UNIVERSITY OF VIRGINIA NET-ZERO RESIDENCE INITIATIVE 2022

PROJECT ENERGY GENERATION GROUP

WHY DO A LARGE NUMBER OF AMERICANS DISTRUST CLIMATE SCIENTISTS AND DO NOT BELIEVE IN GLOBAL WARMING?

An Undergraduate Thesis Portfolio

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In Partial Fulfillment of the Requirements for the Degree

Bachelor of Science in Major Mechanical Engineering

By:

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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EXECUTIVE SUMMARY: A SOCIOTECHNICAL SYNTHESIS

Evidence for human caused climate change has been prominent since the end of the Second World War. Later, research performed in the 60's and 70's resulted in nearly all climate scientists saying that the Earth's climate is changing and it is because of Humans. Even though this has been the scientific consensus for over half a century, many people still do not believe that humans are causing the planet's climate to change. My STS paper looks into why certain people do not trust climate scientists who have dedicated their lives to understanding the Earth's climate. I looked into what groups of people are more likely to be skeptical about the existence and severity of man caused climate change. My technical project looks into specialized materials that are capable of racing a surface temperature that is below the ambient air temperature while they are receiving direct sunlight. They can do this because they reflect nearly all sunlight that they come in contact with and they exclusively emit radiation in a window where the atmosphere will not trap the heat in. These materials radiate heat back into outer space which helps the planet cool. These materials can be used to help slow down the negative effects of climate change.

My technical project was designed for me to research ways of cooling the earth through technology and engineering. The Earth is getting hotter because of the actions of humans and my technical project looked into ways to prevent this from continuing. I looked into materials that do not absorb a lot of heat from the sun, but instead reflect the sun's heat back into space. I looked into materials that have a very high reflectability among the range of wavelengths that sunlight is emitted as. In addition, materials also need the radiation they emit to go back into outer space, not the atmosphere. The atmosphere has a small window of wavelengths where it allows radiation to escape through it, into space. This window is very different from the range of

wavelengths that the sun emits light in. This means we need materials to be very reflective of light in one wavelength while emitting light nearly exclusively in a different range of wavelengths.

I found that this process is possible and it has already been done before. There have been several groups of people who made materials that are capable of reaching a temperature below the ambient air temperature while they are receiving direct heat from the Sun. I determined an equation for determining a material's net cooling power. I used this equation to determine what aspect a material needed to maximize and minimize in order to achieve the largest net cooling power possible. I made theoretical models of the net cooling of different materials in different conditions. I also found that this process works best in warmer, arid climates. I then gave recommendations for ways to accomplish this. I determined it is possible for a material to achieve a net cooling power of 23.1 W/m^2 while under direct sunlight.

Approximately 57% of Americans believe in global warming and that it is caused by humans. That means that 43% of Americans do not trust climate scientists when they say that humans are causing the Earth's climate to change. I looked at what groups of people were most skeptical about the existence of human caused climate change. I looked into what reasons people in these groups have for not believing in experts in the field of climate science. I also looked into if they are also more likely to distrust experts in other fields. Are people who do not trust climate scientists more likely to distrust experts in different fields? I also looked into why people believe in other conspiracy theories like that the COVID-19 pandemic is a hoax. I compared people who were skeptical about the existence and severity of the COVID-19 virus and compared them to people who do not believe in climate change. I looked to see if there was overlap in these groups.

I looked into the type of media that they consume and where they receive their news. I found that people who consume primarily conservative biased media are more likely to be skeptical about the existence of climate change. I also found that people who receive their news on social media are more likely to distrust experts in this field. I also looked into how a person's religious beliefs can impact what they believe about climate change. I found out that the more religious a person considers themself to be, the more likely they are to be skeptical about the existence of human caused climate change. When people were asked to rank how religious they believe themselves to be on a scale from 1 to 7 with 7 being the most religious, for every one number above one a person put, they were 12% more likely to deny the existence of human caused climate change. The groups of people that I found to be the most likely to be skeptical about the existence of climate change were very similar to the groups of people who were most likely to believe that COVID-19 is a hoax.

I looked into why people do not believe in global warming and different ways humans can prevent global warming from inflicting damage. I looked at how policies need support to be passed which they will only receive from people who believe in global warming. I also looked into fighting global warming using new technologies.

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