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Climate Change is caused by Humans

The uncertainty surrounding the past, present, and future of our climate elucidates different perspectives about the cause of climate change. However, the scientific community and environmental advocates are confident that climate change is an effect of anthropogenic advances. To understand how humans have caused climate change, we must accept the change between historical and present climate, recognize the physical and chemical plausibility for specific molecules to warm the earth, and realize that these same molecules have increased due to human emissions since the 1850s.

The industrial revolution enhanced the development of climate measurement tools in the last few hundred years, making it possible to compare historical and present climate. Even with the multiple scientists and sources measuring climate, the climate from the 1880s to present-time is universally trending positive, with about an adjusted 1.2°C increase from 1880.[1] According to the International Panel on Climate Change (IPCC), it is scientifically indisputable that each decade was warmer than the previous one, starting in 1850.[2] Climate does not only consist of temperature, it also contributes to long-term weather patterns and subsequent natural disasters. The most regarded organizations on climate change have confirmed that climate change has caused an increase in hot and very hot days while also causing a decrease in cold days across the globe.[3] The certainty behind this increase in warmer temperatures also contributes to the certainty behind the increase in heatwaves, cold waves, heavy precipitation, drought, hurricanes, flooding, and sea level rise.[2] With experts and scientists actively measuring climate from past to present, the change in climate is explicit.

Molecules that conduce global warming are called greenhouse gases (GHGs). Based on their chemical and physical properties, these molecules capture heat in the earth's atmosphere and act as a coating of warmth.[4] Of the sunlight that reaches earth's atmosphere and surface, a majority of it is reflected back out of earth's atmosphere as infrared light. This light is then captured by the GHGs, preventing infrared light from escaping outside of earth's atmosphere.[5] The most popular and most abundant molecule is carbon dioxide (CO_2), which both naturally exists and is emitted by human activity.[5] Other noteworthy and concerning GHGs include methane (CH_4), nitrous oxide (N_2O), fluorinated gases, and water vapor.[4,5] With an increase of GHGs released, the planet is bound to chemically and physically warm itself.

Since the start of the industrial revolution, human GHGs have increased due to technological advancement to reach today's feats. Burning fossil fuels for energy production first started in the 1700s and amplified the release of GHG emissions.[6] The sectors that have both flourished and emitted the most GHGs include energy, agriculture, and transportation.[7] In 2019, the concentration of CO_2 in the atmosphere was 410 ppm[2], when the concentration of CO_2 before the industrial revolution was approximately 280 ppm.[8] It is evident that the world nations with the most wealth also contribute the most to GHG emissions, with China, US, and India emitting 19 billion tons, 5.3 billion tons, and 2.5 billion tons respectively in 2017.[9] Human reliance on fossil fuels provided sectors with the tools needed to succeed while also degrading earth's climate through the release of and warming from GHGs.

With scientific evidence surmounting the increase in temperature, the chemical characteristics of a warming planet, and anthropogenic release of GHG emissions, climate has and will continue to change. Human impact on climate is irrefutable as our reliance on fossil fuels drives our warming planet, which ultimately influences our health impacts.

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Health Impacts of Climate Change

Climate change increases morbidity and mortality in all aspects of human life. Intuitively, changes to temperature affect our habitat, behaviors, health; however, the impact from climate change devastates society in unprecedented ways. From drastic flooding to overwhelming droughts, the range of health impacts is extensive. For greater insight on health and climate, we must conceptualize the impact of heat on health, as well as water and land-based health impacts.

Heat changes our lives, and we have adapted to these temperature increases in past. As the temperature continues to rise, it is increasingly more difficult to adapt in places where high heat was never an issue previously. Researchers developed a way to attribute heat-related deaths to anthropogenic climate change and found that each nation experiences differences in these impacts, ranging from a 9%-57% relative risks for heat-related mortality.[1] The same study found that 37% of deaths during the warm season are attributable to climate change.[1] With the variability of climate change and its impacts across the world, climate vulnerability is unique to each region.[2] More specifically for humans, heat is also associated with an increase in chronic disease related hospital visits (for health issues such as heart disease and lung disease), hospital visits due to mental health, and negative birth outcomes.[3] However, the most prominent effect of heat on human health is the devastating health inequities experiences by vulnerable populations. With rising temperatures and accompanying natural disasters, privileged populations are planning to move away from areas with environmental decline. On the other hand, almost 50% of US citizens do not have the means to move, so their quality of life will diminish with greater heat and less water.[4] With greater mortality, increased hospitalizations, and escalated health inequities, climate change impacts human health on the individual and societal level by intensifying already established health issues and creating new ones.

Climate change not only affects health directly through heat, but it also affects health and quality of life through changed water and land. With our reliance on water for survival, the increase of extreme weather events such as droughts and torrential rains strains our water resources.[2] The increase in rain events and flooding leads to a better environment for many vector-borne diseases to thrive in, with dengue transmissions increasing by more than 10%.[5] Conversely, drought is associated with poorer air quality (through fires and dust), which in turn impacts our lung health by introducing particulate matter.[6] With water and land being inextricably linked, the land used to bolster our health through healthy foods, exercise, and mental health is also impacted. Without the right amount of water, our food system is severely threatened in agricultural and livestock production, leading to an increased risk in global malnutrition.[2] Our land use also changes due to how and where we live. With the ongoing climate migration mentioned earlier, land farther from the equator that hasn't been previously developed will likely turn into metropolitans for humans to continue living in a comfortable state of being.[4] With all resources that support human health affected by climate change, an inevitable change must occur to protect our quality of life.

Heat is the most popular health impact due to climate change. Heat endangers human health directly and indirectly through water scarcity and food insecurity. We must continue to recognize that these effects are inequitable depending on inherent vulnerabilities. As our health is so closely intertwined with the impacts of climate change, we must make better efforts in reducing our emissions and stabilizing climate with the goal of preserving our health.

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What should we do about Climate Change?

Governments, organizations, corporations, and individuals need to put forth extreme efforts to mitigate inevitable loss and damage from climate change. Previous efforts have failed societies on the promise of reduced emissions, preparedness plans, and financial contributions. Moving forward, I propose a stringent approach that begins with simultaneously relating climate mitigation to health co-benefits and instituting an emissions allocation focused on equalizing emissions. With these strict policies in place, our research into carbon and solar geoengineering can then be financially funded and supported.

Climate change is currently thought of as a politically divisive topic, based on scientific evidence to some and fantasies to others. We must shift this divisive thinking from opposition to communal concern for climate change's affect on human health. By improving our climate, we concurrently improve health through cleaner air, more opportunities for physical activity, and more nutritious foods.[1] One article documented health-related costs in the US from extreme weather events in 2012 equated to approximately $10 billion dollars at the 2018 rate.[2] If health was clearly defined as being related to climate, lobbyists would be able to convince decision-makers to invest in immediately rigorous climate mitigation policies. Pairing health co-benefits to climate mitigation leads to dedicating climate investments in research, finances, and policies.

With support for climate investments, political leaders now have a greater inclination for climate politics. Carbon budgets and emissions allocations are examples of these policies that require enforcement due to previous failures in emission limits. Many reviews suggest that countries are falling short on their Nationally Determined Contributions (NDCs) due to vast implementation gaps.[3] Without an international governing body issuing sanctions, countries will continue to miss their NDCs and reduce climate change to the 2° C threshold by 2050. The equalize emissions approach of an emissions limit for all countries combined with international regulation will ensure countries abide by these limits. Countries are likely to set their own emission limits per industry to meet these national requirements, further reducing global emissions. The rigor of equalizing emissions with regulatory discipline leads to immediate action that is necessary to meet the global 2050 emissions goals.

The funds generated from equalized emissions penalties should be invested in all geoengineering. In 2019, the US government allocated a minimal $4 million dollars to the National Oceanic and Atmospheric Administration to increase their research on Earth's radiation budget.[4] This scratches the surface for geoengineering, being more investigative instead of developing sufficient solutions. Financial awards need to shift towards more efficient carbon engineering practices that have high confidence in carbon sequestration and solar geoengineering solutions with low impacts on earth's closed system. Both carbon and solar geoengineering will inevitably have externalities, but by modeling technologies after nature with enough funding, further developments ensure that these externalities will become negligible. Geoengineering is a viable solution to climate change due to our dependence on a capitalistic, carbon economy.

Informing global leaders on health co-benefits from climate mitigation will influence immediate action towards emission standards. With these standards coupled with sanctions, these funds can be dedicated towards improved development of geoengineering techniques. We need to take these actions since so little has been done in the past without globally rigorous programs. To prevent drastic morbidity and mortality and permanent damage, we should do everything in our power to reduce the impacts of climate change for humans and the world.

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