

MECH-426 Fuel Cell Science and Engineering

The Threat of Climate Change and Mitigation Technologies

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The Threat of Climate Change and Global Warming

Since the dawn of the industrial revolution, it has been recognized that humanity has driven temperatures to rise across the globe. This has resulted in a shift of weather patterns, the melting of the polar ice caps, flooding, wildfires and even intense droughts. Consequences which have been predicted to only get worse as we continue to burn more fossil fuels, chop down large swathes of forests, drive more cars, and raise livestock to support our modern consumer based economies. Ultimately, all these factors play a role in driving Climate Change and makes it pertinent that action is taken to mitigate future disasters, particularly in regards to human health.

Global Warming and Climate Change are often used interchangeably but it is important to understand the difference. Global Warming is an aspect of Climate Change, it refers to long term warming of the Earth. As more fossil fuels like coal, oil and natural gas are burned to provide energy, greenhouse gasses such as carbon dioxide are released into the atmosphere. These greenhouse gasses trap significant amounts of sunlight and have allowed the Earth to heat up over the course of 200 years by about 1°C. Meanwhile, Climate Change takes into account Global Warming but also refers to the other changes in climate that occur. This includes the rising of sea levels, glacial retreat, and even changes in rainfall patterns.

While Climate Change and Global Warming are indeed wreaking havoc on our planet, as mentioned in the many forms above, they are also a great threat to human health. For one example, the increase in the average global temperature will result in more frequent and longer lasting heat waves. These changes have the potential to increase the number of heat-related deaths such as stroke, dehydration, or cardiovascular disease as the end of the century approaches. Those that are more vulnerable to these extremes are the ones that are most likely to suffer from it, such as those that are poor, lack air conditioning, those who work outside often, and old and young people. As these people will be exposed to extreme heats during the summer and will not be offset by a reduction in the number of deaths linked to being cold.

Climate change has also been linked to increased disease and allergy transmissions. Pollen season in the U.S. now starts earlier and lasts longer compared to historic norms. This increase in airborne allergens is due to raised CO₂ levels and warmer temperatures, which currently the world possesses a surplus of. Even “despite significant improvements in U.S. air quality since the 1970s, as of 2014 about 57 million Americans lived in counties that did not meet national air quality standards. Climate change may make it even harder for states to meet these standards in the future, exposing more people to unhealthy air” (EPA).

In similar fashion, the change in humidity, temperature and climate have increased the geographic range of vector borne diseases. Ticks, flees, and mosquitos are such examples of these vectors that are enabled. As temperature has increased, so have the ideal conditions for these insects. Allowing for disease they carry to start earlier in the year and even spread to formally colder climates.

Lastly, an increase to foodborne and water based illness will pose a significant threat to human health as well. Climate Change has resulted in more severe weather events leading to heavy rains and runoff. This runoff can contaminate drinking water and bring along with it gastrointestinal illnesses. In the case of food, high concentrations of CO₂ “in the air can act as a ‘fertilizer’ for some plants, but lowers the levels of protein and essential minerals in crops such as wheat, rice, and potatoes, making these foods less nutritious” (EPA). Higher air temperature can also lead to higher concentrations of chemical contamination of food and increased chances of Salmonella and other similar bacteria that thrive in warm conditions.

Thoughts on Mitigation Technologies

Personally, I have high hopes that via the use of alternative technologies, we can become carbon neutral and even revert some of the changes we have incurred. For large stationary applications, I believe that nuclear, wind farms and hydropower will likely be the ideal candidates for sustainable energy. They are capable of operating in nearly any condition and all day every day unlike solar power. In the case of mobile applications, I champion that hydrogen is the likely best candidate in the long term. Unlike battery electric vehicles (BEVs), fuel cell powered vehicles can be refueled much quicker than it takes to charge those batteries and oftentimes have increased range. BEVs also suffer from three other key concerns that I have in regards to their widespread adoption. For one, while they themselves produce no emissions, the power they tend to be charged with tends to come from fossil fuels, creating a demand for more power on the grid, which currently is fulfilled by even more fossil fuels. Secondly, the lithium batteries themselves are not ideal choices for the environment with all the heavy elements they contain and the CO₂ offset it takes to produce them where fuel cell vehicles should be able to reduce this issue. Lastly, BEVs are extremely heavy, producing the most amount of road wear and tire pollution.

Despite the recent thrusts into alternative energy, I feel that the current rate of adoption of these mitigation technologies is still lacking. It is one thing to say we can adopt solar, wind and hydrogen power in favor of fossil fuels, increase our carbon capture rates, cease deforestation, and make our buildings and infrastructure more efficient... but these changes take time to implement. Time the world does not seem to have.

References:

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