

Depletion of Ozone Layer in Antarctica

There are three main factor responsible for it.

1. Shape of the Earth
2. Rotation of the Earth
3. Lowest temperature of Antarctica.

In the tropical areas of N.H, when industrial emission take place it carries the ODSs into the atmosphere. When the hot tropospheric air mixes with the

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Cold stratospheric air. DOBSON BREWER CIRCULATION is generated which is responsible for pushing the emissions towards the Pole. These emissions accumulated near the pole due to nearer centre of Gravity.

The Industrial emissions now whirl along with the VORTEX WIND which is formed due to rotation of Earth.

When the winter falls the VORTEX WIND condenses to form a highly reactionary clouds called Polar Stratospheric clouds. When the winter gets over

and sunlight again reaches this area from the PSCs ODS₅ would be emitted and maximum damage to ozone layer takes place during this period.

The PSCs consist of thin sheets of ice from where ODS₅ would be emitted and also where ozone depletion reactions occurs. Since the temperature of Antarctica is lowest at earth and in winter it can fall down to -115°C , The PSCs in this

region would be staying for a greater period of time and damage to ozone layer would be maximum at antarctica when compared to any other part of Earth.

The Adverse effect of Ozone^{Depletion} not only include skin Cancer and Cataract but also damage to nuclei Acid, damage to Immune system and disrupting photo-synthesis performed by phytoplankton. which would be influencing the food chain of ocean.

Sources

CFCs → Air conditioners & Refrigerators, Industrial Solvent, plastic foam, Propellants used for Aerosols, Sterilisers used for medical equipment.

N₂O → Fertilizer Use, Vehicular Emission.

CH₄ → Paddy fields, Swamps, Tundra Region, Coal mines, Intestinal fermentation in Cattles, Ruminants.

In 1985 - Ozone layer Depletion was reported by Antarctica where the ozone layer reduced to 136 DOBSON Unit from (280-320 D.U) - in 1958-1970.

In 1985 - Vienna Conference Convened which was mainly promote research to study the impact of Anthropogenic Activity on Ozone layer and also to take legislative and administrative measures for this purpose.

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But concrete steps were taken for Ozone Depletion was taken in 1987 under the Montreal Protocol signed by 27 Nations. The objective of this Protocol was to limit the production of Ozone depleting substances and also to phase them out.

In the 1990, 93 countries attended a UN Conference which was responsible setting up a fund of \$240 million to help the developing Nations find alternate for CFCs. The alternate was found in the form of HFCs, which is 5 to 10 times less damaging to Ozone layer when compare to CFCs. But the heat retention capacity of HFCs is 1000 times more when compare to CO₂.

To phase out HFCs, the KIGALI Agreement was signed in 2016, which is regarded as an amendment to Montreal Protocol. The objective is to phase out HFCs by 2050. which would reduce the temp of earth by 0.5°C and would be significant for meeting the target of Paris declaration.

The KIGALI Agreement would be implemented in three phases. the first phase started 2019, where developed Nations like U.S, Japan would start their phasing out initiative.

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The second phase - start in 2024- where 100 developing nation including China would be doing so.

The Third phase - starts in 2028, where countries like India, Pakistan, Saudi Arabia would start their phasing out programme.

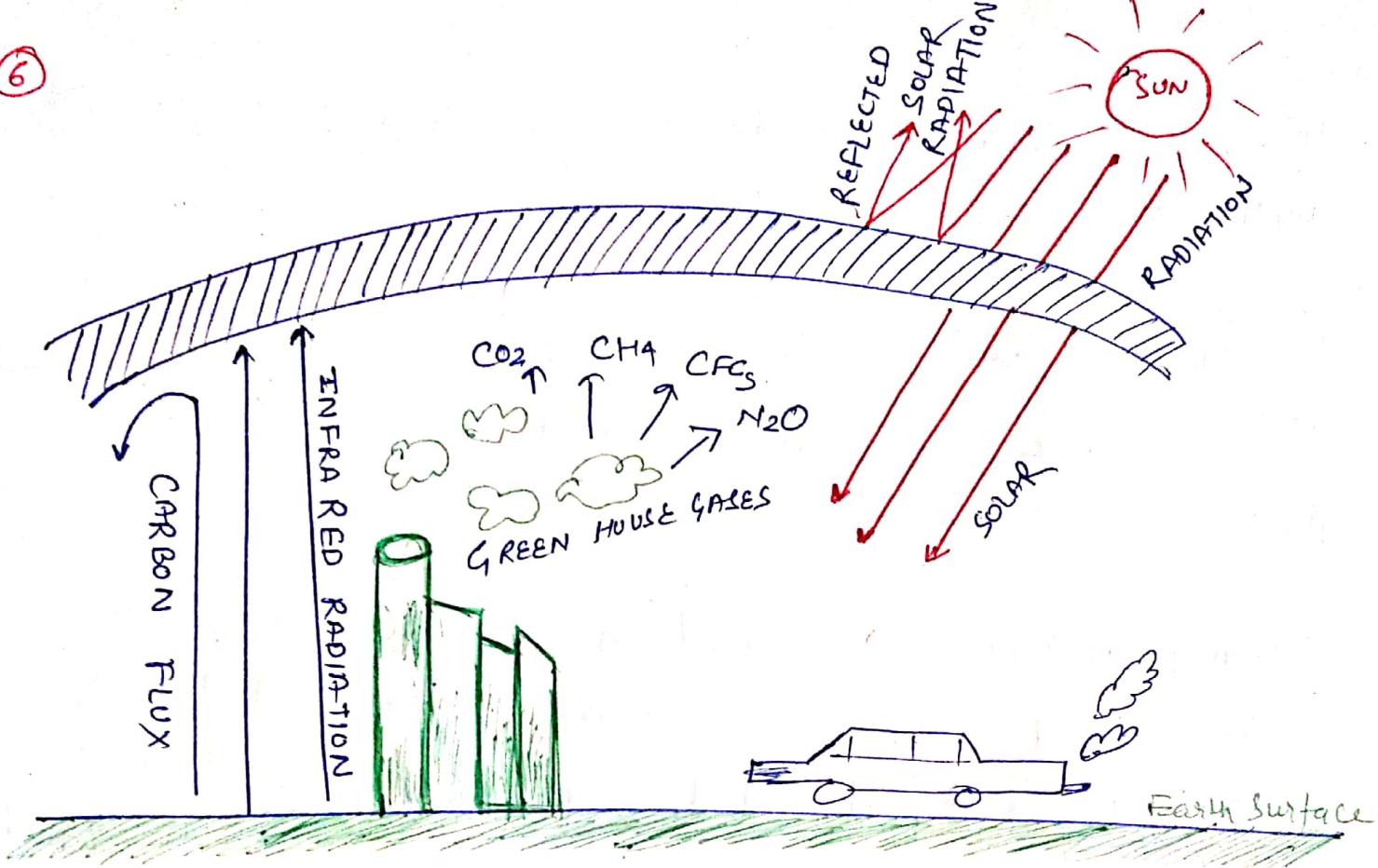
KIGALI Agreement is based on CBDR (Common But Differentiated Responsibilities) and implies that the objective of both developed and developing nation is identical but more responsibility should be shared by developed country.

In 2016, India started HPMP-II (HCFC phasing out management plan-II). The objective is to phase out 8.5 million tonnes of HCFCs by the year 2023.

GLOBAL WARMING AND GREEN HOUSE EFFECT

Green House gases present in atmosphere is responsible for moderating the temp of Earth. If they are not present the temperature of earth would be -20°C in hospitable for our survival. The incoming solar radiation is of a shorter wavelength and strike the surface of Earth. ($0.2 \text{ to } 4 \mu\text{m}$)

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From the surface of Earth the long wavelength Infra Red Radiation would be generated a part of which is absorbed by the greenhouse gases, and some infrared Radiation would also be reverted back towards the surfaces which is called carbon flux.

This is how the temperature of Earth is moderated and become hospitable for our survival.

The concern is rising level of greenhouse gases due to industrial or vehicular emissions because of which more of Infrared radiation is absorbed and the temperature of Earth enhancing which is term as global warming.

Since temperature is responsible for determining a number of geographical phenomena as such climate change due to global warming is inevitable.

CRYOSPHERE AS A Contributor to Global Warming:

Cryosphere is that part of biosphere which is covered with ice it includes the permafrost region the formation of which takes place at high altitude and high latitude. In this region even the summer solar radiation is not able to thaw(melt) the frozen soil. Permafrost Regions are those where for two consecutive years the temperature hardly enhances above the freezing point due to melting of polar ice which results as a global warming. The Cryosphere is shrinking and the ALBEDO Phenomena performed by cryosphere is getting reduced which enables the solar radiation to reach the surface of the Earth in abundance and contribute to global warming.

In the permafrost region organic matter was trapped and due to melting of permafrost it would be exposed and decomposed by microbes. If Aerobic decomposition take place CO_2 would be released

And if anaerobic decomposition take place CH_4 would be released which would further enhance global warming.

Permafrost are the region of gas hydrates due to melting of ice these hydrates would get dissociated releasing green house gases. The phenomena through which organic matter trapped in permafrost region is exposed the decomposition of which is responsible for emission^{as well} of green house gases as well as dissociation of gas hydrates due to melting of this region is referred as carbon bombs.

In the 2010, former Chairman of ISRO, Dr U.R. Rao came to the conclusion that in the last 150 years of time the solar activities have reduced because of which the intensity of Solar Radiation is less as a result of it cloud cover over the earth has also reduced as a result of which the solar radiation is reaching the surface of earth in abundance and contributing to global warming.

Significance of Clouds in Global Warming

Clouds are responsible for performing 30% of Albedo phenomena as such they reduce the adverse impact of global warming if the clouds cover is less the adverse impact of global warming would be enhanced.

In 2016, an agreement was signed between India, US and China to enhance cloud cover by pumping Sulphate particles in atmosphere. On the other hand Cirrus cloud are responsible for aggravating the influence of global warming. These clouds consist of ice crystal which is responsible for absorbing the infrared radiations.

Planes are not only responsible for aggravating the influence of global warming through fossile fuel combustion but the exhaust acts as seed nuclei on which formation of CIRRUS clouds take place called CONTRAIL CIRRUS.

Objective of above mention agreement was also to develop a technology for thinning of CIRRUS clouds to reduce the adverse impact of global warming.

Ruminants as a Contributor to Global warming

According to a FAO (Food and Agri Org.) reports ruminants contributes 14.5% in total green house gas emissions. Slightly more than that contributed by vehicles (14%). Gases emitted by ruminants include CO_2 , N_2O , CH_4 . Which is emitted in abundance. Of late some step has been taken which includes —

1) SILVO PASTORALISM

This process is being conducted in Latin American nations by planting trees in the pasture land. not only to neutralized emission from ruminants but also to check the degradation of lands.