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# The Ozone Layer Depletion
## *International Response and Bangladesh*

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**Abstract** Global warming, air pollution and Ozone layer thinning are transforming the earth's climate and atmosphere. Of these, Ozone depletion is the one in which there has been the most significant progress in triggering international response. As it goes, Ozone limits the amount of harmful solar ultra-violet radiation that reach the earth. Without it, life on earth would be impossible. under normal conditions, chemical reactions triggered by sunlight destroy and replenish Ozone in the stratosphere, 15-50 Kms above the earth surface. But with the introduction of chemicals that contain chlorine, florine and bromine, the balance of nature with respect to the Ozone layer in the stratosphere has been upset; the earth's Ozone shield is being depleted by chemicals such as chloroflorocarbons(CFCs) which contain chlorine, florine and bromine (halons). These substances can survive in the atmosphere for more than a century, and each chlorine or halogen atom can gobble up tens of thousands of Ozone moleculs. Thinning of Ozone layer poses a great threat to life on earth as it allows dangerous UV radiation to pass through to the earth. The UV-B has potential harmful effects on human health, animals, plants, micro-organisms and air quality; long term exposure is associated with the risk of eye damage, suppression of the immune system and skin cancer. One percent decrease in Ozone layer may result in 3-6% increase in human skin cancer. Gradual unfolding of the atmospheric chemistry in relation to Ozone layer caused grave concern, and the UNEP took the lead in raising awareness about the danger amongst politicians, bureaucrats and members of the civil society. The UNEP pressed on for an international agreement and proded the governments of both developed and developing countries to sign a convention in 1985 in Vienna and later in 1987 a protocol in Montreal called "Montreal Protocol on Substances that deplete Ozone layer." The Protocol envisaged phasing out of the use of Ozone depleting substances (ODS) land the developing countries were allowed a grace period of 10 years for the purpose. The Protocol was ammended in London in 1990, in Copenhagen in 1992 and in Vienna in 1995. Bangladesh is a party to the protocol and as a developing country, enjoys a grace period of ten years and a schedule of ban for CFCs, halons and $CCl_4$ in 2010, methyl chloroform in 2015 and HCFCs in 2040. Bangladesh shares the concern and together with the international community, she has been implementing plans to promote the protection of Ozone layer.

"Nowhere, writes UNEP, is the interdependence of humanity more clearly demonstrated than in the intricate balance of the atmosphere around our planet. Riding the winds, or floating up to the stratosphere, pollution knows no frontiers. No country can fence off its patch of the skies. The ozone layer, the fragile

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shield of gas which protects the earth from the harmful rays of the sun is a case in point. At the earth's surface, ozone is harmful, but its presence in the stratosphere, 15-50 kms. above our head is vital to life on earth."

**What is Ozone layer ?**

High up in the stratosphere, twice as high as Mount Everest or as Jet planes fly; is a gossamer veil with a crucial function. It is made of the gas called Ozone ($O_3$)- three Oxygen atoms (O) combined together as opposed to two oxygen atoms, stuck together, forming oxygen gas ($O_2$). In the Language of Chemistry, Ozone is another version of Oxygen, called allotrope of Oxygen. It is a poisonous, pale blue gas with pungent small. It is unstable so much so that it attacks and oxidies almost anything it contacts. Therefore, in the lower atmosphere, which is dense with materials with which it can react, including plant tissue and human lungs, Ozone is destructive and a short-lived air pollutant. in the stratosphere, however, there is not much for an ozone molecule to run into. Ozone is continuously created there by the action of sunlight (UV) on Oxygen molecule, and it lasts a relatively long time. Therefore, an "Ozone Layer" accumulates.

**The Chemistry of Ozone formation**

Although Ozone is present in the earth's atmosphere at all altitudes from the surface upto atleast 100 km. bulk of it is available in the stratospheric zone. Its concentration in the troposphere is low. However, in the troposphere it plays a vital role and effects the thermal radiation balance - warms up the earth's surface as a Green-house Gas.

The sunlight that falls on the upper atmosphere, stratosphere, contains much more ultra violet (UV) lights than those fall on the surface of the earth. UV light has enough energy to bring about photochemical reactions that convert Oxygen ($O_2$) into Ozone ($O_3$). With the evolution of plant life on earth, the concentration of Oxygen increased in the atmosphere, and so the formation of Ozone from Oxygen, until an equilibrium was reached between the rate of formation of Ozone from Oxygen and the rate of decomposition of Ozone into Oxygen. $O_2 \Leftrightarrow O_3$. A Natural balance !

Ozone can absorb UV light. In doing so, Ozone protects Oxygen in the lower atmosphere (troposphere) from being dissociated and prevents most of the harmful rays from entering the earth's surface. The energy of the absorbed radiation heats up the Ozone creating warm layers high up in the stratosphere. The maximum concentration of Ozone, about 10 ppm, occurs 25-50 km from the earth's surface. The reactions may be shown as below:

(a) Oxygen ($O_2$) is dissociated by solar UV rays

$$O_2 \xrightarrow{\text{UV rays}} O + O \text{ (Oxygen atoms)}$$

(b) Some of the Oxygen atoms (O) formed combine with the Oxygen molecules ($O_2$) to form Ozone.

$$O + O_2 \longrightarrow O_3 \text{ (Ozone)}$$

(c) Ozone ($O_3$) absorbs UV light and dissociates:

$$O_3 \xrightarrow{\text{UV light}} O_2 + O$$

(d) Ozone ($O_3$) reacts with Oxygen atoms (O) to form Oxygen ($O_2$) molecule:

$$O_3 + O \text{ ------------> } 2O_2$$

The rates of formation and destruction of $O_3$ result in a steady state (equilibrium) concentration of Ozone ($O_3$) in the stratosphere. This is how nature balances itself. An attribute of nature.

The Ozone layer, thus formed, has a specific duty assigned by nature. In the stratosphere (upper atmosphere), it absorbs from the sun's incoming light most of a particularly harmful ultraviolet wavelength, UV-B. The light is like a stream of little bullets of energy with just the right frequency to break down organic molecules- the kinds of molecules that make up all life, including DNA molecules which are believed to carry the CODE for life's reproduction.

**The UV Rays:**

What are the ultra-violet rays ? How do they effect the life system on earth ? It is one of the components of the solar radiation - the sun rays-in the invisible region. Ultraviolet radiation is an electromagnetic radiation in the wavelength of approximately $4X10^{-7}$--- $5X10^{-9}$ metre --- between visible light waves and X-Rays

Wavelength

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X- UV - VIBGYOR - IR--

Invisible visible

The longest ultraviolet radiation has wavelengths shorter than those of violet light - shortest perceptible by the eye. They affect photographic film and plates; their action in the human body produces vitamin D. Most of the ultraviolet rays are absorbed by the Ozone layer and UV rays are classified as UV-A, UV-B and UB-C depending on wavelength or frequency. UV rays can be artificially produced by mercury-vapour lamp

Of the different types of UV rays, UV-B is the most harmful ray for humans. It is like energy bullet and when hits the living organisms, one possible result is cancer. UV-B light has long been known to cause skin cancer in fair-skinned people with considerable exposure to sun. Australia has the highest rate of skin cancer in the world; at current rates, two of every three will develop some kind of skin cancer during their lifetimes, and 1 in 60 will develop the most deadly type. Scientists estimate that for 1% decrease in the ozone layer, there will be an increase of 2% in the UV-B radiation at the earth's surface and an increase of 3-6% in the incidence of human skin cancer.

UV-B radiation can induce the growth of cancer as also suppress the immune system's ability to fight cancer. This suppression of the immune system also makes people more susceptible to other infections.

UV-B effects the eye. It can damage the retina and generate cataracts. It can burn the cornea and cause what is known as "snow blindness", occasionally very painful and repeated incidence can reduce vision permanently. Animals with eyes and skin are also expected to suffer like humans, when exposed to the sun. Briefly, other effects may be:

- Very small organisms are more likely to be damaged than large organisms because UV-B light can only penetrate a few layers of cells.

- UV-B light enters only the top few meters of the ocean, but this is the layer where most aquatic microorganisms live. These small plants and animals are particularly sensitive to UV-B radiation. They are also the base of most ocean food chains. An increase in UV-B could greatly perturb many populations of ocean life and destroy the food chain.

- UV-B light decreases leaf area, plant height and photosynthesis in green plants. Agricultural crop yields go down.

- Cultivated plants seen more sensitive to UV light than weeds.

It is to be borne in mind that nature induces many ways for the protection of living creatures form UV rays such as pigmentation, coverings of hairs or scales etc. and living creatures have varying degree of resistance or tolerance, so they respond differently.

**The Ozone Hole: the signal of the disaster**

1974 : Two scientific papers were published independently. Both suggested a continuing threat to the ozone layer. One predicted that chlorine atoms in the stratosphere could be powerful ozone destroyers. The other said that CFCs (Chlorofloro Carbon) were reaching the stratosphere and breaking up, releasing chlorine atoms. These papers predicted that human CFC use could trigger a hitherto unsuspected environmental disaster. October, 1984. Scientists of the British Antarctic Survey measured a 40% decrease in Ozone in the stratosphere. Their survey site was at Halley Bay in Antarctica. Their measurements showed Ozone declining steadily for about 10 years.

This was unbelievable. Scientists could not agree, and a 40% drop seemed impossible to them. The British Scientists rechecked their instruments. They looked for confirming measurements from other parts of the world, and finally they got one- 1600 kms to the north-west reported enormous decrease in the stratospheric Ozone.

May, 1985. An historic paper was published that announced on "Ozone hole" in the Southern Hemisphere. This was reverberating. Scientists at NASA, USA checked their instruments of Ozone measurement by Nimbus 7 satellite but found no ozone hole. Checking back, NASA scientists found that their computers had been programmed to reject very low Ozone readings. Recovering the rejects, they confirmed the Halley Bay readings and showed that Ozone readings had been droping over the south pole for over a decade. They provided a detailed map of the hole in Ozone layer. It was enormous, as big as the united States and as deep as the Mount Everest. It has been growing most years since 1979. Elsewhere, the Ozone layer is thinning. Over a wide belt of the Northern Hemisphere, average concentration of Ozone has decreased by 1% in summer and 4% in the winter in the last 20 years.

**Why the hole ? Why over Antarctica ?**

Questions that puzzle us are: why a hole ? Why over Antarctica ? Why not elsewhere ? The work of the scientists over the next few years to solve this mystery was extra-ordinary. The most stunning evidence that chlorine was indeed the culprit causing the Ozone hole was gathered in September, 1987 when scientists flew an airplane from south America directly toward the South Pole and into the Ozone hole.

Rises and drops in Ozone are almost exactly mirrored by drops and rises in ClO. Furthermore, the measured ClO concentrations in the "Hole" are hundreds of times higher than any level that could be explained by normal atmospheric chemistry. This is often referred to as the "smoking gun", even the CFC manufactures thought that the Ozone hole was not a normal phenomenon. It is a sign of a highly perturbed atmosphere, caused by human induced actions using chlorine containing pollutants.

It took several years for scientists to come up with an explanation for the hole. Here it is:

Antarctica is surrounded by oceans, so winds circle around the continent uninterrupted by land mass. In the southern winter, they create a "circumpolar vortex"- a whirl of winds that traps air over Antarctica and keeps it aloof from mixing with the rest of the atmosphere. The vortex then sets up a "reaction vessel" of polar atmospheric chemicals. By contrast, there is not such a strong vortex around the North Pole, so the northern Ozone hole is less pronounced.

In winter, the Antarctic stratosphere is the coldest place on earth (down to - $90^0$c). In that extreme cold, water vapour hovers as a fog of minute ice crystals high up where the Ozone layer is. The surfaces of these innumerable tiny crystals enhance the chemical reactions that release chlorine which destroys Ozone.

The chlorine atoms formed in the dark of the winter of the Antarctica do not immediately enter the chain reaction of Ozone destruction. Instead, they react just once with Ozone to form ClO. The ClO molecules come together to form a relatively stable ClO-ClO, a dimer. An accumulation of the ClO-OCl dimer builds up, poised and waiting for the return of the sun.

In the spring, when the light returns in the Antarctica, solar radiation breaks up the ClO-OCl dimer to release an enormous burst of chlorine (Cl) which goes to work on the Ozone. Ozone concentration drops propitiously within a few weeks which is why the hole is observed only in the spring. At some altitudes, more than 97% of the Ozone vanishes.

The returning sunlight gradually dissipates the "circumpolar vortex, allowing south polar air to mix again. Ozone depleted air is dispersed over the rest of the globe, as Ozone levels over Antarctica return nearly to normal.

Lesser hole has been observed over the North Pole in the northern spring. Discrete holes are not expected to be found elsewhere. But as the Ozone-destroying gasses in the atmosphere mix, the concentration of ozone in the stratosphere above the whole earth is decreasing measurably. Because of the long delays in CFCs reaching the stratosphere, more Ozone depletion is inevetible. Because of long lifetimes of CFCs and chlorine in the atmosphere, the depletion will last for at least a century, even if all CFC release stop immediately.

**Ozone layer destruction : How ?**

The question is: How is Ozone layer in the upper atmosphere depleted ? What causes this depletion ? We have so far learnt that chlorine in the upper atmosphere (stratosphere) is responsible for the thinning of the Ozone layer, and this chlorine originates from human use of an organic compound, called CFC (chloroflorocarbon). CFCs used in aerosol, electronic and other industrials, when released in the atmosphere, gradually rises to the stratosphere, and are broken down by the UV-B rays in the stratosphere, to release free chlorine atoms. Chlorine, so released, reacts with the stratospheric Ozone to make Oxygen and chlorine oxide (CIO). Then the chlorine oxide (CIO) reacts with an oxygen atom (O) to make oxygen gas ($O_2$) and chlorine (CI) again. The chlorine atom can then turn another Ozone ($O_3$) molecule into oxygen and be regenerated yet again.

The reactions may be shown simply as follows:

$$CFCI_3 \xrightarrow{UV-B} CI + fragment$$

$$CI + O_3 \longrightarrow CIO + O_2$$

$$CIO + O \longrightarrow CI + O_2$$

It is obvious that a chain reaction occurs. One notorious chlorine atom can cycle through this series of reactions over and over, destroying one Ozone molecule each time and gobbling Ozone molecule one after another and then being regenerated to gobble again. The average CI atom can destroy about 100,000 Ozone molecules before it is finally removed from the atmosphere. For the removal, CI reacts with methane to produce Hydrochloric acid ($CH_4 + CI_2 = CH3CI + HCI$). At that point, two things can happen: either the HCI can break up, release CI again, and continue the cycle of Ozone destruction or the HCI can sink down into the lower atmosphere, where it typically dissolves in water and comes back to the earth as acid rain.

Regeneration of CI is only one insidious characteristic of the Ozone destruction process. Another is the time-leg between the human synthesis of a CFC molecule and its arrival in the stratosphere. For some uses (such as aerosol propellants), CFC is quickly discharged into the air. For other uses (such as refrigerators and foam insulation), the CFC may be released

**Table-I** : Uses, Production Rates, and Residence Times of the Important Ozone-Deploementing Chemicals

| Compound | Chemical formula | Ozone depletion potential | Uses | 1985 world production (tons) | Residence time in atmosphere (Year) |
|---|---|---|---|---|---|
| CFC-001 | $CFCl_3$ | 1.0 | Refrigeration, aerosol, foam | 298,000 | 65-75 |
| CFC-012 | $CF_2Cl_2$ | 0.9-1.0 | Refrigeration. aerosol. foam. sterilization. food. freezing. heat. detectors. warning devices. cosmetics. pressurized blowers | 438,000 | 100-140 |
| CFC-113 | $CCl_3CF_3$ | 0.8-0.9 | Solvent cosmetics | 138,500 | 100-134 |
| CFC-114 | $CClr_2CClF_4$ | 0.7-1.0 | Refrigeration | 300 | |
| CCF-115 | $CClF_2CF_3$ | 0.4-0.6 | Refrigeration. Whipped topping stabilizer | | 500 |
| Halon-1301 | $CBrF_3$ | 10.0-13.2 | Fire fighting | 2,600 | 110 |
| HCFC-22 | $CHClF_2$ | 0.05 | Refrigeration. aerosol. foam fire fighting | 81,200 | 16-20 |
| Methyl | | | | | |
| Chloroform | $CH_3CCl_3$ | 0.15 | Solvent | 499-500 | 5.0-10 |
| Carbon | $CCl_4$ | | | | |
| Tetrachloride | $CCl_4$ | 1.2 | Solvent | 71,200 | 50-69 |

years or even decades after production. After release, it takes about fifteen years for a CFC molecule released on the earth's surface to work its way upto the high stratosphere where it breaks down, releases chlorine (CI), which reacts with Ozone. So the thinning of Ozone layer measured at any time is a result of CFCs manufactured and released fifteen or more years ago.

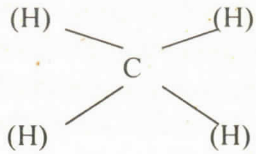
**What are CFCs ?**

The CFCs are organic chemical compounds. The CFCs stand for chloroflurocarbons - C for chlorine, F for Flurine and the C for Carbon. These are some of the most useful compounds ever invented by human beings. The list of the compounds is shown at **Table I.** They are non-toxic and stable. They do not burn or react with other substances or corrode materials. Because of their low thermal conductivity, they make excellent insulators when blown into plastic foam for hot-drink cups, hamburger containers or wall insulation. Some CFCs evaporate and these properties make them perfect coolants for refrigerators under trade name Freon. They also make good solvents for clearing metals, electronic circuit boards and airplane parts.

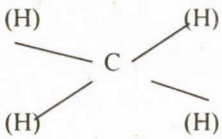
Originally developed in 1920s for use as refrigerant fluids these compounds were called 'MIRACLE' compounds because of their so many uses, easiness to use and low cost. They are inflammable and insoluble in water. Because of their lack of reactivity and insolubility in water, there is no natural and easy process of removing CFCs. In fact they drift up high into the stratosphere where they are consumed in the most undesirable reaction leading to Ozone layer depletion. Structurally, CFCs may be considered derivatives of methane ($CH_4$), a major component of natural gas. Let us see how it looks like:

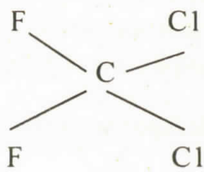
**$CH_4$**

**Methane**



When the hydrogen atoms of methane are replaced by chlorine and Flourine atoms, we get chlorofluoro carbons. Examples:

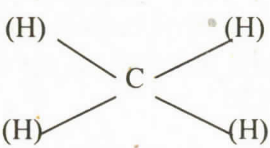


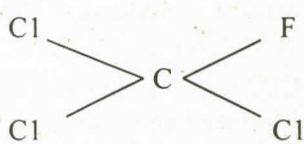


**Methane ($CH_4$)**

**(dichloro fluoro methane)**

CFC-12





**(trichloro Fluoro methane)**

CFC-11

CFCs contribute to the Greenhouse effect which warms the earth. CFCs are 10,000 times more effective than carbon dioxide in absorbing infra-red radiation i.e. 10,000 times stronger than $CO_2$ in terms of warming potential.

As the table shows, from 1950 to 1975, world production of CFCs grew at 7% to 10% per-year - doubling every 10 years or less. By the 1980s, the world was manufacturing a million tones of CFCs annually. In the United States alone, CFC coolants were at work in 100 million refrigerators, 30 million freezers, 45 million home air conditions, 90 million car air conditioners and hundreds of thousands of coolers in other places. The average North American or European was using 2 pounds (0.85 Kg) of CFC per year. The average Chinese or Indian was using less than an ounce (0.03 Kg). For large number of chemical companies, the CFCs were a major source of income.

**The Response to the Threat**

The first response was launched by a body of American environmentalist who went into action by first condemning the aerosol spray cans. Consumers responded. Sales of aerosols plummeted by over 60%. Political pressure mounted for a law to ban CFC containing aerosol. A law forbidding the use of aerosol containing CFCs was passed in the United States in 1978. This resulted in a 25% drop in worldwide manufacture of CFCs. In most of the rest of the word, however, its use still continued along with other uses of CFCS.

Since UNEP's ear!iest days, Ozone layer had been high among its concern. UNEP was mounting its rescue operation even before all the evidence was in. In 1977 UNEP convened an experts' group meeting which adopted a World Plan of Action on the Ozone Layer and it published its first assessment of the problem in 1978. As the atmospheric scientists gradually unfodded the complicated chemistry of the Ozone layer. UNEP pressed on, hosted and prodded international political process. In 1981 it set up a working group to develop a global convention for the protection of the ozone layer. The idea was to get down to the difficult task of agreeing on how to control the chemicals which are harming it.

The convention was signed in Vienna in March 1985 by 20 countries and the EC. The signatories made no commitment to control measures or to limit the use of CFCs. In spite of this, the convention was a landmark. Five years later, the convention had 66 parties including the EC. It contained pledges to cooperate in research and monitoring and share information on CFC production and emission etc.

**The Montreal Protocol**

The story of the Ozone hole, published in May 1985, added urgency to the task of agreeing a protocol to control emissions of CFCs and other Ozone destroying substances. So did the fact that CFCs and halons also contribute to the greenhouse effect which will probably change the earth's climate in the next century.

The negotiating process was not easy. The nations had never before confronted a global environmental problem before it was completely understood. Major CFC producing nations played predictable role in trying to block any strong cutback in CFC use. Critical decisions hung on delicate political threads. The USA, for example, played a strong leadership role which was sometimes undercut by deep divisions within Regan administration.

UNEP pressed on. Its director, Mostafa K. Tolba proved a skilled environmental diplomat, remaining neutral in many squabbles that arose, and reminding everyone that short-term or selfish consideration would jeopardise existence of life on earth. Environmental groups in Europe and the USA put heat on their governments. Scientists conducted workshop to educate journalists, parliamentarians, and the public.

The negotiations in 1986 and 1987 were tough, with some countries arguing for an almost total phase-out of CFCs and halons, and others maintaining that a freeze on production would be adequate. Developing countries which only consumed some 10% of the worlds' CFCs, were naturally anxious that countries should not stop them developing such technologies as refrigeration.

In spite of these difficulties, national governments finally - and surprisingly quickly - signed in Montreal in September 1987 a Protocol on Substances that Deplete the Ozone Layer. Known as the Montreal Protocol, it stipulated first that world production of the first five most commonly used CFCs should be frozen at 1986 levels. Then production should be reduced by 20% by 1993, and finally by another 30% by 1998. This "freeze-2030" agreement was signed by 46 nations including all the major producers of CFCs. The protocol came into force on 1 January, 1989. Meanwhile, in May 1989, 81 countries agreed in Helsinki to phase out CFCs and halons altogether and to restrict emissions of other substances.

In June 1989, the Parties to the Montreal Protocol met in London and agreed to phase out CFCs, halons and carbon tetrachloride by 2000 and Methyl Chloroform by 2005. The conference marked a breakthrough in environmental diplomacy. For special needs of the developing countries, Montreal Protocol, however, allows the developing countries with per capita consumption of less than 0.3 Kg., a 10 years grace period for the control measure. The protocol was further amended in Copenhagen in 1992 and Vienna in 1995. In these amendments, the phase-out programmes were further advanced. Bangladesh is among the Parties to the Protocol.

**The Multilateral Fund**

During the amendment of the Montreal Protocol in London in 1990, several third world countries refused to sign unless an international fund was established to help them with the technical shift to CFC alternatives. When the United States balked at contributing to that fund, the agreement almost failed, but in the end the fund was established. Industrialised countries contribute to the Fund according to the standard UN scale of assessment.

The Multilateral Fund has its secretarial in Montreal and is directed by its Executive Committee comprising of representatives of seven developed and seven developing countries selected by the annual meeting of the Parties to the Protocol. The Fund now operates through UNEP, UNDP, UNIDO and the World Bank. From this Fund, grants and concessional disbursements are made to developing countries, provided the Parties agree to the specific expenditures. This agreement on financing arrangements paved the way for the support of major third world countries such as China, India and Brazil. Bangladesh received a great of US $ 150,000 for strengthening institutional capacity implemented by Department of Environment. For the ACI Project which aims at phasing out use of Ozone depleting substance, Bangladesh got a small chunk of US $ 322,000/ from the Multilateral Fund.

**Bangladesh in Ozone layer Protection**

Bangladesh joins the international response process against Ozone layer thinning and the promotion of its protection.

Sharing the global concern, Bangladesh accessed to the Montreal Protocol on Substances that Deplete the Ozone Layer on 02 August, 1990 and ratified the London amendment on 18 March, 1994. In terms of the provisions of the protocol, control measures are to be pout in place with regard to import and consumption of ODS (Ozone depleting Substances) in Bangladesh from July, 1999. The relaxation for the developing countries will also apply to Bangladesh. It will enjoy a 10- year grace period and a schedule of ban for CFCs, halons and carbon tetrachloride in 2010, Methyl Chloroform in 2015 and for HCFCs in 2040.

As a signatory to the Montreal protocol, Bangladesh is committed to gradually phasing out use of ODS. According to a survey of 1995, the ODS used in Bangladesh was as follows:

| Substance | Quantity (M.T) | % of total ODS in aerosol/ refrigeration/industry |
|---|---|---|
| CFC-11 | 88,610 | 27.00 |
| CFC-12 | 192,070 | 58.50 |
| HCFC-22 | 37,810 | 11.52 |
| Methyl Chloroform | 2.231 | 0.68 |
| Others | 0.060 | 0.06 |

Bangladesh is also using alternative substances and technologies in firefighting, aerosols, refrigeration and foam. Government approved ACI project will phase out 50% use of CFC-11 and CFC-12. Contemplation of recycling will reduce demand for new production. To contain unnecessary emission of CFCs, a comprehensive national program for recovery and recycling of refrigerants is under consideration.

Raising awareness among the stakeholders is high on the agenda of the Government. The Department of Environment has been implementing various projects and has established an "Ozone Cell" in the department. In keeping with the declarations of the UNEP, Bangladesh observes 'Ozone' day on 16 September'99.

NGOs are also active in raising awareness of the people. The people can also help supplement Governments' efforts by using CFC free refrigerators, LPG based aerosol products and using substitutes for other products. Care should also be given to repair leakage of air conditioners/refrigerator to reduce risk of release of CFCs in the atmosphere. The sense of wisdom thus displayed by the world community with so much of concern and celerity to protect the earth from the environment disaster was unique in the recent history. The line of divide between the developing and the developed nations sunk for a common cause - the shared concern for existence on earth.

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