GLOBAL ENVIRONMENTAL ISSUES- OZONE LAYER DEPLETION, ACID RAIN, GREENHOUSE EFFECT, CARBON FOOTPRINT

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ABSTRACT:
Global Environmental Issues is indeed the most discussed topic along with the world health, economy, and sustainability. Moreover, these sectors are highly interrelated too. Standing on the current century, even a toddler can counter what does the 'Climatic Change' mean? Unfortunately, not only him but all of us know the harsh realities and the grounds of these complications worldwide. We are at such a point of development, there are no other options left other than sacrificing either the ecosystem or the economy. Only sustainable practices may keep both partially but not to their fullest form. International politics and understandings, meeting up the climate commitments are the major needs of this hour. Here in this chapter, we will be discussing a few environmental issues which have impacted enormously. Ozone depletion, acid rain, greenhouse effects, and carbon footprints are a few of them.

Keywords: Global, Environmental, Sustainability, Greenhouse Effect, Ozone Depletion, Acid Rain, Carbon Footprints

INTRODUCTION:

The issues regarding the global environment were initiated in 1912, in the UN Conference on Environment and Development (UNCED) at Rio de Janeiro, this conference was followed by the Stockholm Conference in 1972. The Rio declaration set up and implemented the concept of sustainable development, theoretically and practically as well. Several environment related national level problems which were impracticable to resolve within the countries even by designing the best possible policies, were re-analysed and most of them had been put in the context of the global concerns. "Global environmental problems are changes in the atmosphere, in the oceans, and on land the causes of which can be attributed, directly or indirectly, to human activities; These changes affect the natural metabolic cycles, the aquatic and terrestrial ecological systems, as well as the economy and society; and they call for international agreements (cooperation) if they are to be dealt effectively" – as defined by The German Global Change Council (WBGU), 1993. The environmental policies were highly needed to be internationalized as an economy and ecosystem are interrelated, moreover, the changes in one of the two as the impact of the other one, are mostly irreversible. Besides, implementation (voluntary) of global environmental policies is so designed that it is effective as per the economic condition and societal position of a nation, be it a developed or a developing one. Rapid globalisation,

increased urbanization and industrialization, enhanced consumerisms, uncontrolled population growth, imbalances in economy and societies are the few major causes of accelerated environmental degradation. Problems like ozone layer depletion, Climate change, deforestation, biodiversity loss, etc. can be addressed only by global efforts. In the current scenario, the environment is being destroyed at such a rate that it will definitely be the toughest thing for humans to even survive in the near future, unless there are sample effective and intense management practices. Although we are going to discuss the four major global environmental crises, we will be having brief ideas about a few more which may also be considered as the serious concerns as well.

- **Depletion of natural resources:**

Depletion of natural resources means, withdrawal of naturally produced resources large amounts very fast; before it gets replenished naturally. Now, natural resources can be renewable or non-renewable. Thus, in case of the nonrenewable resources (such as coal, petroleum etc.) they would lose their existence once the entire storages are used up by humans. Besides, the increasing Human population leads to the enhancement of consumption, hence, over exploitation of resources. Moreover, while wildlife is over exploited, several species, even gone extinct. Besides, a massive use of fossil fuels are the major cause of carbon and other toxic emissions in nature. Thus, overall we can well understand that uses of natural resources are essential for living, but over use of them damages the environment.

- **Water pollution**

Water pollution could be marked as one of the major global issues on today's earth. Discharges of water having toxic chemicals, factory effluents, agricultural runoffs and domestic or municipal waste water generally mix with local water bodies, streams, water channels and finally get merged with the major streams or rivers and seas or oceans. Water pollution primarily hampers the aquatic ecosystems, and most of the cases it leaks through the soil channels and reaches the groundwater, thus affecting human lives that are dependent upon the ground water and the polluted surface water for daily purposes and even for drinking. Hence the toxin enters into aquatic plants, animals, hence the entire food chain.

- **Water scarcity**

Water scarcity is another worldwide problem that has arisen since the last few decades, and is worth discussing as several reports portray that more than 1 billion humans are unable to access clean potable water. When the fresh water is not enough to meet the basic needs of the human as well as other animals for their survival, it is called water scarcity. This scarcity leads to stress, deficits and thus several crises. Although the problem of dearth of water is a relatively new one, if it continues to recur in every summer or dry season, it would lead to further deterioration of available water. Moreover, fresh water is the pillar of a civilization; its societal, economic,

agricultural, industrial, environmental status directly depends upon the availability of the usable water.

- **Plastic pollution**

Production and use of plastic has started from the 1950s and has been under control for a couple of decades. But by the 1990s, the production uses and disposal had gone out of manageability by humans. Then in the following decade, the highest production of plastic took place. Since, plastic can cover commodities and protects from drying out or getting wet; i.e., air tight in nature; its usages have become universal and intense. In addition, single -use plastics make daily lives easier and cheaper. The dark part is, plastic forming materials are mostly derived from petroleum, and few other toxic chemicals, and; non-biodegradable. Studies reveal that approximately 300 million tonnes of plastic get dumped every year. Among those, only 9% are recycled, around 12% is incinerated and the rest is either land-filled or left on the land surface. Plastics mixed with the soil, damages the soil porosity, furthermore, it enhances toxicity in the soil, destroys soil ecosystems and fertility as well. Plastic waste hampers sanitation systems. A large (around 8 million tonnes per year) sink of plastic waste is the ocean; thus holding back the ocean – aquatic ecosystems.

- **Soil pollution**

Soil pollution means degradation of soil quality due to any type of contamination; either naturally or by human activities. The reduction of soil fertility and turning the soil inhabitable for the soil organisms, thus destroying the soil ecosystem or the surface soil or subsoil of any terrestrial ecosystem may characterize the overall impact of the soil pollution. Destruction of soil fertility directly holds back the crop production while contamination of pollutants in the soil may be one of the entrance routes of toxins into the food chain. Mostly, soil pollution takes place due to human activities such as, uncontrolled use of chemical pesticides, fertilizers; other chemicals from industrial effluents and plastics and plastic materials in the soil.

- **Extinction of wildlife and loss of biodiversity**

The current reports reveal that the earth has already lost 60% of the entire vertebrates, i.e., more than 50% of species of mammals, birds, reptiles, amphibians and fishes. The flying insect population also has been reported to have crashed by around 75% since the last 4 decades. The IUCN Red List shows that, more than 40% of amphibians, 25% of mammals, more than 30% of coniferous plants, around 13% of avian species, more than 30% of aquatic animals like sharks, 33% of corals and more than 25% of crustaceans are categorized as threatened with extinction. There are several causes of these losses, but it is very evident that the major causes are the results of uncontrolled anthropogenic activities; such as over exploitation of wildlife resources, unsustainable usages and consumption of forest animals and plants and most importantly the accelerated growth of human population.

- **Nuclear wastes and radiation issues**

Radioactive elements have several uses in modern life; starting from energy production, medical uses, and up to scientific and medical research it has opened a new avenue. But as always, every good thing must have a darker part, so nuclear technology isn't the exception. The pollution as a result of unplanned disposal of radioactive wastes is a global problem. The high – level wastes are generally dumped off from nuclear power plants, whereas the low - level wastes are generated from medical, research, and industrial sectors. Several countries have given the guiding principles and permissible limits, issuing licenses, waste management guidelines besides providing flexibilities in technical handlings.

OZONE LAYER DEPLETION

Stratospheric ozone layer depletion was identified first in the latter part of the 1970s. A sharp decline in stratospheric ozone layer, much evident during springtime, especially around the Polar Regions had been noted. This phenomenon has been denoted as the depletion and the formation of ozone holes. Now, let's have an overall idea about what the stratospheric ozone layer is and why is the layer so important? The Ozonosphere is located roughly between 15 and 35 km above the surface layer. This layer is very significant as it efficiently blocks the harmful portions (less than 290 nm wavelength; a part of UltraViolet radiation) of solar radiation; which may even destroy living organisms on earth. The major cause of this depletion and formation of the ozone hole is a certain group of chemicals, named as halocarbons, mainly produced for refrigeration, foam blowers, propellants and solvents for few particular uses. The halocarbons include Chlorofluorocarbons (CFCs), Hydrochlorofluorocarbons (HCFCs) and they are altogether referred to as the ozone Depleting Substances (ODSs). These ODSs were first invented in 1928, and started to be produced commercially by 1930.

Several researches have been conducted exactly in this matter; in 1974, the first report published stating the efficacy of CFCs to breakdown ozone in presence of UV radiations. Further studies went on in support of the similar fact, as the results of several laboratory based experiments. The strongest report, rather the toughest shock, came upon in the year 1985, showing the already dropped (10%) ozone level over Antarctica. The discovery of the "ozone hole" by NASA added to the evidence in very effective ways. Again, numerous investigations started on the ozone hole and its existence had been proved for many times.

- **The Montreal Protocol**

On the 15th day of September in the year 1987, the only treaty which had been implemented in every country all over the globe – the all United Nations Member States, to control over nearly hundred man-made ODSs. This historical treaty is known as The Montreal Protocol (1987). This Protocol induces the phasing down of the uses of ODS in step wise systems as per the economic and the societal situation of the countries. Both the developed and developing countries had been allotted with equal responsibilities, but in different ways. All the mentioned bindings are

measurable and time – targeted. Besides, the protocol includes all the technical details related to the control measures and also the strategies that could be adopted by the developing world. With time the treaty evolved in many aspects, and continued to be adjusted as per the changing situations. The meetings are held annually, where the platform is shared between the governing body members of the treaty and the working groups. The control program is assisted by the UN Environmental Programme (UNEP) headquarters.

The Montreal Protocol is such a treaty, which is regarded as the most effective international environmental concurrence till date. Scientists have assured that the stratospheric ozone layer is healing.

ACID RAIN

Acid precipitation or acid rain includes any kind of deposition with acidic constituents such as sulphuric acid and nitric acid. The form might be rain, fog, snow, dust or hail. Acid rains take place when the oxides of sulphur and nitrogen are emitted into the atmosphere; they undergo reactions with atmospheric oxygen, water vapours in the presence of few physical and chemical conditions, and end up forming sulphuric and nitric acid respectively. Then they get mixed up with the atmospheric water vapours and fall on the ground as rainfall has lower pH. Although there are few natural sources of SOx and NOx like volcanic eruptions, the chief sources of those gases are combustion of fossil fuels. It has been recorded that more than 60% of SO2 and around 25% of NOx is added to the atmosphere only from the power generating sectors. Besides, automobile emissions, manufacturing and refineries industries and some other production industries add up the amounts. There are two types of acid precipitations, viz., wet deposition (i.e., acid rain, snow, fog etc.) and dry deposition (i.e., acidic particles and gases).

- **Measurement of Acid Rain**

We all know that acidity and alkalinity are the parameters which are calculated by measuring the pH level of the media. The scale ranges from 0 to 14 (Figure. 1.3). Lower pH value denotes acidity and thus higher does the alkalinity. In general, the pH of rain water is around 5.6 (<7 or neutral), acidic due to the presence of carbon di-oxide, hence forming carbonic acid (weak). In case of acid rain the acidity increases as sulphuric or nitric acid get added to the rainwater, henceforth bringing down the pH to 4.2 – 4.4.

- **The Impacts of Acid Rain**

➢ Effects of Acid Rain on biodiversity: The aquatic ecosystems get highly affected, since acidic precipitation can even kill the fishes and other organisms.

➢ Effects of Acid Rain on the terrestrial green world: Plants die after the exposures to the acid rains. Acid rain washes out minerals from the soil; those minerals are essential for plants' survival and growth. Moreover, acid rain results in leaching of aluminium in soil, which is damaging to the plants. Plants in higher altitudes turn brown in colour, carry dried dead leaves or develop needles on the plant bodies, while getting exposed to acidic

fog or clouds. Though many forests have thick layers and unique composition of soil, they are able to buffer the changes in pH and thus can save their organisms.

- ➢ Sudden increase in nitrogen level: Acid rain doesn't only increase acidity, excess downpour of nitric acid increases the nitrogen level crossing its permissibility, thus problems arise, especially in coastal waters, where a decline in shell fishes and other coastal species, since there are few more anthropogenic sources of nitrogen already there, as reported.
- ➢ Several ecological and scientific researches have been done and depending upon those conclusions, policies and models are designed. National Trends Network (NTN) has been set up by the National Atmospheric Deposition Program (NADP) to measure the deposition in US, Canada and other nations.

GREENHOUSE EFFECT

The greenhouse effect is a natural process of raising the global average temperature by trapping a portion of solar radiation, by certain gases present in the atmosphere. The mentioned gases that can stop a certain range of waves of solar radiation from getting reflected back to space, are mentioned as the greenhouse gases, e.g., water vapour, carbon dioxide, methane, ozone etc.

As we already know it is a natural process; now we would come to know that if there were no greenhouse effects, we would haven't had the existence of life on the earth; the ice ages would prevail till date. Thus, it is the greenhouse effect that has brought the earth to a habitable planet. The excessive production of greenhouse gases has accelerated the effect within a few decades and hence the climatic condition is gradually changing and becoming non adaptable for many organisms. Besides, the forests, which were working as the sink of greenhouse gases like carbon dioxide, have been cut down, enhancing the problem to many folds. The infra-red portion of the radiation gets absorbed by these gases and re-radiates them back to the surface.

CARBON FOOTPRINT

As defined by the Carbon Trust (2008), carbon footprint is, "A quantity of greenhouse gas is converted into CO2e by multiplying its mass by its global warming potential, e.g. 1 kg of methane is equal to 25 kg of CO2e". In easier terms, the carbon footprint is the measure of the extent of the impacts of any greenhouse gas emission to the environment; keeping CO2 as a standard scale, i.e., CO2e (where, e stands for equivalent). It can be categorized in several parts to make out the exact amount of impact in terms of CO2.

- **TYPES OF CARBON FOOTPRINTS:**

Starting from industrial activities, vehicle movements, product uses, different services and even daily human activities have carbon footprints and these different types of footprints have different limits, diverse methods of management, as set by the policymakers. So we can categorize carbon footprints as follows-

a. **Product carbon footprint**

This is basically a life cycle analysis of any product, i.e., how much carbon dioxide or its equivalent in the entire lifetime of the product. This includes every footprint of each step starting from resource collection, transport, the entire production system, the by-products, the wastes – in the form of solid, liquid and gas, packaging and delivery; thus it is either business to business analysis or business to customer analysis of production.

b. **Corporate Carbon Footprint**

It is for the organizations that are willing to consider the lesser carbon footprints in each stage operation. In this process the organization fixes the business goals, keeping the account of greenhouse gas emissions in parallel. Thus, these plans are set up having proper organizational limits, suitable criteria, side by side data collection and analysis and thus continual quality management.

c. **Value-Chain Carbon Footprint**

The value chain carbon footprint the value chain of a product in totality, i.e., the carbon debt gets started counting from the extraction or exploitation of each resources (either be natural or man-made; if man-made, the carbon footprint of those resources fall under the account) and up to the end of the product life (that is the remnants thrown off by the individual customers or organizations; even includes (if) the GHGs are emitted during its use by the customers – individual or organizational). Hence, the value chain carbon footprint is an aggregated viewpoint that includes multiple stages and ways of greenhouse gas emissions.

- **CO2 Equivalence (CO2e)**

CO2e is a system to express the amount of all greenhouse gas emissions in a single scale. Every GHG has a particular Global Warming Potential (GWP); this GWP index (identified under the Kyoto Protocol) considers the GWP of CO2 is 1, as referred to in the IPCC (Intergovernmental Panel for Climate Change) report.

KYOTO PROTOCOL:

The Kyoto Protocol brings the United Nations Framework Convention on Climate Change into action. Although the protocol was approved in December, 1997, it got enforced in February, 2005; having 192 signatory parties till date. This protocol sets the limits of GHGs emissions; and makes agreements with the countries with individual targets as per their affordability. This protocol itself offers the mechanisms and asks the countries to fulfil the allotted targets of emission reduction within the assigned time period. There is also the platform of updating the country wise periodic updates. The uniqueness of this protocol is, it has given tough bindings to the developed nations, since they are the major sources of carbon emissions. The first commitment period was 2008 to 2012. The second amendment period was set in the Doha Amendment of Kyoto Protocol in 2012. The second commitment period is 2013-2020. Though

the last amendment has not yet come into force. The second commitment period differs from the former one, while the first one enforced a reduction of 5% carbon emission compared to the emission in 1990, whereas, the second commitment allows the parties to reduce the emission by 18% (against the 1990 emission levels) during the eight year period from 2013 to 2020. However, all the parties who committed to reaching the first target were not the same as those who signed the latter one. The Kyoto Protocol has introduced emission reduction mechanisms such as the International Emission Trading, Clean Development Mechanism (CDM) and Joint Implementation (JI). Kyoto has also introduced the systems for through monitoring, keeping transparencies and keeping the parties under it.

CONCLUSIONS:

The global environmental problem is immense as a topic indeed. Intensive research and studies are still going on and will continue to be pursued until we reach a point of sustainability. It is no doubt the hard-hitting one, as we have to bring the global economy, education, society and environment under a single umbrella of equilibrium. Since the beginning, the economy has been accused as the prime opponent of the environment, though societal development, such as urbanization; education or research, such as scientific innovation of wireless connectivity and rapid growth of GPRS to 5G also shapes nature detrimentally. Still, developments must move forward, but necessarily maintaining the living wildlife, bright greeneries, fresh air, pure water, and healthy soil are the indispensable parts of the development. A superior wealth is not enough, without quality health in all aspects, starting from an individual to the entire earth.

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