OZONE LAYER DEPLETION

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Contents

Summary

The Vienna Convention on the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer are the first international agreements in the history of mankind to address a truly global crisis. The ozone layer shields the Earth and its inhabitants from harmful doses of ultraviolet light. However, since the early 1930s humankind has released into the atmosphere increasing quantities of chemicals that, while extremely versatile, safe and profitable, will gradually destroy the ozone layer.

It was in order to protect the ozone layer that, in the early 1980s, negotiations started under the aegis of the United Nations Environmental Programme for the adoption of an international agreement. The Vienna Convention, adopted in 1985, laid down the basic principles and structure of the regime, calling for a coordinated international effort to research the causes of ozone layer depletion. The Montreal Protocol to the Vienna Convention, adopted in 1989, pinpointed a series of substances (CFCs and halons) believed to be the culprits of ozone layer depletion and mandated their gradual phasing-out. Currently, the Vienna Convention and the Montreal Protocol enjoy almost universal acceptance. They are binding on 176 and 175 States respectively.

During the 1990s, the regime created by these two international agreements has incessantly grown, adding new institutions, enlarging the list of controlled substances and constantly reviewing phasing-out schedules in light of ongoing scientific research about the ozone layer and the dynamic of its depletion.

After a decade of relentless enlargement and deepening, it seems that ozone layer depletion might eventually be curbed, and pre-CFC levels of the ozone layer reached by the mid-twenty-first century. At the same time, however, the regime for the protection of the ozone layer is facing new challenges. New substances are constantly created, and while some may harmlessly replace ozone-depleting substances, others might pose new threats. Countries in transition towards market-based economies are experiencing difficulties in keeping pace with developed countries in phasing out efforts. Meanwhile, although the phasing out of ozone-depleting substances in developing countries has begun, the compliance-monitoring organs of the Montreal Protocol are strained by the limitation of funds available to finance phasing out activities. Illegal trade and incomplete and faulty reporting also threaten the effectiveness of the regime. The next decade will tell whether humanity has been able to successfully address the first global environmental crisis or resigned itself to live on a planet stripped of ozone protection.

1. Introduction 

The depletion of stratospheric ozone has been a major environmental issue during the last 25 years. At first, it was only an intriguing scientific hypothesis and there was no *prima facie* case against chlorofluorocarbons (CFC). However, when a large hole in the ozone layer was detected above Antarctica in 1985, suddenly ozone depletion became a matter of urgency requiring intergovernmental action. The result has been the growth of a complex international regime for the protection of the ozone layer.

The first stone was laid in 1985 with the adoption of the Vienna Convention on the Protection of the Ozone Layer (Vienna Convention). Two years later in Montreal, the Protocol to the Vienna Convention (Montreal Protocol) gave substantial content to the institutional framework laid down by the Vienna Convention. Since then, the ozone protection regime has evolved to tackle new challenges arising from evolving scientific knowledge, the identification of new ozone-depleting substances (ODS), and mutating international political and economic realities.

The Vienna Convention and subsequent protocols are the first international agreements in the history of mankind to address a truly global crisis. In this sense, they paved the way for the adoption a few years later of the United Nations Framework Convention on Climate Change. Moreover, because the ozone regime is precautionary in nature, scientists have played a fundamental role in its evolution. Because the dynamic of the phenomenon is extremely complex and shrouded by significant uncertainty, scientific research has gone hand-in-hand with the negotiating process and the administration of the regime.

The ozone regime is the result of a series of compromises: first, the need for immediate and effective action had to be balanced against the industry interests and economic welfare. The easiest and fastest way to address the problem would have been to immediately ban any chemical substance with ozone-depleting potential (as several environmental NGOs advocate). Yet, such a decision would have not only imposed huge costs on chemical industries, but created ripple effects throughout society and the economic system at large, as substitutes to ODS were yet to be discovered.

Another compromise at the heart of the ozone regime is that between industrialized and developing countries. A few industrialized countries have massively produced and consumed ODS in the past, while developing countries, which have hitherto minimally contributed to the problem, may have a huge impact in the near future. The participation of developing countries in the ozone-protection regime is essential because ODS regardless of where they are produced and/or released into the atmosphere, could render phasing-out efforts in developed countries meaningless. To ensure universal participation, developed countries had to accept the so-called principle of 'common but differentiated responsibility', which translates into looser phasing-out timetables and financial help for developing countries.

1.1 The Ozone Layer: What it is and Why it is Threatened

Ozone is a simple molecule made up of three atoms of oxygen (O_3). It can be found naturally in the Earth's atmosphere. However, ozone is very rare (averaging three molecules of ozone for every 10 million air molecules) and unevenly distributed, primarily in two regions of the Earth's atmosphere. Approximately 90% of the ozone layer can be found 8–18 km (5–11 miles) above the Earth's surface, extending up to about 50 km (30 miles). This region of the atmosphere is called the stratosphere and the ozone in it is commonly known as the ozone layer. The remaining ozone is found in the lower region of the atmosphere (the troposphere).

Although ozone molecules in the stratosphere and the troposphere are identical, they have opposite effects on the planet. Stratospheric ozone (i.e. the ozone layer) plays a beneficial role by absorbing most of the biologically damaging ultraviolet sunlight (i.e., UV-B) and completely screening out lethal UV-C radiation. Increased exposure to UV-B and UV-C weakens the immune systems and causes increased occurrence of melanoma and non-melanoma skin cancers and eye cataracts, reduces plant yields, damages the oceans' ecosystems, has adverse effects on animals and deteriorates plastic materials. Moreover, by absorbing ultraviolet radiation, the ozone layer helps regulate the Earth's temperature. Indeed, it creates a source of heat, which forms the stratosphere itself (a region where the temperature rises as altitude increases).

Conversely, at the Earth's surface, ozone has severe toxic effects when it comes into contact with life forms. Ozone in the troposphere is the result of human activities and an important component of air pollution (the so-called photochemical smog). In sum, the dual role of ozone leads to two separate environmental issues: the increase of ozone in the troposphere and the decrease of ozone in the stratosphere. This paper will address only the latter, as it has become an issue requiring international action. The former has mainly been the object of national measures.

It was only at the beginning of the 1970s that scientists began questioning the possibility that certain chemicals could interact with and destroy the ozone layer. F. Sherwood Rowland and Mario Molina (who, together with Paul Crutzen, won the 1995 the Nobel Prize in Chemistry for their discovery) hypothesized that CFCs introduced into the troposphere were capable of slowly rising unaltered into the stratosphere via air currents. CFCs would be dissociated by ultraviolet light, releasing chlorine atoms, which would act as catalytic agents in the dissociation of ozone molecules. In particular, free chlorine atoms (Cl) decompose ozone into oxygen (O_2), and are regenerated by interaction with the now free oxygen atoms

(O). When chlorine is regenerated, it is free to continue to break down other ozone molecules, for as long as its atmospheric life-span (one to two years). At the end of the process one atom of chlorine can destroy as many as 10 000 molecules of ozone. Stripped of its natural shield, the Earth and its inhabitants would be exposed to the harmful effects of unfiltered sun radiation. Considering the production and consumption figures of CFCs (during the late 1960s more than one million metric tons of CFCs were produced annually) and their ubiquitousness, all the ingredients were in place for a major environmental catastrophe at the global scale.

2. The architecture of the ozone layer regime

The alarm launched by these scientists spurred a research campaign, both at the national and international levels, to verify the soundness of their theories. In the United Nations, the issue of ozone depletion was first discussed by the Governing Council of the United Nations Environmental Programme (UNEP) in 1976. A meeting of experts was convened in 1977, after which UNEP and the World Meteorological Organization (WMO) set up the Coordinating Committee on the Ozone Layer (CCOL), to periodically assess ozone depletion and bring together scientists from governments, industry, universities and international organizations.

Negotiations for an international agreement to address the presumed threat from the depletion of the ozone layer started under the aegis of UNEP in 1981, but scientific uncertainty, lack of conclusive evidence, difference of views between the EC countries and the so-called Toronto Group (Australia, New Zealand, Canada, Finland, Norway, Sweden, Switzerland and the USA) and pressure from industries delayed the conclusion of a treaty until 1985.

2.1 The Vienna Convention for the Protection of the Ozone Layer

On March 22, 1985 representatives of 43 states, including 16 developing countries, concluded the Convention for the Protection of the Ozone Layer in Vienna. Although the Vienna Convention was in itself an unprecedented accomplishment, being the international community's first formal effort to deal with an environmental problem before incontrovertible proof of its existence could be produced, it stopped short of what many had hoped it would be. Indeed, signatory states merely agreed to 'cooperate by means of systematic observations, research and information exchange in order to better understand and assess the effects of human activities on the ozone layer' and to take 'appropriate measures ... to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the ozone layer' (art. 2.1).

Yet, the Convention did not specify how to reach that goal. There was no mention of any substances that might harm the ozone layer, and CFCs only appeared towards the end of the annex to the agreement, where they were generically mentioned as chemicals that should be monitored. The main thrust of the Convention was to lay down a framework to encourage cooperation among States through research and exchange of information on the phenomenon. As a 'framework treaty', it set forth general principles and institutional structures—a Conference of the Parties to meet regularly, a Secretariat to act as a clearinghouse for information, and a procedure to

amend the Convention (see 4)—but it did not contain substantive emission reduction provisions, or list proscribed substances, control procedures or rules on liability.

2.2 The Montreal Protocol on Substances that Deplete the Ozone Layer

Less than eight weeks after the conclusion of the Vienna Convention, the journal *Nature* published a paper by a group of British scientists containing astonishing findings based on a review of land-based measurements of the stratospheric ozone in Antarctica. Those measurements were so unbelievable at first, that the scientists had delayed publication for nearly three years (while Vienna Convention negotiations were ongoing) while they reviewed the accuracy of their instruments and data. They finally concluded that ozone levels recorded during the Antarctic spring had fallen to about 50% of what they had been in the 1960s. Moreover, the amount of seasonal loss appeared to have sharply accelerated beginning in 1979. The so-called 'ozone hole' (the portion of the stratosphere in which ozone levels are greatly diminished) had expanded by 1985 to cover an area as large as the US.

The British findings were later confirmed by American satellite observations. These findings constituted the first tangible evidence of severe ozone depletion, making the need for definite measures urgent. In the meantime, an extensive research effort was launched to try to prove that chlorine was the ultimate culprit. Prompted by a strong public concern and a large mass-media campaign, negotiations intensified and, on September 16, 1987, an agreement was reached in Montreal delineating specific measures to be taken under a Protocol to the Vienna Convention (the Montreal Protocol).

The Montreal Protocol (Protocol) is the center-piece of the international regime for the protection of the ozone layer, for it enshrines the fundamental principles states should follow to curb ozone-depletion, and sets up its pivotal structures and procedures. First, the Protocol contained a list of targeted substances, along with agreed cuts and timetables. In particular, it called for a cut to 1986 levels of production and consumption of some CFCs by mid-1999 and a freeze on production and consumption of certain *halons* (used primarily in fire extinguishers) to 1986 levels. Moreover, the Protocol banned trade in ODS with non-parties. In this way, it created a disincentive for free riders, discouraged relocation of ODS production facilities to non-parties, and created an incentive (particularly for developing countries) to join.

Second, the Protocol was endowed with a mechanism to constantly review control measures on the basis of evolving scientific, environmental, technical and economic information, through a process of adjustments and amendments (see, 4). Without this feature, the Montreal Protocol would inevitably have been left behind by rapid advancements in science and study of the ozone layer, condemning it to irrelevance.

Third, in Article 5, the Montreal Protocol introduced the principle of 'common-but-differentiated responsibilities'. Recognizing that developing countries had hitherto contributed only in minimal part to ozone depletion, but, at the same time that their potential CFC and halon use was enormous, developed countries agreed to grant developing countries preferential treatment. 'Article 5 States' (i.e. developing countries, defined as those countries whose consumption of controlled substances

was less than 0.3 kg per capita upon entry into force of the Protocol) could benefit from less strict phasing-out schedules and a ten-year delay in compliance with CFC and halon elimination. In addition, they were allowed to increase consumption during this period, as long as the 0.3 kg per capita calculation was not exceeded and base levels were calculated by using either the 0.3 kg per capita limit or the average of the annual consumption of the country for the years 1995–1997, whichever was lower. Finally, developed countries (i.e. 'Non-Article 5 States') agreed to help developing countries phase-out ODS through aid, credits, guarantees and technology transfers.

It should be noted that former communist countries ('economies in transition') do not qualify for developing country treatment under the ozone regime. Currently, twenty-seven such states: the successor states of the USSR and Yugoslavia, and those central and eastern European states which once were part of the Soviet bloc. The ozone regime (designed when the collapse of communist countries was unimaginable) uses the criterion of 0.3 kg per capita consumption of ODS upon entry into force of the Protocol as the only divide between developed and developing countries. However, since the beginning of the 1990s and the entry into force of the Montreal Protocol, most of these countries have experienced deep recessions, with plummeting economic indicators. Many of them have struggled to comply with phasing out schedules for developed countries, with mixed results.

2.3 The institutional structure and decision-making process

In addition to the Secretariat, the Montreal Protocol created a set of organs to study and collect data on the production and consumption of controlled substances, introduced data reporting requirements, with indications on how to calculate control levels, and provided for the future establishment of a procedure to address eventual non-compliance: the so-called non-compliance procedure.

With the passage of time, further progress researching the scientific, technological, economic and political aspects of ozone-depletion, and the rise of new potentially damaging substances, the institutional structure laid down by the Montreal Protocol has been tailored to service the needs of the parties and ensure the regime's functionality. This approach is far from original, since, to differing degrees, some traits of it can be found in the regime set up by the 1979 Long-Range Transboundary Air Pollution Convention. However, it has proved a model for similar environmental treaties, such as the Climate Change Convention.

Figure 1. The Montreal Protocol Institutions

2.3.1. The Meeting of the Parties

At the center of the institutional structure is the Meeting of the Parties to the Montreal Protocol, which combines executive, quasi-legislative and quasi-judicial

functions in a supreme decision-making body. Both the Vienna Convention and the Montreal Protocol provide for convocation of the parties to the agreements. The convocation of parties to the Vienna Convention is called the 'Conference of the Parties', while that of the Montreal Protocol is called 'Meeting of the Parties'. Yet, the difference between the two is minimal and the real engine of the ozone-layer regime is the Meeting of the Parties.

Indeed, for the sake of efficiency and expediency and as required by the Montreal Protocol, the gatherings of the parties to the Vienna Convention and the Protocol take place simultaneously in the same location. The difference between the two assemblies is that only the parties to the Montreal Protocol have voting rights on adjustments and amendments (see, *4*). Moreover, only they can be Executive Members of the Multilateral Fund, the disbursing agency of the regime.

Regardless of this, the number and identity of party states to the two agreements is currently almost identical. Currently, 176 states are parties to the Vienna Convention and 175 to the Montreal Protocol (only Equatorial Guinea is party to one and not the other). The same was not necessarily true in the past. Until 1993 there was some discrepancy in the number of parties to the Convention and the Protocol, as some national parliaments lagged behind in the ratification process.

Furthermore, because the number of states that have ratified the various amendments can vary (see, *4*) within any given Conference of the Parties/Meeting of the Parties, there are usually further informal sub-groupings of parties to the various amendments. Meetings of the Parties are also open to non-party states, UN agencies, and other intergovernmental institutions and NGOs, which can all participate in discussions without voting power.

The Conference of the Parties to the Vienna Convention takes place every two years, while the Meeting of the Parties to the Montreal Protocol is held every year. To date there have been five Conferences and 11 Meetings of the Parties. Meetings usually last one to two weeks, with states often represented at the ministerial level. A new set of officers (a president, three vice-presidents and a rapporteur) is elected each time on the basis of equitable geographical representation.

The main function of the Meeting of the Parties is to consider and decide on adjustments and amendments (see, *4*) and to make other formal decisions relevant to the Protocol's obligations and operations. These include: establishing subsidiary panels and determining their terms of reference; reviewing the implementation of the Protocol and considering reports of the Implementation Committee ; establishing guidelines for reporting procedures; assessing and reviewing control measures; adopting the budget for the implementation of the Protocol; and reviewing requests for technical assistance.

In their deliberations, the parties rely on reports prepared by the Open-Ended Working Group of the Parties to the Montreal Protocol (OEWG). The OEWG is a less formal negotiating body, open, to any party wishing to participate. It reviews the bulky documentation concerning scientific, technological, economic, financial, compliance, and other issues submitted by the various regimes' organs and panels (i.e. the Scientific Assessment, Environmental Assessment, and Technology and Economic Assessment panels, and the Implementation Committee), and prepares

detailed options for decisions by the Meeting of the Parties. The OEWG holds two or three meetings during the course of the year.

The Meeting of the Parties is also supported by the Bureau, which consists of a president, three vice-presidents, a rapporteur of the Meeting and Secretariat representatives. The Bureau meets before and during negotiations of the OEWG to define issues, agree on agendas and documentation, and consider other logistical and substantive preparations for the meetings.

2.3.2 The Ozone Secretariat

Secretarial services are provided by UNEP, therefore the Ozone Secretariat is located in Nairobi, Kenya. Its functions include convening Meetings and Conferences of the Parties; providing support by keeping track of revisions to negotiating texts and other documents; collating and distributing such texts; assembling reports from the various panels and working groups, collecting data on implementation; and redistributing it to the relevant organs of the regime.

2.3.3 Implementation Committee and the Non-Compliance Procedure

To ensure compliance with the phasing-out obligations under the Montreal Protocol and successive amendments and adjustments, a first interim non-compliance procedure, based on the conclusions of an *ad hoc* working group of legal experts, was adopted by the Second Meeting of the Parties (London 1990). However, on account of its novelty, complexity and, in certain respects, sensitivity, the Terms of Reference of the non-compliance procedure were only approved at the Fourth Meeting of the Parties (Copenhagen 1992).

The overall aim of the NCP is to 'secure an amicable solution of the matter on the basis of respect for the provisions of the Protocol'. To ensure the attainment of this goal, the NCP is based upon five fundamental principles. Namely, the Montreal Protocol NCP should be:

a. non-complex;
b. non-confrontational;
c. non-judicial;
d. transparent; and
e. subject to the authority of the plenary organ (i.e. the Meeting of the Parties).

The NCP of the Montreal Protocol consists of two interlocking systems that are managed by a standing committee called the Implementation Committee. Under the first (i.e. regular) system, the Implementation Committee debates general matters related to reporting requirements and the implementation of and compliance with the Protocol, making recommendations to other bodies on ways to improve working procedures. Under the second (i.e. *ad hoc*) system, the Implementation Committee reviews specific submissions concerning alleged non-compliance filed by parties to the Protocol, or by the Convention's Secretariat. The Implementation Committee then reports on the submissions, including any recommendations it deems necessary to the plenary organ of the regime, the Meeting of the Parties (see . During the first five years of its life, most of the Committee's workload arose out of the regular system; the first submission under the *ad hoc* system was first filed in mid-1995 .

However, the *ad hoc* system is the real novelty of the Montreal Protocol, setting it apart from other international environmental regimes.

The Implementation Committee consists of 10 members who represent their states and are elected by the parties on the basis of the principle of equitable geographical distribution. The Committee meets biannually (to date it has met twenty-three times) and its meetings are organized by the Secretariat. When performing its duties, it may request further information on phasing-out activities and ODS emissions, or it can send a mission to gather data inside the territory of a party state, although 'only upon invitation of the Party concerned'.

Cases of non-compliance can be submitted to the scrutiny of the Implementation Committee when one or more parties have reservations regarding another party's implementation of its obligations under the Protocol. The Secretariat can also become involved when, during the course of preparing its reports, it becomes aware of possible non-compliance. Otherwise, if a Party concludes that, despite having made a good-faith effort, it is unable to comply fully with its obligations under the Protocol, it can approach the Implementation Committee. The fact that a State can submit its own non-compliance to the scrutiny of other members is probably one of the most striking features of the whole procedure. Self-submission to the Implementation Committee is further indication that the underlying aim of the procedure is to build confidence among parties and to search for a satisfactory solution rather than to allocate blame and sanction breaches. Clearly, such a procedure would be absurd if the context was one of mere legal responsibility where violation equals sanction.

Under the Terms of Reference, participation in the meetings of the Implementation Committee is a privilege restricted to the so-called 'involved parties', that is, the party, if any, that initiated the non-compliance procedure and the party whose implementation is at issue (provided it is not the same), unless they already sit on the Committee. Their participation, however, is restricted to the discussions, since they are unable to take part in the elaboration and adoption of the Committee's Report. Besides the members of the Committee itself and the parties involved in the procedure, the Implementation Committee has developed the practice of inviting representatives from both technical organs of the Convention, such as the Technology and Economic Assessment Panel, and the various implementing agencies for the financial mechanisms under the Montreal Protocol (e.g. UNEP, United Nations Development Programme, United Nations Industrial Development Organization, World Bank, Global Environmental Facility), as well of the Secretariat of the Multilateral Fund . As financial assistance plays a key-role in the actual implementation of the Protocol's obligations, particularly in the case of developing countries and economies in transition, the presence of the funding agencies helps the Committee to verify the regular flow of resources to complying States while putting pressure on non-complying parties.

Finally, the Committee reports to the Meeting of the Parties its recommendations for the adoption of any measures it deems necessary. The Report usually includes, at a minimum, a reasonably well-documented case for the decision, as well as the decision itself. The result, as may be derived from the spirit of the whole procedure, is more than a laconic decision: it includes specific information and an interpretation of the facts, along with possible recommendations for action to be

taken and provisions for eventual follow-up by the Meeting of the Parties.

The Meeting of the Parties may adopt whatever measures it deems appropriate to 'secure an amicable solution of the matter on the basis of respect for the provisions of the Protocol'. It has a latitude of choice that goes well beyond classical forms of reaction to non-compliance included in many international agreements, ranging from common penalties, like issuing cautions and suspending spec rights and privileges under the Protocol, to development measures, such as supplying appropriate technical, technological and financial assistance, as well as information transfer and training.

2.3.4 Multilateral Fund

The Multilateral Fund (the Fund) was established in 1990 by the London Amendments and began its operations in 1991 (until 1992 it was called the 'Interim Multilateral Fund'). Its aim is to implement the principle of 'common-but-differentiated responsibilities' contained in Article 5 of the Montreal Protocol (see *3.2*). Although many developing countries did not participate in the negotiations that led to the adoption of the Montreal Protocol, developed countries admitted responsibility for a large part of the past and present destruction of the ozone layer. They also recognized that any agreement reached amongst them would be rendered useless if developing countries chose to use ODS at the same scale they had done in the past.

The Multilateral Fund was established to pay for the 'incremental costs' of developing countries to implement the control measures provided by the Protocol and its adjustments and amendments. The way 'incremental costs' have been defined by the Meeting of the Parties is very broad and encompasses almost all possible costs arising from the transition to or the adoption of clean technologies. Namely, it includes costs of conversion of existing production facilities, as well as of research to adapt technology to local circumstances; retraining personnel; premature retirement or enforced idleness; establishing new production facilities for substitutes or converting old ones; and of collection, management, recycling and destruction of ozone-depleting substances. It also includes the net operational costs of substitute facilities, including the cost of raw materials, cost of import substitutes, patents and designs and incremental costs of royalties.

Responsibility for overseeing the operation of the Fund, including developing operational policies and criteria for eligibility, and the monitoring and evaluation of performance, rests with an Executive Committee made up of fourteen members (seven from developing, and seven from developed countries). The Executive Committee meets three times a year and is supported by various sub-committees. Moreover, a Secretariat, based in Montreal, assists the Executive Committee in the discharge of its functions. Finally, four international agencies, UNEP, UNDP, UNIDO and the World Bank, have contractual agreements with the Executive Committee to assist developing countries in preparing feasibility studies and project proposals for ODS phase-out activities. Thus, from the bottom up, recipient enterprises in developing countries, with the assistance of the four implementing agencies as well as other bilateral agencies, prepare project proposals for ODS phase-out related activities. These are then reviewed by the Fund Secretariat and considered by the Executive Committee.

Since its establishment, the Fund has been replenished four times: $240 million (1991–1993), $445 million (1994–1996), $446 million (1997–1999) and $440 million (2000–2002) for an aggregate total of $1.01 billion. The 41 contributor states are to a large extent developed-countries (mostly OECD members) party to the Montreal Protocol and, to a lesser extent, former communist countries from Eastern Europe and the USSR. The burden is shared among them following the UN scale of assessment for the organization's regular budget. The UN scale of assessment is based on the 'capacity to pay' principle which is measured mainly by the national income (Gross National Product) of each member state, adjusted by factors such as external debt and population. National income is converted into US dollars, adjusted and expressed as a share of the total income of UN members. Finally the scale is subject to floors and ceilings whereby no member will be required to pay more than 25% or less than 0.001% of the organization's expenses.

Currently, there are 130 states eligible to receive help from the Multilateral Fund. To date, out of the $1.01 billion budget of the Fund, the Executive Committee has approved (during about 30 meetings of three days each) 3300 projects and activities in 121 developing countries. Of the last fund replenishment ($440 million for the triennium 2000-2002), $150 million has been earmarked for China and $82 million for India to close down their facilities that produce CFCs.

The Multilateral Fund is not the only international fund which helps finance the cost of phasing-out ODS. The Global Environmental Facility (GEF) was established in 1991 by the World Bank, UNDP and UNEP as a mechanism to finance the implementation of the growing number of multilateral environmental treaties. In 1994, it received pledges of $2 billion from 34 states, while in 1998, 36 states pledged $2.75 billion. The GEF currently supports projects and activities for phasing-out ODS in countries with economies in transition, which are not eligible for assistance by the Multilateral Fund (but which, nonetheless, contribute to the Fund). To date, $148 million has been approved by the GEF to assist Azerbaijan, Belarus, Bulgaria, the Czech Republic, Hungary, Latvia, Lithuania, Poland, Russia, Slovakia, Slovenia, Turkmenistan, Ukraine and Uzbekistan (all these countries together, excluding Slovenia, contribute $12.4 million to the Multilateral Fund).

3. The Evolution of the Ozone Layer Regime: Adjustments and Amendments to the Montreal Protocol

The Montreal Protocol entered into force on January 1, 1989, binding 36 states, accounting for 85% of the global consumption of CFCs and halons. By then it was already clear that what had been agreed to in 1987 was too little, too late. Reports provided evidence that the 1987 Antarctic ozone hole was the largest ever reported and that ozone depletion was occurring at a faster rate and over a larger area than models predicted. Evidence also indicated that a complete phase-out of all controlled substances was necessary, along with a widening of the Protocol's scope to include other ODS. Indeed, the leitmotif of the ozone layer regime's history is a constant game of tag between scientists discovering new and alarming data and diplomats trying to catch up with stricter deadlines and longer lists of proscribed substances. Sadly, every major overhauling of phase-out schedules and lists of controlled substances has been anticipated or immediately followed by the announcement that the newest hole in the ozone layer is the largest-ever.

Before describing how the legal regime for the protection of the ozone layer has evolved, it is necessary to briefly sketch the revision mechanism of the Montreal Protocol. Indeed, the terms 'adjustments' and 'amendments' have a very precise meaning in the ozone layer protection regime.

Adjustments revamp phasing-out timetables. Consensus is always sought, and, despite intense debating, is usually achieved. However, if consensus is not reached, adjustments can be adopted by a two-thirds majority vote of the parties present and voting, representing at least 50% of the total consumption of the controlled substances (in this way the 120 majority of developing countries cannot force a decision on developed countries). Decisions on adjustments become binding for all parties six months after they have been communicated to the depositary of the Protocol, thereby instituting a quasi-legislative process which has been extensively used throughout the life of the ozone regime.

Conversely, to add or remove substances from the blacklist or to modify the institutional structure of the regime (e.g. adoption of the non-compliance procedure or creation of the Multilateral Fund), the Protocol must be amended. The process of *amendment* is much more labored than that of an adjustment. If all efforts to reach consensus have been frustrated, amendments can be adopted by a two-thirds (three-fourth for the Vienna Convention) majority vote of the parties present and voting. Yet, entry into force is not automatic but is subject to ratification by a minimum number of states (usually 20). On average, amendments to the Montreal Protocol have entered into force about two years after their adoption. Most importantly, they do so only for those states that have ratified. This means that at any given time, there are different groups of states bound by different proscription lists and -timetables. As an illustration, at the time of this writing, 176 states have ratified the Vienna Convention, 175 the Montreal Protocol, 140 the London Amendments, 107 the Copenhagen Amendments and only 37 have ratified the Montreal Amendments. Moreover, the Beijing Amendment have only been ratified by Chile and have therefore not yet entered into force.

Finally, it must be remembered that one state cannot ratify an amendment unless it has also ratified all previous amendments (including the Vienna Convention and the Montreal Protocol). Moreover, phase-out schedules do not adapt to the date of ratification by states. In other words, if a developed country, which hitherto remained aloof of the ozone layer protection effort, decided to accede to the Montreal Protocol and the London and Copenhagen amendments (which mandate phasing-out of CFCs by 1996) in 1995, it would only have a few months to bring itself to compliance. Hence, the overall structure of the normative regime resembles a pyramid, with a handful of forerunners that set the pace and an increasingly larger group of states that is spurred by the bans in trade of controlled substances with non-parties to the relevant protocols and amendments and by the rapid approach of unstoppable phasing-out deadlines.

3.1 London Amendments (1990)

The Second Meeting of the Parties to the Montreal Protocol was held in London in 1990. On the basis of the scientific data pouring in, the parties agreed to speed up the phasing-out of the substances targeted by the Montreal Protocol (which called for total elimination of certain CFCs and halons by 2000), and to include other

CFCs in the blacklist, as well as two substances widely used as solvents: *carbon tetrachloride* (with a phase-out deadline of 2000) and *methyl chloroform* (with a phase-out deadline of 2005).

Yet, most significantly, the London Amendments established the Multilateral Fund to 'meet all agreed incremental costs of [article 5] Parties in order to enable their compliance with the control measures of the Protocol' .

3.2 Copenhagen Amendments (1992)

In the meantime, new studies indicated that the ozone layer was thinning twice as fast as previously expected over highly populated regions of the Northern Hemisphere. It was also thinning over a larger area than was previously thought. As a result, in 1992, the parties to the Montreal Protocol decided to substantially overhaul the list of controlled substances and time-lines. First, the timeline for the complete phasing-out was pushed up to 1996 for CFCs, to 1994 for halons, and to 1996 for carbon tetrachloride and methyl chloroform. Second, some new substances were added to the list. A new group of 34 largely theoretical substitutes for halons, *hydrobromofluorocarbons* (HBFCs), which had been identified by scientists as potentially powerful ozone destroyers and were still not widely used, were targeted for total elimination by 1996. This was a significant development because for the first time negotiators were trying to pre-empt development of a sizeable market of new ODS.

Third, as of 1996, a freeze was placed on *hydrochlorofluorocarbons* (HCFCs) with the object of eliminating them by 2030. These substances had been developed in the 1980s as substitutes for the CFCs, but it had soon become evident that, although their ozone depletion potentials ranged from 2% to 14% from that of the principal CFCs, they nonetheless could significantly contribute to ozone-layer depletion. Still, because many industries had invested substantial amounts in the development of these cleaner alternatives to CFCs (especially in the USA), the problem was to set a phase-out date that was not too early to discourage their development as substitutes, but not too late to increase unacceptable risks for the ozone layer.

Finally, for the first time *methyl bromide* appeared on the list of controlled substances only to come back again and again in negotiations during subsequent meetings. Methyl bromide is a broad-spectrum fumigant used to combat insects, fungi, bacteria, nematodes and weeds, and it is used both on plants and for pre-shipment applications. The chemical is relatively inexpensive to produce and is used in a variety of climates for a variety of crops, mostly export ones. Due to these considerations, and because no one chemical is known to be able to replace methyl bromide for all uses, the agricultural industry was wary of eliminating it. Despite having an ozone-depleting potential far higher than that of CFCs, and a potentially large market in developing countries, all that could be agreed in Copenhagen was that developed countries were to freeze their production and consumption of methyl bromide by 1995 on the basis of the 1991 baseline.

Finally, as parties were accelerating the phase-out, ensuring compliance with the Montreal Protocol obligations was becoming all the more essential. Thus, as in London, another essential component was added to the ozone layer protection regime: the Implementation Committee and the so-called non-compliance procedure

(NCP).

3.3 Vienna Adjustments (1995)

Ten years after signing the Vienna Convention, the parties to the Montreal Protocol met again in the Austrian capital. This time the list of controlled substances was not further expanded and only very slow progress was made in the phasing-out of ODS. Small adjustments were made to the phasing-out schedule of HCFCs for developed countries, while developing countries agreed to a diluted phase-out plan, whereby they committed to freeze HCFCs by 2016 on the 2015 base-level, and to eliminate them by 2040 (sic!). Some greater progress was made on methyl bromide. Unlike what occurred at Copenhagen, developed countries agreed on a phase-out plan by 2010 (1991 baseline), while developing countries agreed on a freeze by 2002, using as a baseline the average of the calculated annual level for the period 1995–1998. Still, use of methyl bromide was allowed at levels necessary to meet 'basic domestic needs' of developing countries.

At Vienna, the non-compliance procedure was given its first serious test. In a joint statement, Russia, Belarus, Bulgaria, Poland and Ukraine expressed concern about their capability to be in full compliance with the Protocol obligations by 1996, due to the impact that the transition to a market-based economy was having on their industries. The five parties, led by Russia, originally intended to submit their request for a special five-year grace period directly to the Meeting of the Parties. One issue that arose was that Russia, due to its high-levels of ODS production and consumption, did not qualify as a developing country despite the long and deep recession that its economy underwent during the 1990s. It was therefore not eligible (as are most other countries in economic transition) to receive preferential treatment from developing countries or financial assistance from the Multilateral Fund.

The five countries' request was treated as a self-submission, and rerouted through the Implementation Committee and the non-compliance procedure. At its twelfth meeting, just before the Vienna Meeting, the Implementation Committee sought to agree with the Russian delegation on an approach to responding to Russia's likely non-compliance that could be recommended to the Meeting of the Parties for adoption. Russia and the Committee failed to agree, especially on monitoring issues and international trade in ODS. After long debates, the Committee's recommendation (a mix of trade restrictions and financial help) went forward to the seventh Meeting of the Parties without Russia's full agreement.

The Meeting of the Parties adopted the Committee's Report, requiring not only better data reporting, but also reporting on planned actions to prevent re-exports from the Commonwealth of Independent States to any party of the Montreal Protocol. The Report was adopted by the Meeting of the Parties notwithstanding Russia's objections to certain points (namely trade restrictions).

Since Russia is one of the largest world producers and consumers of ODS and accounts for over 60% of the consumption of controlled substances in economies in transition, it is the only producer of controlled substances and the main supplier of ozone depleting substances to at least 20 of the countries with economies in transition. Russia's request put the non-compliance procedure to its most severe test. The incident cast serious doubts on the capacity of the regime to keep certain large

developing countries, such as China, India and Brazil, on track with their impending phasing out-obligations.

3.4 Montreal Amendments (1997)

The ninth Meeting of the Parties to the Montreal Protocol revolved around two main issues: first, the long debated issue of the phasing-out of methyl bromide, and second, the increasing concern about the booming black-market and illicit trade in ODS.

In Montreal, developed countries' phase out of methyl bromide, set in Vienna for 2010, was brought forward to 2005 (with exemptions for pre-shipment and quarantine uses) with interim reductions of 25% by 1999, 50% by 2001, and 70% by 2003. Developing countries, which had previously only committed to a freeze by 2002, agreed to a 20% reduction by 2005 and a phase-out by 2015. As part of the deal, developed countries agreed to provide $25 million per year through the Multilateral Fund for methyl bromide phase-out activities, including research into alternatives.

Yet, the most momentous development registered in Montreal was the decision to develop a licensing system to help governments track international trade in CFCs and discourage illegal sales. The licensing system was set to take effect on January 1, 2000. A large black market had been rapidly developing, fuelled, on the one hand, by the entry into force of the accelerated phase-out date (1996 for developed countries) and on the other, by industries, mainly in Russia, which were illegally producing chemicals in excess of their quota and selling the remainder for hefty fees. Moreover, the fact that developing countries could produce and consume legally CFCs until the beginning of their freeze in 1999 created further demand and supply. The system required the parties to assist each other in preventing illegal traffic and facilitate the exchange of information between importing and exporting countries.

3.5 Beijing Amendments (1999)

The most recent Meeting of the Parties was held in November 1999 in China, the country which, with the phasing-out of CFCs and halons in developed countries, has become the largest producer and consumer of ODS in the world. Unsurprisingly, the single most important element of negotiation during the meeting was the replenishment of the Multilateral Fund. The ten years grace period granted to developing countries by the Montreal Protocol had expired a few months before (July 1999), setting into effect the freeze of several ODS, activating reporting and controls requirements, and making imminent the beginning of their phasing-out. Eventually, developed countries agreed to contribute $440 million (plus $35.7 million in late payments carried over from the previous budget) over the 2000–2002 triennium .

European countries resumed the effort towards the phasing-out of HCFCs despite continuous resistance from the US and some developing countries. The result was a compromise that created different timetables for the freeze and phasing-out of HCFCs, both in production and consumption. Specifically, since by 2004 industrialized countries will have to freeze HCFC production (consumption was

frozen by the 1996 Vienna Amendments) at the level of the average production and consumption in 1989 plus 2.8% of the average of production and consumption of CFCs in the same year. Conversely, developing countries will have to freeze HCFC production by 2016 (under the Vienna Adjustments it is that same year that they must also freeze consumption). In addition, the EU was able to reach agreement on the inclusion of HCFC trade controls between parties (controls which hitherto had been mainly applied to CFCs and halons), and on a ban on HCFC trade with countries that had yet to ratify the 1992 Copenhagen Amendment (introducing HCFC phase-out).

Finally, the Beijing Amendments preempted the use of *bromochloromethane*, a new ozone-depleting substance that some companies had sought to introduce into the market in 1998, by mandating its phase-out by 2002.

3.6 The Current State of Play of Obligations under the Montreal Protocol and its Adjustments and Amendments

In short, these are the phases that have slowly expanded the obligations contained in the Montreal Protocol. During the last decade, obligations have been gradually thickened and phasing-out accelerated, creating an intricate normative web. Moreover, there have also been a number of alterations to control measures and reporting requirements, which, for the sake of brevity have not been touched upon here.

Table 1. Substances Targeted by the Montreal Protocol and its Amendments and phasing-out schedules.*Production*= total production minus amounts destroyed or used as chemical feedstock.*Consumption*= production plus imports minus exports. Trade in recycled and used chemicals is not included in the calculation of consumption to encourage recovery, reclamation and recycling.**N.B.** Under the Montreal Protocol and its amendments, allowances (of approximately 10 to 15% of base level production) to meet basic domestic needs are granted. Even after phase-out, both developed and developing countries, are permitted to produce limited quantities in order to meet the essential uses for which no alternatives have yet been identified.

On the whole, the Montreal Protocol and its successive adjustments and amendments controls and mandates the phase-out of 96 chemicals. Whether a State is bound to phase-out a particular substance according to a given schedule depends in the first place, upon the ratification of the relevant amendment, and second, upon the entry into force of the amendment itself. The London, Copenhagen and Montreal amendments entered into force (for parties that have ratified them) on August 10, 1992, June 14, 1994 and November 10, 1999, respectively. The Beijing amendments have not yet entered into force.

To summarize, *developed countries* must completely eliminate the production and consumption of halons by 1994; CFCs, carbon tetrachloride, methyl chloroform and HBFCs by 1996; bromochloromethane by 2002; and methyl bromide by 2005. They must also freeze consumption and production of HCFCs by 1996 and 2004 respectively, totally phasing-out these substances by 2030.

Developing countries must eliminate production and consumption of HBFCs by

1996; bromochloromethane by 2002; CFCs, halons and carbon tetrachloride by 2010; and methyl chloroform and methyl bromide by 2015. Finally, the production and consumption of HCFCs must be frozen by 2016 and completely phased-out by 2040. The phase-out schedules cover both the production and consumption of the target substances (with the exception of HCFCs, for which a distinction was drawn between production and consumption in Beijing It should be stressed that, under the Montreal Protocol and its amendments, allowances to meet basic domestic needs are granted (of about 10 to 15% of base level production), and that even after phase-out, both developed and developing countries are permitted to produce limited quantities in order to meet the essential uses for which no alternatives have yet been identified (for example, the use of CFCs in metered dose inhalers for asthma).

Finally, it must be noted that the Montreal Protocol and its Adjustments and Amendments simply set a floor for international goals and standards. States are free to phase-out more substances than those targeted by the Ozone Layer regime and/or to reach its objectives ahead of schedule. Several developing countries have done so in the past, and several declarations and resolutions attached to the Amendments and Adjustments bear witness to the willingness of States to surpass and exceed their targets.

4. Future Challenges 

In sum, two distinctive periods in the development of the ozone layer protection regime can be identified. During the 1980s policy-makers recognized the alarm launched by scientists and laid the first institutional foundations. During the 1990s, worldwide research efforts accelerated and an increasing number of substances, which hitherto had been considered innocuous and extremely useful, were proscribed. Earnest phasing-out efforts began in developed countries, with developing countries keeping a watchful eye on the process.

The outlook for the 2000s is mixed. Although scientific research into the dynamics of ozone depletion continues unabated, it is unlikely that other ODS will be singled out and added to the list of controlled substances. The major culprits have been identified. However, the danger is that new substances with substantial ozone depleting potential (such as *n-propyl bromide*) will be invented and marketed. In Beijing, the European Union suggested that parties consider an expedited procedure for adding new substances to the control regime without the need for amendments and ratification. The idea was met with opposition from several parties, and was postponed for consideration in the future.

In the next few years, efforts will likely be concentrated on ensuring compliance and strengthening control over the production and consumption of ODS, particularly in developing countries and economies in transition. The ozone regime has not yet been put to the test of handling the phasing-out process in developing countries. The organs of the regime will now have to bear the burden numerous reports and ensuring effective monitoring in more than 170 countries. Moreover, developing countries have so far had the benefit of the doubt as to their commitment, but the beginning of CFC and halon phasing-out schedules will put them to the test. The struggle between developed and developing countries over financing of ozone protection projects and activities will probably remain a centerpiece of the debate

during the next decade. The amounts made available by developed countries have stagnated since 1994 (to about $440 million). But as cheap and cost-effective emission measures are exhausted, decreasing returns will inevitably require increasing levels of financing.

Among countries with economies in transition, Russia's continuing non-compliance is only the most visible concern. Incomplete and faulty reporting on the amounts of ODS produced, consumed, imported and exported, coupled with a flourishing black market and smuggling, is a serious issue that will likely remain high on the agenda of both the Implementation Committee and the Meeting of the Parties.

Another major area of concern is the slow pace with which amendments to the Montreal Protocol are ratified and the regime's lack of universality. About 175 states have ratified the two pivotal instruments of the regime: the Vienna Convention the and Montreal Protocol. Afghanistan, Iraq, Somalia and Taiwan are some of the countries that for obvious political reasons, have not ratified these agreements. 141 countries have ratified the London Amendment, whereas only 108 have ratified the Copenhagen Amendment (which introduced controls on methyl bromide). Figures fall drastically for the Montreal (39 ratifications) and the Beijing Amendments (just one so far). It took more than ten years for the Montreal Protocol to reach quasi-universal acceptance and there is no reason to think the amendments will be ratified at a faster pace.

However, can the ozone layer wait for universal ratification? There is a significant time lag between the phasing-out of production and the beginning of a decrease in ODS in the atmosphere. ODS have varying decay times. Some, like methyl bromide, decay in less than a year. CFCs can take 50 (CFC-11) to 1700 years (CFC-115). HCFCs, which have substituted CFCs, decay in 1.4–19.5 years. Halons can resist 65 years and carbon tetrachloride, 42. Because of this, stratospheric concentrations are still increasing, despite declining emissions of CFCs. The later ODS are phased-out the more they accumulate in the atmosphere to impart their devastating effects far in the future. In November 1999, on the eve of the Beijing Meeting, UNEP announced yet another hole over Antarctica, the largest ever, at 22 million square kilometers, or twice China's size.

Yet, it seems we are on the right track. According to the Ozone Secretariat, in 1986 the total consumption of CFCs worldwide was approximately 1.1 million tons. By 1998 this had decreased to approximately 156 000 tons. The bulk of the 1986 total was consumed by developed countries, but during 1998, this group consumed just 22 000 tons, including exemptions approved by the parties. During the same period, developing countries increased their consumption by approximately 0.6%. Scientists on the assessment panels, predict that, assuming the Montreal Protocol is fully implemented (and that their calculations are right and the data complete and correct) ozone depletion will reach its worst point during the next few years and then gradually improve until it returns to normal near the year 2050.

Finally, during recent years there has been growing concern over the interaction between the ozone protection regime and the one created by the Climate Change Convention. The two regimes pursue consistent objectives. Indeed, global warming slows the ozone layer's pace of recovery by warming up the troposphere and cooling down the stratosphere (see, 2). However, the advancements in ozone

protection have been made possible because science and industry have been able to develop and commercialize alternatives to ozone-depleting chemicals. Substitutes have proved particularly important in electronics. The foam-blowing sector has made use of water, carbon dioxide and hydrocarbons, as well as HCFCs. The refrigeration and air-conditioning sector has resorted to HCFCs as interim alternatives, yet new equipment is increasingly relying on potential non-ozone–depleting substances, such as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), ammonia and hydrocarbons. Nevertheless, these substances can exacerbate the greenhouse effect. HFCs and PFCs are two of the six substances targeted by the Kyoto Protocol to the Convention on Climate Change. Because climate change and ozone layer problems are interlinked, sharing a number of common physical and chemical processes, there is an urgent need for new strategies that will combat them simultaneously. Decisions made in one regime will have an impact on the attainment of the aims of the other.

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Glossary

Article 5 States/Non-Article 5 States : Article 5 States are those countries whose consumption of CFCs and halons was less than 0.3 kg per capita at the time of the Montreal Protocol's entry into force. They are generally referred to as 'developing countries'. Those states whose consumption of CFCs and halons exceeded 0.3 kg per capita at the time, are known as Non-Article 5 States or 'developed countries'.

CCOL : Coordinating Committee on the Ozone Layer

CFCs : Chlorofluorocarbons. Organic compounds that contain carbon, chlorine and fluorine atoms.

GEF : Global Environmental Facility

Halons : Organic compounds similar to CFCs that in addition to carbon, chlorine, and fluorine atoms, also contain bromine atoms. Bromine is 40–100 times more harmful to ozone than chlorine.

HBFCs : Hydrobromofluorocarbons. Organic compounds similar to CFCs and which contain bromine.

HCFCs : Hydrochlorofluorocarbons. Organic compounds similar to CFCs but less destructive to ozone. HCFCs consist of carbon, hydrogen, chlorine and fluorine. They are currently used as replacements for CFCs, but are to be phased out by the year 2020.

HFCs : Hydrofluorocarbons. Organic compounds containing hydrogen,

carbon and fluorine. HFCs that do not contain chlorine or bromine, are not harmful to the ozone layer. They will replace CFCs and HCFCs.

Methyl bromide : Organic compound that contains hydrogen, carbon and bromine (CH_3Br) which has ozone-depleting potential. It is a broad-spectrum fumigant used to combat insects, fungi, bacteria, nematodes and weeds in soil. It is used both on plants and for pre-shipment applications.

NCP : Non-Compliance Procedure.

ODS : Ozone-depleting substances, meaning any substance with ozone-depleting potential (e.g. CFCs, halons, HCFCs, methyl bromide).

OEWG : Open-Ended Working Group of the Parties to the Montreal Protocol.

Ozone : A molecule made up of three atoms of oxygen (O_3). Ozone absorbs certain bands of ultraviolet light (UV).

Ozone layer : The ozone that is found in the stratosphere.

Ozone hole : The portion of the stratosphere in which ozone levels are greatly diminished. Currently the largest hole can be found above Antarctica.

Ozone protection regime : The set of international institutions, norms and regulations established to prevent ozone layer depletion.

PFCs : Perfluorocarbons. Human-made chemicals composed of carbon and fluorine only, such as perfluoromethane (CF_4) and perfluoroethane (C_2F_6). They are CFC substitutes and are used as a purging agent for semiconductor manufacture. They are also by-products of some industrial processes, such as aluminum smelting and uranium enrichment procedures. PFCs are greenhouse gases.

Stratosphere : A region of the Earth's atmosphere that extends above the troposphere and below the mesosphere (beginning 8–18 km or 5–11 miles above the Earth's surface, and extending to about 50 km, 30 miles). Temperatures increase with elevation in the stratosphere.

UNEP : United Nations Environmental Programme.

UV : Ultraviolet light. Part of the light spectrum of wavelengths on the border of the x-ray region just beyond the violet in the visible spectrum. The sun produces ultraviolet rays, which are commonly split into three bands: UV-A, UV-B, and UV-C. UV-A is not absorbed by ozone. UV-B is mostly absorbed by ozone. UV-C rays are completely absorbed by ozone and normal oxygen.

WMO : World Meteorological Organization.

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Useful websites

Http://www.unep.org/ozone/ [The Ozone Secretariat website, which. is the starting line for any research. It contains all the basic documents concerning the ozone regime, together with the Reports of the various regime organs. The site is also available at http://www.unep.ch/ozone/].

Http://www.unmfs.org/ [Official website of the Multilateral Fund]

Http://www.gefweb.org/ [Official website of the Global Environmental Facility]

Http://www.uneptie.org/ozonaction.html [Official website of the Ozone Action Programme of UNEP. It contains an interesting and constantly updated analysis of trends in consumption and production of ODS in developing countries]

Http://www.nas.nasa.gov/Services/Education/Resources/TeacherWork/Ozone/Ozone.homepage.html [Excellent web page made available by NASA. It provides a general overview of the ozone layer depletion phenomenon]

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