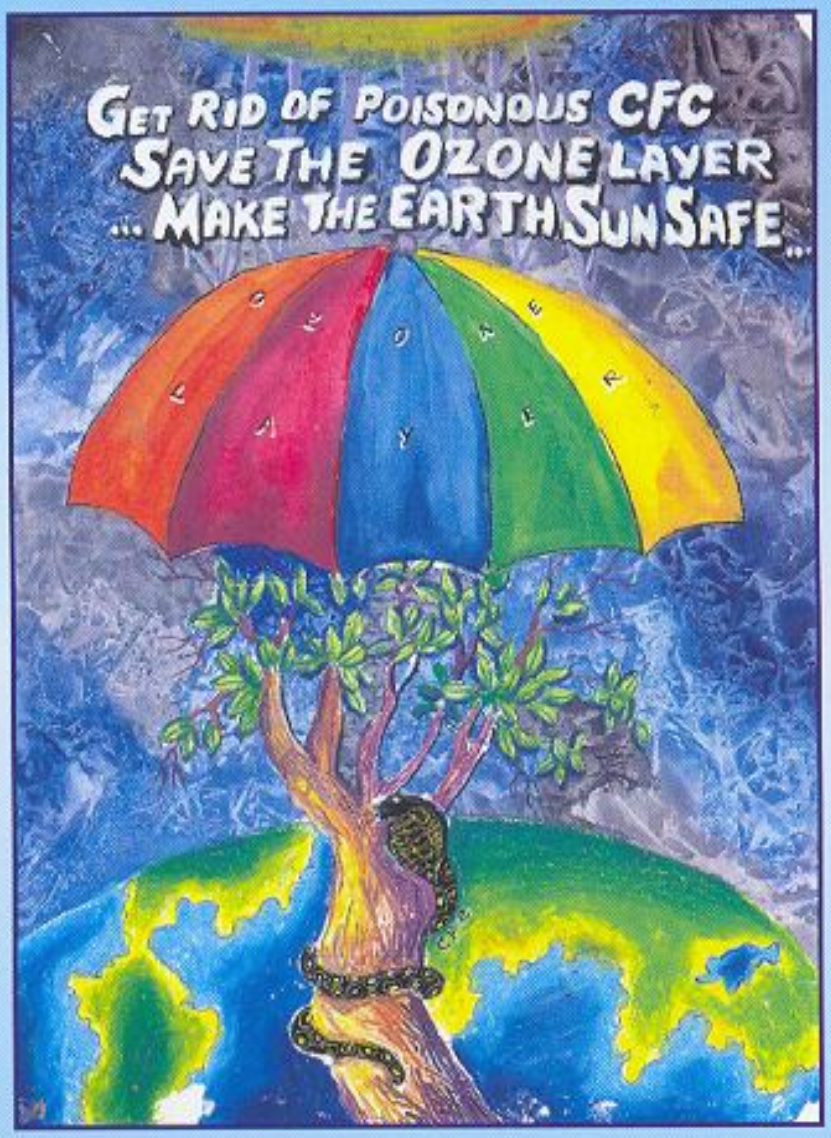
ACT OZONE FRIENDLY AND STAY SUN SAFE

THE MONTREAL PROTOCOL
INDIA'S SUCCESS STORY



Ozone Cell
Ministry of Environment and Forests
Government of India
New Delhi, India

ஆ. இராசா
ए. राजा
A. RAJA

मंत्री
पर्यावरण एवं वन
भारत सरकार
नई दिल्ली-110003
MINISTER
ENVIRONMENT & FORESTS
GOVERNMENT OF INDIA
NEW DELHI - 110003

FOREWORD

The Montreal Protocol on Substances that Deplete the Ozone Layer was signed on 16th September 1987 to protect the ozone layer. So far, 189 countries have ratified the Montreal Protocol. The Montreal Protocol is now being recognized as an extraordinary environmental success and also is a very successful model of global environmental cooperation to protect mankind from the harmful impact of ultra-violet solar radiations on human health and environment.

The implementation of the Montreal Protocol, in developing countries includes technical and financial support through well established financial mechanism. This has enabled the developing countries to play a meaningful role in phasing out the use of Ozone Depleting Substances (ODS), which is essential for ensuring a clean and safe environment for our children and future generations.

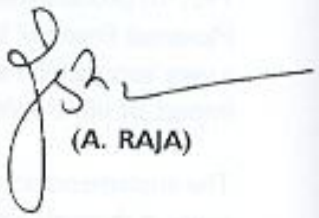
India, with political commitment through a sustainable institutional arrangement, has since been very active in implementation of the Montreal Protocol. After having signed the Montreal Protocol and its London Amendment in 1992, the country programme was prepared to phase-out ODS, which prescribes actions based on principles of minimum dislocation of the industry and with less impact on socio-economic structure of the country. Our endeavour in the last 16 years has been to create an enabling environment for the industry to have smooth transition to non-ODS technology. Efforts have also been made to generate awareness among different stakeholders, particularly the small and medium scale enterprises, on the impact of the Protocol and to encourage them to come forward to participate in the phaseout process. As a result, we have been able to fulfill our first commitment to freeze production and consumption of chlorofluorocarbons (CFCs) on 1st July 1999 and further to reduce production of CFCs as agreed to. The reduction in consumption of CFC has been addressed through implementation of about 270 individual phase-out projects and National CFC Consumption Phase-out Plan (NCCoPP). Total phase-out of halon production and consumption has been achieved. Technical Assistance and other supports measures have also been received from the Multilateral Fund through 80 non-investment activities.

The Government of India has a pragmatic approach to combat this global problem by taking a number of policy measures, both fiscal and legislative, to encourage early adoption of non-ODS technologies. Since 1995, full exemption from payment of Customs and Excise duties was granted on capital goods required to implement ODS phaseout projects funded by the Multilateral Fund and new establishments with non-ODS technology. To further strengthen the commitment, our

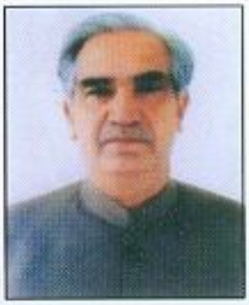
financial institutions have issued a directive to stop funding of new investments in India with ODS technologies from as early as 1997. We have also notified detailed Rules to regulate ODS phaseout under the Environment Protection Act, 1986 which have been put in place with effect from 19th July, 2000. These Rules give the necessary legal backing and time frame for the phase out of ODS. Further, Rules have been amended to support the smooth implementation of the provisions of the Protocol.

This year is a critical year for developing countries including India where more than 50% of ODS need to be phased out. In order to achieve this inherently, we need to maintain the momentum generated in the past and should continue to achieve the future targets.

The Montreal Protocol, as an environmental protection agreement, offers a great promise for protection of the Earth's stratospheric ozone layer. On the occasion of the eleventh International Ozone Day for the Preservation of Ozone Layer, we reiterate India's commitment to the Montreal Protocol and Vienna Convention.



(A. RAJA)



पर्यावरण एवं वन राज्य मंत्री
भारत सरकार
नई दिल्ली–११० ००३

MINISTER OF STATE FOR ENVIRONMENT & FORESTS
GOVERNMENT OF INDIA
NEW DELHI-110 003

नमो नारायन मीना
Namo Narain Meena

MESSAGE

At the outset, I congratulate the Ozone Cell for bringing out the 7th edition of the "The Montreal Protocol : India's Success Story", which highlights activities undertaken to meet India's obligations under the Montreal Protocol and the way forward to comply with the future targets.

Over the last 13 years, India has implemented an integrated programme for implementation of this important and one of the most successful multilateral environmental agreements. The institutional framework and regulations have, in a systematic manner, been adopted to meet the requirements and challenges posed through the implementation of the Protocol. We are proud to take note that we have, till date, complied with the targets specified for reduction of production and consumption of Ozone Depleting Substances (ODS) in the Protocol.

Though the industry has been adequately sensitized to the ODS phase-out issues and schedules specified under the Protocol, there is still a need to take actions to maintain momentum of the ODS phase-out activities and its sustainability in India. This is proposed to be achieved through a multi pronged strategy which includes supply control, facilitation of non-ODS technology, training and capacity building of user industry and regulatory interventions. I am happy to note that actions in this direction have already been initiated by the Ozone Cell under the National CFC Consumption Phase-out Plan (NCCoPP) and National CTC Phase-out Plan. I am confident that these actions would enable India in achieving smooth transition to non-ODS technologies in a cost effective manner.

Again, I congratulate Ozone Cell for initiating activities to facilitate regional cooperation in South Asia. Our support to the Government of Bhutan and dialogues with Governments of Nepal and Bangladesh were significant steps in this connection and these will go a long way in demonstrating how regional actions can facilitate faster achievement of targets under such multilateral environmental agreements.

On this occasion, let us all join hands to reiterate our commitment to the Protocol to save the Ozone Layer.

(NAMO NARAIN MEENA)

1. Ozone Layer

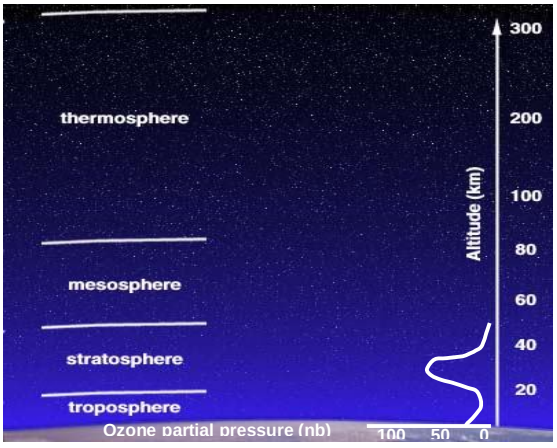
The small blue and green planet we call home is a very special and unique place. We live on the only planet in our solar system and possibly in the galaxy where life is known to exist. All life exists within thin film of air, water, and soil this spherical shell of life is known as the biosphere. The biosphere can be divided into three layers; the atmosphere (air), the hydrosphere (water), and the lithosphere (rock and soil). It is the unique attributes of the Earth's atmosphere that allow it to be a habitable place for humans, animals, microbes and plants as we know them.

The atmosphere is a mixture of gases and particles that surround our planet. When seen from space, the atmosphere appears as a thin seam of dark blue light on a curved horizon.

The Earth's atmosphere is divided into several layers. The lowest region, the troposphere, extends from the Earth's surface up to about 10 kilometers (km) in altitude. Virtually all human activities occur in the troposphere. Mount Everest, the tallest mountain on the planet, is only about 9 km high. The next layer, the stratosphere, continues from 10 km to about 50 km. Most commercial airline traffic occurs in the lower part of the stratosphere.

Most atmospheric ozone is concentrated in a layer in the stratosphere, about 15-50 kilometres above the Earth's surface.

Concentration of Ozone in the atmosphere



Ozone is a molecule containing three oxygen atoms. It is blue in colour and has a strong odour. Normal oxygen, which we breathe, has two oxygen atoms and is colourless and odourless. Ozone is much less common than normal oxygen.

Ozone's unique physical properties allow the ozone layer to act as our planet's sunscreen, providing an invisible filter to help protect all life forms from the sun's damaging UV (ultraviolet) rays. Most incoming UV radiation is absorbed by ozone and prevented from reaching the Earth's surface. Without the protective effect of ozone, life on earth would not have evolved the way it has. Most importantly, it absorbs the portion of ultraviolet light called UV-B. UV-B has been linked to many harmful effects, including various types of skin cancer, cataracts, and harm to some crops, certain materials, and some forms of marine life.

What is Ultraviolet Radiation?

The sun emits radiations of varying wavelengths known as the electromagnetic spectrum. Ultraviolet radiation is one form of radiant energy coming out from the sun. The various forms of energy or radiation, are classified according to wavelength (measured in nanometres where one nm is a millionth of a millimetre). The shorter the wavelength, the more energetic the radiation. In order of decreasing energy, the principal forms of radiation are gamma rays, x-rays, ultraviolet radiation (UV) rays, visible light, infrared rays, microwaves, and radio waves. Ultraviolet, which is invisible, is so named because it occurs next to violet in the visible light spectrum. The three categories of UV radiation are:

- UV-A between 320 and 400 nm
- UV-B between 280 and 320 nm
- UV-C between 200 and 280 nm

Of these, UV-B and C being highly energetic are dangerous to life on earth. UV-A being less energetic is not dangerous. Fortunately, UV-C is absorbed strongly by oxygen and also by ozone in the upper atmosphere. UV-B is also absorbed by ozone layer in the Stratosphere and only 2-3% of it reaches the earth's surface. The ozone layer, therefore, is highly beneficial to plant and animal life on earth in filtering out the dangerous part of sun's radiation and allowing only the beneficial part to reach earth. Any disturbance or depletion of this layer would result in an increase of UV-B and UV-C radiation reaching

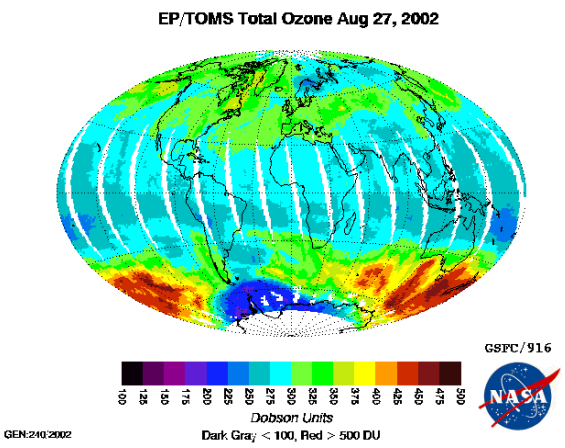
the earth's surface leading to dangerous consequences.

Ozone Depletion

At any given time, ozone molecules are constantly formed and destroyed in the stratosphere. The total amount, however, remains relatively stable. The concentration of the ozone layer can be thought of as a stream's depth at a particular location. Although water is constantly flowing in and out, the depth remains constant.

While ozone concentrations vary naturally with sunspots, the seasons, and latitude, these processes are well understood and predictable. Scientists have established records spanning several decades that detail normal ozone levels during these natural cycles. Each natural reduction in ozone levels has been followed by a recovery. Recently, however, convincing scientific evidence has shown that the ozone shield is being depleted well beyond changes due to natural processes.

Ozone Concentration



Ozone depletion occurs when the natural balance between the production and destruction of stratospheric ozone is tipped in favour of destruction. An upset in this balance can have serious consequences for life on Earth, and scientists are finding evidence that the balance has changed. Concentration of Ozone within the protective ozone shield is decreasing, while levels in the air we breathe are increasing.

Environmental Effects of Ozone Depletion

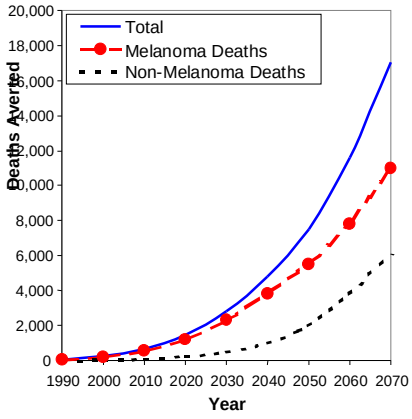
Ozone acts as a shield to protect Earth's surface by absorbing harmful ultraviolet radiation. Without this shield, we would be more susceptible to skin cancer, cataracts, and impaired immune systems. Recent studies have shown that even exposure for short length of time in sun suppresses the immune system in the human. A 1% decrease in total column ozone causes the amount of transmitted UV radiation that damages deoxyribonucleic acid (DNA), to increase by about 2%.

If this ozone becomes depleted, then more UV rays will reach the earth. Exposure to higher amounts of UV radiation could have serious impacts on human beings, animals and plants, such as the following:

- **Harm to human health**:
  - More skin cancers, sunburns and premature aging of the skin.

Annual Deaths from Melanoma and Non-Melanoma Skin Cancer Averted Due to Montreal Protocols (Mean Estimate)

(Source: Global Benefits and Costs of the Montreal Protocol)



  - More cataracts, blindness and other eye diseases: UV radiation can damage several parts of the eye, including the lens, cornea, retina and conjunctiva.
  - Cataracts (a clouding of the lens) are the major cause of blindness in the world. A sustained 10% thinning of the ozone layer is expected to result in almost two million new cases of cataracts per year, globally (Environment Canada, 1993).
  - Weakening of the human immune system (immunosuppression) Early findings suggest that too much UV radiation can suppress the human

immune system, which may play a role in the development of skin cancer.

- **Adverse impacts on agriculture, forestry and natural ecosystems**:
  - Several of the world's major crop species are particularly vulnerable to increased UV, resulting in reduced growth, photosynthesis and flowering. Many agricultural crops are sensitive to the burning rays of the sun, including the world's main food crops, rice, wheat, corn and soybean.
  - Many species of crops like sweet corn, soybean, barley, oats, cow peas, carrots, cauliflower, tomato, cucumber, peas and broccoli are highly sensitive to UV-B radiation. As a result, food production could be reduced by 1% for every 1% increase of UV-B radiation.
  - The effect of ozone depletion on the Indian agricultural sector could be significant.
  - Only a few commercially important trees have been tested for UV (UV-B) sensitivity, but early results suggest that plant growth, especially in seedlings, is harmed by more intense UV radiation.
- **Damage to marine life**:
  - In particular, plankton (tiny organisms in the surface layer of oceans) are threatened by increased UV radiation. Plankton are the first vital step in aquatic food chains.
  - Decreases in plankton could disrupt the fresh and saltwater food chains, and lead to a species shift.
  - Species of marine animals in their growing stage, including young fish, shrimp larvae and crab larvae, have been threatened in recent years by the growing UV-B radiation under the Antarctic ozone hole. Loss of biodiversity in our oceans, rivers and lakes could reduce fish yields for commercial and sport fisheries.
- **Animals**:
  - In domestic animals, UV overexposure may cause eye and skin cancers. Species of marine animals in their developmental stage (e.g. young fish, shrimp larvae and crab larvae) have been threatened in recent years by the increased UV radiation under the Antarctic ozone hole.
- **Materials**:
  - Wood, plastic, rubber, fabrics and many construction materials are degraded by UV radiation.
  - The economic impact of replacing and/or protecting materials could be significant.

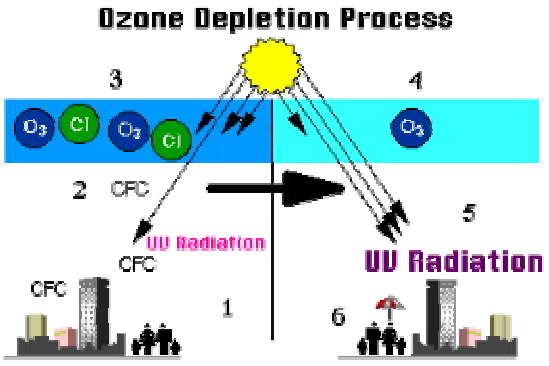
Beginning of Threat to Ozone Layer

For over fifty years, chlorofluorocarbons (CFCs) were thought of as miracle substances. They are stable, nonflammable, low in toxicity, and inexpensive to produce. Over time, CFCs found uses as refrigerants, solvents, foam blowing agents, aerosols and in other smaller applications. Other chlorine-containing compounds include methyl chloroform, a solvent, and carbon tetrachloride, an industrial chemical. Halons, extremely effective fire extinguishing agents, and methyl bromide, an effective produce and soil fumigant, contain bromine. All of these compounds have atmospheric lifetimes long enough to allow them to be transported by winds into the stratosphere. Because they release chlorine or bromine when they break down, they damage the protective ozone layer. The discussion of the ozone depletion process below focuses on CFCs, but the basic concepts apply to all of the ozone-depleting substances (ODS).

In the early 1970s, researchers began to investigate the effects of various chemicals on the ozone layer, particularly CFCs, which contain chlorine. They also examined the potential impacts of other chlorine sources. Chlorine from swimming pools, industrial plants, sea salt, and volcanoes does not reach the stratosphere. Chlorine compounds from these sources readily combine with water and repeated measurements show that they rain out of the troposphere very quickly. In contrast, CFCs are very stable and do not dissolve in rain. Thus, there are no natural processes that remove the CFCs from the lower atmosphere. Over time, winds drive the CFCs into the stratosphere.

The CFCs are so stable that only exposure to strong UV radiation breaks them down. When that happens, the CFC molecule releases atomic chlorine. One chlorine atom can destroy over 100,000 ozone molecules. The net effect is to destroy ozone faster than it is naturally created. To return to the analogy comparing ozone levels to a stream's depth,

CFCs act as a siphon, removing water faster than normal and reducing the depth of the stream.



1. CFCs released
2. CFCs rise into Ozone layer
3. UV releases Cl from CFC
4. Cl destroys Ozone
5. Depleted Ozone → More UV
6. More UV → More skin cancer

Large fires and certain types of marine life produce one stable form of chlorine that does reach the stratosphere. However, numerous experiments have shown that CFCs and other widely-used chemicals produce roughly 85% of the chlorine in the stratosphere, while natural sources contribute only 15%, as per United States Environmental Protection Agency.

Large volcanic eruptions can have an indirect effect on ozone levels. Although Mt. Pinatubo's 1991 eruption did not increase stratospheric chlorine concentrations, it did produce large amounts of tiny particles called aerosols (different from consumer products also known as aerosols). These aerosols increase chlorine's effectiveness at destroying ozone.

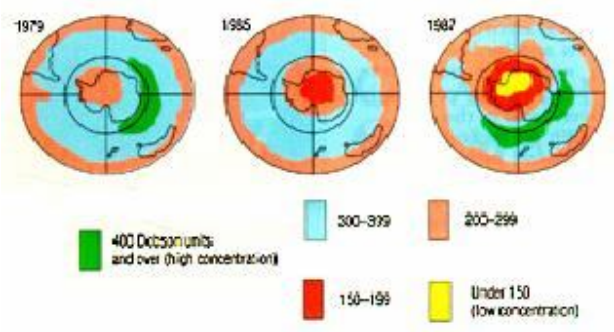
The aerosols only increased depletion because of the presence of CFC- based chlorine. In effect, the aerosols increased the efficiency of the CFC siphon, lowering ozone levels even more than would have otherwise occurred. Unlike long-term ozone depletion, however, this effect is short-lived. The aerosols from Mt. Pinatubo have already disappeared, but satellite, ground-based, and balloon data still show ozone depletion occurring closer to the historic trend.

Antarctic Hole

The terms “ozone hole” refers to a large and rapid decrease in the concentration of ozone molecules in the ozone layer, not the complete absence of them. The Antarctic “ozone hole” occurs during the southern spring between September and November. The British Antarctic survey team first reported it in May 1985. The team found that for the period between September and mid November, ozone concentration over Halley Bay, Antarctica, had declined 40% from levels during the 1960s. Severe depletion has been occurring since the late 1970s.

The problem is worst in this part of the globe due to extremely cold atmosphere and the presence of polar stratospheric clouds. The land under the ozone depleted atmosphere increased steadily to more than 20 million sq km in the early 1990s and in the Antarctic spring of 1998, the area of the Ozone hole exceeded 26 million sq kms and also covered some populated areas of the southern hemisphere. The total ozone dropped to about 97 Dobson units on 1 October 1998.

Evolution of the Antarctic Ozone hole (1979 – 1987 October)



In addition, research has shown that ozone depletion occurs over the latitudes that include North America, Europe, Asia, and much of Africa, Australia, and South America. Thus, ozone depletion is a global issue and not just a problem at the South Pole.

No one could imagine that these miracle chemicals could one day turn out to be harmful substance to life on Earth. It all began when at the first United Nations Environment Conference at Stockholm in 1972, questions were asked about the effect of jet aircrafts on upper atmosphere. It was known that the high temperature jet exhausts contain an appreciable amount of nitrous oxide and it was also known that this substance can catalytically decompose ozone. The conference authorized United Nations Environment Programme (UNEP) to address this issue and focus on the possible damage to the ozone layer by hundreds of supersonic aircrafts that were expected to be in operation by the late 1980s. They were also entrusted

with the task of finding out the effect of release of nitrous oxide from fertilizer manufacturing units on the ozone layer. These investigations did not make much headway and were dismissed as false alarms.

The Real Alarm

In 1974, two United States (US) scientists Mario Molina and F. Sherwood Rowland at the University of California were struck by the observation of Lovelock that CFCs were present in the atmosphere all over the world more or less evenly distributed by appreciable concentrations. They suggested that these stable CFC molecules could drift slowly upto the stratosphere where they may breakdown into chlorine atoms by energetic UV-B and UV-C rays of the sun. The chlorine radicals thus produced can undergo complex chemical reaction producing chlorine monoxide, which can attack an ozone molecule converting it into oxygen and in the process regenerating the chlorine atom again. Thus the Ozone-destroying effect is catalytic and a small amount of CFC would be destroying large number of ozone molecules. Their basic theory was then put to test by the National Aeronautic Space Authority (NASA) scientists and found to be valid, ringing alarm bells in many countries and laying the foundation for international action.

Recent measurements by the European Space Agency's Envisat Satellite using an ultra sensitive Sciamachy spectrometer which can detect oxides of nitrogen in parts per billion has produced a high resolution map of global atmospheric nitrogen dioxide pollution which vividly illustrates how human activities affect air quality. Nitrogen dioxide is released from Power Stations, Heavy Industries and Road Transport. There are swathes of high nitrogen concentration across industrial belts in North America, Europe, China and Korea. In India heavy nitrogen dioxide (NO_2) concentration is to be found over U.P. and Eastern Bihar or North Bengal. It is well known that nitrogen oxides are ozone depleting substances and the effects of such high concentration of nitrogen oxides will be detrimental to the Ozone Layer in the long run.

Recent issue of VATIS update reports decline of Ozone Layer over North pole. The effect has been ascribed to solar flares and record frigid temperatures working with manmade chemicals. According to reports published in **geophysical research** latter the arctic ozone level declined more precipitously than ever in upper atmosphere.

Researchers from the EU SCOUT – 03 integrated project coordinated by Chemistry Department of University of Cambridge, U.K. have found that over all temperatures in the Ozone Layer was lowest of 50 years and from late November to late February large areas of polar stratospheric clouds were present over the arctic region. This causes the changes of the breakdown products from CFCs so rapid that ozone destruction could occur in the presence of sun light. Cold conditions also effected the distribution of nitrogen oxides allowing ozone losses to continue longer than usual.

The Antarctic ozone hole grew rapidly from mid August to early September to reach around 19 million square km. It then slowly decreased to 15 million sq. km in early October and then rapidly dropped to zero after mid November.

Current Status

Ozone-depletion science: achievements and challenges

Our scientific understanding of the ozone layer has grown substantially over the past decades and has provided essential guidance to the Parties to the Montreal Protocol. Scientific research has led to: discovery of the Antarctic ozone hole and ozone depletion at other latitudes, development and validation of the ozone depletion theory, deployment of the ozone and ODS-monitoring networks, and estimation of benefits of phase-out of ODS under the Montreal Protocol.

Early warning and periodic assessments by scientists of policy-relevant information allowed nations and multiple stakeholders to build consensus on actions to protect the ozone layer. Scientific findings guided Governments to design controls for ODS and incentives for alternatives; guided industry to develop alternatives with higher energy efficiency, greater reliability, and less manufacturing
waste; and provided the information necessary to transform markets at a pace that protected existing investment. Since the onset of ozone depletion in the 1980s, however, human activities have continued to alter atmospheric composition through the increased emissions

of a variety of chemical species in addition to those containing chlorine and bromine. These other species have changed important conditions that directly or indirectly influence the transport and loss of stratospheric ozone. For example, water vapour has increased and temperatures have decreased in the ozone layer. It is important to be able to predict future ozone abundances in our chemically changing atmosphere.

Furthermore, climate change is expected from the continuing accumulation of greenhouse gases in the atmosphere. Because ozone, ODS, HFC and some other substitutes are greenhouse gases contributing to the radiative balance of the Earth's atmosphere, climate change is influenced by the reduction and phase-out of ODS. Ozone depletion, in turn, depends on climate change through changes in atmospheric composition and meteorology. As a consequence of the complex interrelationship between ozone depletion and climate change, there is a clear need for scientists to continue development of atmospheric models to predict with greater accuracy how the ozone layer will change in the future.

The protection from ultraviolet radiation provided by the ozone layer limits damage to phytoplankton that provide a carbon sink in oceans. Because the formation of skin cancer by ultraviolet radiation increases at higher temperatures, climate change will increase skin cancer incidence, compounding the effects of ozone depletion. Monitoring and assessment of the global atmosphere by a large international group of scientists using space-borne and ground-based instruments has successfully guided the Montreal Protocol and will be essential in the coming decades as the ozone layer recovers. It is paramount to maintain and further strengthen the scientific basis of the Protocol, particularly in developing countries, by building expertise and institutions for addressing, in a sustainable manner, the depletion of the ozone layer and other adverse environmental changes. This strengthening requires financing of scientific activities by national governments, private organizations, and multilateral agencies such as the United nations Environment Programme (UNEP), World Meteorological Organization (WMO), the World Bank and United Nations Educational, Scientific and Cultural Organization (UNESCO).

International Action

The first international action to focus attention on the dangers of ozone depletion in the stratosphere and its dangerous consequences in the long run on life on earth was initiated in 1977, when in a meeting of 32 countries in Washington D.C. a World Plan on action on Ozone layer was adopted with UNEP as the coordinator.

As experts began their investigation, data piled up and in 1985 in an article published in the prestigious science journal, "Nature" by Dr. Farman, pointed out that although there is overall depletion of the ozone layer all over the world, the most severe depletion had taken place over the Antarctica. This is what is famously called as "the Antarctica Ozone hole". His findings were confirmed by Satellite observations and offered the first proof of severe ozone depletion. These findings stirred the scientific community to take urgent remedial actions. A framework for such actions were designed and agreed in an international convention held in Vienna on March 22, 1985.

This, subsequently, resulted in an international agreement in 1987 on specific measures to be taken in the form of an international treaty known as the Montreal Protocol on Substances That Deplete the Ozone Layer. Under this Protocol the first concrete step to save the Ozone layer was taken by immediately agreeing to completely phase out chlorofluorocarbons (CFC), Halons, Carbon tetrachloride (CTC) and Methyl chloroform (MCF) as per a given schedule.

Evolution of the Montreal Protocol

The urgency of controlling the Ozone Depleting Substances (ODS) particularly CFCs was slow to pick up. CFCs were so useful that society and the industry were reluctant to give up consuming them. However, even as the nations adopted the Montreal Protocol in 1987, new scientific findings indicated that the Protocol's control measures were inadequate to restore the ozone layer. In addition, the developing countries had a special situation as they needed the technology of substitutes as well as financial assistance to enable them to change over to non ODS substances.

Meanwhile, the report of the scientific panels entrusted with the task of finding the extent of ozone depletion showed that the actual harm to the ozone layer was much more than

predicted by theoretical models and the control measures envisaged by the Protocol in 1987 would not stop the process. More urgent action was therefore necessary. Therefore, at the 2nd meeting of the Parties in London in 1990, 54 Parties as well as 42 non-Party countries agreed on a package of measures satisfactory to all. It was agreed in this meeting that the 5 important CFCs and Halons would be phased out by the year 2000 and other minor CFCs and CTC would be controlled and eventually phased out. A special provision was made to fund the developing countries with an annual consumption of ODS of less than 0.3 kg per Capita (also called as Article 5 countries) in their efforts to phase out these harmful chemicals. These countries were also given a grace period of 10 years to phase out ODS.

In 1991, more alarming reports came up to show that the depletion of ozone is continuing in all altitudes except over the tropics. It was recognized that it is not enough to control emissions of CFCs and Halons. Other fluorocarbon chemicals like Hydro chlorofluorocarbons (HCFCs) and Methyl bromide, which are also ozone depleting need to be controlled. They have also been brought under the ambit of the Protocol in 1992.

Multilateral Fund (MLF)

With a view to assist the developing countries in their phase out efforts, a Multilateral Fund has been created. This is known as the Montreal Protocol Multilateral Fund (MPMF). The Fund will finance incremental cost of ODS phase out. The incremental cost includes, cost of transfer of technology, purchase of capital equipment and operational costs for switching over to non ODS technologies enabling the developing countries to phase out controlled substances. Enterprises using ODS technology established before 25.7.95 are eligible for funding for conversion to non ODS technology from MPMF.

India being an Article 5 country is entitled to this assistance from Multilateral Fund in its efforts to phase out ODSs and switch over to non ODS technologies.

Alternatives to currently used Ozone Depleting Substances

During the last few years intense research has yielded a large number of substitute chemicals as replacements to currently used chlorofluorocarbons (CFCs), Halons, Carbon tetra chloride, and Methyl chloroform. These are summarised below on end-use basis:

Technology Options for Phaseout in Refrigeration and Air-conditioning Sector

Sub-sector	ODS used at present	Preferred alternatives / substitutes
Domestic refrigerators	Refrigerant CFC-12 Foam Blowing CFC-11	HFC-134a Isobutane Drop-ins (substitutes) Cyclopentane HCFC-141b
Refrigerated Cabinets (Deep Freezer, Ice-cream cabinets, Bottle coolers, Visi coolers)	Refrigerant CFC-12 Foam Blowing CFC-11	HFC-134a Blends of HC-290 and HC-600a HCFC-141b Cyclopentane
Water Coolers	CFC-12 HCFC-22 (for bigger capacity)	HFC-134a Blends of HC-290 and HC-600a HCFC-22
Mobile (car, bus, van, refrigerated trucks, train)	CFC-12 HCFC-22 (train)	HFC-134a HCFC-22 (trains only)
Central A/c plants	CFC-11, CFC-12 HCFC-22	HFC-134a HCFC-123 HCFC-124 HCFC-22 Ammonia
Process Chillers	CFC-12	HCFC-22, Ammonia

Technology Options for Phaseout in Refrigeration and Air-conditioning Sector contd.

Sub-sector	ODS used at present	Preferred alternatives / substitutes
Ice Candy Machines	CFC-12	HCFC-22, HFC-134a
Walk-in Coolers	HFCF-22, CFC-12	HCFC-22 HFC-134a
Room A/C	HFCF-22, CFC-12	HCFC-22
Packaged A/C	HCFC-22	HCFC-22
Shipping	HFCF-22, CFC-12	HCFC-22 HFC-134a

Technology Options for Phaseout in Aerosol Sector

Sub-sector	ODS used at present	Preferred alternatives / substitutes
Perfumes, shaving foams, insecticides, pharmaceuticals, paints, etc.	CFC-11/12	HAP. DME (Di-methyl Ether) Small, Tiny & Cottage sectors use contract fillers, establish common filling facility for a cluster of units and switch to not-in-kind substitutes. (destenched LPG)
Metered Dose Inhalers	CFC-12	HFC -134a

Technology Options for Phaseout in Foams Sector

Sub-sector	ODS used at present	Preferred alternatives / substitutes
Flexible PUF Slabtstock	CFC-11	Methylene Chloride
Flexible Moulded PUF	CFC-11	Water blown technology
Rigid PUF General Insulation (other than refrigeration)	CFC-11	HCFC-141b
Thermoware	CFC-11	Current- HCFC-141b Long term - CFC-free systems (water blown)
Integral Skin PUF	CFC-11	HCFC-141b
Thermoplastic Foams - EPE/EPPN Foams - EPS Foams	CFC-11 CFC-12	Hydrocarbons CO_2
Phenolic Foams	CFC-11	Hydrocarbons

Technology Options For Phaseout in Fire Extinguishing Sector

Sub-sector	ODS used at present	Preferred alternatives / substitutes
Fire Extinguishers	H-1211, H-1301	Portable type - ABC powder, CO_2. Fixed type - FM200, HCFC blend, NAF-SI/SIII

Technology Options for Phaseout in Solvent Sector

Sub-sector	ODS used at present	Preferred alternatives / substitutes
Electronic and precision cleaning	CFC-113	DI Water
	CTC	Aqueous cleaning process
	Methyl chloroform	Semi-aqueous cleaning process, organic non-halogenated and halogenated, solvents, perfluorocarbons
Coatings	CFC-113 Methyl chloroform	Aqueous solvents Tri chloro ethylene
Manufacture of pesticides and pharmaceuticals	CTC	Ethylene-dichloride Monochloro-benzene
Metal cleaning	CTC	Tri chloro ethylene
Chlorinated rubber	CTC	Aqueous system
Textile cleaning	CTC	Aqueous system, chlorinated solvents

During the last several years due to intense R&D efforts new solvent systems are being discovered as alternatives to CFCs solvents used earlier. At first hydroflouroethers (HFEs) made appearance. Although satisfactory in many respects these were very high cost alternatives. Recently Servisol, an UK based company, has come out with alternatives solvents for electrical cleaning specially for tape head and disk drives (Video 40), flux removal and PCB cleaner (Deflex 160); degreasing agent (Cold kleen 110); adhesive sticker removing, computer disk cleaning (CD-150) etc.

Although these are patented and detailed chemical compositions are not available but the trend is good. Future may see many more alternative solvents readily available in the market so that the absence of Ozone depleting solvents like MCF and CFC-113 will not be felt.

2. India's Commitment to the Montreal Protocol

India signed the Montreal Protocol on 17.9.92. India's per capita consumption of Ozone Depleting Substances is at present less than 3 grams and did not cross 20 gms between 1995-97 as against 300 gms permitted under the Protocol. India is self sufficient in production of chlorofluorocarbons (CFCs). India mainly produced and used seven of the 20 substances controlled under the Montreal Protocol. These are CFC-11, CFC-12, CFC-113, Halon-1211, Halon-1301, Carbon tetrachloride, Methyl Chloroform and Methyl Bromide.

India prepared a detailed Country Programme (CP) to phaseout ODS in accordance with its national industrial development strategy in 1993. The objectives of the CP were to phaseout ODS without undue economic burden to both consumers and industry manufacturing equipment using ODSs and provided India with an opportunity to access the Protocol's Financial Mechanism. The other objectives of the CP also include minimisation of economic dislocation as a result of conversion to non-ODS technology, maximisation of indigenous production, preference to one time replacement, emphasis on decentralised management and minimisation of obsolescence.

The Government of India has entrusted the work relating to ozone layer protection and implementation of the Montreal Protocol to the Ministry of Environment and Forests (MOEF). The MOEF has set up an Ozone Cell as a national unit to look after and to render necessary services to implement the Protocol and its ODS phaseout programme in India.

The MOEF has also established an Empowered Steering Committee, which is supported by four Standing Committees, namely the Technology and Finance Standing Committee, Standing Committee for Small Scale, Tiny and Unorganised industries, Standing Committee on Implementation of ODS phaseout projects and Monitoring and Evaluation Committee. The Empowered Steering Committee is responsible for the implementation of the Montreal Protocol provisions, review of various policy and implementation options, project approvals and project monitoring.

Although these miracle chemicals have been used in large scale in the developed countries since 1930s, India was slow to derive benefits from their use. The early use of these chemicals, in India, was in refrigerators and CFC-12 needed for servicing was imported. The use of CFC in refrigeration industry can be traced back to the 1960s. Other industries using CFCs such as foam blowing industry, aerosol industry etc., have developed only during the last 15 to 20 years in India. With the availability of CFC-11 and 12 from indigenous production, the growth of these industries consuming CFCs increased very rapidly.

Use of ODS as solvents is estimated to account for the maximum consumption, both in ODS as well as Ozone Depleting Potential (ODP) terms. Refrigeration & Air-conditioning and Foam are next large user sectors, followed by Aerosol. The consumption of ODS in fire extinguisher sector has considerably decreased over the years because of switch over to non-ODS technology by enterprises consuming large quantities of halons.

Progress of ODS Phaseout in India

India is in the process of phasing out ODSs both in the end-use consumption sector and production sector. A total of 357 projects have been approved and funded by the Multilateral Fund. Of these, 277 are ODS phaseout investment projects while 80 are non-investment and support activities. A total amount of about USD 180 million has been approved by the Executive Committee of the Multilateral Fund Secretariat for the phasing out 11, 052 ODP tons.

CFC production sector phaseout project in India

The Executive Committee of the Multilateral Fund approved a total of US $ 82 million for the phased reduction and cessation of the entire CFC production in India. In this project,

it has been agreed to reduce total CFC production in accordance with an agreed upon schedule. A Project Management Unit (PMU) is operational in the Ozone Cell for monitoring CFC production phaseout and implementing other support activities to aid CFC production phaseout. So far, the CFC producers have achieved a reduction of 9456 MT of ODS production since calendar year 1999 and have complied with their respective Production Quotas.

The Executive Committee of the Multilateral Fund also approved US $ 2.6 million for phasing out halon production and remaining consumption of halons. The enterprises producing halons have dismantled their production plants and rendered them incapable of producing halons.

Sector wise breakup of the funds approved by the Multilateral Fund for ODS phase-out projects in India is given in the table below:

Sector-wise Approved Projects as on 31.8.2005

Sl. No	Sector	No. of Projects	Grant Amount (US $)	OPD Tonnes Phased out
1.	Aerosol	23	3,174,582	709.9
2.	Foam	155	41,400,216	4967.3
3.	Halon	15	4,939,389	1768.1
4.	RAC	53	34,500,366	2418.6
5.	Solvent	30	30,186,870	1188.4
6.	Production	1	56,201,700	0
7.	Support Activities	80	9,690,060	0
	Total	**357**	**180,093,183**	**11,052.3**

Remembering O_3ur Future: Commemorating closure of ODS Production Sites under the Montreal Protocol

The Ozone Cell, MoEF and UNEP jointly launched a new global initiative to raise awareness on the ozone layer protection on 7th March, 2005 at 7 PM in Hotel Taj Mahal, Man Singh Road, New Delhi.

On this occasion, the closed facility of halon production in SRF Limited was marked with a plaque that describes in a standard message to the effect that "ODS manufacture once took place here, but for the benefit of future generations the production facility was permanently closed as part of this global agreement". Hon'ble Minister of Environment and Forests, Shri A. Raja inaugurated the function and unveiled the plague.

Progress of Implementation of Projects

Progress of the Implementation Status of Umbrella Project in Foam Sector

The project was approved at the 37th Meeting of the Executive Committee of MLF, at a total funding level of US$ 5,424,577, to be provided in five tranches, leading up to the complete phase-out of CFCs in the Foam Sector in India by 01 January 2007.

The Phase-out Plan will be implemented through five annual implementation programmes and together with the implementation of the approved ongoing projects, will result in the complete phase-out of CFCs in the Foam Sector in India in four years. The Phase-out Plan will cover the technology conversions in all the remaining eligible enterprises in the Foam Sector and also ensure timely, sustainable and cost-effective phase-out in the Foam Sector through a combination of investment, technical support and management components.

A total of 91 enterprises have been identified for implementation of ODS phase out activities. Out of which at 12 enterprises, non-ODS equipment have been installed. For remaining enterprises purchase orders for equipment have been placed with the supplier. As per the agreement during 2004, the target of 508 ODP tones phased out of CFC-11 was achieved Further 15 more enterprises have

been identified and endorsed for implementation in 2005.

First regional workshop for foam sector was organised at Bangalore for enterprises located in South of India. 40 participants attended the workshop.

Progress of the Implementation Status of Umbrella Project in Commercial Refrigeration Sector

The Plan for Phase-out of CFCs in the Refrigeration (Manufacturing) Sector in India project was approved at the 38th Meeting of the Executive Committee of MLF, at a total funding level of US$ 3,609,186, to be provided in five tranches, leading up to the complete phase-out of CFCs in the Refrigeration (Mfg) Sector in India by 01 January 2007. The Plan is to be implemented by two agencies. The portion of the Plan to be implemented by UNIDO covers the phase-out in the transport refrigeration sub-sector and the component of the plan to be implemented by UNDP, as the lead Implementing Agency, covers all other sub-sectors within the Refrigeration (Mfg) Sector excluding the transport refrigeration sub-sector. The Phase-out Plan will cover the technology conversions in all the remaining eligible enterprises in the Refrigeration (Mfg) Sector (excluding the MAC Sector) through a combination of investment, technical support and management components.

A total of 82 enterprises have been identified for implementation of ODS phase out activities. Out of which at 27 enterprises non-ODS equipment have been installed. For remaining enterprises purchase orders for equipment have been placed with the supplier. As per the agreement during 2004, target of 368 ODP tones of CFC-11 phase-out was achieved. Further 28 more enterprises have been identified and endorsed for implementation in 2005.

Implementation Status of the National CFC Consumption Phase-out Plan (NCCoPP).

Background: National CFC Consumption Phase-out Plan was approved at 42nd meeting of the Executive Committee at a total cost of US$ 6.388 million. The Government of Germany, as the lead Implementing Agency, has initiated the implementation process. The UNDP has taken steps for procurement of equipment. The UNEP has also initiated activities to launch the awareness programme. The NACEN as coordinating agency for the Customs and Policy Training, launched its first training programme in February 2005.

Two pilot training courses for MAC servicing were successfully completed in Bangalore. Follow on work with regard to data collection of a Maruti Zen vehicle retrofitted with HC blend is ongoing. 1200 service technician had been trained till February 2005. 40 out of 60 ITI's have received charging equipment. The UNDP part has been ordered for all.Consolidated list of refrigeration service enterprises (RSES) for ESS is ready.

Three planned ESS workshop have been completed. 6 out of 9 dealer meetings have been completed. The second core group meeting was held on 10th & 11th March, 2005 to review the progress

Commercial Refrigeration & Foam Workshop at Bangalore, Mumbai & Amedabad

India being a party to the Montreal Protocol mandates to phase out all CFC consumption in all the sectors including Foam Sector. The Sector Phase out Plan was approved by the Executive Committee (ExCom) of the Multilateral Fund (MLF) for implementation of Montreal Protocol at its 37th Meeting in July 2002. UNDP is the Implementing Agency.

The Sector Phase out Plan Unit (SPPU) has been set up for executing the implementation of CFC phase out activities at the enterprise level and to undertake activities relating to the Montreal Protocol.

The objective of the workshop was to :

- Facilitate awareness and information dissemination about the Foam Sector Plan and the obligations arising from its implementation
- Promote participation of those enterprises in the Foam Sector Plan, which have not yet participated, and to brief such enterprises on the implementation process
- Provide technical assistance, information and technical resources as may be required, related to application of sustainable alternative technologies

Implementation of Foam Sector Plan will result in total phase out of CFC-11 by 31st December 2006. In view of this, following workshops were organized under no investment activities.

- The first Foam workshop was held on 26th February 2005 at Hotel Taj West End, Bangalore.

- The second Foam workshop was held on 9th June 2005 at Hotel Orchid, Mumbai

- The first Commercial refrigeration workshop was held on 14th june 2005 at Hotel TGB, Ahmedabad.

Implementation Status of CFC Phase out Project.

CFC production sector gradual phaseout project was approved in the 29th Meeting of the Executive Committee. It includes US$ 80 million for compensation of producer enterprises and US$ 2 million for Technical Assistance Programme.

Till date the project has successfully phased out 9456 MT of CFCs beginning from the baseline of 22,588 MT in the year 1999.

Production Quota for CFC-11, 12, 113a has been issued to all the four beneficiary enterprises for the year 2005 i.e., (Jan-2005 to Dec.-2005). The quota transfer order between M/s Chemplast Sanmar Limited and M/s Navin Fluorine Industries Ltd. for year 2005 has been issued. A three years strategy of PMU for 2004-2007 was prepared for implementation of activities under PMU. The Final strategy was submitted to UNEP & WB and discussed during the meeting on 8th March, 2005. MOU between MOEF and UNEP for Policy and Custom Training Strategy has been prepared and signed which will be implemented as part of PMU's activities in the CY 2005.

Implementation Status of National CTC Phase out Plan.

Carbon Tetra Chloride (CTC) National Phase out Plan has been approved by the Executive Committee at its 40th Meeting at the total cost of US$ 52 million. During February 2005 the breakup of the fund support between Production and Consumption Sectors was negotiated and finalised. The details for the same are given below:

Production US$ 28.5 million
Consumption US$ 21.5 million
Technical assistance US$ 2.0 million

Production Sector : Meetings have been held with the CTC producers on the verification protocol for non feed stock applications in March, 2005. During this meeting the protocol draft was finalised incorporating few changes suggested by producers. Production quota order for CTC production for non feedstock application was also finalised and approved in April, 2005. CTC producing enterprises are in the process of finalising sub grant agreement with IDBI and performance agreement with Govt. of India.

A meeting was held with the DV acid chloride manufacturers to appraise them on the verification process and the need for maintaining data which, can be independently verified on feed stock use of CTC.

Consumption Sector : The amended agreement and Annual Programme including UNIDO's activities for CTC Phase Out Plan for the year 2005 have been approved by the Executive Committee in its 45th Meeting held in April, 2005. Project activities relating to identification of CTC consuming enterprises verification and project implementation are being under taken by the PMU.

Meeting of all the Implementing Agencies to review the status of Implementation of Projects

India being a Party to the Montreal Protocol mandates to phase-out production and consumption of Ozone Depleting Substances (ODS) as per the specific schedule of the Montreal Protocol. As per the control schedule, India has to meet the immediate target of 50% reduction in CFC production and Consumption and 85% reduction of CTC production and Consumption, a meeting with Implementing Agencies was held on 7th – 8th March 2005 in India Habitat Centre, Lodhi Road, New Delhi. The meeting was convened by inviting all the lead Implementing Agencies and Coordinating Agencies to discuss the progress made so far in implementation of the National Phase-out Plans.

National CFC Consumption phase-out project (NCCoPP) in the RAC Servicing Sector

NCCoPP is India's final CFC phase-out project in the RAC Servicing Sector. The project aims to phase-out CFC consumption in this sector by 1st January 2010 in compliance with the Montreal Protocol schedules.

The project's main scope is on training of

refrigeration servicing sector technicians in handling alternative refrigerants and containing CFC, when servicing domestic and small airconditioning equipment. It also covers training for Mobile Air-Conditioning (MAC), Open Type Compressor (OTC) and specifically targets the Railways as a key institutional user of CFC refrigerants. The project adopts a multi-pronged approach to achieve its targets. In addition to training, it includes equipment support, awareness building and information dissemination, and customs support components.

Information dissemination and creating awareness regarding CFC phase-out in India is of utmost importance to ensure the project's success. Various methods are being employed to create awareness: viz. video film, posters, newsletter, flyers, dealer workshops, equipment support workshops, articles in newspapers and this; dedicated website.

NCCoPP is funded by the Multilateral Fund of the Montreal Protocol. NCCoPP takes over from the Indo-Swiss Human and Institutional Development in Ecological Refrigeration (HIDECOR) project. The HIDECOR operation, initiated in 1998, was geographically restricted to selected states and the target group was limited to Micro and Small and Medium-sized service Enterprises in the RAC sector. NCCoPP currently has a presence in 15 States of India. It aims to encourage good servicing practices among all RSEs, with a special focus on those firms consuming more than 50 kg CFC per annum.
The project is scheduled to end by 31 December 2009**.**

Meeting Challenges in phase out of CFCs from India's RAC Servicing Sector

A one day conference on "**Meeting Challenges in phase out of CFCs from India's RAC Servicing Sector**" was held on Wednesday, March 09, 2005 at India Habitat Centre, Lodhi Road, New Delhi. The conference was organized jointly by Ministry of Environment & Forests, Government of India, Government of Switzerland, Government of Germany and IIT, Delhi. The main focus of this conference was to share the initiatives taken to minimize consumption of CFCs in this sector in India and solicit the active cooperation and support of all the stake-holders.

Hon'ble Minister of Environment and Forests, Shri A. Raja inaugurated the conference and Dr. Prodipto Ghosh, Secretary (E & F) delivered the Key Note Address. Shri K. Madhav Sarma has also been invited as one of the distinguished guests. The target audience for the conference was from Departments/Ministries of Government of India, State Government, Development Commissioner Small Scale Industries, refrigeration industry etc.

SRF HFC-32

In order to counter the phase-out of CFCs and to ensure growth, SRF Limited proposes to set-up a new manufacturing facility for Hydrofluorocarbons (HFCs), which are ozone friendly replacement gases for CFCs and HCFCs that are being phased out under the Montreal Protocol. This facility will be for production of HFC-32 and will have flexibility to produce HFC-134a. The technology for HFC-32 has been developed in house by SRF and technology for HFC-134a has been developed in association with Indian Institute of Chemical Technology (IICT), Hyderabad. The manufacturing processes have been designed to be most competitive globally.

The market for HFCs is growing globally and the supplies have also been tight for these new generation HFCs.. SRF has already captured more than 50% of Indian HFC market by importing the products and selling in India.

CTC production and Consumption sector phaseout Plan in India

India signed an agreement with the Executive Committee of the Multilateral Fund Secretariat to the Montreal Protocol for phasingout production and consumption of CTC for non-feedstock applications for a total funding of US $ 52 million. The lead implementing agency for this agreement is The World Bank and the cooperating implementing agencies include UNIDO, Government of Germany, Government of France and Government of Japan. During the last year, India signed the Performance Agreement with The World Bank for this project. Agreements were also signed by the Government of India with the Governments of Germany, France and Japan for implementation of different components of this project.

Activities relating to CTC production sector and consumption sector are progressing with support from various implementing agencies. These activities are facilitated by a Project Management Unit for CTC phaseout plan set up in the Ozone Cell.

For implementation of this project, awareness activities covering a wide range of industries consuming CTC as a solvent and process agent have been carried out last year. Further, for controlling supply of CTC which is a key measure to drive the momentum of phaseout, a Quota Order for production of CTC for non-feedstock applications has been issued by the Government of India. Agreements have been signed with the CTC producers binding them to performance requirements i.e., maximum CTC production levels allowed, under this project. Consumption sector projects are also under various stages of development and implementation under this phaseout plan.

This project proposes to bring down the consumption of CTC which is estimated to be about 6,000 ODP tons in the year 2001 to nil by 2010 in a phased manner.

State Workshops

States play a key role in Montreal Protocol implementation by virtue of their geographic proximity to the industries consuming ODSs particularly SMEs and their ability to control and monitor activities relating to phasing out ODSs. To increase awareness of State authorities on Ozone related matters, the Project Management Unit, established under Technical Assistance component for CFC production sector phaseout project, conducted workshops in over 25 States since May 2001. This has also been followed up periodic dialogue and meetings with the State authorities with primary focus on implementation of projects for SMEs and remaining ODS consuming industries and regulation implementation.

A networking workshop for stakeholders was held on 25th June, 2005 at Bangalore in assistance with CEE Ahmedabad under Regional Networking Strategy.

Fiscal Measures

The Government of India has granted full exemption from payment of Customs and Excise duties on capital goods required for ODS phase out projects funded by the Multilateral Fund. The Government extend the benefit of Customs and Excise duty exemptions for ODS phaseout projects which were eligible for funding under the Multilateral Fund, whether or not such enterprises actually sought assistance from the fund. This also covered projects submitted for retroactive financing. The benefit is available subject to the condition that enterprises give clear commitment to stopping using ODS in all future manufacturing operations after the projects are implemented.

The benefit of duty exemption has been extended for new capacity with non-ODS technology. Indian financial institutions have decided not to finance/re-finance new ODS producing/consuming enterprises. The Tariff Advisory Committee (TAC) - a statutory body under the Insurance Act, 1938 - has decided to grant suitable discounts on fire insurance premiums if alternative agents are used to replace halons in fire extinguishing systems.

Ozone Depleting Substances (Regulation and Control) Rules 2000

In accordance with the National Strategy for ODS phaseout the Ministry of Environment and Forests, Government of India, has notified Rules, covering various aspects of production, sale, consumption, export and import of ODS.

Important provisions of the Ozone Depleting Substances (Regulation and Control) Rules 2000

These Rules prohibit the use of CFCs in manufacturing various products beyond

1.1.2003 except in metered dose inhaler and for other medical purposes. Similarly, use of halons is prohibited after 1.1.2001 except for servicing and essential use. Other ODS such as carbon tetrachloride and methyl chloroform and CFC for metered dose inhalers can be used upto 1.1.2010. Further the use of methyl bromide has been allowed upto 1.1.2015. Since, HCFCs are used as interim substitute to replace CFC, these are allowed to be used upto 1.1.2040.

The Rules also provide for compulsory registration of ODS producers, manufacturers of ODS based products, importers, exporters, stockist and sellers and the same provision is applicable to manufacturers, importers and exporters of compressors. They are also required to maintain records and file periodic reports for monitoring production and use of ODS. Enterprises which have received financial assistance from Multilateral Fund for switchover to non-ODS technology have to register the date of completion of their project and declare that the equipment used for ODS has been destroyed. Creation of new capacity or expansion of capacity of manufacturing facilities of ODS and ODS based equipment has been prohibited. Purchasers of ODS for manufacturing products containing ODS, are required to declare the purpose for which ODS is purchased. Authority has been specified to issue license for all imports and exports of ODS and products containing ODS.

These rules also indicate specific phaseout dates for manufacturing products using ODSs.

Trade in ODS with non-Parties is banned. The import and export of ODS are subject to licensing requirement. The export of ODS to Non-Article-5 Parties is also banned. This regulatory measure is part of the Ozone Depleting Substances (Regulation and Control) Rules 2000 which have been notified in the Gazette of India on July 19, 2000.

Amendments

Compulsory registration under the ODS Regulation and control, amendment rules, 2004 under EPA, 1986. it was informed that all enterprises using CTC and HCFC for manufacturing activities are required to register with the designated authority vide amendment Rules, 2004 on or before 31 Dec, 2004 and 19 Jul, 2007 respectively.

Awareness Generation

The National Ozone Unit (NOU**)** has undertaken comprehensive public awareness campaign to ensure that both the public and the companies responsible for actually phasing out the ODS understand and support the policies to protect the ozone layer. Awareness campaigns on Montreal Protocol implementation were conducted between 2001 to 2004 at State level on implementation of Montreal Protocol in India and assistance that can be availed under the Protocol.

Further, the International Ozone Day for the year 2001 was celebrated at Hyderabad. This year was the first year where the International Ozone Day was celebrated at the State level. This was undertaken as a part of higher involvement of States in Ozone layer protection activities. During the celebrations, a pledge was taken by participants for protection of environment and following environmental friendly measures and practices.

Information dissemination package for school teachers and NGOs prepared by Centre for Environment Education was launched on 16th September, 1998 and distributed in four workshops organized in Calcutta, Delhi, Pune and Chennai in November - December 1998. This kit has been developed in consultation with the UNEP-DTIE office in Paris.

The reports of Meeting of Parties and of Meetings of the Executive Committee are sent to industry, Government departments and other stakeholders to inform them of deliberations of these meetings on a regular basis.

Painting Competitions have been organized by the Ozone Cell. An Indian entry won the prize in the International Competition organised by UNEP in 1999. A Painting Competition has been organised on the occasion of Eighth International Ozone Day.

A car sticker, a poster and a special day cover are being brought out for distribution every year on the International Ozone Day.

Ozone Friendly equipment and products are being exhibited during Ozone Day celebrations every year. A similar exhibition is held on the occasion of the International Ozone Day, 2002.

A quarterly newsletter Value Added Technical Information Service (VATIS) is published and distributed to about 2000 individuals and

institutions in collaboration with United Nations Asia Pacific Centre for Technology Transfer.

Workshops and Seminars are being organised on a regular basis for interaction with industry, Government bodies etc.

Monitoring System in India

A detailed monitoring mechanism has been established by the Ozone Cell to ensure that the investments, which are made with financial assistance from the Multilateral Fund through implementing agencies, are being fruitfully utilized by the enterprises. The key aspects relating to monitoring mechanism are given below.

A Monitoring and Evaluation Sub Committee set up under the chairmanship of Special Secretary MOEF, including representatives from four implementing agencies, other line ministries and industry associations, regularly monitors the implementation of ODS phase out programme. The Sub-Committee is an advisory body to the Empowered Steering Committee on the Montreal Protocol, which is fully responsible for the implementation of the Protocol in India.

The Director (Ozone Cell) has been convening regular meetings with representatives of UNDP, IDBI and UNIDO with a view to note the progress of implementation and to sort out short term problems, which might occur during the implementation process. Further, Director, Ozone Cell is holding periodic meetings with industry to monitor their implementation progress for ODS phaseout.

Site inspections of the projects under implementation are carried out. Normally, during the course of the year, implementing agencies send three to four missions to visit sites where project implementation work is going on and where projects have been completed and handover protocols are to be signed. During such missions, ODS equipment is also destroyed. Now, an officer of MOEF is accompanying the mission of the implementing agency with a view to evaluate the work being done by the enterprises. It is also proposed to send a team of officers to the project sites to ensure that the enterprises have not reverted back to using ODS and that the new technologies in the respective enterprises have been put in place. These visits are being planned on a quarterly basis.

Key To Success

India attributes its success in achieving rapid progress in ODS phase out to the following:

- Identifying the priority sectors for early phase-out.
- Choosing wisely a project portfolio with the right mix of investment and non-investment projects.
- Involving key stakeholders early in the phaseout process at both the planning and implementation level.
- Sending clear messages from the government to various stakeholders by notifying appropriate regulations and policies.
- Conducting awareness raising programs for key target audiences.
- Recognizing early the importance of building local capacity through training.
- Increasing the capacity of the Ozone Cell by its active involvement in the Regional Network of ODS officers and other international fora.

The Road Ahead

India is aware of the challenges ahead - maintaining momentum and exceeding the present achievements will require a sustained effort from all stakeholders. A shift in the nature of the activities will also be needed to reflect the country's evolving needs. Some challenges that are yet to be addressed include:

- Phaseout in the small and medium sector, both identification and providing assistance, especially in the refrigeration and air-conditioning servicing sector.
- Phaseout in the solvent sector especially use of CTC as solvent and as process agent.
- Illegal trade of CFCs and other ODS.
- Inclusion of Ozone depletion issues and its relation to refrigeration practices in the curricula of all technical training institutes in the country.
- Mechanism for higher involvement of State level organisations on ODS phaseout.

3. How Can You Help The Ozone Layer:

"**Being Ozone friendly**" means taking individual action to reduce and eliminate impacts on the stratospheric ozone layer caused by the products that you buy, the appliances and equipment that your household or business uses, or the manufacturing process used by your company. Products made with, or containing ozone depleting substances (ODS) such as CFCs, HCFCs, halons, methyl chloroform and methyl bromide can contribute to ozone layer depletion.

The following list describes some actions individuals can take to help protect the ozone layer:

Be an Ozone-friendly consumer

Buy products (aerosol spray cans, refrigerators, fire extinguishers, etc.) that are labelled "ozone friendly" or "CFC free". The product labels should indicate that they do not contain ozone depleting substances such as CFCs or halons. Ask for more information from the seller to ensure that the product is ozone friendly. Tell you neighbour that you are the proud owner of "ozone friendly" products.

Be an ozone-friendly homeowner

Dispose of old refrigerators and appliances responsibly. CFC and HCFC refrigerants should be removed from an appliance before its is discarded. Portable halon fire extinguishers that are no longer needed should be returned to your fire protection authority for recycling. Consider purchasing new fire extinguishers that do not contain halon (e.g. dry powder) as recommended by your fire protection authority.

Be an ozone-friendly farmer

If you use methyl bromide for soil fumigation, consider switching to effective and safe alternatives that are currently being used in many countries to replace this ozone damaging pesticide. Consider options such as integrated pest management that do not rely on costly chemical inputs. If you don't currently use methyl bromide, don't begin to use it now (you will have to get rid of it in the future).

Be an ozone-friendly refrigeration servicing technician

Ensure that the refrigerant you recover from air conditioners, refrigerators or freezer during servicing is not "vented" or released to the atmosphere. Regularly check and fix leaks before they become a problem. Help start a refrigerant recovery and recycling programme in your area.

Be an ozone-friendly office worker

Help your company identify which existing equipment (e.g. water coolers, air conditioners, cleaning solvents, fire extinguishers), and what products it buys (aerosol sprays, foam cushions/mattresses) use ozone depleting substances, and develop a plan for replacing them with cost-effective alternatives. Become an environmental leader within your office.

Be an ozone-friendly company

Replace ozone depleting substances used on your premises and in your manufacturing processes (contact your National Ozone Unit to see if you are eligible for financial and technical assistance from the Multilateral Fund). If your products contain ozone-depleting substances, change your product formulation to use alternative substances that do not destroy the ozone layer.

Be an ozone-friendly teacher

Inform your students about the importance of protecting the environment and in particular, the ozone layer. Teach students about the damaging impact of ozone depleting substances on the atmosphere, health impacts and what steps are being taken internationally and nationally to solve this problem. Encourage your students to spread the message to their families.

Be an ozone-friendly community organizer

Inform your family, neighbors and friends about the need to protect the ozone layer and help them get involved. Work with non-governmental organizations to help start

information campaigns and technical assistance projects to phase out ozone depleting substances in your city, town or village.

Be an ozone-friendly citizen

Read and learn more about the effects of ozone depletion on people, animals and the environment, your national strategy and policies to implement the Montreal Protocol, and what the phase out of ozone depleting substances means to your country. Get in touch with your country's National Ozone Unit and learn how you can get involved on an individual level.

4. OZONE IN OUR ATMOSPHERE

Twenty Questions and Answers about the Ozone Layer

Q.1. : What is ozone and where is it in the atmosphere?

Ozone is a gas that is naturally present in our atmosphere. Each ozone molecule contains three atoms of oxygen and is denoted chemically as O_3. Ozone is found primarily in two regions of the atmosphere. About 10% of atmospheric ozone is in the troposphere, the region closest to Earth (from the surface to about 10-16 kilometres (6-10miles)). The remaining ozone (90%) resides in the stratosphere, primarily between the top of the troposphere and about 50 kilometres (31 miles) altitude. The large amount of ozone in the stratosphere is often referred to as the "ozone layer".

Q.2. : How is ozone formed in the atmosphere?

Ozone is formed throughout the atmosphere in multistep chemical processes that require sunlight. In the stratosphere, the process begins with the breaking apart of an oxygen molecule (O_2) by ultraviolet radiation from the Sun. In the lower atmosphere (troposphere), ozone is formed in a different set of chemical reactions involving hydrocarbons and nitrogen-containing gases.

Q.3. : Why do we care about atmospheric ozone?

Ozone in the stratosphere, absorbs some of the Sun's biologically harmful ultraviolet radiation. Because of this beneficial role, stratospheric ozone is considered "good ozone". In contrast, ozone at Earth's surface that is formed from pollutants is considered "bad ozone" because it can be harmful to humans and plant and animal life.Some ozone occurs naturally in the lower atmosphere where it is beneficial because ozone helps remove pollutants from the atmosphere.

Q.4. : Is total ozone uniform over the globe?

No, the total amount of ozone above the surface of Earth varies with location on the time scales that range from daily to seasonal. The variations are caused by stratospheric winds and chemical production and destruction of ozone. Total ozone is generally lowest at the equator and highest neat the poles because of the seasonal wind patterns in the stratosphere.

Q.5. : How is ozone measured in the atmosphere?

The amount of ozone in the atmosphere is measured by instruments on the ground and carried aloft in balloons, aircraft, and satellites. Some measurements involve drawing air into an instrument that contains a system for detecting ozone. Other measurements are based on ozone's unique absorption of light in the atmosphere. In that case, sunlight or laser light is carefully measured after passing through a portion of the atmosphere containing ozone.

Q.6. : What are the principal steps in stratospheric ozone depletion caused by human activities?

The initial step in the depletion of stratospheric ozone by human activities is the emission of ozone-depleting gases containing chlorine and bromine at Earth's surface. Most of these gases accumulate in the lower atmosphere because they are unreactive and do not dissolve readily in rain or snow. Eventually, the emitted gases are transported to the stratosphere where they are converted to more reactive gases containing chlorine and bromine. These more reactive gases then participate in reactions that destroy ozone. Finally, when air returns to the lower atmosphere, these reactive chlorine and bromine gases are removed from Earth's atmosphere by rain and snow.

Q.7. : What emissions from human activities lead to ozone depletion?

Certain industrial processes and consumer products result in the atmospheric emission of "halogen source gases". These gases contain chlorine and bromine atoms, which are known to be harmful to the ozone layer. For example, the chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs), once used in almost all refrigeration and air conditioning systems, eventually reach the stratosphere where they are broken apart to release ozone-depleting chlorine atoms. Other examples of human-produced ozone-depleting gases are the "halons", which are used in fire extinguishers and which contain ozone-depleting bromine atoms. The production and consumption of all principal halogen source gases by human activities are regulate worldwide under the Montreal Protocol.

Q.8. : What are the reactive halogen gases that destroy stratospheric ozone?

Emissions from human activities and natural processes are large sources of chlorine-and

bromine-containing gases for the stratosphere. When exposed to ultraviolet radiation from the Sun, these halogen source gases are converted to more reactive gases also containing chlorine and bromine. Important examples of the reactive gases that destroy stratospheric ozone are chlorine monoxide (ClO) and bromine monoxide (BrO). These and other reactive gases participate in "catalytic" reaction cycles that efficiently destroy ozone. Volcanoes can emit some chlorine-containing gases, but these gases are ones that readily dissolve in rainwater and ice and are usually "washed out" of the atmosphere before they can reach the stratosphere.

Q.9. : What are the chlorine and bromine reactions that destroy stratospheric ozone?

Reactive gases containing chlorine and bromine destroy stratospheric ozone in "catalytic" cycles made up of two or more separate reactions. As a result, a single chlorine or bromine atom can destroy many hundreds of ozone molecules before it reacts with another gas, breaking the cycle. In this way, a small amount of reactive chlorine or bromine has a large impact on the ozone layer. Special ozone destruction reactions occur in Polar Regions because the reactive gas chlorine monoxide reaches very high levels there in the winter/spring season.

Q.10. : Why has an "ozone hole" appeared over Antarctica when ozone-depleting gases are present throughout the stratosphere?

Ozone-depleting gases are present throughout the stratospheric ozone layer because they are transported great distances by atmospheric air motions. The severe depletion of the Antarctic ozone layer known as the "ozone hole" forms because of the special weather conditions that exist there and nowhere else on the globe. The very cold temperatures of the Antarctic stratosphere create ice clouds called polar stratospheric clouds (PSCs). Special reactions that occur on PSCs and the relative isolation of Polar stratospheric air allow chlorine and bromine reactions to produce the ozone hole in Antarctic springtime.

Q.11. : How severe is the depletion of the Antarctic ozone layer?

Severe depletion of the Antarctic ozone layer was first observed in the early 1980s. Antarctic ozone depletion is seasonal, occurring primarily in late winter and spring (August-November). Peak depletion occurs in October when ozone is often completely destroyed over a range of altitudes, reducing overhead total ozone by as much as two-thirds at some locations. This severe depletion creates the "ozone hole" in images of Antarctic total ozone made from space. In most years the maximum area of the ozone hole usually exceeds the size of the Antarctic continent.

Q.12. : Is there depletion of the Arctic ozone layer?

Yes, significant depletion of the Arctic ozone layer now occurs in some years in the late winter/spring period (January-April). However, the maximum depletion is generally less severe than that observed in the Antarctic and is more variable from year to year. A large and recurrent "ozone hole", as found in the Antarctic stratosphere, does not occur in the Arctic.

Q.13. : How large is the depletion of the global ozone layer?

The ozone layer has been depleted gradually since 1980 and now is about an average of 3 % lower over the globe. The depletion, which exceeds the natural variations of the ozone layer, is very small near the equator and increases with latitude toward the poles. The large average depletion in Polar Regions is primarily a result of the late winter/spring ozone destruction that occurs there annually.

Q.14. : Do changes in the Sun and Volcanic eruptions affect the ozone layer?

Yes, factors such as changes in solar radiation, as well as the formation of stratospheric particles after volcanic eruptions, do influence the ozone layer. However, neither factor can explain the average decreases observed in global total ozone over the last two decades. If large volcanic eruptions occur in the coming decades, ozone depletion will increase for several years after the eruption.

Q.15. : Are there regulations on the production of ozone-depleting gases?

Yes, the production of ozone-depleting gases is regulated under a 1987 international agreement known as the "Montreal Protocol on Substances that Deplete the Ozone Layer" and its subsequent Amendments and Adjustments. The Protocol, now ratified by over 180 nations, establishes legally binding controls on the national production and consumption of Ozone depleting gases.

Production and consumption of all principal halogen-containing gases by developed and developing nations will be significantly reduced or phased out before the middle of the 21st century.

Q.16. : Has the Montreal Protocol been successful in reducing ozone-depleting gases in the atmosphere?

Yes, as a result of the Montreal Protocol, the total abundance of ozone-depleting gases in the atmosphere has begun to decrease in recent years. If the nations of the world continue to follow the provisions of the Montreal Protocol, the decrease will continue throughout the 21st century. Some individual gases such as halons and hydrochlorofluorocarbons (HCFCs) are still increasing in the atmosphere, but will begin to decrease in the next decades if compliance with the Protocol continues. By mid-century, the effective abundance of the ozone-depleting gases should fall to values present before the Antarctic "ozone hole" began to form in the early 1980s.

Q.17. : Does depletion of the ozone layer increase ground-level ultraviolet radiation?

Yes, ultraviolet radiation at Earth's surface increases as the amount of overhead total ozone decreases, because ozone absorbs ultraviolet radiation from the Sun. Measurements by ground-based instruments and estimates made using satellite data have confirmed that surface ultraviolet radiation has increased in regions where ozone depletion is observed.

Q.18. : Is depletion of the ozone layer the principal cause of climate change?

No, ozone depletion itself is not the principal cause of climate change. However, because ozone is a greenhouse gas, ozone changes and climate change are linked in important ways. Stratospheric ozone depletion and increases in global tropospheric ozone that have occurred in recent decades both contribute to climate change. These contributions to climate change are significant but small compared with the total contribution from all other greenhouse gases. Ozone and climate change are indirectly linked because ozone-depleting gases, such as the chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), and halons, also contribute to climate change.

Q.19. : How will recovery of the ozone layer be detected?

Scientists expect to detect the recovery of the ozone layer with careful comparisons of the latest ozone measurements with past values. Changes in total overhead ozone at various locations and in the extent and severity of the Antarctic "ozone hole" will be important factors in gauging ozone recovery. Natural variations in ozone amounts will limit how soon recovery can be detected with future ozone measurements.

Q.20. : When is the ozone layer expected to recover?

The ozone layer is expected to recover by the middle of the 21st century, assuming global compliance with the Montreal Protocol. Chlorine and bromine-containing gases that cause ozone depletion will decrease in the coming decades under the provisions of the Protocol. However, volcanic eruptions in the next decades could delay ozone recovery by several years and the influence of climate change could accelerate or delay ozone recovery.

List of enterprise (sectorwise) that have received assistance from the Multilateral Find.

Aerosols

S No	Project Activity
1	Aero Pharma Aerosol Conversion, Maharashtra
2	My Fair Lady Aerosol Conversion, New Delhi
3	Aerol Formulations Aerosol Conversion, New Delhi
4	Texas Enterprises Aerosol Conversion, New Delhi
5	Ultra Tech Specialty Chemicals Pvt Ltd. Aerosol Conversion, Maharashtra
6	Accra Pack India Pvt. Ltd. Aerosol Conversion, Gujarat
7	Stella Industries Ltd. Aerosol Conversion, New Delhi
8	Aeropress Aerosol Conversion, Gujarat
9	Aero pack Products Aerosol Conversion, Maharashtra
10	Asian Aerosols Pvt. Ltd. Aerosol Conversion, Gujarat
11	Aerosols D'Asia Pvt. Ltd. Aerosol Conversion, Gujarat
12	A.A. Attarwala and Co. Pvt. Ltd. Aerosol Conversion, Maharashtra
13	Aero Industries Aerosol Conversion, Gujarat
14	Chem Versa Consultants Ltd. , Maharashtra
15	SaraChem Pvt. Ltd. Aerosol Conversion, Maharashtra
16	Spray Products Ltd. Aerosol Conversion, Maharashtra
17	Sunder Chemical Ltd. Aerosol , Delhi
18	Maja Cosmetics Pvt. Ltd., Delhi
19	Midas Care Pharmaceuticals Ltd. Maharashtra
20	Syncaps Aerosols, Maharashtra
21	Ruby Aerosol, Delhi
22	Vimsons Aerosol, Gujarat

Foam

S No	Project Activity
1	Camphor & Allied Products Ltd., Gujarat
2	Sunpra Ltd., Pune, Maharashtra
3	Eagle Flasks Industries Ltd., Maharashtra
4	U-Foam Pvt. Ltd., (A.P)
5	Bakelite Hylam Ltd., Secunderabad
6	Alfa Foams , Maharashtra
7	Blue Star Ltd., Maharashtra
8	Duroflex Coir Industries P. Ltd., Karnataka
9	Industrial Foam P. Ltd. , New Delhi
10	Ishwar Arts, Gujarat
11	Ishwar Ashish Plastics P. Ltd., Gujarat
12	Karnataka Consumer Product Ltd.(Kurlon), Karnataka
13	Madras Polymounds, T.N.
14	Milton Plastics Ltd., Maharashtra
15	Milton Polyplast, Maharashtra
16	Tranquil Rubbers Sales P. Ltd., T.N
17	Vikram Plastics, Gujarat
18	Panorama Plastics, Gujarat
19	Polynate Foams P. Ltd., Karnataka
20	Polyflex (India) P. Ltd., Karnataka
21	Real Polymers, New Delhi
22	Vijyajyot Seats Ltd., Gujarat
23	Bharat Seats Ltd., Haryana

Foam cont.

S No	Project Activity
24	PUR Polyurethane Products P. Ltd., New Delhi
25	Pfeda Synthetics (P) Ltd., New Delhi
26	SDC Polyurethane Products Ltd., Gujarat
27	Shroff Textiles Ltd., Maharashtra
28	Harita Grammer Ltd., Karnataka
29	Punjab Scooters Ltd., Punjab
30	Amit Polyseats Ltd., U.P
31	Meenakshi Polymers Pvt. Ltd., Delhi
32	Beardsell Ltd., T.N.
33	Asha Handicraft., Maharashtra
34	Wimco Pen Co., Maharashtra
35	Llyod Insulation (India) Ltd., Delhi
36	Cello Plast., Daman
37	Cello Thermoware Ltd., Daman
38	Polyproducts , Gujarat
39	Kaygee Foams P. Ltd., Maharashtra
40	Preto Foams, Hyderabad, A.P.
41	Bharat Plastic Products., Daman
42	Inalsa Ltd., New Delhi
43	Mahavir Enterprises, Maharashtra
44	Omkar PUF Insulation, Maharashtra
45	Krishna Fabrications Ltd., Karnataka
46	K.B. Poly Industries P. Ltd., Orrisa
47	Vora Cork Industries, Maharashtra
48	Best Plastronics Pvt. Ltd. , New Delhi
49	Bharat Plast, Daman
50	Amar Enterprises, Maharashtra
51	Deccan Engineering Enterprises, A.P.
52	Bharat Cottage Industries, Maharashtra
53	80 Small and medium sized enterprises - group project SMEs
54	Super Urethane Products P. Ltd., Daman
55	Blowkings KFTZ, Maharashtra
56	Delta Foams Engineering Co., Maharashtra
57	Panna International, Gujarat
58	Viral Corporation, Gujarat
59	Ras Polybuild Products P. Ltd., A.P.
60	Alaska Industries., Daman
61	Bluplast Corporation, Maharashtra
62	Reliable Rotomoulders Pvt. Ltd. , West Bengal
63	Malanpur Entech Pvt. Ltd., M.P.
64	Nissan Thermoware P. Ltd., Daman
65	K.J. Polymers P. Ltd., Delhi
66	Venus Auto P. Ltd. U.P
67	Shri Krishna polyurethane Industries (P) Ltd., Delhi
68	Sidhi Polymer P. Ltd., Karnataka
69	Legend Interiors , Delhi
70	National Flask Industries Ltd., Gujarat
71	Sintex Industries. Ltd., Gujarat
72	Jayson Industries, Delhi
73	Duab International, Haryana
74	Jaypee Tech-noplast P. Ltd., Jammu
75	Galaxy FRP Pvt. Ltd., Haryana
76	Ajay Corrugating & Plastics P. Ltd., Gujarat
77	Puff Insulators , Delhi
78	Joti Foam Products P. Ltd., Maharashtra
79	Bansal Plastic Industries, Delhi
80	Baba Insulators, Delhi
81	Shree Nath Plastics, Delhi
82	R.S. Insulators, Delhi
83	P.K. Construction Co., Delhi
84	Ganga Thermoware P. Ltd. U.P.
85	Shivathene Linopack, H.P.
86	Nav Texfeb Pvt. Ltd., U.P.
87	Ashok Metals, Delhi
88	O.K.Industries, Delhi

Foam cont.

S No	Project Activity
89	28 small and medium-sized enterprises-group project
90	Devisons P. Ltd. , Delhi

91	Varivar Plast Products Pvt. Ltd., U.P.
92	Supertek International, Delhi
93	Standard Electric Appliances, T.N.
94	N.D.Plastics , Delhi
95	Primrose Multiplast Pvt. Ltd., Delhi
96	Delite Foam and Polymers, Haryana
97	Reactive Polymers Ltd., Gujarat
98	National Plastics, Daman
99	Tokyo Plast International Ltd., Daman
100	Crystal Electronics and Plastics, U.P.
101	Mayur Jugs Pvt. Ltd., Delhi
102	Santech Industries, Punjab
103	Saddle Poly Products P. ltd., A.P.
104	24 Small and medium-sized Enterprises
105	Harjas Plastic and Metal Components P. Ltd. Maharashtra
106	Naorang Plast, Delhi
107	16 Spray Foam Enterprises
108	Crown Industries, Gujarat
109	Evershine Plastic Industries P. Ltd., U.P.
110	Ramakrishna Moulders, Delhi
111	Sanjay Industries, West Bengal
112	Enertech engineering P.Ltd., A.P.
113	M-Plast, Delhi
114	Raipur Agencies, Chattishgarh
115	Pyarelal Coir Products Ltd., U.P.
116	Alka International Ltd., U.P.
117	SR Poly Steel P. Ltd., Haryana
118	Nindra Foams, Delhi
119	R.H. Industries, Punjab
120	Pinnacle Inudstries Ltd., M.P.
121	Coolwels Automobile Engineers, Haryana
122	Jaiswal Industries, New Delhi
123	Premium Mouldings & Pressing P. Ltd., Haryana
124	Sawhney Seating Systems, Haryana
125	Sun Steering Wheels Ltd., Haryana
126	Netplast Ltd., U.P.
127	Group Project spray and Insitu insulation 14 Enterprises
128	SR Polymers and Printers, New Delhi
129	Roome Plastics P. Ltd., Rajasthan
130	Apollo Steelcrafts, Delhi
131	17 Small and Medium-sized enterprises
132	Solvay Moulding P. Ltd., Dadar & Nagar Havelli
133	Polyrub Industries, Gujarat
134	Prince Plastoware Ltd., Daman
135	Nandadeep Fibrotech P. Ltd. , Maharashtra
136	Lear Insulation Engineering P. Ltd., Maharashtra
137	Essa Aircons Ltd., Daman
138	UNC Plast Industries, Navi Mumbai
139	Poly Glass Fibre Industries P. Ltd., New Delhi
140	Caryaire Equipments India P. Ltd., U.P.
141	Bhatia Plastics, New Delhi
142	Flexo Foam P. Ltd., Haryana
143	Malvika Polymers, Haryana
144	Nu-Foam Rubber Industries P. Ltd., Haryana
145	Sutlej Coach Products P. Ltd., Punjab
146	Viking Engineers P. Ltd., U.P.
147	Oto Industries P. Ltd., Haryana
148	Precision Engineering Tools and Components
149	Pramukh Polymers

Foam cont.

S No	Project Activity
	Multiple - Subsectors
150	Enkay Foam P. Ltd., U.P
151	Manali Petro chemicals Ltd., Madras
152	UB Petrochemicals Ltd., Madras
153	Expanded Incorporation, Mumbai
154	Polyurethane (Asia) P. Ltd., Mumbai
155	Sectoral Phaseout plan for elimination of CFCs in the foam sector
156	Chromewell Industries
157	H. R. Innovations
158	Kakar Trading Co.
159	Suchi Foams
160	Texoplast
161	Aakar Industries
162	Aman Enterprises
163	Anmol Plast
164	Atul Marketing Company
165	Balaji Plastics
166	Jai Laxmi Enterprises
167	Jupiter Engg. Works
168	Mukesh Plastic & Engineering Industries
169	Eaphel Industries
170	Payal Products
171	Pradeep Polymers
172	Thermo Plast Industries (P) Ltd
173	A S Polymers
174	Bhutani Industries
175	Foam India
176	Indrayani Udyog
177	Jindal Petro Foams
178	Joginder Singh Tejvinder Singh
179	Koyas Polymers Pvt. Ltd.
180	Omega Lining Industries
181	Polycrafts
182	Sri Sidhi Vinayak Polymers
183	Surbhi Polymers
184	Advance FRP
185	Bharat Traders
186	Boopathy Associates Pvt. Ltd.
187	Citizen Industries Ltd.
188	De Laval Ltd.
189	Dura Puf
190	Em Cee Cee Sports Agencies (P) Ltd.
191	Ethos Hvac Systems Limited
192	Kalyani International
193	Rashmi Industries
194	Sharmeen Enterprises
195	Sheetal Enterprises
196	Sunpreet Engineers
197	Sharp Batteries and Allied Industries Ltd.
198	Pawan Precast and Fabricated Pvt.
199	Sheth Fabricated Pvt. Ltd.
200	Baby Lon Plast (India)
201	Bhagwati Plastic
202	Craftway Engineers Ltd.
203	Gautam Industries
204	J. J. Plast
205	Jain Plast
206	Palm line Plastics Pvt. Ltd.
207	Industrial Foams P. Ltd.

208	Organometallic Industries
209	Tandy Innovative Chemicals
210	APL Corporation
211	Duurotex Polymers Private Limited
212	Foam Products
213	Gypsy Rubber Industries
214	Modern Amenities
215	Monarch Moulding Pvt. Ltd.
216	Lux Auto Foams
217	Pyarelal Foams Pvt. Ltd.
218	Sigma Industries
219	Suz Dent (India) Pvt. Ltd.
220	Vam Polyplast Pvt. Ltd
221	*Canara Refrigeration*
222	Gupta Plastics
223	Janik Developers
224	Kala Industries
225	*Mukesh Ganjawalla*
226	Nihad Coozer
227	Panel Power Movers
228	Radiant Elastomers
229	Sagar Industries
230	Shivam Enterprises
231	SRM Industries
232	TDC India
233	Trehan Doors
234	Ukay Metals
235	*J K Industries*
236	Alpha Insulation
237	Amijit Enterprises
238	Bright Insulations
239	Enecon Engineers
240	Insulations India
241	Insultech
242	Narmada Insulations
243	Om Insulations
244	Pioneer Insulation & Engg
245	Pravin Enterprises
246	Professional Insulations
247	Witco
248	Birla Aircon
249	Coromandel Foam (P) Ltd
250	Foam Udyog
251	Jayashri Rubber Industies
252	Jai Durga Plastic Molders
253	NTF (India) Pvt.ltd
254	Polychem Enterprises
255	Polyex Private Limited
256	Polyflex India Private limited
257	Premier Industries
258	Reliance Engineers
259	Samrat Foam Industries
260	Select Foam Products
261	Siddhi Foam
262	Vicktra Polyfoams

Commercial Refrigeration (CR)

1	Aaco Refrigeration
2	Air Control Systems
3	Amber Enterprises P. Ltd.
4	Chandra Corporation
5	Hemair Systems (India) P. Ltd.
6	Kool King Industries
7	Krishna Agro Industries Corp.
8	Mech Air Industries
9	New Coolwel Industries (India)
10	Pury's Refrigeration
11	Tristar Services
12	Beeco Electricals (India) P. Ltd.
13	Benner Comfort Systems
14	Bharat Refrigeration
15	Freeze Tech Enterprises
16	Ranco Raja Cool Home Industries
17	Sarup Singh Engineers P. Ltd.
18	Soni Enterprises
19	Vijay Refrigeration
20	Anand Refrigeration
21	Aulakh Enterprises
22	Azad Refrigeration
23	Cheraag Fabrication P. Ltd.
24	Cosmic Refrigeration
25	Everfrost Refrigeration
26	Expo Refrigeration Company
27	Hillstar Refrigeration Company
28	Hillview Industries
29	Jai Refrigeration Industries
30	Lalwani Refrigeration
31	Saturn Sheet Metals
32	Udaya Enterprises
33	Vatsal Enterprises
34	Daffoo Industries
35	Aar Kay enterprises
36	Associated Engineers
37	Coolage Cabinets
38	Coolkit Care Engg..Co.
39	Daffoo Engineering Enterprises
40	Everest Engineers
41	Gemko Engineers
42	*Guru Nanak Refrigeration*
43	Royal Refrigeration Works
44	Sagar Air Pvt. Ltd.
45	Sant Refrigeration
46	Simran Refrigeration

47	Yamuna Telefridge Agencies
48	Climate Creators
49	Everest Industries
50	Frig-On Service
51	General Crafters Ref. Pvt. Ltd.
52	G.N. Cool System
53	Kamal Cool Cabinets
54	Kohinoor Industry
55	Pritam Refrigeration Engineering
56	Sandeep Engineering Co.
57	Taj Cooling Cabinets & Ref.
58	Techcons Refrigeration
59	Waves Cool Systems (P) Ltd.
60	York Scientific Industries Ltd.
61	Paramount Industries
62	Glacier Refrigeration
63	Kalyan Cooling Corp.
64	Pooja Refrigeration
65	Siddharth Refrigeration Industries
66	Amee Refrigeration
67	Avon Refrigeration
68	Balaji Refrigeration Centre
69	Eskimo Hvac & R Systems
70	Gokul Refrigeration
71	Hi Mac Engineers
72	Hiral Refrigeration
73	*J.K.Industries Refrigeration*
74	Kelvin India refrigeration
75	Krishna Refrigeration Industries
76	Ladhar Enterprises
77	Mangaldeep Engineering Co.
78	Metro Engineering Co.
79	Refrigeration Marketing Co.
80	Regal Refrigeration
81	Shree Geeta Ref. & Rewinds
82	Super Chillers Pvt.ltd
83	Snow Freeze
84	Antarctica Equipments
85	Biswal Refrigeration Industries
86	Excel Rerigeration
87	Kalsi Frost Engg Co.
88	Imperial Refrigeration
89	Oriental Ref. Airconditionong & Electricals
90	Semko
91	Shiva Frost *
92	Anucool Engineers
93	Cosmos AR Corporation
94	Bhaskar Refrigeration Services
95	Carriers Refrigeration Industry
96	Data Refrigeration
97	Frigdex Enterprises
98	Frigdex Trading Company
99	Kadam Engineering works
100	Maars Refrigeration
101	Mapex Airconditioning Co.
102	Nikhil Enterprises
103	Oriental Refrigeration
104	Prachi Enterprises
105	Punchu Refrigeration
106	Remi Instruments Ltd
107	Shanker Refrigeration
108	Super Refrigeration Industries
109	S-Cool System
110	Tempcon
111	Weathermakers

Halon

S No	Project Activity
1	Real Value Appliances Ltd., Maharashtra
2	Vijay Fire Protection Systems Ltd., Gujarat
3	Nitin Fire Protection Industries Ltd., Maharashtra
4	New Age Industries, Maharashtra
5	Steelage Industries Limited, T.N.
6	Vimal Industrial Safety Equipment Corporation, Baroda
7	Atkins, New Delhi
8	Ashoka Engineering Co., New Delhi
9	Standard Casting Pvt. Ltd., Delhi
10	Bharat Engineering Works, Maharashtra
11	Zenith Fire Services, Maharashtra
12.	New Fire Engineers Pvt. Ltd., Maharashtra
13.	Cascade Counsel Ltd., New Delhi
14.	Kooverji Devshi & Co Pvt. Ltd., Maharashtra
15.	Umbrella project for the closure of Two Plants in India – SRF & NFI

RAC

S No	Project Activity
1	Blue Star Ltd., Maharashtra
2	Subros Ltd., New Delhi
3	Meghdoot Refrigeration Industries, Maharashtra
4	V. Krishna & Co., Maharashtra
5	Friz-Tech. P. Ltd., Maharashtra
6	V. Krishna P. Ltd., Maharashtra

7	Rockwell Devices P. Ltd., A.P.
8	Rabi Run Refrigeration Pvt. Ltd., Karnataka
9	Sethia Appliances P. Ltd., A.P.
10	Seepra Refrigeration P. Ltd., Maharashtra
11	Shakti Fabricators, Punjab
12	Chandra Frig. Co. P. Ltd., New Delhi
13	Supercold Refrigeration Systems., Kerala
14	Murali Refrigeration and Engineering Co., Kerala
15	Godrej-GE Appliances Ltd., Maharashtra
16	Standard Refrigeration Appliances, Maharashtra
17	Polar Enterprises , Maharashtra
18	Refrigerators and Home Appliances P. Ltd., New Delhi
19	Hindustan Refrigeration Industries, New Delhi
20	Refrigeration Components and Accessories, New Delhi
21	Sheetal Engineering Works P. Ltd., Gujarat
22	Videocon Appliances Ltd., Maharashtra
23	Voltas Ltd., A.P.
24	Electrolux – Kelvinator Ltd. (Maharaja International Ltd.), Rajasthan

RAC

S No	Project Activity
25	Pranav Vikas India Ltd., Haryana
26	Sanden Vikas India Ltd., Haryana
27	Arkay Industries., Goa
28	Saikrupa Industries, Maharashtra
29	Sarkar Refrigeration Industries., Maharashtra
30	Sidwal Refrigeration., Delhi
31	BPL Refrigeration Ltd., Karnataka
32	Sandeep Refrigeration, Maharashtra
33	Whirlpool of India Ltd., Haryana
34	Fedders Lloyd Corporation Ltd. U.P.
35	Sandlas Air-Com Systems P. Ltd. Punjab
36	Umbrella Project of three commercial refrigeration enterprises , Delhi
37	Nine Enterprises for Commercial Refrigeration
38	Five Enterprises for Commercial Refrigeration
39	Nine Enterprises for Commercial Refrigeration
40	Fourteen Enterprises for Commercial Refrigeration
41	Ice-Make Refrigeration
42	Konark Refrigeration Appliances
	RAC (Compressor)
43	Shriram Industrial Enterprises Ltd. Hyderabad
44	Kirloskar Copeland Ltd., Karad, Maharashtra
45	Freezeking Industries, New Delhi
46	Godrej G.E. (Compressor), Maharashtra
47	IOC for Sidwal Refrigeration Industries, New Delhi
48	IOC for Sarkar Refrigeration, Maharashtra
49	IOC for Saikrupa Refrigeration, Maharashtra
50	IOC for Aarkay Industries, Goa

Solvent

S No	Project Activity
1	ITI Mankapur, U.P.
2	Hindustan syringes & Medical Devices P. Ltd., Haryana
3	Electronics Research Ltd., Bangalore, Karnataka
4	ITI, Palakkad, Kerala
5	ITI, Bangalore, Karnataka
6	Modi Xerox, U.P.
7	Malhotra Shaving Products Ltd., A.P.
8	Harbans Lal Malhotra & Sons Ltd., West Bengal
9.	Vidyut Metallics Ltd., Maharashtra
10.	Microraj Electronics Pvt. Ltd., A.P.
11	Videocon Group (VCD), Gujarat
12	Excel Industries Ltd., Gujarat
13	Blue Star Ltd., Maharashtra
14	Alpha Drugs India Ltd., Punjab
15	Doctors Organic Chemicals , A.P.
16	Svis Labs Ltd., Ranipet, T.N.
17	Satya Deeptha Pharmaceuticals P. Ltd., Karnataka
18	Sapna Coils Ltd., Maharashtra
19	Engineering Industries, Maharashtra
20	Sapna Engineering, Maharashtra
21	Pradeep Shetye Ltd., Maharashtra
22	Benzo Chemical Industries, Maharashtra
23	FDC Limited, Maharashtra
24	GRD Chemicals Ltd., M.P.
25	Rishiroop Organics P. Ltd. & Rishiroop Polymers P. Ltd., Gujarat
26	Chiplun Fine Chemicals Ltd., Maharashtra
27	Amoli Organics Limited

WHOM TO CONTACT TO LEARN MORE ABOUT OZONE

DR. A DURAISAMY
Director
Ozone Cell
Ministry of Environment and Forests
Government of India
India Habiat Centre
Core 4B, 2nd Floor, Lodhi Road
New Delhi - 110 003
Tel.: 011-24642176, Fax : 011-24642175
E-mail: ozone@del3.vsnl.net.in
Website: www.ozonecell.com

MR. RAJENDRA SHENDE
Chief Energy and Ozone Action Unit
UNEP Industry and Environment
Tour Mirabeau, 39-43 Quai Ander Citreon
75739 Paris Cedex 15, France
Tel.: (331) 44371450, Fax: (331) 44371474
E-mail: ozonaction@unep.fr
Website: www.unepie.org / ozoneaction.com

MR. MARCO GONZALEZ
Executive Secretary
Ozone Secretariat
United Nations Environment Programme
PO Box 30552, Nairobi, Kenya
Tel.: (2542) 623850, Fax: (2542) 623913
E-mail: ozoneinfo@unep.org
Website: www.unep.org/ozone

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