Review Study on Global Warming A Concerned Problem

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Abstract

This study focuses on an examination of the causes, consequences, and political reactions to global warming. The term "global warming" is now commonly used to refer to the increase in greenhouse gas concentrations in the atmosphere, which is primarily due to human activity. For many years, evidence shows that there has been a heated and frequently emotional debate about the origins and implications of global warming. Despite the fact that the causes are still debated and there is no consensus among proponents, much of the evidence points to increased global warming. It's no longer a prediction; it's occurring right now. Extinction of numerous species, population displacement/migration, desertification, starvation, drought, and chronic food insecurity are all major indications. Governments, scientists, and politicians do not agree on how to reduce global warming because of their political differences and competing interests. What causes global warming is at the heart of the discussion. There is strong evidence in the scientific literature that global warming has accelerated in recent decades and that the increases are due to human-induced greenhouse gas emissions. On the other hand, opponents of anthropogenic global warming claim that the cause of global warming is natural and that human involvement is negligible. Global warming is now at the top of the international political agenda, making it a key political, institutional, and environmental problem of our day. The study's overall goal is to analyze the discussions between politicians and scientists over the origins and consequences of global warming.

Keywords: Global warming, Climate change, Climate variability, Greenhouse gas, Anthropogenic, Extreme events

Introduction

Studies and discussions of global warming as well as initiation of ice ages remained mainly as a scientific problem in the 19th century and most of the 20th century. Starting in the mid to late 1980s, this debate has spilled over into the media, the public and in the political arena as well. The debate has become Studies and discussions of global warming as well as initiation of ice ages remained mainly as a scientific problem in the 19th century and most of the 20th century. Starting in the mid to late 1980s, this debate has spilled over into the media, the public and in the political arena as well. Despite the fact that the terms "global warming" and "climate change" are sometimes used interchangeably, they refer to two distinct processes. Changes in the Earth's temperature, humidity, air pressure, wind, clouds, and precipitation patterns over time are referred to as climate change. Global warming refers to the effect of green house gases

on the Earth's average surface temperature and is a contributing element to climate change. Global warming is a term that can be used to describe rising temperatures produced by greenhouse gases. When it comes to other long-term changes in the planet's weather patterns, though, climate change is the more correct word.[1]

"Climatic Change: Are We on the Brink of a Pronounced Global Warming?" by geochemist Wallace Broecker featured in the 1975 Science magazine article "Climatic Change: Are We on the Brink of a Pronounced Global Warming?" However, scientists began researching the impact of greenhouse gases on the Earth's climate more than a century ago, in 1820. During this time, French scientist Joseph Fourier made the ground breaking discovery that the Earth's atmosphere serves to retain the sun's heat. Milutin Milankovitch, a Serbian scientist, discovered the long-term climate consequences of natural oscillations in Earth's orbit, as well as the tilt and precession of its axis, in the early 1900s. Since then, scientists and politicians have tried to get a better understanding of how the atmosphere works and how to respond to the difficulties posed by climate change.[2] Various gases in the earth's atmosphere operate as a blanket, trapping heat from the sun and preventing it from escaping back into space. The greenhouse effect is the name given to this process, and the gases involved are known as greenhouse gases. Carbon dioxide, methane, and nitrous oxide are the three most common greenhouse gases found in nature. The Earth would be too cold to support life if the greenhouse effect did not exist. The amount of greenhouse gases trapped in Earth's atmosphere has increased dramatically over time, producing global warming.[3]

Greenhouse gases are constantly created and destroyed by natural processes on Earth. Carbon dioxide is produced by the breakdown of plant and animal materials, which plants ingest during photosynthesis. The level of carbon dioxide in the atmosphere is kept relatively constant by this natural cycle. Weather is influenced by changes in the planet's crust and ocean patterns, as well as variations in the sun's output of radiation. Because eruptions release greenhouse gases and other pollutants into the atmosphere, volcanic activity has an impact on the climate. Scientists at the National Aeronautics and Space Administration (NASA) and other federal and international organisations acknowledge that natural forces continue to play a part in climate change, but they argue that their impact alone does not explain the significant rise in Earth's temperature. Climate change caused by natural processes is referred to as naturogenic, whereas climate change caused by humans is referred to as anthropogenic.[4]

Review of Literature

Every year, Earth's vegetation emits and absorbs almost 200 billion metric tonnes of carbon dioxide. Human activities, such as the combustion of fossil fuels, add an additional seven billion metric tonnes of CO_2 to the atmosphere each year. These additions have had a significant impact on the atmosphere over time. Carbon dioxide concentrations in the atmosphere have increased by more than 30% in the last 150 years. Deforestation, which removes forests that would otherwise absorb tonnes of carbon dioxide, has also contributed to this rise.[5] Human activities have also resulted in higher amounts of other greenhouse gases including nitrous oxide and methane. Nitrous oxide is produced through a variety of agricultural and industrial operations, including the use of specific fertilisers in agriculture. Methane is released into the atmosphere by the production of fossil fuels, landfills, and animals. Because they have a far bigger influence per pound on Earth's temperature, these gases may inflict even more harm than carbon dioxide, despite the fact that there are fewer of them. Methane, for example, is twenty one times more potent than carbon dioxide as a greenhouse gas. A methane gas leak from a California storage facility released around five billion cubic feet of gas into the sky starting in October 2015. On February 18, 2016, the leak was ultimately sealed after more than three months of work. The incident was the largest unintentional release of greenhouse gases in US history, emitting the equivalent of 572,000 autos' annual exhaust emissions. Humans have produced and released greenhouse gases that do not occur naturally in the environment. Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride are among them (SF6). These gases, which are generated during industrial operations such as aluminium manufacture and electrical transmission, have a ten thousand fold larger impact on global temperature than carbon dioxide.[6,7]

Evolution of Earth's Atmosphere

All of the components that make up the atmosphere and oceans were thought to be contained within the earth when it originated roughly 5 billion years ago. The atmosphere began as a mixture of water vapour, hydrogen, carbon monoxide, carbon dioxide, and nitrogen about 4.5 billion years ago. It gradually attained its current composition,

approximately 280 million years ago, through interaction with surface rocks and living things, and has remained mostly constant since then. The most major transition in the previous 4.5 BY to 280 MY was the conversion of much of the CO2 into oxygen by abundant plant life, especially during the carboniferous epoch, when most of our coal and oil deposits were formed.[8] Apart from these four gases, Geophysics as a pure application, Helium, Methane (CH_4), and Nitrous Oxide are among the other trace gases (N_2O), Krypton Hydrogen, etc., whose volume proportion is too tiny to be of any significance. In the context of this discussion, it has a lot of weight. Methane and nitrous oxide, as well as other gases, the greenhouse gases (GHG) whose radiative properties include carbon dioxide are referred to as greenhouse gases (GHG). At the moment, properties are a hot topic of research. the most changeable component of the atmosphere, namely water vapour, which is the most important greenhouse gas and has a substantial impact on the earth's mean temperature structure. At any temperature, the amount of water that can be held in gaseous (vapour) form in the atmosphere has a limit. At the greatest temperature measured near the earth's surface, water vapour might theoretically increase to a maximum of 5% of the whole atmosphere (by volume); but, in practise, a value of 2% of water vapour in the atmosphere is regarded a high value reflective of a very humid environment.[9]

Natural Green House Effect

Except for the ultraviolet part of the solar energy, which is absorbed by ozone in the stratosphere, the sun's radiation is largely in short wavelengths and travels through the atmosphere with little absorption. Longwave radiation is created when solar energy heats the earth and seas, which then emits radiation back to space in longer wavelengths. Some gases in the atmosphere, like as water vapour and CO_2, absorb this longwave radiation from the earth (and seas) and, as a result, keep the yearly global surface temperature between 14 and 15 degrees Celsius. This phenomenon is known as the greenhouse effect since it is analogous to keeping plants warm in a greenhouse. Vertical mixing is limited in the actual greenhouse by the glass panes, although the atmospheric greenhouse gas effect is not via absorption and later reemission, lowers radiative loss to space CO_2, O_3, and water vapour emit longwave radiation downward. Without it, the earth's yearly average surface temperature would be between 18 and 19 degrees Celsius due to natural greenhouse warming. As a result, the natural greenhouse effect contributes about the annual average surface temperature of the planet is 33 degrees Celsius. The greenhouse effect is a natural phenomenon that occurs when the troposphere and stratosphere are also affected.

For yearly mean conditions, the global energy balance is calculated. At the top of the atmosphere, the earth receives 343 units (W.m2), while the worldwide averaged longwave emission by the earth's surface is 395 5 units. A total of 237 3 units are lost to space at the top of the atmosphere. The Greenhouse Effect is caused by the intervening atmosphere and clouds, which results in a loss of energy of (395–237) = 158 7 units. It is because of this natural greenhouse effect that the earth's mean temperature remains at a pleasant 289 K, or roughly 33 C warmer than it would be without it. Average for the entire world Based on ERBE data from earth-orbiting satellites, the clear-sky vs average cloudy-sky radiation budget. The ERBE data distinguished between clear-sky and average cloudy-sky radiation. The difference, around 18 W/m2, is based on a five-year period (1985–1989). Cloud radioactive forcing is to blame. This is the average because of the gloomy sky, the forcing is much higher than the 2.45 W/m2 forcing. GHG concentrations have risen (IPCC, 2001) as well as, this can be a key source of uncertainty in the greenhouse gas induced climate change hypothesis changes in the climate.[10]

Cause of Global Warming

Joseph fourier, a French mathematician, initially proposed the idea that the earth's atmosphere functions like the glass of a greenhouse, allowing sunlight (shortwave light rays) to pass through but preserving a portion of the longwave radiation emitted from the earth's surface (1827). *Tyndall* (1861) elaborated on this hypothesis by conducting extensive experiments to investigate the infrared radiative properties of water vapour and carbon dioxide, demonstrating that water vapour is the most important greenhouse gas. A Swedish chemist developed the first estimations of how changes in worldwide concentrations of "carbonic acid" would affect mean global surface temperature more than a century ago. *Arrhenius* demonstrated that increasing CO_2 content in the atmosphere by a factor of two will result in a 5 to 6 degree Celsius increase in global temperature. The investigations of American geologist focused on the role of CO_2 in the creation of glacial episodes in geological times followed Arrhenius' work.[11]

The research received little support from the atmospheric science community at the time,

because it was widely assumed that water vapour absorption of longwave radiation was so high that carbon dioxide absorption was minimal. *Callendar*, a British engineer, established in 1938 that CO_2 has absorption bands other than those dominated by water vapour in laboratory studies, and that higher CO_2 concentrations might have substantial worldwide effects on the earth's surface temperature. The change in ocean heating, not the (earth's) surface air temperature record, is the most immediate and obvious evidence of global warming, despite the fact that the latter has received the most attention from the IPCC and the media. Joules, not degrees Celsius, are a better unit for measuring heat (or cooling). A new work by *Pielke* (2003) examines the earth system's heat storage system, pointing out that using surface temperature as a monitor of climate change in the earth system is ineffective in assessing heat storage changes.[12]

The earth's temperature grew very significantly from 1910 to 1945, then declined from 1945 to 1975, and since around 1977, the mean temperature has grown by about 0.3 degrees Celsius. The current global warming argument has centred on this recent temperature increase of around 0.3 degrees Celsius or more. Temperature fluctuations at the bottom of the planet over the last millennia. Using a variety of proxy data such as tree-ring widths and ice core data from Greenland, researchers believe that current warming in the Northern Hemisphere is exceptional, and the 1990s are likely the warmest decade in 1000 years. According to the most current IPCC assessment on climate change, carbon dioxide levels in the atmosphere grew from 280 parts per million in 1750 to 367 parts per million in 1999. (31 percent increase). Carbon dioxide concentrations today have not been exceeded in the last 420,000 years, and are unlikely to be exceeded in the next 20 million years. The IPCC also mentions a significant recent increase in other greenhouse gases, such as methane and nitrous oxide, which have risen by 145 percent and 15%, respectively, in the last 250 years. According to the IPCC, these greenhouse gases have produced a total direct radiative forcing of around 2.45 W.m)2, resulting in an increase in the earth's mean surface temperature.[13]

Furthermore, the recent significant increase in the mean surface temperature (0.16 C per decade) has been closely related to rising greenhouse gas emissions during the last 25/30 years. A variety of climate models built at various national and international organisations in North America, Europe, and other parts of the world have reproduced the rise in mean surface temperature and its close link to rising greenhouse gas concentrations. These modelling experiments used steadily increasing levels of greenhouse gases to replicate the earth's temperature change over the twentieth century, particularly the recent temperature increase.[14]

The claim (by the IPCC) that the increase in the mean surface temperature of the planet cannot be explained only by natural variability of the atmosphere-ocean system is central to the case for global warming and its link to GHG. Furthermore, the recent increase in the mean temperature is unprecedented and can only be explained (partially) by climate model simulations that show a claimed link between rising GHG concentrations in the atmosphere and rising mean temperature.[15]

Effect of Global Warming

Global warming's repercussions are still a source of much controversy and uncertainty, with some scholars predicting dramatic and significant issues for future generations. Hurricanes could become stronger and more common as the waters warm. As temperatures rise, some areas may be subjected to more regular heat waves, as well as disastrous droughts and wildfires. Many parts of the United States experienced record-breaking heat and drought during the 1990s and the first decade of the twenty-first century. Severe drought hit the United States' Wheat Belt, which is located in the North American Great Plains, in 2012. In early 2013, Australia was hit by a heat wave that resulted in hundreds of wildfires.[16]

Climate change has also been connected to California's catastrophic drought, which lasted from 2011 to early 2017. Thousands of people have been displaced, property has been destroyed, and at least eight people have died as a result of the devastating wildfires that ravaged California in 2018. Scientists blamed the fires, which included the state's worst wildfire ever, on the existence of extremely dry vegetation caused by rising temperatures, which produced circumstances that allowed the fires to spread quickly and burn ferociously.[17]

California Governor Jerry Brown bemoaned that such disasters have become more prevalent in the southwest United States, and cautioned that as climate change continues, fires will certainly get more intense. Rising sea levels may cause major flooding in many coastal places throughout the world. The Pacific Ocean's low-lying islands would soon become uninhabitable. The world's sea level has increased four to eight inches in the last century. Some of these consequences were felt in 2012, when Superstorm Sandy slammed the East Coast of the

United States and a typhoon in the Philippines killed over 1,000 people. The 2017 hurricane season was the most expensive since 1900, with extreme weather and increasing sea levels resulting in devastating loss of life and over $215 billion in property damage in Florida, Texas, and Puerto Rico, as well as other Southeast states and many Central American and Caribbean countries.[18]

Climate change may have a significant impact on habitats. Some agriculturally suitable places may become too dry or wet to support agriculture. Droughts for long periods of time have the potential to change fertile places into deserts with minimal vegetation. Plants and animals may be unable to adapt to the rapid changes brought on by global warming, and may become extinct as a result. Such changes would result in a loss of biodiversity on the planet in the long run. Coral reefs and coastal mangrove swamps, for example, are expected to vanish totally.[19-25]

Extreme Weather Event

Extreme weather events could become more common as a result of global warming, which is a significant effect. According to the most current climate change report (IPCC, 2001), a number of extreme weather events are anticipated to become more common in the twenty-first century. During the second half of the twentieth century, increased incidences of several extreme weather events (e.g., frequent heavy precipitation, increased summer hot spells, greater summer continental drying and related drought risk) are said to have been observed and recognised. Warmer temperatures will lead to a more robust hydrologic cycle, which means more severe droughts and/or floods in some places and less severe droughts and/or floods in others, according to an earlier climate change document (IPCC, 1996). A rise in precipitation intensity is predicted by several models, implying the probability of more intense rainfall events.[30-34]
In recent years, various research have looked into the link between global warming and extreme weather. A number of informal pieces and remarks have emerged in news and print media, in addition to scientific studies. In addition, news of extreme weather occurrences occurring around the world (e.g., hurricane landfalls, tornado outbreaks, summer heat waves, big forest fires) is broadcast on television and in newspapers, with speculations that they may be linked to global warming. According to *Unger* (1999), today's American television viewers are three times more likely than thirty years ago to witness a report about extreme weather. The increasing news coverage of extreme weather events and their socioeconomic impact has produced the impression that extreme weather occurrences are on the rise right now, and that this is linked to the earth's rising mean temperature.[35]
When examined closely, the link between global warming and extreme weather appears to be more of a myth than a reality. A number of peer-reviewed papers mentioned by the IPCC appear to establish a link between global warming and extreme weather, but a detailed examination of the available data reveals no evidence of such a link at this time. When the cost of damage in terms of human life and property is corrected for inflation, population growth, and affluence, the upward trend in cost vanishes. Another extensive study came to a similar conclusion, documenting that the shifting economic impact of weather extremes in the United States is a product of cultural change rather than global warming.[36]

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