ENVIRONMENT

in 21st Century

(Volume I)

Editor

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Kripa Drishti Publications, Pune.

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1.1 Introduction:

Globally, one of the serious issue is the change in the environment and its deleterious effects on us. A French word "environmer" which means "surround" is the root word from where the word "environment" originated. It ecological terms, it includes everything that surrounds us. All the biotic and abiotic factors and their interconnection and interdependence which also includes us constitutes our surroundings. Thus, environment is the totality of all the external conditions affecting the life, development and survival of an organism (UN, 1997). In past few decades the constant deterioration of the environment at an alarming rate has been the matter of concern worldwide.

This deterioration due to many natural and anthropogenic factors and the long term ecological effects have contributed to various acute and chronic ill effects. Also, all significant events have some impacts on the environment. Presently the most talked about issue globally is the outbreak caused by the pandemic COVID 19. This pandemic has significantly altered many customary ways in which different things and machinery work in the world drastically in a very short span of time. Many human activities and movements have been limited. Therefore, a proper understanding and estimation of the impact on environment in light of the COVID 19 outbreak becomes significant. COVID-19 is an acute respiratory disease caused by Corona virus Sars-Cov-2 (World Health Organization, 2020a). Since WHO declared COVID-19 as pandemic disease (World Health Organization, 2020b), many countries worldwide have responded seriously to this pandemic.

According to the World Health Organization (WHO), corona viruses are a family of viruses that cause illnesses ranging from the common cold to more severe diseases such as severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS). These viruses were originally transmitted from animals to people. SARS, for instance, was transmitted from civet cats to humans while MERS moved to humans from a type of camel. Several known corona viruses are circulating in animals that have not yet infected humans. The name corona virus comes from the Latin word corona, meaning crown or halo. Under an electron microscope, the looks like it is surrounded by a solar corona.

The novel corona virus, identified by Chinese authorities on January 7 and since named SARS-CoV-2, is a new strain that had not been previously identified in humans, now, although human-to-human transmission has been confirmed. This new virus can be transmitted just in minutes through droplets or even touching surface metals or other materials which have been infected from a person who has respiratory problems. Even though the elderly and the very young children are easily affected, nobody is immune to this new infectious disease once it hits the body, so all people are susceptible to its devastating effects (Bender, 2020; Meng, Hua, & Bian, 2020).

In the past two decades, the three corona viruses' outbreaks emerged that have caused considerable global health consternation. There is a new public health crises threatening the world with the emergence and spread of 2019 novel corona virus (2019-nCoV) or the severe acute respiratory syndrome corona virus 2 (SARS-CoV-2). The virus originated in bats and was transmitted to humans through yet unknown intermediary animals in Wuhan, China in December 2019 (Goel, 2020). Corona viruses are any of family Coronaviridae of large single-stranded, enveloped, non-segmented, positive sense RNA viruses ranging from 60 nm to 140 nm in diameter that have a lipid envelope studded with club-shaped spike proteins giving it a crown like appearance under the electron microscope, hence the name Corona virus, infecting birds and many mammals including humans with respiratory diseases. On the basis of antigenic relationships of the spike (S), membrane (M) and nucleocapsid (N) proteins, Corona viruses are classified into three groups. The Novel human corona viruses (HCoV), HCoVs229E and NL63 are group 1 Corona viruses, while OC43, HKU-1and SARS corona viruses are categorised into group 2 Corona virus. Group 3 corona viruses are found in basically avian species (Kupferschmidt et al., 2020). Genetic Recombination initiates between the members of the same and of different corona virus groups providing an opportunity for increased genetic diversity. The diverse bat corona viruses in both group 1 and group 2 are closely related phylogenetically to different mammalian corona viruses. The time between catching the virus and beginning of symptoms of the disease is known as incubation period. For COVID-19, it ranges from 1-14 days but most commonly around five days. The most common symptoms of COVID-19 are fever, tiredness, and dry cough. Some patients may have aches and pains, nasal congestion, runny nose, sore throat or diarrhoea. These symptoms are usually mild and begin gradually. Some people become infected but don't develop any symptoms and don't feel unwell. Most people (about 70 %) recover from the disease without needing special treatment. Around 1 out of every 6 people who get COVID-19 becomes seriously ill and develops difficulty in breathing. Older people and those with underlying medical problems like high blood pressure, heart problems or diabetes, are more likely to develop serious illness. It has given a severe impact on global and national economies irrespective of the level of virus impact on the people of individual nations.

The novel corona virus has no border, no religion and spread beyond cast and creed. It is highly contagious in nature and easily unpredictable. World was never prepared for this kind of pandemic, where we are in a race of developing a vaccine against its spread.

The COVID-19 spread around the world and severely affected the many sectors and related economies. The global disruption caused by the COVID-19 has brought about several effects on the environment and climate. Due to movement restriction and a significant slowdown of social and economic activities, air quality has improved in many cities with a reduction in water pollution in different parts of the world. Besides, increased use of PPE (e.g., face mask, hand gloves etc.), their haphazard disposal, and generation of a huge amount of hospital waste has negative impacts on the environment. Both positive and negative environmental impacts of COVID-19 are present. This article describes the impact of COVID-19 on environment and society including the possible ways in which the disease can be controlled has also been discussed therein and also how to mitigate its effects on environment.

The blow of the COVID-19 pandemic on the environment raise notice from the very commencement of the predicament, consisting of (a) explanation and analysis of the instant effects and (b) estimations related to long-standing changes. Qualitative assumptions are happening, while constant quantitative research must wait for appropriate data sets and supplementary data. Most facets of the environmental blow of the COVID-19 pandemic have not openly resulted from the virus itself. The consequence of rapidly restrictive or closing economic sectors, such as heavy industry, transport, or hospitality businesses, has affected the environment directly. Moreover, the blow of the COVID-19 pandemic on socio-ecological systems may be highly erratic, from radical changes in individual lifestyle, society and international affairs, to simply facilitating a quicker change than would normally have emerged. From an anthropocentric perception, the pandemic may show the way to a more sustainable future, including increased flexibility of the socio-ecological systems or shorter supply chains, which is a constructive progress.

Nevertheless, it is still probable that a number of nations will decide on for less sustainability by pursuing quick economic expansion and focusing less distress on the environment. While negative impacts on the economy and society in general are possibly vast, it is very likely that the global-scale decrease of economic conduct due to the COVID-19 emergency triggers a lot of reasonable improvements in environmental worth and climatic systems. However, not all the environmental consequences of the crisis have been or will be encouraging. This includes an increased volume of non-recyclable waste, the generation of large quantities of organic waste and difficulties in maintenance and monitoring of natural ecosystems. The temporal resolution of the corona virus impact ranges from instant (days to weeks), immediate (months) and lasting (years), and different examples are there. At the same time as the first impacts are divided between rapid environmental improvements, such as urban air and water quality, and pollution episodes, such as the ones caused by the sanitary disposals, the estimated short as well as long term impacts are mainly positive.

An ecosystem wishes three kinds of diversity namely biological, genetic and functional. Biological diversity refers to the opulence of species in a particular area; genetic diversity refers a way for a scrupulous species to adapt itself to changing environments while functional diversity equates to the biophysical processes that happen within the area.

The genetic diversity acts as a shield for biodiversity. Humans must recognize the levels and morals of biodiversity for the larger importance of the globe. Biodiversity or biological diversity refers to the continuation of a wide variety of plant and animal species in their natural environments or the diversity of plant and animal life in an exacting habitat.

The biodiversity is usually described at three levels: (a) genetic diversity, (b) species diversity and (c) ecosystem diversity. There is a requisite of ecological balance for widespread biodiversity. Anthropogenic actions and indefensible cultivation have several effects and perturb the ecological balance. The ecological equilibrium is a necessary need for human survival. Devoid of conserving the biodiversity and minimizing the anthropogenic activities, it is almost impossible to get the inclusive and sustainable development. The sustainable development is openly related with environmental beliefs and from time to time it seems to rethink and redefine the environmental ethics in current perspective. The climate change has massive brunt on biodiversity. Nature always favours and promotes the diversity and coexistence amid all the organisms by providing appropriate environment to all. Human is since exceedingly evolved product of evolution hence tried for all time to control the environment and its own society in order to get conducive ambience. But due to overexploitation of natural resources, augmented anthropogenic activities and human centric environmental loom, we are facing global warming and COVID-19 like unparalleled threats. Such global threats are compelling the academicians, policy makers and other stakeholders to introspect their visions and actions. Today, the World is a 'global village' due to the use of Information and Communication Technology and human are there and deriving all the benefits from Nature. When we are deriving the benefits, we must have to bear some responsibilities. We have to develop environment centric approach to utilize the natural resources in such a manner so that we can achieve the comprehensive and sustainable development with coexistence of all other species of organisms of the globe. The lockdown therefore provided us a prospect to shift our principles from anthropocentric or human centric worldview to eco-centric worldview. The former worldview puts the human beings in the centre giving them the chief status, considers man to be the most able for managing the planet earth, realizes that man is the planet's most important species and is the in-charge of the rest of nature. It emphasizes that earth has limitless resources for humans only and a healthy environment depends upon a healthy economy. The later worldview states that the earth resources are limited and belong to all the species that exist in nature. Though humans have right to draw their wishes from the environment but certainly not the extent that degrades the environment and harms other species and living beings. This eco-centric worldview is therefore based on earth-wisdom and urges us to live on this earth as a part of it, like any other creature of nature and live sustainably. It realizes that healthy economy depends upon a healthy environment (healthy environment does not depend upon a healthy economy). Due to lockdown, a large number of birds together with vultures are clearly on the go to appear. Insect pollinators have appeared in loads on crops and other plants. All these are good indication for ecological balance and biodiversity. Almost total lockdown due to COVID-19 outbreak has minimized the anthropogenic activities including overexploitation of natural resources. The major human population is bound to live in their homes, automatically prevented them to cause various types of pollution. The surrounding environment is reflecting clean and green. We all are observing a clean environment where almost all animals including birds etc. have started to flourish. Almost all humans are feeling healthy without any major clinical problems.

It is observed that during persistent lockdown period, the water of Brahmaputra, Ganga and Yamuna rivers in cities also became clear and transparent due less deposition of domestic and industrial effluents. During lockdown it was not possible to estimate the water quality parameters but the transparent condition of water of these holy rivers clearly indicate that pollution level definitely reduced to a great extent. These reductions in pollution level helped in flourishing the aquatic organisms including fishes.

1.2 Impact of COVID-19 on Environment:

The global disruption caused by the COVID-19 has brought about several effects on the environment and climate. Due to movement restriction and a significant slowdown of social and economic activities, air quality has improved in many cities. A significant reduction in water pollution in different parts of the world has also been reported. On the other hand, increased use of Personal Protective Equipment, (e.g., face mask, hand gloves etc.), their haphazard disposal, and generation of a huge amount of hospital waste has negative impacts on the environment.

1.3 Reduction of Air Pollution and GHGs Emission:

As many industries, transportation and companies have closed down; it has brought a sudden drop of greenhouse gases (GHGs) emissions. Compared with this time of last year, levels of air pollution in New York have reduced by nearly 50% because of measures taken to control the virus (Henriques, 2020). It was estimated that nearly 50% reduction of NO2 and CO occurred due to the shutdown of heavy industries in China (Caine, 2020). Also, emission of NO2 is one of the key indicators of global economic activities, which indicates a sign of reduction in many countries (e.g., US, Canada, China, India, Italy, Brazil etc.) due to the recent shut down (Biswal et al., 2020; Ghosh, 2020; Saadat et al., 2020; Somani et al., 2020). Usually, NO2 is emitted from the burning of fossil fuels, 80% of which comes from motor vehicle exhaust (USEPA, 2016). It is reported that NO2 causes acid rain with the interaction of O2 and H2O, and several respiratory diseases suffered by humans (USEPA, 2016). The European Environmental Agency (EEA) predicted that, because of the COVID-19 lockdown, NO2 emission dropped from 30-60% in many European cities including Barcelona, Madrid, Milan, Rome and Paris (EEA, 2020). In the US NO2 declined 25.5% during the COVID-19 period compared to previous years (Berman and Edisu, 2020). The level of NO2 demonstrated a reduction across Ontario (Canada) and found to be reduced from 4.5 ppb to 1 ppb (Adams, 2020). Up to 54.3% decrease of NO2 was observed in Sao Paulo of Brazil (Nakada and Urban, 2020). It was also stated that, the levels of NO2 and PM2.5 reduced by almost 70% in Delhi, the capital of India (Thiessen, 2020). Overall, 46% and 50% reduction of PM2.5 and PM10 respectively, was reported in India during the nationwide lockdown (IEP, 2020).

1.4 Reduction of Water pollution:

Water pollution is a common phenomenon of a developing country like India, and Bangladesh, where domestic and industrial wastes are dumped into rivers without treatment (Islam and Azam, 2015; Islam and Huda, 2016; Bodrud-Doza et al., 2020; Yunus et al., 2020).

During the lockdown period, the major industrial sources of pollution have shrunk or completely stopped, which helped to reduce the pollution load (Yunus et al., 2020). For instance, the river Ganga and Yamuna have reached a significant level of purity due to the absence of industrial pollution on the days of lockdown in India. It is found that, among the 36 real-time monitoring stations of river Ganga, water from 27 stations met the permissible limit (Singhal and Matto, 2020). This improvement of water quality at Haridwar and Rishikesh was ascribed to the sudden drop of the number of visitors and 500% reduction of sewage and industrial effluents (Singhal and Matto, 2020; Somani et al., 2020). Usually, huge amount of solid trashes is generated from construction and manufacturing process responsible for water and soil pollution, also reduced. Moreover, owing to the reduction of export-import business, the movement of merchant ship and other vessels are reduced globally, which also reduces emission as well as marine pollution.

1.5 Reduction of Noise Pollution:

Noise pollution is the elevated levels of sound, generated from different human activities (e.g., machines, vehicles, construction work), which may lead to adverse effects in human and other living organisms (Goines and Hagler, 2007; Zambrano-Monserrate et al., 2020). Usually, noise negatively effects on physiological health, along with cardiovascular disorders, hypertension, and sleep shortness of human (Kerns et al., 2018). It is reported that, globally around 360 million people are prone to hearing loss due to noise pollution (Sims, 2020). World Health Organization predicted that in Europe alone, over 100 million people are exposed to high noise levels, above the recommended limit (WHO, 2012). Moreover, anthropogenic noise pollution has adverse impacts on wildlife through the changing balance in predator and prey detection and avoidance. Unwanted noise also negatively effects on the invertebrates that help to control environmental processes which are vital for the balance of the ecosystem (Solan et al., 2016). However, the quarantine and lockdown measures mandate that people stay at home and reduced economic activities and communication worldwide, which ultimately reduced noise level in most cities (Zambrano-Monserrate et al., 2020). For instance, noise level of Delhi the capital of India, is reduced drastically around 40–50% in the recent lockdown period (Somani et al., 2020).

1.6 Increase of Biomedical Waste Generation:

Since the outbreak of COVID-19, medical waste generation is increased globally, which is a major threat to public health and environment. For sample collection of the suspected COVID-19 patients, diagnosis, treatment of huge number of patients, and disinfection purpose lots of infectious and biomedical wastes are generated from hospitals (Somani et al., 2020; Zambrano-Monserrate et al., 2020).

For instance, Wuhan in China produced more than 240 metric tons of medical wastes every day during the time of the outbreak (Saadat et al., 2020), which is almost 190 m tonnes higher than the normal time (Zambrano-Monserrate et al., 2020). Again, in the city of Ahmedabad of India, the amount of medical waste generation is increased from 550-600 kg/day to around 1000 kg/day at the time of the first phase of lockdown (Somani et al., 2020). Around 206 m tonnes of medical waste are generated per day in Dhaka, the capital of Bangladesh because of COVID-19 (Rahman et al., 2020).

1.7 Safety Equipment Use and Haphazard Disposal:

To protect from the viral infection, presently peoples are using face mask, hand gloves and other safety equipment, which increase the amount of healthcare waste. It is reported that, in USA, trash amount has been increasing due to increased PPE use at the domestic level (Calma, 2020). Since the outbreak of COVID-19, the production and use of plastic based PPE is increased worldwide (Singh et al., 2020).

For instance, China increased the daily production of medical masks to 14.8million since from February 2020, which is much higher than before (Fadare and Okoffo, 2020). However, due to lack of knowledge about infectious waste management, most people dump these (e.g., face mask, hand gloves etc.) in open places and in some cases with household wastes (Rahman et al., 2020). Such haphazard dumping of these trashes creates clogging in water ways and worsens environmental pollution (Singh et al., 2020; Zambrano- Monserrate et al., 2020).

1.8 Municipal Solid Waste Generation and Reduction of Recycling:

Increase of municipal waste (both organic and inorganic) generation has direct and indirect effects on environment like air, water and soil pollution (Islam et al., 2016). Due to the pandemic, quarantine policies established in many countries have led to an increase in the demand of online shopping for home delivery, which ultimately increase the amount of household wastes from shipped package materials (Somani et al., 2020; Zambrano-Monserrate et al., 2020).

However, waste recycling is an effective way to prevent pollution, save energy, and conserve natural resources (Ma et al., 2019). But, due to the pandemic many countries postponed the waste recycling activities to reduce the transmission of viral infection. For instance, USA restricted recycling programs in many cities (nearly 46%), as government worried about the risk of COVID-19 spreading in recycling facilities (Somani et al., 2020). Overall, due to disruption of routine municipal waste management, waste recovery and recycling activities, increasing the land filling and environmental pollutants worldwide.

1.9 Other Effects on the Environment:

Recently, huge amount of disinfectants is applied into roads, commercial, and residential areas to exterminate SARS-CoV-2 virus. Such extensive use of disinfectants may kill non-targeted beneficial species, which may create ecological imbalance (Islam and Bhuiyan, 2016).

Moreover, SARS-CoV-2 virus was detected in the COVID-19 patient's faeces and also from municipal wastewater in many countries including Australia, India, Sweden, Netherlands and USA (Ahmed et al., 2020; Nghiem et al., 2020; Mallapaty, 2020). So, additional measures in wastewater treatment are essential, which is challenging for developing countries like Bangladesh, where municipal wastewater is drained into nearby aquatic bodies and rivers without treatment (Islam and Azam, 2015; Rahman and Islam, 2016).

1.10 Potential Strategies of Environmental Sustainability:

It is assumed that, all of these environmental consequences are short term. So, it is high time to make a proper strategy for long-term benefit, as well as sustainable environmental management. The COVID-19 pandemic has elicited a global response and makes us united to win against the virus. Similarly, to protect this globe, the home of human beings, united effort of the countries should be imperative (Somani et al., 2020). Therefore, some possible strategies are proposed for global environmental sustainability.

a. Sustainable industrialization: Industrialization is crucial for economic growth; however, it's time to think about sustainability. For sustainable industrialization, it is essential to shift to less energy-intensive industries, use of cleaner fuels and technologies, and strong energy efficient policies (Pan, 2016). Moreover, industries should be built in some specific zones, keeping in mind that waste from one industry can be used as raw materials of the other (Hysa et al., 2020). After a certain period, industrial zones should have been shut down in a circular way to reduce emission without hampering the national economy. Again, industries especially readymade garments (RMG) and others where a huge number of people work, proper distance and hygienic environment should maintain to reduce the spread of any infectious communicable disease.

b. Use of green and public transport: To reduce emissions, it is necessary to encourage people to use public transport, rather private vehicles. Besides, people should encourage to use bicycle in a short distance, and public bike sharing (PBS) system (like China) should be available for mass usage, which is not only environment friendly but also beneficial for health.

c. Use of renewable energy: Use of renewable energy can lower the demand of fossil fuels like coal, oil, and natural gas, which can play an important role in reducing the GHGs emissions (Ellabban et al., 2014; CCAC, 2019). Due to the COVID-19 pandemic, global energy demand is reduced, which results in the reduction of emission and increased ambient air quality in many areas (Somani et al., 2020; Zambrano-Monserrate et al., 2020). But, to maintain the daily needs and global economic growth, it is not possible to cut-off energy demand like a pandemic situation. Hence, use of renewable energy sources like solar, wind, hydropower, geothermal heat and biomass can meet the energy demand and reduces the GHGs emission (Ellabban et al., 2014).

d. Wastewater Treatment and Reuse: To control the challenges of water pollution, both industrial and municipal wastewater should be properly treated before discharge. Besides, reuse of treated wastewater in non-production processes like toilet flushing and road cleaning can reduce the burden of excess water withdrawal.

e. Waste Recycling and Reuse: To reduce the burden of wastes and environmental pollution, both industrial and municipal wastes should be recycled and reused. Hence, circular economy or circularity systems should implement in the production process to minimize the use of raw material and waste generation (Hysa et al., 2020). Moreover, hazardous and infectious medical waste should be properly managed by following the guidelines (WHO, 2020c).

It is now clear that majority of the people (especially in developing countries) have a lack of knowledge regarding waste segregation and disposal issues (Rahman et al., 2020). So, government should implement extensive awareness campaign through different mass media, regarding the proper waste segregation, handling and disposal methods.

f. Ecological Restoration and Ecotourism: For ecological restoration, tourist spots should periodically shutdown after a certain period. Moreover, ecotourism practice should be strengthened to promote sustainable livelihoods, cultural preservation, and biodiversity conservation (Islam and Bhuiyan, 2018).

g. Behavioral Change in Daily Life: To reduce the carbon footprint and global carbon emission, it is necessary to change the behaviour in our daily life and optimum consumption or resources like; avoid processed and take locally grown food, make compost from food waste, switch off or unplug electronic devices when not used, and use a bicycle instead of a car for short distances.

h. International Cooperation: To meet the sustainable environmental goals and protection of global environmental resources, such as the global climate and biological diversity, combined international effort is essential (ICIMOD, 2020). Hence, responsible international authority like United Nations Environment Programme (UN Environment) should take effective role to prepare time-oriented policies, arrange international conventions, and coordination of global leaders for proper implementation. The detrimental effect of polluted environment is no more an unknown facet to us. In past due to poor air quality, compromised water quality and many more we have suffered a lot. Our lack of consciousness has cost us our health. Many people worldwide suffer from many diseases due to pollution which are our report cards of development at the cost of the environment. This sudden outbreak of the pandemic and a complete seizure of many human activities are the proof that it is us significantly contributing to environmental degradation. And some restrictions imposed on us can definitely give us a more green earth. We should wake up to the reality that as a species man is a part of the ecosystem and not at the pinnacle of it. Making environment the utmost priority we must turn the tide of ecological imbalance around and ensure that we have sustainably managed the environment for future generation only a long term global as well as individual commitment to the conservation of sustainable development can reverse the plethora of unimpeded environmental damage. A sound policy frame work keeping proper environmental health as a goal is the utmost important step. In mass awareness and sensitization on environmental protection and conservation is the need of the hour. Also a more holistic approach towards the environment can make this goal attainable one. Community awareness and equal participation from all the strata of the society can actually bring about a substantial change. Directly or indirectly, the pandemic is affecting human life and the global economy, which is ultimately affecting the environment and climate. It reminds us how we have neglected the environmental components and enforced human induced climate change. Moreover, the global response of COVID-19 also teaches us to work together to combat against the threat to mankind. A well maintained waste disposal system, encouraging local biodegradable as the alternative for usage of the harmful chemicals, identifying and trying to resolve many attitude based problems of wrong waste disposal, considering environmental ethics and global wellbeing before any major activity that possess threat to the environment are certainly some minimum points we can follow so that we can stride together a more green and clean environment.

1.11 Further Readings:

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2. Impact of Covid 19 on Environment

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Abstract:

The global outbreak of coronavirus disease 2019 (COVID-19) is affecting every part of human lives, including the physical world. The measures taken to control the spread of the virus and the slowdown of economic activities have significant effects on the environment. Therefore, this study intends to explore the positive and negative environmental impacts of the COVID-19 pandemic, by reviewing the available scientific literatures.

This study indicates that, the pandemic situation significantly improves air quality in different cities across the world, reduces GHGs emission, lessens water pollution and noise, and reduces the pressure on the tourist destinations, which may assist with the restoration of the ecological system. In addition, there are also some negative consequences of COVID-19, such as increase of medical waste, haphazard use and disposal of disinfectants, mask, and gloves; and burden of untreated wastes continuously endangering the environment. It seems that, economic activities will return soon after the pandemic, and the situation might change. Hence, this study also outlines possible ways to achieve long-term environmental benefits. It is expected that the proper implementation of the proposed strategies might be helpful for the global environmental sustainability.

Keywords:

Environmental assessment, Environmental pollution, Environmental management, Environmental sustainability, COVID-19, Public health, Lockdown, GHGs emission, Biomedical waste.

2.1 Introduction:

The outbreak of coronavirus disease-2019 (COVID-19) first emerged at the end of December 2019, from the Hunan seafood market in Wuhan City of China and declared as an international public health emergency in a couple of weeks by the World Health Organization (WHO, 2020a). It is an infectious disease caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) (Islam et al., 2020; Nghiem et al., 2020; Wang et al., 2020). Genomic analysis revealed that SARS-CoV-2 is phylogenetically associated with SARS viruses, and bats could be the possible primary source (Chakraborty and Maity, 2020). Although the intermediate source of origin and transfer to humans is not clearly known, the rapid human to human transmission capability of this virus has been established (Hui et al., 2020).

The transmission of the virus mainly occurred through person-to-person via direct contact or droplets produced by coughing, sneezing and talking (Islam et al., 2020; Li et al., 2020; Wang et al., 2020). As of September 06, 2020; the virus has claimed to spread 216 countries, areas or territories with the death of 876, 616 humans from 26,763,217 confirmed cases (WHO, 2020a), and the number is increasing rapidly.

2.2 Positive Environmental Effects:

- **Reduction of Air Pollution and GHGs Emission:**

As industries, transportation and companies have closed down, it has brought a sudden drop of greenhouse gases (GHGs) emissions. Compared with this time of last year, levels of air pollution in Ney York has reduced by nearly 50% because of measures taken to control the virus (Henriques, 2020). It was estimated that nearly 50% reduction of N2O and CO occurred due to the shutdown of heavy industries in China (Caine, 2020). Also, emission of NO_2 is one of the key indicators of global economic activities, which indicates a sign of reduction in many countries (e.g., US, Canada, China, India, Italy, Brazil etc.) due to the recent shut down (Biswal et al., 2020; Ghosh, 2020; Saadat et al., 2020; Somani et al., 2020). Usually, NO2 is emitted from the burning of fossil fuels, 80% of which comes from motor vehicle exhaust (USEPA, 2016). It is reported that NO2 causes acid rain with the interaction of O2 and H2O, and several respiratory diseases suffered by humans (USEPA, 2016).

The European Environmental Agency (EEA) predicted that, because of the COVID-19 lockdown, NO2emission dropped from 30-60% in many European cities including Barcelona, Madrid, Milan, Rome and Paris (EEA, 2020). In the US NO2 declined 25.5% during the COVID-19 period compared to previous years (Berman and Edisu, 2020). The level of NO2 demonstrated a reduction across Ontario (Canada) and found to be reduced from 4.5 ppb to 1 ppb (Adams, 2020). Up to 54.3% decrease of NO2 was observed in Sao Paulo of Brazil (Nakada and Urban, 2020). It was also stated that, the levels of NO2 and PM2.5reduced by almost 70% in Delhi, the capital of India (Thiessen, 2020). Overall, 46% and 50% reduction of PM2.5 and PM10 respectively, was reported in India during the nationwide lockdown (IEP, 2020).

It is assumed that, vehicles and aviation are key contributors of emissions and contribute almost 72% and 11% of the transport sector's GHGs emission respectively (Henriques, 2020). The measures taken globally for the containment of the virus are also having a dramatic impact on the aviation sector. Many countries restricted international travelers from entry and departure. Due to the decreased passengers and restrictions, worldwide flights are being cancelled by commercial aircraft companies.

For instance, China reduces almost 50–90% capacity of departing and 70% domestic flights due to the pandemic, compared to January 20, 2020, which ultimately deducted nearly 17% of national CO2 emissions (Zogopoulos, 2020). Furthermore, it is reported that 96% of air travel dropped from a similar time last year globally due to the COVID-19 pandemic (Wallace, 2020), which has ultimate effects on the environment. Overall, much less consumption of fossil fuels lessens the GHGs emission, which helps to combat against global climate change.

According to the International Energy Agency (IEA), oil demand has dropped 435,000 barrels globally in the first three months of 2020, compared to the same period of last year (IEA, 2020). Besides, global coal consumption is also reduced because of less energy demand during the lockdown period (Figure 5). It is reported that, coal-based power generation reduced 26% in India with 19% reduction of total power generation after lockdown (CREA, 2020). Again, China, the highest coal consumer in the world, dropped 36% compared to same time of the preceding year (early February to mid-march) (CREA, 2020; Ghosh, 2020). According to UK based climate science and policy website Carbon Brief, recent crisis of COVID-19 reduces 25% CO2 emission in China, and nonetheless below the normal limit more than two months after the country entered lockdown (Evans, 2020). They also projected that, the pandemic could cut 1,600 metric tons of CO2, equivalent to above 4% of the global total in 2019 (Evans, 2020)

2.3 Negative Environmental Effects:

2.3.1 Increase of Biomedical Waste Generation:

Since the outbreak of COVID-19, medical waste generation is increased globally, which is a major threat to public health and environment. For sample collection of the suspected COVID-19 patients, diagnosis, treatment of huge number of patients, and disinfection purpose lots of infectious and biomedical wastes are generated from hospitals (Somani et al., 2020; Zambrano-Monserrate et al., 2020). For instance, Wuhan in China produced more than 240 metric tons of medical wastes every day during the time of the outbreak (Saadat et al., 2020), which is almost 190 m tonnes higher than the normal time (Zambrano-Monserrate et al., 2020). Again, in the city of Ahmedabad of India, the amount of medical waste generation is increased from 550-600 kg/day to around 1000 kg/day at the time of the first phase of lockdown (Somani et al., 2020). Around 206 m tonnes of medical waste are generated per day in Dhaka, the capital of Bangladesh because of COVID-19 (Rahman et al., 2020). Also other cities like Manila, Kuala Lumpur, Hanoi, and Bangkok experienced similar increases, producing 154–280 m tonnes more medical waste per day than before the pandemic (ADB, 2020). Such a sudden rise of hazardous waste, and their proper management has become a significant challenge to the local waste management authorities. According to the recent published literature, it is reported that the SARS-CoV-2 virus can exist a day on cardboard, and up to 3 days on plastics and stainless steel (Van-Doremalen et al., 2020). So, waste generated from the hospitals (e.g., needles, syringes, bandage, mask, gloves, used tissue, and discarded medicines etc.) should be managed properly, to reduce further infection and environmental pollution, which is now a matter of concern globally.

2.3.2 Safety Equipment Use and Haphazard Disposal:

To protect from the viral infection, presently peoples are using face mask, hand gloves and other safety equipment, which increase the amount of healthcare waste. It is reported that, in USA, trash amount has been increasing due to increased PPE use at the domestic level (Calma, 2020). Since the outbreak of COVID-19, the production and use of plastic based PPE is increased worldwide (Singh et al., 2020). For instance, China increased the daily production of medical masks to 14.8 million since from February 2020, which is much higher than before (Fadare and Okoffo, 2020).

However, due to lack of knowledge about infectious waste management, most people dump these (e.g., face mask, hand gloves etc.) in open places and in some cases with household wastes (Rahman et al., 2020). Such haphazard dumping of these trashes creates clogging in water ways and worsens environmental pollution (Singh et al., 2020; Zambrano-Monserrate et al., 2020).

It is reported that, face mask and other plastic based protective equipment are the potential source of microplastic fibers in the environment (Fadare and Okoffo, 2020). Usually, Polypropylene is used to make N-95 masks, and Tyvek for protective suits, gloves, and medical face shields, which can persist for a long time and release dioxin and toxic elements to the environment (Singh et al., 2020). Though, experts and responsible authorities suggest for the proper disposal and segregation of household organic waste and plastic based protective equipment (hazardous medical waste) but mixing up these wastes increases the risk of disease transmission, and exposure to the virus of waste workers (Ma et al., 2020; Somani et al., 2020; Singh et al., 2020).

2.3.3 Municipal Solid Waste Generation, And Reduction of Recycling:

Increase of municipal waste (both organic and inorganic) generation has direct and indirect effects on environment like air, water and soil pollution (Islam et al., 2016). Due to the pandemic, quarantine policies established in many countries have led to an increase in the demand of online shopping for home delivery, which ultimately increase the amount of household wastes from shipped package materials (Somani et al., 2020; Zambrano-Monserrate et al., 2020). However, waste recycling is an effective way to prevent pollution, save energy, and conserve natural resources (Ma et al., 2019). But, due to the pandemic many countries postponed the waste recycling activities to reduce the transmission of viral infection. For instance, USA restricted recycling programs in many cities (nearly 46%), as government worried about the risk of COVID-19 spreading in recycling facilities (Somani et al., 2020). United Kingdom, Italy, and other European countries also prohibited infected residents from sorting their waste (Zambrano-Monserrate et al., 2020). Overall, due to disruption of routine municipal waste management, waste recovery and recycling activities, increasing the landfilling and environmental pollutants worldwide.

2.3.4 Other Effects on the Environment:

Recently, huge amount of disinfectants is applied into roads, commercial, and residential areas to exterminate SARS-CoV-2 virus. Such extensive use of disinfectants may kill non-targeted beneficial species, which may create ecological imbalance (Islam and Bhuiyan, 2016). Moreover, SARS-CoV-2 virus was detected in the COVID-19 patient's faeces and also from municipal wastewater in many countries including Australia, India, Sweden, Netherlands and USA (Ahmed et al., 2020; Nghiem et al., 2020; Mallapaty, 2020). So, additional measures in wastewater treatment are essential, which is challenging for developing countries like Bangladesh, where municipal wastewater is drained into nearby aquatic bodies and rivers without treatment (Islam and Azam, 2015; Rahman and Islam, 2016). China has already strengthened the disinfection process (increased use of chlorine) to prevent SARS-CoV-2 virus spreading through the wastewater. But, the excessive use of chlorine in water could generate harmful by-product (Zambrano-Monserrate et al., 2020).

2.4 Potential Strategies of Environmental Sustainability:

It is assumed that, all of these environmental consequences are short-term. So, it is high time to make a proper strategy for long-term benefit, as well as sustainable environmental management.

The COVID-19 pandemic has elicited a global response and make us united to win against the virus. Similarly, to protect this globe, the home of human beings, united effort of the countries should be imperative (Somani et al., 2020). Therefore, some possible strategies are proposed for global environmental sustainability (Figure 6).

a. Sustainable Industrialization: Industrialization is crucial for economic growth; however, it's time to think about sustainability. For sustainable industrialization, it is essential to shift to less energy-intensive industries, use of cleaner fuels and technologies, and strong energy efficient policies (Pan, 2016). Moreover, industries should be built in some specific zones, keeping in mind that waste from one industry can be used as raw materials of the other (Hysa et al., 2020). After a certain period, industrial zones should have been shut down in a circular way to reduce emission without hampering the national economy. Again, industries especially readymade garments (RMG) and others where a huge number of people work, proper distance and hygienic environment should maintain to reduce the spread of any infectious communicable disease.

b. Use of Green and Public Transport: To reduce emissions, it is necessary to encourage people to use public transport, rather private vehicles. Besides, people should encourage to use bicycle in a short distance, and public bike sharing (PBS) system (like China) should be available for mass usage, which is not only environment friendly but also beneficial for health.

c. Use of Renewable Energy: Use of renewable energy can lower the demand of fossil fuels like coal, oil, and natural gas, which can play an important role in reducing the GHGs emissions (Ellabban et al., 2014; CCAC, 2019). Due to the COVID-19 pandemic, global energy demand is reduced, which results in the reduction of emission and increased ambient air quality in many areas (Somani et al., 2020; Zambrano-Monserrate et al., 2020). But, to maintain the daily needs and global economic growth, it is not possible to cut-off energy demand like a pandemic situation. Hence, use of renewable energy sources like solar, wind, hydropower, geothermal heat and biomass can meet the energy demand and reduces the GHGs emission (Ellabban et al., 2014).

d. Wastewater Treatment and Reuse: To control the challenges of water pollution, both industrial and municipal wastewater should be properly treated before discharge. Besides, reuse of treated wastewater in non-production processes like toilet flushing and road cleaning can reduce the burden of excess water withdrawal.

e. Waste Recycling and Reuse: To reduce the burden of wastes and environmental pollution, both industrial and municipal wastes should be recycled and reused. Hence, circular economy or circularity systems should implement in the production process to minimize the use of raw material and waste generation (Hysa et al., 2020).

Moreover, hazardous and infectious medical waste should be properly managed by following the guidelines (WHO, 2020c). It is now clear that majority of the people (especially in developing countries) have a lack of knowledge regarding waste segregation and disposal issues (Rahman et al., 2020). So, government should implement extensive awareness campaign through different mass media, regarding the proper waste segregation, handling and disposal methods.

g. Ecological Restoration and Ecotourism: For ecological restoration, tourist spots should periodically shutdown after a certain period. Moreover, ecotourism practice should be strengthened to promote sustainable livelihoods, cultural preservation, and biodiversity conservation (Islam and Bhuiyan, 2018).

h. Behavioral Change in Daily Life: To reduce the carbon footprint and global carbon emission, it is necessary to change the behavior in our daily life and optimum consumption or resources like; avoid processed and take locally grown food, make compost from food waste, switch off or unplug electronic devices when not used, and use a bicycle instead of a car for short(er) distances.

i. International Cooperation: To meet the sustainable environmental goals and protection of global environmental resources, such as the global climate and biological diversity, combined international effort is essential (ICIMOD, 2020). Hence, responsible international authority like United Nations Environment Programme (UN Environment) should take effective role to prepare time-oriented policies, arrange international conventions, and coordination of global leaders for proper implementation.

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3. Human Population and Environment: Reference to Different Global Aspects

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3.1 Introduction:

Population growth is a matter of concern and thinking. Experts in various fields and researchers are constantly studying population issues from their perspectives. One of the main reasons for global population growth and dying at the same time. As now we experienced the Covid-19 pandemic causing the situation. As the epidemic of covid-19 kills many people, floods, earthquakes and droughts in a region can cause great loss of life, In short, as the principles and methods of demographics evolved, so did the problems that arose as the population grew. Man is a major component of natural resources.

He is also the creator of natural resources to some extent. People make maximum use of natural resources for their comfort and knowledge, ingenuity and research. So some countries in the world have made spectacular progress. China, Japan, Korea, Israel and USA, these countries are more advanced in terms of population skills and quality and life styles. Population is considered an important resource asset of all countries gender and age is an important factor in an efficient population.

Older children are paralyzed. Working population includes adults and youth. In a country with a large working population, the country develops holistically. In a country with a low working population, population is a problem. At present, we know much about the and their branches, humanities and it has helped us in the development and conservation of nature and natural resources, solution of various issues regarding population and their problems.

3.2 Population Growth and Distribution of Information in Different Countries:

In the past, population growth was very slow. In the sixteenth century, the world's population was forty crores. Seventeen to eighteen centuries in these two centuries, it significantly increased the world's population from 1830 crosses to 100 crores and reached 300 crores in 1960. In 1991, the world population reached 537 crores.

Experts estimate that the population will increase to 890 crore in 2030 years. Experts predict that the huge increase in population in the last decade is a population explosion; it has become a matter of concern for everyone. Statistically, an average rate of five babies is born every second, while two people die.

Worldwide birth rate is increasing by 2.5 per second, which is 2.14 million per day or 78 million per year. The world's population is officially announced from time to time by UNO. The world's population is divided into two types.

Poverty and population growth at the same time in developing countries Africa, Asia and Latin America have a population growth rate of 80%, while developed nations North America, Western Europe, Japan, Australia, Italy, Germany and Hungary have the lowest population growth rates.

Densely populated areas are generally considered to be with a population density of more than two hundred people per square kilometer. East and Southeast Asia, West and Central Europe, Brazil, California, Southeastern Canada and East America populations have high population density. In the agricultural country of Asia the fertile ground of silt is the natural resource material, superstition, ignorance, illiteracy, traditions. Due to social differences, the population is growing tremendously.

Western and European parts of the country are densely populated also in southeastern Brazil, California; Java has a hot and humid climate with a dense population due to favorable factors of good agriculture and a natural balanced environment. In countries like Canada and the United States, after industrial development, urbanization, migration, and economic well-being have led to a centralization of the population.

3.3 Regions of Moderate Population:

Areas with a density of fifty to two hundred people per square kilometer are generally considered to be areas of moderate population. Peru, Portugal, East Brazil, Turkey, Denmark, South Africa, Namibia, Egypt, etc., have a moderate population. The agro-industry trade is well developed in these countries and the geographical factors are well controlled.

3.4 Regions of Sparse Population:

Regions in which the population density is generally less than fifty people per square kilometer are called low population regions. Canada, Siberia, West Arabia, Sahara Kalahari, Mexico Attakama, West Asia Gobi, Greenland, Congo Valley, Amazon Valley, New Gini population in these countries is sparse. The climate here is unfavorable and the environment is not conducive to human survival and centralization. The climate is very dry, very humid, very cold, very hot because of these geographical factors affecting the population here, the above distribution of the population on Earth is heterogeneous. Snow in the North and South Poles makes it uninhabitable. China, India, Japan, Pakistan are densely populated. This is because the historical geographical culture elements here are very conducive to population growth.

The northern part of the Asian continent is extremely cold and the natural environment is not conducive to population. Naturally, the population is sparse in Central Asia. Due to desert, low rainfall, no suitable climatic conditions hence the population density is sparse. Where rainfall is more than 50 cm. Monsoon rains are high. Agricultural productivity is high. The land is in the plains and low lying river valleys. Double crops can be grown. Population growth is largely due to the geographical environment of the area where food is plentiful. Western and northwestern Europe has a mild climate with many mineral deposits and carbon rock deposits. Due to the need for manpower in this place, the population density is gradually increasing. The Mediterranean region is surrounded by mountainous terrain and is sparsely populated due to limited agricultural and industrial development. Extreme cold in Northern Europe and North America. The surface of the land is icy with low intensity of sunlight and long winters. This has limitations on industries and occupations and affects the population. In some parts of the eastern United States, there is the area of Panch Maha Sarovar.

To the south, there is the Mississippi Plain. Plenty of water supplies, cheap shipping, availability of minerals the rugged terrain is mildly stimulating and conducive to health. The migration of people from the Europe and other areas led to a huge increase in population. The Boston to Washington metropolitan area grew because of the naturally favorable conditions for hydropower generation. Here the population stabilized automatically. The rate of development in this region is great as people from all over Europe have special momentum in science and technology also. The population distribution here is dense. Due to the equatorial climate of the northern region of South America, the humid environment here is detrimental to health. The plateau is a natural phenomenon with a wide expanse of dense forests. As a result, the population is sparse. The continent of Africa is largely deserted. The climate here is semi-arid and the population of the Nile is densely populated. Malnutrition, poverty poor living standards have left the population out of control. Discovery of the Australian continent was delayed, so human colonization of other parts of the world has always been slow. The continent is sparsely populated due to the abundance of forests and deserts. The population around the world is quite increasing. Table 1 showing yearly increasing rate.

Table 3.1: Percentage Growth Rate of World Population

Year	Total World Population	Ten-year growth rate (%)
1950	2,556,000,053	18.9%
1960	3,039,451,023	22.0
1970	3,706,618,163	20.2
1980	4,453,831,714	18.5
1990	5,278,639,789	15.2
2000	6,082,966,429	12.6
2010	6,956,823,603	10.
2020	7,794,789,739	8.7

Source: www.infoplease.com/world/population/total

In 1990, the world's population was 529 million; about 58.8 percent of the population was in Asia. The population of the Asian continent is expected to double by 491.2 in year of 2025. The population of South America has quadrupled in the last fifty years. The percentage of the population is not much difference in Australia and New Zealand.

India has a wide variety of population densities. At present, the population of India is around 130 crores. West Bengal has the highest population density in India. In Jammu and Kashmir, on the other hand, it is the least common. From this we can easily find out the reasons for population density and distribution.

The natural environment and population density are closely related. Population density is concentrated in regions favorable to natural environmental factors. Natural composition, climate, forest, kind of resources like water resources soil, mineral resources. All these factors depend on population density and distribution.

3.5 The Future of the World Population:

The steady growth of the world's population over the last few centuries has been the subject of concern and reflection for all scholars and thinkers. At the end of the twenty-first century, the world's population will stabilize to a certain extent. As the world's population continues to grow until 2030, it will begin to decline somewhat. This prediction has been made by demographers, scientist and geographers.

Efforts need to be made at the national level to curb such a drastic increase in population. High density populations will continue to consume large amounts of natural resources. This will greatly affect the energy resources. Some energy would be generated with the help of science and technology but it had a serious impact naturally on the environment.

3.6 Population Explosion:

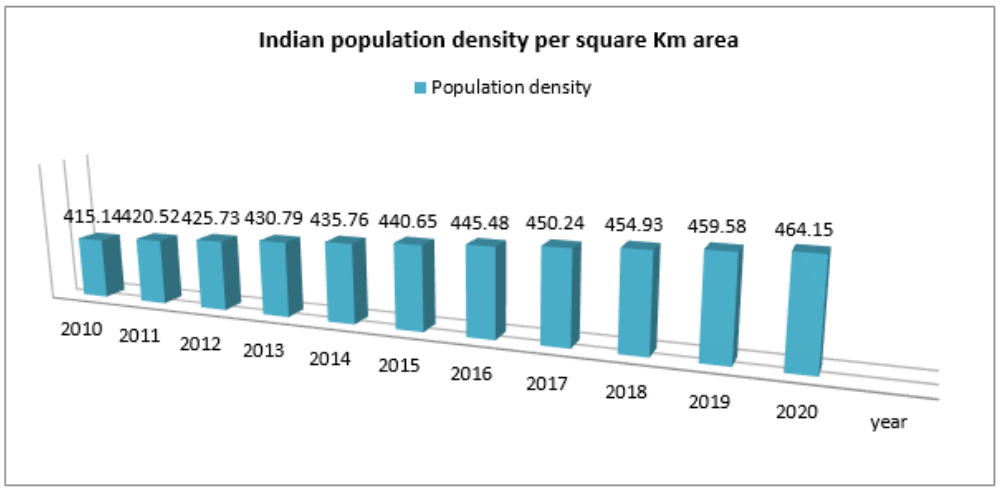
In many parts of the world, the population is growing at an uncontrolled rate. This uncontrolled population growth is called population explosion. Man is an integral part of nature. He has made great strides from the transition of many ages to the space age. He can spread and develop communication in any region of the world with the help of science and technology. With the advancement of science and technology, population growth has accelerated. Over the last few centuries, medical research has reduced the rate of births. Disease control has increased the life expectancy of the common man. We have mastered the technology of making full use of natural resources. As a result, our population has grown rapidly in all parts of the world over the past five hundred years. In 1659 the world population was 50 crores, in a hundred years tripled. In 2000, it was increased fourteen times. The world's natural resources have certainly not increased in many ways. From this we will see how the impact of the population explosion on the various resources of the environment. The explosion of population has changed the cause of world economic development. Poverty, famine, malnutrition, and hunger in some parts of Africa and Asia. Russia, North America, Japan, New Zealand, Australia population growth has been slow. These countries have high standard of living and controlled birth rates. The rate of population growth in Sweden, Norway, and France is declining dramatically.

Population growth slows down planning for development. Lack of education, economic exploitation, corruption, disease faces the population. China is the most populous country in the world. Since 1986, China has succeeded in controlling its population effectively. Population control by implementing schemes such as an offspring scheme, discipline education, training, schemes, unemployment elimination, family planning policy. In India, such planning requires strict enforcement of laws. India's population has been growing steadily from 2011 to 2020 (Table 2), Graph 1 showing the increasing Indian population density per square kilometer area. As the population increases but the geographical area does not increase to that extent, the available land water falls on this natural element of population growth, thus exacerbating the environmental problems.

Table 3.2: Indian population (2011-2020)

Year	Population
2011	1210.86
2012	1226.73
2013	1242.61
2014	1258.48
2015	1274.36
2016	1290.24
2017	1304.46
2018	1318.68
2019	1332.9
2020	1347.12

Source: Tradingeconomics.com (Ministry of statistics and program implementation)



Source: Data world populationreview.com/countries/India-population

Figure 3.1: Population Explosion

India's population is disproportionately divided into rural and urban areas. Population density in rural areas has been declining since the last century and urban population is increasing significantly. Population migration from rural to urban areas due to unaffordable agriculture and unemployment in rural areas. Migration is projected to exacerbate the process of over-urbanization and the urban population to become barren.

3.7 Population Control Measures:

Reducing the population growth rate is essential for environmental conservation. Population control is the protection of the environment. Population control schemes should be implemented globally and population should be properly controlled due to cultural and social disparities in different countries. It is necessary to plan in different ways. Table 3 showing the top ten countries population as the China has highly populous.

Table 3.3: Top ten countries population in increasing order and growth rate (2020)

Rank	Country	Year-2020	Growth rate %
1	China	1,439,323,776	0.34
2	India	1,347,120,385	0.97
3	United States	331,002,651	0.58
4	Indonesia	273,523,615	1.04
5.	Pakistan	220,892,340	1.95
6.	Brazil	212,559,417	0.67
7.	Nigeria	206,139,589	2.55
8.	Bangladesh	164,689,383	0.98
9	Russia	145,934,462	-0.02
10	Mexico	128,932,753	1.03

Source: World Population Prospects (2019 Revision) - United Nations population estimates and projections.

We will see what action is needed to make population control more effective.

a. To Create Public Education and Teaching Facilities:

Ignorance, illiteracy, superstition are the mainstays of population growth. The more educated a society is the more population control will be achieved. To create awareness among the general public about environment and population versus explosion through education. This should be the goal of education. This can be done through both formal and informal teaching methods. Public education should reach all sections of the society without the participation of common people The destruction of the environment cannot be prevented. Women's education is very important in terms of the need to increase the facilities required for education. It has been observed that the birth rate has decreased due to women's education.

Population education should be included in the educational curriculum from secondary level to university level as a priority. The curriculum for population education, which is currently included for some college classes, should be more comprehensive and appropriate. Environmental protection through education. Objectives of public education should be achieved through this ways. Scientific approach should be rooted in the society. The future young generation should be endowed with all virtues. This will create awareness among the people about education.

b. Enhancing Economic Development:

As population growth and unemployment are closely linked, employment should increase in the society.

It is necessary to create tools for economic development to meet the needs of the population. New technologies should be introduced in the industry for modern agriculture and manufacturing. Government to develop the country power projects, irrigation projects, roads for communication transport, telecommunication message improved, agriculture various industries trade, self-employment tools should be carefully planned and developed. If everyone gets the means of economic income, the country will prosper.

c. Enhancing Research Attitude:

Superstition, sorcery, witchcraft, godliness, innocence are present in the majority of society, and then population growth is encouraged. On the other hand, if the elements of society are motivated by the qualities of medical research, rationalism, then population control is promoted.

Human and environmental development requires research at various levels. Discovery of new techniques for limited use of natural resources. Exploration of new methods for environmental protection. The population can be brought under control through all these social treatments in all countries.

d. Family Welfare Program:

A family is a group of two or more men and women who are bound to each other by marriage, blood relationship, joint residence and adoption statement. This group kitchen property accommodation etc. these things have connected to each other. A society is formed by many families. The work of the family is based on the principle of power and division of labor. Reproductive rearing in the family, socialization of the new generation and giving each individual a special place in society are happening.

Modern family life has undergone major changes due to urbanization, industrialization, and increase in individual freedom, etc. The family organization has done a great job in terms of social cohesion, cultural convergence and environmental protection. The Family Welfare Program was formerly known as the Family Planning Program. This program is closely related to population control and welfare. Every family should be happy and the overall development of the nation should be accelerated.

For this purpose, the program is designed to deliberately limit the number of offspring in the family, thus avoiding many of the problems that arise in the population. So all the nations of the world have adopted the family welfare or family planning program. If the population grows beyond certain limits, it becomes difficult to improve the living standards of the society and individual as well. Per capita GDP growth slows, food supply becomes inadequate, unproductive population and unemployment continues to rise, therefore, the government makes a conscious effort to control population growth through family planning programs.

Many methods of contraception are prevalent around the world as a major tool of family planning but due to lack of scientific knowledge such methods have not been very useful in the past. It was not until the nineteenth century that contraception became widespread. Jeremy Bentham first proclaimed birth control in England in 1797. Malthus suggested some measures to reduce the birth rate so that people would get married late to avoid the limitations on the world's population as the conflict between droughts and diseases increased. His ideas are known in economics as Malthus's theory.

India has been honored as the first nation in the world to implement family planning at the governmental level. In 1930, then Mysore government established the world's first government family planning center. The first Five Year Plan for Family Planning had a provision of Rs. 65 lakhs. In the 5th Five Year Plan, it was increased to Rs. 516 crores. One can only imagine the seriousness of the Indian government's efforts effectively.

Special efforts should be made by all along with government efforts to spread awareness on how family planning can lead to family welfare and thus population control. For this, radio, short films, folk drama and television programs should be widely used in urban and rural areas. The family planning program is not only a way to limit the size of the family but also an important factor in the overall development of the nation. Such awareness must be created in all strata of society.

e. Human Rights:

The Indian Constitution and India's international policy are consistent with the philosophy of human rights. Poverty, ignorance and inequality must be eradicated if human rights are to be implemented. Programs such as education, environmental protection, conservation, education, land reform, family planning, medical health care need to be given priority. The need of the hour is for all nations of the world to work together for the protection of human rights and major problems of the citizens.

f. Value Education:

Value is the code of human conduct. It shows how one should behave. The goals and objectives of life are expressed through kind of values. Values make our lives happier and more prosperous. Value is a principle that reflects the interpersonal relationships in society and contributes to the development of social institutions. Society needs ethics today. Leadership of society should be based on patience, intellectual integration and awareness of values. Nature makes us aware of moral values.

Today's youth are in dire need of value education along with environmental conservation and population problems. Many kinds of problems have arisen due to many reasons. The society needs the youth for their solution. The power lies in the youth. It is the job of the experts to give them the right direction. Values are formed from the culture of the society and public conduct. Every person or citizens needs value education from which personality development takes place.

g. Health Education:

Population growth in many countries is a serious problem that raises a number of complex issues. The government lacks the power to solve it. Cancer, AIDS, Ebola, dengue, Covid-19 are spreading rapidly. Young people need to get sex education. Sex education is considered to be the foundation of comprehensive health education. Everyone should rely on health education to become ideal parents so that future generations will be valued.

h. Environmental Protection:

The growing population is upsetting the balance of the environment. The responsibility to protect the environment lies with all the people and citizens. Different ecosystems function in the environment and are interconnected in a chain manner. If every element of the environment is maintained properly, the balance of the environment is maintained. We are moving towards perishable by disregarding the environment. Future generations need to be aware of the environment in order to prevent the destruction of the earth, which is plagued by many environmental problems. Consumption of your home needs to be limited aspirations all elements of the environment and natural resources should be protected. Rainwater harvesting, forest cover pollution free air and food should be carefully planned. Everyone should be aware that environmental protection is an important.

i. Patriotism:

It is the first duty of every citizen to have a sense of patriotism. Every citizen should perform his duties honestly. Corruption is the antithesis of national progress, but it must be eradicated. Everyone should consciously work for the great progress of our country in every field. Soldiers guarding the borders of their countries continuously, farmers growing food for all, Researchers who work day and night for human progress and create a new generation of teachers should be respected by all. Everyone should put forward the ideal of great thinkers working in the field of religious spiritual ideology. Patriotism is expressed through environmental protection and conservation also.

j. Women and Child Welfare:

Since 1975 was the International Women's Year, the issue of women was brought to the attention of the entire world. The situation of women in developing countries was found to be dire. The United Nations held the International Women's Conference in Nairobi. All the women in the world made the Dawn document at the Nairobi conference it is called the dawn of women's development awareness. In 1995, the International Women's Conference was held in Beijing.

Women's issues were addressed in detail here and the declaration of women's rights was adopted at the conference. The Government of India declared 2001 as the Year of Women Empowerment. On this occasion, awareness was created to inculcate gender equality in the society. It includes various competitions, film festivals on women's life, police and court proceedings, gender equality awareness campaign, organizing tally conferences for direct dialogue between women and governance in rural areas, guidance programs for women leadership, Sarva Shiksha Abhiyan, organizing programs for women's health, women's contribution to Environmental Conservation Programs. Environmental awareness from home to home environment will definitely be universal.

Women's personality development must come from school and college. Girls must get personality development education in college. The personality development of girls is essential for the development of many generations. If she is properly nurtured at a receptive age, she becomes a good citizen of country. Her ability to think and make decisions develops properly. Schools, colleges and universities should invite learned women and emphasize the importance of environmental education for them. Proper diet personal and public hygiene, labor culture arboriculture women's laws, nutrition laws, all types of Government Schemes for girls' education. If every woman knows this, then the women's welfare program will be successful in real sense. Indian women have not been as advanced as women in the West. Indian women remained associated with agriculture, animal husbandry, textiles, handicrafts, and kitchen. This situation has changed since the beginning of the twentieth century, but women's education will get a boost and the winds of equality will blow.

The Indian constitution has made some provisions for the protection and welfare of women's rights. All women in government jobs have the same opportunity as men. The government has enacted clauses and laws on protection of women victim's. It is a pity that exploitation, injustice and oppression have not stopped yet. Therefore, everyone needs to take initiative for the welfare of women.

k. Child Welfare Activities:

In November 1959, the United Nations adopted the declaration of the rights of the child. This manifesto consists of three parts. The first part is called objectives. In it, every human being deserves all the rights and freedoms. There can be no distinction between caste, gender, language and religion. They are told to protect the law. In the second part, children should have a good childhood and they should have all the rights and freedoms for the betterment of the society. It is mentioned that the third part contains ten principles.

- Every child should get all the rights irrespective of caste, gender, language and religion.
- The law should provide opportunities for the mental, physical and social development of the child.
- Every child has the right to a name and nationality from birth.
- Every child should get all the benefits of social security.
- Children with disabilities should be given special treatment and special care.
- An infant should not be separated from his mother. Special care of food grains and destitute children is the major duty of the society and the government.
- Every child should receive free and compulsory minimum primary education.

- Every child was the first to receive protection and all kinds of assistance.
- Children should not be employed or engaged in deadly unhealthy occupations till the minimum age.
- Peace reconciliation, tolerance, brotherhood, every child in such a situation should be taken care of.

Raising young children from birth is a major responsibility of parents. In order to strengthen their body, they should be given healthy nutritious food. There is malnutrition in rural areas. Uneducated and ignorant, there is no gap in the birth of two children. Children in the family should be inculcated with body hygiene habits. Parents need to teach their children from an early age about body care, playing, studying, etc. Pollution and unsanitary conditions cause physical complaints in children. Fever, headache, jaundice, contaminated water causes vomiting, diarrhea, outbreaks occur in children, so parents should take good care of them. The government has come up with a number of schemes for the health of children. Polio, Hepatitis B and other vaccinations are given to the next generation to make them free from the dangerous diseases. In this regard, the gap between rural and urban areas seems to be very large, so the grieving parents should take good responsibility. This will create a capable and responsible citizen for the next generation.

3.8 Environment and Human Health:

The relationship between humans and the environment is uniquely normal. Your health needs a healthy environment to live happily ever after. To provide clean air to all, a large number of oxygen-rich plants should be planted. Everyone must make efforts at all levels to reduce water pollution. Today it seems that clean drinking water is not available in many places. Unhygienic conditions are also found in rural and urban areas, so this action spreads bad smell in the environment. Malaria is the leading cause of death for more than one million people worldwide each year. The vaccine is available to prevent it and is nutritious to protect humans and the environment. Inadequate sanitation and improper disposal of sewage can lead to poor health, even observed today. Unhealthy growth of slums in urban and rural areas, do not have gutters, dirt, and street lights in such places, People's health is threatened, and there is an increase in various diseases. This harm is not only to such residents but also high societies.

The idea that will remain pope, both human and environmental, should be considered at all levels. A clean environment is nutritious and healthy for human life. Millions of people come together for religious purposes like getting festivals Yatra Simhastha, wedding, ceremony etc. Therefore, awareness is needed to prevent the adverse effects of both the environment and human health. South Africa has the highest number of HIV patients in the world, both nationally and internationally. Health scientist's fear about AIDS could spread if large-scale measures are not taken to prevent AIDS.

a. Role of Information Technology in Population and Human Health:

Information technology is the process of collecting and distributing different types of information in a scientific way. In modern times, human life has become extremely dynamic.

Technology is of special importance in the field of agribusiness and various occupations. A literal pictorial number of all events in the past, present and future or any form of revelation are information. On the basis of it, the world's population is organized to keep track of the environment and all other factors and related events and predictions about the future are made. Some mechanisms have been put in place to collect and exchange information nationally and internationally. It includes,

- Universal System for Information Storage and Technology.
- International Nuclear Information System
- Agricultural Information System
- Industrial Information System
- International Patent Documentation Center
- National Information System for Science and Technology
- Environmental Information System

Paper has long been used as a medium to store and transmit a wide variety of written or typed information. Such papers are kept in the library in book form. The paper pair is now paired with devices such as radio, video, microfilm, computer, mobile, television, etc. Therefore, the place and role of information technology in the context of environment and human health has become important.

The US economy was initially dominated by the agribusiness industry, followed by industry and the rise of information technology. The exchange of technical knowledge became important in other industrially advanced countries. Today, modern society relies heavily on science and information technology. Technical knowledge has become an effective tool for controlling the population and the environment and their conservation, so information technology expands the boundaries of time and space.

With the help of information technology, weather forecasts of different parts of the world are regularly broadcast on All India Radio and Television. It provides good guidance to fishermen, farmers, tourism and pilots. Early warning of natural disasters like storms, hurricanes, earthquakes, floods, etc. can help to avoid financial and loss of life. Modern farmers have started doing excellent farming with the help of information technology. Computer systems plan the supply of fertilizers, water, etc. to the crops. Fishermen plan fish production with the help of computer. Air transport depends on the weather. Water and electricity planning in metros is done on the basis of information technology.

To have a functioning body and mind according to the surrounding conditions, to have enthusiasm in the mind and strength in the body and to have a happy life, These things are included in the concept of human health, along with population control, human health is based on many factors such as hygiene, dress, routine, rest, etc.

When it comes to public health, it starts with a child giving them preventive vaccines to protect them from various diseases is the foundation of their good health. Tuberculosis, polio, tetanus, gonorrhea, paralysis, whooping cough, etc. are some of the diseases that occur at a young age. Harmful germs enter the human body through food, water and air. Often the wound is infected, so everyone should take proper care of this.

There should be an arrangement where fresh air and plenty of fresh air will play in the home, office and public places. The fact that factories cause a lot of air pollution is dangerous to human health and environment. Harmful germs enter the body from contaminated water, so Naru, diseases like vomiting, and diarrhea etc. are caused by adulteration of food. It also definitely affects human health.

Information technology has led to tremendous advances in biotechnology and the discovery and production of many healthcare drugs. Diseases that pose a threat to human health as information technology is exchanged day and night between all nations. Scientists, doctors have been able to control a large number of deadly diseases. Vaccination against recombinant, polio, hepatitis B is widely done through information technology. The eradication of diseases like polio from the entire world has been made possible with the help of information technology.

The world is currently in the throes of a covid-19 pandemic, with tireless effort, scientists have developed the covishield, Covaxin etc. vaccines. Vaccination has now started all over the world so that people can be safe to live in the future. For betterment of life and environment control the population.

3.9 Conclusion:

In this article we trace the relationship between population and environmental awareness. If the size of the earth and the environment are limited, if the population becomes unlimited, everyone will have to suffer the consequences. Therefore, the people, including the government, need to make a concerted effort to control population growth. Population should be literate. In this regard, family welfare programs must be implemented effectively. People also need to be made aware of human rights and values. Population control and environmental conservation are the need of the hour everyone should know this. The impact of information technology on human health and the environment is increasing day by day. This is a very auspicious sign.

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4. Environmental Degradation and Challenges Faced in 21st Century

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Abstract:

Environment in the 21st Century systematically addresses the larger issues of energy technology and the environment, providing an up-to-date assessment of projected energy requirements worldwide and of the ways these requirements can be met in an environmentally acceptable manner.

How to deal with the environmental consequences of energy use is a complex problem that poses a serious challenge to industrial leaders, policymakers, and research scientists the world over. Environment in the 21st Century systematically addresses the larger issues of energy technology and the environment, providing an up-to-date assessment of projected energy requirements worldwide and of the ways these requirements can be met in an environmentally acceptable manner. This valuable compendium of more than eighty original contributions provides the basis for an international agenda of energy and environmental technology and policy. The various chapters are united by the theme that new and improved energy technologies are central to meeting humanity's goals of environmental, economic, and social well-being.

4.1 Introduction:

Environmental degradation has become a common concern for humankind over the past few decades. The distinctive nature of the present environmental problems is that they are caused more by anthropogenic means than by natural phenomena [1].

Mindless consumerism and economic growth have started to demonstrate pernicious effects on Mother Nature. In spite of this, the pace and desire for economic development have never ceased. It is the branch economics that has dictated environmental policy and its effect on the resources.

Emphasis has been placed on the role of science and technology as a catalyst for integrating ecology with economics to heal the damage cause to the environment. In this process, sustainable development became a buzzword to fight against human greediness and save resources for future generations [2]. Environmental degradation is the deterioration of the environment through depletion of resources such as air, water and soil; the destruction of ecosystems and the extinction of wildlife. It is defined as any change or disturbance to the environment perceived to be deleterious or undesirable.

Environmental impact or degradation is caused by the combination of an already very large and increasing human population, continually increasing economic growth or per capita affluence and the application of resource depleting and polluting technology. Environmental degradation is one of the Ten Threats officially cautioned by the High-Level Threat Panel of the United Nations.

The United Nations International Strategy for Disaster Reduction defines environmental degradation as the reduction of the capacity of the environment to meet social and ecological objectives and needs. Environmental degradation is of many types. When natural habitats are destroyed or natural resources are depleted, the environment is degraded. Efforts to counteract this problem include environmental protection and environmental resources management.

4.2 Environmental Degradation are as Follows:

• Climate Change:

Climate change occurs due to pollution of the atmosphere by greenhouse gases (and by other) is now regarded as one of the major global environmental issues. It occurs largely as a result of the burning of fossil fuels, emissions from agriculture, and land-use changes that accompanies the destruction, clearance and burning of forests.

Climate change already has noticeable ecological and social effects, and its projected impacts could potentially result in profound changes in global mean surface temperature, sea level, ocean circulation, precipitation patterns, climatic zones, species distributions and ecosystem function [3].

• Stratospheric Ozone Depletion:

The depletion of stratospheric ozone occurs due to the pollution of the atmosphere by chlorofluorocarbons (CFCs) which are another serious environmental issue. It is a significant concern because the lack of protective ozone at high altitudes results in increased levels of harmful solar ultraviolet (UV-B) radiation reaching the earth's surface, causing a range of health-related issues and ecological impacts [4].

• Degraded Air Quality:

There are various forms of air pollution which are significant, particularly at regional and local scales, as they seriously degrade the air quality; worldwide, According to various reports, approximately one billion people who reside in areas that mainly include industrial cities suffer the most from the pollution. Many air pollutants are responsible for the degradation of air quality, but some key pollutants include particulate matters such as oxides of nitrogen, oxides of sulphur, lead and various aromatic compounds (such as benzene). Many air pollutants may cause aggravate respiratory and vascular illnesses; some are known carcinogens; and some can cause damage to vegetation and, in turn, produce a range of ecological effects [5].

- **Degraded Water Quality:**

Water quality can also be seriously degraded by impurities caused by pollutants, giving rise to a range of many health-related and ecological effects [6]. A major source of water pollution is the terrestrial run-off to inshore waters that occurs in many coastal locations; such as surface run-off may contain significantly elevated levels of nitrogen and phosphorus from agricultural land and from human settlements. Many other human activities lead to water pollution, including mining and industrial processes, which may discharge of toxic effluents. Oil spills, accumulation of plastics and the bio accumulation of persistent organic chemicals are some of the other causes of serious degradation of the marine environment.

- **Deforestation:**

It has been estimated that around half of the world's mature forests have been cleared by humans. Deforestation occurs for a variety of reasons, but the majority of deforestation now occurs when tropical forests are cleared for agriculture and pastoralism; other reasons include the destruction of trees for charcoal production and the selective logging of forests for timber.

Whilst tropical forests cover only around 6% of the earth's surface, they are an essential part of the global ecosystem and of the biosphere: they help to regulate climate; they protect soils from erosion; and they provide habitats for a vast number of plant and animal species. One estimate suggests that around 90% of the world's species are found in tropical forest.

4.3 Effects of Environmental Degradation:

- **Physical Environment:**

Healthy physical environment is the basic requirement for our economic and social soundness. Need of the hour is that there should not be air, water and even noise pollution. The refreshing atmosphere will improve the health standard of the people. It will build sound mind and sound body. Consequently health, energetic and efficient working force will add considerably to the production and the productivity of the nation [7].

- **Economic Environment:**

Our economic development and growth is also considerably affected by economic environment. The survival and success of a business enterprise is fully decided by the economic environment and market conditions [8].

- **Loss of Biodiversity:**

Biodiversity is vital to sustain balance of the ecosystem in the form of combating pollution, restoring nutrients, protecting water sources and stabilizing climate. Deforestation, global warming, overpopulation and pollution are few of the major causes for loss of biodiversity [9].

- **Loss for Tourism Industry:**

Speedy activities of tourism industry is also responsible for the worsening of environment that rely on tourists for their daily livelihood. Environmental damage in the form of loss of green cover, loss of biodiversity, landfills, and increase air and water pollution can be a big turn off for most of the travellers.

- **Economic Impact:**

The huge cost that a nation may have to borne due to environmental degradation can have huge economic impact in terms of restoration of green cover, cleaning up of landfills and protection of endangered species. The economic impact can also be in terms of loss of tourism industry. The potentials of human economic activity leading to regional and world-wide conflicts especially as the emission of dangerous gases into the atmosphere (environmental degradation) results in changes in agriculture production and inaccessibility of resources eventually causing food scarcities [10].

4.4 Challenges in 21st Century:

- **Public Health:**

Many of the issues we face all tie back into one central concern – public health. Pollution, water scarcity and overpopulation all present a clear threat to public health. Nearly one out of every four deaths each year are directly caused by unhealthy environments, according to the WHO. Even in developed countries, the growing anti-vaccination movement threatens public health, causing a resurgence in diseases like measles that were almost completely obliterated. The health and wellness of human beings is an important issue to watch. What people eat, drink and breathe in play a significant role in their wellness. Polluted air and water are a mounting crisis we need to address.

- **Water-Related Challenges:**

According to the report of UNICEF 2017) 2.1 billion people lack access to safely managed drinking water services and 4.5 billion lack safely managed sanitation servives. Also 340,000 children under five die every year from diarrhoeal diseases. Water scarcity already affects four out of every 10 people and according to UNISDR 90% of natural disasters are water-related. If we spot some light on UNESCO Report (2017) we found that 80% of wastewater flows back into the ecosystem without being treated or reused. Around two-third of the world's trans boundary rivers do not have a cooperative management framework and agriculture accounts for 70% of global water with drawl [11].

- **Population:**

Rapid population growth puts strain on natural resources which results in degradation of our environment. Mortality rate has gone down due to better medical facilities which have resulted in increased lifespan.

More population simple means more demand for food, clothes and shelter. You need more space to grow food and provide homes to millions of people. This results in deforestation which is another factor of environmental degradation.

- **Ecosystems and Endangered Species:**

Due to the list of environmental issues happening on this planet, both ecosystems and species are affected. In fact, one out of every 10 plants and animal species is expected to go extinct by 2050. The endangered species list continues to grow as ecosystems continue to decrease. Lost habitats mean losing the species that live there. While some may be able to migrate elsewhere, others are not so lucky. With the rising temperatures of the Arctic, sea ice melts, which eliminates the habitat of polar bears. The list of endangered species includes other animals as well. The best way to save species is to support organizations dedicated to fighting species extinction. By supporting the cause, you're helping to combat the issue. You can also find laws and government acts available to sign that protect ecosystems and endangered species [12].

- **Effects of Industrialization and Globalization:**

Industrialization is the process of developing industries in a country which brings the social & economic change and changes the face of a nation. It also plays an important role in modern business and leads to the urbanization. The industrialization is the basic element of any economy. The unfair pay rates, working hours and labor disputes may affect the overall business. The lack of sanitation, pollution and health issues are other negative sides of the industrialization.

Globalization in modern business is an interconnection of global markets and managing the overall businesses in a global industry by fulfilling all the global requirements to perform businesses in the global market. It is one of the main pillars of overall business and economy.

To run business globally; there are various terms & conditions, policies, procedures, rules and maximum funding. The proper care should be given to the research & development and technology sector. There is inequality in income. For an example, the same company delivers huge salary to the employees in the United States of America as compared to that running in India, Philippines, or Brazil. It also affects the capital flow as the maximum generated profit is taken back to the parent country [13].

4.5 Conclusion:

The impact of environmental disasters can be devastating on the social, economic, and environmental systems of a country or region as well as the global ecosystem. Environmental disasters do not recognise man-made borders, and threaten the legacy left to future generations of a clean and supportive environment. Thus, Governments, International organizations and communities must work together – at all levels – to lessen the risks associated with environmental degradation and its contributing factors, such as climate change, and ensure that vulnerable people are prepared to survive and adapt.

At the same time, companies, organizations and individuals must also ensure that their work is environmentally friendly and sustainable [14]. We should always remember that pollution problems affect us all so each of us has to do his or her best to help restore ecological balance to this beautiful place we call home. The primary causes of environmental degradation in India are attributed to the rapid growth of population in combination with economic development and overuse of natural resources. Air, water and noise pollution together with water scarcity dominate the environmental issues in India. According to World Bank estimate, between India has made one of the fastest progresses in the world, in addressing its environmental issues and improving its environmental quality. Still, India has a long way to go to reach environmental quality similar to those enjoyed in developed economies.[15]

4.6 Suggestions to Overcome the Problem:

- **Social Awareness:** It is the need of the hour to spread social awareness about the dangers of pollution. It is also required how each individual can contribute to check this problem.
- **Population Control:** If environment is to be protected it is essential to check population growth.
- **Strict Application of Environment Conservation Act:** The Environment (Protection) Act was passed in 1986 in India. Its objective was to check deterioration in the quality of environment. This legislative measure should be strictly enforced.
- **Control over Industrial and Agricultural Pollution:** It is necessary for environmental protection that air and water pollution caused by industrial development should be controlled properly. To avoid agricultural pollution, use of pesticides and chemical fertilizers should be minimized.
- **Afforestation Campaign:** Extensive afforestation campaign should be launched in the interest of environment protection.
- **Water Management:** River waters should be made clean. Moreover, provision should be made to supply clean drinking water to the rural population.
- **Management of Solid Waste:** Planned management of solid waste is very essential. It is suggested that rural garbage be converted into compost.

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5. Environment and Covid-19

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Abstract:

The pandemic caused by Coronavirus infection (COVID-19) is having a worldwide impact that affects health, the economy and indirectly affects the air pollution in cities. This chapter analyses the indirect effect produced by this pandemic on environment. Recent research suggests greater COVID-19 prevalence in areas burdened with higher exposure to chronic air pollution, and socially disadvantaged populations are more likely to reside in communities located at the convergence of both COVID-19 and air pollution health risks. With the global lockdown, meteorological factors are highly studied for the transmission of COVID-19. Studies on several nations were used to explore the effect of temperature, absolute humidity and diurnal temperature range on COVID-19 transmission. The current coronavirus COVID-19 outbreak has had a substantial impact on many aspects of general life. The outbreak of COVID-19 raised numerous questions on the interactions between the occurrence of new infections, the environment, climate and health. COVID-19 has emerged as a chance to choose a better way forward in saving the environment and looking towards the solutions to save the mankind.

Keywords:

Environment; Covid-19; Air pollution; SARS-CoV-2; viral infection; Disease.

5.1 Introduction:

Corona Virus Disease 2019, also known as "COVID-19″, named by the WHO i.e., World Health Organization (Wu and Mc. Googan, & Zu et al., 2020), caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) infection has been confirmed as an acute respiratory infectious disease (WHO, 2020a; Huang et al., 2020; Yu et al., 2020). As a result of its fast and wide transmission world-widely, it has been recognized as a global pandemic (WHO, 2020b), which has infected 47,930,397 confirmed cases, including 1,221,781 deaths as of 5:00 pm CEST, 5 November 2020 (WHO, 2020c).

This worldwide pandemic is moderately partial by the change of ambient environment is tranquil a hot topic, which needs to be discussed always (Fu et al., 2021). This virulent disease (COVID-19) is having a universal bang that affects our health, the wealth and ultimately affects to the air pollution in all cities. In Portugal air pollution data was analysed from a period of movement control of the citizens by the government COVID lockdown period (March–May 2020 & also 2021) with data from baseline conditions (signify the mirrored periods from the five previous years (March–May from 2015 to 2019)).

Air quality data in particular NO2 and PM10 hourly concentration from approx 20 monitoring stations spread over mainland Portugal was used to perform this evaluation. The represent reduction observed on pollutant concentrations was higher for NO2 (41%) than for PM10 (18%). Intended for NO2 reductions were additional significant in traffic and surroundings urban sites than in rural stations. The reduction of NO2 concentration observed in traffic sites were compared to the opinion of traffic input by the incremental method, suggestive of latter come up to is not reliable and alert to the suspicious use of this approach in potential works (Gama et al., 2021).

Global studies that investigate whether racial minorities, socio-economically rundown inhabitants, and other susceptible groups are extensively more represented in counties where significantly higher COVID-19 incidence spatially coincides with higher respiratory health risks from outdoor coverage to HAP i.e., hazardous air pollutants. COVID-19 data from the Johns Hopkins Centre for Systems Science and Engineering database are correlated to respiratory risk estimates beginning the U.S. Environmental Protection Agency's National Air Toxics Assessment and variables from the 2018 American Community Survey. Bivariate local measures of spatial association are implemented to identify county clusters indicating relationships between COVID-19 incidence rate and respiratory risk from HAP exposure.

Significantly socio-demographic inequities symbolize the opening point for more detailed investigations of places facing the double burden of high prevalence and air pollution exposure, and also give emphasis to the urgent need to expand easing strategies for addressing both COVID-19 and chronic air pollution in socially exposed communities (Chakraborty, 2021).

In the midst of global lockdown, meteorological factors are highly discussed for COVID-19 transmission. Data sets from United Kingdom, Italy, Germany and Spain were used to look at the effect of temperature, unlimited humidity and diurnal temperature range on COVID-19 transmission. Results have shown that both the cold and the dry environment are likely to assist the COVID-19 transmission (Fu et al., 2021). The research clusters were identified based on a systematic content analysis of the studies.

The clusters are in four underlying such as: (Shakil et al., 2020).

a. Environmental degradation & COVID-19
b. Air pollution & COVID-19
c. Metrological factors & COVID-19 and,
d. Temperature & COVID-19

COVID-19 outbreak raised numerous questions on the interactions between the rate of new infections, the environment and health. The appearance and spread of SARS-CoV-2 to be related to locale destruction live animal trade, intensive livestock farming, global travel and urbanization. Significantly, the severity of COVID-19 depends on the interactions among the viral infections, ageing and chronic diseases like respiratory, cardiovascular diseases, metabolic and obesity which are they partial environmental stressors.

Together the pandemic and the social response to the disease have elicited a range of behavioural and societal changes to might remain long after the pandemic and that might encompass extensive term health effects counting on mental health. Obviously, COVID-19 will have ongoing impact on the environmental health field and will open new research policy and perspectives needs (Barouki et al., 2021).

Although, COVID-19 cases worldwide there is no final conclusion on the meteorological impact over the continuously growing, it usually indicates that SARS-CoV-2 may be chiefly responsive to weather (Bashir et al., 2020; Kumar et al., 2020c; Liu et al., 2020; Tosepu et al., 2020). A preliminary laboratory test found that the survival time of new corona viruses decreased with increasing temperature and humidity (Van Doremalen et al., 2020). Besides, airborne based virus spread depends on the respiratory droplet size (Altamimi and Ahmed, 2020; Kumar et al., 2020b).

In statistical analysis, a lot of studies reported that meteorological factors were closely related to the confirmed cases of COVID-19. The cold and dry weather may reason for droplets drift and evaporation, which promote the dynamics of the infection transmission. (Chien and Chen, 2020; Halaji et al., 2020; Hon et al., 2020; Kumar et al., 2020a; Liu et al., 2020; Rabaan et al., 2020; Sahin, 2020).

Still, many analyses only obtained the conclusion in a simple regression model without controlling social factors and in a limited studying time period, which may lead to missed opportunities in understanding how the epidemic began and resolved.

It is well acknowledged too many countries have implemented changing degrees of traffic restrictions, public health measures, including restricted assembly, contact tracking and family isolation in order to prevent the spread of COVID-19 since its outbreak. Thus, it is necessary to adjust these factors like government responses before concluding the effects of meteorological factors on COVID-19 transmission. The environment or climate has also had a significant influence on COVID-19 transmissions and mortality.

The pros and cons of COVID-19 on the environment are evident in the literature. Moreover, studies have argued that temperature influences the COVID-19 transmissions, but have found mixed such as positive, negative and insignificant impacts on COVID-19 transmissions. Consequently, COVID-19 can influence the environmental factors and vice versa. While this investigating incident studies have focused on one side of the coin or the other. However, to the best of our facts, no studies have explored the bidirectional characteristics of COVID-19 and the environment. Being a promising study domain, a vital review of studies on the nexus between the COVID-19 and the environment can devise a current state of knowledge that can provide directions to future research (Fu et al., 2021).

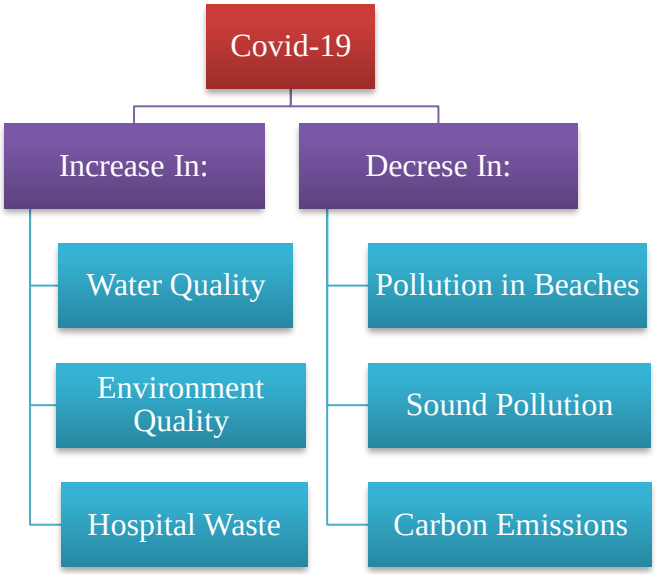

Figure 5.1: Positive and negative impacts of Covid-19 on environment

The world has been trapped on an unsustainable pathway, reinforced by mechanisms that oppose change, such as infrastructure with long lifespan, investment cycles on the order of decades, and cultural and political inertia (Otto et al., 2020). Crises, be they health, economic, or environmental, give rise to uncertainty and confusion that can act as windows of opportunity. Destabilizing the status quo can shift power structures and motivate actors to deviate sharply from existing policies and plans (Otto et al., 2020). The economic shock of COVID-19 should trigger policies and shifting norms that could deliver decarburization and progress towards other SDGs.

The most promising may include subsidies to decarbonize energy production and storage; carbon-neutral cities; divesting from fossil fuel assets; and increasing public perception of fossil fuel use as immoral Public support will be essential. The current model of responding to serial crises misses important opportunities for integrated solutions to multiple challenges. Instead, systemic, structural change through long-term, international cooperation is needed to accelerate progress towards the SDGs. Policy makers have a once-in-a-generation opportunity to use stimulus packages while reviving their economies to bring greenhouse emission reductions in line with the Paris agreement and to implement the SDGs rapidly. The stakes for selecting a radically more sustainable path forward could not be higher (Tonne, 2021).

5.2 COVID-19 and Geographical Origin Areas:

The existing COVID-19 pandemic caused by infection with the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) diseases having an exceptional global impact at a human, social and economic stage, precipitating rising efforts by the scientific community to identify the exact pathogenesis of the infection and risk factors related with morbidity and mortality.

The U.K. and the U.S.A. have highlighted a possible organization between more severe disease in patients from ethnic minorities, although whether this may be due to individual genetic factors or socio-economic differences remains unclear (Williamson et al., 2020; Price-Haywood et al., 2020; Hsu et al., 2020; Knight et al., 2020). The objective of this study was to describe and compare the main clinical characteristics and outcome measures in hospitalized patients with confirmed COVID-19 according to geographical area of origin. These studies have included patients from non-Hispanic ethnic data and backgrounds for certain alternative groups have been under represented (Norman et al., 2021).

5.3 COVID-19 and Environment Linkage between Air Pollution:

In Wuhan city, China, A pneumonia disease of unidentified source caused a catastrophe. This disease spread around the globe affecting a wide range of people. WHO i.e., World health organization called it a pandemic and it was officially named as Severe Acute Respiratory Syndrome Corona virus 2 (SARS CoV-2), also called presently a Corona virus disease (COVID-19). More research is needed in order to set up linkage between COVID-19 spread and air pollution. Still, it can be partially recognized to both higher rate of population density and frequent exposure of population to enhanced levels of PM2.5 concentrations before lockdown period (Ali et al., 2021).

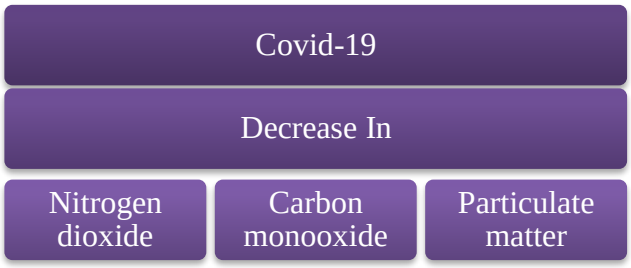

Figure 5.2: Positive impact of Covid-19 on air pollution

The genomic sequence of this disease showed that it is caused by a novel Corona virus, therefore, officially named as Severe Acute Respiratory Syndrome Corona virus 2 (SARS CoV-2) by ICTV i.e.; International Committee on Taxonomy of Viruses (Lai et al., 2020). Corona virus disease, also termed as COVID-19 is the fifth pandemic to have occurred after the Spanish Flu pandemic back in the year 1918. COVID-19 spread from China to other countries by human to human transmission (Liu et al., 2020) and mainly hits the respiratory system (Waris et al., 2020). This virus and its spread, affecting peoples in a small period of time

WHO announced SARS CoV-2 as a Public Health Emergency of International Concern (PHEIC) on (WHO Timeline, 2020). It is known that increased air pollution can result in viral respiratory diseases affecting 10%–20% of the population (Frontera, 2020). Exposure to criteria pollutants, for example, Nitrogen dioxide, Oxides of Sulphur, Ozone and Particulate matter (2.5 & 10) are known to caue respiratory and various other diseases (Saqlain et al., 2020).

How adversely a pollutant can affect health depends upon its morphology and residence time. PM2.5 is very small in size and its residence time is longer as compared to PM10, which makes it more convenient to penetrate in lungs, becoming part of blood circulation and reaching to other organs and causing more toxicity (Mehmood et al., 2018). PM2.5 can cause progressive and slow inflammation of the respiratory pathways producing more mucous and less ciliary movement which results in acute respiratory and viral infections in people exposed chronically to it. A recent study has found that increased level of PM2.5 also results in the transmission of influenza virus (Frontera, 2020). And this proposes a plausible linkage between COVID-19 and air pollution hotspots (especially areas with air pollutant immobility as a result of climatic conditions, local emissions and topography of that region).

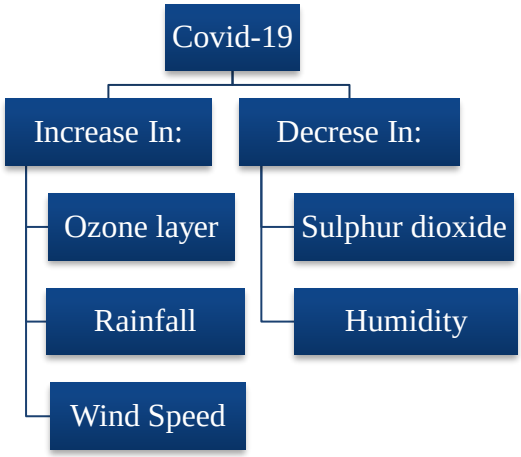

Figure 5.3: Positive and negative impacts of Covi-19 on meteorological factors

5.4 Global indirect effects of COVID-19:

COVID-19 has affected almost every country and there are many impacts of this pandemic that cannot be seen directly. The most direct and evident impact of COVID-19 is on the health of humans, which is the main focus throughout the world. This pandemic has also directly affected the sectors of transport, industry, tourism, education, and offices etc. however, the direct impacts on these sectors have created indirect impacts of COVID-19 on the environment. Many impacts of COVID-19 are short-term and long-term but mainly they are considered to have a positive impact on the environment like decrease in PM2.5 and NO2 concentrations, decreased noise pollution, and improvement of adaptation plans, better environmental monitoring systems, and better disaster risk management planning.

There are other negative indirect impacts also occurred due to this pandemic that include decreased waste management activities, impacts on ecological systems, and current challenges faced environmental monitoring and climate services. Other indirect impacts that may have long-term impacts like the effect of present pandemic situation on achieving Sustainable Development Goals (SDGs) (Zambrano-Monserrate et al., 2020; Cheval et al., 2020; Ali et al., 2021).

5.4.1 Positive Indirect Impacts:

a. Improved Air Quality.

Sudden decrease in economic and industrial activities due to lockdown caused by COVID-19 has resulted in decrease of emissions of greenhouse gases, worldwide. This results in a considerably sensible improvement in the environmental quality and climate condition. Air quality mainly depends on the human activities, due to lockdown, there was a significant decrease in the air pollution in the cities of Italy, China, and New York and considerable decrease was projected in the greenhouse gases (GHG) emissions for the rest of the year. One of the sectors that was majorly affected by this pandemic was Aviation. Aviation contributes to 3–5% of global CO2 and 1–2% of the total greenhouse gas emissions in the environment (Cheval et al., 2020; Zambrano-Monserrate et al., 2020; Ali et al., 2021).

b. Decrease in Noise Pollution:

Transport sector is one of the main causes for both greenhouse gas emissions as well as noise pollution. As the governments of many countries issued the lockdown and quarantine orders to protect the people from this pandemic, there was seen a considerable decrease in traffic flow on the roads. This not only resulted in the decrease of emissions of GHGs but also a significant amount of decrease in noise level was also observed that was produced from horn honking and other vehicles. Also, this reduction in noise levels resulted in improved detection of seismic waves and earthquake prone areas and the seismographic records were enhanced positively (Ali et al., 2021).

c. Effect on Water Bodies:

Due to COVID-19 lockdown, in areas where there was boating travel a common means of transport e.g. Italy and various tourists locations have faced an immediate positive impact on water bodies by decrease in the water pollution as no such boating travel was being used (Cheval et al., 2020). A study performed on the Suspended Particulate Matter (SPM) in a freshwater lake, Vembanad Lake of India to find out if there was a change in SPM concentration during these lockdown conditions (Yunus et al., 2020) (Ali et al., 2021).

5.4.2 Negative Indirect Impacts:

a. Decreased Waste Management Activities:

Majority population all around the world is in isolation and is staying at home due to which the domestic waste generation has peaked. Along with the domestic waste, the hospital waste has also increased. Discarding of Personal Protection Equipment (PPEs) on the roadsides and near the shoreline is increasing as the time of lockdown in this pandemic is increasing (Cheval et al., 2020). SEPA has the responsibility for the disposal of the hospital or otherwise hazardous waste so that none of the public is affected by it, but the organization has been inactive and no such measures has been taken as of yet (Ilyas, 2020; Ali et al., 2021).

b. Effect on Ecological System:

Considering the ecological point of view, there can be a link between our society and the ecosystem. COVID-19 is the result of climatic alterations in the ecosystem because of habitat destruction of many species, introduction of invasive species, and changes in the distribution pattern of species. Around 300 animal welfare organizations wrote letter to World Health Organization (WHO) to consider the relationship between the occurrence of pandemics and animal markets.

Deforestation is also another cause that increases the interaction of human to wild animals that may also result in transmission of some alien virus or specie that can cause such a catastrophic effect as caused by this COVID-19 pandemic and the ones before it. The pandemic has affected the ecological research and field work that has resulted in the limitation of research activities causing consequences for the species and habitat conservation. This has resulted in the assessment of the long-term practicality of various wildlife conservation programs e.g. Global Environment Fund (Cheval et al., 2020; Ali et al., 2021).

c. Challenges in Environmental Monitoring and Climate Services:

The COVID-19 has highlighted that there must be better preparedness for the monitoring of environmental and climatic services. The sustainability issue this pandemic has identified has caused the environmental scientists to strengthen the monitoring capability. Climate services along with the ocean and remote area observations have also been biased by this pandemic. Better monitoring can help many countries to study and identify the spread of this novel COVID-19. The tools established now, lessons and data from the present, can be used in the future to efficiently combat the spread of such a disease (Cheval et al., 2020; Ali et al., 2021).

5.5 Long-Term Effect of COVID-19 on SDGs:

It is expected that the current situation of COVID-19 can affect the future environmental and economic policies on an international scale. “Transforming our World: the 2030 Agenda for Sustainable Development” include 17 SDGs which focus mainly on attaining sustainability by 2030 and removal of poverty. These SDGs have faced a direct effect due to COVID-19 and are expected to experience long-term effects as well. Many of these SDGs are directly related to the health of population and urban areas (Cheval et al., 2020; Ali et al., 2021).

5.6 Relationship between Environmental Factors and the Spread of COVID-19:

There have been a few cases in history where the spread of viruses such as the West Nile virus in Europe has been linked with meteorological conditions, i.e. weather, temperature variations, etc. That is why researchers are interested in studying the link between the spread of COVID-19 and meteorological conditions i.e. temperature variations and other weather conditions changes such as humidity.

After the initial spread of the COVID-19 virus in mid-December, the virus quickly spread from China to regions with cooler weather conditions such as Europe and North America. After the research on the initial spread, the findings indicated that like pneumonia, COVID-19 also causes respiratory disorder closely associated with variations in weather and climatic conditions between different regions (Mazhar et al., 2020). According to Shi et al. (2020), increased temperature resulted in a decreased rate of transmission, outbreak magnitude, and rate of infections. Other meteorological parameters are also important for studying the spread of similar respiratory diseases like influenza and Severe Acute Respiratory Syndrome (SARS). A study in China explored the relationship between the death rate caused by COVID-19 and the varying environmental conditions i.e. varying temperature and humidity. A positive relationship was observed between the death rate and diurnal temperature range while anti-correlated with relative humidity (Ma et al., 2020).

Therefore, determining the potential influences of meteorological/environmental parameters is mandatory in order to retrain the spread of COVID-19 and other precautionary measures. It can be speculated that the spread of COVID-19 in the areas where the pollutant concentrations were higher than other areas caused more health impacts derived from this pandemic. A sharp decline in pollutant emissions (GHG and other toxic gases) has been observed during socio-economic lockdown after the COVID-19 outbreak, and such a decline in global emissions have not been observed in the past 25 years. This decrease in global emissions might have consequences for the entire planet, causing a possible cooling effect.

However, this depends upon the already accumulating concentrations of carbon dioxide and other atmospheric greenhouse gases. While the growing impacts of climate change have long demanded a reduction in global emissions, this pandemic has lowered global emissions more successfully than ever in the past. It is uncertain whether this pandemic will help reduce long term carbon emissions and hence cause a cooling effect, or the world will bounce back to its previous emission concentrations (Sheikh, 2020). There are many things that countries can gleam from their battle against the COVID-19 virus and incorporate them into the fight against climate change. There is an urgent need and demand from the scientific community to work on it in order to suggest the intensity and frequency of lockdowns without compromising on socio-economic development (Ali et al., 2021).

5.7 Conclusions:

This study concludes that various factors are involved in alleviating the spread of COVID-19. Both the cold and the dry environment also likely facilitate the COVID-19 transmission after controlling the bias from population density, government response policies, air pollutants and other factors. Strong scientific evidence has been found for the importance of cold weather effect on COVID-19 transmission with the arriving colder season. Studies covering the entire earth for a longer period are urgently needed to quantify the collective effects of meteorological factors and policy interventions on the spread of COVID-19. There is a strong relationship between the spread of Covid-19 and the environment. Covid-19 has affected the environment, societal conditions, economic conditions and human activities. Now is the time to realise the importance of environment for the survival of human beings, plants and animals; and take necessary steps to save our environment.

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6. Environmental Laws in India

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Abstract:

Environment is defined as the totality of human surroundings. Environment means the nature and ecology surrounding a society. Environment includes nature and natural resources in a society. The common constituents of environment are earth i.e. land, water resources, air and natural resources like minerals, metals, forests, rivers, ground water etc. Environmental laws comprise of all legal rules, strategies or guidelines that are envisioned to protect our environment.

The main objective of environmental laws is to preserve and protect the natural environment i.e. air, water, earth, forests, rivers etc. from pollution. Further, the objective of environmental law is to permit a life of dignity and wellbeing to everyone and which also protect the man's fundamental rights of freedom, equality and suitable conditions of life. Thus, the objective of the present paper is to discuss various environmental laws of India and to suggest ethical practices and its need or importance to control pollution.

6.1 Introduction:

Today's generation is going through a valuable phase. Nature and environment. Which gave birth to man and nursed him in its peril. Environmental preservations, on which the very existence of mankind is dependent, is posing an overriding challenge to him. Environmental degradation is not a new problem. It has been arising ever since the human civilization began on earth and man began to exploit the natural resources for his survival. At that time the natural resources for his survival. At that time the population was not so imposing a problem as it is now.

Therefore, environment was not much affected. With the arrival of western culture in India, consumerist culture began to flourish, and worked havoc on environment. Nature and environment was given great importance from the Rigvedic period the medieval period. A Sulkta (Verse) of Rigveda states that, "The sky is like a father, the earth is like a mother and the space like their son.

This, universe consisting of these three is like a family. Any kind of damage to any one of the three throws the universe off balance". The aim in giving such messages was to warn the people of the hazards of environmental pollution. In Chanakya Niti, it is said that planting even single tree with fruits and flowers makes the environment full of fragrance just as a family becomes delighted with a worthy son. Hence, we will be safe, so far the earth is full of nature.

6.2 Environmental Protection: Who's Concern?

The main power is in the hands of Central Government to take all such measures as it considers necessary for the people of the country through which to protect and improve the quality of environment and to prevent environmental pollution. It can lay down standards for quality of environment / emissions or discharge of pollutants, specify areas where certain industries shall not be located and in other cases may lay down measures and safeguards for inhibition of accidents that may cause environmental pollution. The government may also examine manufacturing or other processes that can cause pollution, inspect, investigate and carry out related research besides establishing / recognizing environmental laboratories and institutions to carry out functions entrusted under the act. There is heavy punishment of contravention of Act, rules, direction in the form of fines of imprisonment, or both, irrespective of the fact that the defaulter is a firm, company or government department. The Government, if it deems fit, may direct closure, prohibition, or regulation of an industry, operation and process or that of any service such as electricity, water etc.

6.3 Environment Protection in India:

Environmental disasters can create serious problems to the society. Bhopal gas tragedy was the greatest industrial disaster in the world that took place on 3 December 1984 at a Union Carbide pesticide plant in the Indian city of Bhopal, Madhya Pradesh. The plant accidentally released methyl isocyanate (MIC) gas, exposing more than 5, 00,000 people to MIC and other chemicals. The first official immediate death toll was 2,259. Around 25,000 people have since died from gas-related diseases, making it the deadliest man-made environmental disaster in history. Another tragic incident occurred on July 14, 2010, when chlorine gas leaked from the Sewri industrial area on land owned by the Mumbai Port Trust and nearly 76 people were treated in hospital. The infamous list of the most polluting industries in the world includes industries of recycling of lead batteries, lead industry, mines, tanneries, industrial discharges or municipal industrial sites, artisanal gold mining, manufacturers, petro chemistry, drycleaners.

Indian government, entrepreneurs, politicians and businessmen all have now realized that the time has come to consider seriously about this severe issue of environment pollution. India's approach towards environment issue is changing and social workers, NGOs and government involvement in environmental concern is increasing. To make our younger generations aware of environmental theories, laws, harms and effects of environment pollution, a subject in the course curriculum has been started at different stages. Even before India's independence, several environmental legislations existed but the real impetus for bringing about sophisticated framework came after the UN conference on Human Environment which was held on Stockholm in 1972. After that environmental policy and planning was done with the department of science and technology which was set up in 1977. This council later on in 1985, grown into full-sized ministry of environment and forests (MOEF). Today, it is the apex administrative body for regulating and ensuring environmental protection in the country. The Environment Protection Act, 1986 was enacted under Art. 253 of the Constitution of India to contrivance the decisions of UN Conference on Human Environment which was held at Stockholm for providing a progressive policy for protecting the eco-system.

6.4 Regulatory Framework of Environment Protection in India:

Under Indian Constitution, the Directive Principles of State Policy directs the state to ensure protection and improvement of environment and to protect forest and wild life. The Directive Principle of State Policy on Environment has been eloquently articulated in Article 48A of the Constitution, introduced by the 42nd Amendment in 1977. It is mentioned in that, the State shall make an attempt to protect and improve the environment and to protect or safeguard the flora and fauna of the country. Similarly, Article 51 (A) (g) lays down protection and improvement of environment as one of the fundamental duties of every citizen. This duty of citizens would mean that it is the duty of every citizen to protect and improve the environment together with lakes, forests and wild life and to have concern for all living creatures of the country. Ministry of Environment and Forest (MoEF) is responsible to enforce the Regulations established pursuant to major legal enactments which are as under:

a. The Water (Prevention and Control of Pollution) Act was passed in 1974. This Act provides several measures to keep the level of water pollution caused by the discharge of effluents by industry in rivers, lakes and similar water sources. It also makes it compulsory for the industries to install the water purifying equipment so as to keep the pollution within limits.
b. The Air (Prevention and Control of Pollution) Act 1981 provides several measures to keep the level of air pollution caused by smoke, fume, dust, and gas etc., emitted by industry.
c. The Environment (Protection) Act was enacted in 1986 with the objective of providing for the protection and improvement of the environment. This legislation was passed to regulate the pollution caused by industry and to save the environment. As per this law no polluting industry can be started without obtaining the approval of appropriate authority. The approval is granted if the level of pollution caused by such industries is within the permissible limits. To keep the pollution under control a central pollution control board has been established along with state pollution control boards.
d. Public Liability Insurance Act 1991 was made for the purpose of providing relief to the persons affected by accident occurring while handling any hazardous substance and matters connected therewith or incidental thereto.
e. National Green Tribunal (NGT): The National Green Tribunal was established under the National Green Tribunal Act 2010. The main aim of this Act is to effectively and promptly dispose of the cases relating to environmental protection and conservation of forests, wildlife and other natural resources of the country. It is like a specialized body having necessary know-how to handle various environmental disputes involving various issues. The Tribunal shall be guided by principle of natural justice and is not bound by the procedure laid down under the Code of Civil Procedure, 1908.
f. The Tribunal's dedicated jurisdiction in environmental matters shall provide speedy environmental justice. It helps to decrease the burden of hearing before the courts.
   The Tribunal is also directed to make and attempt promptly to dispose of the applications or appeals within 6 months of the filing.
   National Green Tribunal will require to follow a procedure which make it more accessible. For that, it is proposed to set up at five places of sitting which includes New Delhi as the major place of sitting and other four place of sitting are Bhopal, Pune, Kolkata and Chennai.

g. The Prevention of Cruelty to Animals Act 1960 is to prevent the infliction of unnecessary pain or suffering on animals and to amend the laws relating to the prevention of cruelty to animals. After the enactment of this Act, the Animal Board of India was formed for the promotion of animal welfare.
h. The Government of India enacted Wild Life (Protection) Act 1972 with the main objective of effectively or efficiently protect the wild life and its derivatives of the country. It further controls the illegal trade, plundering and smuggling in wildlife. The Act have made rigorous or strict punishment as well as penalty for offences of the same. In January 2003, the Act was amended. It further proposed by the Ministry to make amendments in the law by announcing more rigid measures in order to strengthen the Act. The objective is to provide protection to the listed endangered flora and fauna and ecologically important protected areas.
i. Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, recognizes and provides rights of forest-dwelling Scheduled Tribes and other traditional forest dwellers over the forest areas occupied by them. It further provides a framework for the same.
j. Forest Conservation Act 1980 was enacted which provide rules for protection of and the conservation of forests of the country. It strictly restricts and regulates the de-reservation of forests. Without approval of Central Government, it restricts the use of forest land for non-forest purposes.
k. Indian Forest Act, 1927 make the law relating to forests timber or produce. It makes laws on the transportation of forest-produce and the duty leviable on timber and other forest-produce.
l. Biological Diversity Act 2002 aims at conservation and sustainable use of biological diversity or resources and its components of the country. It also provides fair and equitable distribution of the benefits arising out of its use. Further, through a just process for purposes of implementing the objects of the Act it establishes the National Biodiversity Authority in Chennai.

6.5 Can Environmental Laws Bring Sustainable Development?

Article 14 in constitution of India clearly provides for equality before laws and equal protection of laws, which is one of the concepts of Rule of Law as propounded by Sir A.V. Dicey. Hence it may be safely be said that, if we adhere to the law, we can protect the environment and bring the sustainable development, because it is said in Upanishads that,

"Law is the King of Kings. He (king) is not above the law. If he violates the law then him (even the king) could be punished like another citizen.

6.6 Role of Activists in Sustainable Development:

The laws have not stopped pollution of the country's air, water and land. The country's forests present a bleak picture. Poverty and crass commercialism have been responsible for the rapid depletion of the rich ecological resources of India. Specialists and environmental activists have played a useful role in generating public awareness and attracting Government's attention to the ignorant poor and their wanton destruction by rapacious commercial interests.

Their success has been dramatic, but limited. Community pressure to protect the environment is also a powerful factor than the formal rules. In many localities such efforts had set in motion sustained environmental reforms.

For example, 1960 in Japan the local medical association began to petition against oil refinery emissions and the health damages they caused. Many factories made an agreement and they were able to crob the pollution.

6.7 Ethical Practices to Control Pollution:

Following are the ethical practices or approaches to control pollution:

6.7.1 Self-Regulation:

The finest way to control pollution is self-restraint by industrial enterprises. Business enterprises must adopt themselves the measures so that there is minimum loss to environment. Self-regulation by enterprises includes any of the following environment friendly practices:

a. Limited Extraction of Natural Resources: Industries should exploit only that much of natural resources which are essentially required and which get replenished in a natural way. For example, only that much trees be cut during a time period which grow up naturally. Similarly water harvesting may be undertaken to maintain ground water.

b. Replenishment: Enterprises must try to replenish natural resources extracted. For example if an enterprise cuts 10,000 trees, it must plant similar number of trees and ensure that these grow.

c. Least Waste: Business enterprises must not take the nature for granted they should not waste natural resources.

d. Environment Friendly Technology: Business enterprises should adopt such technology that does not adversely affect environment. For example refrigeration industry may use eco-friendly gases in place of CFC, which has tempered the ozone layer.

e. Recycling Waste: Enterprises must reuse and recycle their waste. They should not throw the industrial waste as it is.

f. Segregation of Waste: Industrial waste must be divide into two parts i.e. Biodegradable substances and other before throwing them.

g. Education and Awareness: Enterprises must take awareness and educational programmes to inform their workers and public at large about environment issues.

h. Environment Audit: Enterprises should evolve a system of environment audit to access the damage made to environment periodically.

i. Compliance of Environmental Laws: Business enterprises must follow the laws made to check pollution. They must adhere to norms of air pollution, water pollution, noise pollution and land pollution.

j. Upgradation and Modernization: Industries must keep on modernizing their plant and machinery to check the pollution. They should spent on buying the latest technology.

6.7.2 Pollution Standards:

Pollution can also be controlled be establishing pollution standards in areas like emission of smoke or gases, level of noise, treatment of discharges. In India Pollution Control Board has prescribed standards of emission of gases, heat and smoke. Industries emitting gas or smoke more than the standard prescribed are required to install equipment's to control pollution. To regulate pollution from smoke caused by automobiles, Euro-III emission norms have been enforced. Before throwing the industrial discharge, industries are required to clean and treat it.

6.7.3 Environment Audit:

Environment audit means carrying out a complete check to ascertain loss to environment. It is carried out after a specified time interval. The exercise involves locating the reasons causing pollution and prescribing measures to rectify it. It studies sources of air, water and land pollutions.

6.7.4 Ban:

A ban on certain activities can help to control environment pollution. Some of these measures include;

- Ban on use of timber and wood in industry
- Prohibition on cutting trees.
- Prohibition on discharge of effluents without treatment.
- Installing such equipment so as to minimize air pollution.
- Ban on use of leaded petrol.
- Introduction of use of Compressed Natural Gas (CNG).
- Banning smoking in public places.
- Ban on use of toxic substances by industries.
- Ban on use of polythene bags.

6.8 Need and Importance of Pollution Control / Prevention of Pollution:

Some of the reasons to control pollution are as follows:

a. To save environment: All types of pollutions need to be checked to preserve and protect environment. If we do not check air pollution, ecological balance will be disturbed.

For example, the cutting of forests has not only reduced the agriculture land but has also depleted the flora and fauna. Availability of wood, firewood, chemicals, herbs, medicines and other forest and natural produces has reduced to a large extent. Air pollution is increasing global temperature, melting glaciers, reducing rain and increasing deserts. Similarly due to water Pollution Rivers, lakes and ponds have contaminated and their water is becoming unusable. Land pollution has even contaminated the ground water.

Thus pollution has depleted the availability of water and other natural resources for business and industry. It is therefore necessary to save environment so as to protect water reserves, forest reserves, prevent global warming and to avoid such climatic changes, which endanger the mankind and adversely affect business environment.

b. To Prevent Health Hazards: Pollution directly spoils environment. It lowers air quality, contaminates water and erodes land fertility. These pollutions together adversely affect human health. For example, noise pollution has caused hearing problem, problem relating to heart and blood pressure. Water pollution has added several water borne diseases. Air pollution has caused breathing ailments like bronchitis and other respiratory disorders. The incidence of heart and respiratory ailments in industrially developed cities has increased several times as compared to villages having almost zero pollution. Industrial diseases relating to lungs, brain, blood, skin and nervous system are increasing at a high rate. Therefore, pollution caused by industry has adversely affected health of masses. Business and industry owe responsibility to control pollution to save mankind.

c. To Prevent Economic Losses: Cost incurred by an enterprise is directly related to level of pollution. Higher the pollution level, higher the recurring cost. For example, special protective clothes / dress with gears or guards are to be provided to workers working in industrial processes, which emit greater smoke, gas, fume dust or heat etc. Similarly, expenditure on dress and washing etc. is also to be incurred. Industries with risky and hazardous processes need to spend on medical facilities and compensation to workers if they contact any disease caused by pollution. Pollution also affects the old monuments and cultural heritage in its surroundings. For example, the pollution of industries at Agra has immensely damaged the white stone of Taj Mahal. To save Taj the Supreme Court of India intervened and ordered closure of industry around Taj. The government has incurred heavy expenditure on protection of Taj from industrial pollution. Similarly to clean up Yamuna and Ganga government has incurred huge expenditure. Thus pollution has its economic coat as well losses, which can be prevented if business units keep pollution level in control.

d. To Avert Natural Disasters: Pollution disturbs balance of nature. Nature when disturbed takes its revenge by causing floods, earthquake and epidemics. Large scale cutting of forests and mining activities have lessened vegetation cover, resulting in large land becoming barren and mountains losing their natural grip. For example, unchecked mining activities in Aravali ranges of Rajasthan and Haryana has lowered ground water level, reduced rains and increased temperature in surrounding states. Haryana and Delhi have recently witnesses several jerks of earthquakes. To check this, the Supreme Court of India banned all deforestation and mining activities in Aravali ranges. Similarly, the unchecked cutting of trees in Himalayan ranges has also been regulated to save further melting of glaciers, the prime source of water for northern India.

6.9 Conclusion:

Finally, it can be said that the pollution is an evil but no one can get out of it and hence it is not the responsibility of any single party. Here we can quote the observation of Justice Krishna Iyer. "Ultimate solution is not theoretical constitution and black letter laws but a profound movement for justice to Nature and Homosapians". Thus, it is true that neither law nor judiciary (Rule of Law) can only bring sustainable development; unless a well mobilized public opinion (Rule of People) is created against environmental pollution by making people aware of its benefits.

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7. Climate Change: A Global Environmental Challenge

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Summary:

The 4 environmental elements in energy security are environmental change, water accessibility, air contamination, land-use change and quality change and other ecological effect of 12 energy frameworks on all are examined in recent study. Environmental changes undermine huge land, individuals, and the economies in small Pacific island states and Asia country than some other area of the world. Air contamination negatively affects public medical care consumptions furthermore, economies as a rule. Of the 17 to 19 big cities in whole world with serious degrees of aggregate restoring particulate object out flows, ten are in country of Asia. As to accessibility and attribute, hydropower, atomic force, and nuclear energy represent 12% to 16% of worldwide water utilization, and the amount of freshwater vanished from supplies surpasses the joined sterile water indispensable of industry and home grown utilization. In the space of environmental change, growing ocean levels could pollute sterile water springs conceivably lessening consumable water supplies by 50%. The Change of land used for fuel wood assortment and bio fuel creation in Asia country have brought about deforestation at multiple times in worldwide normal what's more, multiple times in normal for the remainder of Asia country. Policymakers should start to fuse the expense of these adverse results in energy costs.

Keywords:

Environmental biology, Microbiology, Climate, Botany, Asia.

7.1 Introduction:

The climate is being affected by the environmental pollutions and changes rapidly occurring in the worldwide Environment. As results the glacier are melting rapidly and decreasing. The water from the melted glacier are overfilling the rivers and lakes which is causing flood. As another result the sea water level is continuously increasing. As result the climate is being changed and trees are blooming sooner or later. The animal breading is also effected as the breading season of the animals are being changing. Researchers have found much anticipation in past. the worldwide Environment changes are sped up ocean level ascent, loss of ocean ice and more as Temperature increase in the waves. The global warming is another result that is being found in several researches.

For a long time continuously the global temperature is increasing stated in many researches. The ozone layer is being affected by the global warming. The human tasks are causing ozone layer degradation. The Intergovernmental Panel on Climate Change (IPCC), which incorporates in excess of 1,250 researchers from the United States and different nations, gauges a temperature ascent of 3.5 to 10 degrees Fahrenheit throughout the following century. As the indication of the IPCC the range of environmental change in a singular district has ranging harmful long-term effects.

As indicated by the IPCC, the degree of environmental change consequences for singular districts will shift over the long haul and with the capacity of various cultural and natural frameworks to relieve or adjust to change.

The IPCC predicts that extensions in overall mean temperature of under 1.6 to 5.5 degrees Fahrenheit (1 to 3°C) more than 1990 levels will make significant impacts in specific locale and dangerous ones in others. Net yearly costs will increase as time goes on as overall temperatures increase.

Ecological change joins both an Earth-wide temperature support driven by human-impelled surges of ozone exhausting substances and the ensuing tremendous degree shifts in environment plans. Disregarding the way that there have been past occasions of climatic change, since the mid-20th century individuals uncommonly influence Earth's current circumstance structure and caused change on an overall scale.

The greatest driver of warming is the spread of gases that have a nursery effect, of which more than 90 to 95% are carbon dioxide (CO_2) and methane. Oil subordinate devouring (coal, oil, and combustible gas) for energy usage is the crucial wellspring of these radiations, with additional responsibilities from cultivating, deforestation, and collecting. The human justification ecological change isn't addressed by any coherent collection of public or overall standing. Temperature rise is accelerated or tempered by climate contributions, for instance, loss of sunshine reflecting snow and ice cover, extended water smoulder (an ozone exhausting substance itself), and changes to land and ocean carbon sinks.

Temperature climb aground is about twofold the overall typical augmentation, inciting desert expansion and more ordinary warmth waves and furious bursts. Temperature rise is in like manner improved in the Arctic, where it has added to dissolving permafrost, freezing retreat and sea ice hardship. More sweltering temperatures are extending speeds of disappearing, causing more genuine storms and environment limits.

Consequences for natural frameworks fuse the movement or demolition of various species as their present situation changes, most rapidly in coral reefs, mountains, and the Arctic. Ecological change sabotages people with food slightness, water deficiency, flooding, overpowering ailments, silly warmth, monetary setbacks, and dislodging.

These impacts have driven the World Health Organization to consider natural change the best peril to overall prosperity in the 21st century. Whether or not undertakings to restrict future warming are productive, a couple of effects will continue for a serious long time, including rising sea levels, rising ocean temperatures, and ocean aging.

7.2 The Historic Climate Signal:

While human civilization has emerged during a time of generally consistent environment, the Earth has seen a wide range of environments over its 4.5 long term history. Through assessment of the fossil record and profound ice centres, we can draw an image of what life on Earth resembled at various time spans. There are steady isotopes of oxygen, Oxygen-16 (16O), which contains eight neutrons and protons, and the more uncommon oxygen-18 (18O), containing ten neutrons and eight protons. In the paleo sciences the proportion of 18O: 16O (δ18O) found in corals, fossils, and ice centres can be utilized as an intermediary for temperature. This emerges from the differential rates at which water particles containing these isotopes dissipate or gather. At the point when water fume gathers, the heavier water particles containing 18O molecules consolidate and hasten first. In this manner, there is a particular dissipation of 16O from seawater, and henceforth new water precipitation is 16O-improved, prompting a slope in the δ18O with scope. Sea surfaces contain more prominent measures of 18O around the jungles where there is expanded vanishing and diminished measures of 18O at the multitudes where there is more down pour.

Furthermore, the measure of 18O present in water fume is more noteworthy at the jungles than nearer to the posts, because of higher temperatures and more prominent dissipation. Snow that falls in Russia or Canada has substantially less H_2 18O than downpour that falls in Malaysia or Peru. Also, snow falling at the focal point of an ice sheet will have less 18O than snow falling at the edges of the ice sheet, which is because of the special buildup of 18O and H_2 18O hastening first. From the δ18O proportion we can gather the temperature of precipitation, and subsequently how much hotter or colder the Earth was at the time the snow fell. Furthermore, investigation of Antarctic ice centres inspecting the proportion of oxygen to nitrogen in rises inside the ice can be utilized to deduce the degree of in solation (sun oriented radiation force).

These air pockets inside the ice can likewise be dissected to decide the centralizations of ozone harming substances at that point, like carbon dioxide (CO_2) and methane (CH_4). Resultant changes in environment from varying ozone depleting substance fixations adjust the examples of worldwide vanishing and precipitation, and subsequently change the δ18O proportion. Information from Vostok Station in Antarctica shows that the Earth's environment has changed significantly over earlier centuries, with pinnacles and box in temperature.

7.3 The Anthropogenic Greenhouse Effect:

As we have investigated in the past segment, the cosmetics of the Earth’s air are Responsible for the climatic conditions we experience and for life as far as we might be concerned. Given the huge volume of the environment it appears to be far-fetched that human exercises could impact the arrangement of the climate and adjust the fiery equilibrium of the planet.

The characteristic nursery impact was first portrayed in 1859 by the British Scientist John Tyndall, when he found that the most well-known segments of the Atmosphere—nitrogen and oxygen—were straight forward to both apparent and infrared Radiation. While gases like carbon dioxide, methane, and water fume were not straightforward in the infrared.

He reasoned that such gases should impact our environment. In 1894 the Swedish scientific expert Svante Arrhenius showed that Anthropogenic (man-made) discharges could adjust the environment by additional reducing the straightforwardness of the air in the infrared range. He further concluded that at the current pace of emanations that it would take humankind 3000 years of consuming coal to twofold the convergence of CO_2 in the environment; in this last Point he was off by around 28 centuries, while we can look at past environment through ice centres and forums, the goal both transiently and spatially is very low. Just generally as of late have we begun to monitor the environment of the Earth in more noteworthy details? The most seasoned having nonstop Series of fever perceptions on the planet is the Central England Temperature Record. Day by day and month to month temperatures from three perceptions stations are utilized to create delegate estimations of a three-sided region encasing Lancashire, London, and Bristol. Month to month estimations start in 1659, and everyday estimations Begin in 1772. Figure 1.13 shows a plot of the mean yearly temperature from 1659 to the furthest limit of 2015, made by averaging the month to month means. While there is a lot of inconstancy in the temperature record, we can see that there are cooler and hotter periods. For instance, we can make out the 'small Ice-age' of the later seventeenth century, just as especially cold or warm individual Years. Notwithstanding, since the modern upheaval we can see a consistent ascent in the Temperature signal, regardless of the Earth being inside a cooling cycle controlled by Orbital mechanics talked about in the past area. This can be credited to the Changing centralizations of ozone harming substances inside the climate because of human exercises, upgrading the all-around present regular nursery impact. Figure 1.2 shows the pattern in environmental CO_2 since 1958, the supposed keeling curve, based on the work began by Charles Keeling. Month to month estimations of air CO_2 focus at the Mauna Loa observatory (Hawaii) by the National Oceanic and Atmospheric Administration (NOAA) show a speeding up pattern in CO_2 fixation. As of late, climatic fixation passed 400 ppm (parts per million) interestingly since current people have strolled the Earth.

The motions in the climatic CO_2 (red line) are a consequence of the occasional varieties in the northern half of the globe. Since most of the Earth's properties mass and woods are situated in the Northern Hemisphere, the climatic CO_2 focus is overwhelmed by the northern summer and winter, because of the yearly patterns of vegetation. Worryingly, this pattern in CO_2 fixation doesn't show any noticeable deviations because of the Rio Earth highest point (1992), the Kyoto convention (1997), or Rio + 20 (2012); the lone advance in the information is credited to the breakdown of the Soviet Union in the mid-90s. There is regularly much disarray about the beginning of this extra CO_2: regardless of whether it comes from volcanoes, deforestation, or from the copying of non-renewable energy sources.

There is proof in any case, to show that the fossil fuel by products expanding the CO_2 centralization of the air are a consequence of anthropogenic emanations, basically from the consuming of petroleum product. Like oxygen, carbon displays a few unique isotopes, with various masses. Carbon in the climate is ~99.89% carbon-12 (12^oC) and ~1.11% carbon-13 (13^oC), and follows measures of carbon-14 (14^oC). 12^oC and 13^oC are steady, however 14^oC is radioactive with a half-existence of 5730 years (a half-life is the measure of time it takes for the radioactivity of a substance to split as it rots). The length of this half-life implies that any 14^oC that was made when the Earth shaped would since a long time ago have vanished, suggesting that new 14^oC should be continually being made.

Figure 7.1: Climate Change a Global Environmental Challenge

Plot of mean annual temperature from the Central England Temperature record.

Table 7.1: Lifetime and relative GWP of different atmospheric chemicals against a 100 year baseline of CO_2

Year	Annual Temperature (°C)
1650	8.25
1685	7.25
1720	6.75
1755	7.75
1790	7.5
1825	7.25
1860	8.5
1895	8
1940	8.75
1975	7.5
2000	8

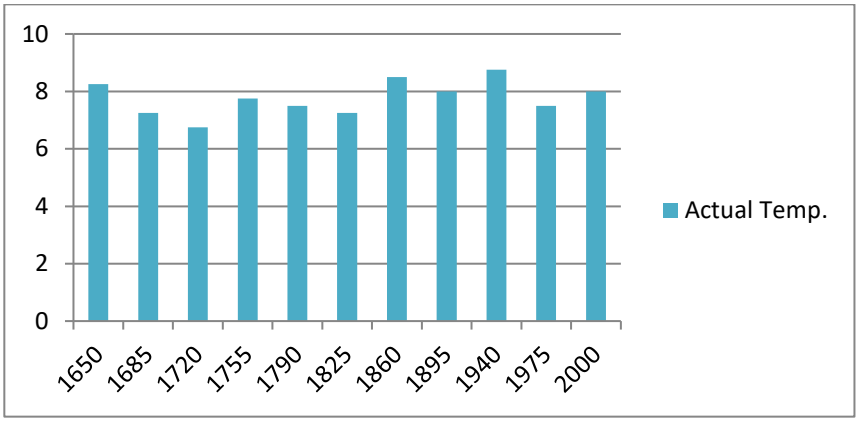

Figure 7.2: Lifetime and relative GWP of different atmospheric chemicals against a 100-year baseline of CO_2

Table 7.2: Accounting for climate-carbon feedbacks.

Name	Formula	Lifetime	Relative GWP
Carbon dioxide	CO_2	100	1
Methane	CH_4	12.4	34
Nitrous oxide	N_2O	121	298
Hydrofluorocarbon	HFC-134a	13.4	1550
Chlorfluorocarbon	CFC-11	45	5380
Carbon tetrafluoride	CF_4	50 000	7350
Sulphur hexafluoride	SF_6	3200	22 800

(Source IPCC AR5 and AR4 for SF6)

7.4 Climate Change Effects:

The effect of environment change depends on this point. These effects include temperature rise which affects the biological system and connection in US and throughout the whole world. The thing that we believe on and hot water, transport, energy, untamed life, biological systems, farming and human wellbeing that are withstand the effects of involving environment.

- **Water:** Changes to water assets can immensely affect individuals' lives. In certain districts, especially in the western United States, dry season is a significant factor influencing networks. Less snow aggregation in the mountains is significant in the West and Alaska, where the snowpack stores water for some time in the future. In the Midwest and north eastern states, the recurrence of hefty deluges has expanded. In numerous areas, floods and water quality issues are probably going to be more terrible due to environmental change.

- **Food:** Our food supply relies upon environment and climate conditions. Albeit rural practices might be versatile, changes like expanded temperatures, water pressure, sicknesses, and climate limits make difficulties for the ranchers and farmers who put food on our tables.
- **Health:** Human wellbeing is powerless against environmental change. The changing climate is required to cause more warmth stress, an increment in waterborne illnesses, helpless air quality, and sicknesses sent by bugs and rodents.
  Outrageous climate occasions can intensify a considerable lot of these wellbeing dangers.
- **The environment:** Biological systems are additionally influenced by environmental change.
  Living spaces are being adjusted, the circumstance of occasions, for example, blossoming and egg lying are moving, and species are modifying their home reaches.

Changes are likewise happening to the sea. The sea assimilates about 30% of the carbon dioxide that is delivered into the air from the consuming of petroleum derivatives.

Therefore, the sea is turning out to be more acidic, influencing marine life. Rising ocean levels because of warm development and softening area ice sheets and icy masses put seaside regions at more serious danger of disintegration and tempest flood.

7.5 Changes in Weather Patterns:

Climate designs in the district of Gulf of Maine have been shown comparable patterns to worldwide Climate changes. Burtis in 2006 describe that:

- There are expansions in normal winter and summer area temperature, with expanded changeability.
- Minimum precipitation in US – Canadian country border area has expanded by a normal of 132 mm (13%) over the previous years.
- After 1970 year has encountered the solitary 4 years on recorded with precipitate more prominent than 1300 mm and 8 of the 10 dampest years are recorded.
- Many dry season generations have been likewise capable, and a few destinations have shown diminishes in normal precipitation.
- The normal number of outrageous precipitation occasions (in excess of 45 mm of downpour or fresh water same if the tempest brings about snowfall) during a 2 days frame for the whole locale is 2.4 occasions each season.
  Locales in pieces of Massachusetts have multiple occasions every year. All of the 49 observing areas in the border area, 34 areas show an expansion of larger than 12% in the quantity of outrageous occasions in 1949 period.
- The signs of the circumstance of liquefying and defrosting of ice and snow are happening prior as a result to change hydrological examples of waterways streaming in Gulf Maine.

7.6 Rising Sea Level:

Late projections many researchers in 2009 measure an overall mean sea Level climb of between 45cm and 185cm over the period 1990 – 2100. According to Burtis in 2006 sea level in Atlantic Canada and the north-eastern United States has risen about 30cm in the period of 1920. Enduring tide checks have been established in the Gulf of Maine as an element of the overall association. For many areas with the more large stretch data (Bar Harbor ME, Yarmouth NS, Eastport ME, Portland ME, Boston MA and Saint L. John NB,) ordinary Sea level rising is represented in Table 1.2.

Table 7.3: Table of average Sea level rise:

Station	Start Year	End Year	Average Sea Level Rise (mm/a)
Saint John, NB	1967	2007	2.5
Yarmouth, NS	1929	1999	4.1
Eastport, ME	1930	2007	2.2
Bar Harbor, ME	1948	2007	1.6
Boston, MA	1921	2007	2.4
Portland, ME	1912	2007	1.2

Figure 7.3: Typhoon storm

7.7 Tempest Events and Hurricanes:

Typhoons of storm strength convey twists more than 90 to 110 km/h wind and flood related effects are constantly capable. The north eastern country US and the eastern states Canada are powerless against landfalls from hurricanes, in that emerge in the ocean of Atlantic. Albeit no specific high haul pattern of increment is obvious over the season of 1900 – 2000, a repeating design is apparent and Atlantic Ocean is at present encountering a functioning period.

Burtis (2006) revealed that the most noteworthy recurrence of hurricanes of any other decadent on recorded was for the season of 1995 – 2005. The Maine Gulf is a region that gets somewhere in the range of two and 5 storms every year. In view of their size and following course, more tempests by and large have an impact over the entire of the Maine Gulf coastal area, just as extensive distance in island.

7.8 Environmental Change Projections:

The Intergovernmental Panel on Climate Change (IPCC) appraisal reports Summarize worldwide environmental change impacts. We will examine projections of climatic Change in more noteworthy detail in the accompanying parts of this book. Here we will momentarily summarize a portion of the projections from the IPCC, and their starting points. For the initial four IPCC appraisal reports (1990–2007), evaluations of future Climate change have been founded on financial situations, itemized in the IPCC 'Uncommon Report: Emission Scenarios' (SRES). Future ozone harming substance emissions are a result of the unpredictable collaborations of a wide range of dynamic frameworks. These SRES situations cover a wide scope of main thrusts that impact current and Future emanations, including segment, innovative, and financial developments. These situations incorporate the scope of discharges for every one of the important ozone depleting substances and their main impetuses.

Accordingly, the IPCC express that the probability of any Single discharges way really happening is little. Accordingly, when managing Future environmental change, we are thinking about potential projections of what the world Could resemble, instead of conclusive expectations of what the world will in 20, 40, or 100 years' time. Before this current century's over, the world will have changed in manners that are exceptionally difficult to envision, similarly the individuals who inhabited the turn of the most recent century would think that it’s difficult to anticipate the present lifestyle. The SRES situations consider four Different storylines to depict reliably the interrelationships between emanation Driving powers and their advancement. Every storyline (A_1, A_2, B_1, and B_2) addresses Different segment, social, monetary, mechanical, and ecological developments. These storylines become progressively different, irreversible. Moreover, due to their intricacy, their plausibility can't just be founded on extrapolation of current financial patterns.

- The A_1 storyline depicts a universe of fast financial and populace development, and quick presentation of new and more productive innovation. Worldwide Population tops in the century and decays from there on. The Major basic topics are expanded social and social connections and Convergence between locales with decrease in the distinctions in territorial per Capita pay. The A_1 family is parted into three unmistakable situations: petroleum product Intensive (A_1FI); non-fossil fuel sources (more innovative) (A_1T); or a Balance across all fuel sources (A_1B).
- The A_2 storyline depicts a heterogeneous reality where confidence and Preservation of neighbourhood character is critical. Populace development rates across all Regions unite gradually, prompting ceaselessly expanding population. Technological progression is increasingly slow divided than in different Storylines, and financial improvement is basically connected with territorial and per capita monetary development.

- The B_1 storyline portrays a merged world with a populace that tops in the century and decays from there on (as in A_1). There are fast Changes in financial constructions towards an assistance and data economy, with related decreases in material force and the presentation of clean Resource effective advancements.
  The accentuation is upon worldwide answers for economic, social, and ecological manageability and value, without Additional environment drives.
- The B_2 storyline depicts an existence where the accentuation is on neighbourhood answers for economic, social, and ecological manageability. The worldwide populace continuously increments, however at a slower rate than A_2, with a middle of the road level of financial turn of events. Innovative headway is more different than in the B_1 and A_1 storylines. The situation is orientated towards Environmental insurance and social value, however at a more provincial nearby level. No likelihood or probability is related with any of these storylines or Scenarios. A few storylines, like B_2, are getting progressively infeasible because of recent populace development; yet different elements inside the storyline are as yet conceivable.
- Henceforth, this storyline can't just be overlooked. The essential issue with the SRES Storylines is their age. Made in 1990, they don't represent the ascent of nations Such as China and India as monstrous monetary forces and the related demographic, social, and neighbourhood innovative enhancements executed, or the resultant Carbon discharges. Therefore, another arrangement of situations were made by the scientific people group and executed in the latest IPCC fifth Assessment Report, the supposed 'Delegate Concentration Pathways' (RCPs). There are four RCPs, each covering the period 1850–2100 with expansions (broadened fixation pathways (ECPs)) figured for up to 2300. The RCPs are named by the radiative constraining level (in W m−2) at 2100, for example RCP 2.6, RCP 4.5, RCP 6, and RCP 8.5. The RCPs address a less difficult arrangement of situations Compared to SRES: rather than four primary storylines, each is expanded with a scope of possible situations dependent on various financial fates. The RCPs are essentially related to a level and speed increase of radiative driving to stay away from uncertainty. The science behind them is in reality more perplexing than was utilized for the SRES storylines.
- The four RCPs are predictable with certain financial suspicions, and are expected to provide adaptable depictions of various conceivable social, monetary, segment, and Technological prospects. Each RCP has been demonstrated to be feasible through a few diverse Regional and worldwide financial courses. Along these lines, these new RCP situations are devolved from financial elements, to help keep away from disarray and excusal by the General public. For comparative reasons, four pathways were picked as opposed to three to avoid the discernment that the centre alternative is ideal and the most secure bet. Table 1.2 provides a rundown of the vital highlights of the diverse RCP situations. The subtleties and pertinence of the diverse social, monetary, segment, and technological parts of can be difficult to appreciate. Basically, these perspectives can be decreased down to anthropogenic CO_2-eq discharges and a degree of radiative forcing. Figure 1.14 shows changes to air CO_2 focus structure 1958 to the current day, while figures 1.16 and 1.17 broaden this pattern in air CO_2 for The distinctive SRES and RCP situations up to the furthest limit of the century. We can see that notwithstanding the new science and consideration of later financial information, like the ascent of China and India as major monetary forces and the Associated outflows, there is little distinction between the better quality situations (A_1FI And RCP 8.5) before the century's over.

For curtness, the accompanying parts of this Book will utilize environmental change projections dependent on RCP 8.5, with the exception of more territorial projections, which have not yet been refreshed, where A_1FI will be utilized. The UK has among the most natty gritty environmental change projections in the World.

The current cycle of these projections, accumulated by the Met Office Hadley centre, were delivered in 2009 and are named UKCP09 (UK Climate Projections 2009). These originate before the arrival of the IPCC fifth Assessment report, and consequently are based upon the SRES outflows situations. In any case, they contrast from numerous environmental Change projections in that they are probabilistic.

7.9 Future Effects of Climate Change:

- **Ice free Season (and Growing Season) will lengthen:**

The length of the ice free season (and the comparing developing season) has been expanding broadly since the 1980s, with the biggest increments happening in the western United States, influencing environments and horticulture. Across the United States, the developing season is projected to keep on stretching. In a future where heat-catching gas emanations keep on developing, increments of a month or more in the lengths of the ice free and developing seasons are projected across a large portion of the U.S. before the century's over, with marginally more modest expansions in the northern Great Plains. The biggest expansions in the ice free season (over about two months) are anticipated for the western U.S., especially in high rise and beach front regions. The increments will be extensively more modest if heat-catching gas discharges are decreased.

- **More Droughts and Heat Waves:**

Dry spells in the Southwest and warmth waves (times of unusually sweltering climate enduring days to weeks) wherever are projected to turn out to be more extreme, and cold waves less exceptional all over. Summer temperatures are projected to keep rising, and a decrease of soil dampness, which worsens heat waves, is anticipated for a large part of the western and focal U.S. in summer. Before this present century's over, what have been once-in-20-year outrageous warmth days (one-day occasions) are projected to happen each a few years over a large portion of the country.

- **Ocean Level will more Rise:**

Worldwide ocean level has ascended by around 8 creeps since dependable record keeping started in 1880. It is projected to rise another 1 to 8 feet by 2100. This is the consequence of added water from softening area ice and the development of seawater as it warms. In the following quite a few years, storm floods and elevated tides could join with ocean level ascent and land subsidence to additional expansion flooding in numerous locales. Ocean level ascent will proceed past 2100 in light of the fact that the seas set aside an extremely long effort to react to hotter conditions at the Earth's surface. Sea waters will accordingly proceed to warm and ocean level will keep on increasing for a long time at rates equivalent to or higher than those of the flow century.

7.10 Discussion:

The scientists have shown us that there are significant consequences of the global climate change and the environmental pollutants. As a major result the sea level is increasing per year. The rising sea level is a threat to the coastal areas. The greenhouse effect is another result of the global warming and pollution. This causes the holes in ozone layer and they are causing skin cancer of several human being.

The methane concentration rise also causing damage to humans. The changes in weather patterns are another effect of the environmental pollutions. This is causing the problem in crop production. And many of the crops are destroyed that is causing the food problems. The change in water patterns also occur that cause flood and many more types of disaster. The environmental hazards as storm and hurricane are often found due to the global climate change. There are many more problems found in the situation.

7.11 Conclusion:

Climate change is having a very serious impact on the entire world environment. The environment is very closely related to human life so the bad effects of environment also fall on human life. Again air pollution, soil pollution and water pollution are responsible for environment change and climate change. Climate change can be caused by a variety of factors, from man-made effects or natural causes. Man-made chemicals emitted from various chemical industries, vehicle emissions result in water and air pollution which has a very bad effect on the environment. In addition, glaciers have begun to melt due to rising temperatures, which has led to rising sea levels. Greenhouse gases cause environmental pollution in which methane (CH_4) and carbon dioxide (CO_2) gases are more responsible. So, some steps have to be taken to reduce this pollution.

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8. Sprouts as Novel Anti-Fungal Agents against Isolates from Air Conditioner Remote and Docking Studies against Aspergillus Niger

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Abstract:

Air conditioners and Air conditioner remotes acts as sources of infections caused by microbes. Sprouts are cheap, easily prepared, and safe and composed of multiple active constituents to combat life threatening infectious diseases caused by microorganisms. The main aim of this study was to investigate the level of fungal contamination and determination of antifungal activity of crude extracts of sprouts followed by docking studies. Seeds such as Lentils, Mung bean, Chick pea, Field pea and Green peas were used for germination of Sprouts. The aqueous crude extracts of sprouts were prepared. The fungal isolates were identified as A. Niger, A. flavus and Rhizopus. The fungal isolates from AC remotes were screened by using aqueous crude extracts of sprouts by agar well diffusion technique at different concentrations. Mung bean sprout aqueous extract was found to most effective. The MIC of the Mung Bean aqueous sprout extract to inhibit the sensitive strain was found to be 0.125µg/ml. The RF values of TLC of Mung Bean were 0.52, 0.21 and 0.39 under iodine stain and UV. The docking studies reported that Gallic acid of Mung Bean and Endo- Polygalacturonase II of A Niger has more binding interaction to inhibit the fungal cell wall with binding energy of – 4.92

Keywords:

Aqueous extracts, MIC, Docking studies, Gallic acid, Endo- Polygalacturonase II, Sprouts.

8.1 Introduction:

Air conditioners serves as sources of microbial infections. AC makes indoor environment sterile but due to personal unhygienic conditions and dust may lead to bronchitis, rhinitis, keratitis, conjunctivitis, pharyngitis and pneumonia. Indoor air quality is directly propositional to the microbial growth due to changes temperature, relative humidity and

high temperature. The reported organisms in air-conditioned filter are Legionella pneumophilla, Streptococcus pneumonia and Bacillus spp, Penicillium pneumocystis, Carinii and species of Aspergillus, Rhizopus, Fusarium and Alternaria. The aim of this study was to reveal the level of bacterial and fungal contamination by using of Air conditioner remotes AC and its remote spread the diseases in such environments like long-term care facilities, sports facilities and hospitals.

Different types of microorganisms are identified includes rhinovirus, rotavirus, Serratia marcescens and methicillin- resistant staphylococcus aureus (MRSA) these organisms causes common cold, catheter associated bacteremia, necrotizing facilities, gastrointestinal diseases. Staphylococcus causes infections to diabetic patients, immunocompromised patients, new borns, surgical and burns. The sources of infection are hands, towels, touched objects

Sprout is a major source of protein and constituents an important health food in wide variety of Indian traditional foods. Sprouts are economically feasible and preparation is possible with minimum efforts. Sprouts can be prepared using vegetables and grains, cereals, pulses, etc. Sprouts play an important role in promoting human health. Sprouts make an important nutritive supplement for majority of people suffering from diabetes, thyroid, obesity, arthritis and infectious disease caused by microorganisms. Microbial infections are most common in crowded communities, immunocompromised people leading to the major outbreaks in several countries. Most of the microbes are becoming resistant to multiple antibiotics leading to the development of multidrug resistant bacteria such as Escherichia. Coli, Salmonella spp, Vibrio cholera, Shigella spp, Staphylococcus spp, Bacillus spp, Pseudomonas spp, Aspergillus spp, Candida spp and Actinomycetes.

The sources of these microbial infections are due to improper hygienic conditions, aerosol, water and food. The route of infection might include ingestion, inhalation and contact. As microbes are becoming resistant to multidrug and choice of antibiotic treatment is troublesome hence, there is a need to troubleshoot this problem by selecting an alternative treatment to overcome chemoprophylaxis. Sprouts are cheap, easily prepared, safe and composed of multiple active constituents to combat life threatening infectious diseases caused by microorganisms. The prevention and reduction of cross contamination and spread of infections could be done by proper washing of hands using Hand wash.

8.2 Materials and Methods:

a. Collection of Seeds:

Seeds such as Lentils, Mung bean, Chick pea, Field pea and Green peas were bought and allowed for germination of sprouts.

b. Germination of Sprouts:

The seeds were soaked in drinking tap water and kept in plastic box covered with aluminum or silver foil followed by germination of sprouts for one week at room temperature under aseptic condition.

c. Preparation of Extracts from Sprouts:

- The sprouts were separated from seeds aseptically using sterile disposable gloves and spread in sterile filter paper to absorb excess of moisture.
- He sprouts were dried under shade, powdered and soaked in sterile distilled water for overnight in sterile flask.
- The respective flask was subjected to filtration using sterile whatmann filter paper.
- The filtrates of respective sprouts were centrifuged to obtain supernatant consisting of Bioactive components.
- The residue was discarded and supernatant from respective flask were transferred aseptically into sterile flask and filtrates were stored at 4°c for antimicrobial activity.
- The sprouts were separated from seeds aseptically using sterile disposable gloves and spread in sterile filter paper to absorb excess of moisture.
- The sprouts were dried under shade, powdered and soaked in sterile distilled
- Water for overnight in sterile flask.
- The respective flask was subjected to filtration using sterile whatmann filter paper.
- The filtrates of respective sprouts were centrifuged to obtain supernatant consisting of Bioactive component

Figure 8.1: Preparation of sprout extracts from seeds- Lentils, Mung Bean, Green Pea, Chick Pea and Field Pea

Collection of Air conditioner remote samples: The non-clinical samples were collected from Air condition remotes. The fungal isolates were isolated and identified based on morphological and biochemical characters.

Figure 8.2: Preparation of Inoculum

The fungal strains such as Aspergillus Niger, Aspergillus flavus and Rhizopus species were inoculated into potato dextrose broth and incubated for 30 minutes.

d. Screening of Antimicrobial Activity of Sprouts of Lentil, Mung Bean, Green Pea, Chick Pea and Field Pea:

Anti-fungal activity of sprouts of lentil, mung bean, green pea, chick pea and field pea were determined investigated by agar well diffusion method. Sterile cotton swabs were used for preparation of lawn. Muller Hinton agar plates were prepared and lawn was done on punched wells the wells were filled with different concentration (1000µl, 500µl, 250µl and 125µl) of liquid extracts of respective sprouts for all the fungal isolates. The plates were incubated and plates were absorbed for inhibitory zones. Minimum inhibitory concentration was determined followed by thin layer chromatography. Auto Docking was performed to find out binding energy of compound of sprout with fungal cell wall protein.

Figure 8.3: Preparation of Lawn Using Fungal Isolates

Figure 8.4: Broth dilution

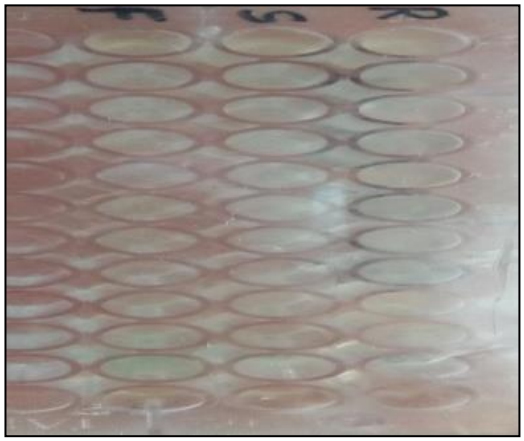

Figure 8.5: Micro dilution technique MIC

e. Result and Discussion

- **Fungal Identification**

Table 8.1: Fungal Identification

Sr. No	Fungi Name	Cultural Characters	Morphological Characters
1	*Aspergillus niger*	Woolly, Dark brown to black	Conidiophores wit variable length, phalides are biseriate
2	*Aspergillus flavus*	Velvety, Yellow to green or brown	Conidiophores with variable length, rough, pitted are single and double cover entire vesicle with point out various direction
3	*Rhizopus*	Dense cottony growth, becoming grey or yellowish brown	Stolon and pigment rhizoid, sporangiospores are globose to ovoid, one celled hyaline to brown and striate

f. *Aspergillus Niger*:

i. Lentil Aqueous Sprout Extract:

Table 8.2: Lentil aqueous sprout extract

Sr. No	1000µl	500µl	250µl	125µl
R2	++	+	-	-

The highest activity was found to be good at 1000µl as compared to 500 µl concentration of Lentil sprout extract.

ii. Mung Bean Aqueous Sprout Extract:

Table 8.3: Mung Bean aqueous sprout extract

Sr. No	1000µl	500µl	250µl	125µl
R2	+++++++	++++	+++	++

The highest rate of inhibition was found to be excellent and most promising at 1000µl followed by zone of inhibition at 500 µl & 250 µl and minimum rate of inhibition at 125 µl of Mung Bean aqueous extract.

iii. Green Pea Aqueous Sprout Extract:

Table 8.4: Green Pea Aqueous Sprout Extract

Sr. No	1000µl	500µl	250µl	125µl
R2	++++++	++++	+++	++

The maximum rate of inhibition was found to be excellent at 1000 µl of Green pea aqueous sprout extract and minimum inhibition at 125 µl.

iv. Chick Pea Aqueous Sprout Extract:

Table 8.5: Chick Pea Aqueous Sprout Extract

Sr. No	1000µl	500µl	250µl	125µl
R2	+++	++	+	-

The zone of inhibition was found to be very good at 1000µl of Chick Pea aqueous sprout and showed no zone of inhibition at 125 µl concentration of extract.

v. Field Pea Aqueous Sprout Extract:

Table 8.6: Field Pea Aqueous Sprout Extract

Sr. No	1000µl	500µl	250µl	125µl
R2	+++	++	++	+

The zone of inhibition was found to be good at 1000 µl and least rate of inhibition at 125 µl of Field Pea aqueous sprout extract.

g. *Aspergillus flavus:*

vi. Lentil Aqueous Sprout Extract:

Table 8.7: Lentil aqueous sprout extract

Sr. No	1000µl	500µl	250µl	125µl
R1	+++	++	-	-

Lentil aqueous sprout extract showed maximum zone of inhibition at 1000 µl concentration and was found to show no zone of inhibition at 125 µl concentration of lentil sprout extract for *Aspergillus flavus*.

vii. Mung Bean Aqueous Sprout Extract:

Table 8.8: Mung Bean Aqueous Sprout Extract

Sr. No	1000µl	500µl	250µl	125µl
R1	++++	++	+	+

The zone of inhibition for Mung Bean aqueous extract was found to be excellent at 1000µl concentration when compared to 125 µl which showed least rate of inhibition.

viii. Green Pea Aqueous Sprout Extract:

Table 8.9: Green Pea Aqueous Sprout Extract

Sr. No	1000µl	500µl	250µl	125µl
R1	+++	+++	+	+

Green aqueous sprout extract exhibited very good rate of inhibition at 1000 µl of concentration and low rate of inhibition at 125 µl concentration.

ix. Chick Pea Aqueous Sprout Extract:

Table 8.10: Chick Pea Aqueous Sprout Extract

Sr. No	1000µl	500µl	250µl	125µl
R1	+	-	-	-

The zone of inhibition was found to be very low at 1000 µl followed by no zone of inhibition at 500 µl to 125 µl concentrations of the aqueous extract.

x. Field Pea Aqueous Sprout Extract:

Table 8.11: Field Pea Aqueous Sprout Extract

Sr. No	1000µl	500µl	250µl	125µl
R1	+	-	-	-

The zone of inhibition was found to be very low at 1000 µl.

Followed by no zone of inhibition at 500 µl to 125 µl concentrations of the aqueous extract.

h. *Rhizopus Spp:*

xi. Lentil Aqueous Sprout Extract:

Table 8.12: Lentil Aqueous Sprout Extract

Sr. No	1000µl	500µl	250µl	125µl
R2	++++	+++	+++	++

Lentil sprout aqueous extract showed excellent rate of inhibition for Rhizopus spp at 1000µl and low rate of inhibition at 125 µl of concentration.

xii. Mung Aqueous Bean Sprout Extract:

Table 8.13: Green Pea Aqueous Sprout Extract

Sr. No	1000µl	500µl	250µl	125µl
R2	+++++	++++	++	+

The zone of inhibition was very high and most potent at 1000 µl concentration and least at 125 µl concentration of Mung Bean aqueous sprout extract**.**

xiii. Green Pea Aqueous Sprout Extract:

Table 8.14: Green Pea Aqueous Sprout Extract

Sr. No	1000µl	500µl	250µl	125µl
R2	++++	+++	++	+

The zone of inhibition was found to be maximum at 1000µl concentration of aqueous Green pea extract and minimum at 125 µl concentration.

xiv. Chick Pea Aqueous Sprout Extract:

Table 8.15: Chick pea aqueous sprout extract

Sr. No	1000µl	500µl	250µl	125µl
R2	+++	+	+	-

The zone of inhibition for Rhizopus spp was found to be very good at 1000 µl of Aqueous Chick pea extract and no zone of inhibition was observed at 125 µl concentration. Field pea aqueous sprout extract

Table 8.16: aqueous extracts of Field Pea

Sr. No	1000µl	500µl	250µl	125µl
R2	++++	+++	+++	+++

The rate of inhibition was found to be maximum at 1000µl and showed moderate levels of inhibition at low concentrations of aqueous extracts of Field Pea.

Figure 8.6: *Aspergillus Niger*

Figure 8.7: A. niger on SDA

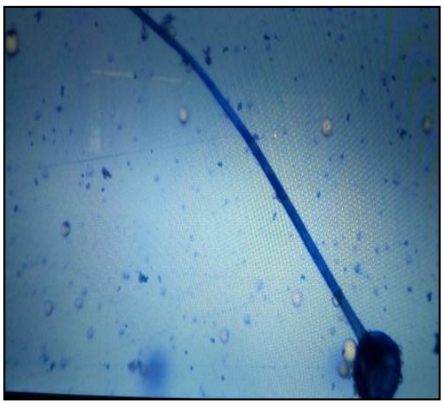

Figure 8.8: *A.flavus*

Figure 8.9: A. flavus on SDA

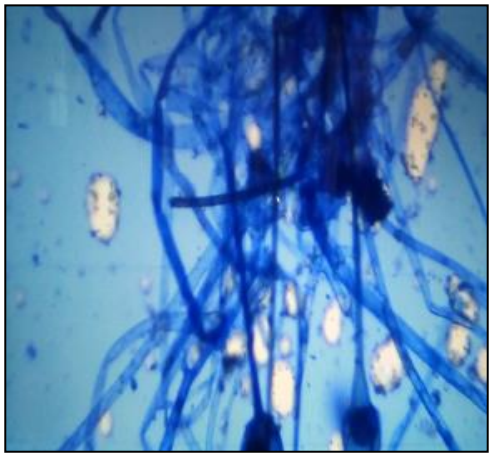

Figure 8.10: Rhizopus spp

Figure 8.11: Rhizopus spp on SDA

xv. Anti-fungal Activity of Lentil, Mung Bean, Green Pea, Chick Pea and Field Pea Aqueous sprout extracts- Aspergi
xvi. llus Niger

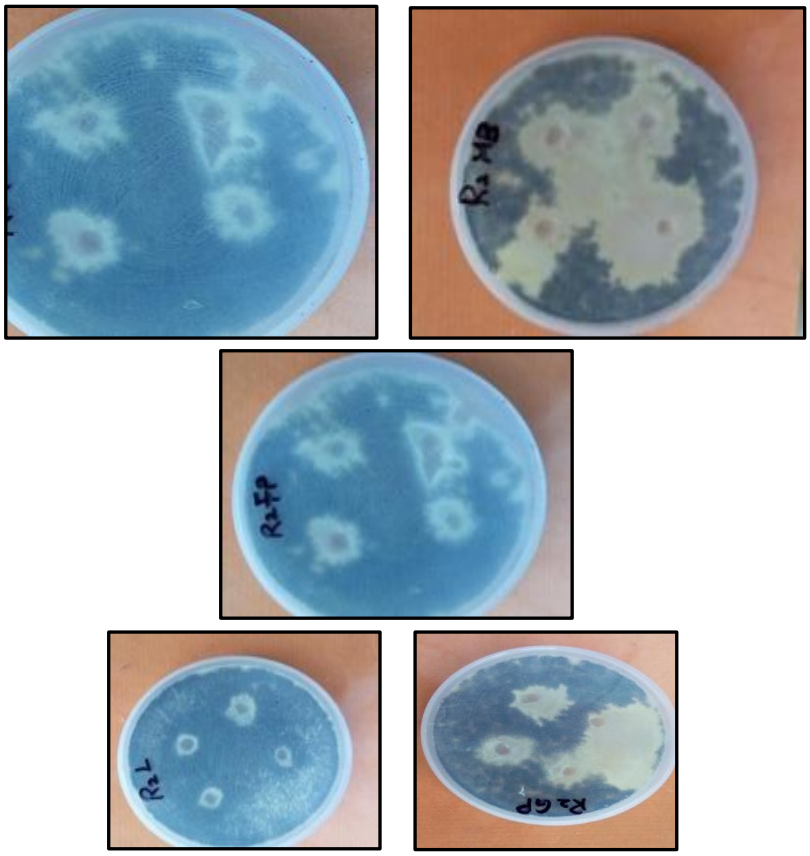

Figure 8.12: Anti-fungal Activity of Lentil, Mung Bean, Green Pea, Chick Pea and Field Pea Aqueous sprout extracts- Aspergillus Niger

xvii. Anti-fungal Activity of Lentil, Mung Bean, Green Pea, Chick Pea and Field Pea Aqueous sprout extracts — Aspergillus flavus

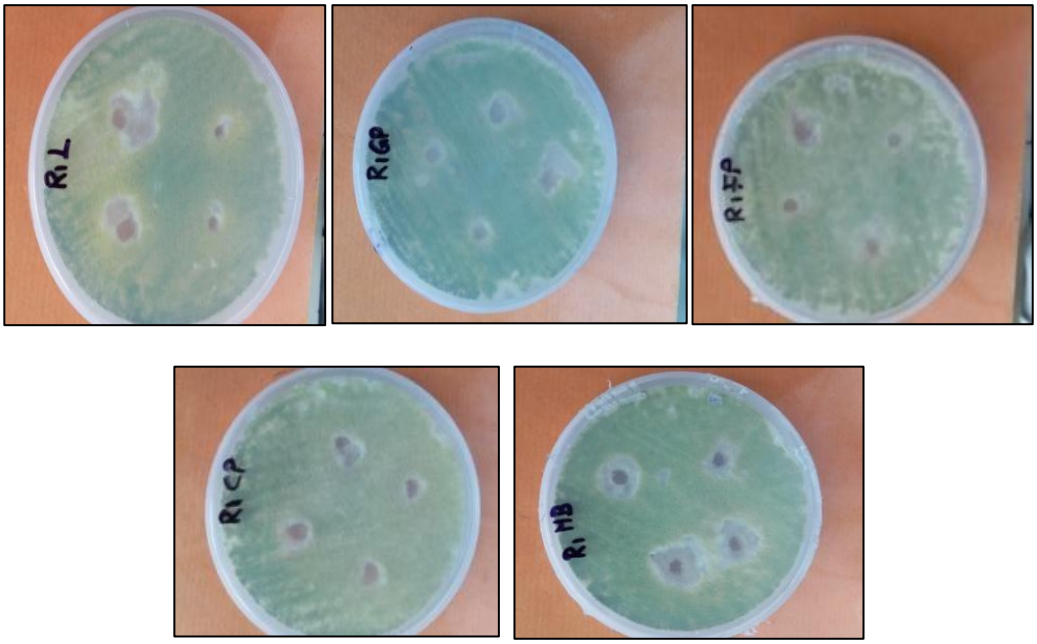

Figure 8.13: Aqueous sprout extracts — Aspergillus flavus

xviii. Anti-fungal Activity of Lentil, Mung Bean, Green Pea, Chick Pea and Field Pea aqueous sprout extracts

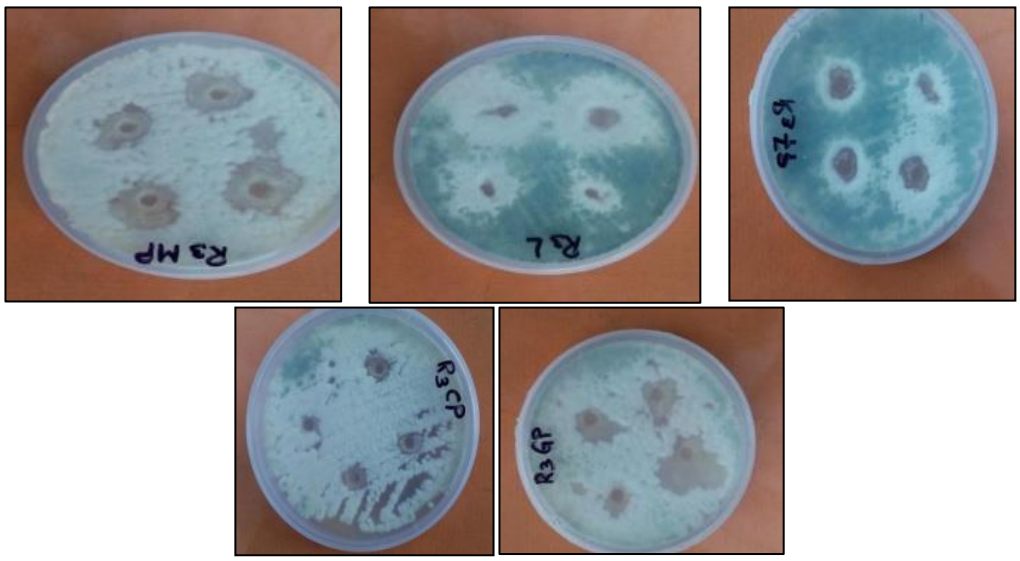

Figure 8.14: Anti-fungal Activity of Lentil, Mung Bean, Green Pea, Chick Pea and Field Pea aqueous sprout extracts

xix. Thin layer Chromatography- Mung bean aqueous sprout extract

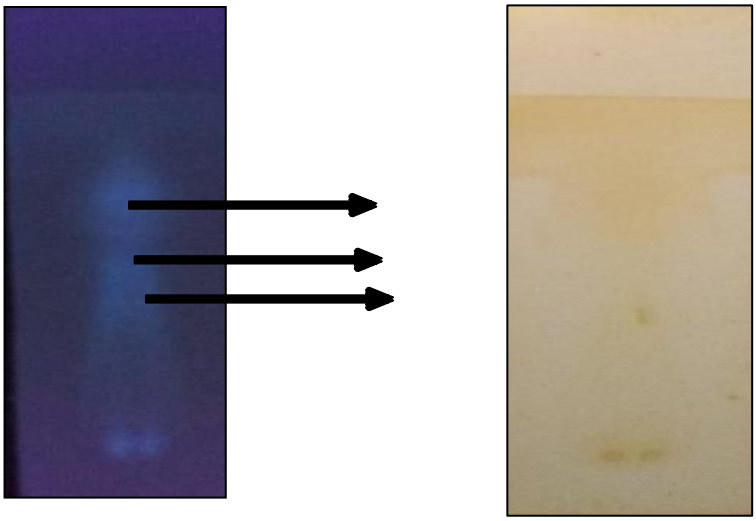

Figure 8.15: Thin layer Chromatography

i. Bioinformatics:

xx. Gallic acid

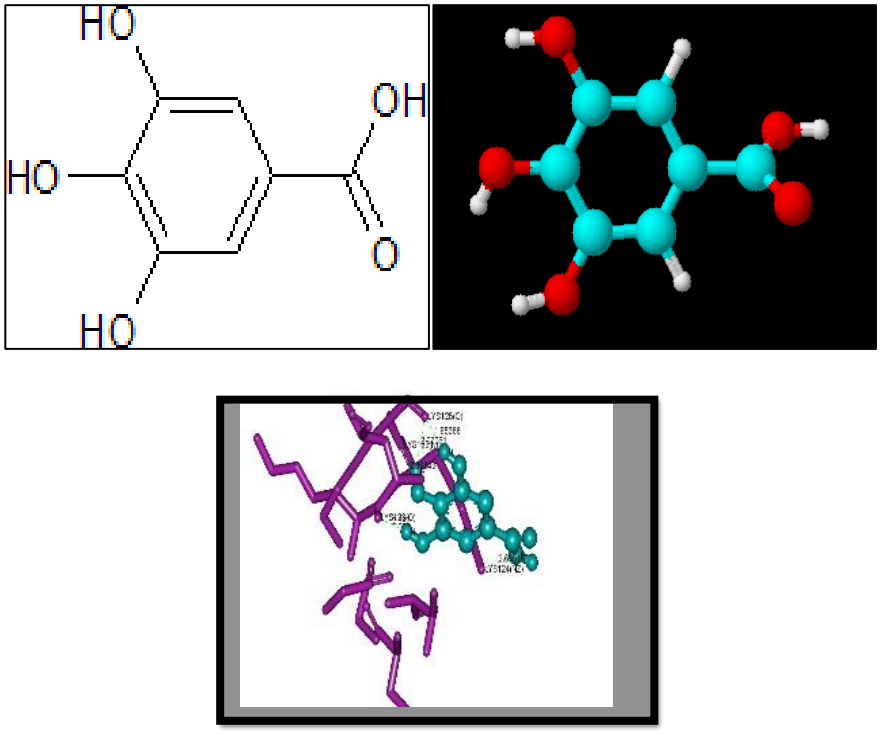

Figure 8.16: Gallic acid

xxi. Visualizing hydrogen interactions between Gallic acid and endo-Polygalacturonase -Discovery studio visualizer

Table 8.17: Visualizing hydrogen interactions between Gallic acid and endo-Polygalacturonase

Endo- Polygalacturonase II		Gallic acid	Distance (Å)	Docking Energy (Kcal/Mol)
Residue	Atom			
LYS123	O	H	2.08	-4.92

The current study was focused on anti-fungal activity using aqueous extract of sprouts. The highest activity was found to be good at 1000µl as compared to 500 µl concentration of Lentil sprout extract. The highest rate of inhibition was found to be excellent and most promising at 1000µl followed by zone of inhibition at 500 µl &250 µl and minimum rate of inhibition at 125 µl of Mung Bean aqueous extract.

The maximum rate of inhibition was found to be excellent at 1000 µl of Green pea aqueous sprout extract and minimum inhibition at 125 µl. The zone of inhibition was found to be very good at 1000µl of Chick Pea aqueous sprout and showed no zone of inhibition at 125 µl concentration of extract.

The zone of inhibition was found to be good at 1000 µl and least rate of inhibition at 125 µl of Field Pea aqueous sprout extract against A. Niger. Lentil aqueous sprout extract showed maximum zone of inhibition at 1000 µl concentration and was found to show no zone of inhibition at 125 µl concentration.

The zone of inhibition for Mung Bean aqueous extract was found to be excellent at 1000µl concentration when compared to 125 µl which showed least rate of inhibition. Green aqueous sprout extract exhibited very good rate of inhibition at 1000 µl of concentration and low rate of inhibition at 125 µl concentration.

The zone of inhibition was found to be very low at 1000 µl followed by no zone of inhibition at 500 µl to 125 µl concentrations of the aqueous Chick Pea extract. The zone of inhibition was found to be very low at 1000 µl followed by no zone of inhibition at 500 µl to 125 µl concentrations of the aqueous Field Pea sprout extract against A. flavus. Lentil sprout aqueous extract showed excellent rate of inhibition for Rhizopus spp at 1000µl and low rate of inhibition at 125 µl of concentration.

The zone of inhibition was very high and most potent at 1000 µl concentration and least at 125 µl concentration of Mung Bean aqueous sprout extract. The zone of inhibition was found to be maximum at 1000µl concentration of aqueous Green pea extract and minimum at 125 µl concentration. The zone of inhibition for Rhizopus spp was found to be very good at 1000 µl of aqueous Chick pea extract and no zone of inhibition was observed at 125 µl concentration. The rate of inhibition was found to be maximum at 1000µl and showed moderate levels of inhibition at low concentrations of aqueous extracts of Field Pea against Rhizopus spp.

8.3 Conclusion:

The present study revealed that the minimum concentration of the Mung Bean aqueous sprout extract to inhibit the sensitive strain was found to be 0.125µg/ml of the extract. This study reported that the RF values of TLC of Mung Bean are 0.52, 0.21 and 0.39 under iodine stain and UV. The docking studies revealed that Gallic acid of Mung Bean and Endo-Polygalacturonase II of A Niger has more binding interaction to inhibit the fungal cell wall protein.

8.4 Acknowledgement:

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9. International Conventions and Protocols in Mitigating Environmental Challenges: A Conspectus

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"The Earth will not continue to offer its harvest, except with faithful stewardship. We cannot say we love the land and then take steps to destroy it for use by future generations."
John Paul II

9.1 Introduction:

The conceptualization of the term environment can be said to be as ancient as the evolution of human beings, though its existence is more ancient than the latter. Interpreting environment has varied connotation. To a nonprofessional it confines to as the mere surroundings, a student in school reading an NCERT or a State Board textbook refers to it as the space for both living and non- living creatures, to take it further to an environmentalist it means the atmosphere of ecology and biodiversity. The environment is an interlocking system and operates in a state of dynamic equilibrium. Material and energy flow perpetually, regenerate and maintain an environment suitable for life. The most common definition of environment is the sum total of the conditions, elements and factors in the surroundings which may have an impact on an organism or group of organisms on its survival, action and development. This definition can be viewed from a general human's perspective; however, this same human is also a bank of knowledge. This knowledge system has been gradually passed on leading to different changes and demands in living styles.

If on one hand the change and demand has witnessed a positive impact on the environment, on the other hand it has also laid its hands on negative influences. In sum, when human tends to overuse environment's ability to fulfil any single function, the environment fails to keep its strength retained in the same ability leading to unnatural changes, which often dumps into disasters and tragedies. For this reason, it becomes imperative to look into the matter of challenges faced by the environment with urgency. It becomes an important facet, which will answer our question, if the challenges not met on time will be the cause of our collective survival or collective suicide. Environment is the umbrella unit that includes biosphere, habitats of organisms and different ecosystems. In the recent decades, the concept has taken a global stand. It has not only remained a matter of local or national concern but has awaken insights internationally. This can be seen in the instance of our very own Padma Shri awardee Jadav Payeng who has been invited by Mexico government to undertake a mission to make Mexico greener by replenishing its forests.

'The Forest Man of India' has signed an agreement with an NGO Fundacion Azteca, to collaborate on environmental projects in Mexico, which aims to plant 7 million trees in the North American country. We can witness how important conservation of forests have become and how from local to global everyone is taking such initiatives for a well-maintained environment. The counting of organizations at international and national levels would touch up to more than 30-40 such organizations who are initiating projects or small endeavors trying to tackle threatening environmental situations. However, certain question arises such as- what challenges are being faced by the environment resulting in its degradation? How can these challenges be dealt with on a universal stand? What major measures or initiatives have been taken worldwide? The answers may be rendered in the form of types of environmental challenges and international conventions and initiatives forwarded to combat the situation.

On a recent serious note, the UN Secretary General warned that humans have waged a "suicidal war" on the Planet Earth, and led it towards its brokenness. He informed the earth is facing every conceivable environmental challenge at global and local levels, creating serious health hazards on humans and deterioration of the natural environment. There is no denying to the fact that our environment is constantly changing and it is a call of the hour to identify and become increasingly aware of the challenges faced. With a massive influx of different types of natural disasters, weather patterns, warming and cooling periods and much more, it becomes an urgency to be aware of the environmental challenges our planet is facing. Mere making one aware of the challenges will not bring a solution and it is in this context that the conventions and initiatives play an important role. We are at a planetary emergency whereby witnessing piling up of environmental challenges around us. To provide a solution to such problems the conventions and initiatives have been framed thereby enabling pursuits to endure a healthy environment.

Across the globe, people are threatened with a wealth of new environmental challenges every day. Some are small and only affect a few ecosystems, but others are drastically changing the landscape. An overview of such challenges will help to understand the direful situation.

A. **Pollution And Generating Unsustainable Waste:** There are seven key types of pollution – air, water, soil, noise, radioactive, light and thermal and these are primary causes that affect our environment in many ways. All these types of pollution are interlinked and influence each other. Along with the pollutants of these various sources, is the huge production of waste due to our hyperactive consumption, which poses a threat to the environment. As per a study, the average person produces 4.3 pounds of waste per day resulting in non-biodegradable trash in the form of plastic packaging, toxic e-waste, and harmful chemicals that leach into our waterways. These wastes ending up in landfills, generates enormous amounts of methane, which ranks as one of the worst greenhouse gases because of its high potential for global warming. It creates severe explosion hazards.
B. **Global Warming/Climate Change:** Global warming is attributed directly or indirectly to human activity that alters the composition of the global atmosphere. It leads to climate change, which is usually a major shift in temperature, rainfall, sea levels, snow and wind patterns lasting decade's more.

Humans are creating this change by altering the composition of greenhouse gases in the atmosphere by burning large amounts of fossil fuels emitting carbon dioxide and other greenhouse gases and deforestation. The anthropogenic alteration in the greenhouse gas composition is claiming climate change posing a threat to the natural environment.

C. **Loss of Biodiversity:** The IUCN Red List (2004) documents the extinction of 784 species in the last 500 years. Ecologists warn that if the present trend continues, nearly half of all the species on earth might be wiped out within the next 100 years. Loss of biodiversity in a region may generally lead to decline in plant production, lowered resistance to environmental perturbations such as droughts and increased variability in certain ecosystem processes.

   The loss in the biodiversity is the cause in the growth of human population and encroachment into forestlands, transformation in the use of lands for industrialization, stochastic events like fire, floods etc. Some other causes are over exploitation of certain species by humans such as Steller's sea cow, passenger pigeon, alien invasive species (when alien species are introduced unintentionally or deliberately for whatever purpose, some of them turn invasive and cause decline or extinction of indigenous species; e.g., the Nile perch) or even due to natural extinction.

D. **Ozone Layer Depletion:** The ozone layer is an invisible layer of protection around the planet that protects us from the sun's harmful rays. The depletion of the crucial Ozone layer of the atmosphere is attributed to a pollution, which is caused by Chlorine, and Bromide found in Chloro fluoro carbons (CFCs). Once these toxic gases reach the upper atmosphere, they create a hole in the ozone layer. CFCs are banned in many industries and consumer products. The ozone layer is valuable because it prevents harmful UV radiation from reaching the earth. This is one of the most important current environmental challenge.

E. **Natural Resource Depletion:** Another crucial environmental challenge is the depletion of Natural resources. As humans, we use many natural resources that it would need almost 1.5 Earths to cover all our needs. This would not stop here and will further increase in the future due to massive industrialization in Asian countries like India and China. Over time, natural resource depletion will lead to energy crisis. The chemicals emitted from many natural resources, fossil fuel consumption resulting in the emission of greenhouse gases is primarily responsible for global warming and climate change. Exhaustive use of natural resources will ultimately lead to an environment deteriorating in nature. Globally, people are making efforts to shift to renewable sources of energy like solar, wind, biogas and geothermal energy. As such, the cost of installing the infrastructure and maintaining these sources has plummeted in recent years.

F. **Public Health Issues**: The current environmental challenges pose a lot of risk to the health of humans and animals. Dirty water is the biggest health risk in the world and poses a threat to the quality of life and public health. Run-off to rivers carries with it toxins, chemicals and disease-carrying organisms. Pollutants cause respiratory diseases like Asthma and cardiac-vascular problems. High temperatures encourage the spread of infectious diseases like dengue.

G. **Deforestation:** Deforestation simply indicates the clearing of the green cover and making the land available for residential, industrial or commercial purposes. Forests are natural sinks of carbon dioxide and produce fresh oxygen, as well as helps in regulating temperature and rainfall. At present, forests cover 30% of the land, but every year tree cover is lost, amounting to the growing population's demand for more food, shelter and

cloth. The imbalance caused due to this demand and shedding of the forests pose a big threat to the environment.

H. Soil Degradation: Food security on a global basis is dependent on the factor whether soils are in good condition to produce crops. According to UN estimates, about 12 million hectares of farmland a year are seriously degraded. Soil is damaged due to many reasons, which include erosion, overgrazing, overexposure to pollutants, monoculture planting, soil compaction, land-use conversion and many more. Nowadays, a wide range of techniques of soil conservation and restoration exist, from no-till agriculture to crop rotation to water-retention through terrace building.

I. Overpopulation: If the population of human continues to increase at this rate in the future, there will be no future left for the humans. The population of the planet is reaching unsustainable levels as it faces a shortage of resources like water, fuel and food. Population explosion in less developed and developing countries is straining the already scarce resources. Intensive agricultural practice to produce food damages the environment with chemical fertilizer, pesticides and insecticides.

J. Urban Sprawl: Urban sprawl refers to the migration of population from high-density urban areas to low-density rural areas, which results in the spreading of the city over more and more rural land. Urban sprawl results in land degradation, increased traffic, environmental issues and health issues. The ever-growing demand for land displaces the natural environment consisting of flora and fauna, instead of being replaced. This stands as a major threat to environmental degradation.

There is an urgent need for change in our daily lives so that the present day's activities will not affect the future generations. Although it is a fact that it is not possible on our part to physically stop the ozone layer depletion from thinning, there are still ways by which we can try to put a dent in what has been already known.

It is high time to join hands globally to fight back all the anomalies that are both fabricated and natural to seize the further degradation of the environment.

Environmental ethics as a discipline becomes essential here to make the humans have a shift in their thought process and act as benign stewards of the earth.

It calls for thinking globally and acting locally. In purview of the declining condition of the healthy environment, it gets impulsive to assure that steps are taken to maintain the prosperity of the environment.

In this context, mention may be made of the various conventions and protocols undertaken for the conservation of the environment. A brief categorization of the conventions and protocols for mitigating the environmental challenges can be made which can be given as-

a. Nature conservation
b. Land conservation
c. Atmosphere

Let us look into the conventions and protocols for mitigation under each head:

a. Nature Conservation:

- **Ramsar Convention on Wetlands, 1971:**

Ramsar Convention on Wetlands is the intergovernmental treaty that provides the framework for the conservation and wise use of wetlands and their resources. The convention was adopted in the Iranian city of Ramsar in 1971 and came into force in 1975. Since then, almost 90% of UN member states from the entire world's geographic regions have acceded to become "Contracting parties". It was signed on second of February 1971.

The number of parties to the convention is 171. Montreux Record under Ramsar Convention is a register of wetland sites on the List of Wetlands of International Importance. Currently, two wetlands of India are in Montreux Record: Keoladeo National Park (Rajasthan) and Lohtak Lake (Manipur). As of now, 27 sites of India are listed as Ramsar sites.

- **Stockholm Convention, 1972:**

The Stockholm Convention was held in Sweden from June 5-16, 1972. The object behind the convention was to 'create a basis for comprehensive consideration within the United Nations of the problems of the human environment' and to focus the attention of Governments and public opinion in various countries on the importance of the problem'.

The convention paved the way for other international conventions on the preservation of the environment such as Conventional on International Trade in Endangered Species of Wild Fauna and Flora, 1973. In the same line, the Parliament of India passed the AIR (Prevention and Control of Pollution) Act, 1981, the Water (Prevention and Control Act, 1974 and the Forest Conservation Act, 1980 to give effect to the Stockholm Convention.

- **Convention On International Trade in Endangered Species of Wild Fauna and Flora (CITES), 1973:**

CITES is an international treaty to prevent species from becoming endangered or extinct because of international trade. Under this treaty, countries work together to regulate the international trade of animal and plant species and ensure that this trade is not detrimental to the survival of wild populations. It was in 1963 that the International Union for Conservation of Natural Resources (IUCN) called for an international convention on the trade in animal species and their products.

A first draft of the convention was produced in 1964, and in 1973 CITES was signed by 21 nations in Washington DC. It is also known as Washington Convention. The United Nations Environment Programme (UNEP) administers it. India is a CITES party since 1976. Out of 34 global biodiversity hotspots in the world, India has four of them: Western Ghats, Sundaland, Himalayas and Indo- Burma region. As an active CITES party, India prohibits the international trade of endangered wild species.

- **Convention on Migratory Species, 1979:**

CMS is also known as the Bonn Convention. It is the only convention that deals with taking or harvesting of species from the wild.

It currently protects 173 migratory species from across the globe. The convention came into force on November 1, 1983. Migratory species threatened with extinction are listed in appendix I of the convention. CMS parties strive towards strictly protecting these animals, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them.

Migratory species that need pr would significantly benefit from international cooperation are listed in appendix II of the convention. For this reason, the convention encourages the Range States to conclude global or regional agreements. India has been a party to the convention since 1983.

India has signed a non- legally binding Memorandum of Understanding with CMS on conservation and management of Siberian cranes (1998), turtles (2007), dugongs (2008) and raptors (2016).

- **Convention on Biological Diversity (CBD), 1993:**

CBD is a step towards conserving biological diversity or biodiversity with the involvement of the entire world. It was opened for signature at the Earth Summit in Rio de Janeiro in 1992 and entered into effect in 1993. The convention has three main goals-

1. Conservation of biological diversity
2. Sustainable use of its components
3. Fair and equitable sharing of benefits arising from genetic resources.

It is often seen as the key document to sustainable development. The convention is legally binding; countries that joined are obliged to implement its provisions. 195 UN states and the European Union are parties to the convention.

b. Land Conservation:

- **United Nations Convention to combat Desertification (UNCCD), 1994:**

The convention stemmed from a direct recommendation of the Rio Conference's Agenda 21 in 1994. UNCCD is a convention to combat desertification and mitigate the effects of drought through national action programs that incorporate long-term strategies supported by international cooperation and partnership arrangements.

The convention is based on the principles of participation, partnership and decentralization- the backbone of good governance and sustainable development. It has 197 parties, making it near universal reach.

c. Atmosphere:

- **Montreal Protocol, 1987:**

The Montreal Protocol on Substance is a global agreement to protect the ozone layer by phasing out the production of various substances that are responsible for ozone reduction. The main objective of the protocol was to protect the ozone layer by taking different steps to manage the production and consumption of depleting substances (0DS) and to remove it completely. The parties to the protocol mees once a year to make decisions aimed at ensuring the successful implementation of the agreement. These include adjusting or amending the protocol, when has been done six times since its creation. The most recent amendment, the Kigali amendment, called for the phase-down of hydrofluorocarbons (HFCs) in 2016.

These HFCs were used as replacements for a batch of ozone- depleting substances eliminated by the original Montreal protocol. Although they do not deplete the ozone layer, they are known to be powerful greenhouse gases and thus contributors to climate change. The protocol continues to provide an inspiring example of what international cooperation at its best can achieve.

- **Vienna Convention for Protection of the Ozone Layer:**

It is a multilateral environmental agreement agreed upon at the 1985 Vienna Conference and entered into force in 1988. It acts as a framework for international efforts to protect the ozone layer. These are laid out in the accompanying Montreal Protocol. It does not include legally binding reduction goals for the use of CFCs, the main chemical agents causing ozone depletion.

- **United Nations Framework Convention on Climate Change (UNFCCC), 1992:**

UNFCCC was negotiated at the Earth Summit 1992 and signed in the same year in New York City. It is an international environmental treaty that came into existence under the aegis of UN. Today it has near universal membership, as of 2019 it has 197 parties. UNFCCC provides a framework for negotiating specific international treaties that aim to set binding limits on greenhouse gases. Its main objective is to stabilize the greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous consequences. The treaty is legally nonbinding and sets no binding limits on greenhouse gas emission for individual countries.

- **Kyoto Protocol, 1997:**

This protocol was signed on 11th of December 1997 and waw effective from 16 February 2005 in Kyoto. Over 192 countries participated in the protocol. Its goal is to fight global warming by reducing greenhouse gas concentrations in the atmosphere to a level that would prevent dangerous anthropogenic interference with the climate system.

The protocol aimed to cut emissions of greenhouse gases across the developed world by about 5 percent by 2012 compared with 1990 levels. Kyoto protocol is the only global treaty with binding limits on greenhouse gas emissions and is based on the principle of common but differentiated responsibilities.

It is applied to six greenhouse gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride. Classification of parties and their commitments- Kyoto Protocol.

Table 9.1: Kyoto Protocol

Annex I	Legally binding commitments to reduce emissions of greenhouse gases Developed countries [US, UK, Russia etc.] + Economies in transition (EIT) [Ukraine, Turkey, some Eastern European countries etc.]
Annex II	Developed countries (Annex Il is a subset of Annex I) Required to provide financial and technical support to the EITs and developing countries to assist them in reducing greenhouse gas emissions.
Annex B	Annex l Parties with first or second round Kyoto Protocol greenhouse gas emission targets. The first- round targets apply over the years 2008-2012 and the second-round target applies from 2013- 2020. Compulsory binding targets to reduce GHG emissions
Non - Annex I	Parties to the UNFCCC Not listed in Annex l of the convention (mostly low-income developing countries). No binding targets to reduce GHG emissions.
LDCs	Least Developed Countries. No binding targets to reduce GHG emissions.

Some other Conventions and initiatives of significance:

a. 1972, United Nations Conference on the Human Environment:

The United Nations Conference on Human Environment was first held in Stockholm, Sweden, in 1972. It marked the emergence of international environmental law. It is also known as The Declaration on the Human Environment. It set out principles for various international environmental issues, natural resource management, pollution prevention and the relationship between the environment and development.

b. 1972, World Heritage Convention:

The General Conference of UNESCO adopted the convention concerning the protection of World Cultural and Natural Heritage on 16 November. 1972. It links in a single document the concept of nature conservation and preservation of cultural properties. It identified the ways by which people interact with nature and the fundamental need to preserve the balance between the two. The convention defines the kind of natural and cultural sites, which can be considered as World Heritage Sites. It provides an explanation to how the World Heritage Fund is to be used and managed and under what conditions international financial assistance may be provided.

c. 1976, The Wild Life Trade Monitoring Network (TRAFFIC):

The TRAFFIC is a leading non-governmental organization, which works on the wildlife trade in the context of both biodiversity conservation and sustainable development. Established in 1976, it is a joint program of World Wildlife Fund (WWF) and the International Union for Conservation of Nature (IUCN).

The goal of the organization is to ensure that trade in wild plants and animals is not a threat to the conservation of nature. It has helped in the evolution of international wildlife trade treaties. It focusses on leveraging resources, expertise and awareness of the latest globally urgent species trade issue such as tiger parts, elephant ivory and rhino horn.

d. 1982, World Charter of Nature:

It was adopted by United Nations member nation-states on October 28, 1982. It proclaims 5 principles of conservation by which all human conduct affecting nature is to be guided and judged. Nature shall be secured against degradation caused by warfare or other hostile activities. It will ensure protection to representative samples of all the different types of ecosystems and the habitats of rare or endangered species.

e. 1989, Basel Convention:

The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as "hazardous wastes" based on their origin and/or composition and their characteristics, as well as two types of wastes defined as "other wastes" - household waste and incinerator ash.

The Conference of Plenipotentiaries in Basel, Switzerland adopted the convention on the Control of Trans boundary Movements of Hazardous Wastes and their Disposal on 22 March 1989.

The provisions of the Convention center around the following principal aims:

- the reduction of hazardous waste generation and the promotion of environmentally sound management of hazardous wastes, wherever the place of disposal;
- the restriction of trans boundary movements of hazardous wastes except where it is perceived to be in accordance with the principles of environmentally sound management; and
- a regulatory system applying to cases where trans boundary movements are permissible.

f. 1998, Rotterdam Convention:

The Rotterdam Convention on the Prior Informed Consent Procedure Hazardous Chemicals and Pesticides in International Trade was adopted in 1998 and entered into force in 2004. As of April 2016, it has 155 parties and thus its coverage is global.

The main objective of the Convention is to promote shared responsibility and cooperative efforts among Parties in the international trade of certain hazardous chemicals in order to protect human health and the environment from potential harm and to contribute to their environmentally sound use. The Rotterdam Convention serves as a first line of protection for Parties against the unwanted import of potentially harmful hazardous pesticides and industrial chemicals. The Convention covers 47 pesticides and industrial chemicals that have been banned or severely restricted for health or Parties have notified environmental reasons by Parties and which for inclusion in the Prior Informed Consent procedure.

g. 2015, International Solar Alliance:

In International Solar Alliance, over 122 countries participated and the same was initiated by India and founded in the year 2015. The main objective of this alliance is to increase the use of solar energy among the international Solar Alliance member countries in a convenient, safe, affordable and sustainable manner. Its vision and mission are to provide a dedicated platform for cooperation among solar resource- rich countries where the global community, including bilateral and multilateral organizations, corporate, industry and other stakeholders can make a positive contribution to assist and help achieve the common goals of increasing the use of solar energy in meeting energy needs of prospective ISA member countries in an equitable and sustainable manner. Its major objective includes global deployment of over 1000GW pf solar generation capacity and mobilization of investment of over US $1000 billion into solar energy by 2030.

h. 2015, Paris Agreement:

It is an international agreement to fight against climate change. The main objective of this agreement was to stop global warming and the threat of dangerous climatic changes. Over 195 countries participated in the agreement from 30 November to 11 December 2015. Its aim is to hold the increase in the global average temperature to well below 2℃ above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5℃ above pre-industrial levels.

Our planet is poised on the brink of a severe environmental crisis. The current environmental challenges make us vulnerable to disasters and tragedies, now and in the future to come. The need for a prudent and serious address to the challenges is necessary or else the entire species of human beings with other living creatures is not far away from its doom for disaster. The need of the hour is not merely to look for the solution to the environmental challenges but also sustain a healthy environment for the future generations. That brings into the scene the significance of the Sustainable Development Goals (SDGs). It has spoken of the goals that need to be met for a sustained living pertaining to a well-balanced environment giving priority to good health and living, clean water and sanitation, affordable and clean energy, responsible consumption and production patterns, climate action, life below water and life on land. Many research studies have been carried out and are in the process to look for ways to minimize the causes leading to the threats to the environment. In relation to climate change, new discoveries are made on a regular basis. There are instances, which are overlooked or considered less significant but still poses threat to the environment. In a recent study by scientists at Leipzig University, Imperial College

London and the Institute Pierre-Simon Laplace in Paris shows that high levels of aviation drive global warming, not only through greenhouse gas emissions, but also through additional clouds. They studied how Cirrus clouds, known for their high, wispy strands, contribute to warming the climate. “In order to mitigate or even avoid the warming effect on the climate, flight routes could be adapted in the future to avoid cirrus cloud formation, for example by separating flight corridors," said Professor Quass of Theoretical Meteorology at Leipzig University. The situation has become such that every corner of the planet has to be kept on a proper check. It is to be done because of the interrelation of the environmental challenges of one to the other.

It is high time to declare a permanent ceasefire and reconcile with nature if we want to secure a sustainable and safe future for us and the earth. For this, the emphasis on the challenges merely would not be beneficial enough but joining hands globally to mitigate through strict adherence to the previously mentioned conventions, protocols and initiatives appears must. Change and challenges of the environment are taking place at a pace of the fastest horses in the racecourse, so the initiatives to tackle the situation must also catch its pace. Mere living is not the scenario at present anymore, living and sustaining life on the planet has to be the trend now.

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10. Electronic Waste Management: Some Issues

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Abstract:

In modern contemporary society electronic industry is one of the world's largest and rapidly growing manufacturing industries, has provided leverage to the socio-economic and technological growth of developing society of India. However, consequences of its consumer oriented growth combined with rapid product obsolescence and technological advances are a new environmental challenge – the growing menace of "Electronics Waste" or e-waste. The word 'waste' and the act of 'wasting' are human inventions. Waste doesn't exist in nature. In nature, everything has a purpose. Wasting results in long-term harmful consequences for humans, nature and the economy. The e-waste has become a matter of concern in today's world because of the presence of toxic and hazardous substances presents in electronic goods and if not managed properly on timely basis, it can have adverse effects on environment. Hence, there is a need to adopt sustainability practices to tackle the growing threat of e-waste. This paper on the basis of secondary data highlights an overview of the problem of e-waste globally as well as in Indian context and its effects on our environment as well as on individual's health and provided some concrete solutions to tackle the issue.

Keywords:

Electronics, e-waste, Environment, Sustainability.

10.1 Introduction:

E-waste is a popular informal name for electronic products nearing the end of their useful life. Anything that runs on electricity/battery or has wire and completed its life is e-waste Electronic waste may be defined as discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets and refrigerators. E-wastes are considered dangerous, as certain components of some electronic products contain materials that are hazardous, depending on their condition and density. The hazardous content of these materials pose a threat to human health and environment. Discarded computers, televisions, VCRs, stereos, copiers, fax machines, electric lamps, cell phones, audio equipment and batteries if improperly disposed can leach lead and other substances into soil and groundwater. Electronic industry is one of the most well renowned world's largest manufacturing industries which has provided some leverage to the socio-economic and technological growth of developing society of India. However, with the impact of higher consumer oriented growth with rapid increase of product obsolescence and the technological advancement is new environmental challenge

The growing menace of "Electronics Waste or e-waste that consists of obsolete electronic devices. We already manage our Solid waste management which is already serious concern for our country but now days it is becoming more complicated by the invasion of e-waste, particularly computer waste.

10.2 What Is Waste?

Merriam-Webster defines waste as "refuse from places of human or animal habitation". The World Book Dictionary defines waste as "useless or worth-less material; stuff to be thrown away". Unfortunately, both definitions reflect a widespread attitude that does not recognise waste as a resource. Zero Waste America defines waste as "a resource that is not safely recycled back into the environment or the marketplace". This definition takes into account the value of waste as a resource, as well as the threat unsafe recycling can present to the environment and public health. The word 'waste' and the act of 'wasting' are human inventions. Waste doesn't exist in nature. In nature, everything has a purpose. Humans for short-term convenience and short-term profit created waste. Wasting results in long term harmful consequences for humans, nature and the economy.

10.3 Types of Waste:

"Hazardous Waste" means a solid waste or combination of solid wastes which because of its quantity, concentration or physical, chemical or infectious characteristics may – (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

"Medical Waste" means any solid waste which is generated in the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biological. "Mixed Waste" means waste that contains both hazardous waste and source, special nuclear, or by-product material subject to the Atomic Energy Act of 1954.

"Solid Waste" means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining and agricultural operations and from community activities, but does not include solid or dissolved material in domestic sewage, or solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under section 1342 of title 33, or source, special nuclear, or by-product material as defined by the Atomic Energy Act of 1954, as amended.

"Transuranic Waste" means material contaminated with elements that have an atomic number greater than 92, including neptunium, plutonium, amercium, and curium, and that are in concentrations greater than 10 Nano curies per gram, or in such other concentrations as the Nuclear Regulatory Commission may prescribe to protect the public health and safety.

"High-level radioactive Waste" means – (A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and (B) other highly radioactive material that the Commission, consistent with existing law, determines by rule requires permanent isolation.

"Low-level radioactive Waste" means radioactive material that – (A) is not high-level radioactive waste, spent nuclear fuel, transuranic waste, or by-product materials defined in section 2014 (e)(2) of this title; and (B) the Commission, consistent with existing law, classifies as low-level radioactive waste.

"Solid Waste": Garbage, refuse, sludge and other discarded solid materials including solid waste materials resulting from industrial, commercial and agricultural operations, and from community activities, but does not include solid or dissolved materials in domestic sewage or other significant pollutants in water resources, such as silt, dissolved or suspended solids in industrial waste-water effluents, dissolved materials in irrigation return flows or other common water pollutants. Unless specifically noted otherwise, the term "solid waste" as used in these guidelines shall not include mining, agricultural and industrial solid wastes; hazardous wastes; sludge's; construction and demolition wastes; and infectious wastes.

Municipal Solid Waste: The term 'municipal solid waste' means all waste materials discarded for disposal by households, including single and multifamily residences, and hotels and motels. The term also includes waste materials generated by commercial, institutional, and industrial sources, to the extent such wastes are essentially the same as waste normally generated by households or were collected and disposed of with other municipal solid waste as part of normal municipal solid waste collection services, and regardless of when generated, would be considered conditionally exempt small quantity generator waste.

Examples of municipal solid waste include food and yard waste, paper, clothing, appliances, consumer product packaging, disposal diapers, office supplies, cosmetics, glass and metal food containers, elementary or secondary school science laboratory waste, and household hazardous waste. Such term shall include debris resulting from construction, remodeling, repair, or demolition of structures other than debris that is not otherwise commingled with other municipal solid waste and has been determined by the generator, to be contaminated. For purposes of determining whether any such debris is contaminated, the generator shall conduct representative sampling and analysis of such debris, the results of which shall be submitted to the affected local government for record keeping purposes only, unless not required by the affected local government. Any such debris that has been determined to be contaminated shall be disposed of in a landfill that meets, at a minimum, the requirements of this subtitle. "Electronic Waste" is defined as discarded computers, office electronic equipment, entertainment device electronics, mobile phones, television sets and refrigerators.

E-wastes are considered dangerous, as certain components of some electronic products contain materials that are hazardous, depending on their condition and density. The hazardous content of these materials pose a threat to human health and environment.

10.4 Magnitude of the Electronic Waste:

In the present times, advances in information technology have radically changed the life of Indian people especially urbanites. But, it's a really a matter of concern because due to its mismanagement, it has led to new problems of contamination and pollution. For instance, we all know that personal computers are generally a combination of various components which include highly toxic elements like chlorinated and brominated substances, toxic gases , metals, acid, plastic additives etc. An alarming issue for environment as well it has a hazardous effect on health of the individual in the existing society. Rapid economic growth, urbanisation, and increasing consumerism have increased both the production and consumption of electronic gadgets and electrical equipments. It has been found that in India in spite having world's most advanced high tech software and hardware developing facilities but as far as the recycling of these facilities is still underdeveloped in its nature. Majority of the population is unaware of the potential negative impact of the rapidly increasing use of computers, monitors and televisions. When such types of electronic gadgets are dumped in landfills, they pose health risks because of the hazardous material they contain. Improper segregation of electronic products leads to the possibility of damaging the environment as well. The information technology industry has been one of the prominent agent of change in the economy since the last decade and has significant contribution to digital revolution in every aspect of our daily lives, providing our society with more comfort and easy information acquisition and exchange. The Global E-Waste Monitor, 2017 published by United Nations University, estimated that India generates about 20 lakh ton of e-waste annually, nearly 82 percent of which is basically personal devices. Similarly another study highlighted that 70 percent of the e-waste followed by telecommunication equipments like phones 12 percent, electrical equipment 8 percent and medical equipment 7 percent with remaining from the household e-waste.

10.5 Indian Scenario:

In Indian context, there are generally two main leading industries i.e.IT and telecom. India, by 2011, has achieved a PC penetration of 95 per 1000 from the 14 per 1000 in 2008. At present, India has 95 million one of the most threatening substances is lead, of which only 5 percent is recycled in India. Indians will not trash their e-waste gadgets, but pass them on to a new low-end user who will, in turn, junk them in the flea market from where the instruments make their way to the Kabadiwallas. Major issues related to Indian scenario are: India's hospitals to see patients with 10 times the expected level of lead in their blood. In India, a water sample revealed levels of lead 190 times as high as the drinking water standard set by the World Health Organization. • Thousands of children throughout the India are attending schools that were built on or near toxic waste sites, with increased risk of developing asthma, cancer, learning disorders and other diseases linked to environmental pollutants. • 1-20 kg per person/p.a and growing at 3 times faster than the municipal waste • Over 200 million current mobile users • Preliminary estimates suggest that total WEEE generation in India is approximately 1, 46,000 tonnes per year. • 20 million electronic household appliances including TV, washing machines, PCs etc.) and 70 million cell phones reach end-of-life every year. Memory devices, MP3 players, iPods, ipads etc. are the newer additions. • About 70% of the heavy metals (mercury and cadmium) and 40% lead, in landfills in India come from e-waste

• 22% of the yearly world consumption of mercury is used in electronics manufacture • More of acid content flow into the land contaminating the soil and land value. • About 70 percent, of heavy metals in India landfills comes from E-Waste. • World's 80% population live in areas of cell phone reception • Indians upgrade or exchange their cell phones every 18 months, meaning there are approximately 16 million unused mobile phones stashed away at home or in the office • Average working life of a mobile phone is 7 years but worldwide the average consumer changes their mobile every 11 months. Recently, Ministry of Electronics and Information Technology has developed a guideline on uniform inventorisation of e-waste in the country. As per the information available with CPCB, 69,414 MT of e-waste was collected, dismantled and recycled during 2017-18. On 15 July, 2019, the question has been raised in Rajya Sabha on Pollution due to e-waste. It has been found that only 1.5 percent of e-waste generated in India gets recycled.

10.6 Impact on Environment and Health:

a. On Health:

Electronic products actually are a complex mixture of several hundred tiny components, many of which contain deadly chemicals thereby threatening human health and the environment. Most of the components in e-devices contain lead, cadmium, mercury, Polyvinyl Chloride, chromium etc. TVs and video and computer monitors use CRTs which have significant amount of lead and long-term exposure to these substances can damage the nervous system, Kidney and bones, and even the reproductive and endocrine systems. Some of them are highly carcinogenic. These e-wastes, when improperly disposed (incinerated/ land filled instead of recycling) with domestic waste, without any controls, can contaminate the soil, water and air. In general the electronic goods/ gadgets are classified three major heads:

- White goods: Household appliances
- Brown goods: TVs, cam recorders
- Grey goods: Computers, Printers, fax machines, Scanners

In general waste from the white and brown goods is less toxic when compared to grey goods.

b. On Environment:

One of the most common effects of e-waste on air is through air pollution. Scavengers going through numerous landfills, looking for improperly disposed electronics to make some income from the recycling of these wastes, are exposed to such hazardous elements. When electronic items containing heavy metals such as lead, barium, mercury, are improperly disposed, these heavy metals leach through the soil to reach ground water channels which eventually run to the surface as streams or small ponds of water.

Consequently, the local communities often depending on these water bodies and the groundwater suffer multiple diseases. Not only this chemicals resulting in death of aquatic plants and animals, has intake of the contaminated water by humans and other animals resulted in lead poisoning.

Burning of e-waste in open landfills for obtaining gold and other precious metals produces fine particulate matter and cause cardiovascular and pulmonary ailments in children. The wind carries toxic particles and they enter the soil crop food pathway affecting both humans and animals as they enter the food chain. The motherboards have high level of mercury and their improper disposal may cause skin and respiratory diseases. Drinking water contaminated with lead affects the central and nervous system and causes poor brain growth, hearing disability, and impaired formation and function of blood cells. Since, these chemicals are not biodegradable; they persist in the environment for long time, increasing the risk of exposure.

c. Preventive Measures to Solve the Issue:

K. The Product designers must ensure the longevity of the products through their re-use, repair, and or upgradeability features.
L. More emphasis should be laid on use of less toxic, easily recoverable, and recyclable materials which can be refurbished, disassembled and remanufactured.
M. Recycling and reuse of material which ultimately reduce generation of e-waste.
N. Policy makers need to focus on such issues related with production, and trade to final disposal including technology transfers for the recycling of electronic waste.
O. Adoption of regulatory instruments adequate to control both exports and imports of e-wastes and ensuring their environmentally sound management should be in place.
P. Legal framework should be initiated to resolve this issue to a large extent. In other words, manufacturers of products must be financially, physically and legally responsible for their products.
Q. All vendors of electronic devices shall provide take up backup and management services for their products at the end of the life of those products.
R. The old electronic product should sent back and carefully dismantled for its parts to be either recycled or re-used, either in a separate recycling division at the manufacturing unit or in a common facility.
S. Hybrid methodology should be adopted to overcome the problem. This strategy can provide new and emerging area of metallurgy which may facilitate the extraction of metals present in the trace quantity from their ores.

10.7 Conclusion:

The word ‘waste’ and the act of ‘wasting’ are human inventions. Waste doesn’t exist in nature. In nature, everything has a purpose. Wasting results in long-term harmful consequences for humans, nature and the economy. There has been significant increase in the generation of electronic waste in the last few decades. E-waste management is a great challenge for governments of many developing countries such as India. This is becoming a huge public health issue and is exponentially increasing by the day. In order to take healthy initiative to tackle this problem, it is important to integrate the formal and informal sector. The competent authorities need to establish certain mechanisms for handling and treatment of e-waste in as safe and sustainable manner. In the end, technical and policy level based interventions; proper implementation, capacity building, and increasing the public awareness are the need of the time. They on convert this challenge into an opportunity and set global credible standards concerning environmental and occupational health.

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11. Challenges to the Environment Degradation and Their Mitigation

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Abstract:

Environment comprises of atmosphere, lithosphere, hydrosphere and biosphere. The interaction between these components is crucial for life. The links between human activity and the environment are complex and varied. Humans need to interact with the environment to obtain our food, water, fuel, medicines, building materials and many other things. The world has begun to witness the dramatic environmental degradation caused by anthropological activity in the name of development.

The impact of environmental problems on humans is notable leading to bleak outcomes in health and socio-economic development. Global warming, acid rain, water and air pollution, toxic waste, and dwindling energy supplies are startling challenges that may menace our future if we don't confront them.

The environment gives us multitudinous benefits that we can't compensate our entire life. The severe environmental problems of the 21st century have the capability to alter the course of life on this planet. To address this crisis, we need to make better use of and manage our resources, support a green mind, sustainable development, and a society that is actively involved in all on going activities.

Keywords:

Environmental degradation, sustainable development, pollution, exploitation, mitigation.

11.1 Introduction:

Environmental degradation is a deterioration in which the natural environment is harmed in some way, resulting in a reduction in biological diversity and overall environmental health.

This process can be fully natural, or it can be expedited or triggered by human actions. It is the central causes of diseases, health issues and incessant impact for the world. The relationship between physical environment and individual and societal well-being is complex and varied, with both qualitative and quantitative aspects.

The sustainable administration of the earth and natural resources is vital for financial progress and human opulence. Natural resources give line of work to a substantial number of individuals and create sizeable assessment revenue.

The long-term development of financial areas requires healthy biological systems. They as of now give legions of occupations. The entire biosphere relies on the biological communities that regulate the world's air, water, and soil.

They form a unique and useful cradle in the face of unprecedented climate change and atmospheric change. However, the integrity and functionality of these critical natural resources are progressively being jeopardised.

Environmental degradation, according to the United Nations International Strategy for Disaster Deterioration, is defined as "the reduction of the environment's capacity to meet societal and ecological objectives and needs.

The relationship between human health and the environment has been extensively researched, and environmental dangers have been shown to have a significant impact on human health, either directly by exposing humans to hazardous chemicals or indirectly by disturbing life-sustaining ecosystems.

Sanitation has been linked to notable health benefits and can contribute significantly to the achievement of the Millennium Development Goals of environmental sustainability, health, and development by reducing exposure to environmental elements of danger by improving air quality and access to improved sources of drinking and bathing water.

11.1.1 Causes of Environment Degradation:

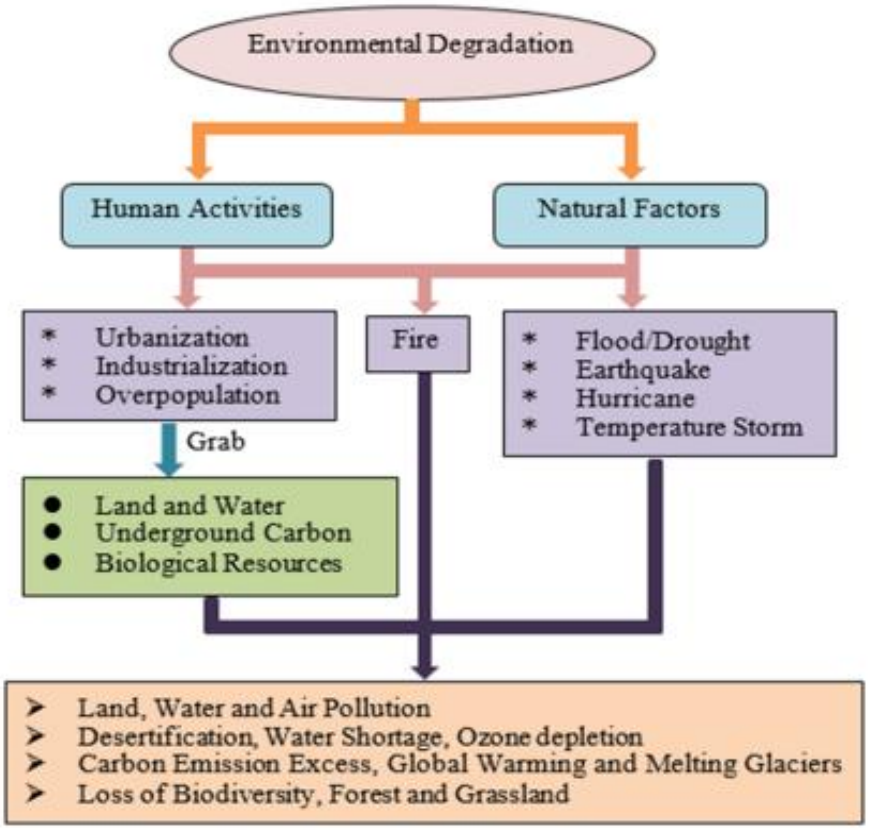

Figure 11.1: This Flow Chart Shows The Different Causes Of Environmental Degradation.

A. Human Sources:

Changes to biophysical environments, ecosystems, biodiversity, and natural resources caused directly or indirectly by humans, such as global warming, environmental degradation, mass extinction and biodiversity loss, ecological crisis, and ecological collapse, are examples of anthropogenic impact on the environment. Population expansion, overconsumption, overexploitation, pollution, and deforestation are just a few of the human activities that are causing havoc on the environment on a massive scale.

B. Air Pollution:

Unfortunately, air pollution is one of the most common causes of environmental damage. Pollution releases contaminants into the environment, which can harm or even kill plants and animals. Industry and automobiles are the principal and secondary sources of air pollution, respectively.

It is a major health danger in the environment, causing an estimated two million premature deaths each year throughout the world. The worldwide burden of disease from respiratory infections, heart disease, and lung cancer is predicted to decrease when air pollution is reduced. Because air quality is a major concern for both developed and developing countries, there have been a slew of first-hand studies published in the literature aiming to quantify the health advantages of improved air quality.

Air pollution is a serious problem in India, with the main causes being the burning of wood and biomass for fuel, fuel adulteration, car emissions, and traffic congestion. The increased use of coal for energy generation and the growing number of car owners are two key contributors to rising fine particulate matter levels.

The preponderance of air pollution is caused by energy use and production. The earth's temperature rises as a result of carbon dioxide and methane pollution in the air. Smog, a kind of air pollution that develops when the temperature is warmer and there is more UV light, is exacerbated by the increased heat. Every year, the cumulative effects of ambient (outdoor) and indoor air pollution cause approximately seven million premature deaths, chiefly due to increased mortality from stroke, heart disease, chronic obstructive pulmonary disease, lung cancer, and acute respiratory infections.

Figure 11.2: This Picture Shows Air Pollution Caused by Industries by Emitting Smoke into the Environment.

According to the World Health Organization (WHO), on a yearly basis air pollution is responsible for almost seven million deaths around the globe. Nine out of ten human beings presently breathe air that outstrip the WHO’s guideline limits for pollutants, with those living in low- and middle-income countries suffering the most.

A countless number of air pollutants give rise to severe health risks and can sometimes be disastrous even in small amounts. Almost 200 of them are managed by law; some of the general pollutants are mercury, lead, dioxins, and benzene. These are also regularly emitted during gas or coal combustion, incinerating, or in the case of benzene found in gasoline.

C. Greenhouse Gases:

By trapping the earth's heat in the atmosphere, greenhouse gases lead to warmer temperatures, which in turn lead to the authentication mark of climate change: rising sea levels, more severe weather, heat-related deaths, and the increased transmission of contagious diseases.

In 2018 carbon dioxide rated for 81 per cent of the country's overall greenhouse gas emissions, and methane made up 10 per cent. Carbon dioxide emitted by combusting fossil fuels, and methane hail from natural and industrial sources, including enormous amounts that are released during oil and gas drilling.

We emit far enormous amounts of carbon dioxide, but methane is consequentially more potent, so it's also catastrophic. Another category of greenhouse gases, hydro fluorocarbons (HFCs), are thousands of times more powerful than carbon dioxide in their increased capacity to trap heat. In October 2016 over 140 countries end up at an agreement to bring down the use of these chemicals which are found in air conditioners and refrigerators—and develop greener alternatives over the near future.

D. Global Warming:

Global warming has been the most important confirmation of global climate change. It is one of the primary contributors to environmental devastation and calamities. Evidence suggests that the Earth's climate system is warming in a way that has never been seen before in human history. The current temperature increase may disrupt the balance of a human environment that has been developed at a lower condition for a long timeframe.

In consideration of the Industrial Revolution, the global annual temperature has increased in total by a little more than 1 degree Celsius, or about 2 degrees Fahrenheit. For the last 40 years, we have seen the global annual temperature rise by 0.18 degrees Celsius, or 0.32 degrees Fahrenheit, per decade.

Now climate scientists have drawn the interference that we must constrain global warming to 1.5 degrees Celsius by 2040 if we are to avoid a future in which everyday life around the world is marked by its serious, most disastrous effects: the extreme droughts, wildfires, floods, tropical storms, and other disasters that we refer to jointly as climate change.

These effects are suffered by all people in one way or another but are experienced intensely by the underprivileged, the economically marginalized, and for whom climate change is often a key driver of poverty, displacement, starvation, and social unrest.

Extreme heat waves have resulted in thousands of deaths around the world in recent years and in a startling sign of events to come, Antarctica has lost nearly four trillion metric tons of ice since the 1990s. The rate of loss could increase if we keep burning fossil fuels at our current pace it may cause sea levels to rise several meters in the next 50 to 150 years and wreaking havoc on coastal communities worldwide.

11.2 Water Pollution:

Water is uniquely exposed to pollution. When hazardous substances such as chemicals or microbes enter a stream, river, lake, ocean, aquifer, or other body of water, the water quality deteriorates and becomes lethal to humans and the environment.

Agriculture runoff is a problem caused by farming. Agriculture is a dangerous source of pollutants that can deteriorate the ecosystem, to the point where the EPA has identified agriculture as the leading source of water pollution. Surface water drains into lakes and streams after sweeping over the soil.

Poisons introduced into waterways will have disastrous results. Fertilizers, whether organic or not, are equally dangerous. Large levels of phosphorus in fertilizer can cause algae to bloom in lakes. It quickly devolves into a situation where bacteria consume all of the available dissolved oxygen in the water. Plants, fish, and other species start to die, and the water gets more acidic as a result.

Municipal and industrial waste discharges contribute decent amount of toxins adding to the random wastes that industry and individuals dump directly into waterways.

Groundwater is also widely contaminated by the original polluting source as it seeps into streams, lakes, and oceans. More than 80% of the world's wastewater is discharged into water bodies without remediation.

Figure 11.3: This Picture Shows Water Being Polluted by Industrial Effluents.

At sea, tanker spills account for more than 10% of the oil in the world's waterways, while the maritime industry's systematic operations—both legal and illicit discharges contribute around one-third.

Radioactive Waste Pollution:

Radioactive waste is any pollution that release radiation beyond what is naturally released by the environment. It's created by uranium mining, nuclear power plants, and the manufacturing and testing of military weapons, as well as by universities and hospitals that use radioactive materials for research and medicine. Radioactive waste can persist in the environment for thousands of years, making disposal a major problem.

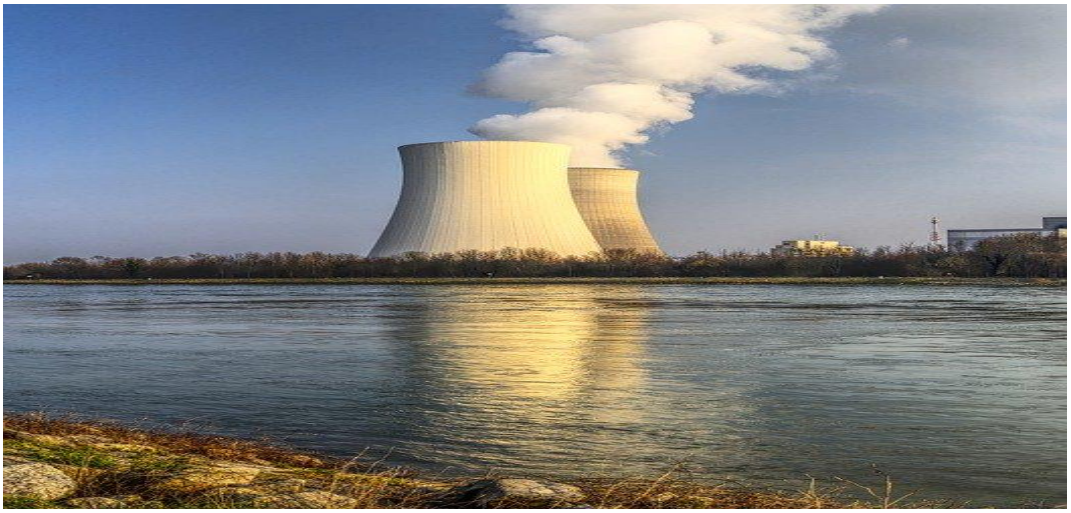

Figure 11.4: This Picture Shows Nuclear Power Plant Near The Water Body.

Every exposure to radiation raises the risk of damage to tissues, cells, DNA and other essential molecules. Each exposure assuredly can cause programmed cell death, genetic mutations, cancers, leukaemia, birth defects, and reproductive, immune and endocrine system disorders.

11.3 Land Pollution:

Land degradation refers to any disruption to the land that is deemed undesirable. It can be caused by both human and natural disasters such as floods and forest fires, as well as a variety of other climate change impacts, land clearance, deforestation, soil nutrient depletion owing to bad farming methods, overgrazing, and over grafting, among others.

The disposal of waste that is not biodegradable, such as plastics, Styrofoam, and metal fragments. These wastes remain trapped in the soil, affecting the soil's fertility. The soil is generally suitable for the growth and cultivation of a wide range of plant species. It also serves as a home for a variety of animals and microbes that play a crucial role in maintaining the ecological balance.

Farming the same crop on the same piece of land might result in fertility loss. Crop rotation can assist to improve soil quality and conserve natural resources, but it is not widely practised, resulting in a progressive decrease in the amount of product produced on the land.

The use of chemicals as fertilisers or pesticides frequently leaves traces of toxic chemical residues, which can eventually make their way into the food chain and pollute water. Up to 40% of the world's agricultural land has been severely damaged, according to estimates.

Figure 11.5: This Picture Shows Dumping of Garbage in Urban Area.

The disposal of waste that is not biodegradable, such as plastics, Styrofoam, and metal fragments. These wastes remain trapped in the soil, affecting the soil's fertility.

Landfills are contributions made by urban cities in response to the massive amounts of trash generated by families, industry, companies, and hospitals.

They represent a serious threat to the environment as well as the people who live there. Furthermore, when burned, they emit a horrible odour that degrades the environment and pollutes the air.

Quarries also create harm to natural environments by generating a variety of pollution types. Soil erosion and landslides are exacerbated by the unregulated cutting of land and stones from slopes.

Deforestation:

Cutting down trees to make place for additional dwellings and industries is known as deforestation. Deforestation is caused by a number of factors, including population expansion and urban sprawl.

Figure 11.6: This Picture Shows the Trees Being Cut Down for Other Uses.

Aside from that, deforestation is caused by the use of forest area for agriculture, animal grazing, fuel wood harvesting, and logging. Deforestation contributes to global warming by releasing carbon into the atmosphere diminishing forest size.

Two-thirds of global forest cover loss is happening mainly in the tropics and sub-tropics, where vast clump of deforestation hotspots are destroying the important ecosystem services forests provide.

Deforestation causes several problems encompassing environmental degradation through increased rate of soil erosion, increase in the sediment load of the rivers, siltation or reservoirs and river beds, increase in the frequency and dimension of Hoods and droughts, changes in the pattern of distribution of precipitation, raise of greenhouse effects increase in the destructive force of the atmospheric storms, etc.

Over Population:

Increasing demands on natural resources, agriculture and livestock is a result of growing population. Population explosion is associated with many negative impacts.

Since 1970 onwards, the world has been facing an ecological overshoot; the demand and the supply capacity are not balanced.

The industrial revolution that began in the 18^{th} century greatly improved the lifestyle of the humankind but put an end of sustainable living.

As people adapted to more comforts, they yearned for still more. The mortality rate has reduced due to superior medical facilities which have resulted in increased lifespan.

Figure 11.7: This Picture Shows Large Group of People Gathering.

Unfortunately, the most polluting species is known to be human. Earth is very good at recycling waste, but people are generating far more than earth capacity can cope with. Pollution occurs at various levels and it doesn't just impact our planet; it impacts all species, including mankind, who rely on it.

Natural Sources:

While environmental deterioration is most commonly connected with human activity, the fact is that ecosystems change through time as well.

Some ecosystems degrade over time, whether or not they are influenced by human activity, to the point where they can no longer support the life that is "meant" to exist there.

Landslides, earthquakes, tsunamis, hurricanes, and wildfires can completely devastate local plant and animal communities, rendering them incapable of functioning.

This can occur either as a result of physical destruction caused by a natural disaster or as a result of resource degradation associated with the introduction of an invasive alien species into a new habitat.

The latter occurs frequently during hurricanes, when lizards and insects are transported over tiny spans of water to new habitats. When the environment can no longer support the new species, deterioration occurs.

Figure 11.8: This Picture Shows The Earth Quake Near The Forest Area.

11.4 Effects of Environmental Degradation:

Biodiversity Loss:

Biodiversity loss can be related to the decline or disappearance of biological diversity.

Biodiversity loss can be a huge threat to the human as we depend on soil and water for the production of our food. Imbalance created in the ecosystem can lead to the arrival of pests that can damage the crops adversely.

Extinction of species can increase over the years as we alter and destruct the habitats for our own sake. Thousands of species are already in danger. CO_2 emission is increased as a result of industrial revolution and it has the ability to reduce the capacity of absorbance of CO_2 by forest and oceans which can lead to some adverse effect in the ecosystem. As we deteriorate ecosystems, the risk of future pandemics increases.

Ozone Layer Depletion:

Ozone layer depletion refers to thinning of ozone layer in the upper atmosphere. Ozone layer protects us from harmful UV radiation which can cause skin cancer when there is a prolonged exposure. 80 per cent of ozone depletion is caused by production and emission of chlorofluorocarbons (CFCs).

The other substances that lead to ozone layer depletion are hydro chlorofluorocarbons (HCFCs) and volatile organic compounds (VOCs). These chemicals can be found in automobile emissions, industrial waste, aerosols, and refrigerants.

Climatic Change:

The effects of climate change on even the smallest species can threaten ecosystems and other species across the food chain. The ~1ºC rise in mean global temperature is causing serious and often unexpected impacts on species, affecting their abundance, genetic composition, behaviour and survival.

Figure 11.9: This Picture Shows Melting of Ice in Antarctica.

Climate change affects the ability of plant species to sequester carbon, turning carbon sinks into carbon sources. Warmer temperatures are also increasingly leading to tree death caused by disease, drought conditions and an upsurge in the number and severity of forest fires, which leads to an increase in carbon emissions.

Environmental policies aimed at reducing CO_2 emissions are essential for reducing the impact of climate change on species.

Species declines threaten the services that nature provides to people, which include functioning as carbon sinks and increasing our resilience to climate change. Prioritising nature conservation and embracing strategies to promote climate change adaptation can enhance species survival.

11.5 Human Health:

As a result of environmental degradation, human health may be jeopardised. Respiratory diseases such as pneumonia and asthma can be caused by toxic air pollution. Indirectly, air pollution has claimed the lives of millions of people.

The air in major cities has become extremely polluted, and the World Health Organization considers pollutant concentrations above a certain level to be dangerous (WHO).

In the recent decade, urban air pollution has risen drastically. Residual suspended particulate matter (RSPM), suspended sulphur dioxide (SO2), and other air contaminants are among the most significant. Increasing industrialization and rising vehicular pollution, industrial emissions, and automotive exhaust are the main causes of urban air quality degradation. The combustion of fossil fuels produces a considerable amount of methane, which causes death by suffocation as well as respiratory damage, heart and lung illness, and other ailments.

Animal excrement and artificial fertilisers damage the soil and water with nitrates. Indoor air pollution may be a larger threat to human health than outdoor air pollution. Smoke containing harmful particles and gases is produced when cooking and heating using wood, crop leftovers, animal dung, and low-quality coal. When these fuels are used indoors with inefficient stoves and inadequate ventilation, TB, other serious respiratory ailments, and even blindness can result.

11.6 Drought, Desertification and Water Scarcity:

Drought and water shortages are the primary drivers of climate change, and they may play a substantial role in climate-related migration. As a result of global warming, droughts, desertification, and water scarcity are becoming more common. Around one-third of the world's population is expected to be affected by these events.

As sea levels rise, areas of salinization in groundwater and estuaries will expand, reducing the amount of freshwater available to humans and ecosystems in coastal locations. Furthermore, it alters precipitation patterns, putting a strain on the availability of safe drinking water.

Figure 11.10: This Picture Shows the Drought During Monsoon in India.

11.7 Mitigation of Environmental Degradation:

The environmental damage that we inflict is enormous. We have taken for granted the precious natural resources due to a lack of "environmental value. It has also resulted in an overabundance of low-cost, short-lived goods that are haphazardly discarded into the environment after use, followed by the purchase and discard of new goods, a cycle that continues indefinitely, jeopardising the planet's ability to restore its environmental services on time. This model of our interaction with the world must be altered. We certainly do not have the right to exploit and destroy the bestowed resources without considering future generations of humans and animals.

- **Role of Government:**

The role of the central and local government in decentralized decision-making is analysed in detail. It is argued that proper and appropriate environmentally sustainable decision-making requires intense institutional and cultural change in the society. It necessitates those environmental concepts to be incorporated in the values, attitudes, and behaviour at both society and individual levels.

The government at any level can play a vital role in this process through direct investment in the environmental sector, the creation of a stimulant system being able to guide private entrepreneurs towards a more sustainable use of natural resources, the design of more appropriate institutions or the re-organization of the pre-existing ones.

It’s important to achieve the above changes is the adoption of a decision-making approach, that is able to better account for the complexities of the environmental problems and of the sustainability concept.

That is, a decision-making framework able to place due importance on: capacity-building; information and communication; co-operation; negotiation; and consultation and partnership, which, in turn will: improve environmental knowledge and awareness; optimize information collection; and gain support, consensus, and commitment of individuals in the identification, preparation, implementation, monitoring and evaluation of environmental programmes

- **Sustainable Development:**

Sustainable development is the guiding concept for fulfilling human development goals while also preserving natural systems' ability to supply the natural resources and ecosystem services that the economy and society rely on. The targeted outcome is a civilization in which living circumstances and resource utilisation continue to meet human requirements without undermining the natural system's integrity and stability. Sustainable development is defined as development that meets current requirements while not risking future generations' ability. Sustainable development aims to ensure that society develops in a balanced manner. The exploitation of natural resources to achieve economic goals is at the heart of both economic growth and environmental degradation.

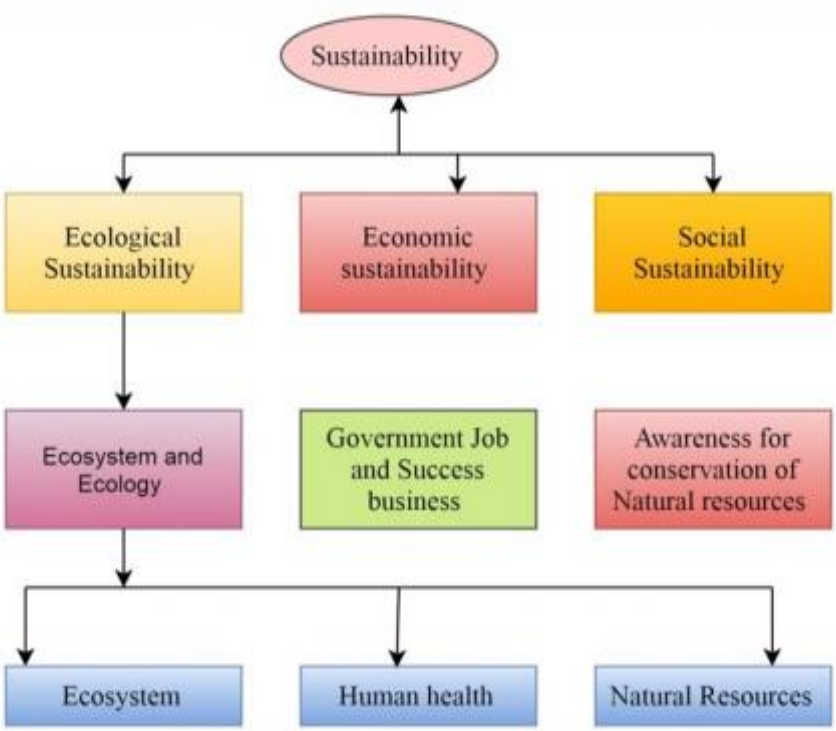

Figure 11.11: This Flowchart Shows Sustainability Components of Human Environment.

- **Solutions for Air Pollution:**

Air pollution is considered to be one of the most serious threats to the living community. Consequently, efficient mitigation strategies need to be adopted. More efforts are needed to improve greenness in developing and developed countries.

zero-emission vehicle , by using alternative fuels, respect to the traditional fossil ones, like electricity, bio-fuels, liquefied petroleum gas (LPG), natural gas (CHG, LNG), and, methane, this kind of cars can produce lower concentrations of pollutants.

Adopt bicycling, skating this also helps to prevent cardiovascular diseases and helps us to stay fit.

Carpooling and public transport must be advised by the enterprises for their labours rather than own transport.

Reduce or eliminate fireplace and wood stove use and try alternatives like LPG and inductions electric and solar cookers.

Avoid burning leaves, trash, and other materials instead try to install compost pit the later can be used as manure. Avoid using gas-powered lawn and garden equipment.

- **Solutions For Land Pollution:**

Make people familiarised with the concept of 3R that is Reduce, Recycle and Reuse. Harvesting resources for requirements can be reduced by reusing materials.

The products which can't be reused can likely be recycled. Use of pesticides and fertilizers in agricultural activities degrade the quality of the soil. So reducing the use of it can improve the quality of the soil. Practicing organic gardening and eating organic food can be healthy also.

By switching to a reusable cloth bag for groceries instead of plastic bags will help break down on the need for non-biodegradable materials. Buying a biodegradable product can be a great alternate.

Avoiding littering and dumping garbage near the residential area is an essential measure. Land is literally the base of our ecosystem as we walk and survive on land. Therefore we should take care of it and nurture it.

- **Solutions For Water Pollution:**

Waste water treatment can be done through physical, chemical and biological process. The more efficient the process the more cleanly the water is.

Green agriculture is also crucial to limit the chemicals that enter the water and it prevents water from getting polluted. Air pollution has a direct influence on water contamination as 25% of human induced CO_2 emissions are absorbed by oceans.

This causes a rapid acidification of oceans, and threatens marine life and corals. Preventing air pollution is the great way to prevent this from happening. In order to reduce plastic entering into the oceans plastic management should be done. Conservation of water is really very important as it is a universal solvent and elixir of life.

11.8 Conclusion:

Since humans have only been given one Earth to work with, and if the ecosystem becomes irreversibly harmed, humankind would become extinct, most international bodies identify environmental degradation as one of the primary risks confronting the world. As a result, in order to live a happy and meaningful life, we must safeguard our environment and focus on environmental degradation.

To build a better relationship between society and its environment, timely preparations for the changes that human activity and competition over resource usage may bring about should indeed be made in order to avoid developing conflicts.

We should conduct both problem-driven and core research to generate the knowledge needed to address current and future environmental concerns.

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12. Environment Degradation and Human Displacement

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12.1 Introduction:

Climate change amplifies extreme weather conditions like intensifying heat waves, extreme rainfalls, etc. affecting vulnerable population throughout the globe. Climate change is not a new phenomenon and is quite evident in last few decades with increasing the risks related with climate change. Anthropogenic pressure not only led to climate related hazards but also amplified their frequencies, intensities and duration leading to damage to nations infrastructure and property, loss of human and animal life along with long term economic effects worldwide. One of the major impact of climate change on human population is the human displacement forcing them to become environment refugee. Persons who are displaced within their country of habitual residence or who have crossed an international border and for whom environmental degradation, deterioration or destruction is a major cause of their displacement, although not necessarily the sole one, belong to environmentally displaced people. These persons are refugees in the real sense of the word, but their situation does not coincide with the legal definition of "refugee." Primary causes for environmental displacements include natural events necessitating disaster relief such as earthquakes, volcanic eruptions and floods. Human-made causes are by far the most underlying causes of the displacements. They include depletion of water, soil and other resources and/or environmental degradation, dam construction, nuclear testing, hazardous waste site construction, and industrial accidents. Global warming necessitates specific attention. Secondary causes (which in part result from the primary ones) include population pressure, diseases, malnutrition and poverty.

People may be forced to leave a region because the environment does not allow a safe living anymore. Moreover, it is possible that the displacement of people may eventually cause environmental insecurity both in the region of origin and in the new settlement area. Environmental security is a state in which an ecosystem is able to support the healthy pursuit of livelihoods of the people living in that system. An environment can by itself be naturally insecure; for example, areas that are prone to natural disasters, such as floods, cyclones and volcanic activity. Moreover, there are human impacts that result in environmental changes, such as industrial pollution, or over-exploitation of natural resources. Special attention should be given to global environmental changes such as desertification, biodiversity and climate changes. Human actions may also lead to sudden and disastrous environmental disruption. This is for example the case when constructing large infrastructures such as dams, transport corridors and industrial accidents. Both human-made and natural environmental security may interact and mutually reinforce each other. For instance, when natural floods in the lowlands are exacerbated by the consequences of large-scale deforestation in the upper regions. Lack of environmental security does not necessarily lead

to displacement of people. There are many examples of populations who coped with difficult environmental conditions and adjusted to possible dangers from natural disasters. If resources such as water become scarce, they may be used more efficiently (e.g. through integrated water management) or be replaced by substitutes (e.g. by replacing surface water by groundwater). Soil degradation can be prevented or slowed down, by using appropriate agricultural techniques. But next to the environmental elements, there are other factors that make people vulnerable to the lack of environmental security. These factors include economic conditions such as ownership, income, the social network, health, education and the family situation. When the combination of environmental, economic and social factors is too unfavorable, people might decide to migrate. If the environmental component is a major factor in their decision to move out, they are referred to as environmentally displaced persons. During the 1980s and the early 1990s, environmentally displaced persons were called environmental refugees. "Refugee" is however a term which has a strong legal connotation. "Refugee" is an international term, defined in section 6B of the 1950 statute of the Office of the United Nations High Commissioner for Refugees (UNHCR), and in article 1 of the United Nations Convention of 1951 relating to the Status of Refugees. In these documents a refugee is "any person who is outside the country of his former habitual residence, because he has or had well-founded fear of persecution by reason of his race, religion, nationality or political opinion, to avail himself of the protection of the government of the country of his nationality or, if he has no nationality, to return to the country of his former habitual residence." Environmental refugees consequently refers then to the people who are being forced to leave their homes; to retreat after losing battles with their environment, both natural, such as droughts, floods, cyclones and earthquakes, and permanent human-caused changes, such as dams, the slow degradation of farmland, the remnants of war and from industrial accidents. A more recent, concise definition has been provided by Myers. Environmental refugees are persons who no longer gain a secure livelihood in their traditional homelands because of environmental factors of unusual scope, notably droughts, desertification, deforestation, soil erosion, water shortages and climate change, also natural disasters such as cyclones, storm surges and floods. Sea level rise, cyclonic storms, desertification have long term effects on populations and also on their resettlements. Risk management approaches are gaining importance.

According to IOM(2017) Environmental migrant is a person who for reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to have to leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their territory or abroad. It has been predicted that by 2050 1 billion people will be forced to migrate due to climate change and environmental causes (IOM 2017b).More than 25 million people were displaced in 2016 due to natural disasters occurring in Asia, particularly China, India and Pakistan (IDMC 2017).

Long term climate variability along with extreme weather events has led to striking displacements both within and international boundaries. Primary causes for environmental displacements include natural events necessitating disaster relief such as earthquakes, volcanic eruptions and floods. Human-made causes are by far the most underlying causes of the displacements. They include depletion of water, soil and other resources and/or environmental degradation, dam construction, nuclear testing, hazardous waste site construction, and industrial accidents. Global warming necessitates specific attention. Secondary causes (which in part result from the primary ones) include population pressure,

diseases, malnutrition and poverty. Environmental displacements are seldom caused by one event. Rather they are a response to multi-factorial stresses.

Moreover, many of the causes are interlinked. The mass and sudden displacement pose logistic and political challenges to the government also. Losses and damages incurred in the form of health, access to services and education, protection and culture(UNICEF UK,2017).The risks associated with these environmental migration vary between different geographic locations and different social structures(IPCC 2014).Globally millions of people are affected by cyclonic storms every year, with 12.9 million people in 2016 alone (IDMC 2017).The internal migrations mostly in poor countries towards capital cities led to more urbanization, overcrowding and threatening the attainment of sustainable development goals, making population more valurnable to communicable diseases due to no access to sanitation(World Bank 2015,Banu *et al*,2013).Poorer countries are more vulnerable to cyclonic storms due to their location in tropical regions and impact on their populations is many fold due to factors like poverty, more dependence of their on natural resources for livelihoods, poor health care facilities and low levels of education in comparison to rich and developed countries(Blaikie *et al* 2014).

Environmental security threatens not only human existence but also the peace and stability of regions around the world, especially (but not only) in poor countries. Environmental security and displacement have been addressed in several international documents. Both the Brundtland report and the UN Conference on Environment and Development in Rio de Janeiro, 1992, pointed to environmental degradation as an important underlying cause for mass migration. Agenda 21 calls for increased research to identify "the major migration flows that may be expected with increasing climatic events and the cumulative environmental change that may destroy people's local livelihoods." Environmental degradation is identified as one cause for the movement of people by the Programme of Action of the UN International Conference on Population and Development in Cairo, 1994.

According to Henrietta fore, executive director at UNICEF (2019) children are the victims of rampant destruction to the planet and a global crisis. It is threatening their basic rights -a clean environment to live in, clean air to breathe, water to drink and food to eat. Frequent droughts and floods has futher increased the global burden of hunger and malnutrition for the next generation of children. More than half a billion children live in areas with extremely high flood occurrence and almost 160 million in high-drought severity zones. Rise in extreme weather patterns, lack of access to clean water to drink, increasing temperature, polluted and toxic air to breathe will worsen children's health. By 2040, one in four children will live in areas of extreme water stress and thousands will be made sick by polluted water. UNICEF is working to mitigate the impact of the climate crisis in countries across the world, especially in African nations-Ethiopia and Malawi.

Traditionally, natural disasters have been associated with temporary displacement or migration but now a day's climate change is triggering widespread extreme weather events leading to unheard of disasters across the world. According to research conducted by IIT, Kharagpur (2019) that climate change was the reason behind the collapse of the Indus valley civilization and led to mass human migration. The gradual southward shift of Intertropical Convergence Zone (ITCZ) over the last 7000 years forced people to migrate for greener pastures as the shifting of the ITCZ decreased monsoon rains, drying up of rivers resulted

in difficulty to do agriculture. The human migration from the dark age is similar to the one that world is witnessing today, especially in low-lying coastal regions and islands which bear the brunt of extreme weather events and sea level rise due to global warming.

Climate change estimates project a 3 to 5°C rise in temperature by 2060. This temperature effect will unevenly be distributed over the world, with more pronounced changes at the poles as compared to the equator. Sea rise is expected to be 18cm by 2030, indicating the loss of coastal lands and flooding estuaries. Today, there are 70 to 80 annual cyclones worldwide, causing 15,000 to 23,000 deaths a year. The damage they cause is estimated at around US$1.5 billion. The trend increases. Areas, which are most vulnerable, include coastal zones where one third of the world population lives. Islands with a minimal elevation above sea level such as the Maldives in the Indian Ocean and many Caribbean Islands, and areas prone to cyclones, which are formed overseas with surface temperatures above 27°C. This allowed the Intergovernmental Panel on Climate Change (IPCC) to conclude, "The gravest effects of climate change may be those on human migration as millions are uprooted by shoreline erosion, coastal flooding and agricultural disruption." The periodic World Migration Report 2020 has dealt in details on the migration due to natural disasters." Many more people are newly displaced by disasters in any given year, compared with those newly displaced by conflict and violence and more countries are affected by disaster displacement', says the report. In 2019, 1.6 million people displaced by disasters were still in camps or places out of their homes. In 2018, of the total new 28 million internally displaced people in 148 countries, 61 percent were due to disasters. At 2.678 million people, India has the highest number of people displaced by disasters and extreme weather events in 2018.According to IDMC, storms displaced 9.3 million people and floods 5.4 million. According to UN, disasters and geophysical hazards have an average of 3.1 million displacements per year since 2008.According to WMO Secretary General Petteri Taalas "Heat waves and floods, which used to be once-in -a -century events are becoming more regular. This is a trend that has continued since the last few decades. According to the report, more than 10 million people were displaced internally-within a country-between January and June 2019.Out of this, 7 million were due to extreme weather events like floods, cyclones and hurricanes.

Environmental Degradation Spirals A growing frequency of natural disasters, partially linked to climate changes, is one of the causes of the destruction of people's basic means of living. Difficult circumstances may drive people towards marginal (e.g. the edges of the Sahara), fragile (e.g. mountain areas) or disaster-prone (e.g. the fertile, but flood prone islands in front of Dhaka's cost) areas, not fit for cultivation or human settlement. The result is a further degradation of a land and a narrowing of the basis for their already precarious situation. In many developing countries, notably in Africa and Southern and Eastern Asia, the likelihood and frequency of natural and human-made disasters is closely linked to economic, social and political difficulties. Countries, which are hardest hit by natural disasters, are often those, in which environmental degradation is proceeding rapidly as a result of human activity. In many Southeast Asian countries upstream deforestation has made coastal areas more vulnerable to cyclones and floods. Rapid population growth and poverty drives people to cultivate fragile and endangered land, and adds to a steadily rising numbers of people vulnerable to environmental change. A vicious spiral of environmental degradation and displacement may start if the problem of environmental insecurity is not addressed at an early phase.

A natural disaster is "the impact of a natural hazard upon a population or area which is vulnerable to such impacts and where impacts result in substantial damage, disruption and casualties."

They include earthquakes, volcanic eruptions, hurricanes, floods, droughts, heat- and cold waves, and fires. In all these situations the impact is manifested as a disruption of the human ecology of the affected area. They have become hazards since humans are involved and they have become disasters as a result of the way humans live in natural hazard-prone areas. Natural disaster prone areas are unevenly distributed over the world. Areas where tectonic plates meet are prone to earthquakes. Hurricanes can only originate in areas where the surface temperature of the ocean water is 26°C or higher. Islands offer an interesting case study. Some of them are prone to earthquakes and volcanic eruptions as a result of their geographic location and geological ontogenesis. Moreover, many islands and island archipelagos lie in the oath of revolving storms. Extreme weather events such as the El Niño/La Niña climatic phenomena also affect island states causing forest fires and droughts and an increase in epidemics and disease outbreaks such as malaria, Dengue fever and cholera. Islands in the Caribbean, South Pacific, and Indian Ocean are particularly at risk to multiple natural hazards. During the last quarter of the twentieth century natural disasters killed an average of 3311 people each year on islands globally. They also affected nearly 6 million islanders per year. During the period 1280 island disasters were reported, an average of 51 natural disaster events per year. Most of them were experienced on Asian islands and the least on European islands. Most disasters during this period were the consequence of high wind incidents (30%), with islands in Asia and the Caribbean being prime hosts of hurricanes and typhoons. There were also a significant number of earthquakes (10.5%) and floods (17%) reported during this 25-year period. "Damages and economic losses directly related to the occurrence of a disaster situation" is the indicator used to estimate the economic impact of disasters. Disasters on islands caused US$61 billion in damage over 25 years, i.e. islands on the average face nearly US$2.5 billion in direct financial costs a year. Asian islands bore over 80% of these costs. In 1998 the incidence of natural disasters was particularly high. 44 disasters were reported to have affected islands. In 1998, one event, a tsunami, killed over 2000 people in Papua New Guinea. This is the event with the highest number of reported deaths during this year. Over 10 million islanders suffered from various consequences of disasters including loss of their homes, livelihoods, family and injuries. Although this is an alarming picture, it is unclear how many people, driven by these catastrophes, decided to leave their homeland and to migrate. Land degradation: Erosion, salinization and water logging of irrigated lands are the main causes of land degradation. Today, an estimated 6 070 500 ha of land each year lose its productive capacity. 20% of vegetated land in Asia is degraded since 1945. In Africa this figure amounts to 22% and in South America it is 14%.Erosion threatens the topsoil in a dramatic way. During the past 20 years some 500 billion tons of topsoil have been eroded away worldwide, roughly equivalent to the topsoil in India's croplands.

In countries as disparate as Mexico, Costa Rica, Mali and Malawi, soil erosion causes annual losses in farm output worth 0.5 to 1.5 percent of the GNP. Yet between a quarter and half a billion impoverished people in developing countries find they obliged to farm hillsides where they cause exceptional erosion. Improper irrigation has caused worldwide 3.5 million km2 of salinized land. 15,000 to 20,000 km^2 are lost every year to salinization.

Water shortage: 550 million people today live in countries with chronic water shortages. According to the World Water Council 25 countries cope today with serious water shortage. In 2005 this number will be increased to 60 countries. By 2025 an estimated number of 3 billion people will have to live with "water stress," structural shortage in different intensities.

The principal risk areas include parts of India and Pakistan, the Middle East and much of Africa. Water shortages cause major problems for health, irrigation agriculture and industry. The World Bank estimated that providing the population worldwide with drinking water would cost 600 to 800 billion dollars. Treating this water (to recycle it e.g. in agriculture) doubles this figure. Offering basic water security by the year 2025 would necessitate at least a doubling of the investment cost in water infrastructure works. Water shortages are made worse by increasing droughts in the wake of global warming. Droughts that have only a five percent frequency today may increase to 50 percent by 2050. Water is intimately related to preventable diseases, as the main group among them is water born, agricultural yield and poverty.

Desertification: Today 30% of the earth's land surface is affected by the degradation of fragile dry lands. It thereby threatens the livelihoods of at least one billion people in 100 countries, of whom 135 million are experiencing the rigors of severe desertification. It eliminates 60000 km2 of agricultural land each year, and reduced another 200 000 km2 to a state of grossly depleted productivity. The cost of agricultural output lost is around US$42 billion per year. Areas which are most threatened include northeastern Brazil, north and central Mexico, western India, Pakistan and North Africa. But drought is a still more important factor in Sub-Saharan Africa. This is the region with some of the greatest population pressures, and committing environmental pressure. It has by far the largest proportional numbers of environmental refugees already. Especially at risk are the Sahel countries, where the desert moves up and down, from the Horn of Africa, and a "dry corridor" in the South and from Namibia through Botswana and Zimbabwe to southern Mozambique. Desertification is a typical example of a complex human ecological problem: it reduces the land's resilience to natural climate variability, it undermines food production and contributes to famine, it deeply affects the socioeconomic conditions of the local population, thereby triggering a vicious spiral of poverty, ecological degradation, migration and conflict.

Deforestation: It has been estimated that up-to-date 350 million people may face absolute shortages in fuel wood. In 2010, 40 to 50% of the existing forest cover is projected to be lost. Slash-and-burn cultivator's cause well over half of all the forestation, most of them are peasants displaced by soil erosion, water deficits, landlessness, poverty and population pressure in traditional farmlands. These "shifted cultivators" now totalize at least 200 million and possibly as many as 500 million.

Whatever the causes of deforestation are, it eliminates the homelands and the livelihoods of large numbers of people. Especially ethnic minorities and other indigenous people are most vulnerable. Documented cases of involuntary migration caused by (among other reasons) desertification exist in the Philippines, Ethiopia, Madagascar, Peru, Haiti and Brazil. Deforestation influences flood/drought regimes and local rainfall. Tropical deforestation is also the cause of the bulk of species extinction.

Climate change: median estimates project a 3 to 5°C rise in temperature by 2060. This temperature effect will unevenly be distributed over the world, with more pronounced changes at the poles as compared to the equator. Sea rise is expected to be 18cm by 2030, indicating the loss of coastal lands and flooding estuaries. Today, there are 70 to 80 annual cyclones worldwide, causing 15 000 to 23 000 deaths a year.

The damage they cause is estimated at around US$1.5 billion. The trend increases. Areas, which are most vulnerable, include coastal zones where one third of the world population lives. Islands with a minimal elevation above sea level such as the Maldives in the Indian Ocean and many Caribbean Islands, and areas prone to cyclones, which are formed overseas with surface temperatures above 27°C. This allowed the Intergovernmental Panel on Climate Change (IPCC) to conclude, "The gravest effects of climate change may be those on human migration as millions are uprooted by shoreline erosion, coastal flooding and agricultural disruption." The possibilities to prevent natural disasters, except those emerging from global changes, are limited. Nevertheless much more can be done on research to develop early warning systems, preparedness, mitigation and rehabilitation. This necessitates a complex system of collecting data, identification of possible affected areas, the building of early warning systems, the training of personnel and the population for disasters, disaster mitigation, and rehabilitation strategies often after the disaster has occurred.

The process of environmental degradation may be gradual, as in the cases of water pollution and water shortage, coastal flooding and more frequent disasters due to global warming and sea level rise, over exploitation of natural resources, desertification and soil erosion. Detrimental environmental problems may remain undiscovered until a certain threshold is reached beyond which they become a severe threat to the environmental security of the region. Preventive action is the most important strategy to use in tackling these problems. Although a legislative and policy basis exists to address these issues, this should be strengthened both at the national and the international level. Next to prevention, there is a need to identify these dangers at an early stage. Regions that are likely to become environmentally insecure should be monitored. Research is needed to collect both the physical data (e.g. using geographic information systems) and the socioeconomic and political situation in the area and the vulnerable groups living there. Geographic information systems (GIS) have an important role to play here. They can be used to describe and analyze a wide variety of drivers, including drought, earthquakes, erosion, floods, forest change, irrigation, landslides, mining, pests, population, salinization, storms and volcanic eruptions. They can equally be used in locating potential problem zones, in making inventories of problem zones and in verification and analysis of the information. They have been used in monitoring both preventive and follow-up aspects of environmental displacements. Specific research is needed to establish early warning systems. They should allow global surveillance of areas at risk of gliding off into environmental insecurity and displacement. These early warning systems are essential to develop, as policy intervention for most causes underlying the problem is most successful at early stages of conflict. Of great importance to all populations living in resource-marginal and natural catastrophe prone areas is disaster preparedness should be developed as an essential tool in facilitating and preventing disruption of the developmental process. Environmental impact assessment (EIA) and strategic environmental assessment (SEA): Environmental assessment is still the most specific instrument for environmental prevention. It has been shown that displaced people

suffer the most important impact in the construction of large dams. Displacements should be addressed more fully to obtain more weight in the assessment of projects. However, as most of the causes which need to be prevented appear more at higher levels of decision making than at the project adjacent mountains, where they start agriculture in inhospitable areas, causing erosion, render the environment most unsustainable, and finally migrate for years leaving behind a trace of environmental destruction.

To avoid this, countries should have resettlement policies to prepare for those situations in which environmentally displaced people cannot return to their home countries. When, such as after floods, return is possible, an active policy which aims at assisting migrants to return to their home areas should be developed.

Environmental displacements are seldom caused by one event. Rather they are a response to multi-factorial stresses. Moreover, many of the causes are interlinked. Water shortage for example results in threatened harvests, famine, disease, poverty and social marginalization. This type of environmental degradation spirals is the real motivation of a population's decision to move, as their homeland cannot sustain them any longer. Action responses to environmentally induced migration have to do both with prevention and mitigation. At the prevention and preparedness side, environmental impact assessment, strategic environmental assessment, implementation of international environmental conventions and national environmental plans are among the most important instruments. Relocation policies, resettlements, technical improvements, early warning systems, and local ownership of mitigating actions are essential elements of the mix of instruments which is necessary to help environmentally displaced people with rehabilitation and their eventual possible return to their homeland whenever possible. Environmental displacement is closely interlinked with environmental security. Displacement can be the cause or the result of a lack of environmental security.

As environmental displacements are in part caused by exploitation of natural resources by mega industrial projects, environmentally displaced people face also environmental injustice. Environmental injustice implies any undue imposition of environmental burdens on innocent bystanders or communities that are not parties to the activities generating such burdens. Environmental inequity involves a skewed (or disproportionate) distribution of environmental risks by nationality, race, ethnicity, or class.

These concepts are intertwined with the concept of environmental racism, which suggests a deliberate targeting of the communities of specific racial, ethnic, tribal, or cultural groups as depots for hazardous waste, environmentally and health-threatening products, and other forms of pollution. Both environmental injustice and environmental racism are promoted through systematic exclusion of minority groups in vital environmental policy decisions.

Minority status, lower socioeconomic status, powerlessness, and other conditions of marginalization have been identified as major factors influencing the extent of environmental injustice and human rights repression. Localizing the cause of environmentally displace persons in the "environmental injustice" framework links up the discussion of part of them with legal frameworks and international legal recognition of the problem.

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13. Green Chemistry: A Strategy to Improve Environmental Toxicity

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Abstract:

The term green chemistry was invented in the 1990s to highlight the growing interest in developing more environmentally friendly chemical processes and products. The United States Environmental Protection Agency reports that "Green Chemistry is the design of chemical products and processes which reduce or eliminate the manufacture of hazardous substances". One of the main causes of pollution and environmental degradation is chemistry. While this is not a new field, the importance of green chemistry has been gained recently because of increasing environmental issues.

Green chemistry involves design and synthesis of environmentally sound chemical processes, green pollution and/or treatment approaches, biofuels and bioenergy development, biocatalysts, green chemistry policies and ethics. For all aspects of Green Chemistry, improved chemical research and advanced techniques, the experimental tasks are made easier for new investigators. This increase is positive and harmless in the field of chemistry. It is a long-term task for the promotion of green chemicals, with many environmental science and technology challenges that need to be overcome, including chemical engineering, physics and biology.

13.1 Introduction:

Environmental issues have become very serious and need government attention. The environmental budget allocation in Indonesia will be Rp 15,428.4 billion in 2018[1]. The increasing diversity of industries is demanding a diversified lifestyle and pattern of human consumption. In addition to increasing waste, diversity in the patterns of consumption affects how material content of waste is composed naturally and pollutes and threatens human health [1]. In addition, waste can be decomposed in an increasingly difficult way. Green chemistry is extremely important for reducing or preventing damage to the environment.

The lack of use of green chemical products will affect environmental damage, such as harmful chemicals for the environment and the health of human beings.

A lack of use of green chemistry will impact the environmental damage or pollution in the overcoming of environmental issues by the government and companies.

The declining environmental quality will also affect economic growth and lead to different sustainability social conflicts, including various social, entrepreneurial and governmental elements.

Green chemistry is known as a study aimed at reducing or eliminating the risk of the adverse environmental effects of chemicals, including humans.

Green chemistry is, according to [2], a very effective approach to pollution prevention because it can be used directly in the current situation by scientists.

Green Chemistry is the design, design, production and end-of-life, of chemical products and processes reducing or eliminating the use and production of dangerous chemicals throughout the entire life cycle.

Green chemistry builds on conventional chemistry and technical engineering by using twelve basic principles that guide sustainable chemicals and processes molecular design.

Adherence to these principles prevents contamination and waste, leads to a less dangerous and more efficient synthesis of chemical products, promotes renewable feed materials and contributes to the development of more secure chemical substances.

Green chemistry incorporates every component in your business, including the way companies manage their businesses to engage their customers throughout our supply chain from product design to feedstock selection and the production to finished products.

Whereas green chemistry is mainly used for chemical discovery, development and formulation, product developers, manufacturers, brands and retailers play a significant role in its execution.

You do this through changes to design specifications, the procurement of materials and products which incorporate green chemistry, changes in production practises in order to substitute for or reduce the use of hazardous chemicals, and the development and implementation of policies that limit the chemicals of concern in products they produce, produce or sell.

The first sustainability report (2012) of the European Chemical Industry outlines the sector's vision of playing a key role in global sustainable development.

The chemical industry seeks, through the application of green science and technology, natural resource efficiency and safe chemical products to chemist and consumer, to ensure its operation is sustainable and a key enabler for a sustainable society.

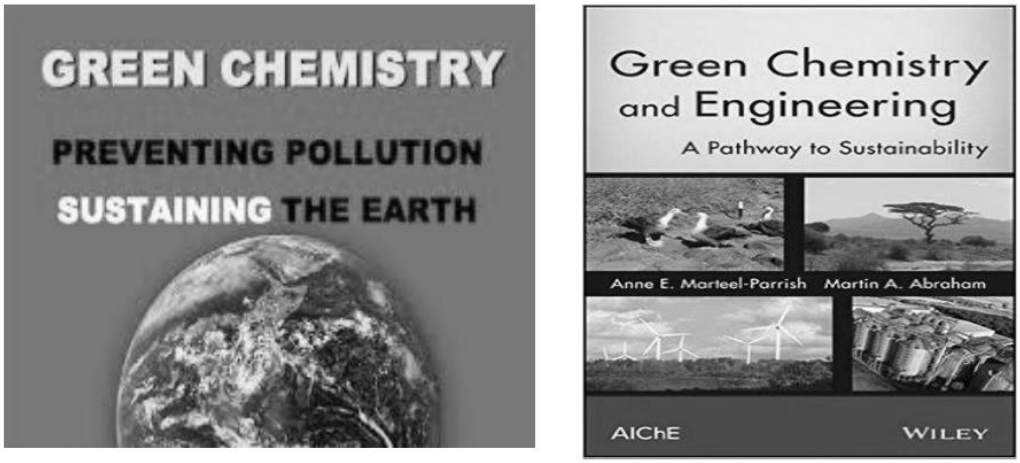

Figure 13.1: A number of books on green chemistry and sustainable development have been published. Figure 1. AE, Abraham MA. Marteel-Parrish. Engineering and Green Chemistry: a path to sustainability. Wiley-AlChE NYC, 2013

A. Methodology:

This study describes green chemistry and its economic impact. The literature review [3] indicates that a method is used to collect data to seek information through books, newspapers, magazines and other literature. The research review articles came from a number of journal studies on green chemistry and its impact on the economy.

B. Findings:

The Green Chemical Concept The new paradigm of green chemistry is solutions for contemporary, ecological and sustainable challenges. Green chemistry is often used to conserve environmental and resources [4] and also to redesign chemicals to eliminate toxicological and environmental consequences [5]. Green chemistry seeks to minimise waste generation, encourage the use of renewable and recycled resources, and ensure maximum energy efficiency [6]. In the article [7] green chemistry was frequently described as 'a novel approach to sustainability that is not regulatory and economically driven.'

In paper[8] it has been mentioned that Green Chemistry offers an excellent framework for systems consistent with the circular economy (consider especially the principles of waste prevention, optimise atom economy, use harmless components, the using of renewable raw materials, and also design for degradation). Green chemistry's concern is to remove or minimise toxic waste generation, which is more serious than treating previously generated waste [9].

According to [10], twelve green chemistry principles exist, in particular:

- Prevention: Preventing production of waste is better than treating or purifying waste after generation.

- Atomic Economy: Synthetic methods should be designed to maximise the integration into the final product of all materials used during the process, i.e. the molecular level reduction of waste.
- Less dangerous chemical synthesis: synthetic methods should be designed where possible for the purpose of using and creating substances with little or no toxicity for the human health and the environment.
- Safer Chemicals design: Chemical products should be designed to finish their desired function while minimising their toxicity and environmental impact throughout the process design.
- Solvent and auxiliary products: for any given step, safe solvents available must be selected and organic solvents should be avoided whenever possible.
- Energy efficiency design: select the chemical method that is least energy demanding. Temperature and pressure are ideal for the ambient environment.
- Use of feed stocks for renewable energy: use chemicals produced from renewable sources (i.e. plant-based) rather than from aggravating resources.
- Reduce derivatives: Minimize the temporary derivative route such as the blocking group and groups of protection.
- Catalysis: In reactions use catalytic instead of stoichiometric reagents.
- Degradation design: Design chemicals which, at the end of their function, degrade to harmless substances which do not persist in the environment.
- Real-time contamination prevention: monitor chemical reaction before the formation of hazardous substance in real time, during processes and before control.
- Safer accident chemistry: select and develop safe and minimise potential for chemical accidents, explosion and fire chemistry techniques and substances.

C. Green Chemistry:

Green chemistry is an approach used to overcome environmental problems in terms of produced chemicals, processes or reaction phases. This concept underlines a method that reduces the use and production, both in design and process, of hazardous chemicals [11]. A range of threats both to human health and the environment, including toxicity, physical dangers, global climate change, and the depletion of natural resources, form part of the Green chemistry concept[11]. Green Chemistry focuses on the application to or manufacturing of chemical substances to reduce the use or production of dangerous substances that can affect the health of lives and protect the environment of a range of chemicals [12].

Rashmi Sanghi quoted from [13] that Green Chemistry is a vital part of a comprehensive human health and environmental protection programme. Green chemistry is generally concerned with waste-minimization issues, the use of catalysts in reactions, the use of harmless reagents, the use of renewable base materials, increased cost-effectiveness and recycling of eco-friendly solvents [13]. Green chemistry is a study designed to improve the environmental and health consequences of the chemical industry [14]. There are 12 green chemistry principles[10], namely the prevention principle: It means that waste prevention is better than waste treatment or waste clean-up; Atomic economy implies the development of synthetic methods to maximise the incorporation into the final product of materials used from process; Lower risky #chemical synthesis; Safer chemical engineering; safe solvents

and auxiliary equipment; energy efficiency design; the use of reusable feedstocks; derivatives reduction; catalysis; degradation design; Real-time pollution prevention analysis; more accident prevention chemistry inherently safe.

13.2 Environmental Sustainability:

The concept of sustainability originated in the 1970s and 1980s and was driven by environmental and catastrophic incidents and concerns about the contamination of chemical and resource depletion [12]. The concept of sustainability was first introduced in a meeting and report. The three-pronged theory in three fields – social, economic and environmental – was historically based on sustainability as well. The theory underlines that the integration and balance between the economy, society and the environment should be ensured in the implementation of development [15]. Sustainability, as well as the design of human and industrial systems can be defined by ensuring that the use of natural resources and the human cycle does not result in a decreased quality of life and a decrease in environmental quality [16]. Environmental sustainable performance can be achieved through the reduction of solid/liquid waste, emissions reduction, resource reduction and consumption of dangerous/dangerous/ toxic material, reducing environmental accident frequency and improving health [17]. Sustainable development has been agreed as a development to meet existing needs without compromise or sacrifice the freedom to meet the needs of future generations' lives There are two important ideas: one is that of the "needs," namely, the essential requirements for the continuation of human life, and b) is that of limitations on the environment's ability to meet current and future needs, as a result of technological and social organizations [18].

Economic Impact:

Using green chemistry can help protect the environment by preventing pollution before it happens. Green chemistry can also help companies become more efficient and save money while doing so. The application of green chemistry, according to the same expert, can improve economic performance. In a paper [9], it was stated that the advantages of economics on the implementation of green chemistry include the need for companies to invest less in waste storage and treatment, as well as environmental damage compensation payments. One of the concepts in green chemistry is recycling, which is crucial for promoting a circular economy, a new paradigm of sustainability that reduces environmental impacts while also opening up new business opportunities [19].

Environmental chemistry is crucial for business and the economy as well as for people and the environment. Finding methods and techniques to speed up chemical reactions with small amounts of reactants and deliver the same results and price for the same product is made easier with this tool. Reduced synthetic steps allow for increased production and plant capacity while using less energy and water. Reducing the amount of chemicals used in product manufacturing reduces waste, which lowers the cost of removing chemical waste and toxic waste treatments. Green chemistry's advancement is largely fueled by the potential financial rewards. In the chemical industry, green chemistry methodologies are being adopted because they improve the bottom line. Green chemistry reduces a wide range of operational costs [2].

Other economic benefits can be obtained from the application of green chemistry, as stated by [9] that the economic benefit of green chemistry such as the reduction in investment in waste storage and treatment and compensation payments for environmental damage.

13.3 Fields of Green Chemistry with New Technological:

A wide range of chemical products and technological innovations have advanced in the last decade due to advances in Green Chemistry/Green Engineering research and practical applications in these fields. Solutions are among the most important areas of GC and GE's research and development. For example: decreasing global warming and using carbon dioxide (CO2) as a raw material in chemistry; microwave and electrochemical synthesis methods; syntheses without solvents (or using water as a solvent); phytoremediation; waste management/wastewater; eco-friendly pigments; innovative food products; biopolymer technology; renewable materials; renewable energy sources; and so on. Other examples: Although GC and GE products have many innovative fields, we've listed some of the most basic here.

- Practical synthetic reaction biocatalysis and biotransformation processes
- The process of evolution is being guided. Synthetic organic synthesis enzymes that are new to science
- Green chemistry and synthetic pharmaceutical processes
- Generating hydrogen from water via catalytic splitting
- Sources of energy that are both green and renewable
- Environmentally friendly chemistry and agricultural technologies
- Green chemistry. Multicomponent reactions
- Chemical industry green flow chemistry and continuous processes
- Green chemistry and biodegradable polymers
- Green chemistry and organic solar cells
- In industrial synthesis, the choice of solvent and solvent

In addition to the aforementioned, numerous other technological fields, such as Green Chemistry and Green Engineering, have advanced recently. Existing innovative inventions have already been put to use and improved sustainability while decreasing environmental pollution and releasing safer chemical products.

Five Strategies:

The agenda identifies five main strategies for accelerating green chemistry innovation and adoption. These are the approaches to:

A. Enhance market dynamics by continuing to develop a thorough understanding of the enablers, market drivers, and obstacles associated with green chemistry. These are some examples of the details:

- Companies across the value chain face numerous and distinct obstacles.
- Green chemistry's key leverage points

- How the market for green chemistry solutions can be developed.
- Models for lowering the high costs of scaling up and sharing market and other risks.
- Priority challenges in green chemistry that must be overcome.
- Why some green chemistry chemicals, materials, and finished goods have been successful while others have failed in the market..
- How to meet green chemistry companies' labour requirements.

B. Support smart policies by developing and promoting policies at the state and federal levels that increase the supply and demand for green chemistry-based products. Smart policies include the following elements:

- Open green chemistry research and manufacturing centres or provide financial support for such efforts.
- Encourage green chemistry research and commercialization by providing financial support, incentives, and/or prizes.
- Manufacturers of green chemistry chemicals and products should be able to get permits more easily.
- Increase the number of people who are educated about green chemistry and have access to green chemistry-related jobs.
- Contribute to expanding the global market for green chemistry innovations from the U. S.
- Develop regulatory frameworks that assist industry in reducing uncertainty.

C. Foster collaboration by making it easier for suppliers and product manufacturers to share information about green chemistry solutions and forming alliances to address key challenges. Collaborations should aim to achieve the following results:

- Make it possible for businesses facing chemistry challenges to connect with those working on green chemistry solutions. Create these opportunities.
- Incorporate more up-and-down supply chain information flow improvements (such as those relating to chemicals and demand).
- Develop design criteria and green chemistry solutions together by identifying opportunities and deploying pre-competitive strategies.
- Encourage the alignment of supply chains for new technologies.
- Enhance green chemistry education and hire more people with green chemistry backgrounds.
- Assist a company's culture in incorporating green chemistry and green engineering practices.

D. Inform the marketplace spreading knowledge about the business, economic, and health benefits of green chemistry, as well as funding options. Included in this type of data would be the following details:

- Funding options from the federal and state governments, as well as financial incentives offered by the location itself.

- Green chemistry's advantages for businesses, public health, and the environment are quantified.
- Employers in the green chemistry industry have specific labour requirements.
- Using green chemistry as an alternative to conventional chemistry in certain chemical processes.
- Information on the societal costs of accidents and incidents resulting from the use of hazardous chemicals.

E. Track progress by enhancing metrics for green chemistry and collecting and reporting progress data on a regular basis. These figures ought to show:

- Examine how far a company, industry or economy has come in terms of green chemistry.
- Make use of and expand on currently-effective economic and sustainability tools and criteria.
- Improve chemistries, materials, products, and processes by establishing benchmarks.
- Green chemistry can help to build business and policy cases by quantifying business risk from conventional chemistry, revenues, job growth and economic benefits as well as trends in capital flow.
- Be evaluated on a regular basis to make sure they're still working.

13.4 Result and Discussion:

Green manufacturing and green chemistry play a role in improving the environment's quality, according to a review of the relevant literature conducted recently.

Reduce the use of harmful chemicals that have an impact on the environment and human health is a goal of green manufacturing and green chemistry, two distinct fields.

While green manufacturing and green chemistry have environmental benefits, they also benefit the economy.

According to [9], some of the economic benefits generated by the implementation of green chemistry in industrial chemical processes, such as reduced investment in waste storage and treatment as well as compensation payments for environmental damage, can be predicted.

The results obtained for humic complex systems lead us to believe that the combination of green chemistry and nature-inspired technology can lead to a new direction in science – ecoadaptive chemistry and technology, which implies manipulation and reproduction of complex natural matter and systems in Figure 13.2.

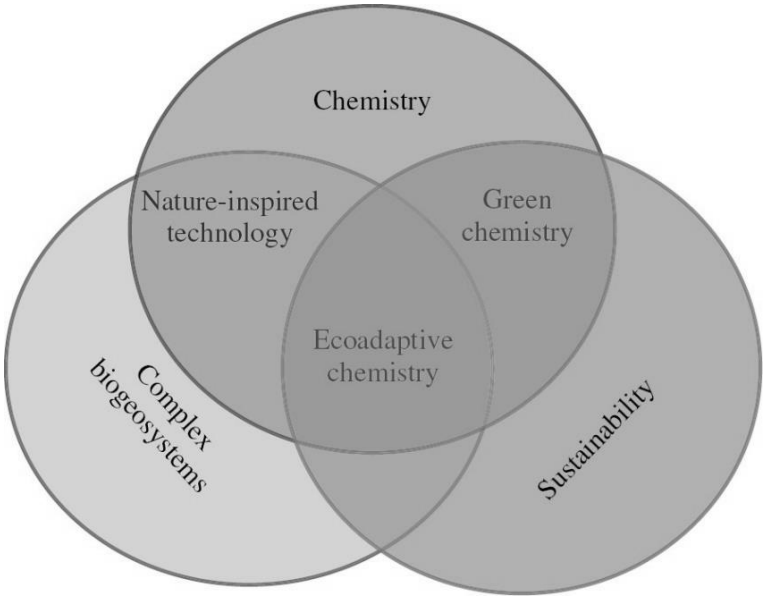

Figure 13.2: Ecoadaptive chemistry as a merge of green chemistry and nature-like technology at the crossing of chemistry, complex systems, and sustainability

13.5 Conclusion:

Research into green manufacturing and green chemistry aims to minimise the negative effects of industrial activity on the environment. There is a positive impact on both the environment and human health when products are made with eco-friendly processes and chemistry. Consequently, the implementation of green manufacturing and green chemistry is an investigation that needs to be carried out in the course of business activities by various companies.

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14. पर्यावरण व जलवायु परिवर्तन

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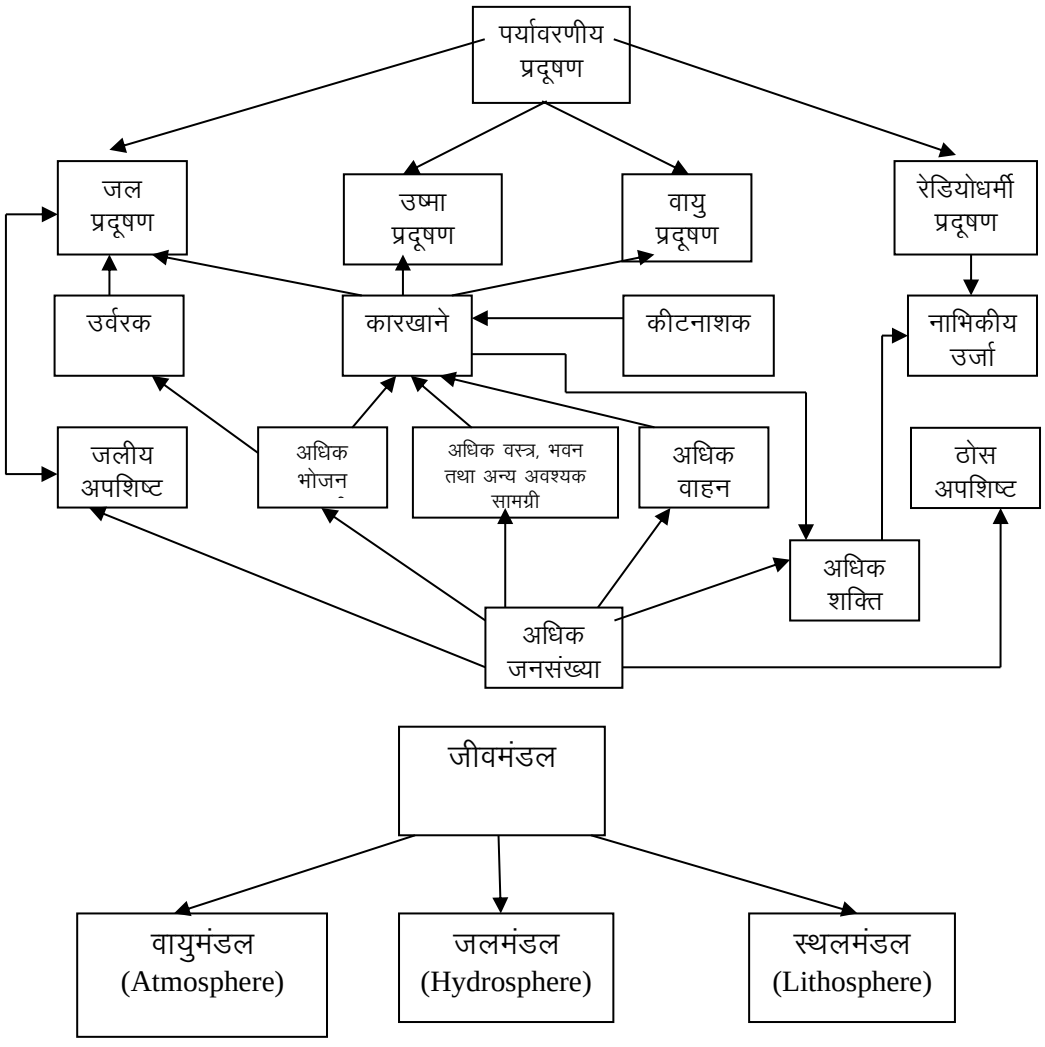
"धरती एक अत्याधिक बीमार ग्रह बन गई है जिसका तुरन्त उपचार आवश्यक है। पृथ्वी पर हर ओर प्रलय का खतरा मंडरा रहा है, यदि इसे ना रोका गया तो पूरा ग्रह रहने लायक नही रहेगा।" – के.वी. नारायण

यजुर्वेद में अंतरिक्ष, पृथ्वी, औषधियाँ तथा समस्त ब्रहमांड में शांति की प्रार्थना की गई है। स्वयं शांति के लिए भी शांति की प्रार्थना की गई है। ऋषियों ने वृक्ष रक्षा को धर्म के साथ जोड़कर वृक्षारोपण के लिए प्रोत्साहन प्रदान किया। उनके द्वारा निर्देशित जीवन पद्धति इस प्रकार है कि व्यक्तियों, जीव–जन्तुओं, पशुओं, वृक्षों, लताओं आदि को हानि पहुँचाए बिना प्रकृति पर निर्भर कर सके। भोजन बनाने के लिए लकड़ियां प्राप्त करने के लिए विधान बनाया कि वृक्ष पर लगी सूखी लकड़ियों का उपयोग उपयुक्त कामों के लिए किया जाए, यज्ञ के लिए भी सूखी लकड़ियां काम में लाई जाती है। यज्ञ में आहूति करने से औषधियाँ सूक्ष्म (अणु) रूप ग्रहण करके समस्त जंगल–जीवों को पोषण प्रदान करती है। उससे वायुमंडल स्वच्छ व सुगंधित होता है, ऐसा उनका मानना था। यज्ञ करना प्रत्येक गृहस्थ के लिए एक दैनिक दायित्व बनाया गया। यज्ञ सृष्टी को नियन्त्रित करते है और सृष्टी समस्त वनस्पतियों तथा जीव–जन्तुओं को नवजीवन प्रदान करती है, ऐसा ऋषि मानते आए है।

जल को जीवन की संज्ञा दी जाती है। इस लिए जल की शुद्धता में भी उन्होनें रूचि दिखाई। जल स्त्रोतों से जल ग्रहण करने की नियमावली का निर्धारण किया। जल को दूषित करना और पापों का प्राश्चित भी निर्धारित किया। गंगा, सिंधु, कावेरी, गोदावरी आदि नदियों को पवित्र घोषित किया। गंगा माँ के प्रति जो पूरे भारत में सम्मान है, वह एक दिन का प्रयास नही है। सरस्वती के प्रमाण उपग्रहों से प्राप्त चित्रों के आधार पर मिले है। सरस्वती आज भी प्रवाहित है, परन्तु व स्थल ना होकर भूमिगत है। मरूस्थलों के बनने का मुख्य कारण वनों का कटाव है। वनों के कटने से वृष्टि कम हुई है। वनस्पतियां न होने के कारण मृदा क्षरण बढा, जिससे पर्यावरण का सन्तुलन बिगड़ गया है। जिससे वनस्पतियों की संख्या में कमी होती गई और मरूस्थल की व्यापकता अधिक होती चली गई।

आईस्टीन ने कहा था दो चीजे असीमित है – एक ब्रहमांड और दूसरी मानव की मूर्खता, मानव ने अपनी मूर्खता के कारण अनेक समस्याएं पैदा कर ली है। इस समय मानव के सामने अनेक समस्याएं है – जनसंख्या वृद्धि, अशिक्षा, दरिद्रता व प्रदूषण। ये समस्याएं इस प्रकार से जुड़ी हुई है कि एक रस्सी का निर्माण हो गया है, यह रस्सी मानव को जकड़े हुए है। ये समस्त समस्याएं एक दूसरे को सहयोग प्रदान कर रही है।

बढती हुई जनसंख्या की पूर्ति के लिए अधिक मात्रा में खाद्य सामग्री, अधिक भवन, अधिक संख्या में परिवहन तथा अधिक मात्रा में उर्जा की आवश्यकता होती है। अधिक जनसंख्या अधिक मात्रा में जलीय उपशिष्ट पदार्थ छोड़ती है। अधिक उपशिष्ट पदार्थ पर्यावरण प्रदूषण में वृद्धि करते है। भोजन सामग्री व अन्य पदार्थ की पूति के लिए अधिक कल कारखाने व अधिक सिंचाई की आवश्यकता होती है। इन सब से अलग अलग प्रकार के प्रदूषण पैदा होते है जैसे जल प्रदूषण, उष्मा प्रदूषण, वायु प्रदूषण तथा मृदा प्रदूषण आदि। जैसे थर्मल पावर प्रोजेक्ट के द्वारा वायु प्रदूषण, निर्वनीकरण, मृदा अपक्षय जैसे दुष्प्रभाव तो होते ही है साथ ही उनकी चिमनियोंसे निकलने वाले धुएं के रूप में वायु में सल्फर–डाइ–आक्साइड, नाईट्रोजन आक्साइड, कार्बन मोनो डाइ आक्साइड आदि गैसे निकलती है जो मानव तथा वनस्पतियों के लिए हानिप्रद होती है। थर्मल पावर प्रोजेक्ट के द्वारा निकलने वाले गरम जल से नालों का तापमान बढ जाता है, जिससे जलीय वनस्पतियां नष्ट हो जाती है। अधिक उर्जा की माँग की पूर्ति के लिए नाभिकीय उर्जा का प्रयोग करना आज की आवश्यकता है। इससे वायु, जल तथा मृदा में रेडियोधर्मिता बढती है साथ ही न्यूक्लियर वेस्ट का निष्पादन करना अपने आप में बड़ी समस्या है।



पृथ्वी के चारों ओर उपस्थित गैसों के आवरण को वायुमंडल कहा जाता है। इसमें मुख्य रूप से नाइट्रोजन (N_2), ऑक्सीजन (O_2), कार्बन डाइ आक्साइड (CO_2), ऑर्गेन (Ar_2), हाइड्रोजन (H_2), हीलियम (HL_2), नियोन (Ne), क्रिप्टान (Cr), ओजोन (O_3) आदि गैसे तथा जल वाष्प, धूल कण पाए जाते है। वायुमंडल की गैसों में नाइट्रोजन प्रमुख है, दूसरी गैस ऑक्सीजन है जो मानव व जीवों के श्वसन के लिए आवष्यक है। कार्बन डाइ आक्साइड पौधों की प्रकाश सश्लेषण की प्रक्रिया के लिए आवश्यक है। ओजोन गैस सूर्य से होने वाली पैराबैगनी किरणों को अवशोषित कर लेता है। यह पृथ्वी की सुरक्षा छतरी के रूप में कार्य करती है।

वायुमंडल कितनी ऊचाई तक फैला है, इसका पूर्ण ज्ञान अभी तक नही हुआ है। वायु के तापमान व दबाव के आधार पर छः परते है।

I. परिवर्तन मंडल (Trosophere)
II. समताप मंडल (Stratosphere)
III. मध्यताप मंडल (Mesosphere)
IV. ओजोन मंडल (Ozonosphere)
V. आयन मंडल (Ionosphere)
VI. आयतन मंडल (Exosphere)

स्थलमंडल (Lithosphere) – स्थलमंडल पृथ्वी का ठोस भाग है, जिसकी ऊपरी परत मृदा, उपमृदा चट्टानो या धात्विक परतो की बनी है। स्थलमंडल की ऊपरी परत चट्टानो के टूटने से बनी है। इस परत को मृदा या मिट्टी कहा जाता है। स्थलमंडल की सरंचना को निम्न परतों में जाना जा सकता है :–

I. सियाल (Sial)
II. सीमा (Sima)
III. नीफे (Nife)

जलमंडल में पृथ्वी का दो तिहाई भाग जल से ढका हुआ है। पृथ्वी पर पहला जीव जल से ही उत्पन्न हुआ है। सभी जीवों के लिए जल आवश्यक है। पृथ्वी का जल वाष्पीकरण द्वारा वाष् में बदल जाता है। जल में उपस्थित लवणों की मात्रा तथा जल स्त्रोत की गहराई के आधार पर जलमंडल निम्न तंत्र में बटा हैः–

IV. समुन्द्री पारिस्थिक तंत्र (Marine Ecosystem)
V. स्वच्छ जलीय पारिस्थिक तंत्र (Fresh Water Ecosystem)

पर्यावरण का स्वरूप (Nature of Environment)

A. भौतिक या अजैविक पर्यावरण (Physical or Abiotic)
B. जीव या जैविक पर्यावरण (Biological or Biotic)

इस संसार में समस्त जीव सामाजिक व सामूहिक रूप से कार्य करते है। वह पदार्थो की प्राप्ति भौतिक पर्यावरण से करते है। इस प्रकार आर्थिक आवश्यकताओं की पूर्ति होती है।

मानव सामाजिक प्राणी होने के साथ–साथ प्राकृतिक प्राणी भी है। मानव प्रकृति के प्राणियों की अपेक्षा अधिक विवेकाशील है। मनुष्य जीवन के तीन महत्वपूर्ण घटक होते हैः–

I. भौतिक घटक – इसका सम्बन्ध प्रकृति के भौतिक वातावरण से होता है, जैसे पृथ्वी, जल व भोजन
II. समाजिक घटक – इसका पूर्णतः सम्बन्ध समाज से होता है जैसे समाज की सुरक्षा के लिए उचित साधनों की व्यवस्था करना
III. आर्थिक घटक – इसका सम्बन्ध मनुष्य की कार्यकुशलता से है। मनुष्य व पर्यावरण का आपस में घनिष्ठ सम्बन्ध है। मनुष्य पर्यावरण की उपज है, वह पर्यावरण का निर्माण करता है। मनुष्य व पर्यावरण की अन्तःक्रिया होने से पदार्थो व उर्जा का स्वाभाविक रूप से संचालन होता है, जिससे पर्यावरण संतुलित बना रहता है।

पर्यावरण की धारणा व अर्थ (Concept and meaning of Environment)

पर्यावरण अर्थात "Environment" शब्द से हुई है। जिसका अर्थ है "To Surround" अर्थात घेरना। शाब्दिक रूप से बना है। परि का अर्थ है – चारो ओर एवं आवरण का अर्थ है – घेरा। इस प्रकार पर्यावरण में वह सब शामिल है जो हमें चारों ओर से घेरे हुए है। जल, वायु, मिट्टी, पौधे, पशु–पक्षी, तापमान, प्रकाश आदि सभी पर्यावरण के अंग है।

सामाजिक वैज्ञान एनसाईकलोपीडिया के अनुसार (Encyclopedia of Social Sciences 1968) – "पर्यावरण की जीव के विकास एवं जीवन को प्रभावित करने वाले सभी बाह्य दशाओं व प्रभावों के योग के रूप में परिभाषित किया जा सकता है।"

"Environment may be defined as the aggregate of all external conditions and influences affecting the life of an organism."

कैम्ब्रिज एनसाईकलोपीडिया (Cambridge Encyclopedia 1970) – "किसी स्थान की वे परिस्थितियां, जिसमे एक जीव रहता है, पर्यावरण है। बड़ी संख्या में विविध प्रकार – जैसे शहरी वातावरण, उष्ण कटिबंधीय वर्षा वन, पर्यावरण की एक परिभाषा का निर्माण असम्भव बना देते है। समान्य रूप से भौतिक पर्यावरण किसी भू–भाग की विशेषताओं का वर्णन करता है जो मानव प्रभाव द्वारा उत्पन्न परिवर्तनों से अछूता रहता है जबकि भौगोलिक पर्यावरण में भौतिक पर्यावरण के साथ मानवीय रूपांतरण जैसे – कृषि प्रणालियां, औद्योगिकीकरण, शहरीकरण इत्यादि शामिल है।"

"The conditions and influences of the place in which an organism lives. The large number of different types of environment e.g. urban environment, Tropical rain, forest environment makes it impossible to formulate a single definition. In general, the physical environment describes the characteristics of landscape, which have not

been marked includes the physical environment together with any geographical human modification e.g. agricultural systems, industrialization and urbanization."

अनस्टॉसी (Anastossi) के अनुसार – "व्यक्ति के वंशानुक्रम (जीन्स) के अतिरिक्त जो कुछ भी उसे प्रभावित करता है, वह पर्यावरण है।"

"The environment is everything that affects the individual except his generation."

डगलस व हालैण्ड (Duglus and Holland) के अनुसार – "पर्यावरण से अभिप्राय सभी बाह्य शक्तियों, प्रभावों एवं परिस्थितियों से है, जो किसी जीव के जीवन, प्रकृति, स्वभाव, व्यवहार, अभिवृति, विकास व प्रौढता को प्रभावित करते है।"

"Environment means all those external forces, effects and situations which effect life, nature, behavior, aptitude, development and maturation of an organism."

सी.सी. पार्क (C.C. Park) के अनुसार – "पर्यावरण से अभिप्राय उन सभी परिस्थितियों के योग से है, जो किसी विशेष स्थान या समय पर मनुष्य को घेरती है।"

"Environment refers to sum total of conditions in space and time."

उपरोक्त परिभाषाओं से स्पष्ट होता है कि प्रकृति के चारो ओर जो कुछ भी हमें दिखाई देता है, वह प्रत्यक्ष व अप्रत्यक्ष रूप से हमें प्रभावित करता है। वायु, तापमान, नमी, दबाव आदि हमारे पर्यावरण की रचना करते है। पर्यावरण के विभिन्न घटक एक दूसरे को प्रभावित करते है। पर्यावरण की जटिलता में जैविक व अजैविक घटकों के अतिरिक्त मानवीय कारको की भी महत्वपूर्ण भूमिका है। पृथ्वी पर रहने वाला प्रत्येक जीव अपने पर्यावरण में अन्तःक्रिया करता है और पर्यावरण में अनुकूलित होने का प्रयास करता है।

जलवायु परिवर्तन (Climate change) :– जलवायु परिवर्तन का अर्थ समय के साथ–साथ जलवायु में होने वाले किसी भी परिवर्तन से है, चाहे व प्राकृतिक हो या मानव के क्रिया कलापों से जलवायु परिवर्तन कई दशको से लेकर लाखों वर्षो की अवधि के दौरान मौसम के स्वरूप में साँख्यिकी वितरण से होने वाले महत्वपूर्ण व चिरस्थायी परिवर्तन किसी विशिष्ट क्षेत्र तक सीमित रह सकता है या सम्पूर्ण धरती पर घटित हो सकता है।

आज पूरा विश्व विकट परिस्थिति का सामना कर रहा है, इस समस्या के परिणाम धीरे–धीरे पूरे संसार के सामने आ रहे है। जलवायु परिवर्तन की समस्या वर्तमान समय की बहुत बड़ी चुनौती है। इसके दुष्परिणाम के कारण विश्व के अनेक देशों का संसार के मानचित्र से अस्तित्व खत्म हो जाएगा। यह एक विकट समस्या का रूप धारण कर चुकी है, समय आ गया है कि सभी देशों को एकजुट होकर जलवायु में होने वाले परिवर्तन की समस्या से होगा।

औद्योगिक क्रांति के बाद जीवाष्म ईंधन के जलने के कारण भारी मात्रा में उत्पन्न कार्बन डाइ आक्साइड एक ग्रीन हाउस प्रभाव वाली गैस है और इस कारण पृथ्वी का तापमान बढ रहा

है। हम भली भाँति जानते है कि जब हमारे शरीर का तापमान समान्य से अधिक हो जाता है तो उसे बुखार कहते है। बुखार अपने आप में रोग नही है, बल्कि रोग का लक्ष्ण है। विश्व के वैज्ञानिक काफी समय से कह रहे है कि पृथ्वी का तापमान भी समान्य से अधिक होता रहा है। शरीर के बुखार व पृथ्वी के बुखार में इतना अन्तर है कि पृथ्वी का बुखार कोई भी लक्ष्ण नही है बल्कि अनेक खतरों की ओर संकेत कर रहा है।

हमारे ऋषि मुनि सदियों से धरती को बचाने की दलीले करते रहे, कभी नही सुना परन्तु अब सुनने का समय आ गया है। अब हमें सोचना होगा कि साँस खुली हवा में ली जाए या दूषित हवा में। स्वच्छ पानी पिया जाए या दूषित पानी इत्यादि।

3 दिसम्बर, 1984 भोपाल कांड त्रासदी को कभी नही भूलाया जा सकता। यूनियन कारवाईड द्वारा संचालित संयत्र से निकली प्राण घातक गैस वातावरण में फैल गई। वहां के 4000 निवासियों को मौत की नींद में सुला गई, बल्कि जीवित लोगों को अंधा व अपंग बना दिया।

जलवायु परिवर्तन का मुख्य स्त्रौत तो विकसित देशों में है, पर इसका प्रभाव विकासशील देशों पर अधिक पड़ रहा है। भविष्य में ये प्रभाव अधिक तीव्र होगें। हिमखंड तेजी से पिघल रहे है। महासागरों का तापमान बढ रहा है, ऊंचाई पर अधिक बारिस हो रही है।

इससे भी अधिक चिंता जनक विषय है मौसम में बदलाव। सर्दियां गरम हो रही है, रातों का तापमान बढ रहा है। बसंत तथा सर्दियों की अवधि कम हो रही है। इन सबका प्रभाव यह है कि मानव स्वास्थ्य प्रभावित हो रहा है।

भारत जैसे विकासशील देश में जलवायु परिवर्तन का पारिस्थितिकी तंत्र तथा सामाजिक आर्थिक व्यवस्था पर अधिक प्रभाव पड़ेगा। वनो का पारिस्थितिकी तंत्र में महत्वपूर्ण स्थान है और भारतीय अर्थव्यवस्था का प्रमुख अंग है।

वनो की भौगोलिक परिस्थियां, प्रजातियां और उत्पादकता निर्धारित करने में जलवायु की महत्वपूर्ण भूमिका है, जलवायु परिवर्तन का प्रभाव वनों पर निर्भर आबादी पर भी पड़ता है।

जलवायु परिवर्तन के कारण – जलवायु परिवर्तन के कारणों को दो भागों में बांटा गया हैः–

अ. प्राकृतिक कारण

1. महाद्वीपीय पृथक्करण
2. ज्वालामुखी
3. महासागरीय धाराएं
4. आर्कटिक के नीचे दबी मीथेन गैस

ब. मानवीय कारण

1. ग्रीनहाउस प्रभाव
2. जीवाश्म ईंधन का प्रयोग

अ. प्राकृतिक कारण

- महाद्वीपो का निर्माण तब हुआ जब लाखों वर्ष पूर्व धरती का एक बड़ा हिस्सा धीरे–धीरे अलग होना शुरू हुआ था। अलग होने का प्रभाव जलवायु पर भी पड़ा था। धरती के विखण्डन ने महासागरीय धाराओं तथा पवनों के प्रवाह को परिवर्तित कर दिया। महाद्वीपो का यह अलगाव आज भी चल रहा है। हिमालयी श्रेणी प्रत्येक वर्ष करीब एक किलोमीटर तक बढती जा रही है।
- ज्वालामुखी विस्फोट से काफी मात्रा में सल्फर डाई ऑक्साइड, जलवाष्प, धुलकण तथा राख वायुमंडल में विखरकर फैल जाते है। इनसे निकलने वाली गैसे व राख कई वर्षो तक जलवायु को प्रभावित करती है।
- महासागर जलवायु व्यवस्था के महत्वपूर्ण घटक है, वे पृथ्वी के 71% भाग में फैले है। ये महासागरीय धाराएं धरती के चारों ओर से ताप की बहुत बड़ी मात्रा स्थान्तरित कर देती है जो वायुमंडल द्वारा स्थान्तरित की गई मात्रा के लगभग बराबर होती है। महासागर से बचकर निकल जाने वाला काफी सारा ताप जलवाष्प के रूप में होता है, जो धरती पर प्रचुर मात्रा में पाई जाने वाली ग्रीनहाउस गैस है।
- वैज्ञानिक एरिक काट के नेतृत्व में नासा (NASA) के वैज्ञानिक के एक दल ने आर्कटिक वातावरण का कई स्तरो पर अध्ययन करके यह निष्कर्ष निकाला कि आर्कटिक के नीचे एक खतरनाक ग्रीन हाऊय गैस मीथेन का विशाल भण्डार है, जो आर्कटिक पर जमी वर्फ को पिघला रहा है जिससे सम्पूर्ण वातावरण गरम हो रहा है। इससे विश्व स्तर का तापमान भी बढ रहा है।
- (IPCC) इन्टरनैशनल पैनल फॉर क्लाईमेट चेज के अनुसार पिछली दो शताब्दीयों से ग्रीन हाउस गैसों में होने वाली बढोतरी के तीन प्रमुख कारण है – जीवाश्म ईंधन, भूमि उपयोग व कृषि।

ब. मानवीय कारण

- ग्रीन हाउस प्रभाव वाली अनेक गैसे वायुमंडल में है। इनमे कार्बन डाइ आक्साइड, मीथेन, नाइट्रस आक्साइड, क्लोरोफ्लोरो कार्बन और ओजोन प्रमुख है। इन गैसों में सबसे प्रमुख कार्बन डाइ आक्साइड है। इसका पृथ्वी के कुल ग्रीन हाउस प्रभाव में 55% योगदान है। अन्य गैसो में क्लोरो कार्बन का 25% मीथेन का 15% और नाइट्रस आक्साइड का 5% योगदान है।

  कृषि के क्षेत्र में उपयोग की जाने वाली नई–नई तकनीको के कारण खाद्य उत्पादन काफी मात्रा में बढा है। इन तकनीको के कारण ग्रीन हाउस गैसों में काफी वृद्धि हुई है। चावल के खेती की बुआई के दौरान मीथेन गैस का उत्सर्जन होता है। अधिक उपज का लोभ में किसान नाईट्रोजन गैस का प्रयोग करता है। मृदा में सुक्ष्म जैविक क्रियाओं के परिणाम स्वरूप ये रसायन नाइट्रस आक्साइड का उत्सर्जन करते है।

- जीवाश्म ईंधन का अधिक प्रयोग होने के कारण वायुमंडल में लगातार ग्रीन हाउस गैसे, विशेषकर कार्बन डाइ आक्साइड की मात्रा में बढोतरी हो रही है। वर्तमान स्थिति में तेल का दहन वायु में 33% तक कार्बन डाइ आक्साइड के उत्सर्जन हेतु उतरदायी है। सबसे ज्यादा उत्सर्जन कोयले के दहन के कारण होता है, जिसका प्रयोग मुख्य रूप से ताप विद्युत में किया जाता है।

  पृथ्वी का अध्ययन करने वाले वैज्ञानिक बताते है कि पृथ्वी का तापमान लगातार बढता जा रहा है। पृथ्वी का तापमान बीते 100 वर्षों में 1 डीग्री फारेनहाइट तक बढ गया है। पृथ्वी के यह तापमान का परिर्वतन संख्या की दृष्टि से काफी कम हो सकता है परन्तु इस प्रकार के परिर्वतन का मानव जाति पर बड़ा असर हो सकता है। तापमान में वृद्धि होने से हिमनद पिघल रहे है, महासागरो का जल स्तर बढ रहा है। जिसके कारण प्राकृतिक आपदाएं बढ रही है और कुछ द्वीपों के डूबने का खतरा भी बढ रहा है।

जलवायु परिर्वतन के प्रभाव – हमारी धरती पर उर्जा के सबसे बड़े स्त्रोत हैः सूरज – जिससे आने वाली गर्मी और उर्जा को धरती ग्रहण करती है, इससे जीव व पेड़ पौधो को पानी मिलता है। जिससे उर्जा व पृथ्वी में संतुलन बना रहता है, इसी को ग्रीन हाउस इफेक्ट कहते है। जब ग्रीन हाउस गैसो की मात्रा बढने लग जाती है है तो वो अधिक मात्रा में सूर्य की उर्जा को सोखने लगती है तो उसके चलते वैश्विक तापमान में वृद्धि होने लगती है इसी को ग्लोबल वार्मिग (Global Warmimg) कहते है। इससे केवल धरती ही नही, समुन्द्रों के तापमान भी प्रभावित होते है। जलवायु में होने वाले परिर्वतन के निम्न प्रभाव हैः–

1. वर्षा पर प्रभाव
2. समुन्द्री जल सतर पर प्रभाव
3. कृषि पर प्रभाव
4. जैव विविधता पर प्रभाव
5. मानव स्वास्थ्य पर प्रभाव
6. पेड़ पौधों और जीव जन्तुओं पर प्रभाव
7. अन्य प्रभाव

1. जलवायु परिर्वतन के परिणामस्वरूप दुनिया के मानसूनी क्षेत्रों में वर्षा वृद्धि होगी, जिससे बाढ, भूस्खलन और अपरदन जैसी समस्याएं पैदा होगी। जल की गुणवत्ता में गिरावट होगी, पानी की स्वच्छता में कमी होगी। अब भारत की बात करे तो मध्य व उत्तरी भारत में कम बारिश होगी और ठीक इसके विपरीत पूर्वोतर तथा दक्षिण–पश्चिम राज्यों में अधिक वर्षा होगी। परिणाम यह है कि कही सूखा और कही बाढ जैसी स्थिति बन जाएगी।
2. जलवायु परिर्वतन के परिणामस्वरूप ग्लेशियरो के पिघलने के कारण पूरे विश्व का औसत जल स्तर शताब्दी के अन्त तक 9 से 88 से.मी. तक बढने की सम्भावना है। दुनिया की आबादी 60 कि.मी. के दायरे पर रहती है। जलवायु के परिर्वतन के परिणामस्वरूप उड़ीसा, आन्ध्रप्रदेश, तमिलनाडू, केरल, कर्नाटक, महाराष्ट्र, गोवा, गुजरात और पश्चिम बंगाल राज्यों के तटीय क्षेत्र जलमग्नता के शिकार होगें। इसके अतिरिक्त आसपास के शहर व गाँव भी जलमग्न हो जाएगें। जल स्तर के बढने का परिणाम यह होगा कि लक्षद्वीप व अंडमान

निकोबार द्वीप समूह खत्म हो जाएगें। इसके अतिरिक्त भयंकर परिणाम यह होगा कि पानी दूषित हो जाएगा तथा पीने लायक नही रहेगा।

3. जलवायु परिर्वतन का प्रभाव कृषि पैदावार पर भी पड़ेगा। विश्व का अध्ययन करे तो सयुंक्त राज्य अमेरिका में फसलों का उत्पादन कम हो जाएगा, जबकि मध्य पूर्व देश, भारत, पश्चिम आस्ट्रेलिया तथा मैक्सिको में गर्मी व नमी के कारण फसलो की उत्पादकता बढ जाएगी। भारत में जलवायु परिर्वतन के कारण गन्ना, मक्का, ज्वार तथा बाजरा जैसी फसलो की उत्पादकता में वृद्धि होगी जबकि गेहूँ, धान और जौ की उपज में गिरावट होगी।
4. जलवायु परिर्वतन का प्रभाव जैवविविधता पर भी पड़ता है। किसी भी प्रजाति को अनुकूलन हेतू समय की आवश्यकता पड़ती है। वातावरण में परिर्वतन का सबसे अधिक प्रभाव समुन्द्री तटीय क्षेत्र में पाई जाने वाली दलदली क्षेत्र की वनस्पति पर पड़ता है। ये ना केवल तट को स्थिरता प्रदान करती है, बल्कि समुन्द्री जीवो का आदर्श स्थल भी मानी जाती है। जैव–विविधता क्षरण के परिणामस्वरूप पारिस्थितिक असंतुलन का खतरा बढ जाता है।
5. जलवायु परिर्वतन का प्रभाव मानव स्वास्थ्य पर भी विपरीत पड़ रहा है। विश्व स्वास्थ्य संगठन (WHO) से लेकर भू. एस. सेन्टर फॉर डिजीज कन्ट्रोल एण्ड प्रीवेन्शन के वैज्ञानिक सभी एकमत है कि श्वसन सम्बन्धी रोगो से लेकर जानलेवा संचारी रोगो का विस्तार तेजी से होता जा रहा है। कार्नेल युनिवर्सिटी के वैज्ञानिक डा॰ हार्वेल के नेतृत्व में किए गए एक अध्ययन के अनुसार तापमान वृद्धि व जलवायु परिर्वतन के कारण पूरे विश्व में कोरल रीफ से लेकर वर्षा वनों तक सभी संक्रामक रोगो की चपेट में है। जलवायु परिर्वतन से तापमान और नमी में हल्की वृद्धि से वायरस, वैक्टीरिया और कवक जैसे रोगकारक तथा मच्छर व चूहे जैसे रोग बड़ी तेजी से फैलते है। गरम मौसम में मच्छर अधिक सक्रिय रहते है और अधिक लोगो को काटते है और रोगो को बढावा मिलता है। जलवायु परिर्वतन से मलेरिया उन क्षेत्रों में भी पहुँच चुका है, जहाँ कमी भी नही होता था।

जलवायु परिर्वतन से वायरस का भी विस्तार हो गया है। वायरस से फैलने वाला डेंगू जिसके शुरू के लक्षण फ्लू जैसे होते है, परन्तु बाद में इसका प्रकोप आंतरिक रक्त स्त्राव के तौर पर सामने आता है और कर्क व मकर रेखा के बाहर फैल रहा है। जलवायु परिर्वतन से दूसरे वायु प्रदूषको का फैलाव अधिक होता है जिससे एलर्जी व दमा का प्रकोप बढता है। 1993 में अमेरिका के दक्षिण पश्चिम भाग में खतरनाक हन्टावायरस का पता चला था। हन्टावायरस का कोई इलाज नही है और इससे ग्रस्त आधे व्यक्ति मृत्यु का शिकार होते है।

6. जलवायु परिर्वतन का प्रभाव पेड़ पौधो व जन्तुओं पर भी पड़ा है। तापमान में वृद्धि से जो बदलाव आ रहे है, वह उस बदलाव को अपना नही पा रहे है, जिससे उनमे जेनेटिक बदलाव आ रही है।
7. उपरोक्त प्रभावो के अतिरिक्त जलवायु परिर्वतन अन्य प्रभाव भी डाल रहा है जैसेः–
    I. मिट्टी – जलवायु परिर्वतन से हमारा बहूमुल्य मिट्टी भी प्रभावित हो रही है। एक अमेरिकी विश्वविद्यालय द्वारा कराए गए अध्ययन से यह पता लगा कि जलवायु परिर्वतन से अन्य कई ईलाको में मिट्टी की पानी सोखने की क्षमता कम हो गई है। जिसका प्रभाव यह है कि भूजल आपूर्ति, खाद्य उत्पादन, जैव विविधता व पर्यावरण प्रणालियो पर गम्भीर असर हो रहा है।

II. जल की क्रिया में परिर्वतन – साईस एडवांस पत्रिका में प्रकाशित अध्ययन के अनुसार जलवायु परिर्वतन के कारण दुनिया में वर्षा के पैटर्न और पर्यावरणीय परिस्थितियों में बदलाव हो रहा है। डेनियल गिमेनेज का कहना है कि कई हिस्सों में मिट्टी के साथ–साथ जलक्रिया में भी परिर्वतन हो रहा है। एक अध्ययन से यह पाया गया कि जलवायु परिर्वतन से दुनिया के विभिन्न हिस्सों में वर्षा बढेगी, मिट्टी में जल की प्रविष्टि कम हो जाएगी, जिससे आकस्मिक बाढ का खतरा बढ सकता है। एक अध्ययन से यह पाया गया कि बारिश से 35% वृद्धि से मिट्टी में पानी की प्रविष्टि दर में यानि मिट्टी द्वारा सोखने की दर में 21% से 30% की दर में कमी हो जाती है। जबकि मिट्टी में पानी को टिकने की दर में मामूली वृद्धि होती है।

III. पक्षियों के प्रवास पर प्रभाव – शोधकर्ताओं ने बताया है कि वायुमंडलीय तापमान और प्रवासन का समय एक दूसरे से जुड़ा रहता है। जो इलाके ग्लोबल वार्मिग का शिकार है वहाँ से पक्षियों का प्रवास सबसे ज्यादा तेजी से हो रहा है। एक ओर सह–लेखक काइल हॉर्टन ने कहा है "यदि हम पूरे महाद्वीप की बात करे तो पक्षियों के प्रवास के समय में बदलाव बाहरी तौर पर अच्छा हो सकता है, लेकिन ग्लोबल वार्मिग के कारण होने वाले इस बदलाव से दीर्घकाल में जैव विविधता के लिए परेशानी खड़ी हो सकती है।

IV. पक्षियों की आबादी पर प्रभाव – एंड्रयू फ्रॉसवर्थ ने कहा कि पक्षी का प्रवास बड़े पैमाने पर बदलती जलवायु की प्रतिक्रिया के रूप में विकसित हुआ है। इसमें कोई भी पक्ष नही है कि पक्षियों की चाल जलवायु को ट्रैक करती है लेकिन तेजी से हो रहे बदलावो के कारण पक्षियों की आबादी सबसे अधिक प्रभावित हुई है। यदि जलवायु परिर्वतन इसी तरह से होता रहा तो भविष्य में बहुत से पक्षी विलुप्त हो जाएगें।

V. जंगलों में आग – जलवायु परिर्वतन के कारण लंबे समय तक चलने वाली हीट वेव्स (Heat Waves) ने जंगलों में लगने वाली आग के लिए गर्म व शुष्क परिस्थितियां पैदा कर दी है। ब्राजील स्थित नेशनल इंस्टीच्यूट फॉर स्पेल रिसर्च (National Institute for Space Research) के आंकडो के मुताबिक 2019 से अब तक (Amazon Forest) कुल 741555 बार वन अग्नि का सामना कर चुके है।

VI. जलवायु परिर्वतन व खाद्य सुरक्षा – जलवायु परिर्वतन के कारण फसल की पैदावार में गिरावट आई है। क्षेत्रों में बढते तापमान से सूखे की चपेट में आ रहे है। इसके अतिरिक्त कम ऊँचाई वाले क्षेत्र में गेहू व मकई जैसी फसलों में गिरावट आई है। वातावरण में कार्बन डाइ आक्साइड की मात्रा बढने से फसलो की गुणवता में अत्याधिक कमी आई है।

VII. अस्थिर मानसून – जलवायु परिर्वतन से मानसून अस्थिर हो गया है, वर्षो से मौसम के उलटफेर से धरती में बदलाव दिखने शुरू हो गए है। अक्सर कहा जाता है कि "मेघों ने अपनी चाल बदलनी शुरू कर दी है, वास्तव में तो मानव ने अपनी चाल बदल दी है।" प्राकृतिक संतुलन बिगड़ता जा रहा है। समुन्द्री चक्रवातो और हवाओ में एक तरफ बढोतरी के हालात बने है तो दूसरी तरफ भूमिगत जलस्तर, नदियों व तालाबों जैसे जल स्त्रोत सिकुड़ चुके है।

VIII. मौसम पर प्रभाव – जलवायु परिर्वतन का सबसे अधिक प्रभाव मौसम पर पड़ता है। गर्म मौसम होने से वर्षा का चक्र प्रभावित होता है, इससे बाढ व सूखे का

खतरा पैदा हो सकता है। इसके अतिरिक्त ग्लेशियर पिघलने से समुन्द्री जलस्तर बढ रहा है। जलवायु परिर्वतन की वजह से होने वाले खराब मौसम के कारण 3660 लोगों की मौते हो जाती है।

IX. सामाजिक असंतुलन – जलवायु परिर्वतन से जनित सूखे व बाढ के कारण बड़े पैमाने पर पलायन होने से सामाजिक संतुलन ठीक नही रहता। इसका परिणाम यह है कि हिंसा व अस्थिरता पनपती है।

X. पशुओं पर प्रभाव – जलवायु परिर्वतन के कारण नाशी जीवों व रोगाणुओं की संख्या में वृद्धि और इनकी नई प्रजातियों की उत्पत्ति का प्रभाव दुधारू पशुओं पर पड़ता है जिससे दुग्ध उत्पादन प्रभावित होता है।

जलवायु परिर्वतन के प्रमुख बिन्दुओं पर प्रकाश – विश्व के जलवायु वैज्ञानिक संगठनो ने सयुक्त राष्ट्र क्लाईमेंट एक्शन सम्मेलन के लिए यूनाईटेड इन साईस (United in Science) शीर्षक से एक रिर्पोट जारी की गई, जिसमें निम्न तथ्य सामने आएः–

- 2015–19 के बीच वैश्विक तापमान अन्य पाँच वर्षों की तुलना से अधिक है।
- 2015–19 औद्योगिक युग के तापमान से 1.1°C के स्तर से 0.2°C अधिक है।
- ग्लेशियर की क्षति भी पाँच वर्षों की तुलना से अधिक है।
- कार्बन डाइ आक्साइड भी गिरावट की बजाय 2% वृद्धि हुई है।
- वैश्विक समुन्द्र तल में वृद्धि की दर 3.04 मि.मी. प्रतिवर्ष हो रही है।
- वैश्विक तापमान की वृद्धि से सागरीय अम्लीयता में 26% की वृद्धि हुई है।

जलवायु परिर्वतन से सम्बन्धित अन्य चरम प्रभाव :–

- फ्रांस व जर्मनी में हीट वैव (Heat Waves) का भीषण प्रभाव।
- वर्तमान वर्षों में दक्षिण यूरोप में दिल्ली जैसा प्रभाव।
- अमेजन, मध्य अफ्रीका व साइबेरिया के वनों में अचानक आग।

इस प्रकार से हम यह देख रहे है कि जलवायु परिर्वतन के कारण विश्व ऐसे मोड़ पर आ गया है जहाँ सुधार सम्भव नही दिख रहा। युनिवर्सिटी ऑफ वॉशिगटन ने अपने शोध में बताया कि कार्बन गैसों के उत्सर्जन को घटाने की कितनी भी कोशिश कर ले 90% सम्भावना यही दिख रही है हम विनाश की ओर बढ रहे है। वातावरण के तापमान में एक डिग्री सेंटीग्रेड तापमान के बढने के फलस्वरूप 7% से अधिक वाष्पीकरण होता है। जीवन शैली में हो रहे बदलावों व औद्योगीकरण के कारण कोयले व पेट्रोलियम का उपयोग बढ रहा है। हार्ड कोयले की माइनिग, प्राकृतिक गैस अन्वेषण तथा परिवहन, जल निपटान संयंत्र (सीवर) आदि से मीथेन व अन्य गैसे उत्पन्न होती है।

डी. टेरा और पीटरसन भारत में हिमयुग का अध्ययन किया है। इन वैज्ञानिको को सिन्ध व कश्मीर की लिदर घाटी में चार से पाँच हिमयुगों तथा उनके बीच तीन इन्टर ग्लेसियस युगों

की मौजुदगी के प्रमाण मिले है। वर्तमान इन्टर ग्लेसियस कालखण्ड गर्म जलवायु है। जलवायु परिर्वतनों ने थार को मरूस्थल में बदल दिया है।

जलवायु परिर्वतन की वास्तविकता को समझने के लिए सबसे बड़े भंडारो को देखना व जानना अति अनिवार्य है। दुनिया में सबसे बड़े भंडार अन्टार्कटिका और ग्रीनलैंड में है। वास्तव में पर्यावरण की दूनिया ही जलवायु परिर्वतन का सूचक है। हाल ही के वर्षो में ग्रीनलैंड का तापमान 5 डिग्री बढा है। 2006 की तुलना में 2007 में 30% अधिक बर्फ पिघली है। अन्टार्कटिका में पिछले 10 सालो में बर्फ की चादर के टूटकर समुन्द्र में गिरने की घटनाओ में 75% की तेजी आई है।

अनुमान यह है कि ग्रीनलैंड की पूरी बर्फ पिघली तो समुन्द्र के स्तर में 7 मीटर की बढोतरी हो जाएगी। मालद्वीप व मुम्बई जैसे अनेक शहर पानी में डूब जाएगे। तापमान वृद्धि के कारण पश्चिमी पैसिफिक महासागर, हिन्द महासागर पर्शिया की खाड़ी, मिडिल ईस्ट और वेस्ट इंडीज द्वाप समूहो की कोरफ रील के 80% से 100% तक लुप्त होने का खतरा रहेगा। यहाँ तक की अम्लीय पानी के असर से ठंडे पानी की कोरफ रील और खोल वाले समुन्द्री जीवो के अस्तित्व का खतरा बढ जाएगा। समुन्द्र में आक्सीजन वाले क्षेत्रों की संख्या बढरही है।यह संख्या 149 से 200 हो गई है। परिणापस्वरूप इन क्षेत्रो में मछलियों की पैदावार कम हो गई है।

दुनिया की अर्थव्यवस्था पर जलवायु परिर्वतन का असर हुआ, जिससे दुनिया की अर्थव्यवस्था में लगभग 20% की कमी आई है। समुन्द्र में जलस्तर के बदलाव के कारण बहुत लोगो का विस्थापन हो गया है।

खेद के साथ कहना पड़ता है कि जलवायु परिर्वतन खगोलीय शक्तियों से नियन्त्रित थे। वर्तमान में औद्योगीकीकरण और अत्याधिक मानवीय हस्तक्षेप बढ गया है। बीते काल व वर्तमान में यही अन्तर है। इस परिर्वतन का अन्तिम परिणाम क्या होगा, कहना कठिन है लेकिन विनाशकारी तो होगा। यह भी तय है कि भाग्यशाली प्रजातियां ही धरती पर राज करेगी।

प्रश्न यह उठता है कि जलवायु परिर्वतन को कैसे नियन्त्रण में लाया जाए तथा पर्यावरण को कैसे बचाया जाए?

पर्यावरण को सरंक्षित करने के उपाय :–

विश्व मौसम संगठन का कहना है कि व्याप्क औद्योगीकीकरण होने से पृथ्वी का तापमान बढ गया है। बढते तापमान के कारण पृथ्वी के ध्रुव पर जमी बर्फ पिघल रही है। इसका असर हम समुन्द्र तल में दिनों दिन हो रही बढोतरी के रूप में कर रहे है। महात्मा गाँधी ने कहा था – "प्रकृति के पास मनुष्य की जरूरत के अनुसार सब कुछ है, लेकिन मनुष्य के लालच के आगे सब कुछ कम है।" पर्यावरण के सन्दर्भ में अमेरिकी राष्ट्रपति बराक ओबामा ने कहा कि – "हमारी सुरक्षा, हमारी अर्थव्यवस्था और हमारे ग्रह के लिए बदलाव लाने का इसमें साहस व प्रतिबद्धता होनी चाहिए।"

आज पर्यावरण की समस्या किसी देश विशेष की नही है, पूरा विश्व इसकी चपेट में है। आज मानव अपने द्वारा किए गए विकास कार्यों की समीक्षा कर रहा है। पर्यावरण आज भी जटिल व ज्वलंत समस्या है।

15 जून को प्रतिवर्ष अन्तर्राष्ट्रीय पर्यावरण दिवस के रूप में मनाया जाता है। इस दिन पूरे विश्व में पर्यावरण की समस्याओं पर प्रकाश डाला जाता है व योजनाए बनाई जाती है।

सन 1948 में फ्रांस में फोनेबला नगर में सयुंक्त राष्ट्र संघ की सहायता से प्रकृति सरंक्षण का अन्तर्राष्ट्रीय संघ (IUCN) स्थापित हुआ। सयुंक्त राष्ट्र संघ व विश्व स्वास्थय संगठन के सहयोग से पेरिस में आयोजित 'जीव मंडल कान्फ्रेस' में पर्यावरण सरंक्षण का कार्य आरम्भ हुआ।

इसमें 110 से अधिक राष्ट्रों के प्रतिनिधियों ने भाग लिया और एक राष्ट्रीय पर्यावरण नीति पर विधेयक पारित किया। दिसम्बर 1980 में भारत सरकार ने अपने यहाँ एक पर्यावरण विभाग खोला। स्वयंसेवी संस्थाएं भी पर्यावरण सम्बन्धी संस्थाएं संचालित कर रही है।

पर्यावरण के दुष्परिणाम को देखते हुए विश्वविद्यालय अनुदान आयोग के निर्देशन में पर्यावरण शिक्षा को अनिवार्य विषय बना दिया गया है। बीसवीं शताब्दी में पर्यावरण सरंक्षण व पर्यावरण प्रबन्ध के क्षेत्र में विशेष प्रयास इस प्रकार से है :–

1. सयुंक्त राष्ट्र शैक्षिक, वैज्ञानिक तथा सांस्कृतिक संस्थान
2. विश्व पर्यावरण एवं विकास आयोग
3. अन्तर्राष्ट्रीय जीव शास्त्रीय कार्यक्रम
4. भारत में पर्यावरण सरंक्षण
5. पर्यावरण सरंक्षण संस्था
6. मानव व जीव मंडल कार्यक्रम
7. विश्व संगठन व पर्यावरण सरंक्षण
8. पृथ्वी अनुरक्षण कार्यक्रम
9. अर्थ स्केन संस्था
10. विश्व वन्य जीव कोष
11. स्टोकहोम सम्मेलन
12. शिक्षा व पर्यावरण सरंक्षण
13. सतत विकास पर पृथ्वी सम्मेलन
14. वियना सम्मेलन
15. बेलग्रेड कार्यशाला
16. रियो सम्मेलन
17. अन्तर्राष्ट्रीय पर्यावरण शिक्षा कार्यक्रम
18. तिब्लसी सम्मेलन
19. अस्तित्व सेवा विकास
20. अन्य प्रयास

1. इस संस्था की स्थापना का उद्देश्य सयुंक्त राष्ट्र सदस्यों की शिक्षा का विकास व वैज्ञानिक शोध निष्कर्षों का आदान प्रदान।
2. अन्तर्राष्ट्रीय स्तर पर समाधान हेतू मानवीय पर्यावरण पर 'स्टोकहोम' में सम्मेलन का आयोजन हुआ जिसमें पर्यावरण के सन्दर्भ में घोषणाएं – हम सबका भविष्य, विश्व को चुनौती, अन्तर्राष्ट्रीय सहकारिता व व्यवहारिकता पर बल दिया।
3. यह कार्यक्रम 1964–74 के बीच क्रियान्वित किया गया। इसका उद्देश्य विभिन्न परितन्त्र – स्थलीय, जलीय व समुन्द्री परितन्त्र का अध्ययन व विश्लेषण करना है। जिससे देशों के पर्यावरण वैज्ञानिको का ध्यान उर्जा व भोजन उत्पादन की तरफ केन्द्रित हुआ।
4. भारत में अन्तर्राष्ट्रीय स्तर पर पर्यावरण सम्बन्धी किए गए निर्णय का लागू करने के लिए राष्ट्रीय व राज्यस्तरीय तथा कानून पर्यावरण संरक्षण के लिए बनाए गए भारतीय संविधान के 42 वें अनुच्छेद (1976) में संशोधन करके एक नया अध्याय जोड़ा गया "पर्यावरण संरक्षण" का, जिसे नागरिको के मूल कर्तव्यों में जोड़ा गया।
5. पारिस्थितिकी संतुलन को बनाए रखने के लिए विश्व के राष्ट्रों ने पर्यावरण संरक्षण हेतू विश्व संगठनो की स्थापना की गई, ये संगठन सयुंक्त राष्ट्र संघ पर्यावरण कार्यक्रम (United National Environment Programme – U.N.E.P.), अन्तर्राष्ट्रीय पशु कल्याण कोष (International Fund for Animal), विश्व वन्य जीव कोष (World Wild Life Fund) आदि।
6. यह कार्यक्रम 1968 में युनेस्को द्वारा आयोजित – अन्तर्राष्ट्रीय जीव मंडल सम्मेलन में की गई। इस परिषद में पर्यावरण सम्बन्धी कार्यक्रम आयोजित किए जाते है। इसकी उपसमितियो में शोधकर्ता, वैज्ञानिक, विश्वविद्यालय और गैर सरकारी संस्थाओं के पर्यावरण विशेषज्ञों को भी शामिल किया गया है।
7. विकसित व विकासशील देशो ने प्राकृतिक स्त्रोतो का अधिकतम उपयोग किया है जिससे पर्यावरण संतुलित नही रहा। पर्यावरण सरंक्षण के लिए विश्व संगठनो की स्थापना की गई है।
8. इस अन्तर्राष्ट्रीय संस्था की स्थापना 1972 में की गई जिसका उद्देश्य पर्यावरण का निरीक्षण करना है। इसलिए इसके केन्द्र विभिन्न राष्ट्रों में स्थापित किए गए है। यह संस्थाए सयुंक्त राष्ट्र पर्यावरण कार्यक्रम में भी सहयोग प्रदान करती है।
9. इसकी स्थापना 1976 में सयुंक्त राष्ट्र पर्यावरण कार्यक्रम के अर्न्तगत की गई। इस संस्था द्वारा पर्यावरण साहित्य पर समाचार पत्र, पत्रिकाएं व पुस्तके आदि प्रकाशित की गई, जिससे विभिन्न देशों में भी वितरण किया गया।
10. पशु व पौधे पारिस्थितिक सन्तुलन बनाते है। वन व जीवन संरक्षण के विश्वव्यापी कार्यक्रम को प्रभावशाली ढंग से लागू करने हेतू (1983) डयूक ऑफ एडिनबरा की अध्यक्षता में इस संगठन का कार्य आरम्भ हुआ, जिसका उद्देश्य प्राकृतिक वनस्पति व जीव जन्तुओ का प्रभावशाली ढंग से सरंक्षण प्रदान करना है।
11. इस सम्मेलन का आयोजन सयुंक्त राष्ट्र संघ द्वारा स्वीडन के स्टोकहोम शहर में 5 से 16 जून 1972 में किया गया। जिसका मुख्य उद्देश्य मानव, पर्यावरण व विकास है। पर्यावरणीय समस्याओं के स्थायी हल के लिए वर्तमान स्थिति को नियन्त्रित करने के लिए सम्भावित कार्यक्रमों की रूपरेखा तैयार की गई। सयुंक्त राष्ट्र महासभा द्वारा पारित प्रस्ताव के अनुसार 5 जून को प्रतिवर्ष 'पर्यावरण दिवस' बनाने की घोषणा की गई।
12. अन्तर्राष्ट्रीय सम्मेलनों में 'पर्यावरण शिक्षा' पर विशेष बल दिया गया। पर्यावरण शिक्षा द्वारा बालको व युवाओ में पर्यावरण सचेतना का विकास किया जा सकता है। इस प्रकार शिक्षा

प्रक्रिया के विभिन्न कार्यक्रमों तथा अभिक्रमो का पर्यावरण सरंक्षण के सैन्द्धातिक व व्यवहारिक उपयोग – औपचारिक शिक्षा कार्यक्रम, अनौपचारिक तथा निरोपचारिक शिक्षा कार्यक्रम, अन्तर्राष्ट्रीय स्तर पर शिक्षा अभिक्रम व कार्यक्रम द्वारा पर्यावरण सरंक्षण पर बल दिया जा सकता है।

13. धारणीय विकास आर्थिक विकास की प्रक्रिया है जिसका उद्देश्य प्राकृतिक साधनो व पर्यावरण को बिना क्षति पहुँचाए प्राकृतिक साधनो व पर्यावरण का प्रयोग इस प्रकार से किया जाए कि उस विकास की दर वर्तमान में नही, भविष्य में भी बनी रहे अर्थात पारिस्थितिक संतुलन बनाना है।
14. वियना संधि ओजोन परत के सरंक्षण के लिए एक बहुपक्षीय पर्यावरण समझौता है। इसे 1985 में वियना सम्मेलन में सहमति बनी और 1988 में लागू किया गया। इसमें 196 देश के साथ–साथ यूरोपीय संघो द्वारा मंजूर किया जा सकता है। यह संधि ओजोन परत की रक्षा के लिए अन्तर्राष्ट्रीय प्रयासो के लिए एक ढांचे के रूप में कार्य करता है।
15. 1975 में बेलग्रेड में एक अन्तर्राष्ट्रीय कार्यशाला का आयोजन किया गया जिसमें विभिन्न पक्षो पर विस्तारपूर्वक चर्चा की गई – पर्यावरण शिक्षा के उद्देश्य, विषय वस्तु, शिक्षक–प्रशिक्षण, औपचारिक व अनौपचारिक शिक्षण हर स्तर पर शामिल करने का निर्णय लिया गया। बेलग्रेड चार्टर के चार अनुभाग – पर्यावरण परिस्थिति, पर्यावरण लक्ष्य, पर्यावरण शिक्षा के लक्ष्य तथा पर्यावरण शिक्षा की आवश्यकता को नए सिरे से परिभाषित किया गया।
16. पृथ्वी शिखर सम्मेलन (रियो डी जनेरियो 3–14 जून 1992) में पर्यावरण और विकास पर सयुंक्त सम्मेलन, रियो शिखर सम्मेलन, पृथ्वी शिखर सम्मेलन के रूप में जाना जाता है। इस सम्मेलन में एजेंडा 21 घोषित किया गया अर्थात 21वीं सदी कैसी होगी, इस बारे में लक्ष्य रखा गया। सतत विकास लक्ष्य को भी इस सम्मेलन में रखा गया।
17. इस कार्यक्रम के अनुरूप पर्यावरण शिक्षा की रूपरेखा निर्धारित की गई।
18. सोवियत रूस के जार्जिया प्रान्त के तिबलिसी नगर में एक अन्तर्राष्ट्रीय सम्मेलन का आयोजन किया गया जिसमे पर्यावरणीय शिक्षा पर रूपरेखा तैयार की गई। घोषण पत्र के अनुसार पर्यावरण शिक्षा के विकास के लिए निश्चित आधार अपनाएं जाए जिसमें राष्ट्रीय, क्षेत्रीय तथा विश्व स्तर पर पर्यावरण शिक्षा के विकास पर बल मिले। सम्मेलन की सिफारिशो के अनुरूप युनेस्को द्वारा प्रथम मीडियम टर्म योजना (1977–1982), द्वितीय (1984–1989) व तृतीय मीडियम टर्म योजना (1990–1995) चलाई गई जिसमे पर्यावरण शिक्षा को विशेष महत्व दिया गया।
19. अस्तित्व सेवा विकास विश्व सरंक्षण संघ की सहायक संस्था है और वन्य जीव, पौधो व जन्तुओं आदि के ह्रास स्तर के अध्ययन से सम्बन्धित है। ये अध्ययन रेड डाटा बुक (Red Data Book) के नाम से प्रकाशित है। इसकी तीन श्रेणियां – दुर्लभ स्थिति, संकट ग्रस्त स्थिति व लुप्त प्रायः स्थिति है।
20. अन्य प्रयासो से अभिप्राय यह है विश्व के सम्पूर्ण राष्ट्रों द्वारा अपने देश के पर्यावरण को सुरक्षित करने के लिए यह अध्ययन करे कि :–
    - (i) पारिस्थितिक तन्त्र क्या है? कैसे सन्तुलित किया जाए?
    - (ii) मानवीय क्रियाओ का भूमि उपयोग क्या है? प्रभाव का अध्ययन।
    - (iii) उर्जा की उपयोगिता।
    - (iv) जनसंख्या व पर्यावरण संतुलन के प्रभाव का अध्ययन करना।
    - (v) पहाड़ी परितन्त्र पर मानवीय क्रियाओ का प्रभाव।

(vi) पर्यावरण प्रदूषण के जीव मंडल व मानवीय प्रभाव का अध्ययन।
(vii) कीटनाशक दवाईयों के प्रयोग का मूल्यांकन।
(viii) पर्यावरण प्रबन्धन का पारिस्थितिक तन्त्र पर प्रभाव।
(ix) मरूस्थलीय क्षेत्र में सिचाई व्यवस्था का अध्ययन।
(x) मानवीय क्रियाओ का भूमि उपयोग।
(xi) रासायनिक खादो के उपयोग के प्रभाव का अध्ययन।
(xii) नगरो में पारिस्थितिक तन्त्र का अध्ययन।
(xiii) ग्रामीण क्षेत्रों में कृषि व्यवस्था का अध्ययन।
(xiv) झीलो व तटीय क्षेत्र का मानवीय उपयोग।
(xv) भू मध्यसागरीय क्षेत्र का पर्यावरण प्रबन्धन व मानवीय उपयोग।

भारत जैसे विकासशील देश में जलवायु परिवर्तन का पारिस्थितिकी तन्त्र, सामाजिक व आर्थिक व्यवस्था पर प्रभाव पड़ रहा है। वैज्ञानिको के अनुसार कार्बन डाई आक्साईड की वायुमंडल में सांद्रता दुगनी होने की स्थिति में भारत का तापमान 2.33 डिग्री से 4.78 डिग्री सेल्सियस के बीच बढ जाएगा।

अन्य वैज्ञानिक अध्ययनो के अनुसार वर्ष 2040 तक औसत तापमान 0.7 से 1.0 डिग्री सेल्सियस में वृद्धि हो जाएगी। बड़ा घातक परिणाम सामने आाने वाले है। आने वाली पीढी के लिए शायद ही कोई पर्यावरण बच सके। जलवायु परिवर्तन का जिम्मेवार प्रकृति ना होकर मानव का स्वार्थ है।

"हम चाहे कही भी रहे, पर्यावरण की देखभाल करना हमारे लिए महत्वपूर्ण है, छोटे स्तर पर काम शुरू करे 10 या 20 मित्रो के साथ पर्यावरण दिवस मनाए। अगले वर्ष बहुत बड़ा समूह हो जाएगा उसके बाद यह जागरूकता विश्व भर में फैल जाएगी।" **पृथ्वी दिवस 22, अप्रैल।**

उपर्युक्त शब्द एक जुट होकर पर्यावरण बचाव तथा जलवायु परिवर्तन की चुनौती का सामना करने के लिए सकारात्मक सोच की और प्रेरित करते है। इस सन्दर्भ में क्या–क्या प्रयास किए जाने चाहिए तथा किस प्रकार आने वाली पीढी के लिए पर्यावरण सुरक्षित किया जाए? सोचना अति अनिवार्य है।

ग्लोबल वार्मिग दुनिया की सबसे बड़ी समस्या है। ये शब्द टैक्निकल है, भारतीय भाग दौड़ जीवन जीते है। अगर हम विज्ञान की भाषा में बात करे तो खतरा बहुत बड़ है कि विश्वयुद्ध या किसी क्षुद्रग्रह के पृथ्वी के टकराने से भी बड़ा माना जाता है। जलवायु परिवर्तन के लिए सबसे जिम्मेवार ग्रीन हाऊस गैसे है।

इन गैसो का प्रयोग अत्याधिक सर्द ईलाके में पौधो को गरम रखने के लिए किया जाता है। यह गैस सूरज से आने वाली किरणों की गर्मी सोख लेती है, ठीक यही प्रक्रिया पृथ्वी के साथ होती है। महत्वपूर्ण गैस कार्बन डाई आक्साइड है जो जीवित प्राणी अपनी सांस के साथ उत्सर्जित करते है।

बढते हुए खतरे को रोकने के लिए अत्याधिक जागरूकता की आवश्यकता है। हाल ही में कुछ वैज्ञानिक अध्ययन बताते है कि इसी तरह जलवायु परिवर्तन का सिलसिला जारी रहा तो भारी जानमाल का नुकसान होगा।

विभिन्न कारणो व विभिन्न क्षेत्रो द्वारा उत्सर्जित ग्रीन हाऊस गैसों का विवरण :–

तालिका	
पावर स्टेशन से	21.3%
औद्योगो से	16.8%
यातायात व गाड़ियों से	14%
खेती किसानो के उत्पादो से	12.5%
जीवाश्म ईंधन के इस्तेमाल से	11.3%
रिहायशी क्षेत्रों से	10.33%
बॉयोमास जलने से	10%
कचरा जलाने से	3.4%

इस संकट से निपटने के लिए मानव जाति को सचेत रहने की जरूरत है। इस गरम होती धरती के लिए कौन जिममेवार है, कि बजाए, यह सोचना अनिवार्य है कि धरती को कैसे बचाया जाए?

अ. <u>जलवायु परिवर्तन – एक अन्तर्राष्ट्रीय पहल</u> :–

1. <u>यू. एन. वार्ता</u> – सयुंक्त राष्ट्र के सदस्यों ने 2015 तक नई जलवायु संधि कराने के लिए पहला कदम उठाया। सयुंक्त राष्ट्र संघ के फ्रेमवर्क कन्वेन्शन ऑन क्लाइमेट चेज 195 देशो ने इस बात पर बहस करी लक्ष्य पाने के लिए वह किस प्रकार काम करेगे। समुन्द्र के बढते जलस्तर पर कहा गया कि – **"समय कम है, हमें अपने कुछ भाईयो, खासकर छोटे द्वीपो वाले देशो की अपील को गम्भीरता से लेना होगा।"**
2. <u>बॉन समझौता</u> – 23 जूलाई 2001 में जर्मनी की राजधानी बॉन में 180 देशों के प्रतिनिधियों ने एक सप्ताह के वाद–विवाद व विचार विमर्श के बाद जलवायु परिवर्तन को रोकने के लिए अन्तर्राष्ट्रीय समझौते की तरफ कदम बढाया। इस सन्दर्भ में तीन कोष बनाए गए – विकासशील देश, अल्पविकसित देशों में ग्रीन हाऊस का कम उत्सर्जन, तीसरा जलवायु से सम्बन्धित अनुसंधान।
3. <u>क्योटा समझौता</u> – 1997 में एफ.सी.सी.सी. (F.C.C.C.) ने जापान के क्योटा शहर के ऐतिहासिक समझौते को स्वीकृत किया। जिसमें छः प्रमुख ग्रीन हाऊस गैस कार्बन डाई आक्साइड, मीथेन, नाइट्रस आक्साइड, हाइड्रो क्लोरो कार्बन, पर

क्लोरो कार्बन और सल्फर हैक्साफ्लोराइड। इसमें ग्रीन हाऊस गैसो में कमी लाने को कहा गया। अमेरिका ने पाँच वर्षों की समय सीमा को तय किया।

ब. <u>जलवायु परिवर्तन – राष्ट्रीय पहल</u>

राष्ट्रीय एक्शन प्लॉन (National Action Plan on Climate Change, NAPCC) यह प्लॉन 2008 में लॉच किया गया जिसका उद्देश्य –

1. जलवायु परिवर्तन के सन्दर्भ में पब्लिक, सरकारी ऐजसी, वैज्ञानिको को जलवायु परिवर्तन के लिए जागरूक करना।
2. इस सन्दर्भ में 8 राष्ट्रीय मिशन है जो दीर्घकालीन उद्देश्यों को पूरा करेगे तथा समन्वित व्यूह रचनाएं बनाएगे –
   - National Solar Mission
   - National Mission for Enhanced Energy Efficiency
   - National Mission on sustainable Habitat
   - National Water Mission
   - National Mission for sustaining the Himalyas Eco-system
   - National Mission for A Green India
   - National Mission for Sustainable Agriculture
   - National Mission on strategic knowledge for climate change

राष्ट्रीय एक्शन प्लॉन की निम्न विशेषताएं है :–

1. गरीबों व पिछड़े वर्ग के लोगो को जलवायु परिवर्तन की सवेदनशीलता को समझाना।
2. परितंत्र की सुरक्षा के लिए राष्ट्रीय ग्रोथ के लिए गुणात्मक प्रयास।
3. ग्रीन हाऊस का उचित प्रयोग के लिए उपयुक्त रणनीति बनाना।

- UNFCCC Secretariat (जलवायु परिवर्तन) की स्थापना 1992 में की गई जिसका उद्देश्य अन्तर्राष्ट्रीय स्तर पर हो रहे परिवर्तनो पर ध्यान देना तथा विशेषज्ञों की सहायता से जलवायु में हो रहे परिवर्तनो पर रिपोर्ट तैयार करना।
- जवाहर लाल नेहरू राष्ट्रीय सोलर मिशन – 2010 में प्रधानमंत्री की अध्यक्षता में लॉच किया गया। मिशन का उद्देश्य भारत में सोलर एनर्जी का विकास करना है। सोलर से उर्जा की खपत सस्ती कीमत पर तथा पूरी क्षमता के साथ पहुँचाना है। स्थानीय स्तर पर भी सोलर एनर्जी का विस्तार करना है। व्यापारिक क्षेत्र को बिल्डिंग की छत पर सोलर की अनिवार्यता पर बल दिया जाना है। रिसर्च व विकास प्रोजेक्ट पर बल दिया जाए ताकि सोलर तकनीक का अधिकतम विकास हो सके।
- National Mission for Enhanced Energy Efficiency - यह "एनर्जी कन्जर्वेशन एक्ट 2001" (Energy Conservation Act 2001) पर आधारित है। जिसका उद्देश्य एनर्जी की अधिकतम प्रभावशीलता को बढावा देना है। एनर्जी का प्रभाव व्यवस्थित रूप से करना चाहिए। इसके साथ–साथ जागरूकता फैलाना है, ताकि एनर्जी क्षमता को अधिकतम किया जा सके। व्यापारिक क्षेत्र में उत्पादन तथा गुडस व सेवाओं में एनर्जी की पूर्ति करना।

समय–समय पर मूल्यांकन करना कि एनर्जी को सही तरीके से बचाया जा रहा है या नहीं।

- National Water Mission – यह मिशन Ministry of Water Resources, River development and Ganga Rejuvenation द्वारा संचालित है। जिसका उद्देश्य समन्वित तरीके से पानी का प्रबन्धन करना तथा पानी की व्यर्थता को रोकना है। भूतल पर कितना पानी है, घरों में पानी की कितनी सप्लाई है तथा उद्योग धन्धों में कितनी है– वितरण पर ध्यान देना है। इसका उद्देश्य यह भी है कि पानी की शुद्धता की तकनीक पर ध्यान बढाना है।
- National Mission for sustaining the Himalyas Eco-system – यह मिशन साईंस व तकनीकी विभाग द्वारा संचालित है जिसका उद्देश्य यह देखना है कि हिमालयन ग्लेशियर, जीव जन्तु सरंक्षण व बचाव करना, प्राकृतिक साधनो की मैपिग करना। प्रकृति में कैसे सन्तुलन बनाना है आदि का अध्ययन करना क्योंकि हिमालय में प्रकृति के अथाह भण्डार है।
- National Mission of Green India & Ministry of Environment, Forest and Climate Change द्वारा संचालित है जिसका उद्देश्य है जंगलों पर फोकस करना ताकि जलवायु परिवर्तन को नियन्त्रित किया जा सके। वनो के अन्धाधुंध कटाव को नियन्त्रित करना है। पारिस्थितिक तंत्र के सन्तुलन के लिए सतत विकास की प्रक्रिया को बढावा देन है।
- National Mission for Sustainable Agriculture – यह मिशन Ministry of Agriculture द्वारा संचालित है। जिसका उद्देश्य है फसलों को पुरानी व नए कृषि तकनीक का अध्ययन करना। असके अतिरिक्त सूखी भूमि, जो कृषि उगाने की योग्य नही है, उसका कैसे सम्पूर्ण उपयोग किया जाए, का अध्ययन करना है। कृषि क्षेत्र को बढावा देने के लिए नई तकनीक का प्रयोग करना।
- National Mission on strategic knowledge for climate change – यह मिशन Department of Technology द्वारा संचालित है। मिशन का उद्देश्य जलवायु परिवर्तन की चुनौतियों का अन्तर्राष्ट्रीय स्तर पर सहयोगी की नीति अपनाते हुए खोज को बढावा देना है। मिशन का उद्देश्य अधिकतम रिसर्च सैन्टर को बढावा देना है ताकि समस्याओं का अध्ययन किया जा सके और विभिन्न रणनीतियों से परिवर्तन के खतरे को टाला जा सके।

स. <u>जलवायु परिवर्तन तथा अन्य पहल</u> –

1. <u>जीवाश्म ईंधनों का इस्तेमाल बंद करना</u> – जीवाश्म ईंधन जलने पर कार्बन डाइ आक्साइड गैस का उत्सर्जन करते है जो धरती के तापमान को बढावा देती है। हमें धीरे–धीरे जीवाश्म ईंधन पर अपनी निर्भरता खत्म करके वैकल्पिक उर्जा स्त्रोतो को बढाना होगा।
2. <u>वस्तुओं के उपयोग को घटाना</u> – हमारे देश में जनसंख्या बढती जा रही है जिससे वस्तुओं का उपयोग बढता जा रहा है। नतीजा यह है कि कच्चा माल की आपूर्ति बढ गई है जिससे प्राकृतिक संसाधनों का दोहन होता जा रहा है। प्रकृति नष्ट हो रही है, फैक्ट्रियाँ जहर उगल रही है। हमें ईको फ्रेंडली व स्थानीय चीजो को महत्व देना चाहिए।
3. <u>घरों को ईको फ्रेंडली बनाना</u> – भारत में 60% बिजली कोयले वाले ताप–विद्युत सयंत्रों से बन रही है जिसका प्रयोग हम घरों में भी करते है। अतः बिजली के

प्रयोग को भी घटाना होगा। विद्युत उपकरणो का कम प्रयोग करना चाहिए। घरों को प्राकृतिक हवा व धूप आने लायक बनाना चाहिए जिससे ग्रीन हाऊस उत्सर्जन को कम किया जा सके।

4. सिंगल यूज प्लास्टिक का इस्तेमाल बंद करना – दुनिया का 40% पैट्रोलियम पदार्थ प्लास्टिक बनाने में खर्च होता है और सिंगल यूज प्लास्टिक अंत में नदी, तालाबो व समुन्द्र में जाकर वातावरण को दूषित कर देते है। अतः थर्मोकोल प्लेट, ग्लास, चम्मच, बोतले आदि का प्रयोग बंद कर देना चाहिए। उसके स्थान पर जूट बैग, स्टील के बर्तनों को प्राथमिकता देनी चाहिए। प्लास्टिक की जगह खुली चीजों को प्राथमिकता देनी चाहिए।
5. वीगन आहार अपनाना – पशु आधारित उत्पाद जैसे माँस, डेयरी, अंडा, मछली आदि के उत्पादन के लिए प्रतिवर्ष फार्म के पशुओ की जनसंख्या 80 खरब से अधिक बढाई जाती है। दाना–चारा उगाने के लिए जंगलों की कटाई की जाती है। अतः पौधो पर आधारित भोजन–फल, सब्जी, अनाज, दाले इत्यादि खानी चाहिए।
6. पौधे लगाना – अधिक से अधिक स्थानीय प्रजाति के पौधे लगाने चाहिए ताकि वातावरण शुद्ध हो सके।
7. साईकिल चलाना – यातायात के माध्यम से होने वाले प्रदूषण को रोकने के लिए हम कम दूरी वाले स्थानों पर, एक स्थान से दूसरे स्थान पर साईकिल चलाकर जा सकते है।
8. जनसंख्या नियन्त्रण – बढती हुई जनसंख्या ने आवास सम्बन्धी समस्याएं पैदा कर दी है जिससे वातावरण असन्तुलित होता जा रहा है। अधिक बच्चों की संख्या से आवासीय समस्या बढती है।

निष्कर्ष रूप से यह कहा जा सकता है कि हमने हवा, पानी, मिट्टी सबको प्रदूषको से जहरीला बना दिया है। हमने "महान जीवन श्रृंखला" नाम के जटिल प्रणाली में अपने अस्तित्व को प्रभावित करने वाले प्राकृतिक समुदाय को बिखेर दिया है।

धरती, वातावरण और समुन्द्रों के प्राकृतिक बलो के सन्तुलन को बिगाड़ दिया है। हमे मानव जाति की पर्यावरण प्रदूषण व जलवायु परिवर्तन के प्रभावो से आने वाली पीढियों को बचाना होगा। फ्रैंकलिन डी रूजबेल्ट ने ठीक कहा था –

"एक देश जो अपनी मिट्टी को नष्ट करते है, वह खुद को नष्ट करता है, जंगल हमारी भूमि के फेफड़े है, वे हमारी हवा को शुद्ध करते है और लोगो को नई ताकत देते है।"

इस समस्या के हल के लिए सबसे बड़ी जरूरत है जागरूकता। यदि समान्य लोग समस्या व प्रभावों को ठीक से समझ ले तो हल आसान हो सकता है। अधिकतर लोग यह समझ बैठते है कि इस समस्या का हल वह व्यक्तिगत तौर पर नही कर सकते।

ओजोन छिद्र, ग्लोबल वार्मिंग व तापमान वृद्धि जटिल समस्याएं है। सरकार को इस दिशा में कड़े से कड़े कदम उठाने चाहिए। जनता को सरकार द्वारा दिए गए दिशा निर्देशो का पालन करना चाहिए।

"प्रकृति की हो सुरक्षा
इससे बढकर नही तपस्या।"
"प्रकृति का ना करे हरण
आओ बचाए अपना पर्यावरण।"

सन्दर्भ पुस्तिका :–

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ABOUT THE BOOK

The environment is all that is present surrounding us. All living organisms on this earth live naturally in the environment. But in the current global scenario, it has been observed that human beings and their certain activities are continuously affecting mother nature in a negative way. As such, in the 21st century our environment is facing lots of problems like climate change, depletion of natural resources, ozone layer depletion, pollution, population explosion, different diseases including COVID-19, extinction of species due to exploitation mostly by human, etc. It is high time to rescue our environment and to help it maintain in a sustainable way for our next generations. The various chapters included in this book are from different areas of environment studies like Human population and environment, the impact of COVID-19 on the environment, environmental degradation and challenges faced during the 21st century, waste management, pollution, environmental laws, etc. I sincerely hope that this book will be of great help and support to all the teachers, students, researchers, foresters, other activists who are directly and indirectly associated with environmental studies and its protection.

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