O_3

Protect the Ozone Layer, Save Our Lives

Produced by | UNEP OzonAction Programme www.unep.fr/ozonaction | Foreign Economic Cooperation Office of MEP www.ozone.org.cn

UNEP
United Nations Environment Programme
OzonAction Programme

Ministry of Environmental Protection

Ozone Protection and Accelerated Phase-out of HCFCs in China

Public Education and Outreach

Ozone Layer Protection

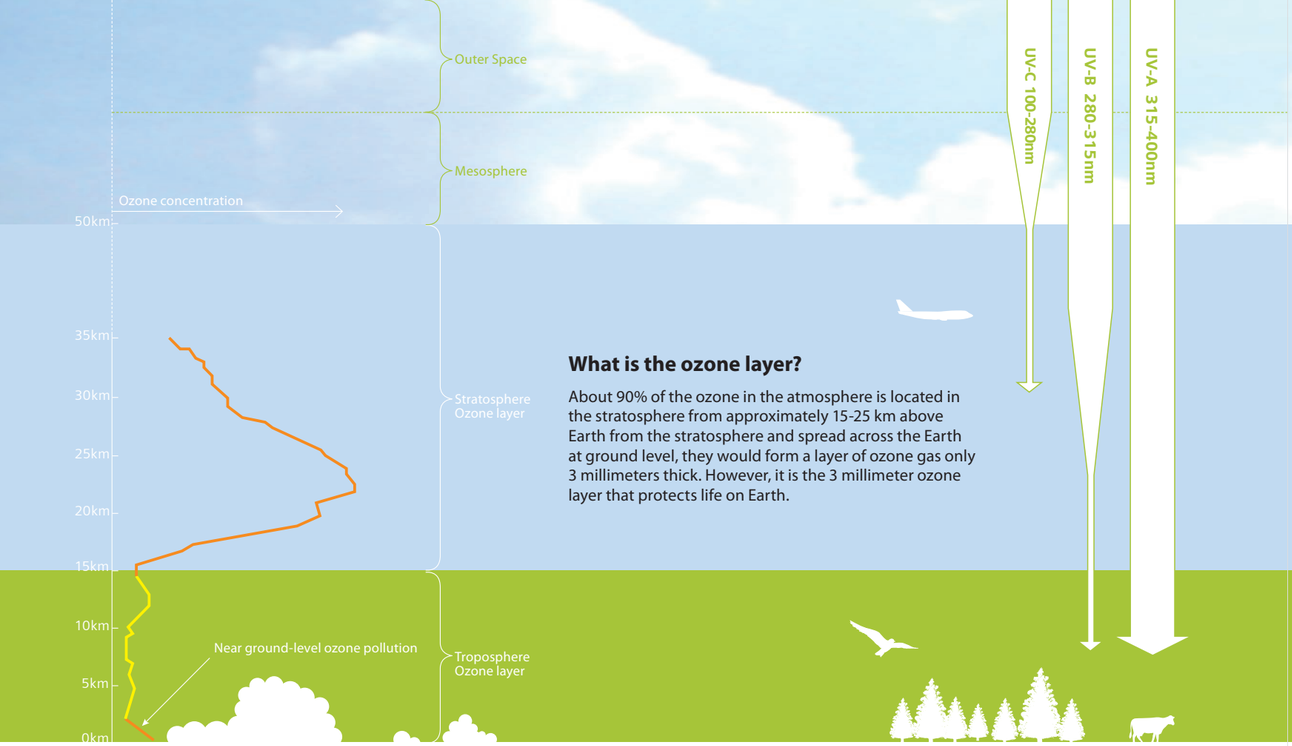
contents

Ozone Layer

1

About the Ozone Layer

The ozone layer acts as a filter to protect the Earth from harmful ultraviolet radiation, but it is gradually depleted through the process of industrialization.



What is the ozone layer?

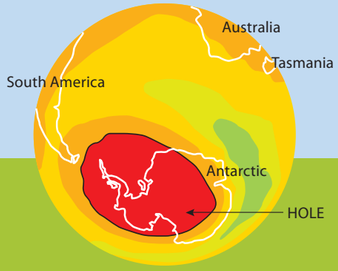
About 90% of the ozone in the atmosphere is located in the stratosphere from approximately 15-25 km above Earth from the stratosphere and spread across the Earth at ground level, they would form a layer of ozone gas only 3 millimeters thick. However, it is the 3 millimeter ozone layer that protects life on Earth.

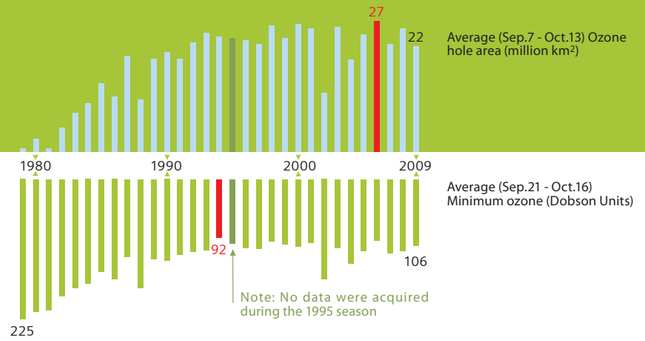
Why is the ozone layer important?

The ozone layer filters the majority of harmful UV radiation emitted from the sun. In our natural atmosphere, Stratospheric Ozone molecules absorb UV energy and break them down into oxygen atoms. At the same time, these oxygen atoms react with oxygen and again form ozone molecules so that the density of ozone molecules reaches dynamic equilibrium in the ozone layer. This endless process protects the Earth from great amounts of harmful UV radiation and protects the ecosystem.

Origin and changes in the ozone hole

In 1985, the ozone hole was first discovered by British scientists Joseph Farman, Brian Gardiner and Jonathan Shanklin, who were members of the British Antarctic Science Team at that time. The ozone hole geographically refers to the area where the ozone is less than 220 Dobson Units in the atmosphere. The hole becomes larger in the late winter and early spring because of seasonal variations in temperature, which creates an environment for efficient destruction of the ozone in sunlit regions. The scale and duration of the large and recurring hole has drawn great attention from around the world.





What are the effects of ozone layer depletion?

On Human Health

Increased exposure to UV-B radiation can suppress the immune system, cause cataract by damaging cornea and crystal lens. It may also increase the chance of melanoma, skin cancer and other skin diseases.

On Plants

Ultraviolet radiation changes the chemical composition of several species of plants. Among the crops most vulnerable to UV-B radiation are melons, mustard and cabbage.

On Aquatic Organisms

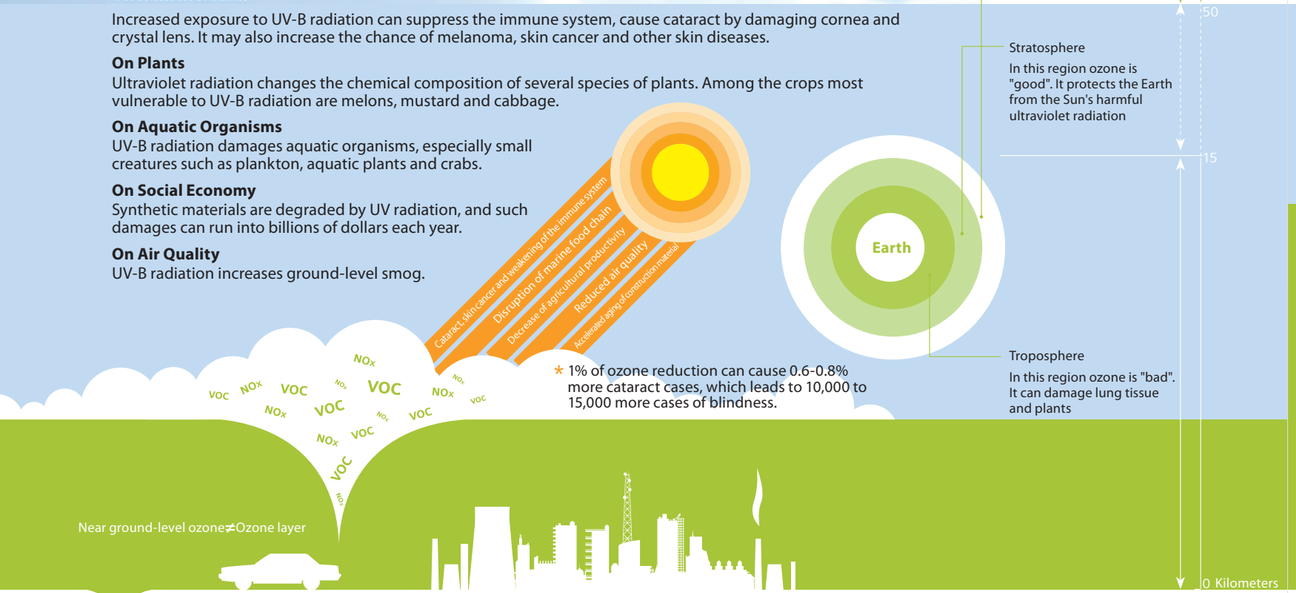
UV-B radiation damages aquatic organisms, especially small creatures such as plankton, aquatic plants and crabs.

On Social Economy

Synthetic materials are degraded by UV radiation, and such damages can run into billions of dollars each year.

On Air Quality

UV-B radiation increases ground-level smog.

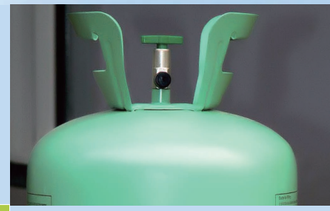


* 1% of ozone reduction can cause 0.6-0.8% more cataract cases, which leads to 10,000 to 15,000 more cases of blindness.

Stratospheric ozone differs from ground-level ozone. Ground-level ozone is produced by industry and traffic emissions in combination with specific weather conditions. Usually the density of ozone at ground level reaches its summit in July and August, since it is the season with the highest frequency of photochemical reactions. As an irritating gas, it may cause human respiratory problems and damage plants. Stratospheric ozone, on the contrary, protects life on Earth.

Ozone Depleting Substances (ODS)

Ozone depleting substances (ODS) are man-made chemicals which deplete the ozone layer and are widely applied as refrigerants, foaming agents, extinguishing agents, solvents as well as agricultural fumigants, etc.

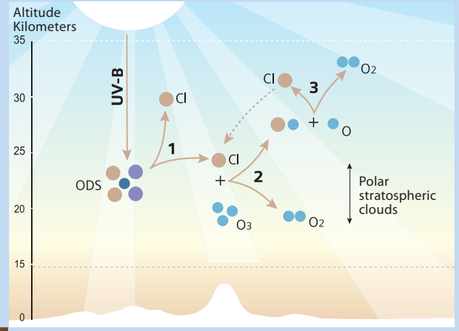


	Refrigerants	Aerosol	Vesicant	Cleaner	Solvent	Pesticides	Chemical Additives	Extinguishing agent	Soil fumigant
CFCs	●	●	●	●	●				
Halon								●	
CTC				●			●		
TCA				●	●				
CH_3Br						●			●
HCFCs	●		●	●	●				

ODS

How do ODS deplete the ozone layer?

The decrease of stratospheric ozone was first reported in 1974 and its decrease was linked to the presence of ODS such as Chlorofluorocarbons or CFCs. The chlorine atomos of the CFCs were split off by intense UV solar radiation in the stratosphere. These chlorine atomos then attract one of the three oxygen atoms in the ozone molecule (O_3) – destroying the ozone by turning it into oxygen. A single chlorine atom can destroy over 100,000 molecules of ozone in this way.



ODS and Greenhouse Gases

Many ODS are also greenhouse gases, which not only deplete the ozone layer but also contribute to global warming.

Ozone depleting potential and global warming potential of ozone depleting substances

Substance	Ozone Depleting Potential	Global Warming Potential
CFC-11	1	4,680
CFC-12	1	10,720
CFC-113	0.8	6,030
CFC-114	1	9,880
CFC-115	0.6	7,250
Halon 1211	3	1,860
Halon 1301	10	7,030
CTC	1.1	1,380
CH_3Br	0.6	5
HCFC-22	0.055	1,780

According to research, greenhouse gases can accelerate the warming of the troposphere and cooling of the stratosphere. Drop in temperature in the stratosphere contributes to the formation of the ozone hole. The warming of the troposphere and corresponding climate change caused by greenhouse gases will therefore accelerate the damage of the ozone layer and cause more harm to human beings.

2

International Conventions for the Protection of the Ozone Layer

To protect the ozone layer and phase out ODS, the international community signed the Vienna Convention for the Protection of the Ozone Layer in 1985 and the Montreal Protocol on Substances that Deplete the Ozone Layer in 1987.

Vienna Convention for the Protection of the Ozone Layer (Vienna Convention)

The Vienna Convention, held under the auspices of the United Nations Environmental Programme (UNEP) in 1985, was the first attempt to provide the framework for co-operative activities aimed at protecting the ozone layer. Parties to the Convention agreed to co-operate in scientific research in order to better understand the atmospheric processes, to share information on ODS production and emissions, and to implement preventive measures to control ODS emissions. Basically, this objective has been achieved. Scientific assessment of ozone depletion shows that the ozone layer can recover in 2049 for middle latitude areas (between 30 degree north latitude to 60 degree south latitude). It further shows that the ozone layer above the Antarctic can also recover, but in about 15 years later than the date predicted due to the extreme meteorology situation such as low temperature and speedy wind.

Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol)

On 16 September 1987, governments signed the Montreal Protocol to reduce and eventually eliminate emissions of man-made ODS, thus 16 Septembers was also designated by the United Nations as ' International Day for the Preservation of the Ozone Layer '.

Adjustments and Amendments to the Montreal Protocol

The Montreal Protocol stipulated that " Beginning in 1990, and at least every four years thereafter, the Parties shall assess the control measures provided for in Article 2 and Article 2A to 2I on the basis of available scientific, environmental, technical and economic information ". According to the scientific assessment, adjustments and amendments can be made by Parties. Over the dynamic history of the Montreal Protocol, four amendments and six adjustments have been adopted to ensure that the Protocol continues to reflect improved scientific and technical understanding.

London Amendment

The 1990 Second Meeting of the Parties in London added to the Protocol additional CFCs, carbon tetrachloride (CTC) and methyl chloroform as controlled substances and introduced control measures for them; accelerated existing and adopted additional control measures for Annex A CFCs and halons for both developing and developed countries; and established a Multilateral Fund to provide developing countries with technical and financial assistance. The London Amendment was signed on 29 June 1990 and came into force on 10 August 1992. China acceded to it on 14 June 1991.

Copenhagen Amendment

The 1992 Fourth Meeting of the Parties in Copenhagen listed methyl bromide, HBFCs and HCFCs as controlled substances; introduced control measures for the production and consumption of methyl bromide and HBFCs, and for HCFCs consumption; advanced the phase-out schedules for CFCs, halons, carbon tetrachloride and methyl chloroform in developed countries. This Amendment was signed on 25 November 1992 and came into force on 14 June 1994. China acceded to it on 22 April 2003.

Montreal Amendment

The 1997 Ninth Meeting of the Parties in Montreal introduced additional control measures for ODS import and export, banned the trade of methyl bromide among Parties and non-parties. This Amendment was signed on 17 September 1997 and came into force on 10 November 1999. China acceded to it on 30 May 2010.

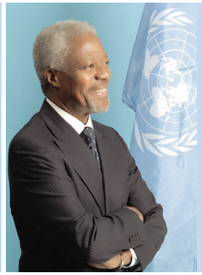
Beijing Amendment

The 1999 Eleventh Meeting of the Parties in Beijing listed bromochloromethane as a controlled substance and introduced production and consumption controls for bromochloromethane as well as production controls for HCFCs. This Amendment was signed on 3 December 1999 and came into force on 25 February 2002. China acceded to it on 30 May 2010.

In addition to amendments, the other important measure that affects the development of Montreal Protocol are the adjustments. In accordance with scientific assessments, it adjusts the ODP of various ODS or the amount of ODS production and consumption. What is different from the amendment is that the adjustment comes into effect automatically after six month of MoP and is binding to all Parties. At the 19th MoP held in September 2007, the MoP endorsed the adjustment on accelerated HCFCs phase-out plan, in which developing countries should freeze ODS production and consumption in 2013, reaching 10% reduction by 2015 and total phase-out of HCFCs in 2040.

Achievements of the Montreal Protocol

Ever since the implementation of the Montreal Protocol, 95% of ODS production and consumption have been reduced, This cannot be achieved without support from governments of Parties, but it also owed to international and local stakeholders' active participation. Cooperation among these stakeholders reformed the structure of society, economy and international trade and enhanced the development of new substitutes and technologies. The efforts protected not only the ozone layer but also the climate.



Kofi Annan
Former UN Secretary General

"Perhaps the single most successful international agreement to date has been the Montreal Protocol."

Ban Ki-moon
UN Secretary General

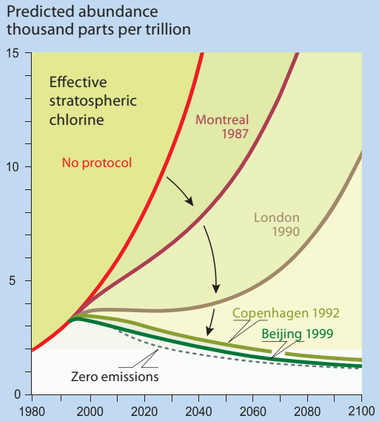
"Sustainable development depends, in large part, on the implementation of agreed environmental goals, targets and objectives. Among the considerable number of multilateral environmental agreements agreed between States over the past 40 years, the Vienna Convention for the Protection of the Ozone Layer and, in particular, its Montreal Protocol, stands out. The manner in which this instrument for repairing and recovering the Earth's protective shield has been financed and implemented serves as an inspiring example of what is possible."

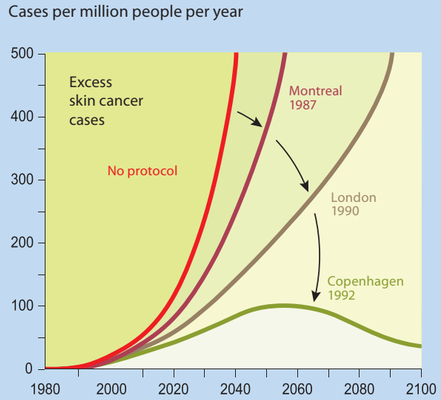
Universal Participation

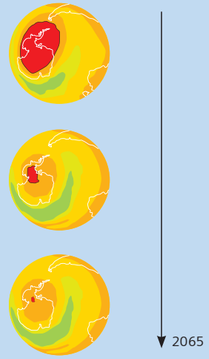
With Timor Leste's accession in September 2009, a total of 196 countries around the world have become Parties to the Montreal Protocol. It signifies that the Montreal Protocol is the only one out of hundreds of international conventions that has universal participation.

Recovery of the Ozone Layer

If the Montreal Protocol had not been signed, ozone layer depletion would have increased 50% above north hemisphere and 70% above south hemisphere, which means the radiation reaching the middle latitude of the northern hemisphere would double and those reaching the southern hemisphere would quadruple. Efforts protecting the ozone layer have prevented millions of deaths due to cancers and hundreds of millions of cataract cases. Practices on implementation in countries demonstrated that with wider global cooperation and concerted efforts of international agencies, governments, enterprises, communities and individuals, we are able to protect and recover the ozone layer. If all parties fulfill their commitment under the Montreal Protocol, the ozone layer will recover to what it's like in 1986 by the year 2065.







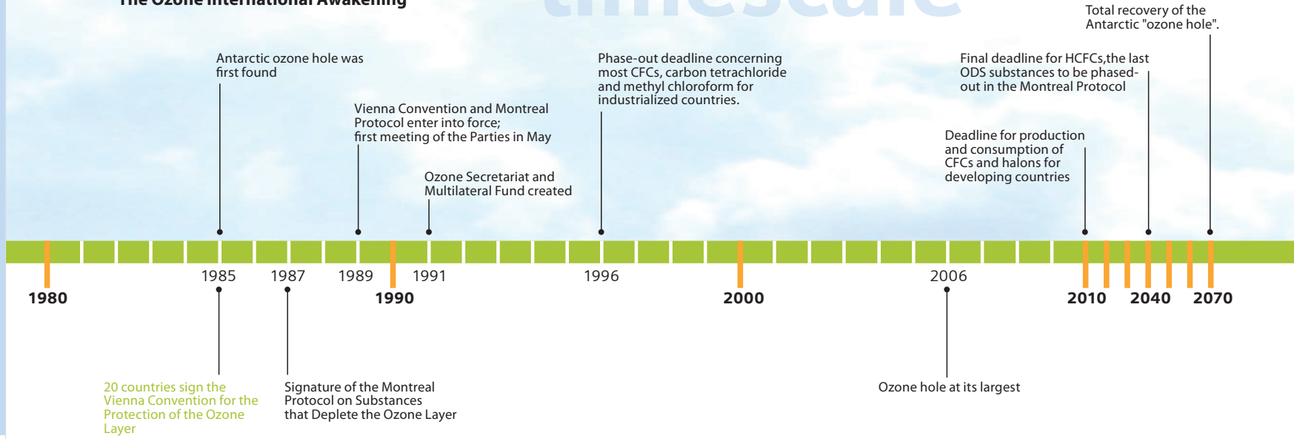
* Chlorine and bromine are the molecules responsible for ozone depletion. "Effective chlorine" is a way to measure the destructive potential of all ODS gases emitted in the stratosphere.

Impact on Climate Change

The Global Warming Potential (GWP) of CFCs, Halon and HCFCs is up to thousands of times higher than that of carbon dioxide. Therefore, the implementation of the Montreal Protocol also creates huge climate benefits. Research shows that the phase-out of CFCs, halon and other ODS under the Montreal Protocol is equivalent to the emission reduction of 25 billion tons of carbon dioxide.

timescale

The Ozone International Awakening



China

3 China's Commitment

In accordance with the phase-out timetable laid out in Montreal Protocol, developed countries has phased out ODS 10 years prior to developing countries. China has become the world's biggest ODS producer and consumer.

Since 1991, China has been carrying out a series of actions to protect the ozone layer and implement the Montreal Protocol and had made remarkable achievements. Now China is facing the significant responsibility of HCFCs phase-out.

The Chinese government attaches great importance to the protection of the ozone layer and is actively involved in international conventions by establishing designated agencies to fully implement the convention.

Management Authorities

National Leading Group for the Protection of the Ozone Layer

National Leading Group for the Protection of the Ozone Layer, a multi-agency coordination unit established in 1991, is responsible for implementing the Vienna Convention and Montreal Protocol, organizing the country programme and reviewing action plans and decision making.

China

National Management Office for ODS Import and Export

Jointly established by the Ministry of Environmental Protection, Ministry of Commerce and General Administration of Customs in 2000, National Management Office for ODS Import and Export takes the responsibility of management on the import and export of ODS.

Project Management Office for the Implementation of Multilateral Fund Projects

Established in the Ministry of Environmental Protection , Project Management Office for the Implementation of Multilateral Fund Project is responsible for the selection, preparation and submission of MLF projects and for uniform coordination, management and supervision of these projects.

Policies, laws and regulations

In addition to basic laws such as the Law on the Prevention and Control of Atmospheric Pollution and Regulation on the Management of Ozone Depleting Substances, the existing regulation and policy system consists of the following 8 aspects:

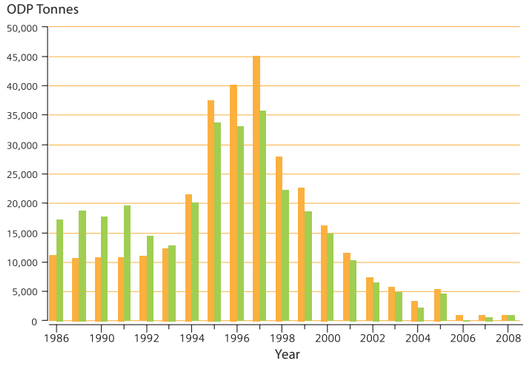
1. Production Management
2. Consumption Management
3. Drainage Registration Systems
4. Products Quality Management
5. Environment Labelling Systems
6. Import and Export Management
7. Restrictions and Prohibitions
8. Supervision Management

Phase-out Actions (Phase I) 1989-2010

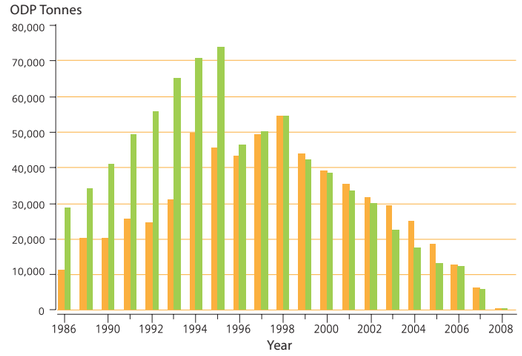
Overall progress

Ever since the accession to the Montreal Protocol, China has achieved remarkable progress. As of the end of 2008, China had implemented more than 400 MLF projects and 18 sector plans, which covers 12 kinds of ODS in 5 categories. More than 3000 enterprises benefited from these projects and 800 million USD from MLF have been allocated to these enterprises. Since 1 July 2007, China has banned the production and importation of CFCs and halons 30 months prior to target of Montreal Protocol. Since 1 January 2010, China has banned the production and use of CTC and TCA. As of today, China has phased out 100,000 tons of ODS in terms of production and 110,000 tons of ODS in terms of consumption, accounting for 50% of total amount that has been phased out by developing countries.

Production and consumption of halons in China from 1986 to 2008



Production and consumption of CFCs in China from 1986 to 2008



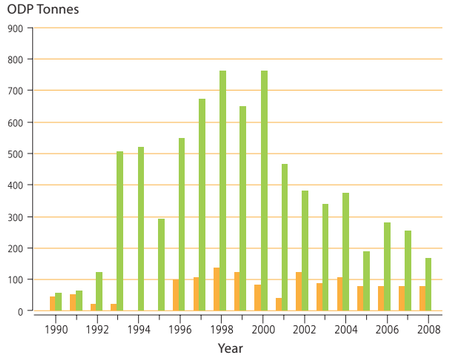
Production

Consumption

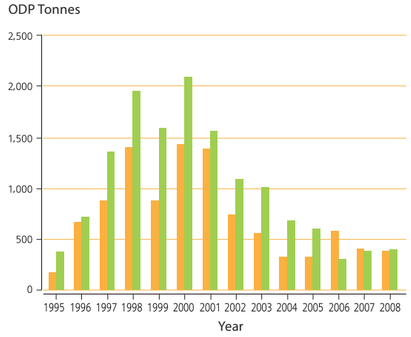
1989-2010

1989-2010

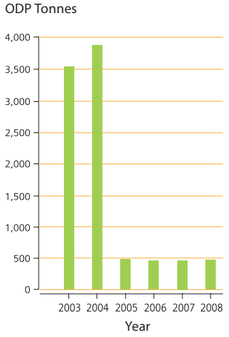
Production and consumption of TCA in China from 1990 to 2008



Production and consumption of Methyl Bromide in China from 1995 to 2008



Consumption of CTC for 25 PA uses in China from 2003 to 2008



Production

Consumption

Overall progress

- In November, China hosted the 11th MOP of the Montreal Protocol, in which the Beijing Declaration was issued.
- In November, Government of China began to implement license management on the import and export of ODS.
- The production and consumption of CFCs was frozen to the level below the average between 1995-1997.
- In November, The State Council approved the China Country Program for the Phase-out of Ozone Depleting Substances (Update).

- On May 1, China banned the use of CFC-based compressors for industrial and commercial refrigeration.
- 12 provinces and cities initiated the accelerated phaseout program voluntarily, committing to phase out ODS one year ahead of the national requirement by 1 July 2006.
- The production and consumption of CFCs were 63% and 74% lower than the freezing level, and the production and consumption of halons were 87% and 96% lower than the freezing level.

- Methyl bromide will be 100% phased out in China.

- China became a Party to the Montreal Protocol on Substances that Deplete the Ozone Layer (London Amendment), and established the National Leading Group for the Protection of the Ozone Layer and the MLF Project Management Office.

- China froze its production and consumption of halons five years ahead of the set date.
- On December 31, China banned the use of CFCs in the production of non-MDI.

- On January 1, the air-conditioners with CFC-12 were no longer equipped to newly produced automobiles.
- The production and consumption of methyl bromide was frozen to the level below the 1995-1998 average.

- On January 1, China banned the production and consumption of CFC-113, and the production and delivery of halon-1211.

- On January 1, CTC and TCA were 100% phased out in China.
- In May, China acceded into the Montreal Amendment and Beijing Amendment to the Montreal Protocol.

- The State Council approved the China Country Program for the Phase-out of Ozone Depleting Substances.

- China committed to accelerate the phase-out of CFCs and halons.

- On January 1, China issued the ban on the use of CFCs in the foam sector.

1989 **1990** 1991 1992 1993 1995 1997 1999 **2000** 2002 2003 2004 2005 2006 2007 2008 **2010** 2015

- China became a Party to the Vienna Convention for the Protection of the Ozone Layer.

- The first MLF-funded project was approved for China.

- The International Workshop on ODS Phase-out Sector Plan was held in Xi'an, in which sector-based phase-out strategy was decided.
- In September, China celebrated the first International Ozone Day.

- In April, China became a Party to the Copenhagen Amendment to the Montreal Protocol.
- On June 1, China banned the use of CTC as solvent.

- On January 1, China banned the use of CFC-11 in the expansion of tobacco and the use of methyl bromide in commodity fumigation.
- On July 1, China stopped the production of CFCs and halons, banned the use of CFCs in the domestic appliance sector, and held the Celebration for Accelerated Phase-out of CFC/Halon in China.

Progress Achieved in Industries

Industry	year	MLF (USD)	Implementation Status
Halon	1993-1997	4.657 million	• demonstration project
	1998-2010	62 million	• phased out 45,202 ODP tons, accounting for 90% of Article 5 countries; closed 15 production lines for extinguishing agent and, 72 production lines for fire extinguishers and 22 fire-fighting systems.
Chemicals	1999-2009	150 million	• chemical industry CFCs phase-out plan, closed CFCs production facilities in 36 enterprises and phased out 50,351 ODP tons of CFCs
CTC	2002-2009	111.5 million	• phased out 35,798 tons of production, established conversion capacity of 66,000 tons by products /year and phased out 52 uses as process agents in 108 enterprises
CFCs/Halon/CTC accelerated Phase-out	2004	10 million	• phased out 12,000 more ODP tons of CFCs, 18,000 ODP tons of CTC and 10,000 ODP tons of halons than original plan, finished phase out plan 2.5 years ahead of schedule
Household Refrigeration	1994-2007	90 million	• converted 54 fridge and compressor production lines, phased out 13,087 tons of CFC; First in the world using natural agents for refrigeration and foaming in the sector
Industrial and Commercial Refrigeration	1995-2005	49.57 million	• retrofitted 24 compressor lines, phased out CFCs 4,973 tons
Mobile A/C	1995-2001	14.45 million	• 15 conversion projects on production lines, phased out 1,659 tons of CFCs
Servicing Sector	2004-2009	7.885 million	• established refrigerants recovery network around 31 provinces, autonomous regions and municipal cities, covering 950 automobile A/C servicing stations, 365 automobile scrapping stations, and 14 training centers trained 6,067 technicians

Industry	year	MLF (USD)	Implementation Status
Tobacco Sector	2000-2006	11 million	• CFC-11 phase-out plan in China Tobacco sector, dismantled 73 blowing facilities using CFC-11 in 58 enterprises and phased out 1090 tons of CFC-11
Foam Sector	1991-2007	150 million	• 140 single projects and 8 umberella projects covering 165 enterprises; China Foam Sector CFC-11 Phase-out Plan implemented, covering 11 regroup projects, 108 individual projects and 4 provincial phase-out projects; phased out CFCs 30,448 tons
Solvent Sector	1992-2010	52 million	• 26 individual projects phasing out CFCs 924 ODP tons and 1 sector plan phasing out CFC-13 3,300 ODP tons, TCA 621 ODP tons and CTC 110 ODP tons, retrofitted cleaning facilities in 380 enterprises
Aerosol sector	1997	--	• phased out CFCs in aerosol products
	2007-2015	19.5 million	• to phase out CFCs in MDI sector covering 174 medicines produced by 77 pharmaceutical enterprises, CFCs 807.59 tons
Methyl Bromide	2002-2015	24.57 million	• to phase out MB 1,087.8 ODP tons in areas of grain storage, tobacco, agriculture; to phase out MB 776.3 ODP tons in Chemicals sector. Phase-out had been finished in grain storage and tobacco before 2008

Summary

China has achieved significant results during the first phase of implementing the convention and accumulated sound experiences for the second phase of implementing the convention:

- By carefully analyzing the international environmental protection situation, China has taken into consideration the actual domestic situation and ensured that its promise to implement the convention is fulfilled;
- China has formed coordination mechanism of unified foreign policy and domestic specialization and cooperation by strengthening the convention implementation authorities and enhancing the coordination and cooperation between government agencies;
- The promulgation and implementation of a series of laws, codes and regulations has provided strong support for the nation in achieving its implementation goals;
- China has sought capital and technological support to promote the alternative technologies and production of substitutes so as to achieve its implementation goals;
- China has called for various forces to actively participate in the efforts of implementing the convention;
- Sustained innovation has continuously brought about new breakthroughs and progress in implementing the convention. For example, China has taken the lead in carrying out industry phase-out model and accelerated phase-out plan, using energy-saving and environmental friendly substitutes, and supported the production of substitutes among the developing countries; it has also formed sound overall quantity control, quota reduction, data report, inspection, performance audit, and monitoring mechanisms and taken great efforts to build the capacity of local governments to implement the convention so as to adapt to the changing needs of international and domestic situations.

Phase II: 2007-2040

The target of phase II will be HCFCs, which was once the transitional substitute for CFCs. The adverse effect of HCFCs is not as strong as CFCs. However, long term and substantial use would also cause severe environmental problems.

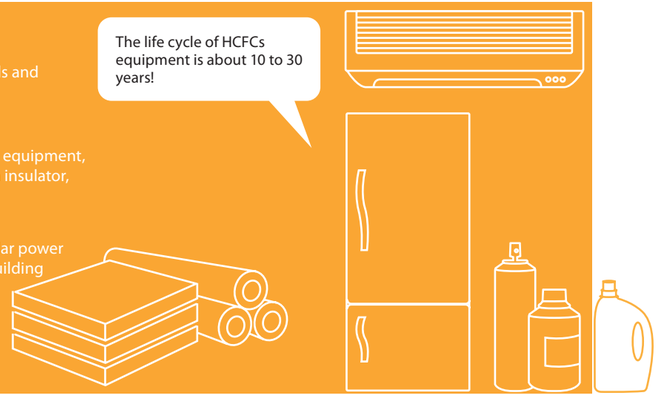
Types of HCFCs:

HCFCs being produced and used in China includes HCFC-22, HCFC-123, HCFC-124, HCFC-141b, HCFC-142b, HCFC-225ca and HCFC-225cb.

Main uses of HCFCs:

HCFCs is mainly used as refrigerants, solvents, foam agents, aerosols and chemical feedstock.

The life cycle of HCFCs equipment is about 10 to 30 years!



HCFC-22:

Household AC, industrial and commercial AC, heat pump, screw AC equipment, supermarket refrigeration equipment, food and drinks chiller, foam insulator, etc.

HCFC-141b:

Foam sheet, insulating pipe, auto upholstery, electric appliance, solar power heater, refrigerator, chilling container insulator, staffing material, building painting, cleaning and solidification of medical facilities, cleaning of metals and electronic parts.

HCFC-142b:

Unit AC and construction insulator

2007-2040

HCFCs' Impact on Climate

HCFCs were introduced in the 1990s as alternative chemicals for CFCs and added to the list of substances controlled by the Montreal Protocol. It was acknowledged at the time that these chemicals, with considerably lower ozone depleting potentials (ODP), were transitional and their production and consumption were also to be phased out under the Montreal Protocol. Although having considerably lower ozone depleting potentials than CFCs, many HCFCs have high global warming potentials. For instance, in the process of producing HCFC-22, by-produced HFC-23 has a GWP as high as 11,700.

By phasing out HCFCs, there are potentials for achieving double ozone and climate benefits. Reducing the use and emission of HCFCs from manufacturing products and servicing refrigeration and air conditioning equipment would have direct impact on the ozone layer and climate change protection. Furthermore, replacing HCFC-based equipment with those with higher energy efficiency would have indirect climate benefit from lower energy use and emission of GHG from low use of fossil fuel.

ODP and GWP of HCFCs substances regulated by the Montreal Protocol

Name	ODP	GWP
HCFC -22	0.055	1,780
HCFC -123	0.02	76
HCFC -124	0.022	599
HCFC -141b	0.01	713
HCFC -142b	0.065	2,270
HCFC -225ca	0.025	120
HCFC -225cb	0.033	586

Accelerated Phase-out of HCFCs

Accelerated Phase-out of HCFCs

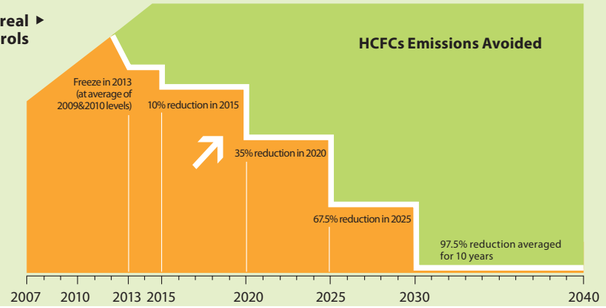
Adjustment on accelerated HCFCs phaseout was agreed at the 19th Meeting of the Parties to the Montreal Protocol (MoP) in September 2007, which regulated the accelerated HCFCs phase-out in developing countries. It also became the priority in ozone protection and mitigation of climate change among other important targets.

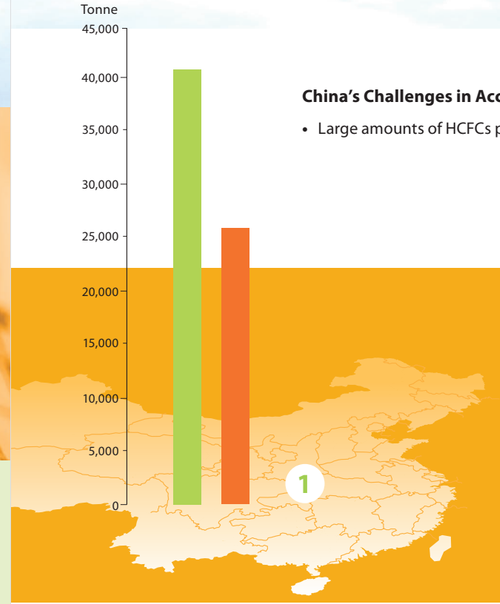
HCFC consumption (production + imports - exports) Base level : Average of 2009 and 2010	
1 January 2013	Freeze
1 January 2015	10% reduction
1 January 2020	35% reduction
1 January 2025	67.5% reduction
1 January 2030	97.5 % reduction*

◄ while allowing for servicing an annual average of 2.5% of the baseline during the period 2030-2040

Accelerated Phase-out of HCFCs

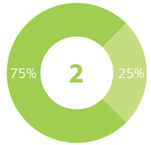
New Stronger Montreal Protocol Controls ►

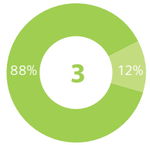




China's Challenges in Accelerating HCFCs Phase-out

- Large amounts of HCFCs production and consumption





1

2007 Production and consumption of HCFCs in China

- HCFCs Production
- HCFCs Consumption

2

Percentage of China air conditioners on the world market

- Percentage of China
- Percentage of other countries

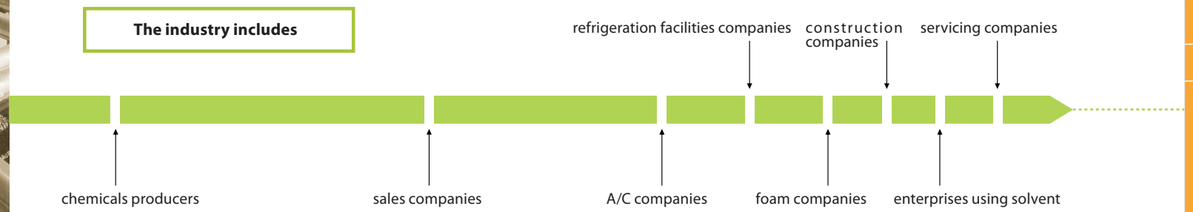
3

Percentage of refrigerant types used by China room air conditioners

- HCFC-22
- Other types of refrigerant

- A large number of sectors are involved
- Difficult to get access to information
- Policy and standards are under developed
- No mature alternative technologies
- Awareness in phasing out HCFCs needs improving
- Limited time is left for achieving the phase-out target

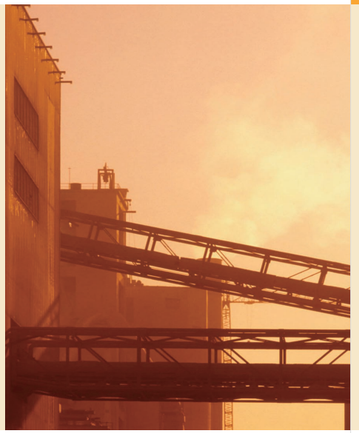
Accelerated HCFCs Phase-out Actions—— Response of the Industry



▸ Taking the initiative by getting ready in advance

Accelerated HCFCs phase-out
The impact on the industry —action in advance

- Adjusting development and production plan
- Considering life cycle of production facilities
- Training for staff and operators
- Raising awareness among distributors and end users
- Selecting alternative technologies



▸ Substitutes

There are two types of substitutes at the present stage. One is HFCs such as R401A, R134a and R404A, etc. which have already been commercialized around the world. However, it should also be pointed out that most of HFCs are high GWP gases which have been listed in the Tokyo Protocol as controlled substances. The other are natural agents, such as carbon dioxide, hydro carbon and ammonia, etc. which are now applied to refrigeration and foaming sectors. But natural substances have not been commercialized in air conditioning sectors where HCFCs are used as main refrigerant. As natural agents are environmentally friendly, many companies are investing in research and development to make them substitutes.

What aspects should be considered when selecting an alternative technology?

At present stage, no optimal substitute technologies have been developed considering the need of environmental protection, energy efficiency and costs. Therefore, companies should make comprehensive assessment on various alternative technologies according to the characteristics of respective sectors. The following factors should be considered when selecting alternative technologies:

- Technical aspects:
  performance in your local conditions (temperature, humidity) / size / weight
- Environmental benefits:
  Global Warming Potential (GWP) and Ozone Depleting Potential
- Economic aspects:
  annual energy consumption / maintenance cost / initial investment cost
- Safety aspects:
  refrigerant flammability / explosion risk / refrigerant toxicity
- Impacts on people's health
- Demands of markets and users
- National and local policies

How do companies reduce HCFCs consumption?

- Research and development of new alternative technologies
- Reducing HCFCs emission during production process
- Reducing leakage rate in refrigeration and air conditioning
- Enhancing training for technicians
- Keeping servicing records for large users
- Recover, reclaim, recycle and professional disposal

Accelerated HCFCs Phase-out Actions—— Management and Policies

▸ The Ministry of Environmental Protection along with the industry community is now taking actions to accelerate the phase-out of HCFCs.

HPMP

Executive Committee for Multilateral Fund for the Implementation of the Montreal Protocol approved in 2007 the HCFCs Phase-out Management Plans in chemical production, ICR, foam, RAC, solvent, servicing sectors in China and one Enabling components for the development of HPMP.

Components of HPMP

a. phase-out plans for HCFCs producers and consumers
b. policies and regulations on HCFCs phase-out
c. training and capacity building on HCFCs phase-out
d. publicity on HCFCs phase-out and alternative technologies.

Laws and Regulations

The Ministry of Environmental Protection has been making efforts to develop policies and regulations on HCFCs phase-out, including catalogues of controlled HCFCs and their blends, bans on new production and capacity of HCFCs, etc.

Regulation on Management of Ozone Depleting Substances was issued by the State Council on 8 April 2010. It has come into effect on 1 June 2010. It consisted of 6 chapters: General Provisions, Production, Sales and Consumption, Import & Export, Supervision & Examination, Legal Liabilities and Annex. Altogether 41 articles, the Regulation established the targets and tasks for ODS management at the national level, ODS overall control and quota system.

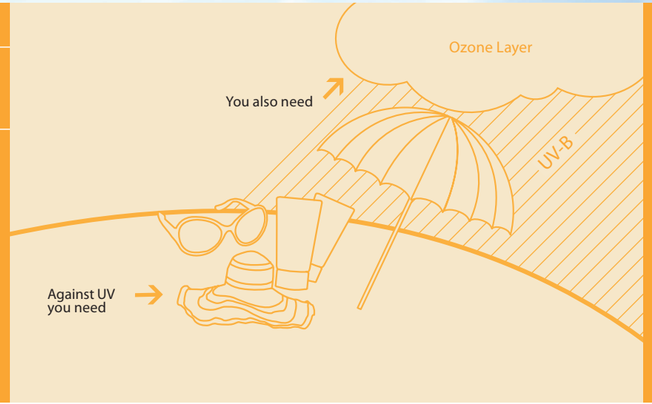
Meanwhile, it stipulated the legal liabilities for illegal production, consumption and trade, etc. of ODS.

The Regulation on Management of Ozone Depleting Substances will further accelerate the sustainable development of relevant sectors and serve as a strong legal tool for the management of ODS phase-out and China's compliance with international agreements on the protection of the ozone layer.

Accelerated HCFCs Phase-out Actions—— Responsibility of Individuals

▸ Everyone shall be responsible for environmental protection so that the world can enjoy the safe sunshine and air.

To safely enjoy the sun, everyone from every corner of the Earth should take responsibility. As a member of society, a citizen of the global village and a consumer, everyone can contribute to ODS phase-out by creating good living habits, thus reducing losses in heath and economy for future generations.



What can we do to protect the ozone layer?

Support and advocacy	Objections and reporting
1. buy non-ODS products and convince the company or institution where you work to buy non-ODS products	1. neglect the adverse effects of ODS when purchasing equipments;
2. go to accredited companies for installation of facilities containing ODS and maintain regularly	2. ignore the instruction of installation of ODS based facilities and neglect regular maintenance;
3. go to servicing stations with recovery and disposal facilities for repairing ODS-based products	3. dump equipments containing ODS without harmless disposal;
4. participate in international, domestic and non-governmental outreach activities for ODS phase-out	4. illegally produce, use, import and export ODS
5. report illegal production, use and import and export of ODS to relevant authorities	

As part of ODS phase-out, ODS production facilities will be dismantled. Because more affordable substitutes are not yet available on the market, there is a growing trend in the smuggling of these chemicals to satisfy the users' demand and pose challenges to border enforcement in the controll of the chemicals. Though Ministry of Environmental Protection, Ministry of Commerce and General Administration of Customs enacted the quota and licensing management on the production, use and import and export of an array of ODS, including halons, CFCs, Methyl Bromide, TCA and CTC, the strike on illegal ODS activities calls for extensive participation of the society.

How to report illegal activities:

Tel: 12369

Website: www.12369.org.cn

For more info, please visit:
www.ozone.org.cn
www.uneptie.org/ozonaction/topics/hcfc.asp

Glossary

CFCs
Chlorofluorocarbons are chemicals that contain carbon, chlorine and fluorine. The abbreviation for chlorofluorocarbons is CFCs. CFCs are used inside freezers, refrigerators, spray cans and air conditioners. When released into the atmosphere, these chemicals cause ozone layer depletion.

Climate Change
The climate of the Earth is not static, and has changed many times in response to a variety of natural causes. Scientists believe that human activity is the primary driver of recently observed changes in global climate patterns.

Dobson Unit (DU)
A measure used in ozone research. 1 Dobson Unit (DU) is defined to be 0.01 mm thickness of ozone at 0 degrees centigrade and 1 atmosphere pressure at the surface of the Earth. So if 100 DU of ozone were brought to the Earth's surface, it would form a layer 1 mm thick. The unit is named after G.M.B. Dobson, one of the first scientists to investigate atmospheric ozone.

Greenhouse Effect
The greenhouse effect is a natural phenomenon. The Earth's atmosphere acts a little like the glass of a greenhouse, allowing the heat of the Sun to enter and heat surfaces on the planet. These surfaces emit long wave radiation that is trapped near the surface of the planet by greenhouse gases. The greater their quantity, the more the atmosphere and surface heat up.

Greenhouse Gases (GHGs)
Gases that warm the Earth by trapping heat in the atmosphere, which leads to global warming. Some greenhouse gases can occur naturally in the atmosphere, while others result from human activities. Greenhouse gases include carbon dioxide, methane, CFCs and others.

Global warming
The observed increase in the average temperature of the Earth's near-surface air and oceans.

Global Warming Potential (GWP)
A measure of how much a given mass of greenhouse gas contributes to global warming over 100 years compared to the same mass of carbon dioxide.

Halon
Halons are chemicals that contain bromide, fluorine and carbon. Halons are used for fire extinguishers. As CFCs, halons are responsible for the depletion of the ozone layer. When released into the atmosphere, they become dangerous to ozone molecules.

HCFCs
A molecule containing hydrogen, chlorine, fluorine and carbon atoms. HCFCs are used to replace CFCs because they are not as dangerous to the ozone layer. HCFCs is a greenhouse gas.

Methyl Bromide (CH_3Br)
Methyl bromide is a gas and a widely used chemical pesticide in agricultural production. It is mainly used to kill parasites and insects. This gas is destroying the ozone layer 50 times faster than CFCs and is also very toxic to humans and animals.

Montreal Protocol
The Montreal Protocol on Substances That Deplete the Ozone Layer is an international treaty designed to protect the ozone layer. The Protocol has been ratified by 196 countries. In so doing, these countries that have agreed to eliminate their production and use of ozone depleting substances according to the timetable set out in the Protocol If all countries continue to meet their obligations under the Montreal Protocol, the ozone layer will recover to pre-1980 levels by around the middle of the 21st century.

Ozone (O_3)
An ozone molecule has three oxygen atoms. Ozone is a pale-blue gas with a sharp, irritating odour and it is toxic in the lower atmosphere. In the upper atmosphere it is vital for all the life on Earth as it blocks the sun's ultraviolet rays. The majority of ozone is in the stratosphere where it plays a crucial role in preventing harmful ultraviolet rays from reaching the Earth.

Ozone Depleting Substances (ODS)
Ozone depleting substances (ODS) are chemicals responsible for ozone layer depletion: these ozone depleting substances are mainly chlorofluorocarbons (CFCs), halons and methyl bromide.

Ozone Depleting Potential (ODP)
An index of the ability of a substance to cause stratospheric ozone depletion.

Ozone layer
The ozone layer is a thin invisible shield made of ozone gas. It protects us from the dangerous UV rays of the sun. The ozone layer stands in the stratosphere (upper atmosphere), at an altitude of 15 to 50 kilometres (10 to 30 miles) above the Earth.

Ozone layer depletion
A number of human activities release in the air some chemicals (ODS) that destroy ozone molecules in the upper atmosphere; while ozone molecules are destroyed in the upper atmosphere, the ozone layer gets thinner and thinner. This is ozone layer depletion. The consequence for us is an increased amount of damaging UV rays reaching the surface of the Earth.

Stratosphere
The upper layer of the atmosphere, situated from 15 km to about 50 km (10 to 30 miles) above the Earth.

Troposphere
The lower layer of the atmosphere. Practically all the human activities take place in the troposphere and all the water vapour is found there. Most of the clouds are in the troposphere layer.

UV Index
The UV Index is a tool to describe the level of solar UV radiation at the Earth's surface. It is aimed at alerting people about the need to adopt protective measures against the sun. The UV Index uses a range of values from zero upward. The higher the value, the greater the amount of dangerous UV rays and the potential for damage to our health.