GLOBAL WARMING

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ABSTRACT

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

What Is Global Warming?

• Definition: The steady increase in Earth's lower atmosphere and ocean temperatures.
• Temperature Change: Global average temperatures have risen by more than 1 degree Celsius (1.8 degrees Fahrenheit) since the pre-industrial era (1850–1900), with the rate of warming more than doubling since 1981.
• vs. Climate Change: Global warming refers strictly to the rising temperature trend, whereas climate change includes global warming and its broader effects (such as shifts in rainfall, wind, and sea levels).
KEYWORDS- global warming, fossil fuels, Earth, temperature, climate

INTRODUCTION

Causes

• Greenhouse Gas Effect: Activities release heat-trapping gases—including carbon dioxide (CO_2), methane (CH_4), and nitrous oxide—into the atmosphere.
• Fossil Fuel Combustion: Burning coal, oil, gasoline, and natural gas for energy and transportation accounts for the largest share of emissions.
• Deforestation & Land Use: Clearing forests reduces the planet's capacity to absorb carbon dioxide from the air.[1,2,3]

Major Effects

• Melting Ice & Rising Seas: Glaciers, ice sheets, and Arctic permafrost are shrinking, which contributes to higher sea levels and coastal flooding risks.
• Extreme Weather: Warmer conditions supercharge storms, heatwaves, droughts, and heavy precipitation events.
• Ocean Warming & Acidification: Oceans absorb most of the excess heat and carbon, harming marine life and coral reefs.

Widespread improvements in the quality of life of many of the world's populations have gone hand-in-hand with increased demands on natural resources. The planet is struggling to keep up. Increases in the average global temperature, and the frequency of extreme weather events are transforming ecosystems around the world and threatening entire species of plants and animals. Forests are drying up because there is less rainfall and thus more fires, and the glaciers of both the North and South Poles are

shrinking. The consequences of climate change affect all of us, but to react and adapt to these challenges, we must first understand them.
Climate is not the same as weather, but the two phenomena are closely related. While weather refers to short-term conditions that can change quickly, climate determines the long-term character of a given place, for instance, whether it is temperate or tropical. The relationship between weather and climate is crucial: the former is subordinate to the latter. Climate determines temperatures, weather diversity, the traits of winters, rainfall totals, as well as the nature of meteorological phenomena such as the severity of storms. It is due to this delicate relationship that we are facing both temperature rises and more frequent weather extremes and natural disasters as a result of climate change.[4,5,6]

DISCUSSION

Present-day climate change includes both global warming—the ongoing increase in global average temperature—and its wider effects on Earth's climate system. In a broader sense, climate change also includes previous long-term changes to Earth's climate. The modern-day rise in global temperatures is driven by human activities, especially fossil fuel (coal, oil and natural gas) burning since the Industrial Revolution.[4][5] Fossil fuel use, deforestation, and some agricultural and industrial practices release greenhouse gases.[6] These gases absorb some of the heat that the Earth radiates after it warms from sunlight, warming the lower atmosphere. Earth's atmosphere now has roughly 50% more carbon dioxide, the main gas driving global warming, than it did at the end of the pre-industrial era, reaching levels not seen for millions of years.[7]

Climate change has an increasingly large impact on the environment. Heat waves and wildfires are becoming more common.[8] Amplified warming in the Arctic has contributed to thawing permafrost, retreat of glaciers and sea ice decline.[9] Higher temperatures are also causing more intense storms, droughts, and other weather extremes.[10] Rapid environmental change in mountains, coral reefs, and the Arctic is forcing many species to relocate or become extinct.[11] Even if efforts to minimize future warming are successful, some effects will continue for centuries. These include ocean heating, ocean acidification and sea level rise.[12]

Climate change threatens people with increased flooding, extreme heat, increased food and water scarcity, more disease, and economic loss.[13] Human migration and conflict can also be a result.[14] The World Health Organization calls climate change one of the biggest threats to global health in the 21st century.[15] Societies and ecosystems will experience more severe risks without action to limit warming.[16] Adapting to climate change through efforts like flood control measures or drought-resistant crops partially reduces climate change risks, although some limits to adaptation have already been reached.[17] Poorer communities are responsible for a small share of global emissions, yet have the least ability to adapt and are most vulnerable to climate change.[18][19] Anthropogenic emissions of greenhouse gases perturb the planetary energy balance, resulting in global warming. We start with a framework for global mean analysis based on planetary energy budget at the top of the atmosphere. A recent 15-year period of 1998-2013 is examined closely to illustrate that internal variability can markedly slow the

rate of global-mean surface warming, but the energetics is distinct from the anthropogenic warming. Robust patterns of warming-induced changes are highlighted, including the Arctic amplification, exacerbated risks of heatwaves and wildfires, poleward expansion of the Hadley circulation, and the surface intensification of ocean circulation.[7,8,9]

RESULTS

Global warming is a real and present danger to the earth as we know it. If we do not deal with global warming now with the technology we have today, we will not be able to maintain the world's population and our standard of living. The authors' objective is not to write another book about the causes and dangers of global warming. We do cover these topics in the interest of providing the reader with a complete discussion of this subject. Our main purpose is to:

Explore the challenges associated with taking action on global warming. This will be an extremely difficult problem to solve for many reasons.

Present a plan of action, a way forward. It will take an estimated 50 years or more to significantly reduce global warming if we start soon. There are no quick solutions. Stopping greenhouse gas emissions will not stop global warming immediately, but will slow future temperature increases[10,11,12]

Global warming, commonly known as "climate change," indicates an increasing global temperature effect on the lower atmosphere (Stranddorf et al., 2005). Naturally, radiation from the sun heats up our planet and a portion of this is reflected into the atmosphere. However, carbon dioxide and other greenhouse gases (GHSs) in the atmosphere (e.g., methane and nitrous oxides) absorb and reflect the radiation again toward the Earth's crust, causing global warming. In most LCIA methods listed above, the global warming effect is calculated with global warming potentials (GWP) for all elements responsible for the greenhouse effect present in the study (Andrić and Al-Ghamdi, 2019). The unit for GWP is CO2-equivalent.

Global warming is a serious threat to life on earth as we know it and cannot be ignored. Most importantly, due to vested interests by the petroleum, coal, and natural gas businesses, the public has been subjected to conflicting and misleading information, and politicians have refrained from passing meaningful legislation for fear of losing financial or political support. The public hesitates to press their governmental representatives about a matter that seems to be far in the future and that might impact them financially through higher costs for fuel and electricity. To better understand the need for immediate action, we need to recognize that latency, or possible catastrophic delayed effects of global warming, is extremely important.[13,14,15]

Global warming is one of the major issues we are being faced with. Global warming has caused change in the climate of the earth, causing temperatures to rise. The greenhouse effect causes the Earth's heat to be trapped in the atmosphere, which results in the increase in temperature. This in turn has an effect on various species dependent on the basic laws of nature. A warmer Earth also causes changes in rainfall patterns, and thus affects humans, plants, and animals as well. Scientists are of the opinion that a further rise in the carbon dioxide levels will aggravate the situation.

Anthropogenic global warming due to atmospheric pollution by CO2 and CH4 is commonly regarded as unprecedented, but the rock and fossil record indicates many comparable past atmospheric redox crises. Commonalities among these past events allow a better understanding of global warming induced by greenhouse gases. Biodiversity generally declined during geologically rapid global warmings due to CO2 and CH4 emissions from volcanic eruption and intrusion, meteorite impacts, or outbursts from submarine and permafrost methane clathrates. Extreme cases of greenhouse release to the atmosphere are the great mass extinctions of the fossil record, when many creatures died from the effects of hypoxia, hypercapnia, and pulmonary edema. At lower levels of greenhouse gases, such lethal effects were limited in area to high altitudes, stagnant wetlands, oligotrophic coral reefs, and deep ocean basins. Some consequences of global warming such as increased precipitation and warmth extending to high-latitude intercontinental land bridges had the effects of increasing biodiversity. Hardships such as soil acidification and increased seasonality of climate selected for sclerophyllous, thickly cutinized plants. Hardships such as hypoxia selected for greater respiratory scope in animals. Such adaptations added to biodiversity. The effects on biodiversity of global warming by greenhouse gases are complex, but a rich fossil and rock record of comparable events in the past promises new perspectives on future global warming.[16,17,18]

Climate Impact on Natural Ecosystems and Human Society

Global warming and associated changes in the hydrological cycle and sea-level rise are expected to cause serious negative impact on natural ecosystems, human health, and economy. It is predicted that climate change will disrupt ecosystems and will result in loss of species diversity, as many species will be not be able to adapt to rapidly changing environmental conditions. Some ecosystems, such as tropical montane, mangrove forest, and Arctic ecosystems, are likely to disappear because warmer climate or sea-level rise will not support them. In the high latitudes, warming will cause degradation of permafrost and an increase of methane release from wetlands. Because methane is the next important greenhouse gas after CO2, this will also amplify global warming.

Simulations with coupled climate model indicate that during 21st century soil moisture in summer will decrease considerably over the large portion of Europe and United States. This could have potentially serious negative impact on natural vegetation and agriculture, and lead to an increase of forest fire frequency. Combination of warming and changes in hydrological cycle will have serious impact on water resources in many regions. Already now one-third of global population is living in water-stressed countries. Unmitigated global warming will considerably increase the number of people exposed to water stress. At the same time, increased probability of extreme weather events, such as catastrophic floods, heat waves, and more devastating hurricanes, are expected to increase the death rate associated with natural disasters.

Sea-level rise will have a profound negative socio-economic impact by increasing the risk of coastal flooding and causing the loss in coastal wetlands. In particular, the estimates show that unmitigated global warming could increase annual number of people in coastal storm surges by factor 10 already in the year 2080. Another potential health impact of global warming is related to the increase of the area where climate is

suitable to malaria transmission. Currently, distribution of malaria is limited to the Tropics but global warming could considerably extend this area, which will lead to an increase in the number of people exposed to malaria.

Among recently recognized aspects of rising of atmospheric CO2 concentration is the acidification of the ocean. The observation and modeling results indicate that carbon dioxide emission from human activity has already led to a reduction of the averaged pH of surface seawater of 0.1 units and pH will fall additionally by 0.5 units by the year 2100. This could lead to mass extinction of coral and some plankton species causing disruption of the entire marine food chain.[19]

CONCLUSIONS

Global warming triggered by human activities has become an indisputable fact and will exert profound and enormous impacts on the global ecosystem and socioeconomic system. This review gives an overview of climate change and comprehensively summarizes its impact on ecosystem, soil, water resource, and groundwater. The feedbacks of soil and groundwater environment to climate change are also discussed in this review. Enzymatic responses to global warming were investigated by performing a simulated incubation experiment. The results showed that some temperature thresholds exist which lead to sudden reductions in substrate affinity, decreasing temperature sensitivity and catalytic efficiency. This emphasizes the importance of including the temperature thresholds of strong changes in enzyme-based processes in the next generation of models. [20]

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