GLOBAL WARMING IN THE PRESENT SCENARIO

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ABSTRACT

Global warming is the long-term rise in Earth's average surface temperature caused primarily by human activities like burning fossil fuels. [1, 2]

Key Definition & Facts

- Temperature Rise: Earth's average global temperature has increased by about 1°C (1.8°F) since the pre-industrial period.
- Current Rate: The warming rate has more than doubled in recent decades, rising over 0.2°C per decade since 1981.
- Greenhouse Effect: Burning coal, oil, and natural gas releases carbon dioxide and methane that trap heat in the lower atmosphere.
- Global Target: The Paris Agreement aims to limit warming to well below 2°C, ideally 1.5°C, above pre-industrial levels

KEYWORDS- Global Warming, temperature, Greenhouse, Target,Paris Agreement

INTRODUCTION

The causes are:-

• Fossil Fuels: Power generation, transport, and industry are the largest contributors to greenhouse gas emissions.

• Deforestation: Cutting down forests reduces the Earth's capacity to absorb carbon dioxide from the air.

• Agriculture: Livestock production and agricultural practices release methane and nitrous oxide.

The effects are:-

• Melting Ice & Rising Seas: Glaciers, ice caps, and polar ice sheets are melting, driving up sea levels and threatening coastal communities.[1,2,3]

• Extreme Weather: Heatwaves, severe droughts, heavy downpours, and intense storms occur more frequently.

• Ecosystem Stress: Ocean acidification and rising water temperatures harm coral reefs and disrupt wildlife habitats.

Rising ocean temperatures and increasing levels of carbon dioxide (CO_2) are driving phenomena such as coral bleaching, ocean acidification, and sea level rise, all of which are rapidly degrading coral ecosystems.

Coral Bleaching

As ocean temperatures rise, corals experience stress and expel the algae (zooxanthellae) that provide them with energy and colour. This process, known as coral bleaching, leaves corals white and highly vulnerable to disease, starvation, and eventual death. Widespread bleaching events have been reported across the world, often linked to prolonged periods of unusually warm water.

Bleaching doesn't necessarily mean immediate death, but prolonged bleaching without recovery time between events can lead to massive coral mortality, leaving entire reef systems barren and lifeless. This has ripple effects on marine biodiversity, as reefs provide shelter and food for countless marine species.

Ocean Acidification

As the atmosphere absorbs more CO2, the ocean absorbs a significant portion of it, leading to ocean acidification. Increased CO2 reduces the pH of seawater, making it more acidic. This affects coral's ability to build and maintain their calcium carbonate skeletons, which are essential for their structure and growth. Weakened coral skeletons mean that reefs are more vulnerable to physical damage from storms and less capable of recovering from other environmental stresses.

Ocean acidification also impacts the broader ecosystem by affecting shell-forming organisms, which are crucial to the marine food chain, further disrupting the balance of reef ecosystems.

Sea Level Rise:

Sea level rise, driven by melting polar ice caps and the thermal expansion of seawater, impacts coral reefs in multiple ways. Healthy reefs may grow vertically to keep pace with rising seas, but factors like sedimentation from coastal erosion and increased wave action can smother and stress corals. These stressors, combined with other climate-related challenges such as ocean warming, can inhibit coral growth and survival.[2,3,4]

DISCUSSION

The fight to save coral reefs from climate change requires global and local actions:

– Reduce Carbon Emissions: Limiting the rise in global temperatures through the reduction of CO2 emissions is the most critical factor. A global shift toward renewable energy sources, sustainable industry practices, and reduced fossil fuel consumption is key to slowing the pace of climate change and allowing reefs to recover.

– Coral Restoration Initiatives: Projects focusing on coral propagation, such as growing more resilient coral species, can help restore damaged areas. Artificial reefs and coral nurseries are also being used to support regrowth in areas heavily affected by bleaching and other climate-related damage. See our Yaf Keru Reef Restoration project which after a 3 year pilot phase demonstrated the feasibility of community-based reef restoration

– Building Reef Resilience: Conservation initiatives that protect coral reefs from additional stressors, such as overfishing and pollution, are crucial. Healthier, less stressed reefs have a better chance of surviving the effects of climate change.

– Community Engagement and Awareness: Local communities, especially those that rely on reef ecosystems for livelihoods, play an essential role in protecting these environments. Sustainable fishing practices, reef-friendly tourism, and pollution reduction are vital steps toward building resilience in coral reef systems.

Addressing climate change is essential to giving coral reefs a fighting chance. With coordinated global efforts and localised conservation initiatives, there is still hope for these precious ecosystems.

RESULTS

Global warming refers to the increase in the planet's overall average temperature in recent decades. Natural processes have always affected Earth's temperature and climate, but more recently, the planet's temperature and climate have changed at a higher pace than nature alone can explain. These rapid changes are due to human activities and the widespread use of fossil fuels for energy.

Fossil fuels include coal, oil and natural gas. Burning fossil fuels causes what is known as the "greenhouse effect" in Earth's atmosphere. The greenhouse effect happens when the sun's rays penetrate the atmosphere, and the Earth's surface reflects that heat. Some of the gasses in the atmosphere then trap heat over Earth. Gasses emitted by the burning of fossil fuels are very good at trapping heat and preventing it from leaving the atmosphere. These greenhouse gasses are carbon dioxide, methane, nitrous oxide, chlorofluorocarbons and water vapor. The excess heat in the atmosphere has caused the planet's average global temperature to rise over time, otherwise known as global warming.[3,4,5]

The Industrial Revolution, beginning in the mid-18th century, led to the start of an anthropogenic (human-caused) rise in greenhouse gas emissions from Europe and the United States. The invention of the coal-fired steam engine introduced coal as a major source of energy. Soon it was heating homes and fueling machines in factories.

Since that time, the burning of fossil fuels has steadily increased. Today, many countries around the world use fossil fuels to generate energy for electricity, heat and transportation. Emissions of greenhouse gasses have skyrocketed in the last 100 years, and especially since the 1980s. This has accelerated the rise in Earth's temperature.

Global warming has presented humans with another issue: climate change. People often use the terms "global warming" and "climate change" interchangeably, but they are different. Global warming refers to Earth's rising average temperature, while climate change refers to changes in weather patterns and growing seasons around the world. Global warming causes climate change, which poses a serious threat to life on Earth.

Humans are feeling the impact of global warming around the world as climate change brings intense droughts, wildfires and extreme storms with heavier rainfall. Higher temperatures are altering ecosystems, forcing animals to migrate to cooler places to survive. Scientists predict that, if nothing is done to lower global temperatures, many species will go extinct.

The ocean is also warming, and glaciers, ice caps and ice sheets are melting. This is causing sea levels to rise, creating flooding problems for many people who live on islands and in coastal communities.

Corals have been a symbol of the consequences of a warmer ocean. Many coral reefs—home to thousands of species of fish and other organisms—are dying. National Geographic Explorer Shireen Rahimi is an underwater storyteller who focuses her lens on the impact of global warming on tropical coral reefs. Her images capture humans' relationships to the changing seas in the South Pacific, the Coral Triangle, and the Caribbean. Rahimi is dedicated to telling personal stories that encourage environmental action.

Countries around the world are trying to lower greenhouse gas emissions to slow global warming. In 2015, nearly 200 countries signed the Paris Agreement at a United Nations Climate Change conference. The international treaty tasks each country with lowering greenhouse gas emissions. The goal is to slow the pace of global warming and prevent Earth's temperature from rising 2°C (3.6°F) above pre-industrial temperatures.[4,5,6]

Alarming Numbers

Greenhouse gas concentrations are at their highest levels in 2 million years. Emissions are continuing to rise. As a result, the Earth is presently around 1.1 degrees Celsius warmer than it was in the late 1800s. The most recent decade (2011-2020) has been the warmest on record.

It is perceived that climate change mainly entails higher temperatures. However, the temperature rise is merely the beginning of the narrative. As everything is interconnected in the ecosystem. Thus, shifts in one aspect will equally impact others. Research has shown that, If the global average surface temperatures rise between 1.5-2 degrees, then world's wealthiest countries will experience fewer changes in their local climate as well as crop yields due to well-built information systems in place whereas low income or less developed countries will suffer more in terms of food security and food safety due to climate change and lesser resilient crop infrastructure.

Recently released "Vulnerability assessment report" by Indian Council of Agricultural Research, ICAR reveals that out of 573 rural districts (excluding Andaman and Nicobar Islands) 109 districts are very high-risk districts and 201 districts are risk districts. Considering the current situation of climate change in India integrated modeling simulation studies indicated that by 2049 the mean temperature of these districts will increase by a minimum of 1.3 degrees. For a tropical country like India, Rise in temperature may affect the various crop yields affecting the production and consumption pattern of food across the year.

The Consequences of Climate Change on Food and Nutrition security

One hand increase in CO2 concentrations are good for crop growth but on the contrary CO2 emissions are resulting in frequent climatic fluctuations like intense heat, severe weather and droughts which are huge threat to In-demand crops like wheat and maize. (2)

According to some projections, in the absence of successful adaptation, worldwide yields could fall by up to 30% by 2050.

Countries already dealing with violence, pollution, deforestation, and other issues are likely to bear the brunt of these consequences. The 2 billion people who already lack adequate food, particularly smallholder farmers and other individuals living in poverty, will be struck the hardest. Despite decades of global commitment, hunger and food insecurity continue at alarming rates.

According to the State of Food Security and Nutrition in the World report, approximately 750 million people experienced extreme food insecurity in 2019.

The number of undernourished people or food insecurity is increasing, with climate shocks playing a significant role. Climate change will raise food prices, reduce food supply, and promote instability and conflict due to competition for water and arable land unless immediate action is taken.

As per a recent report by Children's Climate Risk Index (CCRI) "Climate crisis is a child crisis". With an estimated 850 million children 1-3 worldwide are living in areas where environmental and climatic shocks overlap. Children will suffer more than adults and they require more food and water per unit body weight and have less resilience to hold up against extreme and harsh weather events. Also, Children are more susceptible to toxic chemicals, temperature changes and diseases. (3)

In the last three decades India has witnessed rise in mean temperature and increased frequency of extreme rainfall. According to estimation by National Innovations in climate resilient agriculture rainfed rice yields in India are projected to reduce marginally by <2.5% between 2050-2080, irrigated rice yields by 7%. Further, wheat yield is projected to reduce by 6-25% in 2100 and maize yields by 18-23%. It is predicted that future climatic shifts may benefit chickpea production by 54%. These figures clearly indicate the need for mitigation strategies for food and nutrition sustainability.[5,6]

On the Brightside – Policy Making, Ecosystem strengthening and Advocacy

In 2021 Secretary-General of UN António Guterres organized the Food Systems Summit to inspire renewed global commitment to resilient and sustainable food systems. The summit convened governments, civil society, and the private sector to generate innovative ideas, build new partnerships, and deliver ambitious cross-sectoral actions to transform food systems to meet the Sustainable Development Goals (SDGs) and Paris Agreement emission reduction targets.

Many climate change solutions have the potential to provide economic benefits while also enhancing our lives and safeguarding the environment. Global frameworks and agreements, such as the Sustainable Development Goals, the UN Framework Convention on Climate Change, and the Paris Agreement, are also in place to steer progress. There are three basic types of action: reducing emissions, adapting to climate impacts, and financing necessary adjustments.

Switching from fossil fuels to renewables like solar and wind will lower the emissions causing climate change. But we must begin immediately. While a growing coalition of countries has committed to net zero emissions by 2050, around half of the emissions reduction must be implemented by 2030 to keep global warming below 1.5°C. Between 2020 and 2030, fossil fuel production must drop by about 6% yearly. (6)

India's Approach towards Climate change: Mitigation strategies and preparedness

Placing climate change at the center of its environmental policy, India made bold vows in 2021, with Hon. Prime Minister Narendra Modi declaring at the critical international climate summit COP 26 that India is the only country delivering on the Paris Agreement commitments in "letter and spirit". From vowing to become a net carbon emitter by 2070 to generating 500 gigatons of non-fossil energy capacity by 2030, India led from the front on environmental problems this year, capturing the attention of people worldwide.

To meet the challenges of sustaining domestic food production in the face of changing climate, The Indian council of agricultural research (ICAR) under ministry of agriculture and farmers welfare, has launched a flagship network project aims to study the impact of climate change on agriculture including crops, livestock ,horticulture and fisheries and to develop and promote climate resilient technologies in agriculture which will address vulnerable areas of the country and the output of the projects will help the districts and regions prone to climatic hazards. ICAR has developed resilient varieties in different crops tolerant to climatic stresses to improve the food grain production in the face of changing climate. Out of 2122, 1752 varieties are climatic stress resilient. Based on vulnerability assessment, climate resilient technologies are being demonstrated on farmer's fields covering 446 villages. Agromet advisories are reaching the farmers through m-Kisan portal, whatsapp groups and SMS services etc. To deal with climate change, the government of India is implementing a National action plan on climate change which aims to evolve and implement strategies to make Indian agriculture more resilient to the changing climate and to sustain increase in production. Per drop more crop schemes are being implemented to increase the irrigation area. Similarly, the Rainfed Area Development (RAD) scheme is being implemented to promote sustainable integrated farming systems. With the help of technological interventions GOI is preparing effectively to increase the crop produce and decrease the crop loss. [6]

CONCLUSION

How Action Against Hunger is making efforts to deal with climate crisis

Our primary goal as the world's hunger specialist is to find a better solution to cope with hunger. For more than 40 years, we have led the global fight to end life-threatening hunger once and for all. In more than 45 countries, our professionals have been on the front lines, treating and preventing malnutrition.

We save children and their families' lives. We are there for them both before and after a crisis occurs. We make it possible for people to provide for themselves, for their children to grow up strong, and for entire communities to thrive. We are continuously looking for more effective solutions while also sharing our knowledge and skills with the rest of the world. [6]

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