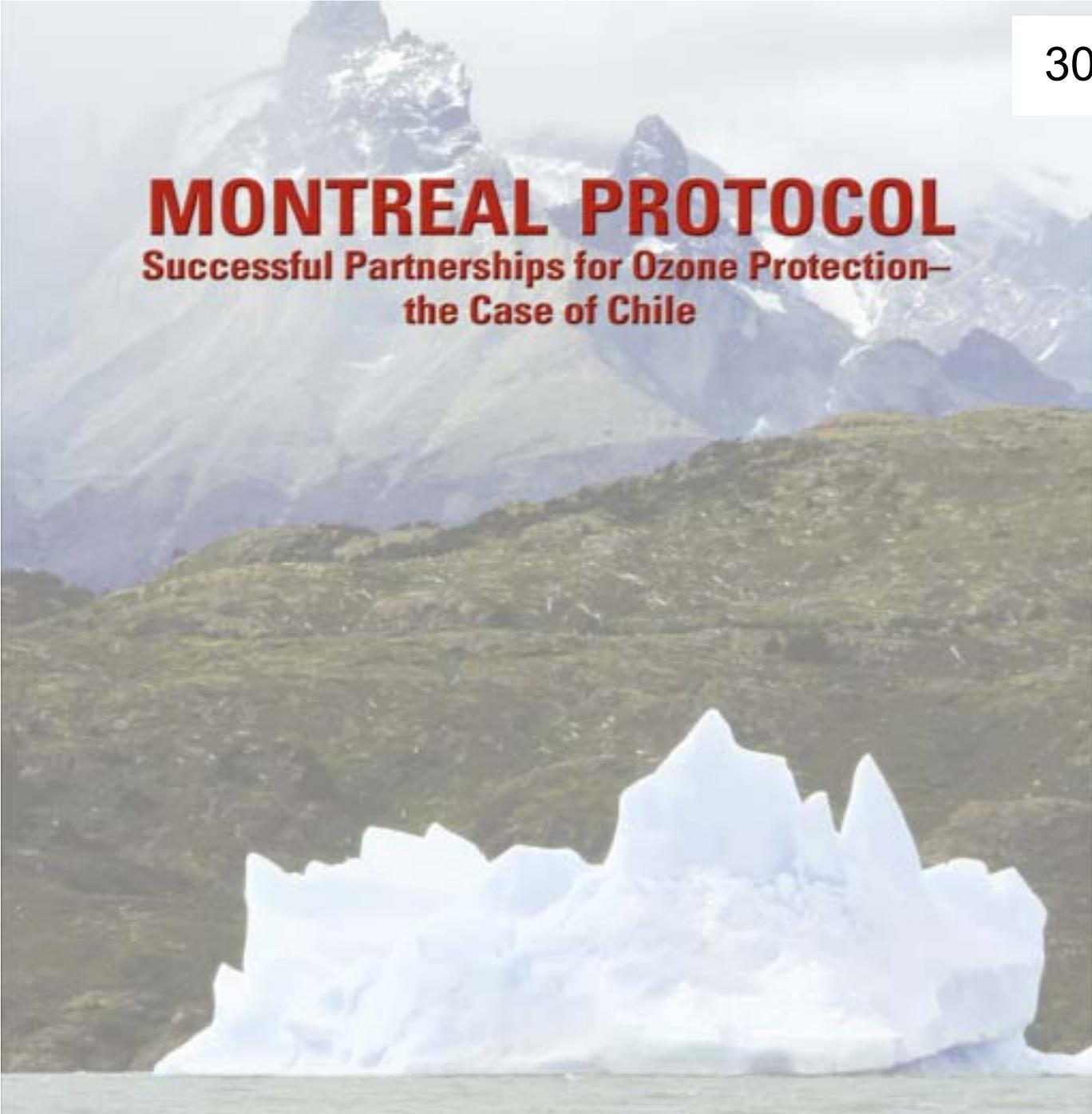


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MONTREAL PROTOCOL

**Successful Partnerships for Ozone Protection—
the Case of Chile**



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FOREWORD

When the Government of the Republic of Chile and the World Bank agreed to form a partnership in 1994 to help meet Chile's obligations as a Party to the Montreal Protocol, we foresaw that greater strength would flow from our joint efforts. Chile early understood the importance of ozone protection because of her geographic proximity to the "ozone hole" where increased ultraviolet radiation can cause severe damage to all forms of life. Here the linkage between the well-being of all of Chile's people and protection of the environment is transparently clear.

We are deeply concerned about the depletion of the stratospheric ozone layer that protects all life on our planet. We want to ensure that potential catastrophic effects on human health, crops and fisheries, animal and plant populations, and ecosystems never come to pass. The only way to restore the ozone layer is for all countries to act upon their Montreal Protocol commitments.

Chile has been successful in complying with the Montreal Protocol phase-out schedule for ozone-depleting substances. Chile met the freeze in consumption 2 years early, and is also reaching the 50% reduction level 2 years ahead of schedule. Full compliance will be certain as remaining issues such as regulation are addressed. The success of the joint World Bank – Chile Montreal Protocol Program, and the

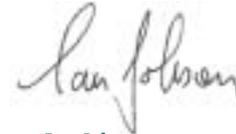
innovative grant auction project that evolved during the program, led to the direct elimination of about 494 ODP tons of ozone-depleting substances from Chile's economy. This report summarizes that success story.

It has become clear that global environmental issues cannot be dealt with by each country or each agency working in isolation. Coordination and collaboration are essential, and here multilateral institutions play a crucial role. The greatest potential in the Bank's Montreal Protocol Program lies in its ability to shape ideas, influence reforms, and leverage the financing of new endeavors. The Montreal Protocol Program is an example that could serve as a model for cooperation between the Bank and its partner countries in fulfilling common goals on other critical global environmental issues, contained in the Bank's Environment Strategy.

There is no further doubt that the future of humanity is linked to the integrity of Earth's natural systems. By working together to ensure the sustainability of these natural systems, we leave the living legacy of a viable planet that is our bridge into the future.



Gianni López Ramírez
Executive Director, Chilean National
Commission for the Environment
CONAMA



Ian Johnson
Vice President, Environmentally &
Socially Sustainable Development
Network, The World Bank



THE GLOBAL ENVIRONMENT AND THE MONTREAL PROTOCOL

The Ozone Layer

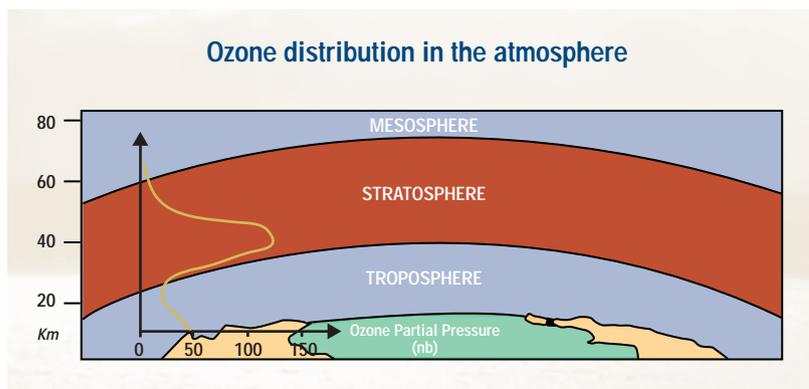
The earth's atmosphere is a surrounding mantle that generates the global climate and shields the earth's surface from harmful radiation emanating from the sun or other sources in space. Ozone, a form of oxygen with three atoms instead of the usual two, is a rare but critical component of the atmosphere's stratosphere region.

Approximately 90% of all ozone in the atmosphere is found in the stratosphere, beginning about 18

kilometers (11 miles) above Earth and extending upwards to about 50 kilometers (30 miles), and therefore called the "ozone layer." Although ozone is also found at ground level, its presence there results from human activities such as burning fossil fuels and it becomes a part of harmful pollution such as smog.

The stratospheric ozone layer is important because it protects life on Earth from short-wavelength ultraviolet radiation produced by the sun. Solar ultraviolet-C radiation is lethal, and ultraviolet-

let-B radiation is damaging to almost all forms of life. Excessive ultraviolet-B radiation is well known to cause human health problems such as skin cancers, eye cataracts, and weakening of the immune system; it also results in smaller crop yields and damage to plant genetic material, damage to marine ecosystems, reduced fishery yields, and animal health problems. The ozone layer absorbs almost all most ultraviolet-B radiation, and completely screens out ultraviolet-C radiation, thus shielding the earth's surface.



Threats to the Ozone Layer

Certain man-made chemicals containing chlorine or bromine are capable of destroying stratospheric ozone by means of chemical reactions that break down ozone molecules. Although these chemicals are stable near the ground, when they rise in the

The earth is shielded from the sun's ultraviolet-B radiation by the ozone layer

atmospheric mix they are broken apart by intense solar radiation. Then, chlorine or bromine atoms are freed to react with ozone molecules and destroy them. Over time, as more and more ozone molecules are destroyed in the stratosphere, the ozone layer becomes depleted and loses its protective capability.

The chemicals that destroy ozone are called “ozone-depleting substances” (ODS). Some chemical compounds, such as those containing bromine, are more highly reactive and destroy ozone faster than those containing chlorine. Thus they have greater “ozone-depletion potential” (ODP) relative to a fixed reference criterion. The relative ozone-depletion potential of a particular compound can be expressed quantitatively as “ODP tons.”

Ozone-depleting substances
ODS include:

- *chlorofluorocarbons* (CFCs), which are used in refrigerators and air conditioners, aerosol sprays, solvents, foams, and other applications. CFCs were discovered in 1928 and have become widely used in many sectors. Many forms of CFC have atmospheric lifetimes of over 50 years.
- *Hydrochlorofluorocarbons* (HCFCs) were initially developed as CFC substitutes, but they too have some ozone-depletion potential. They have atmospheric lifetimes of 1.4–19.5 years.
- *carbon tetrachloride* and *methyl chloroform*, which are widely used as solvents in engineering and manufacturing operations. Carbon tetrachloride has an atmospheric lifetime of 42 years.
- *halons*, which are bromine-containing chemicals used for fire-fighting. Halon 1301 has an atmospheric lifetime of 65 years.
- *methyl bromide*, which is used mainly as an agricultural pesticide and fumigant. Its atmospheric lifetime is 0.7 years.



l certain other chemicals used as solvents, coatings, adhesives, foams, process agents, and sterilants in a variety of sectors.

Growing concern

Concern started in 1970, when scientists first recognized that these types of chemicals might deplete the ozone layer. Scientific measurements of the ozone layer began in 1957, and have become increasingly sophisticated with ground-, balloon-, airplane-, and satellite-based instruments. These measurements have shown that the ozone layer over the middle latitudes (30–60 degrees) in both hemispheres has been depleted at an average rate of 4–5% per decade over the period from 1979 to 1994. However, an area of even greater depletion began to appear in the early 1980s—an “ozone hole” resulting from a decline in ozone cover of up to 60% was found seasonally over Antarctica, even extending

to southern areas of Australia and Chile. All of these decreases are larger than known long-term natural variations.

Protecting the Ozone Layer: the Montreal Protocol

International consensus and concerted global action on protection of the ozone layer have resulted in landmark international agreements, the Vienna Convention and the Montreal Protocol. The 1985 Vienna Convention for the Protection of the Ozone Layer is a framework agreement for cooperation to protect human health

and the environment against human activities that modify the ozone layer. It does not contain legally binding targets or controls. Therefore specific strong measures for ozone protection are spelled out in the protocol and amendments that followed soon after.

The Montreal Protocol on Substances that Deplete the Ozone Layer was adopted in September 1987 and came into force in 1990. It is the legal basis of global efforts to protect the ozone layer by controlling production, consumption, and use of ODS. It originally covered five

Magellanic penguins live in the part of Chile closest to Antarctica where ozone depletion can lead to animal health problems



CFCs and several halons. A series of amendments has been added to revise phase-out schedules, introduce other kinds of control measures, and add new controlled ODS to the list. The Amendments comprise London (1990), Copenhagen (1992), Vienna (1995), Montreal (1997), and Beijing (1999). Ninety-six chemicals are now covered by the Montreal Protocol. Parties to the Protocol have agreed to reduce and then eliminate the use of these ODS according to specific schedules. Recovery, recycling and specifically defined essential uses (for example, metered dose inhalers for asthma) are allowed.

By the end of 2001, 180 countries had ratified the Montreal Protocol. Amendments are ratified separately. Approximately two-thirds of signatories are developing countries described in Article 5 of the Protocol, as well as countries with economies in transition (CEITs), while the remainder are developed countries.

Phasing out ODS

Developed countries have the most stringent phase-out schedules. This is due to recognition

A computer simulation of the ozone hole over Antarctica in September 2000

of the fact that they are responsible for the majority of total emissions over time, and that they have more financial and technological resources to adopt alternatives.

Developing countries had a grace period of 10 years more than developed countries before compliance with Protocol phase-out schedules was required in 1999. In the interim, by 1999 they had to “freeze” both production and consumption of CFCs at average 1995–1997 levels. With the onset of full compliance, developing countries need to reduce CFCs, halons, and carbon tetrachloride by 50% by 2005, by 85% by 2007, and phase them out completely by 2010. Methyl bromide must be reduced 20% by 2005, and phased out by 2015.

Funding the phase-out

Parties to the Montreal Protocol also stipulated financial mechanisms to help signatories meet their phase-out obligations. These

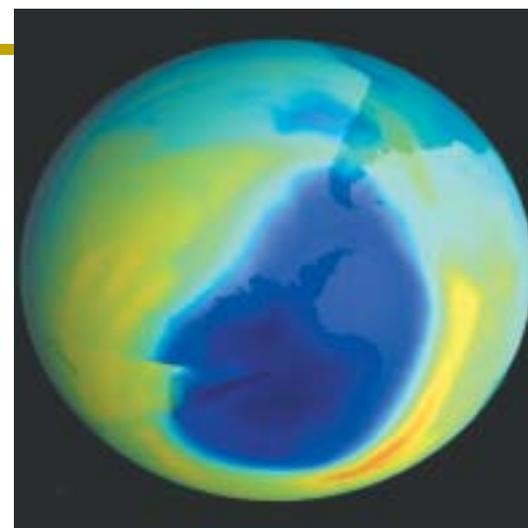


PHOTO BY NASA

mechanisms pay agreed incremental costs faced by countries in phasing out both production and consumption. Contributions come mainly from developed countries. The Multilateral Fund, created under the Protocol in 1990, provides technical and financial assistance to Article 5 developing countries. Eligibility is determined by consumption of less than 0.3 kg per capita of controlled substances, and by criteria of development. An Executive Committee representing seven developed and seven developing Parties to the Protocol manages the Multilateral Fund and approves project funding.

Implementing the phase-out

Four organizations serve as implementing agencies for the Multilateral Fund: the United Nations Development Program

Multilateralism has been a key element in the success of the Montreal Protocol.

(UNDP), the United Nations Environment Program (UNEP), the United Nations Industrial Development Organization (UNIDO), and the World Bank. The Bank, UNDP, and UNIDO provide technical assistance and funding for investment projects to phase out ODS. UNEP's role lies in involvement with information networks, institutional strengthening, and country programs.

The World Bank also serves as an implementing agency for a

second financing mechanism, the Global Environment Facility (GEF), which provides incremental funds for countries with economies in transition to address ozone protection, as well as various other global environmental issues. Under the Global Environment Facility, the World Bank is the only implementing agency involved in investment projects for ODS phase-out, as well as assistance with technical support and capacity-building.

THE WORLD BANK AND THE MONTREAL PROTOCOL

The World Bank Montreal Protocol Portfolio

The World Bank plays a major role in assisting countries to meet their national requirements as Parties to the Montreal Protocol. The Bank's Montreal Protocol program is now in its eleventh year. The Bank partners with developing countries in its role as an implementing agency for the Multilateral Fund. Countries with economies in transition can be funded through the Global Environment Facility, but are ineligible to receive grants from the Multilateral Fund. In 2000, the Bank had committed US\$125 million of Global Environment Facility funds for 11 ozone-protection projects in Eastern Europe and the former Soviet Union. The special initiative to close down CFC production in Russia has been most successful. Countries with economies in

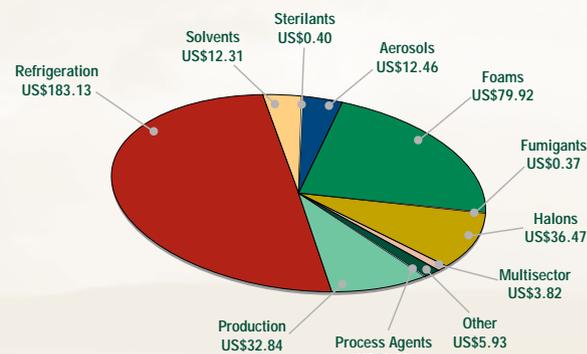
transition have reduced consumption of ODS by over 90%, thus meeting their current obligations under the Protocol.

As of mid-2000, the Bank had committed approximately US\$360 million of Multilateral Fund resources, representing 41% of the global allocated funds for programs exclusively in developing countries.

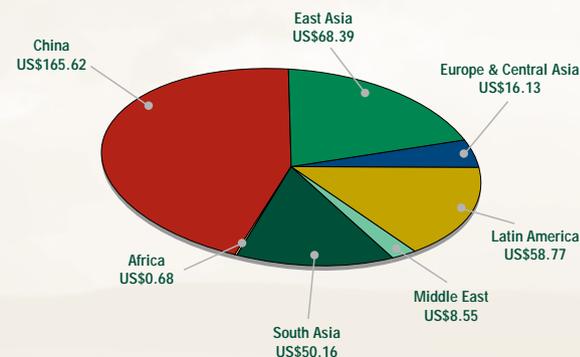
The Multilateral Fund

The Multilateral Fund has been a key element of the current success of the Montreal Protocol, because it assists countries that would not otherwise have the technical and financial means necessary to phase out ODS. As of 2002, the Fund approved nearly US\$1.5 billion in funds to phase out consumption of 221,000 ODP tons through projects in 131 countries.

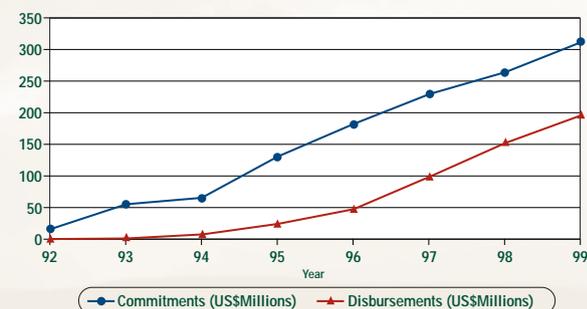
World Bank/Montreal Protocol cumulative commitments by sector (1999)



World Bank/Montreal Protocol cumulative commitments by region (1999)

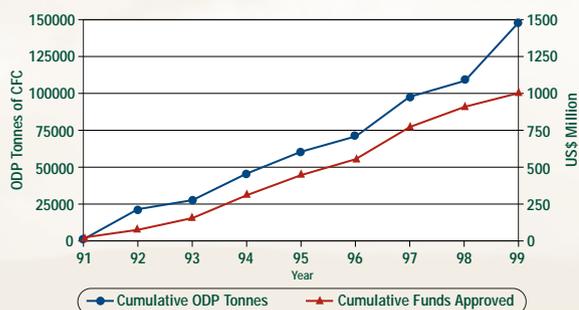


World Bank/Montreal Protocol cumulative commitments* and disbursements

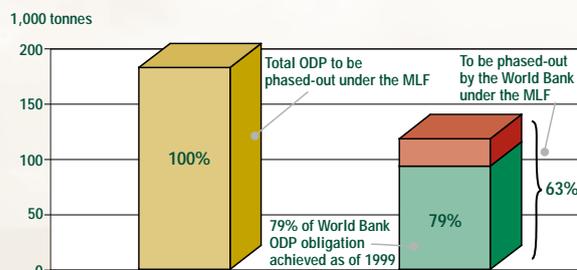


* Commitments are based on World Bank Management approvals

Cumulative Multilateral Fund approvals and ODP tons of CFC phased out



ODP tons to be phased out under the Multilateral Fund, and the World Bank's obligation and achievement as of 1999



Under the Multilateral Fund, the World Bank has been working in partnership with the developing countries that now account for more than three-quarters of the global consumption of ODS. In 1986, before the Montreal Protocol, industrialized countries

accounted for about 82% of the 1.1 million ODP tons of CFCs consumed globally. However, as industrialized countries phased out ODS under their stricter Montreal Protocol schedule, developing countries continued production as allowed during their “grace period.” By 1999, the time the Protocol stipulated for developing countries to freeze ODS production and consumption levels, developing countries accounted for 84% of the 150,000 ODP tons of CFCs consumed globally.

The World Bank Montreal Protocol Program

The Bank’s Montreal Protocol Operations Unit uses a flexible, country-driven partnership approach that depends on the needs and requests of each country. The Montreal Protocol program relies entirely on national execution of phase-out programs. First, the Bank helps client countries set up institutional frameworks for country programs to support project implementation, strengthening local institutions. Operational policies, guidelines and investment projects are devel-

oped in synchrony, so that effective and innovative approaches can evolve. Information and technology transfer is facilitated by the Bank to ensure that expertise and new methodology is quickly available to partner countries.

Some of the program innovations so far include:

- *umbrella grant agreements*, which are time-saving framework agreements that allow Multilateral Fund funds to be transferred to eligible countries without repeated processing for individual, smaller grant projects. Brazil was the first country to sign an umbrella agreement, followed by 23 more countries as of mid-2000.
- *sector-wide phase-out*, an approach that combines comprehensive policy measures with financial incentives to help all enterprises in a given sector convert to alternative technologies that do not involve ODS. For example, China, in partnership with the Bank, has phased out the use of CFCs in the entire national mobile air-conditioning sector,

The Bank's Montreal Protocol program has facilitated phase-out of over 122,100 ODP tons with over 372 projects reaching completion in 20 countries. This is nearly 70% of the total amount to be phased out under the Multilateral Fund—with only 40% of the resources available for investment projects.

as well as production and consumption of halons.

- *market-based instruments*, which increase cost-effectiveness of phase-out projects. For example, in Chile, the Bank provided assistance for a grant auction mechanism in which private companies bid on co-financing grants for conversion to alternative technologies.

- *production phase-out initiatives*, which target ODS production directly. China has been awarded US\$150 million, Argentina US\$8.3 million, and India US\$82 million, in Multilateral Fund funds to close down CFC production during the coming decade. When the target 71,000 ODP tons are phased out, these projects, along with a Bank-implemented Global Environment Facility project in Russia, should eliminate over 72% of CFC production in developing countries and countries with economies in transition.

- *leveraging funding*, which allows concessional lending combined with grants from the Multilateral Fund. For example, the Chiller Replacement Program in Thailand involves an initial grant to establish a revolving fund for replacing 24 old CFC-type chillers with energy-saving, alternative refrigerant technology. The savings expected to be earned by the new chillers will then be used to leverage additional funds to purchase over 500 more non-CFC chillers.

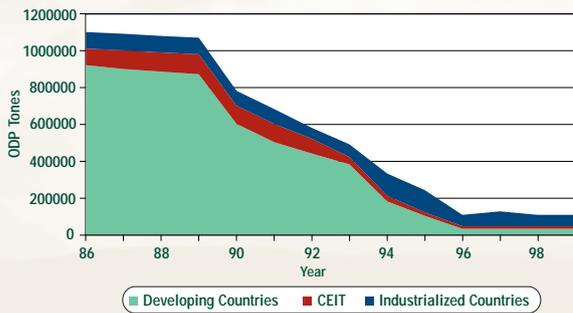
Developing countries are crucial for the Montreal Protocol's continued success in the future

A critical requirement for the Protocol's future success is phase-out of ODS by the developing countries. For example, three developing countries alone, Brazil, China, and the Republic of Korea, accounted for more than 50% of developing-country CFC consumption in 1999. The two largest—China and Brazil—are World Bank client countries. The Bank's Montreal Protocol program has also been working actively with five of the other seven developing countries that accounted for a further 25% of CFC consumption in 1999—Argentina, Mexico, Thailand, India, and Indonesia.

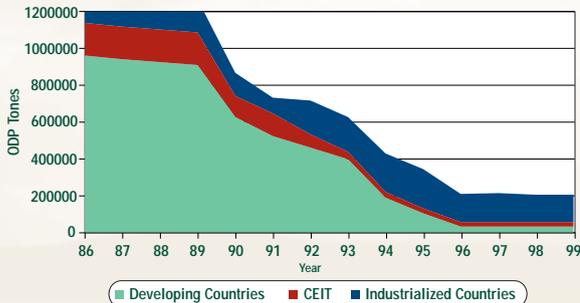
Developing countries are critical to the future success of the Montreal Protocol



Production of CFC
(As reported to Ozone Secretariat, UNEP)



Consumption of CFC
(As reported to Ozone Secretariat, UNEP)



The World Bank's Environment Strategy

The World Bank's success as a Montreal Protocol implementing agency addressing the global issue of ozone depletion has provided a

precedent and a mandate for a broad role on a number of global environmental issues. These issues are:

- ozone depletion,
- climate change,
- loss of biological diversity,

Success of the Montreal Protocol so far

Between 1986 and 1999, the total global consumption of CFCs was reduced from 1.1 million tons to 150,000 ODP tons.

What would have happened if the Montreal Protocol did not exist? Calculations show that without the Montreal Protocol, global consumption of CFCs would have reached about 3 million ODP tons in 2010 and 8 million tons in 2060. By 2050 ozone depletion would probably have been about 10 times worse than current levels, with 50% depletion in the northern middle

latitudes and 70% depletion in the southern middle latitudes. This level of ozone depletion could potentially have doubled, and in some Southern Hemisphere areas such as Chile quadrupled, the amount of ultraviolet-B radiation reaching the earth's surface. The potential human health problems associated with this decrease in ozone could have been staggering—an estimated 20 million more cases of cancer and 130 million more cases of eye cataracts. In addition, catastrophic consequences would likely have followed due to severe biological damage to crop systems and other terrestrial ecosystems such as forests and grasslands; marine and freshwater ecosystems and fisheries; and wild and domestic animal populations.

This scenario will hopefully remain in the realm of the theoretical. If the Montreal Protocol is fully implemented by all Parties, scientists predict that the ozone layer should return to normal around 2050.

- | deforestation,
- | degradation of water resources, and
- | desertification.

The Bank's Environment Strategy is a framework for focusing Bank interventions in three main areas of action:

- | integrating environmental considerations into strategies and actions for poverty reduction,
- | establishing public policies that enable sustainable economic growth led by the private sector, and
- | addressing regional and global environmental challenges.

The Bank's experience with the Montreal Protocol has shown a way forward for solutions to global environment issues that are critically important to the Bank's mission of poverty reduction and sustainable development.

Preventing degradation of water resources is a critical global environmental issue



WORLD BANK – CHILE MONTREAL PROTOCOL PROGRAM

Why Chile?

Because of its geographic location in the Southern latitudes where the ozone layer has thinned most severely, Chile quickly recognized the urgency of global ozone protection. Chile was one of the first

countries to ratify the Montreal Protocol, on March 26, 1990. Ratification of the London, Copenhagen, Montreal and Beijing Amendments followed.

Due to an extremely successful Montreal Protocol program phas-

ing out about 494 ODP tons, Chile will meet the 50% reduction target in 2003 rather than 2005. The amount defined as baseline consumption for purposes of the Montreal Protocol freeze, which

Southern Chile lies under the
Antarctic ozone hole



took effect in 1999, was 828 ODP tons (the average annual consumption from 1995 to 1997). Chilean CFC consumption has been well below the freeze level since 1997, which was 2 years earlier than required by the Protocol.

Although Chile has only a small share in the regional and global markets for ODS, that share is thoroughly intertwined with its economy, exports, and rural livelihoods. For example, in a maritime country such as Chile, fisheries are an important aspect of the local economy as well as the export trade. The refrigeration needed to keep fish fresh relied on ODS. Many agriculture and forestry products are also exported, and require refrigeration, or fumigation and treatment that may involve methyl bromide, another ODS.

The strong national determination to phase out ODS, and the outstanding success of the Chile Montreal Protocol Program, including the innovative grant auction project that evolved as a market-based tool, make Chile's Montreal Protocol program story significant.

Latin American Regional Context

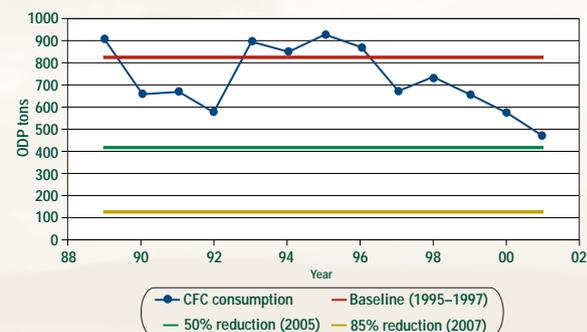
Eighteen other Latin American countries in addition to Chile have ratified the Protocol and various amendments. Most countries in Latin America have started implementing CFC phase-out programs. Consumption is the main issue, because production in the region is limited.

CFC consumption

In Latin America, most countries are consumers of ODS. In 2000, global consumption of CFCs was 139,041 ODP tons, approximately 15% of which was consumed in Latin America. The six major Latin consumers—Brazil, Mexico, Argentina, Colombia, Venezuela, and Chile—accounted for 14% of the total global consumption in 2000. Brazil was the largest consumer, with 9,275 ODP tons, and Mexico was second with 3,060 ODP tons.

Roughly 93% of all CFCs consumed in Latin America in 2000 were CFC-11 and CFC-12. CFC-12 accounted for 64% of the total 13,526 ODP tons consumed in the refrigeration (78%), air con-

Consumption of CFC in Chile relative to MP phase-out schedule

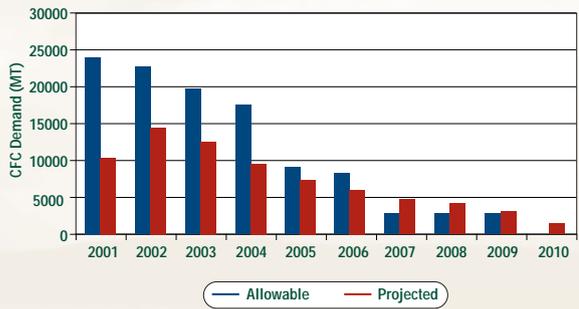


ditioning (13%), and foams and aerosols (8%) sectors. CFC-11 accounted for 29% (5,970 ODP tons) of Latin American CFC consumption, used primarily for foams and aerosols (81%).

CFC production

Latin America has limited CFC production facilities in the region. In 2000, global production of CFCs was 133,670 ODP tons, 10% of which was produced in Latin America. Only three countries in the region produce CFCs—Argentina (24%), Mexico (59%), and Venezuela (18%), Brazilian production facilities closed in 1999, contributing to a 63% decrease in regional production by 2000.

CFC Demand Projections for Latin America



Source: CFC Markets in Latin America, LCR Sustainable Development Working Paper No. 14

Phasing out CFCs

Due to phase-out programs in most Latin American countries, regional consumption of CFCs declined from 31,130 to 20,927 ODP tons, over the period 1995–2000. Latin America was already well below its allowable consumption level in 1999.

Most countries now have consumption levels appropriate to meet the upcoming 2005 CFC reduction target, which is set at 50% of their baseline. Regional consumption is expected to fall to about 13,000 metric tons by 2020.

Refrigerants are necessary to keep fish and seafood fresh

The preferred substitutes for CFCs in Latin America are HCFCs and hydrofluorocarbons (HFCs). Global demand in 2000 for HCFC-22 was 375,000 metric tons, of which Latin America consumed 4.6% in refrigeration and air conditioning applications. Global demand for HCFC-141b was 130,000 metric tons, with 14% consumed in Latin America, entirely for foams applications. Global consumption of HFC-134a was 135,000 metric tons in 2000, of which Latin America consumed approximately 5%, primarily for refrigeration and the remainder for air conditioning.

Chile's Context

Chile is a consumer rather than a producer of ODS, mainly CFCs. These are widely used in various aspects of refrigeration such as in the fabric of rigid foam panels. Refrigerants play an important role in processing of natural products such as fish, livestock and agricultural produce. In 2000, Chile consumed 576 ODP tons of CFCs, which was 2.8% of Latin American regional consumption. Nearly all of these were CFC-11 and CFC-12. Chile imports most CFCs from Mexico, and smaller amounts from

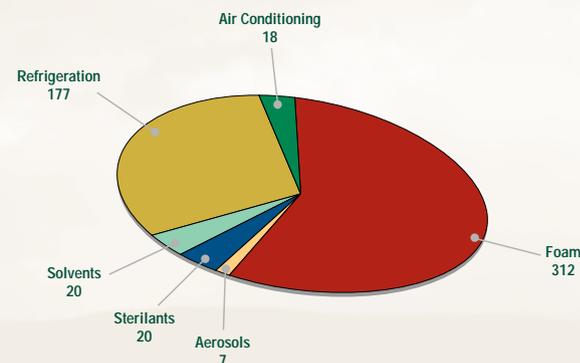


Argentina and Venezuela. Chile produces no CFCs.

Few other ODS are used nationally. Consumption of the solvents methyl chloroform and carbon tetrachloride has decreased over the past decade and is now less

than 10 tons per year for the two products combined, while the use of halons has been virtually phased out. Chile is currently the sixth largest regional consumer of methyl bromide—470 metric tons in 2001—approximately 80% of which is used for agricul-

Chile's Consumption of CFC by Sector (ODP tons)



Montreal Protocol program regional overview

The World Bank's global Montreal Protocol commitments totaled US\$368.3 million as of 2000, of which 16% represented commitments in the Latin American region. The Bank's Montreal Protocol program partners with eight Latin American countries—Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Uruguay, and Venezuela. This includes all the major regional producers and consumers of ODS. Country Montreal Protocol programs involve a combination of components including capacity-building and training, technical assistance, public awareness, and investment projects for conversion to non-ODS technology.

The Bank's strategy for Montreal Protocol activities involved targeting high-visibility large enterprises first. These were easily identifiable and led to rapid, cost-effective phase-out. For example, Brazil closed its CFC production facilities permanently in 1999, contributing to a 63% drop in regional production between 1995 and 2000. Current focus entails a National CFC Phase-out Strategy for each country to identify all projects needed to meet final phase-out—especially users in the refrigeration sector, small and medium enterprises that need technical help, and remaining regional production facilities.

The program goal is complete regional phase-out of ODS by 2010

tural purposes, especially soil sterilization in the production of tomatoes, peppers, and other crops; and as a quarantine treatment for fruits, vegetables, and wood products. The Montreal Protocol compliance schedule requires methyl bromide to be reduced 20% by 2005, and phased out by 2015.

Chile uses the CFC substitutes prevalent in the region. In 2000, Chile consumed about 4% (691 metric tons) of the regional share HCFC-22; approximately 1% (188 metric tons) of the regional share of HCFC-141b; and approximately 1.5% (101 metric tons) of the regional share of HFC-134a.



Chile Montreal Protocol Program Highlights

The World Bank and Chile began their partnership Montreal Protocol program in 1994 to help Chile meet its national phase-out obligations. The Chile program constitutes approximately US\$6.5 million in approved funds, about 11% of the funds for Bank-

implemented programs in Latin America.

An initial 3-year pilot phase (TECFIN I) was followed by ongoing full implementation in Phase II. The pilot phase included components of capacity building and training, as well as awareness-raising, to accompany the technological conversion component.

TECFIN I was funded at a total cost of US\$1.2 million. An Ozone Technical Unit was established in National Commission for the Environment.

During the pilot phase, an innovative auction mechanism was developed for awarding grants to help companies convert their operations to alternative tech-

“ The success of the Montreal Protocol program in Chile lies in the confidence of all involved participants in the Ozone Technical Unit, in the existence of clear, transparent and equal rules for all the participating enterprises, and in a national strategy for the conversion of enterprises. These factors resulted in the fast execution of conversion projects and in lower than expected costs.”

—Jorge Leiva
National Coordinator,
Ozone Technical Unit, CONAMA

Chile is a maritime country with
4,800 kilometers of coastline

nologies that do not require CFCs. The pilot phase started with a main focus on rigid foam products for thermal insulation and refrigeration, and refrigeration units for commercial, industrial and domestic purposes. Under Phase II, the grant auction system evolved flexibly as a cost-effective method to phase out ODS in the refrigeration and foam sectors. Phase II also includes regulatory capacity-building and development of alternatives to methyl bromide.

Chile's Grant Auction Mechanism

The Grant Auction Mechanism is a market-based method of allocating Multilateral Fund grants to

companies that undertake conversion to non-CFC technology. For a winning company, the grant co-finances part of the conversion costs while the company covers the remaining costs. Because companies compete for limited grants, they have a strong incentive to reduce their conversion costs. Before each auction, CONAMA announces the maximum amount that can be awarded—for example, US\$10—for each kilogram of CFC eliminated by conversion. This amount is the “cost-effectiveness threshold,” which companies try to undercut in competitive bidding. The upper limit of the cost effectiveness threshold is

Fish products are one of Chile's
main non-mineral exports



Auction winner

One of the Montreal Protocol grant auction project winners was Compañía Tecno Industria, or CTI, a Santiago-based company that has manufactured domestic refrigerators for the past 50 years. CTI consumed 156 ODP tons of CFCs in 1998, making it the largest commercial refrigeration company in Chile. The plant produced approximately 181,000 units in 1998. CTI won one of the auction bids and received US\$1.17 million from the Multilateral Fund, which co-financed 50% of the conversion of plant operations to CFC substitutes. Along with funds, the Montreal Protocol program provided technical assistance and training to help the company convert. Assistance also included awareness material to help company employees understand that their new operations had a broader significance for protecting the ozone layer and thus protecting human life and the earth's ecosystems.

A workman destroys CFC-based equipment as part of CTI's conversion to non-CFC refrigerant technology, co-financed under the grant auction project



PHOTO BY CONAMA OZONE TECHNICAL UNIT

determined globally by the Multilateral Fund, but locally by CONAMA. The Ozone Team at CONAMA organizes the public bidding process and then evaluates the resulting proposals for funding eligibility on the basis of Multilateral Fund requirements, technical feasibility, and financial record of the company. Companies receive their grant funds retroactively after they show proof of conversion.

The auction system has a number of advantages:

- small and medium-sized enterprises can afford to participate, because cost-effectiveness targets can be flexible for different-sized companies, given that larger companies operate at lower costs
- Multilateral Fund money is spent more efficiently, because competition motivates companies to find the most affordable conversion technology.

The project has had a major impact on CFC phase-out. Through the auction program pilot program, Chile eliminated

118 ODP tons, and eliminated a further 376 ODP tons after all subprojects in Phase II were implemented. In the eight auctions so far, more than 20 enterprises participated, with a cost to the Multilateral Fund of nearly US\$2.6 million. Cost effectiveness has increased steadily—the overall cost-effectiveness threshold per kilogram of eliminated substance has dropped from around US\$10 to under US\$5.3. CONAMA has consistently achieved national cost-effectiveness thresholds that are below the global limit.

The Ozone Seal project

In order to raise public awareness of ozone protection and build momentum for Chile's aggressive CFC phase-out, the program created an Ozone Seal logo that signifies ozone-friendly technology. As part of the public awareness aspect, the Ozone Team launched a public contest in which Ozone Seal logo was chosen by a panel of well-known artists, politicians and industrialists. Service providers and products that do not involve ozone-depleting substances may display the Ozone Seal after they have been certified by an independent third-party



The Ozone Seal logo

certification company. The program chose a well-known Swiss company, SGS Eco Care, to perform the certification. Participation in the Ozone Seal program is voluntary, and requires validation after a certain period of time.

Methyl bromide alternatives project

Chile ranks sixth among Latin American countries after Mexico, Brazil, Argentina, Costa Rica and Guatemala in consumption of methyl bromide, with 470 metric tons consumed in 2001. Methyl

Some of Chile's fruit exports are treated with methyl bromide

bromide is widely used as a soil fumigant to control agricultural pest pathogens, insects, nematodes, and weeds. It is also used as a quarantine treatment for fruits and vegetables.

Methyl bromide has a high ozone-depletion potential and is controlled by the 1992 Copenhagen Amendment requiring 20% reduction by 2005 and then total phase-out by 2015. CONAMA has set a stricter 45% preliminary reduction target by 2006, so it is urgently necessary to find alternative technologies. The Montreal Protocol program currently funded a demonstration project for testing alternatives in soil treatment applications for tomatoes

and peppers in agricultural regions of central Chile. Testing evaluates the economic and technical feasibility of five approaches:

- various seed-bed substrates,
- solarization,
- steam pasteurization,
- integrated pest management, and
- use of substitute agrochemicals.

Transfer of successful technology will be carried out through awareness campaigns and training of methyl bromide users.



Chile's Next Steps

Chile has already taken major steps to protect the ozone layer by meeting its Montreal Protocol commitments early with success, and by promising its future com-

pliance with the Protocol's required total phase-out of ODS.

Chile is now planning to implement a new phase-out schedule with more stringent guidelines

than the Montreal Protocol. The following steps planned by the Government of Chile, and supported by the Montreal Protocol program, will ensure continued compliance with Protocol obligations:

- *New laws, regulations and guidelines* controlling ozone-depleting substances in Chile will support the new phase-out schedule. Although there is presently no regulation to control trade and use of ODS, the government is reviewing the draft of new legislation. This regulatory framework will include:
- legal control over the commerce and use of ODS, with a law phasing out CFC-11 immediately and CFC-12 by 2007;

Native wildlife species like guanacos are also at risk from ozone depletion



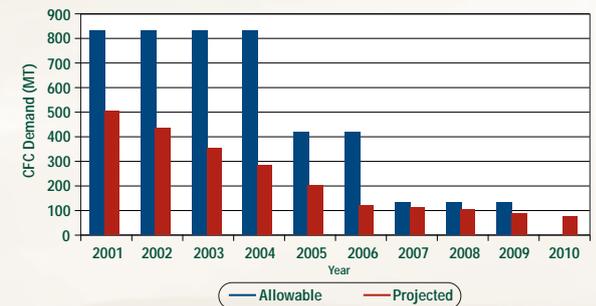
- restrictions on the import and export of CFCs, as part of a Refrigerant Management Plan; and
- an import licensing system to control the use of ODS in Chile.
- *Reduction by 2005 and total phase-out by 2015 of methyl bromide concurrently with*

Chile is well on track to meet its Montreal Protocol targets with outstanding success. The grant auction project is a major contributor to success—after completion, annual consumption will decrease to approximately 63 tons of CFC-11 and 190 tons of CFC-12.

development of technological-ly and economically feasible alternatives to methyl bromide is a high priority.

- *Implementation of the National CFC Phase-out Strategy*, which contains national and sector plans, is needed to meet final phase-out targets in the Protocol compliance period. Targeting remaining ODS users in the service sector and refrigeration is a high priority. Activities are needed to identify existing old refrigerators, mobile air-conditioning units, chillers, refrigeration systems, etc.
- *Implementation of the Refrigerant Management Plan*, which will outline requirements for the education and certification of refrigeration technicians, and for the maintenance, recovery, and recycling of equipment, is needed.
- *Technical support and training* for the transition to substitutes is needed in all sectors, especially for small and medium enterprises.

Chile Projected CFC Demand



Source: CFC Markets in Latin America, LCR Sustainable Development Working Paper No. 14

The Bank's Future Focus

The Bank's Montreal Protocol program will continue to play a key role in supporting Chile's implementation of its next steps for total ODS phase-out.

On a broader plane, the Bank's task is how to increase effectiveness in addressing future priorities with country partners. The Bank has already laid out the blueprint in its Environment Strategy, and is moving to examine how it can simplify its coordination structure and procedures so that Montreal Protocol activities, as well as activities related to international conventions on climate change, persist-

Ozone protection affects every person in Chile

Protecting the ozone layer means protecting the health of everyone in Chile. Ozone depletion is linked to increasing skin cancer in Chile. New medical research in Chile has shown that the proportion of skin cancer in people less than 50 years old has increased from 12% to 20% in the last 2 years. In addition, by the young age of 18, many adolescents have already been exposed to 80% of the safe lifetime dose of ultraviolet-B radiation. In Chile's far south, which lies directly beneath the Antarctic ozone hole, doctors have recorded a 51% increase in photosensitivity disorders over the last 7 years.

Chilean biomedical scientists studied occupational health hazards from ultraviolet-B radiation at different areas in Chile. They found that people working at higher altitudes and in the south were strongly affected. Thus fishermen, agriculturalists, and others with rural livelihoods are especially at risk. But the study also found that the most highly carcinogenic wavelengths are more prevalent to the north, and concluded that ozone depletion is also a threat to human health in densely populated areas such as Santiago.

Ozone depletion affects everyone in Chile



What kind of world will we leave to the next generations?

ent organic pollutants, and other human-induced chemical changes, can be mainstreamed into development assistance projects. Mainstreaming activities could involve integration into the Country Assistance Strategy, functional links to development loan projects, and coordination in project processing.

By drawing on the vast fund of experience and resources contained in the organization and its

partners, the Bank can cross-fertilize its programs to address the challenges of other critical global environmental issues. Its role as an implementing agency of the Montreal Protocol Multilateral Fund and the Global Environment Facility can serve as a precedent and a successful model. For example, the Montreal Protocol Operations Unit has more than a decade of experience with implementation of an international agreement on a critical



global environmental issue. Some of the key factors in this successful implementation experience are partnership, national execution, flexibility, and innovation.

The World Bank is uniquely positioned to help catalyze changes in partner country environment policy and practice that will not only safeguard the ozone layer, but help to stem climate change, loss of biodiversity, deforestation, and land and water degradation. By meeting this challenge, the Bank can make a tremendous contribution toward poverty alleviation and sustainable development.

Further Information

For additional information on the World Bank's role as an implementing agency of the Montreal Protocol, consult the following websites:

[www.worldbank.org/
montrealprotocol](http://www.worldbank.org/montrealprotocol)

[www.worldbank.org/LAC/
MontrealProtocol](http://www.worldbank.org/LAC/MontrealProtocol)

Country Assistance Strategy for Chile

The Country Assistance Strategy (CAS) is the focal instrument in the World Bank's dialogue with partner countries in development assistance. It describes the agreement reached between the Bank and a country government on priorities for Bank development assistance over the next 3 years. The CAS is influenced by policy dialogue, country economic and sector work, supporting analytical work, the Bank's policies, and project design and financing.

Goals of Chile's current CAS are:

- to sustain economic growth and social progress,
- to include rural populations and vulnerable groups,
- to modernize the state structure.

As part of the CAS, the Bank supported integration of environmental concerns through establishment of National Commission for the Environment. The strategy specifically points out the success of the joint Montreal Protocol program as part of CONAMA's action on global environmental issues.

Rural livelihoods: horseman with livestock.
Ozone depletion puts rural workers at risk.



