# OZONE LAYER AND OUR ENVIRONMENT

**Manish Kumar Jain[1], Naqui Akhtar[2], Neeru Goyal[3]**

**Prashant Kumar Tayal[4]**

[1]*Faculty,Department of Electrical Engg.,Govt.Polytecnic College,KARAULI(Raj),(India)*

[2]*Faculty,Department of Electrical Engg.,Govt.Polytecnic College,LATHEHAR(Jharkhand),(India)*

[3]*Faculty,Department of Electrical Engg.,Govt.PolytecnicCollege,SRIGANGANAGAR(Raj),(India)*

[4]*Faculty, Department of Electrical Engg.,Dr.K.N.Modi University, NEWAI, TONK(Raj),(India)*

## ABSTRACT

*Energy plays an important role in economic growth of any country. Economic growth is a measure of country's progress. The amount of per capita use of energy reflects the economic welfare progress of any country. The most developed countries have high per capita use of energy. However, the harnessing and use of energy resources leads to widespread source of environmental pollution. Therefore, minimizing the environmental aspects of energy use has become a prime concerns to all the nations, especially developed countries. Careful balance is required in harnessing available energy resources with minimum impact on environmental along with the steady development activities for achieving desirable economic growth for the overall development of a nation. The promotion of energy efficiency, low emission or $CO_2$-free technologies, and $CO_2$pricing are considered important element of energy policy of majority of the nation around the world. However, there has to be a trade-offs between climate policies on the one hand and the resulting costs & losses of regional competitiveness, growth and employment on the other. Thus, as long as climate policies are not sufficiently globalize ,policy makers in industrial countries have to balance the goals of energy policy: environmental protection, energy security, and regional competitiveness.*

***Keywords: GHG emission, Harnessing of Energy, $CO_2$ free technology etc.***

## I. INTRODUCTION

Ozone is a natural trace component of the atmosphere. It is created continuously through the action of sunlight and oxygen in the upper atmosphere. For millions of years ozone has been protecting the earth by absorbing ultraviolet or poisonous radiation from the sun. This poisoning of the Earth's ozone layer is increasingly attracting worldwide concern for the global environment and the health effects of life on the Planet Earth. As the ozone layer is getting thinner and thinner more and more harmful UV rays are passing into our atmosphere. These rays cause cancer, cataracts, and lowered immunity to diseases. In recent years, scientists have sounded alarms internationally about the depletion of the ozone layer, citing chemical pollution as the major cause.

The ozone layer is a layer in Earth's atmosphere containing relatively high concentrations of ozone ($0_3$). However, "relatively high," in the case of ozone, is still very small with regard to ordinary oxygen, and is less than ten parts per million, with the average ozone concentration in Earth's atmosphere being only about 0.6 parts per million. The ozone layer is mainly found in the lower portion of the stratosphere from approximately 20 to 30 kilometers (12 to 19 miles) above Earth, though the thickness varies seasonally and geographically.

The ozone layer was discovered in 1913 by the French physicists Charles Fabry and Henri Buisson. Its properties were explored in detail by the British meteorologist G. M. B. Dobson, who developed a simple spectrophotometer (the Dobson meter) that could be used to measure stratospheric ozone from the ground. Between 1928 and 1958 Dobson established a worldwide network of ozone monitoring stations, which continue to operate to this day. The "Dobson-unit", a convenient measure of the columnar density of ozone overhead, is named in his honor.

The ozone layer absorbs 97-99% of the Sun's medium-frequency ultraviolet light (from about 200 nm to 315 nm wavelength), which potentially damages exposed life forms on Earth.

## II. OZONE LAYER DEPLETION

The distribution of ozone in the stratosphere is a function of altitude, latitude and season. It is determined by photochemical and transport processes. The ozone layer is located between 10 and 50 km above the Earth's surface and contains 90% of all stratospheric ozone. Under normal conditions, stratospheric ozone is formed by a photochemical reaction between oxygen molecules, oxygen atoms and solar radiation. Measurements carried out in the Antarctic have shown that at certain times, more than 95% of the ozone concentrations found at altitudes of between 15 and 20 km and more than 50% of total ozone are destroyed, with reductions being most pronounced during winter and in early spring. Natural phenomena, such as sun-spots and stratospheric winds, also decrease stratospheric ozone levels, but typically not by more than 1-2%.

The main cause of ozone layer depletion is the increased stratospheric concentration of chlorine from industrially produced CFCs,halons and selected solvents. Once in the stratosphere, every chlorine atom can destroy up to 100 000 ozone molecules. The amount of damage that an agent can do to the ozone layer is expressed relative to that of CFC-11 and is called the Ozone Depletion Potential (ODP), where the ODP of CFC-11 is 1.

The lifetime of some of these ozone depleting substances is very long, and they may continue to deplete the ozone layer long after their use has been phased out. In this publication the ODP values for 100-year timespan are used. Nevertheless some shorter-lived substances may have a very high chlorine loading potential and thus their effect in the short term is much larger than reflected by their ODP value.Aircraft emissions of nitrogen oxides and water vapor add to this depletion effect by creating ice crystals that serve as a base for ozone destroying reactions.

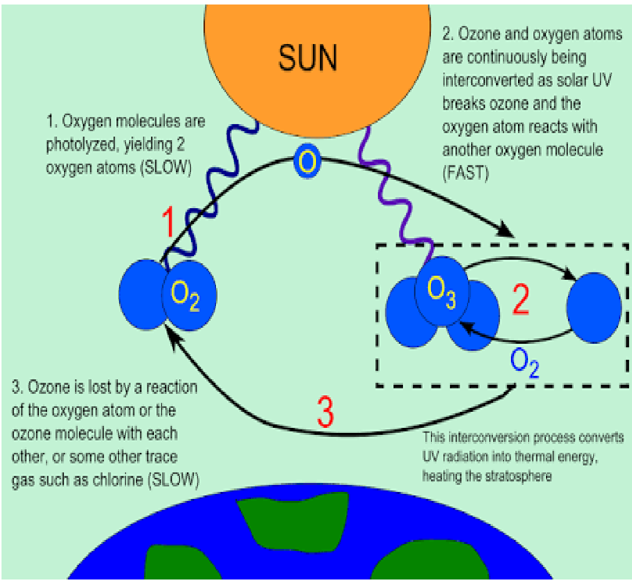


**Fig.1: Ozone-oxygen cycle in the ozone layer**

## III. CAUSES OF OZONE DEPLETION

Scientific evidence indicates that stratospheric ozone is being destroyed by a group of manufactured chemicals, containing chlorine and/or bromine. These chemicals are called "ozone-depleting substances" (ODS).

ODS are very stable, nontoxic and environmentally safe in the lower atmosphere, which is why they became so popular in the first place. However, their very stability allows them to float up, intact, to the stratosphere. Once there, they are broken apart by the intense ultraviolet light, releasing chlorine and bromine. Chlorine and bromine demolish ozone at an alarming rate, by stripping an atom from the ozone molecule. A single molecule of chlorine can break apart thousands of molecules of ozone.

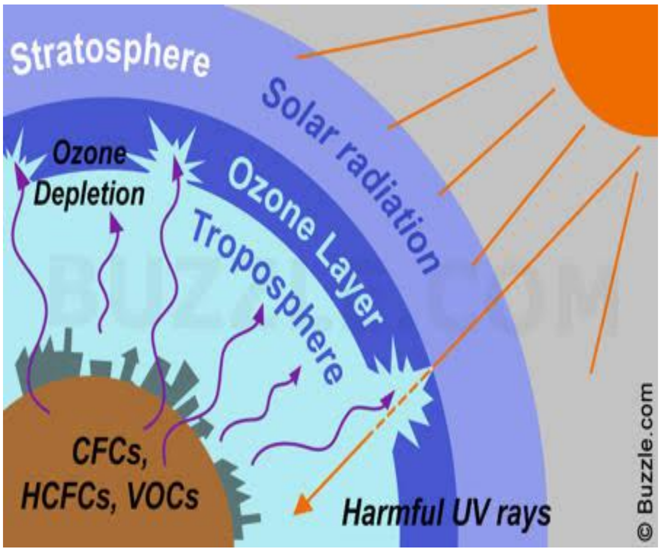


**Fig.2: Causes of Ozone Depletion**

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## IV. THE MAIN OZONE-DEPLETING SUBSTANCES (ODS)

### Chlorofluorocarbons (CFCs):

- The most widely used ODS, accounting for over 80% of total stratospheric ozone depletion.
- Used as coolants in refrigerators, freezers and air conditioners in buildings and cars manufactured before 1995. o Found in industrial solvents, dry-cleaning agents and hospital sterilants.
- Also used in foam products — such as soft-foam padding (e.g. cushions and mattresses) and rigid foam (e.g. home insulation).

### Halons

- Used in some fire extinguishers, in cases where materials and equipment would be destroyed by water or other fire extinguisher chemicals. In B.C., halons cause greater damage to the ozone layer than do CFCs from automobile air conditioners.

### Methyl Chloroform:

- Used mainly in industry — for vapor degreasing, some aerosols, cold cleaning, adhesives and chemical processing.

### Carbon Tetrachloride:

- Used in solvents and some fire extinguishers.

### Hydro fluorocarbons (HCFCs):

- HCFCs have become major, "transitional" substitutes for CFCs. They are much less harmful to stratospheric ozone than CFCs are. But HCFCs they still cause some ozone destruction and are potent greenhouse gases.

## V. THE IMPACTS OF OZONE DEPLETION

Stratospheric ozone filters out most of the sun's potentially harmful shortwave ultraviolet (UV) radiation. 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 tohuman health:

- More skin cancers, sunburns and premature aging of the skin.
- 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).

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- 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. These species include wheat, rice, barley, oats, corn, soybeans, peas, tomatoes, cucumbers, cauliflower, broccoli and carrots.
- The effect of ozone depletion on the Canadian 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 in Canadian waters.
- 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.

## VI. GOVT. REGULATIONS ON OZONE DEPLETION

194 nations have signed an international agreement to end the production of chloro-fluoro carbons(CFCs),halons and other ozone-depleting substances (ODS). The agreement is called the Montreal Protocol on Substances that Deplete the Ozone Layer (1987). The protocol has been amended several times, to speed up ODS phase out dates and to include more types of ODS.

## VII. PREVENTION OF OZONE DEPLETION

The nations of the world have taken a crucial step in joining together to halt the production and use of ozone-destroying chemicals. But the work can't stop there. To prevent the further depletion of Ozone layer, we can take the following precautionary steps:

- Awareness: Know the rules: It is illegal to recharge refrigerators, freezers and home/vehicle air conditioners with CFCs.
- If you have an older vehicle with an air conditioner, have it serviced by a qualified technician, and make sure the CFC is recaptured and recycled by technician who is specifically certified to do this work. If you don't use your air conditioner — or if the vehicle is about to be scrapped — make sure a qualified technician recaptures and recycles the CFC. The same rules apply to older refrigerators freezers and home air conditioners, which may contain CFCs.
- Do not buy or use portable fire extinguishers that contain halons.

## VIII. CONCLUSIONS

The Sustainable Energy Action Plan (SEAP) is a key document that shows how to use the results of the Baseline Emission Inventory to identify the best fields of action and opportunities for reaching the local authority's CO2 reduction target. It defines concrete reduction measures, together with time frames and assigned responsibilities, which translate the long-term strategy into action. Signatories commit themselves to submitting their SEAPs within the year following adhesion. The SEAP should not be regarded as a fixed and rigid document, as circumstances change, and, as the ongoing actions provide results and experience, it may be useful /necessary to revise the plan on a regular basis. Remember that opportunities to undertake emission reductions arise with every new development project to be approved by the local authority. The impacts of missing such an opportunity can be significant and will last for a long time. This means that energy efficiency and emission reduction considerations should be taken intoConsideration for all new developments, even if the SEAP has not yet been finalized or approved.

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