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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

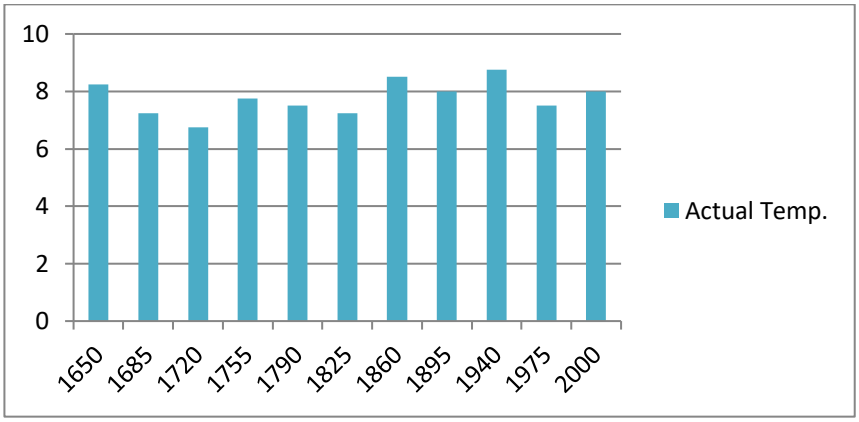

Figure 7.2: Lifetime and relative GWP of different atmospheric chemicals against a 100-year baseline of CO_2

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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