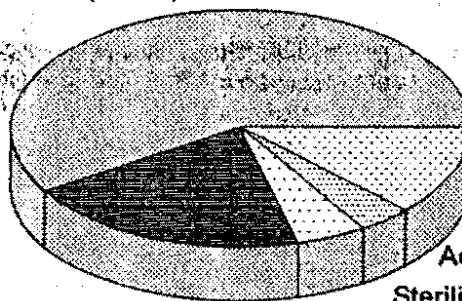
CFC-114 44 tons (0.5%)

CFC-11 2,106 tons (25.9%)

CFC-113 400 tons (4.9%)

By Type of CFC

Refrigeration 4,796 tons (59.0%)



Aerosols 993 tons (12.2%)

Sterilization 310 tons (3.8%)

Solvent Cleaning 400 tons (4.9%)

Foams 1,629 tons (20.0%)

By End Use

Total: 8,128 Tons Consumed in 1989

** Mexico Country Program **

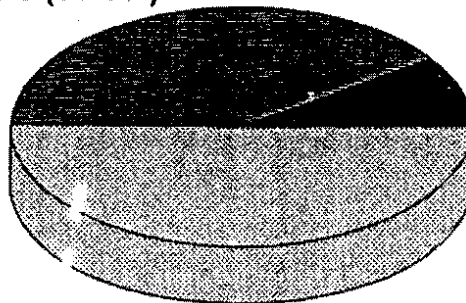
Exhibit 3

Mexico CFC-11 Consumption by End Use

(Based on Actual Tons Consumed in 1989)

Refrigeration 840 tons (39.9%)

Aerosols 207 (9.8%)



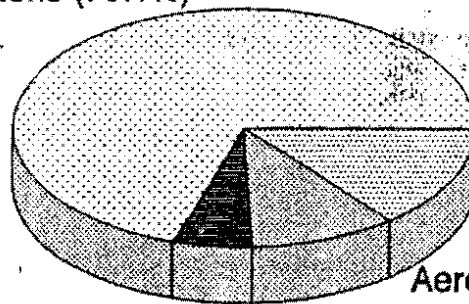
Foams 1,059 tons (50.3%)

2,106 Tons Consumed in 1989

Mexico CFC-12 Consumption by End Use

(Based on Actual Tons Consumed in 1989)

Refrigeration 3,912 tons (70.1%)



Aerosols 786 tons (14.1%)

Sterilization 310 tons (5.6%)

Foams 570 tons (10.2%)

5,578 Tons Consumed in 1989

**** Mexico Country Program ****

Commercial Refrigeration

CFCs are used as refrigerants in the following kinds of commercial systems in Mexico: Retail food storage; chillers; cold storage; industrial process refrigeration; and, refrigerated transport.

Residential Refrigeration

Residential refrigeration includes home refrigerators, freezers, and other small refrigerated appliances such as ice machines and dehumidifiers. There are two major refrigerator manufacturers in Mexico: MABE and Vitromatic. Production of refrigerators in Mexico was approximately 500,000 units in 1989. Approximately 215 metric tons of CFC-12 were used in residential refrigeration in Mexico.

Mobile Air Conditioners

Mobile air conditioners (MACs), which cool the passenger compartments of automobiles, trucks, and buses, represent one use of CFCs in Mexico. Out of 275,000 motor vehicles manufactured or imported in that year, 9% had factory-installed air conditioners. At present, approximately 780 metric tons of CFC-12 are consumed annually in MACs in cars and trucks. CFCs are used to charge new vehicle air conditioners and to replace the charge lost during operation of vehicles.

Plastic Foam and Foam Insulation Products

Mexico produces rigid and flexible polyurethane, polystyrene, and polyethylene foams with CFC-11 and CFC-12 as blowing agents. In 1989, rigid and flexible polyurethane foam accounted for more than 95% of the CFC-11 used in foams, whereas non-polyurethane foams account for all of the CFC-12 used in foams. Currently, flexible polyurethane foam is manufactured without CFC-11 in compliance with voluntary agreements between SEDUE and the Polyurethane Foam Industry Association. Flexible polyurethane foam is used for furniture, bedding, carpet underlays, automotive interiors and other transportation seating applications. Rigid polyurethane foam is used for insulation in refrigerators, freezers, buildings, tanks, pipes, and doors. The market for sprayed and poured rigid foams used for refrigeration panels is growing due to increased exports of construction panels and refrigeration equipment. No information is currently available on the production and foam applications for polystyrene, polyethylene, and other non-polyurethane foams produced in Mexico.

Total CFC consumption in foams is 1,629 metric tons for 1989, or 20% of the 8,128 metric tons of CFC consumed in 1989. It is projected that consumption would grow by 10% per year due to the increased demand for polyurethane foam products in

domestic and export markets. The consumption of CFC-12 as a blowing agent is estimated at 570 metric tons for 1990. There are approximately nine major foam formulators in Mexico all of which used foreign technology and at least three of them are fully owned subsidiaries of European and U.S. firms. OEM foam users include two large refrigeration equipment manufacturers and an unknown number of panel and insulation product manufacturers. There are probably several hundred small foam application firms or individuals.

Aerosols

Aerosols accounted for a consumption of 993 metric tons of CFC, or about 12.2% of total CFC consumed. Mexico produced only 43 million aerosol units in 1987, about 50% less than the number of units produced in 1982. The market has recovered slightly since then, growing to 49 million units in 1989. During this period, an increasing proportion of aerosol products have been produced using hydrocarbons instead of CFCs.

Approximately 12% of all aerosol units produced in Mexico in 1989 contained CFCs. The predominant propellants used currently in 88% of aerosol products are the hydrocarbons isobutane and propane. Consumption declined sharply between 1988 and 1989 as specified in the voluntary industry agreement with SEDUE. CFC consumption in aerosol products in 1989 consisted of 230 tons of CFC-11 and CFC-12 for essential applications (in electronics cleaners, medicinal products, and aerosols for aircraft maintenance) and 763 tons for other uses.

It is estimated that eight large aerosol manufacturers produce about 60% of total aerosol products in Mexico. These firms produce at least 2.5 million units per year in their modern facilities. Many of these manufacturers license technology from U.S. and European firms. Fifteen to twenty medium sized firms account for approximately 20% to 25% of the total aerosol production. A medium-sized firm can produce 0.5 to 1 million units per year. A large number of small firms account for the remaining 15% to 20%.

Solvent Cleaning

CFC-113 is the most common solvent used in the cleaning operations of the electronics and metal cleaning industries in Mexico. CFC-113 consumption in these two industrial sectors is estimated to be 400 metric tons (4.9% of total CFC consumed).

**** Mexico Country Program ****

Exhibit 4

Estimated Unconstrained Demand for Halons 1211 and 1301 (ODP-weighted Metric Tons)

<u>Years</u>	<u>Halon-1211</u>	<u>Halon-1301</u>
1989 ^a	600	600
1990 ^b	660	660
1991	720	730
1992	760	800
1993	780	840
1994	820	880
1995	860	920
1996	900	960

^a Actual figures.

^b Data for 1990-96 are projected.

Source: CAISA.

Halons

Mexico does not produce halons, but halons are imported to Mexico for fire extinguishing applications. Imports in 1989 were estimated at 200 metric tons of Halon-1211 and 60 metric tons of Halon-1301, with expected growth to 293 metric tons and 88 metric tons, respectively, in 1993. These figures will be reduced by taking the necessary measures to eliminate non-essential uses.

Traditionally, halons were supplied to Mexico with custom-made fire extinguishing equipment. ICI (Halon-1211) and DuPont (Halon-1301) also supplied halons to Mexican companies. Generally, the firms importing halons in Mexico are those engaged in the fire extinguishing equipment business. In 1986, Great Lakes Chemical Corporation (U.S.) began exporting Halon-1211 and Halon-1301 to Mexico. Exhibit 4 shows historical and projected consumption figures for Halons 1211 and 1301 based on the experience of developed countries in eliminating unnecessary applications of halons and by their successful banking and re-deployment. Approximately 5% of halon use is considered technically essential, but large amounts of halon are currently required to meet regulations mandating halon extinguishers on cars and trucks. Nevertheless, powder and CO₂ are equally effective in extinguishing vehicle fires.

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Carbon Tetrachloride

Approximately 4,200 metric tons of carbon tetrachloride were produced in 1989 (all by Petroleos Mexicanos, or PEMEX, the state-owned oil company) and 5,000 metric tons were imported. All of the carbon tetrachloride is consumed for the manufacture of CFC-11 and CFC-12 (SEDUE 1990).

Methyl Chloroform

Consumption of methyl chloroform in 1988 ranged from 8,000 to 10,000 metric tons, and was distributed among end-uses as shown in Exhibit 5. Because 75% of this use is by electronics firms operating near the Mexico-U.S. border, future demand will reflect the future needs of those operations and the success of efforts already underway to phase out their use. All of the methyl chloroform is imported, mostly from the United States.

Methyl chloroform is the most common solvent used in cleaning operations of metal cleaning industries in Mexico. Approximately 72% of consumption of methyl chloroform is used in the electronics industry and 23% is used for metal cleaning. Specific solvent cleaning applications used in the electronics industry include those relating to automotive electrical systems, military electronics, and printed circuit board and component cleaning. International manufacturing firms with significant solvent cleaning operations in Mexico include: Zenith, Sanyo, Sony, Motorola, IBM, and Hitachi (Chem Systems 1990). Methyl chloroform demand is expected to grow due to continued growth in maquiladoras and substitution of methyl chloroform for CFC-113 use.

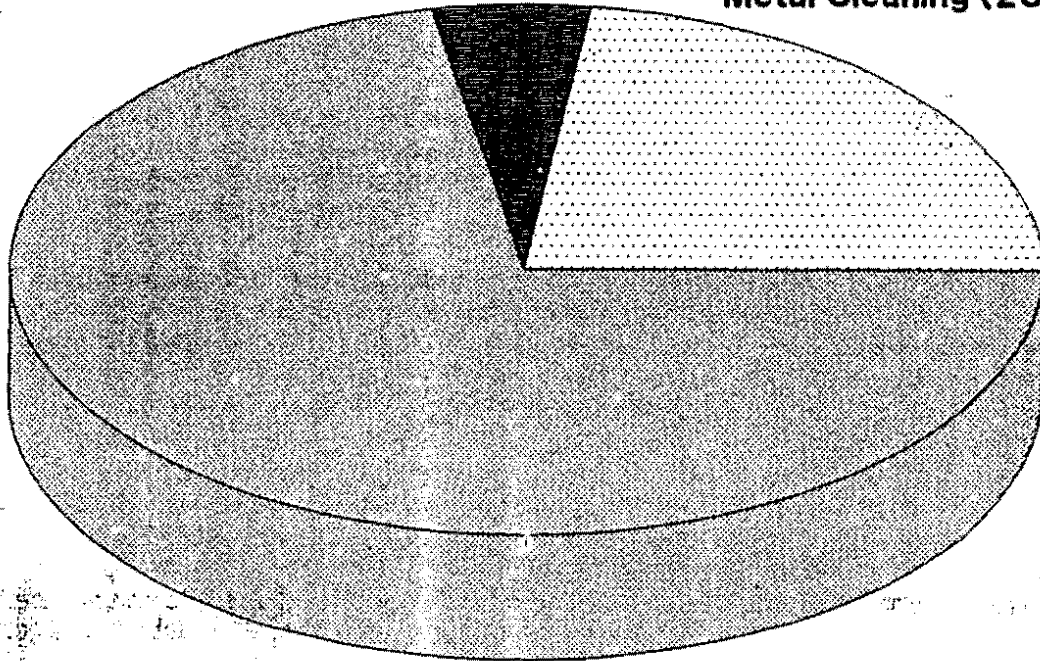
Future demand for methyl chloroform in Mexico would be expected to grow at 3% to 5% annually without the investment planned to eliminate it (Chem Systems 1990). Projections for each end use estimate a growth rate in methyl chloroform demand ranging from 5% to 7% annually for the electrical and electronic industry. Methyl chloroform demand for the metal cleaning industry in the Mexican market is estimated to grow 2 to 4% annually. The various other end uses are small, but they are also expected to experience moderate growth.

Exhibit 5

Consumption of Methyl Chloroform in Mexico by End Use

Adhesives, Aerosols, Medical Products, Coating and Other (5.%)

Metal Cleaning (23%)



Electrical/Electronic Cleaning (72%)

1988 Demand = 9,000 Metric Tons

Source: Chem Systems 1990

** Mexico Country Program **

3. REVIEW OF ACTIVITIES ALREADY UNDERTAKEN

Mexico has been an active participant in efforts to protect the stratospheric ozone layer. In 1985, the Mexican Secretariat for Urban Development and Ecology (SEDUE) met with the two CFC manufacturers in Mexico. During these meetings, the CFC producers agreed to collaborate with SEDUE in controlling the production and emissions of controlled substances. In that year, Mexico helped author the Vienna Convention for the Protection of the Ozone Layer and was a key participant in negotiations leading to the Montreal Protocol. On March 31, 1988, Mexico became the first country to ratify the Montreal Protocol.

As shown in Exhibit 6, as of December 1991, SEDUE and CFC producers, halon distributors, and industry associations have signed several voluntary agreements. These agreements, some of which have been in existence since 1988, include measures to reduce consumption of the controlled substances in aerosols, flexible polyurethane foams, refrigeration, solvent cleaning, and fire protection. The agreements indicate specific reductions or activities leading to their elimination and typically require the industrial party to report its progress to SEDUE each quarter. Through these agreements, Mexico has already achieved a reduction of 40% in the consumption of CFCs and halons, has eliminated CFCs from 88% of all aerosol units, and has phased out CFC use in flexible polyurethane foams.

SEDUE and the Mexican Chamber of Industries (CANACINTRA) have organized various conferences and seminars to exchange technical information on new developments to replace controlled substances. In the summer of 1989, SEDUE, in cooperation with USEPA, prepared a case study of the costs to Mexico of implementing the Montreal Protocol. The study describes the production and consumption of controlled substances in Mexico, including projections for future demand. The study also presents the characteristics of the current technology used in industry end uses and describes the practices, technologies, and substitute technologies and chemicals that can be used to reduce or eliminate such consumption in each end use and estimates the associated costs (SEDUE 1990).

In addition, the case study also highlights cost-effective technologies that could be implemented in the short term in specific end-uses (e.g., CFC recycling in mobile air conditioning, solvents, and refrigeration). The study received strong support from the Mexican Chamber of Industries (CANACINTRA) and technical assistance from the USEPA.

Based on the technologies highlighted in the case study, SEDUE identified and prepared two project proposals which were approved within the context of the 1991 Work Program of the World Bank, during the Fourth Meeting of the Executive Committee of the Interim Multilateral Fund (17-18 June, 1991).

**** Mexico Country Program ****

EXHIBIT 6

VOLUNTARY AGREEMENTS WITH THE MEXICAN INDUSTRY TO REDUCE CFC AND HALON USE

End Use	Agreement Signatories	Nature of Organization	Measures
Polyurethane Foams	DuPont	CFC Producer	■ Phase out CFC use by 1990 in flexible foams
	Quimobásicos	CFC Producer	■ Update information on development of CFC substitutes for adoption in rigid foam systems
	Mexican Polyurethane Institute	Industry Association	■ Facilitate technology transfer
Aerosol Products	DuPont	CFC Producer	■ Cut non-essential CFC use by 50% in 1989
	Quimobásicos	CFC Producer	■ Phase out remaining 50% non-essential use by 1990
	National Chamber of Industries	Association of Manufacturing Industries	■ Medicinal, electronic cleaners, and spray products used in aircraft cabins are considered essential
	Mexican Aerosol Institute	Industry Association	■ Recommend labeling of ozone-safe aerosols
	Chamber of Perfume and Cosmetics Industry	Industry Association	
Halon	DuPont	Halon Importer/Distributor	■ Provide users with information on halon conservation measures
	CAISA	Halon Importer/Distributor	■ Keep users informed of progress in development of alternatives
	ICI	Halon Importer/Distributor	
	National Association of Halon Manufacturers/CANACINTRA	Industry Association	■ Induce the elimination of halon use
Refrigeration	National Association of Domestic A/C Manufacturers	Industry Association	■ Provide guidelines for servicing procedures of domestic refrigerators
	York International	CFC Importer/Distributor	■ Provide users with information on CFC-11 substitutes
Miscellaneous	National Board of In-Bond (Maquiladora) Industries	Association of Export Industries Neighboring the U.S./Mexico Border	■ Promote reduced use of controlled substances

** Mexico Country Program **

The first project proposal presents a program to demonstrate CFC-12 recycling from mobile air-conditioning systems (MACs). The program consists of a pilot recycling project and a recycling technology training and public outreach program. The pilot project provides recycling equipment and training to a large MAC service establishment in Mexico City. This pilot facility will provide hands-on training to technicians from other MAC service establishments. The program will be supplemented with a public education campaign about proper service and maintenance procedures that minimize CFC-12 emissions from mobile air conditioning systems. If this demonstration is successful, recycling will become common practice in this sector. It is expected that the expanded use of this technology in Mexico could result in an cumulative savings of up to 1,100 tons or 25 to 30% of the CFC-12 used in the MAC sector.

The second project proposal is for safety evaluation, engineering, and training to support the safe elimination of CFC aerosol propellants in Mexico and to assure the safe use of flammable substitute hydrocarbons. Aerosols in Mexico are produced without CFCs except for medical and other CFC-dependent uses where no safe substitutes are approved. The experience gained from implementing the program and the existing technical expertise in Mexico can be transferred to other Article 5 countries.

The World Bank reviewed and approved the proposals for these two projects and the Government of Mexico is in the process of reviewing legal documents and establishing a mechanism with a financial intermediary to transfer the approved funds for project implementation. It is expected that these projects will be fully implemented by the second quarter of 1992.

SEDUE, in cooperation with the USEPA and Northern Telecom, has also announced a program to expedite the elimination of CFC-113 solvent consumption from Mexico's electronic manufacturing industries. Northern Telecom, a manufacturer of telecommunications equipment, will provide technical expertise for these efforts. The program will be implemented in four stages: project planning, training, demonstration, and plant conversion. SEDUE's ozone protection unit's staff have assisted in the coordination of workshops and in project planning and implementation of this effort.

4. INSTITUTIONAL FRAMEWORK GOVERNING CONTROLLED SUBSTANCES

SEDUE's Office of Pollution Prevention and Control has been the lead office participating in ozone protection activities in Mexico. As its plan for an accelerated phaseout unfolds, SEDUE has found itself more deeply involved in program implementation including time-consuming tasks such as negotiating voluntary

**** Mexico Country Program ****

agreements, interacting with the implementing agencies, collecting industry data, monitoring compliance with agreements, attending international meetings and technical conferences, providing information in response to public requests, and leading the preparation and execution of technical cooperation projects. In continuing to administer Mexico's ozone protection program, SEDUE has been incurring incremental costs that it would otherwise not normally have had to bear in the absence of the Montreal Protocol.

SEDUE's ozone protection unit, created in April 1991, has responded to the increasing demand for SEDUE's involvement in these ozone protection activities. Furthermore, the unit is actively involved in developing the policy framework for controlling the production and importation of controlled substances in Mexico (see Appendix A for a more detailed discussion of the role and budget of SEDUE's ozone protection unit).

5. POLICY FRAMEWORK GOVERNING CONTROLLED SUBSTANCES

In addition to the existing voluntary agreements and technical support, Mexico will (1) develop additional agreements to cover all end-uses, and (2) will announce specific targets for reduction in the overall consumption of the controlled substances through the phaseout date of each group of controlled substances. A monitoring system will be necessary to ensure reductions on a timetable as close to that of developed countries as possible. The Government of Mexico is analyzing various options for the design of this monitoring system, including the possibility of using the marketable permit system, and is undertaking discussions with the World Bank to this end. Production, imports, and exports will be controlled through permits, as stated in Articles 14, 16, 17, and 37 of the Organic Law of the Federal Public Administration, and in Article 153 of the General Law of Ecological and Environmental Protection. Since Mexico imports raw materials for the production of CFC-11 and CFC-12, SEDUE could control production through import permits.

6. ROLES IN IMPLEMENTING THE PHASEOUT STRATEGY

Mexican Organizations

SEDUE, through the Pollution, Prevention, and Control Office, is the lead agency in charge of implementing the Montreal Protocol in Mexico in accordance with Articles 13 and 37 of the Organic Law of the Federal Public Administration, and Article 24, Sections I, VI, VIII, IX, and XIII of the Internal Regulations of SEDUE. SEDUE is working with Nacional Financiera (the Government's national industrial development bank) to facilitate the transfer of funds for approving ozone protection projects. SEDUE will also consult with Secretaría de Hacienda y Crédito Público on overall management of resources. In addition, SEDUE

**** Mexico Country Program ****

will continue to seek the assistance of industry associations including CANACINTRA and others. The Government of Mexico is also committed to closely collaborating with the implementing agencies of the Interim Multilateral Fund to ensure the expeditious implementation of the Montreal Protocol in Mexico.

World Bank

Mexico is working with the World Bank to establish a mechanism for transferring resources from the Montreal Protocol Multilateral Fund. This mechanism shall allow rapid implementation of the activities described in Section 8 (Budget). As stated in its draft 1992-93 Work Program, the World Bank is:

- supporting Mexico's project preparation and implementation efforts;
- helping to analyze various options to complement its current policy framework with measures which will ensure that the controlled substances phaseout will be done efficiently and at the lowest possible cost to Mexican industry; and
- financing cost-effective ozone protection projects (e.g., the World Bank is already assisting Mexico implement the MACs recycling and aerosols conversion and safety training projects).

Furthermore, in support of this country program, the World Bank will be resubmitting to the Executive Committee a reformulated operation which should help Mexico implement the activities described in this program for the period 1992-1993.

United Nations Development Program (UNDP)

UNDP will assist in Mexico in the design and implementation of training activities which form part of the investment projects presented in this country program (section 7). As stated in its 1992-93 Work Program, UNDP will undertake the following:

- a training program to reduce CFC-11 emissions from commercial chillers;
- an inventory and workshop on halons utilization;
- a training/demonstration program to reduce and substitute halons use in non-essential applications;
- a training program for personnel of a proposed central refrigerant recycling plant;

**** Mexico Country Program ****

- a training program for service personnel to safely use recycling equipment in the mobile air conditioning sector;
- an educational program for personnel affected by changes in operating procedures associated with conversions to alternative blowing agents or low CFC insulation in the foams sector; and
- a training program for personnel responsible for expanding conservation practices to reduce solvent emissions in metal and electronics cleaning applications of CFC-113 and methyl chloroform.

United Nations Environment Program (UNEP)

In addition to its activities with the World Bank and UNDP, Mexico will work with UNEP to facilitate the dissemination of information regarding replacement technology for controlled substances to other Spanish-speaking countries. SEDUE's ozone protection unit will liaise with UNEP's Industry and Environment Office (IEO) to achieve the following goals:

- disseminate Spanish technical manuals which will be developed in the context of investment project and training activities on controlled substances substitute chemicals, technologies, and practices that reduce the use and/or emissions of controlled substances; and
- create public education and outreach programs such as press releases and brochures on specific program requirements and technologies.

7. ACTION PLAN AND TIMETABLE FOR IMPLEMENTATION

The Government of Mexico has pledged to accelerate its phaseout schedule to match those of industrialized countries. As the country program cover sheet indicates, by so doing, Mexico has committed to avoiding an additional consumption of 190,500 ODP-weighted tons of controlled substances between 2000 and 2010.

Through guidance provided by SEDUE and its ozone protection unit, Mexico will undertake a series of activities through 1994 to establish a solid basis for a cost-effective elimination of controlled substances. As stated earlier, Mexico's goal is to eliminate these substances as fast as industrialized nations. Thus, Mexico's ability to meet this goal depends to a large extent on the establishment of a sound government plan. Each element of the action program and the intended effect is summarized in Exhibit 7.

**** Mexico Country Program ****

All of the activities listed in Exhibit 8 will be managed by SEDUE's ozone protection unit. As is evident from this list, if Mexico were not a signatory to the Montreal Protocol and in the absence of Mexico's firm commitment to the Montreal Protocol, none of these activities would normally be undertaken by SEDUE. Thus, the unit's operating costs are clearly incremental by the definition agreed to by the Parties to the Protocol.

As well as implementing several policy measures, the Government of Mexico also intends to undertake a number of projects in each of the major end-uses for controlled substances. A summary of these projects is presented in Exhibit 8.

Information on the amount of reduction achievable by each project and detailed description of each project is difficult to report at this time. SEDUE's ozone protection unit is working with the industry representatives that proposed these projects to obtain detailed terms of reference. Preliminary reduction figures and project profiles are provided in Exhibit 8. However, detailed presentation of all projects will be required before funding is authorized by SEDUE. In addition, projects of or above US\$500,000 will be fully prepared for approval by the Executive Committee.

One of the key objectives of both the government action program and proposed projects is to ensure an expeditious and cost-effective phaseout of controlled substances. Mexico intends to measure its performance in fulfilling this goal by monitoring progress against interim phaseout dates. Exhibit 10 shows the projected consumption of CFCs in Mexico and compares two phaseout schedules which Mexico could follow. Exhibits 11 and 12 show the corresponding phaseout schedules for halons and methyl chloroform. Mexico is evaluating these schedules and, as stated in the action program, will announce the definitive reduction schedules in early 1992.

As indicated in the previously published case study (SEDUE 1990), the estimated costs to Mexico for completely phasing out the production and importation of CFCs range from \$US 64.4 million to US\$ 118.7 million for a 2010 phaseout. A full description of technologies proposed for reducing and eliminating the use of controlled substances in each end use and a description of the methodology for calculating control costs are contained in the case study. As can be seen graphically from Exhibits 10, 11, and 12, by choosing an accelerated phaseout schedule, Mexico is committing itself to saving an additional 190,500 ODP-weighted tons of controlled substances. These large savings must be factored into any evaluation of the cost effectiveness of Mexico's action plan.

**** Mexico Country Program ****

EXHIBIT 7

2. Government Action Program^c

Year(s)	Description of Action	Sector (if any)	Intended Effect
1992	Define a timetable for interim reductions and final phaseout date	All	Set measurable goals for phaseout
1992	Adapt existing procedures for restricting imports and production controls of controlled substances	All	Determine mechanism for allocating production and import quotas
1992	Design a procedure for monitoring progress in import and production reductions and reporting to Protocol Secretariat	All	Measure progress in meeting phaseout targets and reporting compliance
1992-93	Design and implement a computer tracking system for monitoring compliance of approximately 50 importers, 2 producers, and various consumers of controlled substances	All	Monitor reduction in controlled substances
1991-94	Update existing agreements and negotiate additional agreements with industry in support of the above reduction targets	All	Accelerate reduction of demand for the controlled substances
1992-94	Coordinate institutional arrangements for the transfer of funds from the Montreal Protocol Multilateral Fund	All	Ensure implementation of ozone protection projects
1992-94	Define an initial three-year workplan (which can be updated and extended periodically) for SEDUE's ozone protection unit focussing on timely implementation and monitoring of investment projects	All	Provide necessary institutional support for CFC phaseout
1991-92	Support implementation of technical projects already approved by the Executive Committee as included in the 1991 Work Program of the World Bank; - CFC-12 MACs recycling demonstration project - Aerosol safety and training program	MACs Aerosols	Demonstrate technology to reduce CFC-12 emissions Ensure safe manufacturing of non-CFC aerosols
1991-93	Participate in international fora and contribute to UNEP technical assessments	All	Facilitate technology transfer

^c The incremental costs of implementing the actions summarized in the government action program are estimated to be US\$350,000. These costs are covered by the three year operational budget of SEDUE's ozone protection unit.

**** Mexico Country Program ****

EXHIBIT 8

Project Summary

Start Year	Type of Project	Project Description	Project Cost (US Dollars) ^d	Participation of Implementing Agencies	Tons x ODP Phased-out ^e
1991 ^f	1) Mobile air conditioning (MAC) demonstration project (pre-investment, training)	Demonstration of six MAC recycling machines at MAC's servicing sites in Mexico City, on-site training, workshop preparation, translation and distribution of technical manuals, standards, and public education brochure.	75,000	World Bank	35
1991 ^f	2) Elimination of CFC aerosol-propellants and manufacturing safety program (training)	Workshop on safe elimination technology in aerosol sector. Review of existing safety equipment and operating practices in 48 aerosol plants in Mexico. In-plant training. Distribution of education materials among other Latin American countries.	105,000	World Bank	765 ^g
1991 ^h	3) SEDUE's ozone protection unit (management support)	Assisting in implementation of SEDUE's ozone protection program supporting the identification, implementation and monitoring of projects and negotiation of voluntary agreements. Liaison with implementing agencies and other Latin American countries to promote both technical cooperation and information exchange.	350,000	World Bank, UNDP, UNEP	n/a ⁱ
1993	4) Centralized CFC recycling and material handling system (investment/training)	The system will serve refrigerant distributors, service shops for industrial and household air conditioners, MACs, hotels, supermarkets, restaurants, and refineries. The CYDSA company, the holding company that owns Quimobásicos, has qualified technicians, know-how, and a network of distributors. The project will mainly involve recycling CFCs sold by Quimobásicos and will provide training for a comprehensive recycling program.	1,100,000	World Bank, UNDP	8,250 ^j

^d In US dollars. Project cost is the incremental cost.

^e This column contains the cumulative ODP-weighted metric tons that would be phased out from the project start year to the end of the project's effectiveness. For investment projects, this period considers the useful life of equipment purchased (e.g., 5 years for MAC recycling machines) and the timing of the introduction of other substitutes in each end-use (e.g., HCFC blends for domestic refrigeration insulation). For training programs, this column shows reductions estimated as a fixed percent of annual consumption.

^f Approved by the Executive Committee and processed by the World Bank.

^g This project provides the necessary technical information for remaining CFC-using aerosol manufacturers to switch to alternatives. Further investment may be required.

^h The United States is providing bilateral funding to cover the first three years of the unit's budget.

**** Mexico Country Program ****

EXHIBIT 8 (Continued)

Project Summary

Start Year	Type of Project	Project Description	Project Cost (US Dollars)	Participation of Implementing Agencies	Tons x ODP Phased-out
1993	5) Support for expanded use of recycling in mobile air conditioning (MAC) (investment/training)	This project is a follow-up of the demonstration project. This project would involve over 100 service shops from around the country. Each service shop would receive on-site training and a recycling machine.	500,000	World Bank, UNDP	600 ^l
1994	6) Engineering and retrofit of MACs compressor plant (investment)	This project will modify compressor plant to make units that can utilize HFC-134a	950,000	World Bank	3,250 ^k
1993	7) Chiller purge/recycle devices and conversion (investment/training)	This project will reduce CFC-11 emissions from centrifugal chillers through improved diagnostic, maintenance, and servicing techniques, controlled purge/recovery operation, and refrigerant recycling. This will include the establishment of a training program for certifying service technicians, and the installation of purge units in selected chiller units.	1,250,000	World Bank, UNDP	580 ^l
1993	8) Low-CFC foam insulation (investment/training)	This project will introduce low-CFC foam in 3 refrigerator manufacturing facilities using standard equipment only requiring modification to individual factory specifications. The goal of the project to reduce CFC foam insulation while providing equivalent properties and satisfying structural integrity and other performance criteria.	500,000	World Bank, UNDP	750 ^l

^l Not applicable.

^j Preliminary figure.

^k This project contributes indirectly to the complete phaseout of CFC-12 in the MAC sector. Further investment in this sector will likely be required to facilitate the introduction of alternative refrigerants suitable for MACs.

^l Preliminary; applicable to centrifugal chillers only.

EXHIBIT 8 (Continued)

Project Summary

Start Year	Type of Project	Project Description	Project Cost (US Dollars)	Participation of Implementing Agencies	Tons x ODP Phased-out
1993	9) Polystyrene foam conversion from CFC to HCFC (investment)	This project involves the use of HCFC-22, as a replacement for CFC-12, and the modification and retrofitting of facilities used in the expanding polystyrene foam utilized in food packaging. Modification of the extrusion system, replacement of pumps to feed HCFC-22 to process, and other changes to facilities will be required.	600,000	World Bank	1,000 ^l
1994	10) Centralized CFC-113 and methyl chloroform recycling (investment)	This project involves the installation of an off-site recycling facility in the Coahuila, Nuevo Leon and Tamaulipas area, and a storage and transfer facility in Ciudad Juarez/Chihuahua. Technical personnel already trained could be transferred to the new facility, and the already available equipment would allow the facility to be in operation in a few months. The Ciudad Juarez/Chihuahua transfer facility will serve numerous small generators.	500,000	World Bank	450 ^l
1993	11) Training and plant conversion in the electronic industry (investment/training)	This project involves assisting the maquiladora electronic industries along the U.S. - Mexico border reduce and eliminate their use of CFC-113 and methyl chloroform solvents. The project involves training workshops and investment in substitute technologies.	1,850,000	World Bank, UNDP	6,000 ^l
1993	12) Halon conservation training, banking, recycling, and substitution (training)	This project will reduce halon-1211 use where it is not essential and will develop a network program for halon-1211 recycling.	750,000	UNDP	600 ^l
TOTAL			8,530,000 ^m		22,280 ^l

^m Of this total, \$180,000 has been approved for the first two projects on this exhibit; \$4 million was also approved for projects during the Fifth Meeting of the Executive Committee in November, 1991. These funds are sufficient for the implementation of the program during 1992 and 1993. The remaining \$4 million for projects will be requested from the Fund in a subsequent revision of this Country Program.

**** Mexico Country Program ****

8. BUDGET

The budget for Mexico presented in this document covers activities through the end of 1994. The total budget for this time period is estimated at approximately US\$8.5 million. Of this total, US\$4 million for investment projects in 1992-1993 has already been approved by the Executive Committee at its Fifth Meeting (November 18-22, 1991). Descriptions of a set of projects which could commence during 1992-93 using these resources are presented in Appendix B. In addition, US\$180,000 for the MACs recycling demonstration project and the aerosols safety training program is being processed by the World Bank. Furthermore, the United States has already pledged US\$350,000 for the first three years of the operation of SEDUE's ozone protection unit. These funds are believed to be sufficient to implement Mexico's program during 1992 and 1993. In late 1993, progress in implementing proposed projects will be assessed to determine the need for requesting the additional US\$4 million for another set of projects.

**** Mexico Country Program ****

EXHIBIT 9

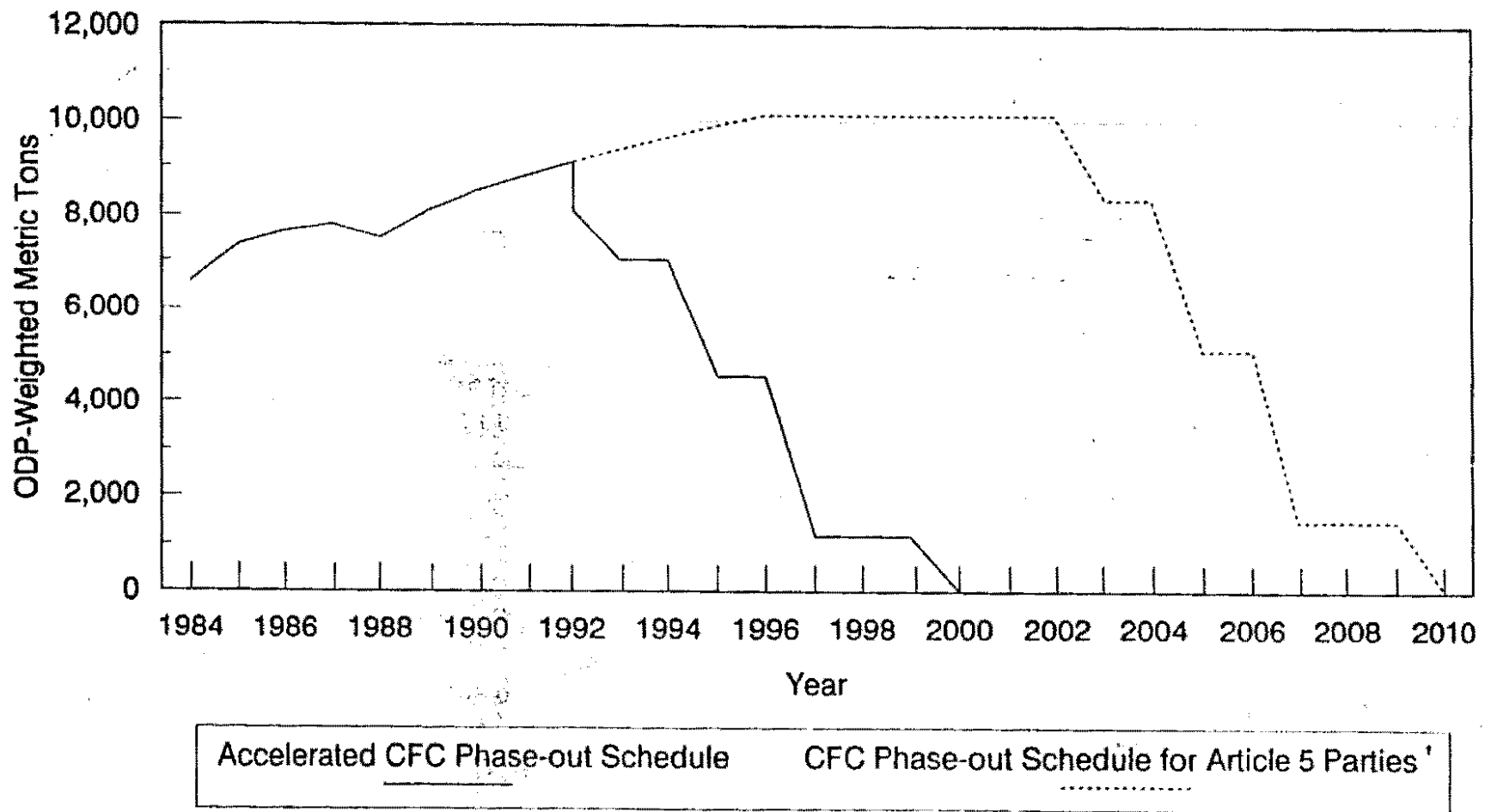
COSTS TO MEXICO OF PHASING OUT CFC CONSUMPTION²
1990 TO 2010 (millions of \$ 1985)

Compound	End-Use	Control	Scenario 1 Likely Growth Likely Cost	Scenario 2 Likely Growth High Cost	Scenario 3 High Growth Likely Cost	Scenario 4 High Growth High Cost
CFC-11	Industrial/Commercial Refrigeration	HCFC-123	5.11	6.33	9.00	11.15
		Recycling	2.81	3.49	4.23	5.26
	Insulation Foam	HCFC-141b/HCFC-123	10.92	13.49	15.44	19.07
	Flexible Foam	HCFC-141b/HCFC-123	6.10	7.54	8.63	10.66
	Aerosol	Compressed Gases	0.00	0.00	0.00	0.00
CFC-12	Mobile Air Conditioning	HFC-134a	2.04	2.53	4.00	5.94
		Recycling	2.25	2.79	3.28	4.06
	Household Refrigerators	Ternary Blend or HFC-152a	0.00	0.00	0.00	0.00
		Reduce Charge	0.00	0.00	0.00	0.00
	Industrial/Commercial Refrigeration	Ternary Blend	13.24	16.40	24.12	29.89
		Recycling	9.59	11.89	11.30	14.02
	Insulation Foam	HCFC-141b/HCFC-123	4.78	5.92	5.80	7.18
	Packaging Foam	HCFC-22/HCFC-142b	3.33	4.13	4.04	5.01
	Aerosols	Compressed Gases	0.00	0.00	0.00	0.00
	Sterilization	Proprietary HCFC Blend	2.76	3.42	3.46	4.29
CFC-113	Metal and Electronic Cleaning	Aqueous Cleaning	0.64	0.80	0.78	0.82
		Recycling	0.00	0.00	0.00	0.00
CFC-114	Industrial/Commercial Refrigeration	HCFC-124	0.76	0.94	0.95	1.10
		Recycling	0.02	0.03	0.03	0.03
Total			64.38	79.71	95.88	118.69

² Source: SEDUE 1990

Exhibit 10

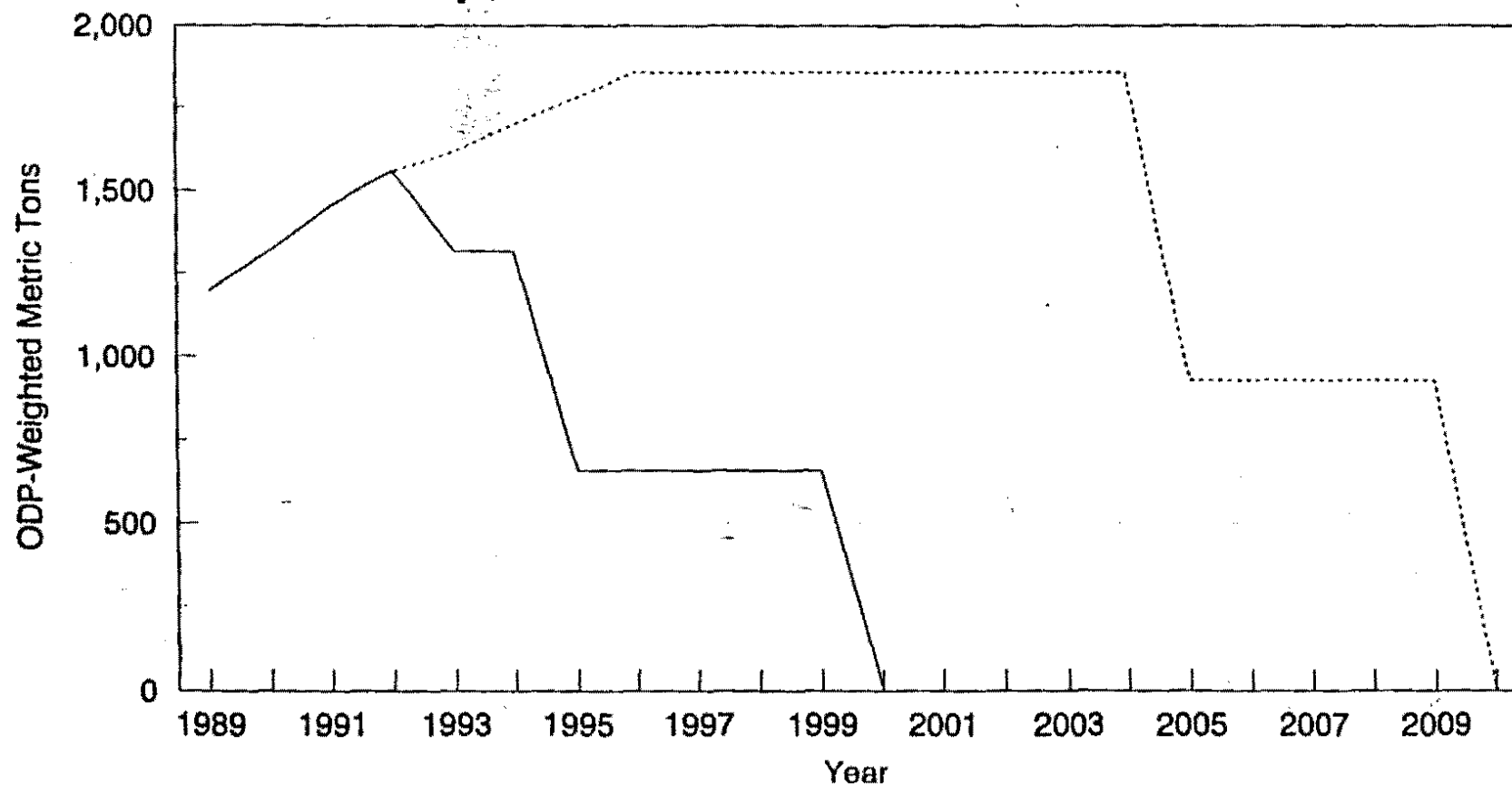
Consumption Phaseout of CFCs in Mexico



¹ Assumes 3.5% annual consumption growth rate between 1990 and 1996.

Exhibit 11

Consumption Phaseout of Halons in Mexico



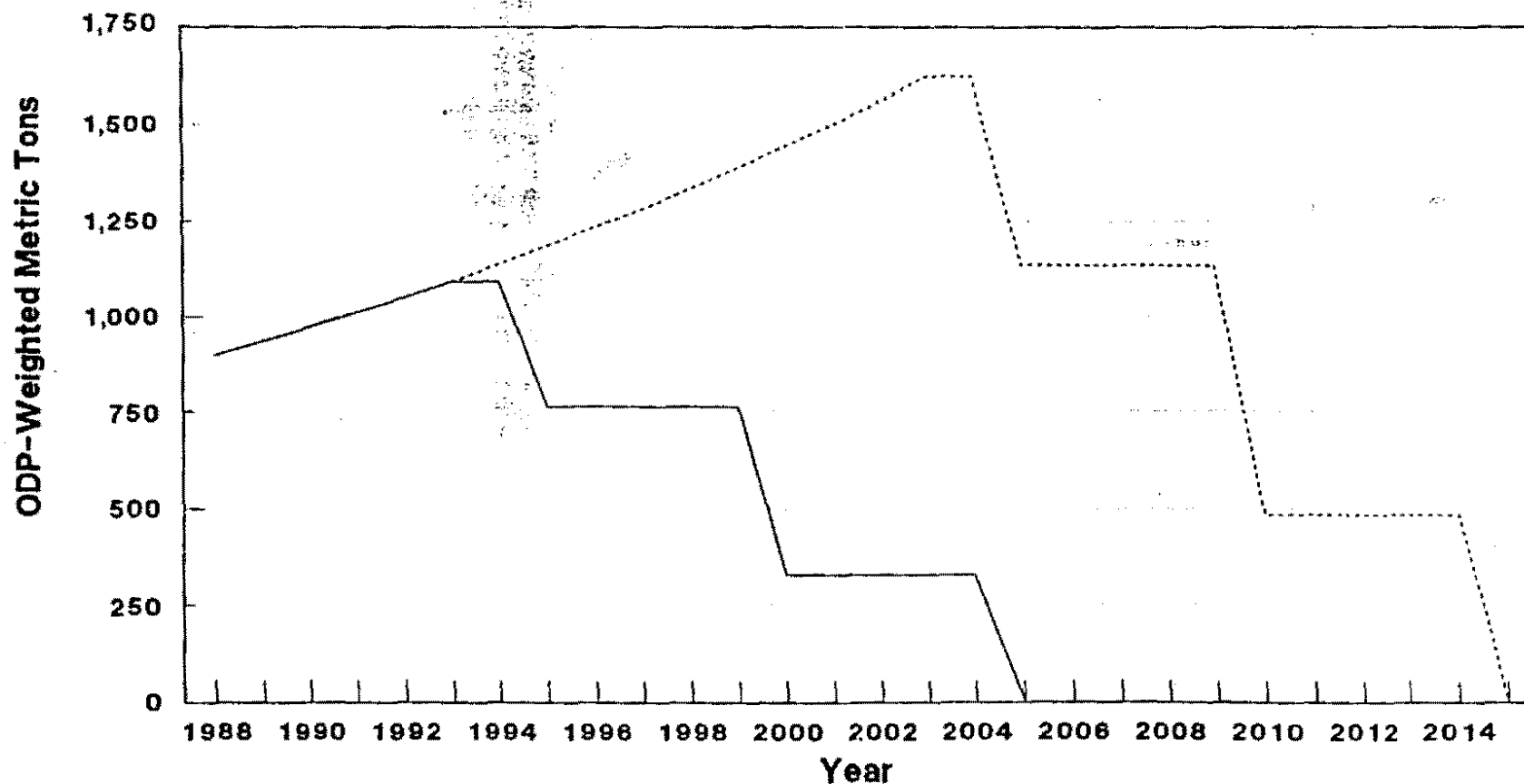
Accelerated Halon Phase-out Schedule
Halon Phase-out Schedule for Article 5 Parties

Assumes a 5% annual consumption growth rate between 1993-1996.

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Exhibit 12

Consumption Phaseout of Methyl Chloroform in Mexico



Accelerated Methyl Chloroform Phase-out Schedule

Methyl Chloroform Phase-out Schedule for Article 5 Parties

Assumes 4.0% annual consumption growth rate between 1988 and 2003.

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APPENDIX A

SEDUE'S OZONE PROTECTION UNIT

In light of the comments received from the Executive Committee at their Fifth Meeting (November 18-22, 1991) on Mexico's Country Program and with the understanding that the Implementing Agencies of the Interim Multilateral Fund will be providing assistance in project preparation, information awareness, and technical training, the budget for the operation of SEDUE's ozone protection unit has been substantially reduced (see Exhibit A-1). The unit's required budget for 1992-1994 is estimated to be approximately US\$350,000 in its entirety. The revised budget reflects the resources required to support key functions of the unit rather than on expenditure items, such as salaries, travel, etc.

Recognizing the fundamental importance of the unit as an apex institution with full responsibility for Montreal Protocol related activities in Mexico, and recognizing that the resources required to run an ozone protection program are incremental costs to Mexico, the United States agreed to provide advance funding to set up the unit in May 1991. Through bilateral funding, the United States has agreed to provide all of the unit's three-year budget of US\$350,000.

Since its creation, the unit has successfully undertaken several key tasks including:

- acting as a liaison for all organizations and individuals working to implement the Montreal Protocol in Mexico;
- managing the preparation of the aforementioned projects which received funding approval from the Executive Committee of the Interim Multilateral Fund;
- interacting with bilateral agencies and the implementing agencies of the Interim Multilateral Fund (The World Bank, UNDP, and UNEP) to assist them in designing suitable work program activities for Mexico;
- assisting SEDUE in the negotiation and completion of three new voluntary agreements;
- supporting industry with the identification and planning of projects, particularly in the solvents and refrigeration areas;

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- building public awareness of, and support for, products and service procedures that are safe for the ozone layer;
- promoting awareness of the ozone issue at all levels in the Mexican private and public sectors by participating in press conferences and international conferences on technical alternatives to controlled substances; and
- identifying Mexican technical experts who can assist in the implementation of the Montreal Protocol in other developing countries in Latin America. For example, a Mexican aerosols expert has assisted in the preparation of the Ecuadorean country program.

In December 1991, in recognition for "exceptional leadership in government/industry cooperation", SEDUE received the USEPA Stratospheric Ozone Protection Award. The award is given every year during an international conference to individuals, associations, and corporations for their exemplary efforts to protect the ozone layer.

In addition to the activities in which it is already engaged, the ozone protection unit will generate concrete results in other areas such as:

- technical review during preparation of projects to be funded with resources from the Interim Multilateral Fund of the Montreal Protocol;
- technical and administrative supervision as follow-up to funded projects to insure that reductions are achieved;
- liaising with the World Bank to ensure proper coordination of the above two activities;
- monitoring compliance with voluntary agreements and Mexico's overall plan for compliance with the Protocol, including reporting of data as required by above agreement;
- liaising with UNDP in the design of prototype training programs in Spanish to support ozone protection projects; and
- developing additional project material that can be widely disseminated by UNEP in public education and outreach programs.

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EXHIBIT A-1

SEDUE PROGRAM OPERATIONS
1992-1994
(in US\$)

Function	First Year	Second Year	Third Year
Develop tracking system for production and imports	\$35,000	-----	-----
Implement tracking system; report data to UNEP; import controls		\$15,000	\$15,000
Coordinate investment project preparation and coordination with industry and implementing agencies; project implementation and monitoring	\$25,000	\$30,000	\$30,000
Coordinate training activities; identify participants and facilitate participation	\$20,000	\$25,000	\$25,000
Negotiation of additional voluntary agreements; data collection and analytical support; monitoring agreement	\$15,000	\$25,000	\$25,000
Update country program		\$15,000	\$20,000
Public information and industry coordination		\$15,000	\$15,000
Yearly Total	\$95,000	\$125,000	130,000
Total (3 years)	\$350,000		

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APPENDIX B

DESCRIPTIONS OF INVESTMENT PROJECTS

This appendix provides further information on the investment projects proposed by SEDUE for initiation during 1992-93 as described in the project summary table in section 7 of the country program.

Refrigeration

1. Centralized CFC Recycling and Material Handling System and Training Program

High volumes of CFC-12 and CFC-11 are emitted from various refrigeration equipment due to improper maintenance practices. Typically, a large portion of the refrigerant charge is vented to conduct repair work in particular components of the system (e.g., compressor, condensor). However, both recovery and recycling of CFCs from refrigeration equipment at service and disposal are established and commercially available technologies for reducing both the demand and emissions of CFCs.

Recycling can be accomplished either on-site or off-site. For example, portable recycling units can process up to four pounds per minute and can be used for refrigeration systems with charges ranging from a few ounces to several pounds. Alternatively, stationary receiver tanks can be used to temporarily store refrigerant while the system is being repaired. Such receiver tanks help avoid the venting of refrigerant to the atmosphere and collect refrigerant for reclamation. Several countries already have centralized reclamation facilities. In the U.S., for example, the Air Conditioning and Refrigeration Institute (ARI) has established ARI standard 700 which provides the specifications that reclaimed refrigerants must meet. Moreover, ASHRAE has developed service practice manuals that provide the necessary guidance for refrigeration service technicians.

The development of a recycling network in Mexico will be an effective means of increasing participation in refrigerant recycling. Such a network could serve refrigerant distributors, service shops for industrial and household air conditioners, MACs, hotels, supermarkets, restaurants, and refineries. The CYDSA company, a holding company that owns Quimobasicos, is interested in pursuing this project and has the necessary qualified service technicians, technical expertise, and a suitable network of distributors. As currently proposed, the project will involve recycling CFCs sold by Quimobasicos and will

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provide the necessary impetus for a comprehensive refrigerant recycling program throughout Mexico. The project will mainly involve trainers from Quimobasicos. Terms of reference for these projects are being developed by CYDSA.

Estimated Project Cost (US\$):	1,100,000
ODP-Weighted Tons Phased Out:	8,250

2. Expanded Use of Recycling in Mobile Air Conditioners (MACs)

The MACs recycling demonstration project is expected to produce several results such as successful demonstration of recycling technology, a small cadre of MAC service technicians skilled in recycling procedures, and educational materials both for MAC service technicians and consumers. As described in the MACs recycling demonstration project proposal, however, the ultimate goal of the demonstration program is to facilitate replication of MACs recycling throughout Mexico. The purpose of this project is to fulfill this objective by implementing the widespread use of MACs recycling technology at all major service sites in Mexico.

An expanded network of MACs recycling will depend on at least two key factors: (1) the availability of more recycling machines, and (2) the availability of adequately trained MACs service technicians. Once the MACs recycling demonstration program is fully implemented, a pool of service technicians trained in MACs recycling procedures will be created. These service technicians will assist in transferring MACs recycling expertise to other MACs service establishments in Mexico. SEDUE will select up to 100 service shops from around the country to receive on-site training and a recycling machine. Only sites with a large volume of MACs servicing will be chosen so as to ensure the cost effectiveness of the project. The project includes public outreach activities to inform consumers about the environmental benefits of CFC-12 recycling and about companies in Mexico that are using recycling equipment.

Estimated Project Cost (US\$):	500,000
ODP-Weighted Tons Phased Out:	3,250

3. Chiller Purge Device and Conversion

This project will demonstrate technology for reducing emissions of CFC-11 from the purge devices on centrifugal chillers.

Centrifugal CFC-11 chillers are normally equipped with purge units. By removing water and non-condensable gases (e.g., air) from refrigeration systems, these units improve refrigeration

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efficiency by ensuring that the presence of non-condensable gases does not artificially inflate the condensor pressure. Because they remove moisture, purge units can also successfully prevent the occurrence of corrosion caused by moisture build-up and acids that are formed when small amounts of moisture mix with the refrigerant.

In removing the unwanted non-condensibles and water, however, the purge units also remove some CFC-11 and vent it to the atmosphere. In order to minimize the amount of CFC-11 vented, high efficiency purge units have been developed and are now manufactured by several companies.

Most of these high efficiency purge units are one of two basic designs: mechanical or thermal. Mechanical units employ a compressor in removing a mixture of refrigerant, air, and other noncondensibles from the refrigeration condensor. The mixture is compressed to a higher pressure which condenses the refrigerant and water vapor. In comparison, thermal purge units use the pressure differential between the operating refrigeration system condensor and evaporator to remove a vapor mixture of refrigerant, air, and other non-condensibles. A second stream of high-pressure refrigerant passes through purge unit coils at a lower temperature to condense the refrigerant out of the mixture that has been drawn off. For both types of systems the cost of a high efficiency purge device is approximately US\$2,500 - 7,000.

This project will involve the installation of purge units in several selected chiller units and will include the establishment of a training program for certifying chiller service technicians. In addition, the project will implement conversion of several chiller units. While SEDUE is in the process of identifying government agencies that have large numbers of chillers to undertake chiller conversions, several firms have expressed interest in participating in this project. For example, the Cautitlan Industrial Complex of Ford Motor Company has indicated that it would like to participate.

Estimated Project Cost (US\$):	1,250,000
ODP-Weighted Tons Phased Out:	580

Foams

1. Low-CFC Foam Insulation

Technology that reduces the amount of CFC-11 foam used in refrigerator manufacturing is now available. Such technology uses standard equipment and would only require slight modifications to Mexico's factory specifications. Reduced CFC-11 foam insulation is capable of meeting the necessary performance criteria of traditional CFC-11 foam. Reductions of up to 50% of

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the CFC-11 normally used can be achieved by substituting water for CFC-11 and adjusting the polyol mix. In addition to reducing the amount of CFC-11, other desirable properties of low CFC-11 foam include completeness of cabinet filling, foam friability, dimensional stability of the foam, structural stability of the cabinet, removal of exothermal heat, and improved viscosity of the process chemicals. Increasing the amount of water used in the foam insulation would include no capital costs, but would result in a 5% increase in operating costs due to changes in the chemicals used.

The goal of this project is to reduce CFC foam insulation while maintaining refrigerators's performance and consumer satisfaction. The latter would be addressed through consumer awareness activities. This project is expected to introduce low-CFC foam in three refrigerator manufacturing facilities. The project would involve several steps: (1) meetings between interested refrigerator manufacturers and foam suppliers, (2) initial factory screening to verify compliance with performance needs, (3) a short production trial, (4) review of results from the short production trial, (5) process and product modifications to reflect production trial results, (6) a full production trial, (7) quality control and assurance verification tests, and (8) full production.

Estimated Project Cost (US\$):	500,000
ODP-Weighted Tons Phased Out:	750

2. Polystyrene Foam Conversion from CFC to HCFC

The Mexican Polystyrene Industry uses CFC-12 as an expansion agent to obtain polystyrene foam boards which are used in food packaging applications. However, in several countries, the substitution of HCFC-22 for CFC-12 in such applications has been proven to be effective. Non-flammable and low in toxicity, HCFC-22 provides high chemical and thermal stability.

This project will involve the use of HCFC-22, as a replacement for CFC-12, and the modification of facilities used in the expanding polystyrene foam utilized in foam packaging. Modification of the extrusion system, replacement of pumps to feed HCFC-22 to process, and other changes to facilities will be required. Du Pont of Mexico presented this proposal and is working with SEDUE to prepare detailed terms of reference.

Estimated Project Cost (US\$):	600,000
ODP-Weighted Tons Phased Out:	1,000

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Solvents

1. Training and Plant Conversion in the Electronic Industry

The largest users of CFC-113 and methyl chloroform in the Mexican electronics and metal cleaning industry are firms located near the Mexico-U.S. border. This project involves assisting these industries in reducing and eventually eliminating their use of CFC-113 and methyl chloroform solvents. Several commercially available alternatives for these solvent applications exist such as low-solids/no-clean fluxes, and aqueous and semi-aqueous cleaning. Each has been proven to meet rigorous performance standards in both civilian and military electronics cleaning applications. Low-solids/no-clean fluxes, for example, can be used to eliminate cleaning in some instances. Both aqueous and semi-aqueous cleaning systems are currently being used in many diverse cleaning applications.

This project involves training workshops and investments in substitute technologies. The Industry Cooperative for Ozone Layer Protection (ICOLP) and Northern Telecom, a manufacturer of telecommunications equipment, have agreed to provide technical expertise for this project. The project will be implemented in four stages: project planning, training, demonstration, and plant conversion. The technical training and demonstration components are scheduled for 1992. Workshops will be organized in various Maquiladora sectors (Tijuana, Juarez, Nogales, etc.) In addition, technical staff of Mexican firms will be invited to visit ICOLP member facilities where alternative processes are in operation.

Following these workshops, participating firms will be asked to provide information on the amount of solvents used, which manufacturing processes use solvents, what technologies they are selecting to eliminate solvent use, and their proposed timetable for elimination of solvents. As a result of these activities, electronics manufacturers will develop plans to convert existing cleaning processes to alternatives such as those listed above.

Estimated Project Cost (US\$):	1,850,000
ODP-Weighted Tons Phased Out:	6,000

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Fire Protection

1. Halon Conservation, Training, Banking, Recycling, and Substitution

Increased training of personnel working in areas protected by halon systems significantly reduces the amount of halon discharged from the system by 30% at essentially no additional extra cost. In addition, implementing alternative training and testing systems will eliminate unnecessary halon discharges. Commercial users of halon systems will be provided with educational materials to raise awareness about the need for prudent use of halons and about improved maintenance of halon fire protection systems.

As currently proposed, this project will substantially reduce halon-1211 use where it is not essential through implementing appropriate training and testing procedures and will develop a network for halon-1211 recycling. This project will be developed further with the assistance of halon suppliers in Mexico.

Estimated Project Cost (US\$):	750,000
ODP-Weighted Tons Phased Out:	600

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