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Environmental Issues and Sustainable Development: The Global and Indian Perspective

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Abstract:- The paper aims to discuss about the historic trend of global warming and greenhouse gas emission since the late 18th century due to widespread use of fossil fuels and industrial processes. This paper provides an overview of rise of greenhouse gases such as carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), nitrogen trifluoride (NF3), and other gases and their contribution in warming the global temperature in the prior and later period of industrial revolution. Highlighting the relationship between greenhouse gas emission and human activities that has resulted in significant challenges to the global ecosystems that includes severe and frequent heatwaves, altered precipitation patterns, melting of glaciers, rising of sea level, along with the backward economies facing disproportionate risks and challenges in water resources, food scarcity due to draughts and high temperature as well as health issues due to low productivity and slow development. Hence, considering the problems faced by the societies worldwide, it is essential to have cooperative strategies with local, national and international agencies to implement effective mitigation measures and adaptation schemes so that the societies could foster resilience, mitigate risks and work towards a sustainable future.

Keywords:- *Global Warming, Greenhouse Gases, Global Ecosystem Challenges, Backward Economies, Low Productivity, Cooperative Strategies, Mitigation, Adaptation And Sustainable Future.*

I. INTRODUCTION

The continuous rise in temperature of the planet is really upsetting, the root cause for this is global warming. Global warming begins when sunlight reaches the earth. The cloud, atmospheric particles, ocean surface, polar regions and ground surfaces reflect back about 30% of sunlight into the space. Whilst the remaining is absorbed by oceans, air and land. This phenomenon consequently heats up the surface of the planet and atmosphere, making life feasible. As the earth warms up, this solar energy is radiated by thermal radiation and infrared rays propagating directly out to space there by cooling the earth. However, some of the terrestrial radiation is re-absorbed by carbon dioxide, water vapours, methane, ozone and other gases in the atmosphere and its radiated back to the surface of the earth. These gases are commonly known as greenhouse gases due to their heat trapping capacity. It must be noted that, this reabsorption process is pivotal, as the earth's average surface temperature would be very cold if there was no existence of greenhouse gases. This concentration of greenhouse gases in the atmosphere has been increased artificially by humans at an alarming rate since the industrial revolution. As of 2004, over 8 billion tons of carbon dioxide was pumped out into the atmosphere, hence, the solar radiation was hindered by the increase of the greenhouse gases, leading to a phenomenon that is known as "human enhanced global warming effect". The recent observations regarding global warming have substantiated the theory that it is indeed a human enhanced greenhouse effect that is causing largest increase in surface temperature over the last 100 years. Between 1906 to 2006 the earth's average surface temperature augmented between 0.6 to 0.9 degree Celsius per year. Millions of pounds of methane Gas are generated in the land fields and agriculture decomposition of biomass and animal manure. Nitrous oxide is released into the atmosphere by various nitrogen-based fertilizers including urea and diammonium phosphate and other soil managements. Once these are released into the atmosphere, they stain for decades and even longer. According to the Intergovernmental Panel on Climate Change (IPCC), carbon dioxide and methane levels have been increased by 35% and 148% since the industrial revolution of 1750. Therefore, it is crucial to look into the emission of greenhouse gases and the increase rate of global warming while addressing it's impacts and how it has affected the planet with proper mitigation strategies and adaptive measures.

II. REVIEW OF LITERATURE

- In the chapter 2 of the book "Modern Geography" of class X, the major problems of the environment are discussed in a global perspective
- In the report "The Causes of Climate Change" NASA has published about the primary and secondary causes of climate change
- AR6 Climate Change report published by IPCC in 2021 has discussed about the temperature during the instrumental period on the surface in the part 2.3.1.1.3 of chapter 2
- The article "Global Warming Potential: Causes and Consequences" published in the website of Researchgate.net, has discussed about the causes of GWP and climate change in part 2 of the article.
- Warm Heart World Wide has discussed the causes of global warming in its article "What is climate change"

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- An article published in the website of World bank as "India: climate change and impacts" has discussed about the changing rainfall patterns, droughts, glacier melts, sea level rise, agriculture and food security and health issues faced in India due to global warming.

➢ *Objectives*

- Discussing the trend of emission of greenhouse gasses in past few centuries and the causes behind it in a global prospective.
- Impacts faced by India due to global warming and how the world is dealing with it through cooperative measures.

III. METHODOLOGY

This paper has extracted its sources from secondary data collection such as: books, journals, research papers, articles and websites of the internet.

The data collected from various sources has been discussed in a descriptive method.

IV. ANALYSIS

In the period of rapid urbanisation, development, technological advancement and critical thinking we are neglecting the source of all energies, our planet, earth. Life on earth started around 3600 million years ago, and since then the earth has faced tremendous changes in its environment, from the Cambrian period to present Quaternary period, originating from a unicellular organism to the modern man. Nature had made it possible for man to develop himself throughout its entire existence. At present it is our duty to preserve our nature and its diverse ecology and climate. But man's activities have never been beneficial to the planet. Looking into the prior and later period of industrialisation, the greenhouse gases have increased into the atmosphere more rapidly than its preceding period. So, it can be coined that industrialisation is the core of greenhouse gas emission into the air. It is worth mentioning that, during the initial days of industrialisation there was misuse of large quantity of fossil fuels which gradually resulted in air pollution and other environmental problems in its succeeding years.

Among the greenhouse gases, carbon dioxide has the most heat trapping capacity and since the onset of industrial times in the 18th century, human activities have raised atmospheric CO2 by 50% – meaning the amount of CO2 is now 150% of its value in 1750. This human-induced rise is greater global temperature than the natural increase observed at the end of the last ice age 20,000 years ago. This phenomenon is known as human enhanced greenhouse effect. As well as, escalation in the use of fossil fuels led to destruction of vegetation cover. The atmosphere became enriched with high proportion of carbon dioxide due to indiscriminate use of fossil fuels by vehicles and different industrial units.

The other sources of increase of greenhouse gases in the atmosphere are the volcanic activities, forest fires and decomposition of flora and fauna into the soil releases methane, nitrous oxide and sulphur dioxide in the air. All these factors are seen to be responsible for about 30% increase of CO2 in the atmosphere during the last 200 years. If it continues with this rate than the CO2 contents will doubled in every 50 years. Although, these greenhouse gases constitute only 0.1% of the atmosphere they have a significant impact upon earth's climate and environment.

➢ *And Apart from Industrialisation, Volcanic Eruptions and Excessive use of Fossil Fuels, Other Causes are:*

Deforestation is a major cause behind heating of earth's temperature, as plants are known as natural purifiers and coolers of the earth. But cutting down of trees for short-term development programmes have resulted in huge air pollution. And it is worth mentioning that trees consume carbon dioxide to produce food in the presence of sunlight, through the process of photosynthesis. This process benefits the entire terrestrial ecosystem, as all heterotrophs are dependent on the autotrophs, i.e., the plants. So, plants are an essential component of the environment that shouldn't be destroyed for the sake of both men and animals. Hence, due to the absence of adequate amount of forest cover, carbon dioxide increases in the atmosphere and heats up the globe. The developing countries have the highest rates of deforestation in the continents of Asia, Africa, North America and South America in the 21st century.

Rapid urbanisation is another important factor for environmental set-back. The percentage of urban population to the total world population was just 2 % till the 19th century, but today it has increased to 50%. Increase in the number of towns and urban centres means excessive use of resources. In a town or city vehicle, more than 13 million barrels of oil are burned each day. Most of the vehicles still runs in petroleum and diesel, thus, releases greenhouse gases and heats up the particular urban centres. With the growth of population density, the demands of resources have increased, resulting in environmental degradation and problems such as air pollution, acid rain and water pollution.

The effect of global warming is multi-dimensional. The first and foremost effect of global warming is the melting action of glacial caps and it is estimated that the increase of global temperature even up to 3°C will result in large scale ice melting in the poles causing rise in the sea level up to a height of even kilometre square will lead to submergence of coastal areas and islands. The South Pacific Coral Islands, Maldives in the Indian ocean and the islands in the Pacific Ocean are already being affected by the rise in sea level as their height is not more than one meter above sea level. As well as, drastic changes in the agricultural practices, decline in the agricultural production and famines are the immediate outcome of global warming.

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➢ *Here are the Impacts of Global Warming in India:*

- Changing Rainfall Patterns: Since the 1950s, India has experienced a decline in monsoon rainfall. If global temperatures rise by 2°C, India's summer monsoons could become highly unpredictable. With a 4°C rise, extremely wet monsoons, which now occur once every 100 years, could happen every 10 years. This shift could lead to more frequent droughts and floods, especially in India's northwest and southeastern coastal regions. In essence, dry years might become drier and wet years wetter.
- Agriculture and Food Security: Global warming poses a significant threat to India's agriculture. Even without climate change, food prices are expected to rise due to population growth and increased demand for biofuels. Rising temperatures and decreased rainfall at the end of the growing season have already led to a significant loss in rice production. Without climate change, rice yields could have been nearly 6% higher. Wheat yields in India and Bangladesh have stagnated since 2001 despite more fertilizer use. Extremely high temperatures in northern India, above 34°C, negatively impact wheat yields, and this situation is expected to worsen. Seasonal water scarcity, rising temperatures, and sea water intrusion could severely threaten crop yields, jeopardizing food security. By the 2050s, under a 2°C warming scenario, India might need to import more than double the amount of food-grain compared to a scenario without climate change.
- Droughts: Since the 1970s, parts of South Asia have become drier, with more frequent droughts. Significant droughts in 1987 and 2002-2003 affected over half of India's crop area, drastically reducing production. Future droughts are expected to be more common, particularly in north-western India, Jharkhand, Orissa, and Chhattisgarh. Extreme heat by the 2040s could further reduce crop yields.
- Glacier Melt: Glaciers in the northwestern Himalayas and the Karakoram range have remained stable or advanced, while most Himalayan glaciers have been retreating for the past century. With 2.5°C warming, melting glaciers and loss of snow cover threaten the stability of northern India's glacier-fed rivers, especially the Indus and Brahmaputra. While the Ganges relies less on meltwater due to heavy monsoon rainfall, the Indus and Brahmaputra may experience increased flows in spring and reduced flows in late spring and summer. These changes could impact irrigation and food production, affecting millions of livelihoods.
- Sea Level Rise: Mumbai has the world's largest population vulnerable to coastal flooding. Unplanned urbanization increases the risk of sea water intrusion. Being close to the equator, India might see higher sea level rises than regions at higher latitudes. Rising sea levels and storm surges could lead to saltwater intrusion, impacting agriculture, degrading groundwater, contaminating drinking water, and potentially increasing diseases like diarrhea and cholera. Kolkata and Mumbai are particularly vulnerable to sea-level rise, tropical cyclones, and flooding.
- Health: Climate change is expected to severely impact health in India, with malnutrition and related disorders like child stunting projected to increase by 35% by 2050. Vector-borne diseases like malaria and diarrheal infections, major causes of child mortality, are likely to spread to new areas. Heatwaves could significantly increase mortality rates, and extreme weather events may cause more deaths and injuries.
- Global Response: These issues aren't limited to India; they require international cooperation. The world is addressing climate change through international agreements, national policies, technological innovation, and collaboration across sectors. The Paris Agreement, adopted in 2015, is a crucial international accord where nations commit to ambitious efforts to combat climate change and adapt to its effects by setting and achieving nationally determined contributions (NDCs). Green finance, including green bonds and climate funds, directs investments toward climate change mitigation and adaptation projects. Many countries are implementing or considering climate legislation that imposes strict limits on greenhouse gas emissions, such as carbon pricing mechanisms like carbon taxes and cap-and-trade systems. These steps aim to create a sustainable future for upcoming generations.

V. FINDINGS

The report highlights the significant and multifaceted impacts of human activity on Earth's climate and environment, particularly due to industrialisation and the excessive use of fossil fuels. Key findings include:

- Human-Induced Climate Change
- Sources of greenhouse gases
- Impacts on the environment
- Global warming effects in India
- Internation cooperation and mitigating measures

VI. CONCLUSION

In the shadow of rapid urbanization and technological advancement, humanity stands at a critical juncture, neglecting the very cradle of its existence, Earth. The relentless march of industrialization, fuelled by the consumption of fossil fuels, has precipitated a stark rise in greenhouse gas emissions, disrupting the delicate balance of our planet's climate system. The consequence is a warmer world, marked by melting polar ice caps, erratic weather patterns, and a cascade of environmental and social upheavals. The evidence is irrefutable; the global average temperature has surged, and the impacts are wide-ranging, from agriculture to human health, threatening food security, exacerbating natural disasters, and rendering populations vulnerable. Yet, amidst this dire scenario, there lies a hope to control the alarming rate of global warming through international cooperation. Frameworks like the Paris Agreement, and a global pivot towards sustainable development and green technologies, offer a pathway to mitigate these challenges. The collective endeavours of nations, communities, and individuals towards reducing

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carbon footprints and preserving our natural environment is imperative. The future of our planet, and indeed, the legacy of our species, hinges on our actions today. It is a call to arms for all of humanity to safeguard and cherish our only home, for the sake of future generations and the myriad species that share this fragile, beautiful Earth.

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