

Climate Change Essay

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Fluid Mechanics – Dr. Berry

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Climate change is a problem that not only affects society today, but also future generations. Environmental issues disrupt climate zones, leading to harsher summers and winters in previously moderate areas, and causing weather disasters and phenomena that wreak havoc on ocean coastlines. Winter temperatures drop further, and record summer heat waves propagate across the planet, while industrialized and corporatized nations continue to shift the burden of finding a solution onto the common citizen. Most individuals are ill-equipped to handle the complex problems associated with climate change and the environment. This is where engineers enter the situation and carry a responsibility to society to mitigate the impact that technology and development have upon the world. The modern role of engineers is to moderate technology and growth, protect the environment, and ensure that humanity enters a sustainable future for the well-being of future generations. This essay will discuss what the responsibilities of engineers are and how they can be applied to the issue of climate change to ensure a sustainable future. Additionally, this essay will discuss the role of engineering tools such as fluid mechanics and following the path of engineering applied to product development in the scope of climate change and environmentalism.

The responsibilities of engineers when developing technologies encompass the health, safety, and well-being of people within society, as well as the protection of the environment that humanity calls home. Engineering encompasses various disciplines, including mechanical, electrical, and computer engineering, among others. Each discipline carries the responsibility of an engineer to develop innovative ideas that ensure the survival of future generations utilizing sustainable practices. One way engineering can be applied to combat climate change is by creating technologies that reduce greenhouse gas emissions, particularly from the transportation and energy production sectors. Engineers can design and optimize existing systems to minimize environmental impact, developing efficient transportation networks and eco-friendly manufacturing processes. Moreover, engineers can spearhead the development of new systems that revolutionize the way society uses energy. Engineers must work to develop new energy production forms such as solar, wind, hydroelectric, and nuclear and convince society of the imminent need to pivot away from society's reliance on fossil fuel burning. Twenty-five percent of all greenhouse gas emissions in the United States in 2021 came from electricity production, where Seventy-nine percent of this

production comes from burning fossil fuels (EPA, Sources of Greenhouse Gas Emissions). This sector is where the most progress can be made by implementing renewable and green energy such as solar and nuclear power. By pushing the boundaries of energy production, engineers can swiftly eliminate a substantial portion of greenhouse gas emissions. However, transitioning away from fossil fuels requires more than just convincing people or introducing legislation, as corruption and greed often plague large industries. Engineers also have the responsibility to lead the world into a future that prioritizes safety and sustainability over profit once society is willing to move beyond fossil fuels. While electricity production contributes significantly to global emissions, transportation is the largest emitter, accounting for twenty-eight percent of global emissions (International Energy Agency). Further dissecting this information, passenger vehicles account for fifty-eight percent of all transportation emissions (EPA – Fast Facts on Transportation Greenhouse Gas Emissions). Empowered with this information, engineers must begin and continue to develop more sustainable transportation technologies. The first that comes to mind for many is electric vehicles, which are a great way to reduce tailpipe emissions and set a precedent for future efforts. There are still many problems with EVs, however, such as battery production and recycling, and engineers must work to solve these issues as well to have a truly sustainable future. The debate between internal combustion and electrification is long and filled with nuance, but regardless of the direction engineers carry the responsibility to make the technology safe, efficient, and effective in protecting people and the environment. Overall, the engineering profession has a responsibility to safeguard future generations by developing sustainable and safe technologies that prioritize the preservation of the environment.

Engineers possess many tools to create, innovate, and refine systems and processes, such as fluid mechanics. Fluid mechanics is applicable to many areas of technology and can be used to improve the efficiency of many processes, from refrigeration, cooling, energy production, and transportation. Engineers use the tools supplied by fluid mechanics every day when working with air, water, and other materials to create a system within our environment. Within refrigeration engineering, fluid mechanics is used to find inefficiencies in the path of a fluid through a pump and pipe system, in addition to playing a role in analyzing fluid flow through a radiator in conjunction with the principles of heat transfer. Improving these processes can save

energy and allow these technologies to be more sustainable in people's daily lives. Additionally, fluid mechanics is crucial in the context of sustainable electricity production. For example, nuclear energy requires extensive cooling efforts to remain safe and efficient. Engineers involved in these projects must design systems that are effective yet follow safety regulations and do not harm people or the environment. A way that this is applied to climate change is with the venting of refrigerant into the atmosphere from a failure or even from maintenance. Engineers must develop these coolant systems so that each failure case does as little harm as possible. An important realization for engineers, however, is the fact that we live with uncertainty every day and that we cannot plan for every contingency. Therefore, it is important to design a system in a way that does not rely on predictable conditions rather than planning for failures and how to control them. This concept was introduced by contemporary writer Sheila Jasanoff, who writes about what she calls technologies of humility. Introducing this concept, and similar environmental justice principles, to engineers would allow them to design sustainable systems that do not create more issues and protect the environment. Fluid mechanics can also be applied to developments in electricity production as engineers must understand and design systems such as wind turbines, hydroelectric pumps, and other energy converters. By harnessing the principles of fluid mechanics, engineers can reduce society's reliance on fossil fuels and improve the efficiency of renewable energy production.

Moreover, fluid mechanics, heat transfer, and thermodynamics are key concepts in transportation technologies, from internal combustion to electrification. Given that we cannot replace all internal combustion engines, it is important for engineers to refine the processes and systems that these engines run on. Combustion, for example, can be refined and improved to achieve a higher thermodynamic efficiency in gasoline and diesel engines. Technologies such as dual port fuel injection, pre-chamber ignition, and compression changes allow manufacturers to further develop internal combustion to offset the emissions of less-efficient technologies. Another way combustion engines can be improved is by using eco-friendly fuels. Porsche is one company that is investigating the use of these alternative fuels in passenger cars, and the FIA is committed to introducing one-hundred percent sustainable fuels into all racing categories within the next ten years. Both organizations and their research are led by engineers using the principles of

thermodynamics and fluid mechanics to analyze how the efficiency of an important technology can be increased to use less fuel and protect the environment, without sacrificing many of the things that consumers value. Another area of this technology that the principles of fluid mechanics are used is with engine cooling. Engineers have been developing methods of “active cooling” for many years now, which not only helps to heat catalytic converters and reduce emissions, but also directs coolant more efficiently to parts of the engine and optimizes their operating temperatures. This is even more important as forced-induction engines become more popular, as temperature control is an important part of maintaining turbo efficiency. Fluid mechanics can also be applied to electrification, as this emerging technology still utilizes pumps which need to be controlled, designed, and refined to successfully and efficiently cool EV batteries and drive units. Choosing a proper pump for the situation, as well as improving the efficiency of the surrounding system, is important to use less energy so that more can make it to the driving wheels and be used to increase electric vehicle range and charging speeds, which are two key points of contention among hesitant consumers. As engineers work vigorously to improve and develop electric vehicles, as well as refine the internal combustion process and all peripherals to both systems, society must also reign in the harmful forms of production and waste management. Overall, the engineering profession has a job to do regarding the future of mobility, which is to create safe and efficient modes of transportation while protecting and ensuring a sustainable environmental relationship.

In conclusion, engineers have a responsibility to design, develop, improve, and implement new technologies that safeguard the environment and people to reduce the impacts that we have on climate change. This is applied to many sectors, including electricity production, transportation, as well as plenty of others, and the role of the engineer is as a leader for society into a sustainable future. In order to ensure the survival of future generations, and create a sustainable world for everyone, engineers must take charge and continue to push the boundaries of technology, not just for humanity, but for everything that surrounds us as well.

References:

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