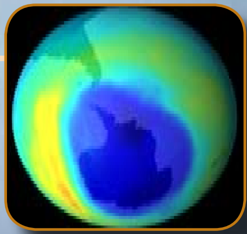

The Montreal Protocol

air

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Luxembourg: Office for Official Publications of the European Communities, 2007

ISBN 978-92-79-05389-4

Printed in Belgium

Printed on recycled paper that has been awarded the EU eco-label for graphic paper

(http://ec.europa.eu/environment/ecolabel)

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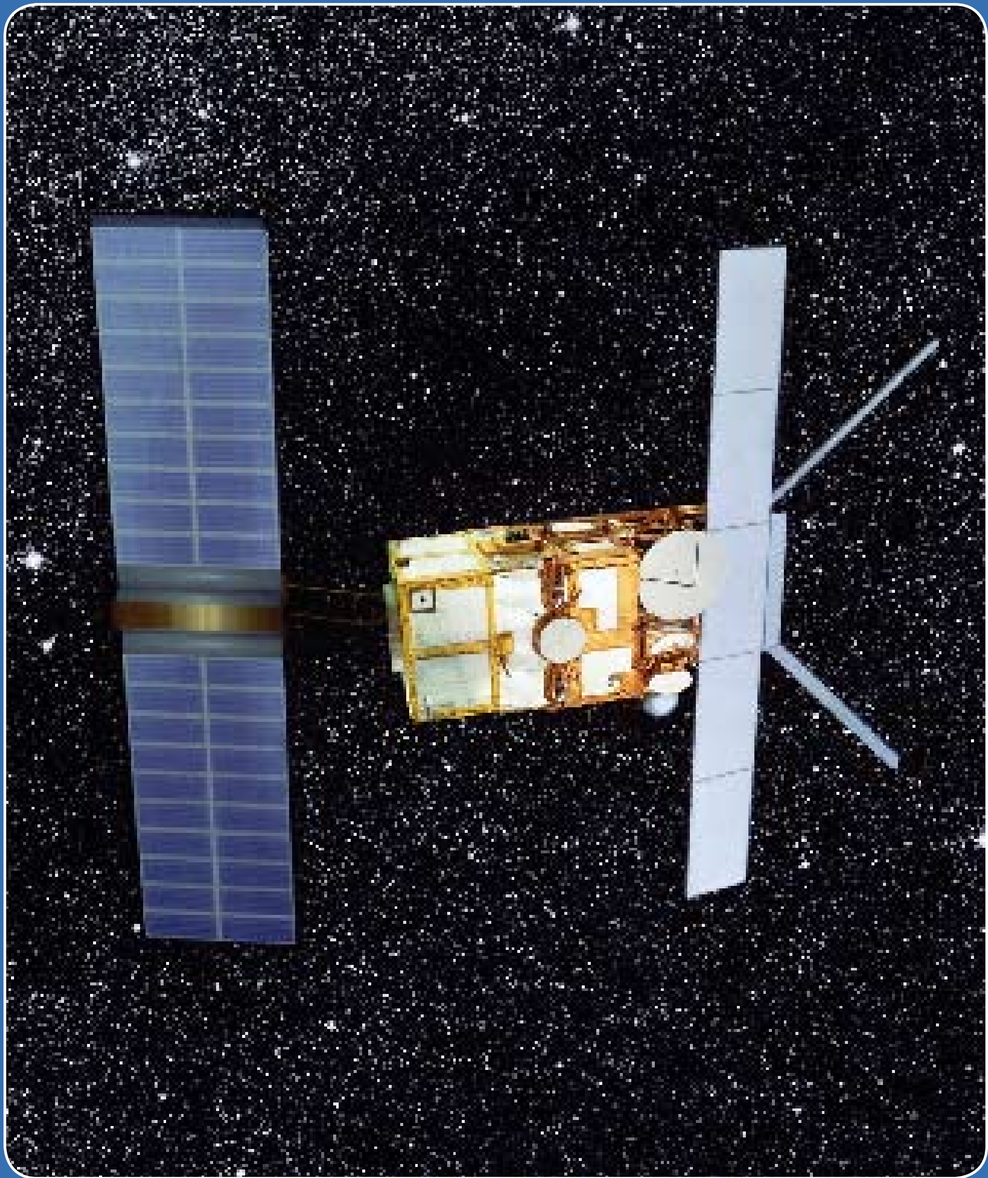


ERS-2 satelite monitoring stratospheric ozone

Keeping up the tempo of ozone protection

The depletion of the ozone layer by man-made chemicals was discovered in the mid-1970s. It was once described by the Nobel prize-winning scientist Paul Crutzen as "the worst disaster to hit the global environment". The international response embodied in the Montreal Protocol has been widely regarded as the most successful environmental protection agreement ever reached to date. The Protocol has contributed significantly to reversing a problem with grave implications for life on earth.

Signed in 1987, and amended a number of times since, the Protocol has done much to control ozone-depleting chemicals and replace them with safer alternatives. Early on the focus was on reducing and phasing out chlorofluorocarbons (CFCs) found in spray cans and refrigerators. CFCs were identified early on as the biggest ozone-depleting substances. Thanks to the Protocol CFCs are no longer used in these applications.

In a similar manner the use of methyl bromide as a pesticide (another important ozone-depleting chemical) has been largely phased out in developed countries and progress is being made in developing countries. And halon – another powerful ozone-depleting substance used mainly in fire-fighting applications – has been widely banned in developed countries as alternatives have become available.

But despite all these efforts the hole in the ozone layer over the Antarctic in October 2006 was the largest ever recorded. While ozone depleting emissions are currently decreasing, the latest assessments suggest that the Antarctic ozone will not return to pre-1980 levels until late in the 21st century. This is significantly later than earlier assessments suggesting 2050.

While the Protocol has achieved much, there is the need for new impetus in international negotiations. There is no time for complacency though. Indeed, the timely recovery of the ozone layer remains heavily dependent on fulfilling commitments already agreed and on urgently tackling upcoming challenges.

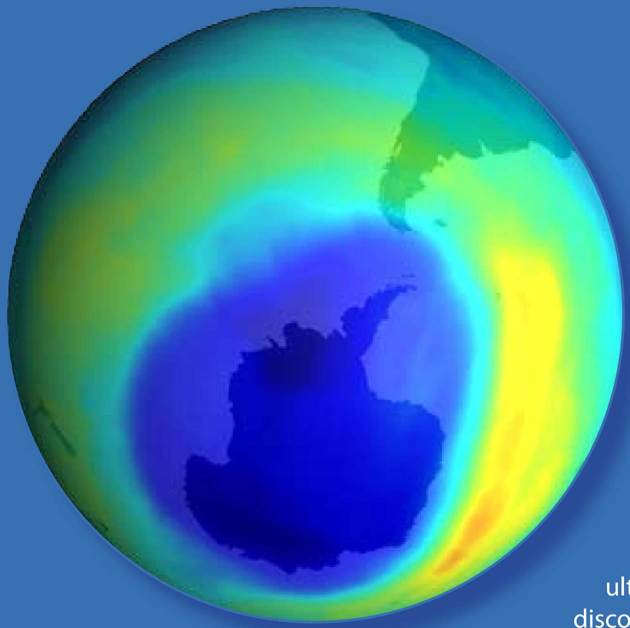
There are still a number of areas where ozone depleting substances are used and that are not covered by the phase-out schedules contained in the Protocol (e.g. methyl bromide use for quarantine and pre-shipment). Another area of concern is the continuing need for exemptions on substances such as methyl bromide and CFCs. Progress must be made to address critical sectors and to reduce exemptions. There is also cause for concern with the growing evidence of significant illegal trade in banned chemicals.

Transitional solutions put in place in the past have also posed challenges. HCFCs, which have replaced CFCs, have been found to destroy ozone while also contributing to global warming, albeit at a significantly lower level than CFCs. Their use in emerging economies is growing at an alarming pace thus jeopardising the recovery of the ozone layer and adding to the problem of climate change. Likewise, the next generation of chemicals, HFCs, do not damage the ozone layer but significantly contribute to global warming. The uptake of more environmentally-friendly alternatives – some of which are already coming onto the market – is becoming an urgent priority.

There are still large volumes of ozone-depleting chemicals trapped in old equipment and building materials. When released, these so-called "banks" can have a significant impact on the ozone layer and on global warming. It is vital to prevent the chemicals in these "banks" from being released into the atmosphere and to stop their build-up by promoting greater use of the latest technologies.

In light of these challenges, the European Union's ozone-protection policies – already ahead of the Montreal Protocol – will continue to evolve with the review of the European regulation on ozone-depleting substances launched early 2007. The EU will thus continue to drive the worldwide move towards further controls.

Representatives from around the globe, during their meeting in Montreal in September 2007 for the 20th anniversary of the Protocol and subsequent meetings, will need to consider the new challenges we face. The strong and united approach demonstrated thus far by the global community will have to continue.



The ozone layer, a layer of gas in the upper atmosphere, performs the vital role of protecting humans and other living things from the harmful ultraviolet (UV-B) rays of the sun. In the 1970s scientists discovered that certain man-made chemicals could potentially destroy ozone and deplete the ozone layer. Further research found that the growing production and use of chemicals like chlorofluorocarbons (CFCs) in aerosol sprays, refrigeration, insulation and air conditioning was contributing to the accumulation of ozone-depleting chemicals in the atmosphere. They also observed that an 'ozone hole' was developing above the Antarctic.

A thinning ozone layer leads to a number of serious health risks for humans. It can cause greater incidences of skin cancer and cataract of the eye, with children being particularly vulnerable. There are also serious impacts for biodiversity. Increased UV-B rays reduce levels of plankton in the oceans and subsequently diminish fish stocks. It can also have adverse effects on plant growth, thus reducing agricultural productivity. Another negative effect is the reduced lifespan of certain materials.

A distinction must be made between ozone in the stratosphere – the part of the atmosphere about 15 km above the earth's surface (commonly referred to as the ozone layer) – and ground-level ozone. Ozone-depleting substances only affect the stratospheric ozone layer. While an abundance of ozone in the ozone layer protects humans by shielding us from harmful UV radiation, excess amounts of ozone at ground level are bad for the health, as ozone is toxic for humans due to its strong oxidant properties. Conversely, increased levels of UV-B rays increase ground-level ozone.

The Vienna Convention and Montreal Protocol – A history of strong action

The discovery in the 1970s of the problem of ozone depletion by man-made chemicals led to decisive and swift global action. The international community adopted the Vienna Convention in 1985 followed by the Montreal Protocol in 1987. Today the Montreal Protocol is still seen as a model of an innovative and dynamic response made possible by the concerted efforts of a wide range of stakeholders such as scientists, policy-makers, economists, engineers, and lawyers.

Twenty years after its launch the Montreal Protocol is recognised as the most successful multilateral environmental agreement (MEA). It has almost universal acceptance among all states worldwide with 191 countries having ratified it as of February 2007.

The latest reports confirm that it has led to phasing out of about 95% of the consumption of ozone-depleting substances (ODS) listed in the agreement. In turn, this has led to the prospect of the ozone layer recovering by 2050 to 2075, albeit with significant risks of further delays.

Some concrete results achieved at international level include:

» CFCs – Their use in aerosols, refrigerators, as solvents or in building insulation is largely non-existent and alternatives have emerged. In general, developed countries led the phase out and found it easier than expected to identify alternative solutions. The foam-blowing sector has largely replaced CFCs with water, carbon dioxide and hydrocarbons, and HCFCs. The refrigerator and air conditioning sectors have replaced CFCs with HCFCs which have in turn been replaced by non ozone-depleting HFCs such as ammonia and hydrocarbons.

» Halons – Other substances such as carbon dioxide, HFCs, inert gases, water, foam and dry powder are now widely used instead of halons in fire-fighting systems. Alternative approaches such as good fire-prevention practices, use of fire-resistant materials and better-building design have significantly reduced the need for halon systems. The total phase-out in industrialised countries was achieved by the end of 2003.

» Methyl bromide – In the past more than 70,000 tonnes of this powerful ozone-depleting substance were used annually as a pesticide for treating soil, grain, wood, packaging materials and food products. It was included in the scope of the Montreal Protocol in 1992. All countries agreed to a complete phase-out of the substance as a pesticide by 2005 for developed countries and by 2015 for developing countries. However, methyl bromide use for quarantine and pre-shipment still falls outside the scope of control measures while some critical uses where no technically or economically feasible alternatives exist remain eligible for exemptions. The EU has almost phased out all exemptions for methyl bromide use and is calling on others to follow its example.

Furthermore, the phasing out of ozone-depleting substances has helped to fight climate change since many of these chemicals are also powerful greenhouse gases. According to a recent study, the phasing out of substances under the Protocol led to more reductions in greenhouse gases than what is foreseen under the Kyoto Protocol. If further measures are to materialise - accelerated phase out of HCFCs - additional climate benefits could be reaped, possibly as much as taking out again the entire reduction potential of Kyoto.

Groundbreaking

The Montreal Protocol has been both groundbreaking and complex for a number of reasons. One of its most important features is the dynamic process in which the controlling of all ozone-depleting substances is based on the latest scientific, technological and economic information. Another is its focus on controlling production and trade rather than the emissions released into the atmosphere. Since the signing of the Protocol several significant amendments have been made. This includes expanding the list of regulated substances and the introduction and subsequent acceleration of phase-out dates for regulated substances.

Because CFCs and other ozone-depleting substances ultimately find their way into the stratosphere – independent of their use – it was deemed appropriate to control their production and trade rather than specific uses. This also allowed using market forces to introduce available alternatives more quickly. Another unique feature of the Protocol – important to build international support – was the threat of trade sanctions against non-signatory countries and sanctions against signatory countries not complying with the Protocol.

A major achievement was made in London in June 1990 when the concept of mutual dependence between developed and developing countries and the principle of shared but differentiated responsibilities was made concrete by the creation of the Protocol's financial mechanism, the Multilateral Fund (MLF). The MLF has been providing substantial financial and technical assistance to developing countries on the basis of agreed control measures. In December 2005 the funding mechanism was renewed with a budget of over €340 million for the years 2006 to 2008. To date the MLF has channelled over €2 billion to developing countries. It has helped establish national legislation to implement the Protocol and has converted entire industries towards more environmentally-sound practices.

Panels

Another key feature of the Protocol is its sound institutional arrangements which have helped reach solid and timely decisions on often complex matters. Under the Protocol, three assessment panels provide periodic assessments on scientific, environmental, and technological and economic developments (this third panel has several subgroups relating to different groups of substances or uses). They have been key to the success of the Protocol providing independent and reliable expertise on which to base changes.

Six assessment reports were published between 1989 and 2006. In addition to these, the Technology and Economic Assessment Panel produces yearly progress reports to review the status of alternatives and technologies and to address the various requests from signatory countries, including so-called "essential-use exemptions" and "critical-use exemptions" for substances such as CFCs and methyl bromide.

Prof. Klaus TöpferGiving a speech at the UN Open Ended Working Group of the Parties to the Montreal Protocol in Nairobi in June 2007

1920s – Thomas Midgeley invents chlorofluorocarbons (CFCs). These find a variety of industrial uses such as aerosol propellants, refrigeration units and insulation.

1930 – Sydney Chapman discovers the basic physical and chemical processes that lead to the formation of the ozone layer.

1950s – Research links certain chemicals such as naturally-occurring free radicals with the removal of ozone from the atmosphere.

1970s – Research links man-made chemicals and ozone depletion. The growing accumulation of ozone-depleting chemicals is discovered and linked to increasing production and use of CFCs and other chemicals.

Several countries move to eliminate the use of CFCs in aerosol spray cans.

1980s – International negotiations begin on controlling ozone-depleting substances (ODS).

Research continues to unearth the scale of the problem.

The ozone hole is discovered over the Antarctic.

1985 – 28 nations, including most of the major CFC producers, sign the Vienna Convention. It establishes a framework for negotiating international ODS regulations.

1987 – The Montreal Protocol is signed by 46 countries and comes into effect in 1989. The signatories agree to freeze production and consumption of CFCs in industrial countries at 1986 levels and reduce production by 50% by 1999. Production and consumption of three halons is to be frozen at 1986 levels from 1993.

1990 (London) – Amendments are made to add methyl chloroform, carbon tetrachloride and more CFCs. Phase-out of other CFCs and halons already in the Protocol is made stricter. A funding and technical assistance mechanism is created to help developing countries.

1992 (Copenhagen) – The CFC phase-out date is moved to 1995 and methyl bromide is added to the Protocol. A set of targets for the long-term phase-out of HCFCs, the replacements for CFCs, is set.

1995 (Vienna) – Targets are set for the phase-out of CFCs and halons in developing countries by 2010. A phase-out for HCFCs is set for 2030 in industrial countries and 2040 in developing countries. A phase-out of methyl bromide is set for 2010 in developed countries.

October 1995 – Paul Crutzen, Mario Molina and Sherwood Rowland share the Nobel Prize for Chemistry "for their work in atmospheric chemistry, particularly concerning the formation and decomposition of ozone".

1997 (Montreal) –The phase-out for methyl bromide is moved forward to 2005 for developed countries and set at 2015 for developing countries. A system of licences is established for trade in ODS.

1999 (Beijing) – Bromochloromethane is added to the phase-out schedule and controls on HCFCs is extended.

June 2005 – A hole in the ozone layer appears for the first time over the Czech Republic and Germany.

December 2005 (Dakar) and November 2006 (New Delhi) – a number of issues are addressed, including compliance with phase-out dates, exemptions to methyl bromide phase-out, process agent uses, continued medical uses of CFCs, budgetary issues and illegal trade.

June 2007 –Discussions start on accelerating the phase-out of HCFCs based on proposals submitted by six Parties.

International challenges ahead

Much has changed since the international community first agreed over 20 years ago to take action to control ozone-depleting substances. Continuing scientific research has further revealed the scale of the problem, which in many cases is bleaker than previously believed. But this has also brought about alternatives and new solutions. The Montreal Protocol will – and must – continue to adapt in light of new scientific information.

The latest information from the Scientific Assessment Panel's report in 2006 found that, even if complying with all present control measures, Antarctic ozone will only return to its previous levels some time between 2060 and 2075, up to 25 years later than earlier estimates. Meanwhile, the solutions put in place to combat ozone depletion have created their own set of challenges – such as illegal trade – which in turn require an international response.

The Montreal Protocol was amended on a number of occasions since it was originally signed in 1987. The dates set for the phase-out of many ozone depleting substances (ODS) have been brought forward as more research and new technology have been developed. According to the scientific panel, the technical and economic feasibility of further actions increased between 2002 and 2006. These actions include the accelerated phase-out of most ozone-depleting substances, the reduction of emissions from many applications, and the collection and safe disposal of chemicals still found in old equipment and buildings.

One of the major strengths of the international regime created by the Protocol is its ability to adapt. In the early days of the Protocol, the focus was on identifying ozone-depleting substances and on agreeing control measures. That is now done. In recent years, attention focused more in strengthening the implementation of control measures, a work that will need to be intensified to address various issues that have emerged. These include:

» **Critical/essential uses.** The overall quantity of methyl bromide used globally in soil fumigation has gone down substantially. However, sectors where no technically or economically feasible alternatives are available are still exempt from the rules. Compared to just 689 tonnes of methyl bromide authorised in the European Union in 2007 (down from 4 393 tonnes in 2005), a total of 8 472 tonnes was authorised by other developed countries (i.e. Australia, Canada, Israel, Japan, New Zealand and the United States).

  A number of medical applications such as treating asthma and other bronchial diseases are still exempt from the rules on CFCs. Alternatives have now been developed in some countries (including almost all EU countries), but incentives must be introduced to make the technology more widespread, particularly in developing countries.

» **Addressing the alarming growth of HCFCs.** Production and consumption of HCFCs in developing countries is set to double from current levels despite the already agreed 2016 freezing date and 2040 phase out date. HCFCs represent about 60 percent of the remaining ozone depleting substances in industrialised countries with overall quantities steadily decreasing. The bulk of currently achieved decreases are due to EU regulation which has a usage ban in place well ahead of the 2030 phase-out date applying to industrialised countries. To avoid further delays in the recovery of the ozone layer, there is a need to address this alarming increase by moving forward with the current phase out schedules.

» **Illegal trade.** There is evidence of a significant black market in ozone-depleting substances, with a trade flow from chemical producers in certain emerging market countries to western companies. A licensing system for chlorofluorocarbons (CFCs) was introduced

by the Montreal Protocol in 1995 but has proven to be insufficient to resolve all concerns. Currently, there is insufficient sharing of licence information between the parties and significant discrepancies remain between data declared by importing and exporting countries. The 2005 Meeting of the Parties to the Protocol held in Senegal agreed to monitor trans-border shipments of these chemicals. A subsequent study emphasised the efforts needed to establish a coherent system to combat trade in illegal chemicals.

» **Banks.** Although the use of chemicals such as CFCs in spray cans, refrigerants and insulation has been largely phased out, there are still vast quantities of these chemicals that can be found in old equipment and buildings. These represent a threat to the timely ozone recovery as well as a significant global warming potential (estimated to amount to about 3.5% of the total greenhouse gases emissions). Action is required to ensure that they are collected and disposed of safely.

» **Compliance.** Although some countries are going beyond their Protocol commitments, compliance is still a major issue in many countries.

» **Assessment.** Action is needed to assess new substances in light of the latest scientific information on their ozone depleting potential and on whether they need to be added to the list of controlled substances.

» **Exemptions for quarantine/pre-shipment.** To ensure goods for export are pest free, the numbers of quarantine and pre-shipment (QPS) applications are increasing rapidly in a number of areas. These applications continue to rely heavily on methyl bromide although more and more alternatives are becoming available. The EU calls on all countries to address this problem. Meanwhile, countries are urged to review their regulations with a view to removing the use of methyl bromide for QPS uses when an alternative treatment is available.

» **Linking ozone and climate policies.** The link between ozone and climate change must be addressed more fully. There is increasing evidence that changes in climate, ground temperature, levels of greenhouse gases and water vapour in the atmosphere will influence the recovery of the ozone layer. HCFCs have largely replaced CFCs in both developed and developing countries and their replacement with HFCs is now underway. Although HCFCs deplete the ozone less and HFCs not at all, both still have large global-warming potential. The next generation of ozone policies must focus on replacing these substances with more climate-friendly substances.

» **Increasing synergies across multilateral environmental agreements.** Where possible, increased synergies should be pursued between the Montreal Protocol and other international or multilateral environmental agreements (MEAs) such as the Kyoto Protocol on climate change, the Stockholm Convention on Persistent Organic Pollutants (POPs), the Basel Convention on waste, the International Plant Protection Convention (IPPC) and the Rotterdam Convention on chemicals.

The European Union at the fore front of efforts to phase-out ozone-depleting substances

The European Union and its Member States have ambitiously put in place solutions to the problems caused by ozone-depleting substances, often going beyond the requirements of the Montreal Protocol. The EU's early phase-out of HCFCs and a near phase-out of CFC and methyl bromide exempted uses have contributed significantly to the global phase-out of the worst ozone depleting substances. The EU will continue to be at the forefront in negotiating a strengthened framework in light of the latest scientific knowledge.

At EU level, a regulation to control ozone-depleting substances was adopted in 1994 and amended in 2000. Its provisions are stricter than those of the Montreal Protocol. They set out controls for the production, trade, use, and recovery of ozone-depleting substances and include detailed reporting requirements. The regulation also sets a legal basis for inspections and penalties while making way for new substances to be included into the control scheme.

The regulation includes an electronic licensing system for importing and exporting ozone-depleting substances (ODS) into and out of all EU Member States and also serves to prevent the illegal trade in ozone-depleting chemicals. The most recent changes to the regulation aim at improving co-operation between environmental and customs and health authorities and at encouraging Member States to find cost-effective sanctions for non-compliance.

EU Member States have ended the use of ozone-depleting substance in many industrial sectors. The EU legislation has been very effective in controlling ozone depleting substances and also acted as a driver for the development of innovative technologies such as the development of methyl bromide alternatives, new insulation foam-blowing agents, CFC-free metered dose inhalers for the treatment of asthma, and the creation of innovative fire fighting systems on board ships and airplanes which do not use halons.

Although chlorofluorocarbons (CFCs) and many of the other original ozone-depleting substances of concern are no longer produced and used in new equipment, thousands of tonnes of these substances are contained in existing equipment and buildings. In many cases, it is possible to recover and dispose of these "banks" of chemicals in a safe manner. This requires recovery systems developed in some countries to be applied more widely and for appropriate incentives to be put in place. Such actions will prevent the release of chemicals into the atmosphere and avoid significant environmental damage that would reverse much of the good work done so far. Also,

countries and customs authorities must make greater efforts in working together to prevent illegal trade and to close their borders to smugglers.

These and other topics will be studied during the review of the EU ozone regulation, scheduled for 2008. Moreover, the EU is currently overhauling its overarching waste legislation. Existing rules on waste cover a number of areas related to ozone-depleting substances, notably end-of-life electrical and electronic equipment, hazardous waste, waste shipments, construction waste and landfill. The links between these areas will need to be strengthened in the future to ensure that the treatment of harmful chemicals found in certain waste materials protects the ozone layer.

Austria promotes alternatives

Austria indicated early on to its industry that HCFCs were only an interim replacement for CFCs and provided incentives for companies to directly adopt alternatives, thus. avoiding a double phase-out.

Austria was one of the first Member States to move forward the phasing-out of HCFCs. In 1995 it adopted legislation banning the use of HCFCs in solvents and in the production of foams from 2000. Under these rules, the use of HCFCs in most new non-commercial refrigeration or air conditioning equipment was banned from 1996 and from 2002 for commercial equipment.

The Austrian regulation was stricter than the EU Regulation in a number of areas, especially on the sale of products manufactured before the date set by the European Union (e.g. 2010 for refrigeration and air conditioning uses) and in the Montreal Protocol (2030). Bans on uses of HCFCs for certain applications were also set.

EU acts on methyl bromide exemptions

Although methyl bromide was phased out as a pesticide in all industrialised countries by 2005, "critical uses" can be exempted where no economically or technically feasible alternatives exist. National authorities have made efforts to significantly reduce the amounts of methyl bromide being used while the European Union implemented a strategy to promote the development of alternatives and end exemptions as soon as possible.

In 2006 eight Member States – Belgium, France, Ireland, Italy, Poland, Spain, the Netherlands and the United Kingdom – requested critical use exemptions.

In Italy, the quantity of methyl bromide licensed for use in melon production went down from over 110 tonnes in 2005 to nil in 2007. Over the same period, the use of methyl bromide in the strawberries sector was reduced in Spain from 330 to nil and in the UK from 32 tonnes to nil.

Under the strategy, the EU sets limits on the amount of methyl bromide that can be used, imported and produced. The management of the system was made feasible by focusing on the number of fumigators as opposed to the number of farmers and food production facilities. In 2006 there were only 91 licensed fumigators across the EU.

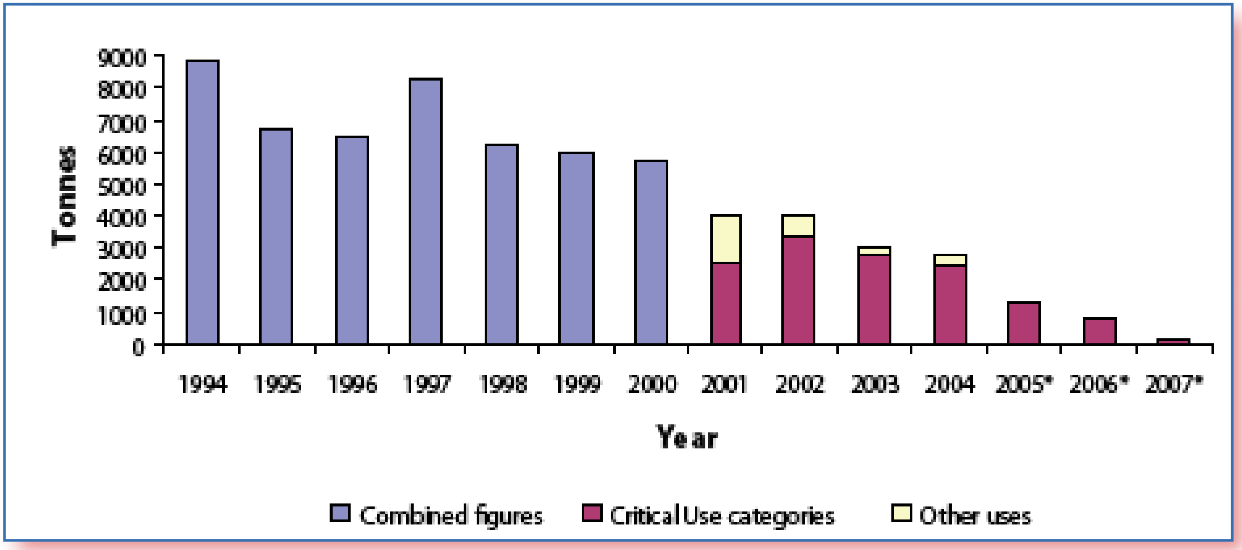
A number of EU funded research projects have promoted the development and uptake of alternatives, hence speeding up the phasing-out of methyl bromide. Examples include projects focusing on microwave fumigation (MICRODIS) and steam disinfestation (SOILPREP). Research in the field is also supported by additional funding from Member States, crop certification organisations and supermarkets.

Italy: finding alternatives to methyl bromide

With an annual use of 7 600 tonnes in 1995, Italy was second only to the US in the global use of methyl bromide. By 2006 it had reduced its use to 640 tonnes.

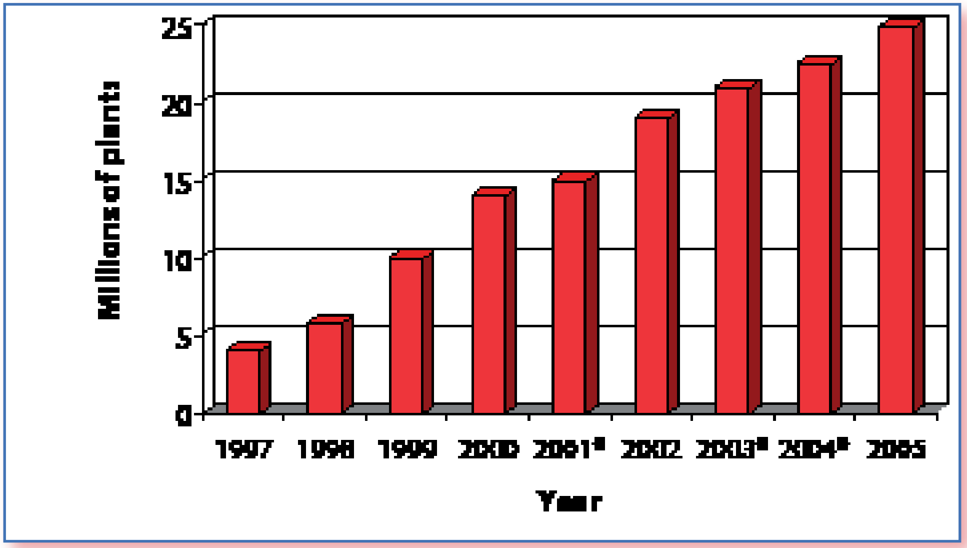
Italy grows around a third of Europe's vegetables. It is also the largest producer of horticultural crops in Europe with high value crops like tomatoes, strawberries, aubergines and ornamental plants. Production is centred in southern Italy, mainly in small and highly specialised and intensive systems. These conditions are particularly favourable for the build-up of pests in the soil thus creating the need for plant protection methods.

Methyl bromide consumption in Italy, 1994 to 2007



Source: Italian Ministry for Environment, Land and Sea

Consumption of cultivated plants in Italy, 1997 to 2005



Source: Italian Ministry for Environment, Land and Sea

The results achieved in Italy prove that ending the use of methyl bromide as a soil pesticide is possible and economically viable.

To successfully achieve the phase-out of methyl bromide Italy took a two track approach. In the short term, it focused on chemical alternatives. Yet at the same time, it emphasised the development of non-chemical alternatives for the longer-term. The most successful solutions consisted of several combined approaches:

- Soil solarisation, in combination with other chemical or non-chemical methods, particularly useful in southern Italy;
- Steam methods have been used mainly in the ornamental sector, although their wider application is limited due to economic and technical constraints;
- Pathogen-resistant hybrids varieties of many vegetables – particularly melons and peppers – are increasingly used.

By actively promoting the development and uptake of alternatives, Italy was able to replace methyl bromide completely on crops such as courgettes, lettuces, basil and watermelons from 2005 onwards. The phase-out was also largely completed at the same time for aubergines, melons and strawberries, with a few exemptions.

The most effective replacements for melon, strawberry and aubergine production were mixtures of 1,3-dicloropropene and chloropicrin, together with non-chemical treatments.

- Aeration for temperature control of grain;
- Use of phosphine gas with carbon dioxide for pest control;
- Storage in sealed and semi-sealed platforms, thus reducing the need for chemicals;
- Elimination of liquid insecticides.

Nordic Member States take joint action

The Nordic countries of Denmark, Finland, Iceland, Norway and Sweden have led the way in controlling ozone-depleting substances. Close cooperation between these countries began in 1987 with the creation of a "CFC group" under the auspices of the Nordic Council of Ministers.

The group focused on the coordination of national and joint projects and on exchanging information. The countries also worked closely together to present joint proposals during the negotiations of the Montreal Protocol.

Over the years, the Nordic Council of Ministers has financed a number of projects and reports looking at alternatives to ozone-depleting substances for a wide variety of applications. They include the use of halons for fire fighting, CFCs for cleaning electronic equipment, banks of chemicals, essential uses, CFC-recovery, alternative refrigerants, economic instruments for reducing CFC emissions, metal degreasing and alternatives to methyl bromide.

Cyprus phases out methyl bromide during the quarantine period of imported grain

In March 2007 the Cyprus Grain Commission was awarded a prize at an international pesticides conference for its efforts related to phasing out the use of ozone-depleting substances. Cyprus never used methyl bromide for pest control and has taken several steps to eliminate its use in imported and stored grains.

Since 1990, Cyprus successfully required the elimination of methyl bromide use on imports of grain shipments. The Grain Commission also acted as a catalyst for introducing a number of advanced environmentally-friendly technologies to protect stored grain and eliminate methyl bromide, including:

The Swedish phase-out of ozone-depleting substances

Sweden decided on a national phase-out plan for ozone-depleting substances (ODS) as early as 1988. The country has played a pioneering role in amending the Montreal Protocol.

In 2000, Sweden took the final step in phasing-out CFCs by banning their use in existing refrigeration and heat-pump equipment. An important measure to phase-out HCFCs came two years later when existing equipment could no longer be re-charged with HCFCs. All other ODSs and their uses are now prohibited unless an exemption has been issued by the Environmental Protection Agency.

Sweden has also been actively involved in creating experience-sharing networks in developing countries based on Nordic co-operation.

Solvents phase-out in Sweden

In Sweden the phase-out in the mid 1990s of ozone-depleting solvents in applications such as cleaning, degreasing, drying and as process agents was particularly successful. The measures adopted led to the quick adoption of alternatives by industries.

The hallmark of the Swedish phase-out was that the regulation controlled the uses of ODS rather than regulating emissions or consumption of the chemicals themselves. This allowed the continued use for several applications. For solvents, the main chemicals of concern were CFC-113, 1,1,1-trichloroethane, carbon tetrachloride (CTC) and a number of HCFCs.

The approach consisted in combining regulatory and economic instruments. From the start Swedish lawmakers declared that ODSs were to be phased out rapidly and entirely. A clear timetable set dates for the phase-out of given chemicals and businesses received financial incentives to take swift action. An import ban was put in place to make sure Swedish companies remained competitive and businesses did not relocate abroad.

Exemptions were possible, but at a cost. Applicants for exemptions had to pay a fee regardless of success and businesses were required to submit an action plan at the same time. If an exemption was granted the cost of the chemical per kilogram increased year-on-year. This served to limit the number of exemptions to about 70.

For cleaning and degreasing uses (excluding dry cleaning) nearly all chemicals were successfully phased-out by 1991, with only a few hundred kilograms exempted in the aerospace sector.

By the end of 1995, virtually all CFC-113 and 1,1,1-trichloroethane

chemicals were phased-out. By the end of 1995, there were no reported uses of HCFCs in the solvent sector. A year later, only 170 kg of all ODSs had exemptions in the solvent sector, mainly for defence applications.

By 1991, the use of CFC-113 for dry-cleaning decreased by about 30 percent. This decreased further when the industry developed techniques using perchloroethylene. All use of CFCs in this sector ended by 1995.

CFCs are also no longer used in the chemical processing industry. In 1996 and in the following two years, about 1 tonne was exempted while the chlor-alkali industry tested alternative processes on an industrial scale. The only current ODS exemptions for this type of use are in small-scale laboratory applications.

Denmark's national ODS phase-out plan

Denmark has had a national ozone-depleting phase-out plan since the early days of international action. By 1991 and 1995 this had resulted in the drop in consumption of ozone-depleting substances by 52% and 98% respectively compared to 1986 levels.

The Danish regime included a tax of 30 DKK/kg on CFCs and halons, which gave users the incentive to use alternatives and collect/recycle the chemicals. Legislation was designed to allow uses of ozone-depleting substances only until alternatives were expected to be available. A development programme helped to foster scientific and technological advances.

Spanish phase-out of HCFCs in foam insulation

The Spanish rigid polyurethane (PUR) industry successfully phased out the use of HCFCs in insulation foam at the end of 2003. PUR foam is used for thermal insulation, thus making buildings more energy efficient. The sector has enjoyed rapid growth in Spain. Today, about 60,000 tonnes of the foam are used annually by the construction industry. In total, an estimated area of 500 million square meters is insulated by this technology in Spain.

Historically, chlorofluorocarbon (CFC) gases were used in these foams because of their good insulation properties combined with their non-flammability. This led the sector to be one of the most significant users of ozone-depleting substances. The CFC gases in the foam were replaced by hydrochlorofluorocarbons (HCFCs) one year ahead of Montreal Protocol commitments which lead to a tenfold reduction in potential ozone-depletion and a substantial decrease in global warming. But, HCFCs also destroy ozone, albeit less then CFCs. Their use in foams was banned from January 2004 under the EU regulation covering ozone-depleting substances (ODS).

At the end of 2003, the main HCFC used in foam spray (HCFC-141b) was replaced largely by alternatives such as HFCs, notably HFC-245fa and HFC-365mfc which have an ozone-depletion potential of zero and a relatively low global warming effect. These gases have a higher global warming effect than other alternatives, but their superior insulation properties and reduced energy consumption made them the preferred choice.

Despite higher cost implications and initial difficulties in securing sufficient quantities of alternative chemicals, it was reported that the entire sector had adopted alternatives by the end of 2004 while still maintaining its competitiveness.

ODS banks: a stored up problem

Austria at the forefront of refrigerator recycling

In 2006, Austria collected and processed about 400 000 old refrigerators to ensure that ozone-depleting substances were not released into the atmosphere.

The amount of equipment collected and safely treated has been steadily rising since 2004, when lawmakers passed national legislation establishing a system that ensured refrigerators were collected at the end of their life cycle. Collection is free of charge

and the ODSs in their cooling circuits and foams are recovered and destroyed in a safe manner.

Before waste management businesses can be registered to deal with refrigerators, the quality of their treatment processes has to be tested on at least 1 000 devices. Recovery standards requires that at least 90% of the total quantity of CFCs in refrigerator has to be recovered and that the CFC content of recovered insulation material (PU-foam) has to be below 0.2% and below 0.1% for compressor oil.

The system also contributes to fighting climate change by doing away with a quantity of CFCs equivalent to about 1 million tonnes of CO2.

Luxembourg's waste collection system

The "SuperFreonsKëscht" is a joint action by Luxembourg's Environment Ministry and its communes to collect and recycle ODS-containing products such as refrigerators, air-conditioners and humidifiers at the end of their life cycle.

Through a partnership with the retail industry the initiative is helping to implement national legislation to dispose of electronic waste and develop state-of-the-art recycling procedures. It also provides information to the public and businesses on environmentally-friendly activities and energy efficiency.

http://www.superdreckskescht.lu/

Replacing halons in defence use

The military has historically been a major user of ozone-depleting substances in its facilities, vehicles, aircraft and naval vessels.

Replacing the ozone-depleting substances remains difficult for many military applications due to the demanding performance and safety requirements, particularly in high-risk and very confined, weight-limited spaces. However, defence departments from across Europe have acted quickly – working together and in partnership with industry – to research suitable alternatives in existing and new systems. Through the informal DEFNET network, environmental experts from national defence ministries share their experiences in military ODS replacement through conferences, joint projects and information exchanges.

An example of progress made in the military sector is the UK Ministry of Defence's work with its armoured fighting vehicles. Many of these originally used CFC-12 in crew compartment cooling systems and halon 1211 and 1301 to protect both crew and engine compartments from fuel or hydraulic fluid fires.

Alternatives were identified for new vehicles: HFC-134a for the cooling applications and dry chemical or HFC-227ea extinguishants for engine fire protection systems. Conversion of all UK in-service vehicle CFC systems was completed by 2004 with engineering modifications and new HFC refrigerants implemented as part of scheduled maintenance programmes.

The replacement of halons proved to be more problematic. Studies and fire-trials on a range of alternatives to convert engine compartment systems began in the late 1990s and conversion of in-service vehicle fleets began in 2004. Most UK armoured vehicle engine compartment systems now have HFC-227ea systems installed with the remaining vehicles scheduled for conversion by the end of 2007. While many conversions have been able to utilise similar-sized cylinders and existing halon system hardware, some vehicle fire protection systems required significant modification to accommodate the larger cylinders necessary to deliver adequate fire fighting performance.

http://www.eudefnet.com/

Alternatives to halon in fire-fighting equipment

Finland

Along with other Nordic countries, Finland has significantly reduced the amount of halons used in fire extinguishing systems. Under national regulations, halons had to be decommissioned from portable extinguishers from 1997, and from fixed systems by 2000. Halons that were taken out of use were treated as hazardous waste.

In 2003, the total stocks of halon 1211 existing in Finland amounted to 5.8 tonnes and halon 1301 stocks amounted to 49.9 tonnes, with a number of exemptions in the military and aviation sectors.

Italy

In Italy, the number of critical use exemptions for halons has decreased dramatically. About 80% of the total amount installed for uses such as fire fighting systems was recovered thanks to a nation-wide strategy started in 1996. Out of a total of 3 843 tonnes in circulation 2 816 tonnes have been recovered at 149 recovery centres.

The results achieved are due to a system of economic incentives for companies who provide alternative non-ODS fire fighting methods. With regard to Regulation (EC) No 2037/2000, Italy has phased out most of its stocks 14 months in advance and further reduced the list of critical uses of halon.

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European Commission

The Montreal Protocol

Luxembourg: Office for Official Publications of the European Communities

2007 — 24 pp. — 21 x 21 cm

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