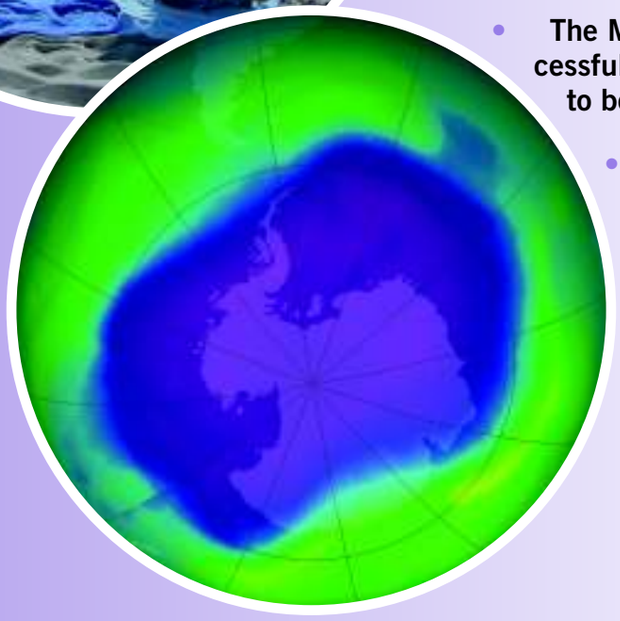
EUROPEAN COMMISSION

Environment fact sheet:

ozone layer protection



- The ozone layer is crucial for life on earth. It protects us from harmful UV rays that can have serious effects on animals, biodiversity and people's health, including skin cancer and eye cataract.
- Experts blame ozone-layer depletion on man-made chemicals containing chlorine and bromine that are emitted from a number of products and industrial processes.
- The international community took action, signing the Montreal Protocol in 1987. The agreement has been successful in curbing many of the substances that are most destructive to the ozone layer.
- The European Union has played a leading role in international negotiations on ozone protection, and has consistently taken strict and decisive measures that go beyond the Montreal Protocol.
- The Montreal Protocol is one of the oldest and most successful international environmental agreements but needs to be further developed to address current issues.
- The continued use of methyl bromide and HCFCs, the illegal trade in chemicals and banks of chemicals in existing equipment in buildings, are areas that require more action.

The ozone layer — vital for life

The ozone layer is a layer of gas about 15 km above the earth's surface. High up in our atmosphere, it performs a vital role in protecting humans and living things on earth from harmful UVB and UVC rays from the sun. Scientists discovered in the mid-1970s that certain man-made chemicals could destroy ozone and deplete the ozone layer. Further research found that the growing production and use of chemicals such as chlorofluorocarbons (CFCs) in aerosol sprays, refrigerators, insulation and airconditioning was leading to a build-up of ozone-depleting chemicals in the atmosphere. They also observed an 'ozone hole' developing above the Antarctic.

A reduced ozone layer causes a number of serious health risks for humans, including increased rates of skin cancer and eye cataract, with children being particularly vulnerable. There are also serious impacts for biodiversity. The increased concentration of UVB rays reduces the amount of plankton in the sea which, in turn, causes fish stocks to go down. These rays also have adverse effects on plant growth, thus reducing agricultural productivity. Another negative effect of a thinning ozone layer is the reduced lifespan of certain materials — such as certain plastics.

It is important to distinguish between ozone in the stratosphere — commonly referred to as the 'ozone layer' — and ground-level ozone. Ozone-depleting substances act on the stratospheric ozone layer. While an abundance of ozone in the ozone layer protects humans by shielding them from harmful UV radiation, excess amounts of ozone at ground level are bad for health because its strong oxidant properties are toxic for humans. Conversely, a greater intensity of UVB rays increases ground-level ozone.

Ozone-depleting substances

The following bromine and chlorine-based chemicals have been found to destroy ozone and are regulated by international and EU legislation.

- **Chlorofluorocarbons (CFCs).** CFCs are haloalkanes containing both chlorine and fluorine. Because they were widely used in industry in applications such as refrigerants, propellants and cleaning solvents, they were the focus of early action under the Montreal Protocol. They are no longer used in most applications. CFCs also contribute to global warming, with a global warming potential (GWP) of 6 000–9 800 times that of carbon dioxide (over a period of 100 years).
- **Methyl bromide (CH_3Br — abbreviated to MB).** MB is an organic halogen with powerful ozone-depleting potential and highly toxic to humans. Before being regulated by the Montreal Protocol, it was widely used as a fumigant to control pests in soil, particularly for high-value crops such as strawberries and tomatoes. Although its use was banned in industrialised countries from 2005, a number of 'essential' or 'critical use' exemptions and also exemptions for quarantine and pre-shipment remain.
- **Halons (halon-1211, halon-1301, halon-2402).** Halons are haloalkanes used primarily in fire-extinguishing systems with powerful ozone-depleting potential. Some applications are exempted, such as military applications where it has been difficult to find replacements with the required combination of properties.
- **Carbon tetrachloride (CCl_4).** In the early 20th century, carbon tetrachloride was widely used as a dry-cleaning solvent, as a refrigerant, and as a component in fire extinguishers. When severe adverse health effects became evident, safer alternatives were found for these applications. Large quantities of this substance were used to produce the freon refrigerants R-11 and R-12 (CFCs), which were later found to destroy ozone. Their use has been phased out under the Montreal Protocol, although carbon tetrachloride is still used as a feedstock to manufacture less destructive refrigerants.
- **Hydrochlorofluorocarbons (HCFCs)** are a class of haloalkanes in which not all hydrogen has been completely replaced by chlorine or fluorine. They are used primarily as

CFC substitutes since their ozone-depleting effect is only about 10% that of CFCs. They are also currently being phased out.

Working successfully together

Pioneering work in the 1970s by scientists Mario Molina, Sherwood Rowland and Paul Crutzen unearthed the problem of ozone depletion by man-made chemicals. They highlighted a grave and complex problem with widespread implications and the international response was strong and decisive, first with the Vienna Convention in 1985 followed in 1987 by the Montreal Protocol, which established a system to control and phase out harmful chemicals.

The Montreal Protocol, negotiated within the framework of the UN Environment Programme (UNEP), is the first and most successful worldwide environmental instrument. It represents an innovative and dynamic response made possible by the combined work of many — lawyers, scientists, economists, technologists and policy-makers. It has almost universal acceptance among all states worldwide, with 191 countries having ratified it as of February 2007.

Latest reports estimate that it has been successful in slowing the build-up of ozone-depleting substances in the atmosphere. Under the agreement, the bulk of ozone-depleting substances — including all those specified in the original agreement — were phased out in industrialised countries by 1995. This in turn significantly reduced emissions of greenhouse gases. Methyl bromide was phased out in 2005 and HCFCs have a target date set for 2030. The protocol has been amended a number of times to reflect the latest research findings and new problems that have emerged.

The European Union — a leader

The EU and its Member States have been ambitious in finding solutions to the problems of ozone-depleting substances. They phased out HCFCs early and pushed to end the critical uses of methyl bromide. They have often gone beyond the requirements of the Montreal Protocol and have been at the forefront of negotiations to amend it.

At EU level, controls on ozone-depleting substances are laid out in a regulation which was adopted in 1994 and then amended in 2000. The provisions of the regulation are often stricter than the Montreal Protocol and establish controls on the production, trade, use and recovery of ozone-depleting substances. The regulation gives details of the information that has to be reported on these substances and sets a legal basis for inspections and penalties. It also addresses how new substances are dealt with.

An electronic licensing system to check imports and exports and counter the illegal trade in chemicals is currently in force in all Member States. Recent changes to the regulation seek to improve cooperation between environmental and customs authorities and find cost-effective sanctions for non-compliance.

The EU legislation has been a positive driver towards 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 aeroplanes without using halons.

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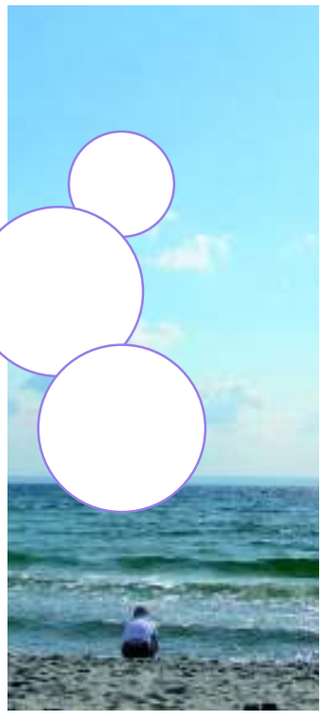
Challenges ahead

An important feature of the Montreal Protocol is the ability to adapt it to meet new challenges. In the early days of the protocol the emphasis was on identifying ozone-depleting substances and agreeing on control measures. This has now been achieved. Attention in recent years has focused on implementation. This aspect must be intensified in light of issues which have recently emerged. Key challenges ahead include the following:

- **Critical/essential uses.** The overall quantity of methyl bromide used globally in soil fumigation has gone down substantially. In crops such as strawberry fruit cultivation, the use of methyl bromide has been completely phased out in the EU. 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**, for example for 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 although dates have already been agreed for a freeze (2016) and a phase-out (2040). HCFCs represent about 60% of the remaining ozone-depleting substances in industrialised countries, with overall quantities steadily decreasing. Most of the decreases which have been achieved to date are due to EU regulation, which has put a ban on use in place well ahead of the 2030 phase-out date applying to industrialised countries. To avoid a further delay in the recovery of the ozone layer, there is a need to address this alarming increase by moving forward the current phase-out schedules.
- **Illegal trade.** There is evidence of a significant black market in ozone-depleting substances, with a flow of trade from chemical producers in certain emerging market economies to western companies. A licensing system for 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, vast quantities of these chemicals can still be found in old equipment and buildings. These represent a threat to the timely recovery of the ozone layer and have significant global warming potential (estimated to amount to about 3.5 % of the total greenhouse gases emissions). Action is required to ensure that such 'banked' ozone-depleting material is 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, 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 would like 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 alternative treatments are 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 under way. 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 them with more climate-friendly substances.
- **Increasing synergies across MEAs.** 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.



Useful resources

European Commission ozone protection website:
http://ec.europa.eu/environment/ozone/index.htm

European Community phase-out strategy for critical uses of methyl bromide:
http://ozone.unep.org/Information_for_the_Parties/Decisions/Dec_ExI_4-3/index.shtml

European phase-out strategy for CFCs in metered dose inhalers:
http://ozone.unep.org/pdf/mditransition-ec.pdf

UNEP Ozone Secretariat website:
http://ozone.unep.org

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Photos: Photodisc, Jorun Boklöv, NASA, Digital Vision, Porter.