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CLIMATE CHANGE AND ENVIRONMENTAL DEGRADATION: EMERGING CHALLENGES AND FUTURE CONCERNS

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Abstract: *Climate change has emerged as one of the most critical environmental challenges of the twenty-first century, with its adverse impacts becoming increasingly evident across the globe. India, like many other countries, is also experiencing the serious consequences of climate change. At present, climate change represents one of the most pressing issues confronting global society and has become a priority concern for policymakers, scientists, and communities alike. The primary driver of climate change is global warming, which is largely caused by the increasing concentration of greenhouse gases in the atmosphere. These gases trap heat and lead to a continuous rise in the Earth's average temperature, thereby causing widespread environmental degradation. Meteorological studies suggest that climate change may result in more frequent and intense extreme weather events. Rapid melting of glaciers, for instance, can lead to floods and other related hazards. Climate change also poses a significant threat to forest ecosystems. Rising temperatures and altered rainfall patterns are changing the environmental conditions required for tree growth, potentially transforming dense forest areas into semi-arid or desert-like regions in the future. Rapid urbanization, industrialization, deforestation, and the excessive use of chemical fertilizers and pesticides are further intensifying the risks associated with climate change. The study emphasizes that only through the adoption of strong, well-defined, and effective policies can the human-induced threats of climate change be significantly reduced.*

Key words: Climate Change, Global Warming, Greenhouse Gases, Industrialization, Deforestation

Introduction

All the developed and developing countries of the world understand the importance of climate change. Right now, climate change is the main problem facing society globally. Dealing with it is the most important need today. Because of climate change, many islands around the world are at risk of disappearing, and it is also harming human life. Climate change affects natural disasters like floods, earthquakes, droughts, storms, agriculture, water resources, forests, biodiversity, health, coastal areas, and rising temperatures. In India, climate change has the biggest impact on agriculture. A large part of the population depends directly on farming. Due to the improper use of natural resources, many natural problems are now facing us. As the Earth's temperature rises, glaciers are melting. Sea levels are going up. There are more extreme weather events, and biodiversity is being harmed. Because of holes in the ozone layer, the protection against harmful UV rays is weakening. Because of all these issues, climate change has become a major and urgent challenge for the whole world. To bring attention to this problem, the first global environmental conference was held in Stockholm, Sweden, from June 5 to 16, 1972. During this conference, the global effects of climate change were discussed thoroughly. Twenty years later, in 1992, the United Nations Earth Summit was held in Rio de Janeiro, Brazil. This conference focused on balancing environment and development and legally defined the rights and responsibilities of all countries in protecting the Earth. After this, a treaty called the United Nations Framework Convention on Climate Change (UNFCCC) was introduced, under which the first major climate conference was held in Berlin, Germany, in 1995. Since then, 28 annual conferences have taken place. The 28th United Nations Climate Conference, known as COP-28, was held in the United Arab Emirates in November 2023. In this conference, the role of fossil fuels in climate change was discussed for the first time. Developed countries like the US and Europe are talking about leaving fossil fuels behind. On the other hand, developing nations like India, China, and fast-growing economies like OPEC are resisting this move. Gradually phasing out fossil fuels could limit global warming to 1.5 degrees Celsius. However, phasing out fossil fuels completely could bring the world back to a primitive state. But there is some hope in that at least the conversation around fossil fuels has started. According to a new report by the International Energy Agency, if all governments fulfill their 2015 climate commitments, the use of oil and gas will almost be cut in half by the middle of the century. India has promised to achieve 'net zero' emissions by 2050. Meanwhile, the International Energy Agency is urging gas companies to stop using trillions of dollars' worth of gas, and the fossil fuel industry is slowly reducing its consumption. It plans to cut the use of gas and oil on a large scale, not eliminate it completely. It is very hard to move the world economy away from energy that depends on carbon. But around the world, agencies have some solutions to move away from fossil fuels, as investments in clean energy have doubled due to subsidies and incentives. Big polluting countries like China and the US now understand how important it is for them to implement carbon taxes. If it is hard to cut back on oil and gas, how much harder will it be to save the Earth? The COP-29 United Nations Climate Change Conference will be held in Baku, Azerbaijan, in November 2024. This conference will play an important role in achieving the goals of sustainable development. Considering climate change and sustainable development, COP-29 aims to build a more resilient and fairer world.

Review of Literature

Climate change and global warming are words that are often used together, but they have different meanings. Global warming refers to one part of the larger climate system, which naturally changes over time. Scientists have used physical evidence from Earth and space to understand the many factors that can influence the planet's climate over long periods. These factors include solar radiation levels, Earth's orbit around the sun, volcanic activity, ocean

currents, and even the movement of tectonic plates. Periods of warming are called interglacial, while periods of cooling are called glacial. Glacial are marked by large ice sheets covering parts of the poles. In recent human history, there have been two notable climate changes: the Medieval Warm Period (A.D. 1000–1270) and the Little Ice Age (A.D. 1270–1850) (Singer & Avery, 2007). The discussion about climate change goes back much further in time than many people realize. As Weart (2007) points out, climate change was thought about in ancient times, and knowledge grew as technology improved. One key figure in climate science was Guy Stewart Callendar, who suggested that carbon dioxide could trap heat. This idea was later confirmed by computer simulations in the 1970s. Studies also showed that slight changes in Earth's orbit could affect the timing of ice ages, showing how sensitive the climate system is to even small changes (Weart, 2007, para. 10). In more recent times, the Intergovernmental Panel on Climate Change (IPCC) has studied Earth's climate. This group consists of scientists who focus on climate issues. The IPCC has released four major reports, examining the links between human activity and climate change. Their most recent report, "Climate Change 2007," concluded with 90% certainty that global warming is directly linked to human-produced greenhouse gas emissions. The IPCC was awarded the Nobel Peace Prize for raising global awareness about this issue.

Methodology

It is easy to feel overwhelmed by the scale of climate change and think it is too big to address. However, the solutions are already available, and the challenge is turning these solutions into real action. This requires strong international cooperation between governments and businesses, especially those in the most polluting industries. Individuals can also make a difference by making more informed choices about how they get energy, travel, and what they eat. But the most effective way to help stop climate change is by taking collective action. This means pushing governments and companies to change their policies and business practices. Governments want to stay in power, and businesses rely on customers. So, pressuring them to take action is a powerful way to bring about real change.

Causes of Climate Change

Humans are seen as the main cause of climate change. They are also regarded as the most intelligent beings on Earth. People are involved in destroying their own habitats and natural resources, whether they do it on purpose or not. These human activities are causing a rise in greenhouse gases like carbon dioxide, methane, nitrogen oxide, chlorofluorocarbons (CFCs), and carbon monoxide. This buildup of these gases is changing the atmosphere, which blocks some of the sun's ultraviolet rays from reaching the Earth. Because of this, the Earth's temperature keeps rising. Based on these factors, the causes of climate change can be divided into two main categories:

Natural Causes

Ocean Currents: Ocean currents affect climate change in two main ways. They help spread heat around the globe by moving warm water from the equator towards the poles and cooler water back, which helps control global temperatures. They also absorb carbon dioxide from the atmosphere, playing a key role in climate regulation. Oceans cover 71% of the Earth's surface and absorb twice as much sunlight as the atmosphere and land. They also hold about 50 times more carbon dioxide than the atmosphere, which is why they are often called carbon sinks.

Man-Made Causes: It is almost impossible to stop climate change because humans themselves are the biggest threat to nature. Climate change cannot be controlled until people's behavior changes, making human activities the main cause of climate change.

Indiscriminate Tree Cutting: Deforestation is one of the main reasons for climate change. People cut down trees for their own needs, such as farming and building homes. Trees and plants take in carbon dioxide through photosynthesis and release oxygen, storing carbon for growth. When trees are cut down, carbon emissions rise rapidly. Forests act as carbon sinks, helping to reduce the effects of climate change. There is a direct link between deforestation and climate change. The more trees that are cut, the more severe the impact of climate change becomes, leading to even more loss of forests. Forests cover about 31% of the Earth's land area. Every year, a significant amount of forest is being lost. 18.7 million acres of forest are being destroyed.

Effect of Greenhouse Gases: The greenhouse effect is like a special room where plants grow. The four walls are made of materials that keep heat inside, and the roof is made of glass. This allows sunlight and heat to enter the room but prevents them from escaping, keeping the temperature warm even in winter. Plants that need higher temperatures can grow well in such a room. Similarly, the Earth's atmosphere acts like this greenhouse. The Earth naturally receives heat from the sun, which passes through the atmosphere and reaches the ground. Then, some of this heat reflects back. The atmosphere is made up of various gases that act as a shield, trapping some of the heat in the same way as the glass in a greenhouse. This process is called the greenhouse effect. Major greenhouse gases include carbon dioxide, methane, nitrogen oxide, and chlorofluorocarbons. These gases are causing the Earth's temperature to rise steadily.

Agriculture: Food is a basic need for humans. To get food, people clear large areas of forest and turn them into farmland, which affects the environment. Farming and animal husbandry also contribute. When animals chew their food, they release methane gas. Similarly, rice and paddy fields also emit a lot of methane. These activities together are causing climate change.

Industrialization: It is believed that climate change began during the industrial revolution. The concentration of greenhouse gases has been high since the start of the industrial era. With modern developments, machines have replaced human labor, using new energy sources in industries. The use of electricity in industrial construction has increased, and manufacturing processes directly release greenhouse gases.

Urbanization: People are moving to cities for jobs and education, which greatly contributes to climate change. With growing commercial and industrial activity in cities, the use of fossil fuels is increasing, leading to climate change.

Effects of Climate Change: The effects vary depending on time and place. These include:

- **High temperature:** Earth's temperature is rising beyond normal levels, affecting both human life and the environment. This increase is mainly due to the rising levels of greenhouse gases in the atmosphere. In some parts of the world, the heat is becoming more intense, while in others, the cold is increasing. According to the World Meteorological Organization, the year 2010 was the hottest decade.
- **Rise in sea level:** Due to climate change, Earth's temperature is rising, causing the ice on major mountain peaks to melt. This melting leads to higher sea levels. As the sea level rises, natural coastlines start eroding and coastal areas get flooded. Many people living in coastal areas become homeless, and the animals there have to move to other places. It is estimated that 18 islands worldwide have already been submerged. In India, the Sundarbans Delta, a group of 54 islands, is also at risk. Additionally, Majuli Island, the world’s largest river island located in the Brahmaputra river valley in the Indian state of Assam, is facing flood threats. Due to rising sea levels, a group of 14 islands is expected to disappear completely by 2020.

- **Rapid melting of ice-glaciers in mountainous regions:** The melting of glaciers in mountainous regions, especially in the Indian Himalayas, is causing the size of glaciers and icy lakes to increase quickly. According to the Indian Space Research Organization (ISRO), data from satellites and worldwide research shows that since the start of the Industrial Revolution in the 18th century, the continuous rapid melting of glaciers has led to the formation of new lakes in the Himalayan region and the expansion of existing ones. These icy lakes formed from melting glaciers are seen as a source of freshwater.
- Water in the Himalayan region is a concern, but building more dams there is very risky. This is because glacier lakes can burst suddenly, causing floods in lower areas that can be very dangerous. It is also hard to monitor these risks. ISRO has said that melting glaciers is a clear sign of big changes in the climate. This melting can lead to big floods in lower mountain areas.
- **Effect on biodiversity:** Climate change is affecting biodiversity, and this has been shown in a new study. Researchers studied how changes in land use affect biodiversity and found that it could decrease by 2 to 11% globally. This study was done by the German Center for Integrative Biodiversity Research and was published in the Science Journal. The rising temperature on Earth is harming biodiversity. One of the ways climate changes affect biodiversity is by making forest fires, storms, and droughts more intense and frequent.
- **Forest fires due to extreme heat and dryness:** People around the world are worried about the growing dangers of climate change. If we do not take action, by 2050, dense forests may turn into dry desert-like areas. This alarming loss of forest cover is because of changes in temperature and rainfall, and long dry periods after the monsoon season. Because of the constant high temperatures, the conditions suitable for trees are changing. This could mean that dense forests might turn into deserts in the future. There are more cases of big forest fires happening quickly. Forests are burning everywhere due to global warming. The ozone layer is being damaged heavily because of toxic gases, and natural water resources are drying up.
- **Change in rainfall pattern:** India is an agricultural country, and two-thirds of its farmland depends on rain. The productivity of agriculture depends on rainfall. Changes in the amount of rain affect soil erosion and moisture. Because of climate change, rising temperatures are causing less rain. This leads to a loss of soil moisture. As a result, changes in rainfall and temperature are increasing the risk of weathering and drought in the land. The effects of global warming have been deeply affecting the environment for years. By 2050, central India is expected to experience a 10 to 20% drop in winter rainfall.

Measures to Stop Climate Change:

- The first important step to stop climate change is to reduce the impact of greenhouse gases as quickly as possible. Trees, plants, and the sea all play a key role in changing the climate.
- **Let fossil fuels stay underground:** Fossil fuels include coal, oil, petroleum, and natural gas. The more fossil fuels are extracted from the earth and used, the more severe climate change becomes. It is extremely important for all countries around the world to move away from fossil fuels as quickly as possible.
- **Protect trees and plants:** Forests are very important in the battle against climate change. Protecting forests is a key solution to stopping climate change. When large numbers of trees are cut down on an industrial scale, big trees disappear from forests, which can absorb a lot of carbon. On one hand, there is a focus on planting more trees

to increase greenery, while on the other hand, shady trees are being cut down from fields. It is believed that shady trees are a major problem in increasing crop yields. About 56 percent of the country's land is agricultural, compared to just 20 percent. There is a greater potential for greenery in these areas. However, this potential is being limited by the cutting down of shady trees. By reducing trees and plants in big cities, humans have disrupted the natural rhythm. They are now facing the consequences of this. These days, many parts of India are experiencing intense heat, like a tandoor. The loss of shady trees is also a big reason behind this. Trees and plants are not only the main source of relief from rising temperatures but also play a crucial role in climate change and the conservation of biodiversity. Biodiversity has been hit the hardest due to the reduction of shady trees in cities. However, the speed at which shady trees in fields are being removed means that in the coming times, many bird species may no longer be seen there. A single shady tree releases 230 liters of oxygen every day. Trees and plants also help to prevent soil erosion and keep the soil attached to the land. They are the most helpful in increasing the level of groundwater. The temperature in an area with trees can decrease by 3 to 4 degrees. Considering all these benefits, there is a need not only to focus on the conservation of shady trees but also to start a massive campaign to plant them. Instead of decorative trees in cities, shady trees would be more beneficial for the population.

- **Reduce the use of plastic:** Plastic is made from oil, and the process of extracting, refining, and converting oil into plastic is extremely carbon-intensive. Plastic does not break down easily in nature, so a lot of it is burned, which leads to emissions. Currently, the demand for plastic is increasing so fast that by 2050, producing and disposing of plastic will account for 17% of the global carbon budget.
- **Protect the oceans:** Oceans absorb a lot of carbon dioxide gas from the atmosphere, which helps to keep the climate stable. Protecting the oceans and the life within them is basically a way to protect ourselves from climate change.
- **Improve farming:** The best way for humans to help prevent climate change is to change farming practices towards plant-based production. There is a need to focus again on research in agriculture under agricultural research programs. Under this, seeds should be. It is encouraging to know that certain methods can cut down the risk of reduced crop production by half during drought-like situations. There is a need to boost crop insurance coverage and the amount of loans provided to farmers. This initiative should be widened to cover all types of crops. The Rural Insurance Development Course for crop insurance should be made more comprehensive. The government should enhance the subsidy provided to farmers on the interest they pay on loans. In this regard, the monthly assistance given to small and marginal farmers by the government is a positive step. To tackle the shared challenges of climate change, efforts are being made to develop climate-smart agriculture across the country. Climate-smart agriculture aims to raise agricultural productivity and income in a sustainable way by cultivating crops that are resistant to temperature changes, rainfall variations, pests, diseases, and salinity. The use of private vehicles should be minimized, and recycling should be promoted.
- Based on scientific studies, the use of refrigerators and air conditioners should be reduced right now because they release harmful gases such as carbon dioxide and CFCs.
- Forests must be protected from fires.
- Items that do not pollute the environment and can be reused should be used more. By adopting technologies like solar and wind energy instead of using fuel for energy, we

can control the environmental changes happening around us.

- To raise awareness in society, publicity should be carried out through newspapers, television, and social media.

Conclusion

Through the above points, we have realized how significant our new discoveries can be in solving environmental issues and involving the general public in understanding the causes and consequences of the severe environmental changes. It is important to adopt a comprehensive and holistic approach to deal with the climate change crisis. This approach should involve different parts of society, including individuals, businesses, governments, and international organizations. Implementing a National Carbon Accounting System will be a key step in this effort, as it will provide the necessary data and framework to guide decision-making and monitor progress towards a more sustainable future. The climate change crisis cannot be effectively addressed through isolated or sector-specific measures. Instead, it demands a comprehensive and holistic approach that integrates environmental, economic, social, and technological dimensions of development. Such an approach requires the active participation of all stakeholders, including individuals, local communities, businesses, policymakers, governments, and international organizations. Coordinated action among these groups is vital to ensure long-term environmental sustainability and climate resilience.

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