

# **MECH-322 FLUID MECHANICS**

**GLOBAL WARMING AND CLIMATE CHANGE ESSAY:**

**“Climate Change Impact on Life”**

**Arthur Jillson**

**Richard Cergau**

**Dr. K. J. Berry**

**Winter 2022**

Climate change has had a huge impact on our society. For the last decade or so, the human population has started to see the effects of climate change on a larger scale than before. More events driven by climate have occurred, including but not limited to the melting of polar ice and changes in climates in regions across the globe. Scientists have also done extensive research that predicts a rise in temperature in the next century. An expected increase of temperature of a maximum of ten degrees is expected. The human population is now trying to combat the effects of climate change that occurred because of our ecological footprint on this planet. Doing so will help reduce our individual carbon footprint and reduce the amount of climate change for years to come. One of these examples would be the ever changing clean energy industry. New ways of obtaining "clean energy" have been seen over the last few decades. Some of these include nuclear fusion, geothermal, and hydrogen energy. These sources of energy are clean sources that are renewable, and they offer little to no emissions from them. We are also trying to minimize vehicle emissions by switching to electric vehicles that run off of electricity rather than gasoline, diesel, and other fuels. This change can help reduce the pollution in our ecosystem and help combat global warming. Some countries have given people "bonuses" if they start buying and using electric vehicles. Even some car companies are planning the push of electrification by no longer producing vehicles with conventional internal combustion engines. Lastly, climate change will eventually change communities, this includes a change in agricultural growing seasons that will change how farmers grow crops for the population. As changes impact precipitation and ecosystem, sea levels will rise which will affect the population living by the coast. With everything considered, global warming will have an effect on how we live our lives and how we adapt over the next few decades. Our future decisions and actions will either set us up for success or failure as the world changes around us.

Clean energy has been around for many years, it has revolutionized and helped us understand that there are renewable energy sources that will never go away around us in the world. For years we've used power stations that have been run off of fossil fuels and coal. For a long time these were the standard of how many people received their power throughout the world. One of the biggest changes to power plants was the use of nuclear power plants. These power plants have been producing about twenty percent of total annual electricity in the United States. These plants also have a small carbon footprint similar to wind farms and solar panel farms. This is because a nuclear reactor operates by a nuclear fission process, which produces a substantial amount of heat through the reactor, resulting in the boiling of water to produce steam. This steam is used to spin a turbine that is connected to a generator inside the plant. This is very similar to how coal and natural gas plants operate (producing heat to create steam that is capable of work), but produces said heat through a nuclear reaction rather than the burning of carbon. This process creates virtually zero emissions in the process of nuclear fission (EIA). Another form of a zero emission

energy source is Geothermal energy. This source is clean and taps into reservoirs of hot water in the earth and is used to produce electricity. This source of energy is renewable and does not change due to a change in weather conditions. This form of energy produces no greenhouse gasses that do not affect the ozone layer of the earth. This layer is one of the main factors of global warming. Lastly, hydrogen fuel sources have been gaining popularity. This is because hydrogen fuel cells operate through reactions rather than combustion, resulting in no carbon emissions and a byproduct of water. Hydrogen fuel cells produce electricity, running electric motors, which have higher efficiencies compared to internal combustion engines. Hydrogen has started to be used in the automotive industry and is a clean source of energy to power an automotive vehicle. All of these sources provide a viable source of clean energy for our future and will help diminish our carbon footprint on the planet as a whole (Energy.gov).

Vehicle emissions have been one of the most talked about subjects when it comes to climate change. This is because the emission from vehicles produce harmful gasses, one of which is carbon dioxide. To combat this, our society has started to look more and more into the electrification of the automobile. An electric vehicle produces no direct emissions into our atmosphere and stouts a substantially higher efficiency. Some of the setbacks that come with electrification are the infrastructure issues, recharging, and maintenance. The infrastructure issues will take time to solve, this is because for the last couple of decades there has always been a gas station around the corner. Electric charging stations are not abundant at this time, but luckily more are being constructed through automotive manufacturers and government incentives. Until then, most people with electric vehicles will have to plan their stops before heading on a long trip. Another drawback with electric vehicles is the recharge time itself. It isn't abnormal for an electric vehicle to take an hour to recharge, even with a fast charger. If you're charging at home using a normal 110 volt outlet found in every house, it can take upwards of 40 hours (Kelley Blue Book). Lastly, electric vehicles have a huge maintenance charge due to their batteries. Batteries are estimated to die in a 10-15 year span. The battery life can also be affected by the climate that the vehicle is in. The push for electric vehicles is a positive one when it comes to reducing our impact on our environment. It is also the way of the future and is becoming more and more prevalent with more automakers producing electric vehicles. Even though electric vehicles are not popular or as accessible for all people to use they are still the way of the future. It will take a while till society accepts all these changes from a normal internal combustion engine to an electric car. But for better or worse, the electric vehicle will lead us to a clean future (McKinsey & Company).

Agriculture is drastically impacted by climate change. Farming, like engineering, involves predictions. Farming requires estimation of when the weather will be stable enough to plant crops. If a

farmer plants crops too early, and a frost hits, they could lose everything. With certain crops, farmers can actually plan and decide on their own when to plant, but apples and other crops start growing on their own. With climate change, weather becomes more unpredictable, resulting in random warm spells in the winter, or random cold spikes in the summer. Earlier snowfall and later thawing in the year can narrow the window of crops being produced. This can be even more dangerous since fuels have tried to adjust towards being biofuels. Ethanol, which comes from corn, is used heavily in fuels. Not only are we relying on agriculture to feed ourselves, we are now relying on agriculture to power how we move, which can be dangerous with these unpredictable farming seasons. Additionally, certain parts of the world are cutting down forests, which are important to the absorption of carbon dioxide and production of oxygen, just to produce crops that can be used for biofuels, which can negatively impact climate change even more.

In locations like California, water for crops comes from precipitation commonly, with the rainy season being fall and winter, resulting in the form of snow (California Department of Water Resources). Throughout the winter, the mountains receive snow, which melts through the summer and is stored in reservoirs and lakes for use throughout the year. This water is used both for agriculture applications, as well as normal water usage of people. With larger changes to the climate, snowfall can become unpredictable, resulting in devastating effects from lack of water. There is a finite amount of freshwater, and at the moment, desalination is an expensive process to be able to use ocean water. With unpredictable and inconsistent snowfall in recent years, it has had devastating effects to the west coast in particular, and has created concerns about the sustainability of living in these regions. With unpredictable weather, issues can also occur when sudden rainfall occurs. If a substantial amount of water happens once a year, rather than a little each month for example, reservoirs may not be able to properly store the water at once. A region may receive an average amount of rainfall on an annual basis, but if dams, for example, are forced to use spillways due to a large surge of rainfall, hydroelectric power isn't able to be captured as much as it ideally could, and fresh water is forced to move beyond storage. Additionally, this can have damages to the land, causing mudslides due to large amounts of water running across very dry land, damaging homes and buildings.

Coastal regions are also having to deal with rising sea levels due to the melting of polar ice caps. This can be problematic since a lot of older, established cities, such as New York, are built close to sea level. Subway systems and roads can't be raised, resulting in higher chances of flooding. This is damaging to infrastructure, and results in more energy usage to alleviate the issues. Small gasoline engines, such as generators, are terribly inefficient, and are commonly used on pumps. With more flooding, it requires more emergency pumping with these small combustion engines, resulting in more

pollution and impact to global warming. Although we are talking inches of rise, the higher sea level is, the less effective hydroelectric power can be. Hydroelectric uses the potential energy of water, which is a function of height, to produce electricity, but if the height difference is smaller due to the ocean being higher, it reduces the amount of potential energy. Although this may be a few inches of height difference, on a large scale, this can have huge implications over a lifetime. On the opposite end of this, droughts can result in lower water levels on the up flow side of the dam, running into issues with having enough water to run through. This is a concern for the future as there are many locations in the western US that receive power from the Hoover Dam, which supplies “4 billion kilowatt-hours of hydroelectric power each year” to provide power to 1.3 million people in Arizona and California (Bureau of Reclamation).

The future in climate change is becoming a worse reality to the human race. In the recent century, we have seen climate change intensify and change certain regions completely. Luckily, scientists and engineers are coming up with more and more ways to combat climate change. These ways that were discussed in this paper have a lot more iterations to go through before they become foolproof. To review, these ways include the use of clean energy sources that will produce less impact on our environment and our atmosphere. The use of electrification in our vehicles vs. the use of conventional fuels that ruin our atmosphere. All of these will affect the rise of sea levels and the change in our ecosystems for the better. An engineering solution that would be useful for the future is being able to make the resources that we have available now more efficient. The typical combustion engine is actually very inefficient compared to an electric vehicle. Additionally, being able to capture more renewable energy through a higher efficiency alleviates some of their current drawbacks. An example of this would be solar panels or wind turbines; if the wind is not blowing or the sun isn't shining now power is being produced, but if there was a more efficient way to capture the energy, it can help compensate for these non-power producing times. As time goes on, more breakthroughs in technology and science will come. This will help the human race adapt to the changes on our planet and produce a more sustainable society.

## Works Cited

“Clean Energy.” *Energy.gov*, <https://www.energy.gov/clean-energy>.

“The Effects of Climate Change.” *NASA*, NASA, 26 Aug. 2021, <https://climate.nasa.gov/effects/#:~:text=The%20potential%20future%20effects%20of,and%20intensity%20of%20tropical%20storms>.

“U.S. Energy Information Administration - EIA - Independent Statistics and Analysis.” *Nuclear Power Plants - U.S. Energy Information Administration (EIA)*, <https://www.eia.gov/energyexplained/nuclear/nuclear-power-plants.php>.

“Why the Automotive Future Is Electric.” *McKinsey & Company*, McKinsey & Company, 14 Sept. 2021, <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/why-the-automotive-future-is-electric>.

California, S. *The California Water System*. Department of Water Resources. Retrieved March 10, 2022, from <https://water.ca.gov/water-basics/the-california-water-system>

Lee, C. (2021, March 15). *How long does it take to charge an electric car*. Kelley Blue Book. Retrieved March 11, 2022, from <https://www.kbb.com/car-advice/how-long-does-take-charge-electric-car/>

Bureau of Reclamation, L. C. R. W. T. (n.d.). *Hoover dam*. Hoover Dam | Bureau of Reclamation. Retrieved March 10, 2022, from <https://www.usbr.gov/lc/hooverdam/faqs/powerfaq.html#:~:text=Hoover%20Dam%20generates%20C%20on%20average,one%20of%20the%20country's%20largest>.