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14. Climate Change and Environmental Ethics: Possible Solutions

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Figure 14.1: Climate Change

Abstract:

Climate refers to the extended weather patterns in a specific location, while weather pertains to the daily atmospheric conditions. Weather can be observed by simply glancing outside, whereas understanding climate requires analyzing long term data.

Climate is typically assessed by examining temperature, precipitation, and snowfall and wind pattern over periods spanning seasons, years, decades, or even centuries. For instance, reviewing the average rainfall data of Manchester from the past thirty years provides valuable insight into the area's climate. Climate is shaped by various factors such as geographical location, proximity to mountains and water bodies, and elevation. For instance, in London, the former experiences colder and wetter conditions due to its northern position and closer proximity to mountain ranges, which tend to enhance precipitation. Another crucial influence is our atmosphere, comprising gases that form a protective layer around the Earth. These gases, akin to a blanket, retain solar heat within the atmosphere.

Among these gases, greenhouse gases, such as carbon dioxide, methane, and ozone, play a significant role. These gases allow sunlight to penetrate but hinder the escape of heat, akin to the functioning of a greenhouse. Consequently, an increase in greenhouse gases, primarily driven by human activities like fossils fuel combustion, contributes to global warming and consequent climate change This chapter will revolve at types of climates and the natural and human made causes of climate change and summing up with a conclusion.

Keywords:

Global warming, climate change, natural disasters, greenhouse gases, human activities.

14.1 Introduction:

In the twenty first century, global climate change (Figure 14.1). Stands out as one of the most pressing ethical and political dilemmas confronting humanity. It represents a critical facet of a broader ecological crisis, stemming from the intricate interactions between human activities[1-5] and the natural world. Various perspectives have emerged to understand these relationships. One such perspective by Descartes, views nature merely as a collection of resources available for human use.

Descartes, a prominent figure in the 17th century and a proponent of modernity, likened living organisms to intricate machines devoid of intrinsic value. In his view, only humans possess a unique soul, elevating them above all other species. Consequently, nature, both living and inert, is perceived as an endless reservoir to be exploited without restraint. This utilitarian outlook has historically justified the rampant exploitation of natural resources across agriculture, fishing, livestock farming, mineral extraction, and various forms of pollution[6-9].

Another perspective on the relationship between the human and nature aims to strike a balance between the extreme views of deep ecologists and the criticisms leveled at ecological science. This perspective advocates for a more respectful coexistence between humans and the natural world. While acknowledging the unique value of human life. It also recognizes the significance of other living being and ecosystems. Just as a work of art is esteemed for its aesthetic qualities, animal and ecosystems are appreciated as remarkable creations of nature. However, this appreciation does not elevate them to d=same status as human. Instead it, suggests a hierarchy of values where humans can choose to respect and cherish certain aspects of the natural world without equating them with human beings.

14.2 Types of Climate:

Tropical climate- when someone folks hear "tropical climate", they might think of their favorite warm vacation spot. But in meteorology, the term means something specific.

A tropical climate[10-15] is found in the areas near the equator, stretching from the tropic of Capricorn in the south to the tropic of cancer in the north. Unlike places with subtropical climates, where temperatures can vary a lot, tropical climates have relatively stable temperatures year- round, with changes mostly driven by rainfall. There are only two main seasons in tropical climates: the dry and wet season. It is because of consistent angle of sun, tropical climate don't experience frost.

14.2.1 Arguments for Tropical Temperature Stability:

Three primary arguments, supported by biotic evidence, have been posited to suggest stable tropical temperatures, casting doubt on the reliability of oxygen isotopic analysis. The balance between solar radiation and evaporation implies tropical temperature stability. They argue that as temperature rises, evaporation increases, curbing surface temperature escalation. However, this overlooks atmospheric dynamics, which would amplify the greenhouse effect, countering surface cooling. Comprehensive climate models incorporating atmospheric dynamic consistently indicate tropical warming with external forcing. Therefore, the simplistic approach of newel and others lacks support from more detailed modeling efforts and should not be used to assert tropical temperature stability. Second, focuses on whether past cool tropical temperatures. The extreme tropical cooling would necessitate unreasonably high heat transport. However relatively modest changes in heat transport, coupled with oceanic influences, can substantially impact tropical temperatures. The plausibility highs on the extent of proposed tropical cooling, with modest decrease deemed feasible by modeling studies. Finally, the role of oceanic thermal circulation is considered as a mechanism for increases oceanic influence on heat transport. Modeling studies support the notion of warm saline deep-water formation during past warm periods. Given the substantial volume fluxes of deep circulation and evidence for warm saline deep-water formation, the circulation emerges as a credible mechanism for enhanced oceanic influence on heat transport. However, further research is needed to fully understand its potential role.

14.2.2 Dry Climate:

In arid region summers bring scorching heat and infrequent rainfall, while winters may see variable temperatures but consistently chilly nights marked by significant day night temperature differentials. This dry climate arises from global air circulation patterns. As per these patterns, warm air ascends in the atmosphere properly by solar heating. Throughout this ascent, the air undergoes heating process, leading to the loss of some of its water vapor. When warm air rises, it encounters cooler layers of air at higher altitudes. As it moves away from the equator, it eventually descends back down hundreds of kilometers away. During this descent, the air warms up again, but it also loses moisture. This process repeats, causing the air to become increasingly dry as it descends from higher altitudes. Additionally, other factors contribute to the formation of dry areas.

For instance, tall mountains can block moist winds coming from the sea. When these winds hit the mountain slopes. By the time the air reaches the other side of the mountain, it has lost much of its moisture, leading to even drier condition in deserts and steppes.

14.2.3 Temperate Climate:

Temperate climates exhibit moderate temperatures and distinct seasonal changes, featuring warm to hot summers and cool to cold winters. Precipitation varies across the year, contributing to diverse landscapes. Within this classification, there are sub types including Mediterranean, humid subtropical, and marine west coast climates.

The Mediterranean climate, prevalent along the coast of California, the Mediterranean Sea, and parts of Australia, is distinguished by dry summers and mild, rainy winters. Humid subtropical climates, found in areas like the southeastern United States and eastern China, are characterized by hot, humid summers and mild winters. Marine west coast climates, tropical of regions like the Pacific Northwest and Western Europe, experience mild, wet winters and cool summers. These temperate zones support a variety of vegetation, ranging from deciduous forests to grasslands.

14.2.4 Polar Climate:

Polar climates are characterized by exceptionally cold temperatures and scant precipitation. These areas, encompassing the arctic and Antarctic regions, endure freezing conditions throughout the year. Polar climate can be further categorized into tundra and ice cap variants. Tundra areas, situated in Alaska, Canada, Russia and Scandinavia, feature brief, cool summers, and prolonged, cold winters. The limited rainfall supports the growth of low-lying vegetation, like mosses and lichens.

Ice cap territories, such as Greenland and the Antarctic, are enveloped in ice and endure icy temperature year-round. These climates harbor distinct flora and fauna uniquely adapted to the severe environment, such as polar bears and penguins. Polar region plays a vital role in regulating the global climate.

14.2.5 Continental Climate:

Continental climates are distinguished by their fluctuating weather patterns and notable temperature variations. Continental gauges how closely a region’s climate resembles that of the interior of a vast landmass. These climates typically occur in mid latitudes, where temperatures aren’t temperate by nearby bodies of water like seas or oceans and prevailing winds pass overhead. Consequently, such areas endure frigid winters and scorching summers, as there’s no aquatic influence to moderate temperatures.

Unlike water, rocks, and soil possess lower heat capacities and dissipate heat more rapidly, contributing to these extremes. Consequently, continental climates tend to be arid, as moisture- laden air masses from distant oceans dissipate before reaching these locales. This climate phenomenon primarily manifests in the northern hemisphere, where extensive landmasses provide the necessary conditions for its formation.

14.2.6 Contribution of People:

Scientists concur that human activities are the predominant force behind the current global changes. This form of climate alteration, often termed anthropological, denotes human induced causation. The extensive combustion of fossil fuels over the past century and a half has significantly escalated the levels of greenhouse gases in the atmosphere, particularly carbon dioxide.

Concurrently, deforestation and urbanization have resulted in the widespread depletion of carbon sinks such as forests and wetland, which naturally absorb and store carbon dioxide, thus hindering its release into the atmosphere. At present, the atmospheric concentrations of greenhouse gases like carbon dioxide, methane, and nitrogenous oxide have reached unprecedented levels, surpassing those observed in the past 800,000 years. Some greenhouse gases, such as hydrochlorofluorocarbon (HFCs), are entirely synthetic and absent in nature.

Through the continuous emission of these gases, the global average temperature rose by approximately 1.9 degrees Fahrenheit during the 20th century, ushering in an area characterized by increasingly frequent and severe weather phenomenon. It's crucial to acknowledge that while climate change affects everyone, its impacts are not distributed evenly. Across the globe, communities of color and those residing in economically disadvantaged or politically marginalized area bear a disproportionately heavier burden, despite contributing less to planetary warming.

14.3 Transportation:

The vehicle s we for transportation, including cars, trucks ships, and airplanes re significant contributors to global greenhouse gas emissions. In fact, in the United States, they represent the largest single source of emissions. The combustion of petroleum- based fuels in engines releases substantial amounts of carbon dioxide into the atmosphere. Passenger cars alone contribute 41% of these emissions, with the average car emitting approximately 4.6 metric tons of carbon dioxide annually. Trucks in particularly are the major source of pollution on roads, as they operate almost continuously and predominantly utilize diesel fuel. Despite comprising only 4% of vehicles in the US, trucks are responsible for 23% of all greenhouse gas emissions from transportation.

14.4 Oil and Gas Development:

Oil and gas production and consumption result in emissions throughout their entire life cycle, starting from the moment drilling commences. Methane, a significant greenhouse gas, is released from various stages of oil and gas operations, including drilling, fracking, transportation, and refining. Although methane is not as abundant in the atmosphere as carbon dioxide, it is much more effective at trapping heat, especially within the first 20 years of its release. Even abandoned or inactive wells, often referred to as "orphaned" wells, emit methane. There are over 3 million such wells scattered across the country, and in 2018 alone, they emitted over 280000 metric tons of methane.

14.5 Deforestation:

Another significant contributor to the increase in greenhouse gases in the atmosphere is the widespread deforestation of forests and the deterioration of wetlands worldwide. Vegetation and soil play a crucial role in storing carbon by keeping it within the ground or underground. However, activities such as logging, and various forms of development involves the removal or disturbance of vegetative biomass, leading to the release of stored carbon into the atmosphere. For instance, in Canada's forest alone, clear cutting results in the emission of over 25 million metric tons of carbon dioxide annually, equivalent to the emissions from 5.5 million vehicles.

14.6 Natural Cause of Climate Change:

While some degree of climate change can indeed be attributed to natural factors such as volcanic eruptions, fluctuations in solar radiation, tectonic movements, and orbital variations, the current pace and magnitude of global warming far exceed anything observed in earth's history. The industrial revolution marks the onset of a significant acceleration in planetary warming, driven primarily by human activities. Despite the continued presence of these natural influences, their impact is relatively minor compared to the rapid warming observed in recent decades. According to NASA, the influence of natural causes on climate change today is either insufficient or too gradual to account for the unprecedented rate of warming. It's crucial to dispel the misconception propagated by some factors are the primary drivers of climate change. Historical climate records provide unequivocal evidence that human activities, particularly the combustion of fossil fuels and deforestation, are the dominant contributors to the current climate crisis. Addressing this reality requires concerted efforts to mitigate greenhouse gas emissions and transition to sustainable practices to safeguard the future of our planet.

14.7 Conclusion:

In 21st century, global climate change presents itself as one of the most pressing ethical and political challenges facing humanity. It is a critical aspect of a broader ecological crisis resulting from the intricate interplay between human actions and the natural environment. Various perspectives have emerged to understand these relationships. One such perspective, epitomized by Descartes in the 17th century, views nature merely as a resource available for human exploitation. According to this utilitarian outlook, living organism are akin to intricate machines devoid of intrinsic value, with humans being elevated above all other species. This perspective historically justified the widespread exploitation of natural resources across agriculture, fishing, mining and various forms of pollution. Contrastive, another perspective advocates for a more respectful coexistence between humans and the natural world. While recognizing the unique value of human life, it also acknowledges the significance of other living beings and ecosystems. This perspective appreciates animals and ecosystems are remarkable creations of nature, akin to works of art, without elevating them to the same status as humans. Regarding climate classification, various types of climates are observed worldwide, including tropical, dry, temperate, polar, and continental climates. Each type exhibits distinct characteristics by factors such as solar radiation, air circulation pattern, and geographical features.

Human activities significantly contribute to climate change, primarily through the emission of greenhouse gases from transportation, oil and gas development, and deforestation. While natural factors like volcanic eruption and orbital variations play a role in climate change, the current pace and magnitude of global warming are unprecedented, primarily driven by human activities since the industrial revolution. Addressing the climate crisis necessitates concerted mitigate greenhouse gas emissions and transition to sustainable practices. Recognizing the disproportionate impacts of climate change on marginalized communities underscores the urgency of taking actions to safeguard the future of our planet (Figure 14.2).

Figure 14.2: Sustainable Planet

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