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Review Article

The impact of human activities on climate change

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ABSTRACT

Human activity increases emissions of greenhouse gases and aerosols, among other things, and has a significant impact on Earth's atmosphere. This alteration is one of the primary causes of climate change. The main source of emissions is carbon dioxide, which is released into the atmosphere when fossil fuels are burned. Greenhouse gases and aerosols affect the Earth's energy balance by varying the quantity of solar radiation that enters the atmosphere and the amount of thermal radiation that escapes. This has an impact on the climate. There is a direct relationship between earth's temperature and human activity. A few more things that contribute to global warming are rubbish, transportation, agriculture, deforestation, and animals in particular. The rise in global temperatures is the result of several factors. fluctuations in the Earth's atmosphere's concentrations of greenhouse gases, particulate matter, black carbon, methane, nitrous oxide, and chlorofluorocarbons are the main causes of fluctuations in global temperature. Since human behavior is the foundation of all aspects of existence, people must always be watching over and guiding others. A detailed examination of environmental economics and the part that human activity plays in global warming is necessary to mitigate the detrimental effects of its spread. Changes in the quantity and composition of various gases and particles in the atmosphere can contribute to fluctuations in temperature within the climate system. This study focused on how human activity has been the primary source of temperature increases since the beginning of the industrial revolution. Human activity has had a significantly greater impact on climate than natural phenomena like solar fluctuations and volcano eruptions, which are known to vary throughout time.

Introduction

The current state of the world is characterized by anthropogenic-ecological warming. Environmental economics asserts that this is a worldwide issue that impacts all living organisms. Expert consensus on the causes of global warming was largely unanimous. The Fifth Report (2013) of the IPCC unequivocally states that human activity is the primary driver of the observed warming since the mid-20th century (Kumar, 2022). Research indicates that changes in the global hydrological cycle, the temperature of the ocean and atmosphere, the quantity of snow and ice cover that falls, and the frequency of some extreme weather events are primarily caused by human activities. The average global sea level has also been rising. Climate projections indicate that in the twenty-first century, temperatures will rise by 2.6 to 4.8 °C in the scenario with the highest emissions and by 0.3 to 1.7 °C in the scenario with the lowest emissions. (Jalota et al., 2018).

According to IPCC projections the world's average temperature will increase by 1.1°C to 6.4°C by 2100. Increases such as these are projected to have an influence on sea levels, storms, and floods. As a result of melting glaciers and ice sheets, rising temperatures will lead the oceans to expand and raise sea levels. Global sea levels are expected to rise by 50–190 cm between 1990 and 2100 (Vermeer, 2009). Due to the risks associated with storm activity, several of the Gulf of Maine's coastal districts are believed to be especially vulnerable to the consequences of sea level rise. Depending on local and regional conditions, the severity of climate-related consequences will differ (Wake, 2006). There are serious repercussions for severe events in addition to global warming, which is primarily caused by changes in the atmospheric composition that humans make, increasing temperatures in the atmosphere and oceans. Changes in severe events are without a doubt the most important effects of climate change on society and the planet ((EPA)., 2023). These inherent variations cause massive oscillations over a range of temporal and geographical dimensions in typical weather systems (Ferranti, 2018). Thus, the fact that strong weather systems also bring forth extreme wind, precipitation, temperature, and other related phenomena is entirely coincidental. Certain extremes that break previous records and transcend averages are made worse by global warming. Furthermore, many systems fail as the effects of global warming beyond the limits imposed by science on heat, precipitation, wind, and sea level, among other factors. This suggests that the freshly recorded material and the events are contained in separate episodes. The numbers are not continuously high; they vary widely, as they always have according to natural weather trends. Moreover, data suggests that monthly records are consistently exceeded in several places. Because people become less aware of the connection between extreme weather events and climate change over time when they occur more frequently in different places, extreme weather events significantly

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underestimate their overall consequences. Moreover, accurately determining the specific impacts of climate change can be challenging due to the annual fluctuations in weather patterns. ((EPA)., 2023).

Importance of Study

It is imperative to understand and address this issue in light of the significant and widespread effects that global warming is having on the environment. Carbon dioxide, methane, and nitrous oxide are just a few of the greenhouse gases that are released into the atmosphere by human activities like industrialization, deforestation, and livestock rearing. Because of their capacity to hold heat, these gases upset the Earth's energy balance and contribute to the shift in the global climate. The security of food and water may be threatened by the effects of this phenomenon on ecosystems, biodiversity, and natural resources. In addition, as global temperatures have risen, so too have the frequency of extreme weather events, endangering infrastructure and human life on a global scale. It is necessary to act quickly to reduce global warming. This plan should include tactics for reducing greenhouse gas emissions, fostering environmental resilience, and implementing sustainable practices.

Objectives of Study

The aim of this study is to make an extensive review of human activities concerning environmental degradation by whether or not they may likely bring about greenhouse effect associated with the warming up of the global atmosphere. In a simplified version, it tries to establish how industrial processes, transportation, agriculture or land-use changes contribute to global warming through an understanding of carbon dioxide equates from them. The study also looks at how aerosols and greenhouse gases impact the Earth's energy balance and climate systems, and it looks at potential strategies to lessen these substances' effects in a variety of domains, such as technology, legislation, and human conduct. Also, this study will explain what needs to be done to stop the release of gases contributing to climate change all around the world by focusing on how different countries can work together effectively; more importantly, it will show several ways in which different countries can work together to reduce their flow of waste gases to near zero.

Methodology

This study's methodology requires exhaustive scrutiny of current scientific literature and authoritative reports IPCC and papers. It comprises data mining from many sources for the greenhouse gas emissions information such as data available nationally on industrial production levels or energy use rates or globally on trends for transportation modes or agricultural techniques. Case studies serve to explore the instances of successful mitigation measures and interventions in diverse fields and zones. In addition, it includes scenario analysis and climate models used for future climate projections under different emission reduction pathways. This approach provides an in-depth insight on global warming causes and effects, practical ideas on how to combat climate changes and adapt. This research aims at consolidating these findings from different sources in order to support informed policy making and decision making in relation to the urgent problem of global warming.

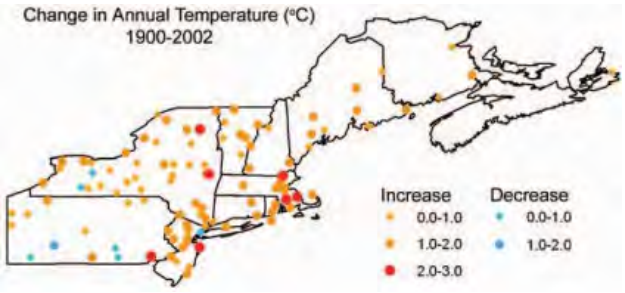
Impact of Human activities

The primary greenhouse gases that humans release into the atmosphere are methane (CH4), nitrous oxide (N2O), carbon dioxide (CO2), and halocarbons (a class of gases made up of fluorine, chlorine, and bromine). As these gases gradually accumulate in the atmosphere, their quantities increase with time. The quantities of these gases have increased noticeably over the course of the industrial age. The cause of all these increases is human activity. (Solomon et al., 2010) The use of fossil fuels in the manufacturing of cement, transportation, and other industries has led to an increase in carbon dioxide emissions. Deforestation releases carbon dioxide (CO2) into the atmosphere, weakening plants' capacity to absorb CO2. One of the natural processes that adds to the releases of carbon dioxide into the atmosphere is the breakdown of plant components. Human activities such as farming, natural gas distribution, and landfill management have resulted in an increase in methane levels (Wuebbles, 2002). In addition, wetlands employ natural mechanisms that result in the emission of methane into the atmosphere. Despite a decline in growth rates over the past two decades, the current state of the atmosphere does not show any evidence of an increase in methane levels. Human activities, such as the combustion of fossil fuels and the use of fertilizers, lead to the emission of nitrous oxide into the atmosphere. N2O is also released into the atmosphere by natural processes occurring in soils and oceans. Human activity is the main factor responsible for the rise in halocarbon gas concentrations. (Crutzen, 1997) The role of natural mechanisms is minimal. CFC-11 and CFC-12 are the two main categories into which chlorofluorocarbons fall. These substances were widely used in various industrial applications and as refrigerants until a link was discovered between them and the ozone layer's thinning. (Shindell et al., 2009) As a consequence of global actions taken to protect the ozone layer, CHF emissions are becoming less common. Ozone is a persistent greenhouse gas that is constantly formed and broken down by chemical reactions in the atmosphere. Because of the release of nitrogen oxide, carbon monoxide, and hydrocarbons into the atmosphere, human activity causes ozone levels in the troposphere to rise. ((EPA)., 2023). These gases take part in the chemical processes that result in ozone. Halocarbons emitted into the atmosphere by human activities have long been associated with the formation of the Antarctic and stratospheric ozone holes. Water vapor is the most prevalent and significant greenhouse gas in the atmosphere. Human activity has very little impact on the atmospheric concentration of water vapor. Changes in water vapor levels and indirect temperature rises are two of the principal effects of human activity. For instance, a rise in temperature results in a rise in the atmospheric concentration of water vapor (Fortin, 2021). Human activity contributes to the levels of water vapor through the emission of CH4, which occurs when CH4 undergoes chemical decomposition in the stratosphere and produces a little amount of water vapor. Aerosols are diverse in terms of their sizes, concentrations, and chemical compositions. They are present in the Earth's atmosphere. Certain aerosols are inhaled, whereas others are directly emitted into the atmosphere. Aerosols consist of a blend of anthropogenic and naturally occurring substances. Surface mining and other industrial processes are human activities that have caused a rise in air dust levels. Particulate matter derived from biomass and fossil fuels, including sulfur compounds, organic molecules, and black carbon (soot), are emitted into the atmosphere. Examples of natural aerosols include mineral dusts, sea salt aerosols, biogenic emissions from land and marine sources, and aerosols consisting of dust and sulfate from volcanic eruptions ((EPA)., 2023).

Climate Driving forces

The main energy source that regulates the climate is sunlight. When Earth orbits the Sun and travels through space, electromagnetic radiation measures the energy required to keep the planet at a constant temperature ((EPA)., 2023). Visible light, radio waves, ultraviolet radiation, and infrared radiation—

sometimes referred to as "thermal" radiation—are examples of electromagnetic radiation. The Earth's climate is influenced by many factors. McMullen and Jabbour (2009) state that these variables interact and operate at various levels of space and time. Numerous factors contribute to the aforementioned oscillations, including volcanism, shifts in the composition of atmospheric gases, variations in solar radiation, cyclical patterns in the Earth's orbit and axis, deterioration of land surfaces, and plate tectonics-induced migration of landmasses and oceans. (McMullen & Jabbour, 2009). The Earth is currently experiencing a phase of heightened acceleration of global warming, according to empirical data (Solomon et al., 2007). Most of the blame for the last century's accelerated global warming goes to human activity's increased atmospheric emissions of gases like carbon dioxide and methane. This is generally acknowledged as the primary source of this phenomenon, together with an amplified greenhouse effect (Solomon et al., 2007). Few countries have been able to successfully reduce their greenhouse gas emissions in accordance with the Protocol's objectives since the United Nations Framework Convention on Climate Change was established in 1994 (IPPC 2007). Trends show that throughout the past ten years, greenhouse gas emissions have noticeably increased in the states and provinces surrounding the Gulf of Maine ((IPCC), 2007). In its examination of global climate scenarios, the IPCC (2007) predicted a range of mean temperature rises by 2100, ranging from 1.1°C to 6.4°C. The idea that the Gulf of Maine is warming is supported by regional and local data from the United States and the Canadian Maritimes Cross Border Region. According to data from monitoring stations, the average yearly temperature has increased by about 0.1°C every ten years (Wake, 2006).



(Wake, 2006)

Solar radiation is reflected as it enters Earth's atmosphere. The atmosphere, clouds, and surface all reflect away around 31% of the radiation. Albedo is the amount of solar radiation that a planet reflects back into space rather than absorbing, helping to keep the planet from becoming too hot. Consequently, Earth's albedo is approximately 31%. The atmosphere and clouds take the remaining 20% of the energy, leaving the Earth's surface to absorb 49% of it. The planet and its atmosphere must, on average, reflect back to space an equivalent amount of energy in order to balance the energy flowing in. Infrared radiation is employed to do this. Earth warms or cools until a new equilibrium is reached if there is any disturbance in the equilibrium, such as a shift in solar energy. (The GCIP module contains more information about solar radiation, the electromagnetic spectrum, and the sun-to-earth energy transmission system as a whole. Sun-Earth System. Because of the atmosphere, particularly the greenhouse gases and clouds that absorb and reemit infrared radiation, a large portion of the energy generated on Earth's surface does not immediately escape into space. Clouds and Earth's energy balance are intimately connected. Greenhouse gases both generate and absorb heat radiation at the same time, much like a blanket. They also help to chill the surface by reflecting incoming sunlight back into space. Space-based statistics indicate that the net global effect of clouds in our current climate is to slightly chill the surface relative to what would occur in the absence of clouds, despite the fact that the two opposing effects nearly cancel each other out. Thus, rather than radiation from the Earth's surface, greenhouse gases and cloud tops are the primary sources of radiation that escape into space.

Key Emissions and Climate Change

The findings unequivocally show that each of the selected elements linked to human activity increases temperature and contributes to global warming. Livestock and industrial activities accounted for the majority of emissions that contributed to global warming between 2009 and 2020. In 2020, industrial activity produced 38.5 billion tons of emissions, compared to 13.2 billion tons from livestock (Sakadevan, 2017). The previous year also saw a major impact on global temperature from emissions related to transportation. The cumulative impact of emissions is also found, indicating a clear relationship between the number of emissions caused by human activity and the rise in temperature. Clearly, further research into the deeper effects of each activity is needed to avoid an unwarranted increase in global temperatures. The study's findings suggest that in order to stop global warming, multiple strategies can be used to create laws in various areas of human activity. One option to address the transportation industry is to create legal frameworks that require trucks and buses to meet certain carbon dioxide emissions requirements. Using eco-friendly fuels like ethyl alcohol, natural gas, and liquid hydrogen is one of the other strategies. A few more include building high-speed highways, modifying the height of street crossings, reducing car bodywork to save fuel consumption, and putting in green spaces beside roadways. Automakers will need to drastically cut the dangerous emissions from these cars in order to comply with the new regulations (Letcher, 2019). Additionally, automakers must guarantee that by 2030, exhaust gas emissions from at least 20% of all trucks manufactured would be at least 50% lower (Zhao et al., 2021). Research on deforestation mostly focuses on these regulations because there is a great deal of national legislation pertaining to forest conservation. Some just increase the number of remediation landings, while others restrict use. But Norway came up with a totally original solution to deal with this issue. This nation's formal declaration stated that there would be "zero deforestation" inside its boundaries. In an attempt to protect the Amazon rain forest, Norway donated one billion rubles to Brazil in 2015. Investments from Norway and a few other nations have been credited with a 75 percent decrease in logging. This human activity example demonstrates how certain straightforward actions can contribute to the solution to the global warming issue (Gorte, 2010). Open methods for assessing emissions data may be developed as a result of efforts to mitigate global warming linked to industrial production [28]. Metrics on public environmental quality from different companies can be made available to demonstrate it. The direction in which an animal feeds lowers its methane emissions. Furthermore, vaccination against traditional viruses lowers the mortality rate from these diseases, allowing farmers to concentrate on raising a healthier and less greenhouse gas-emitting population. Genome editing is one of the most creative approaches to stop cattle from creating methane. Among the study issues related to landfills are policies for non-disposable items, incinerator facilities, recycling for future use, and separate garbage collection. The study's findings unequivocally confirm the significance of the subject under

investigation—global warming. This is a worldwide issue that affects all nations equally.

Conclusion

In conclusion, it is indisputable that human activity is the primary driver of global warming, particularly the production of greenhouse gases such carbon dioxide, methane, and nitrous oxide. But this raises the question of what kind of reprisals we should carry out. These emissions have significantly altered the composition of the air on our planet. They have existed since the beginning of the modern era and originate from a number of sources, including industry, deforestation, agriculture, and transportation. Increased greenhouse gas concentrations lead to an intensified greenhouse effect, which is the main cause of global climate change. A few consequences of this tendency include increased frequency of extreme weather events, melting of ice caps and glaciers, rising global temperatures, and altered rainfall patterns. The significance of global warming cannot be sufficiently conveyed by words alone. Its consequences on ecosystems, biodiversity, and natural resources provide a severe threat to global food security, water supplies, and human health. It also exacerbates socioeconomic inequality and makes it more difficult for infrastructure in weaker areas to endure and rebuild.

Working together, all societal members must confront the challenge of global warming. People need to adopt sustainable lifestyles, employ renewable energy sources, adhere to stringent emission regulations, and participate actively in global climate agreements. The objectives of this research article were to determine the mechanisms underlying climate change, assess the impact of human activities on global warming, and look at several mitigation strategies. With an emphasis on methane emissions, this research investigates various strategies for human intervention-based gas emission reduction. The decisions are based on an analysis of particular cases and fake CO2 emissions inventory data from the preceding few years. These findings suggest that immediate action is needed to cut emissions and mitigate the harmful effects of global warming. Future local, national, and international efforts to stop global warming must be made swiftly and thoroughly. To encourage the use of renewable energy sources, increase energy efficiency, save forests, and support environmentally friendly farming practices, policies that are effective in these four areas must be implemented. Rigid scientific research and innovative thinking are required to develop and implement new technologies that can lower emissions and improve adaptation to environmental changes brought on by climate change. Nations have the power to mitigate the effects of climate change and save the environment for coming generations by acknowledging these causes and resolutely pursuing high goals in this area.

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