

Responsibility towards the environment and living beings: Review

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ABSTRACT

“Live and Let Live”

The environment plays a significant role in human development, human health and diseases. Over the years, the environment has been progressively harsh, due to climate change (CC), global warming (GW) and acid rain (AR), Ozone layer (OL) etc. The increase in the production of green house gases has resulted in enhanced green house effect which has also resulted in changing epidemiological pattern of diseases. The concept of global warming was reviewed; various climatic changes, acid rains and ozone layer were discussed in the present study. Obligation towards the environment and living beings is the environmental ethics. Environmental crisis is in reality, the crisis of ethics. Over exploiting our right and failing in duty towards the environment. It is our duty to save environment for other species and for our future generation. Polluting the environment and depleting the natural resources are dangerous and selfish human acts against the principles of ethics. Living in harmony with nature has always been emphasized with the philosophy to take from nature only what we actually need and not more.

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KEYWORDS

Environment;
Ethics;
Climate change (CC);
Global warming (GW);
Acid rain (AR);
Ozone layer (OL);
Protection act (PA).

EXPLANATION

(I) Climate change (CC)

CC is changing our health, economy and communities in diverse ways. CC is the bigger environmental and humanitarian crisis of current time. Climate change is related to the natural and anthropogenic processes^[1]. The increased amounts of green house gases like CO₂, CH₄, N₂O and CFCs etc. in the atmosphere are affecting the climate and this ultimately result in CC. The human activities that are transforming the biosphere include land use changes, industrial development, energy

production from fossil fuels and urbanization. The conversion of a forest to a grazing land or a crop land through deforestation causes loss of carbon stored in soil and vegetation to the atmosphere and affects the carbon cycle. The cc affects for the livelihood of farm households directly and other intermediaries indirectly^[2]. Biomass burning associated with agricultural practices also releases CO₂ into the atmosphere. In recent times, due to domestic and industrial coal burning, the huge amount of CO₂ is being pumped into the atmosphere. Similarly, the concentration of gases like methane (CH₄), nitrous oxide (N₂O) and chlorofluorocarbon (CFCs) are increasing in the lower atmosphere. These gases (CO₂,

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CH₄, N₂O and CFCs) etc. are radioactively active gases also known as green house gases, because they can absorb long wave infrared radiation (As shown in photographs).



International initiative for mitigating global change

In order to stabilize atmospheric concentrations of green house gases global emissions should be significantly lowered than what they are today. In 1987, 27 industrialized countries signed "Montreal Protocol". This protocol is an international agreement to protect the ozone by agreeing to limit the production and use of ozone-depleting substances and helping the developed countries to implement use of alternatives to CFCs^[4,5]. To date, more than 200 countries have signed the Montreal protocol.

The United Nations Conference on Environment and Development (UNCED, Earth Summit), held at Rio de Janeiro, Brazil in 1992, established the principles for reducing green house gas emission. The Kyoto Protocol, approved by a follow-up conference held in Kyoto, Japan during December 1997, has specified the commitments of different countries to mitigate climate change. This protocol requires countries to take appropriate measures to reduce their overall green house gas emissions to a level at least 5% below the 1990 levels by the commitment period 2008-2012. Fourth Assessment Report (AR-4) of the Inter-Governmental Panel on Climate Change (IPCC-2007) has stressed the comprehensively regarding the nature of human in-

duced climate change^[3].

(II) Global warming (GW)

GW also known as green house effect is the warm-

ing of the earth due to emission of harmful gases from the earth, which form the blanket cover over the earth and do not allow the gases to move upward to the atmosphere^[6]. Every year, almost 7 billion tons of carbon dioxide is released into the atmosphere by human activity, adding up to the largest concentration during the past 420,000 years. Many cars, power plants, and burning of every material containing carbon generously add to this number. The human should realize fossil fuel burning habit is enough to stop the increase of carbon dioxide.

In 1998, the Intergovernmental Panel on Climate Change (IPCC) was established by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), in recognition of the threat that global warming presents to the world. Global temperature will likely rise by about 1-3.5 Celsius by the year 2100.

Causes of GW

Carbon dioxide plays a important role in maintaining proper balance on the earth, as it allow the heat radiations from sun to come down the earth and does not allows the heat to allow to escape into the atmosphere. When the concentration of gases increases in the environment it blocks the heat radiations to go up in

TABLE 1 : Surface air temperature in °c changes during various seasons averaged over the whole of India (+ ve sign indicates an increase and – ve sign represents decrease in temperatures)

Sr. No.	Month	Min. Temp.	Max. Temp.	Mean temp.
1	January and February	+ 0.2 to +0.6	+ 1.0 to +1.2	+1.0
2	March to May (Pre monsoon)	- 0.1 to +0.2	+ 0.6 to +0.8	+ 0.3
3	June to September	- 0.2 to +0.4	+ 0.4 to +0.6	+ 0.4
4	October to December (Post monsoon)	+ 0.6 to +0.8	+ 1.1 to +1.3	+ 1.1



the atmosphere, leading to an increase in the temperature of the earth or gw. Other gases which cause green house effect are methane, chlorofluorocarbon, nitrous oxides etc, (As shown in photographs). These are emitted to the atmosphere through burning of fossil fuels like coal, wood, oil etc. About (07) billion tons of carbon is emitted into environment every year and about (20) billion tons of carbon dioxide is emitted into the air.

Effects of GW

- a Change in climate-A continuous increase of green house gases, leads to the rise in mean global temperature which affects the climate, leading to change in rainfall pattern, conversion of fertile lands into deserts, shortage of water due to evaporation.
- b Effect on agricultural lands-Due to change in the weather conditions, the production of crops is also affected and reduces the yield of rice, maize, wheat and other crops.
- c Rising of ocean beds-High temperature on earth will melt polar ice caps and glaciers raising the sea level by 20 cm. To 140 cm. This leads to the submergence of islands and coastal areas.
- d Ecological disturbances-Green house effect disturb the food chain and destroy many cold habitat species. So United Nations Environmental Program (UNEP) has appropriately chosen the slogan “Global Warming: Global Warming” and since 1989, 5th June is celebrated as World Environment Day.

Control of GW

At the Earth Summit held at Rio de Janeiro in 1992, 153 nations signed the convention on climate change and committed themselves to reduce emission of CO₂ and other green house gases^[7]. Thus, there is already

agreement among nations that GW is a serious problem and rather than wait and watch attitude, steps may be taken towards reducing consumption of fossil fuels by finding out alternative sources of renewable energy, better energy management system and reverse deforestation. It is a documented fact that burning coal produces twice as much CO₂ per unit of heat as natural gas. It is therefore, important to control CO₂ production from burning of coal which can be possible by use of alternative source of energy like solar and wind power. U.S.A. with 7% of World population contributes 30-35% of World CO₂ emission; it has therefore, a greater responsibility in reducing this gas. Also to combat GW, following steps have been suggested by experts,

- 1 Cleaning up coal for which technology exists to reduce pollution.
- 2 More use of natural gas than coal because natural gas contains only half the carbon of coal and no sulfur.
- 3 Renewable sources of energy would ultimately tackle the problem of CO₂ emission and pollution.
- 4 Manufacturing fuel efficient vehicles.
- 5 Deforestation reversal is a major step to reduce CO₂ concentration. It is possible to reclaim more land to plant more trees but requires help from social, political and financial institutions.

(III) Acid rain (AR)

AR has been an increasingly serious problem since the 1950s, particularly in the NE United States, Canada, and W Europe, especially Scandinavia. Acid rain became a political issue in the 1980s, when Canada claimed that pollutants from the United States were contaminating its forests and waters. Since then regula-

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tions have been enacted in North America and Europe to curb sulfur dioxide emissions from power plants, these include the U.S. Clean Air Act (1990) and the Helsinki protocol (1985), in which 21 European nations promised to reduce emissions by specified amounts. To assess the effectiveness of reductions a comprehensive study, comparing data from lakes and rivers across N Europe and North America, was conducted by an international team of scientists in 1999. The results they reported were mixed: while sulfates were lower, only some areas showed a decrease in overall acidity. It remained to be determined whether more time or a greater reduction in sulfur emissions was needed to reduce freshwater acidity in all areas^[8].

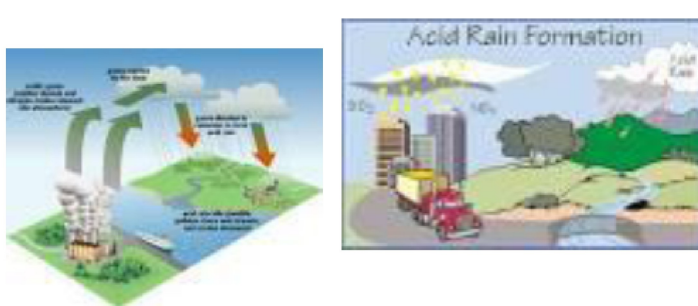
Causes of AR

Nitrogen oxides and sulfur dioxide are produced during the combustion of coal in industry and petroleum in automobile. Lightening in sky also produces nitrogen oxides naturally. These rapidly oxidize to acids (sulfuric or nitric), which quickly dissolve in water and are washed out to the ground^[9] as acid rain. Normally, rainwater is slightly acidic (pH 5.6 to 6.5) because water

ing materials and paints, including irreplaceable buildings, statues, and sculptures that are part of our nation's cultural heritage Taj Mahal at Agra. AR adversely affects terrestrial and aquatic vegetation. Most Planktons, molluscus and fish fry cannot tolerate water having pH below 5.0. Low pH conditions also damage soil microbial community. Prior to falling to the earth, sulfur

TABLE 2 : Rainwater pH values in various regions of the world.(Season July 2010 to September 2012, values are collected from different web sources / internet)

Sr. No.	Name of the Country	pH ranges
1	China (AR area)	4.1 – 4.8
2	China (Non AR area)	6.2 – 6.7
3	Japan	4.5 – 4.8
4	Europe	4.1 - 5.5
5	US north west	5.1 – 5.2
6	US west mid	5.0 - 5.5
7	US north	4.1 4.2
8	India	6.2 - 6.4
9	England	6.1 - 6.3
10	France	5.8 - 6.0
11	Nepal	6.2 - 6.4



and CO₂ combine in air to form a weak acid. The pH of acid rain is less than 5.6 and could be as low as 4 or below.

A pH value of 7 represents a completely neutral substance that is neither acidic nor basic. Lower values indicate acid rain, with the lowest values being the most acidic. Rainwater is naturally somewhat acidic. Rainwater in areas that are not downwind from sources of pollution generally has a pH value of 5.0 or higher.

Effects of AR

AR causes acidification of lakes, streams and contributes to the damage of trees at high elevations e.g., red spruce trees above 2,000 feet and many sensitive forest soils. In addition, ar accelerates the decay of build-

TABLE 3 : Rain water pH values averaged in different regions of the Marathwada (Season July 2010 to September 2012, values are collected from different web sources / internet)

Sr. No.	Districts	pH ranges
1	Aurangabad	6.1 – 6.8
2	Beed	6.5 – 6.7
3	Jalna	6.5 – 6.8
4	Latur	6.1 - 6.5
5	Nanded	6.1 – 6.6
6	Osmanabad	6.0 - 6.5
7	Parbhani	6.1 – 6.2
8	Hingoli	6.2 - 6.4

dioxide (SO₂) and nitrogen oxide (NO_x) gases and their particulate matter derivatives sulfates and nitrates contribute to visibility degradation and harm public health.

Control of AR

There are several ways in which sulfur dioxide emission can be reduced.

- 1 Coal can be crushed and washed before burning.
- 2 Oil can be treated to remove sulfur.
- 3 Cleaning systems can be fitted into chimneys to remove sulfur dioxide before it can be released into the atmosphere.
- 4 Improved furnaces can be built which burn fuel more effectively and produce less pollution.
- 5 Vehicle exhausts can be fitted in vehicles, which remove pollutants from engine emission.

Ozone layer depletion (O.L.)

Ozone is an unstable dark blue gas with a pungent odour and strong oxidizing properties. It is formed when air oxygen is exposed to the electric discharge of the ultraviolet rays emitted by the sun. Hence, earth's atmosphere has a life supporting ozone layer in the stratosphere. The reduction in the amount of ozone resulting in the formation of ozone holes in the atmosphere due to human activities is the ozone layer depletion^[10]. The ozone layer is very important for the existence of life on the earth. This is because ozone layer absorbs most of the harmful ultraviolet radiations coming from the sun which can otherwise cause skin cancer, xeroderma, cataract and disorders of immune systems in human beings. Besides, these can impair plant and marine life^[11]. The ultraviolet rays may cause global warming, thus the existence of ozone layer makes the earth singular planet in the universe where life originates and thrives.

Causes of O.L.

The causes of ozone layer depletion are as follows.

- 1 Human activities-Industrial processes, forest fire, fuel combustion, solid waste disposal, spraying of insecticides, pesticides etc., release lot of nitrogenous gases like nitrogen pentoxides (N_2O_5), nitrous oxides (N_2O) etc which accounts for 10% of the total air pollutants.
- 2 Use of Aerosols-Use of aerosols spray propellants like fluorocarbons and chlorofluorocarbons (CFCs) as industrial solvents and as coolants in refrigerators, cars, air conditioners etc. deplets ozone.
- 3 Use of Halons – Use of halon in fire extinguishers, carbon tetrachloride used as a solvent and methyl

TABLE 4 : Estimated relative contributions to ozone depletion

Chemical	Atmospheric lifetime (Yrs)	Estimated global 1985 emissions (Thousand tones)	Relative depletion efficiency	Share of total contribution (%)
CCl_3F	76.50	238.00	1.00	25.80
CCl_2F_2	138.80	412.00	1.00	44.70
CCl_4	67.10	66.00	1.06	7.60
$(CFCl_2)CF_2Cl$	91.70	138.00	0.78	11.70
CH_3CCl_3	8.30	474.00	0.10	5.10
CF_3Br	100.80	3.00	11.40	3.70
CF_2ClBr	12.50	3.00	2.70	0.90
CHF_2Cl	22.00	72.00	0.05	0.70

chloroform also used as a solvent produces nitrogen containing gases which react with ozone resulting in latter's reduction.

- 4 Use of Bromine – Use of bromine in photography medicine and fire fighter manufacturing chemicals, destroys ozone.
- 5 Air traffic – Supersonic jet planes used in high speed civil transport emit nitrogen oxides which deplets ozone layer.
- 6 Nylon production – These releases N_2O as a byproduct which causes ozone layer depletion.

Effects of O.L.

On ecosystem, rays of varying wavelengths have many effects on the living beings. The shorter the wavelength of rays, more damage these can do to plants and animals. Ozone layer or shield acts as a barrier to UV rays, without this shield the ecological balance of earth would change and life would be paralysed. Though most of the plant and animals have some kind of protective mechanism from UV rays, a longer exposure to these rays results in their penetration to lower layers of body. This leads to skin cancer and damage to eyes in human beings. In plants, the process of photosynthesis by which they manufacture their food is effected.

Control of O.L.

1. The governments of many countries have banned the use of aerosols, halons and carbon tetrachloride.. In 1987, the USA and 22 other nations signed the Montreal Protocol to stop the use of ozone destroying compounds^[12]. In 1997 decision was taken by the international community to celebrate 16th, September as OZONE DAY.

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2. A decision was taken to set-up Montreal Protective Fund of 500 million dollars for safeguarding^[13] the earth's atmosphere at a meeting held in Copenhagen (Dec.2007) and also the strategy is built upon the following principles a) Creating international awareness, b) Promoting constructive dialogue between government-business and science, c) Inspiring global business leaders, etc.
3. United Nations Climate Change Conference was held in 26 November 2012, at Doha, Qatar cofusing on five aspects of climate change i.e. adaptation, finance, mitigation, technology and loss-damage etc.
4. The use of ozone destroying substances will be discouraged with the discovery of new alternative propellant, polygas which is ozone friendly, non-inflammable and fetters solvent abuse.

CONCLUSION

Environmental ethics demand that man should change his present attitude towards the nature. He should learn to live as apart of nature and not a master of nature. He should make a sincere effort to repair the environment and renew the natural resources so that all species may survive in nature. Only this can save the environments, wildlife and ourselves too. Human activities are adding more carbon dioxide to the atmosphere than are being naturally recycled, climate change, acid rain etc. Under the auspices of United Nations Environment Program (UNEP), government of the world, including the United States have co-operatively taken action to stop ozone depletion with the "The Montreal Protocol on Substances that Deplet the Ozone Layer" signed in 1987. This is what scientist believe is causing global warming.

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