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Anthropogenic Reactions, Its Consequences and Remedial Measures (A Review)

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Abstract- Increase in temperature and radiation hazards appear to be serious salient phenomena affecting human and other biota. Increase in temperature is rightly caused by Green house effect also known as Global warming. Natural radiation hazard is chiefly due to ozone depletion affecting various faunal life. Both incidents in general and ozone depletion in particular has been illustrated in the present paper including their impacts and possible remedial measures.

Index Terms- Temperature adversity, Biodiversity, Ozone depletion, Troposphere, Stratosphere, Anthropogenic problem.

I. INTRODUCTION

Ozone is a natural constituent of the atmosphere. It is composed of three oxygen atoms shield together in their configuration by electrical attraction. This electrovalent bond is much weaker than the covalent bond that holds oxygen. So the molecule is always susceptible to having one of its oxygen atoms stepped by an "oxygen seeking molecule". The reactivity of the chemical is in large part determined by the strength of the bonds between atoms. The week bonds in the ozone molecule make it an even more highly reactive gas than oxygen. An increase in the concentration of ozone at the ground level i.e. troposphere is undesirable because it induces toxicity. However, a decrease in the stratospheric ozone is dangerous to human beings, their lives, and biota of the ecosystem. This is because the stratospheric ozone acts as a protective layer or sheath, which absorbs UV radiations from the sun. Present review deals with the anthropogenic reactions in light of causes of depletion of ozone, its consequence on the living biota including human and possible remedial measures. It also sums up the 11th Dec. 2009 deals held at Copenhagen.

It may be rightly referred that ozone is destructor at troposphere but protector at stratosphere. Ozone is a bluish in color and natural component of the atmosphere and about 90% of all ozone is at the stratosphere . Shoenbein, 1840 coined the term ozone made by ozein = to smell. When found on the surface of the troposphere ozone is considered as dangerous pollutant but when present on stratosphere, it is regarded as protector for the plant and animal life. It is because that the stratospheric ozone layer protects the earth from the ultraviolet rays sent down by the sun. If it is depleted then the effects on the planet could be catastrophic . It shall not be out of place to mention that troposphere ozone alters earths radiation budget and changes oxidizing capacity of the earth. Other deleterious pollutants apart from ozone wiz., CO, NOx, SOx, particulate matters etc. have detrimental impact on living flora and fauna. Further, ozone diurnal variations do not reveal a day time photochemical build up while CO, NOx and SOx are characterized by higher levels during day time and lower levels during night time. Also the seasonal variation in ozone , CO, NOx and SOx reveal maxima during spring and minima during summer and monsoon season.

II. WHY MUCH DISCUSSION ON OZONE DEPLETION

Ozone is an unstable and destroyed mainly in the upper stratosphere through photochemical reactions with UV waves. However, nature maintains equilibrium as shown below.

$O2 + UV\ light\ (wave\ length < 24^2 nm) \rightarrow O + O$
$O + O_2 \quad O_3$
$2O_3 \quad 3O_2$
$O_3 \quad O_2 + O$
$O + O \quad O_2$
$O_2 + O \quad O_3$
$O + O_3 \quad O_2 + O_2$

III. PRINCIPAL CAUSES OF STRATOSPHERIC OZONE DEPLETION

Stratospheric ozone depletion may be or Natural anthropogenic.

1. NATURAL

It is believed that ozone is depleted by reactions with atomic oxygen, reactive hydroxyl radicals and NO (Follows reaction 1st , 2nd & 3rd).

REACTION 1st: $O_3 + O \rightarrow O_2 + O_2$

REACTION 2nd: $O_3 + HO^* \rightarrow O_2 + HOO^*$
$HOO^* + O \rightarrow HO^* + O_2$
*= Excited atom

REACTION 3rd: $O3 + NO \rightarrow NO_2 + O_2$
$NO_2 + O \rightarrow NO + O_2$

Nitric Oxide (NO) is produced in the stratosphere below 300 Km. by the reaction of N2O (Nitrous Oxide) with the excited oxygen atom and above 30 Km. by Ionizing radiation on Nitrogen .

$N_2O + O^* \rightarrow 2NO$

N_2+UV Radiation $\rightarrow$ N+N
O_2+N $\rightarrow$ NO+O

2. ANTHROPOGENIC CAUSE (Release of CFCs & Halons):

CFC is used in refrigerators , home insulation , plastic foams and food containers. CFCs and halons remain inactive in the troposphere. CFCs take about 20-40 years to travel to reach the stratosphere . But after that their intermediate products especially chlorine atom remains active for 75-110 years. Once CFCs and halons reach the stratosphere , the chlorine as a result of interaction with UV radiations in the stratosphere acts as catalyst in splitting up ozone into oxygen molecule and chlorine monoxide (ClO). ClO further splits and damages to ozone.

$CFCs + UV \rightarrow Cl + F + Cl$
$Cl + O_3 \rightarrow ClO + O_2$
$ClO + O_3 \rightarrow Cl + 2O_2$

This cycle repeats and notably one chlorine atom may react with one lakh ozone converting it into O2. Even if CFCs were banned, problems would remain. There would still be no way to remove the CFCs that are now present in the environment. Clearly though, something must be done to limit this international problem in the future.

IV. CONCEPT OF OZONE HOLE

Gradual depletion of ozone concentration at Antarctica (South Pole) is more than Arctic (North pole) and it may be due to natural distillation (Data follows):

- 1970 306 DU
- 1971 245 DU
- 1993 240 DU
- 2006 242 DU

V. EFFECTS OF OZONE DEPLETION

Antarctica was an early victim of ozone depletion. A massive hole in the ozone layer right above Antarctica not only that continent but many others that could be victims of Antarctica's melting ice caps. In the future, the ozone problem will have to be solved so that the protective layer can be conserved. Even minor problems of ozone depletion can have major effects. Every time, even a small amount of the ozone layer is lost more UV light from the sun can reach the earth . Every time 1% of the ozone layer is depleted, 2% more UV – B is able to reach the surface of the planet. UV–B increase is one of the most deleterious consequences of ozone depletion because it can cause skin cancer. The increased cancer levels caused by exposure to this UV light could be enormous. The EPA estimates that 60 million Americans born by the year 2075 will be the victim of skin cancer because of depletion of ozone. About one million of these people will die. The increased cancer level caused by exposure to this ultraviolet light could be enormous. The EPA estimates that 60 million Americans born by the year 2075 will get skin cancer because of ozone depletion. About one million of these people will die. In addition to cancer, some research shows that a decreased ozone layer will increase rates of malaria and other infectious diseases. According to the EPA, 17 million more cases of cataracts can also be expected. The environment will also be negatively affected by ozone depletion. The life cycles of planet will change, disrupting the food chain. Effects on animal will also be severe, and are very difficult to foresee. Oceans will be hit hard as well. The most basic microscopic organisms such as plankton may be able to survive. If that happened, it would mean that all the other animals that are above plankton in the food chain would also die out. Other ecosystems such as forests and deserts will also be harmed. The planet's climate could also be affected by depletion of the ozone layer. Wind patterns could change, resulting in climate changes throughout the world.

VI. SALIENT EFFECTS ON HUMAN BEINGS & NATURE

- Basel cell carcinoma
- Squamus cell carcinoma
- Melanoma
- Suppression of immune response
- Sun burns
- Leukemia
- Breast cancer & Eye damage. In addition to cancer, researches reveal that reduced ozone layer will increase rates of Malaria and other infectious diseases. According to EPA, 17 million more cases of cataracts can also be expected.
- Environment will be also negatively affected by ozone depletion.
- The life cycles of the plants will be changed.
- Food chain will disrupted.
- Oceans will hit hard as well.
- Planktons may not be able to survive. If it happened, it would mean that all the other animals above plankton in the food chain would also die out.
- Forests and deserts will also be harmed.
- Wind patterns could changed, resulting in climatic changes through out the world.

VII. SOLUTION FOR OZONE DEPLETION

The discovery of the ozone depletion problem came as great surprise. Now, action must be taken to ensure that the ozone layer is not destroyed. Because CFCs are so widespread and used in such great variety of products, limiting their use is hard. Also, since many products already contain components that use CFCs, it would be difficult if not impossible to eliminate those CFCs already in existence. The CFC problem may be hard to solve because there are already great quantities of CFCs in the environment. CFCs would remain in the stratosphere for another 100 years even if none ere produced again. Despite the difficulties, international action has been taken to limit CFCs. The Montreal Protocol, 30 nations worldwide agreed to reduce usage of CFCs and encouraged other countries to do so as well. However, many environmentalists felt treaty did "too little, too late", as the Natural Resources Defense Council put it. The treaty

asked for CFC makers to only eliminate half of their CFC production, making some people feel it was inadequate. By the year 2000, the US and 12 nations in Europe have agreed to ban all use and production of CFCs. This will be highly significant because these countries produce three quarter of the CFCs in the world. Many other countries have signed treaties and framed the law for restricting the use of CFCs. Modern companies are finding substitutes for CFCs and the people in general becoming more aware of the danger of the ozone depletion.

VIII. FINAL DEAL AT COPENHAGEN WITH U.S. PUSH ON DEC. 18-19, 2009

Eleventh hour deal as a move in the evolution of the fight against the climate change held at Copenhagen is summarized in the following points:

Long-term goals: To reduce global emissions and bring global temperature below 2^0C.

Legally binding deal: A proposal; attached to the accord calls for a legally binding treaty by next year.

Finance: The deal promises short-term financing pledges from developed countries for 2010-2012. EU: $10.6bn, Japan; $11bn, US: $3.6bn.

Emission Cuts: Details of mitigation plans are included in separate annexes, one for developed country targets and one for the voluntary pledges of developing countries.

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