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Global Warming: An In-Depth Overview

As one of the Earth's most controversial and abnormal worldwide phenomena, global warming is relentlessly affecting the planet. Global warming, the long-term heating of the Earth's surface, is a direct result of human activities (Nasa). Climate change, often associated with global warming, plays a significant role in the issue. It is defined as any significant change in measures of climate over a certain period of time (Cunningham and Odle). While "climate change" and "global warming" are often used interchangeably, each term has a distinct meaning. Similarly, the terms "weather" and "climate" each refer to events with broadly different spatial and time scales (Nasa). Global warming refers to a long-term increase in the Earth's average surface temperature that causes large-scale changes in global climate. Human-caused global warming and climate change are an ongoing outcome of human activities that have persisted for the last 150 years (Lerner, 322). The way humanity addresses the challenges associated with global warming will determine not only the fate of the environment, but also the course of life on the planet. The impacts of global warming display a need for effective strategies and adaptation measures that will allow for a sustainable coexistence with the changing climate.

According to NASA, changes observed in the Earth's climate since the mid-20th century are driven by human activities, particularly fossil fuel burning. Fossil fuel burning increases heat-trapping greenhouse gas levels in the Earth's atmosphere, raising its average surface

temperature (Nasa). While fossil fuel burning is one of the major causes, there are a multitude of factors that can be attributed to climate change. The effect people have had on the climate worsened in the twentieth century because of energy production, industrial practices, and deforestation (Cunningham and Odle). Greenhouse gases, such as CO2 and nitrous oxide, are a key regulator of the planet's climate system. Boosting the number of certain gases in the atmosphere will ultimately warm the globe (Freedman). Greenhouse gases trap energy from the sun and transfer it to the atmosphere. This leads to warmer winters and harsher summers. Dry places become drier and wet places become wetter. Countless ecosystems will die while the rising oceans swallow coasts and the cities built on them (Kurzgesagt).

Scientists use observations from the ground, air, and space to monitor and study past, present, and future climate change. Their research provides evidence of key indicators of climate change, such as land and ocean temperature increases, rising sea levels, ice loss, severity changes in extreme weather, and changes in cloud patterns (Nasa). Using machine learning to analyze and map more than 100,000 studies of events that could be linked to global warming, researchers paired the results with a well-established data set of temperature and precipitation shifts caused by fossil fuel use and other sources of carbon emissions. These combined findings, which focused on events such as crop failures, floods, and heat waves allowed scientists to make a connection between rising temperatures and human activities. (Timsit and Kaplan). Right now, these human activities, such as burning coal for energy, are adding greenhouse gases to the atmosphere at such a rapid rate that humanity is well on its way to doubling the amount of CO2 in the atmosphere compared to the pre-industrial era (Freedman). Research shows that the planet is on track to heat up about 4.9° Fahrenheit, or 2.7° Celsius, by the end of the century. This difference in temperature is a level of warming that could lead to drastic food and water

shortages, deadly weather disasters, and catastrophic ecosystem failures (Timsit and Kaplan). Most atmospheric scientists today are convinced that the well-documented increase in greenhouse gases is resulting in an intensification of the Earth's naturally occurring greenhouse effect. The exact climatic response to increased concentrations of radiatively active gases and its potential effects on humans are difficult to predict. If global climate change proceeds as most recent scientific studies forecast, it will have catastrophic climatic, ecological, and sociopolitical consequences (Lerner, 323).

Although the climate remains relatively stable on a time scale of decades or centuries, it rapidly fluctuates over thousands or millions of years. A number of variables simultaneously act and react to create stability in this very complex system. The studies that indicate that human activity has been disturbing larger climate trends raise concern because rapid human-caused climate change could severely stress ecosystems and species around the world (Cunningham and Odle). According to research published in the journal Nature Climate Change, at least 85% of the global population has experienced weather events made worse by climate change (Timsit and Kaplan). The systems that interact to maintain the planet's temperature and climate are extremely complex. There is significant evidence that the Earth has warmed significantly during the past 150 years, and that global climate has responded to the temperature increase. Climate records show a 1° Fahrenheit increase in the average temperature of the Earth's oceans, atmosphere, and solid surface since the late 20th century (Lerner, 323).

The changes initiated from global warming are already affecting plant and animal life and causing extinction at an unprecedented rate. Although climate change may affect some groups more than others, it can affect anybody. Global warming can impact peoples' health, city infrastructures, as well as supplies of food, water, and energy. People who live in areas more

vulnerable to drought or rising seas are more likely to have their lives affected. As climate change increases the chance of extreme weather events, it can have devastating effects and lead to more damage from natural disasters (Cunningham and Odle). The human toll of these events has become difficult to ignore. Hundreds of people in the Pacific Northwest passed away after unprecedented heat baked the normally temperate region. Catastrophic flooding caused people in New York to drown in their own homes, while flash flooding continues to overwhelm refugee camps in South Sudan (Timsit and Kaplan).

How can humanity prevent global warming? Well, it's complicated. The public debate about putting an end to rapid climate change often focuses on a few key aspects, like coal plants or cars. The solutions are often too simplistic, and do not cover every aspect of the issue. Modern industrial society, as it was constructed in the last 150 years, is inherently destructive to the planet. The emissions leaking out of landfills are as significant as the emissions of all the jets in the air. More CO2 is released from homes than from all cars combined (Kurzgesagt). Fixing one small part of the industrial system wouldn’t be enough. Each of the many different parts needs its own solution and many of them aren't straightforward. Further, just because a solution exists doesn't mean people are able or willing to implement it. There is a lot of gray area in the fight against rapid climate change, the most prominent one being the divide between the rich and the poor. The unfortunate reality is that escaping poverty and becoming middle class creates unavoidable emissions. So, asking developing countries to cut emissions just looks like an attempt to keep them down.

In principle, the technology to address climate change already exists. Direct Air Capture of CO2 draws carbon dioxide from the air so that it can be stored and transformed into products. Unfortunately, implementing this technology in every industry everywhere would cost tens of

trillions of dollars per year. This money has to come from somewhere and currently, nobody is offering it. Getting the government to pay for it seems like a logical idea, but a lot of state resources are tied up doing the opposite, like subsidizing oil and gas (Kurzgesagt). By artificially keeping fuel prices low, shipping and everyday goods are kept artificially cheap as well. This has a major social impact on billions of people around the world, which creates political lobbies and incentives that continue this cycle and makes it extremely difficult to stop fossil fuel production.

With every year wasted, more extreme changes become unavoidable. One solution that many people argue is to encourage each and every person to do their part in contributing to a cleaner environment. Shifting the responsibility from the largest carbon emitters to the average person is much easier to do than actually solving the problem. Personal contributions toward reducing greenhouse gas emissions are nice, but they are minimized by the systemic reality of global emissions. When the dangers of rapid climate change are put together, the scale of emissions and the lack of consensus over how to solve it makes a possible solution seem nonexistent. There should be an all-encompassing systemic approach, nothing less than changing the fundamentals of a modern industrial society. The personal responsibility angle is overplayed and is not effective if only a portion of people contribute to a solution (Kurzgesagt).

For systemic changes in technology, politics, and an economy of this magnitude, those in positions of power need to be influenced. They need to know and feel strongly that the people care and that their own success depends on tackling issues like rapid climate change. When governments and local politicians are reluctant to change laws that affect their biggest tax contributors or campaign donors, it may be time to vote in people who respect science. Additionally, there is no reason that the profit interests of industries could not match the need to reduce carbon emissions as much as possible. It is unrealistic to expect a change of that scale to

be able to be forced onto a worldwide economy quickly enough, because low carbon technologies still need a lot of time and research. However, more companies will make more efficient carbon capture systems, resource alternatives, and better batteries if there is a clear and growing demand for them. There are too many opposing interests and complicated grey zones. In the end, if systemic change is implemented, everybody will be unhappy about some aspect of it. Only if everyone accepts that some solutions will have negative impacts, can there be honest conversation and progress made. Everybody is capable of dealing with the reality of the situation and promoting their own priorities through their own behavior and actions (Kurzgesagt).

In conclusion, global warming stands as one of the Earth's most disputed yet significant phenomena, leaving a lasting impact on the planet and those who inhabit it. Global warming, the prolonged heating of the Earth's surface, is a consequence of human activities (Nasa). The consequences of human-induced climate change emphasize just how important it is to address this issue. With the Earth now breaking record highs for the hottest temperatures ever recorded, the challenge lies in how humanity chooses to confront climate change. Humanity's response will not only shape the fate of the environment but also determine the direction of life on the planet. The need to implement sustainable practices, carry out effective industrial strategies, and encourage international collaboration has never been more essential. The collective responsibility to protect the planet requires combined efforts, innovation, and a commitment to a sustainable coexistence with the changing climate. It is not only crucial for the environment, but it is also a moral obligation that requires global cooperation and a shared vision for a better future.

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