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**Cultural Cognition and How It Relates to Climate Change**

Climate change is a serious problem that has been affecting our planet more seriously in the recent years. It projects a continuation. The causes of climate change in our climate have been a controversial topic, but its existence can no longer be denied. There are many factors that can shape climate change. The factors that force the Earth to change are variations in solar radiation, deviations in Earth’s orbit, mountain building and continental drift and changes in greenhouse effect concentrations.

The Earth makes one full orbit around the sun each year. It is tilted at an angle of 23.5 degrees to the perpendicular plane of its orbital path. Orbital variations in the tilt can lead to important changes in the strength of the seasons. When this tilt is 0.00 degrees, the orbital path of the Earth is circular and when its 0.06 degrees, the orbital path is slightly elliptical. Nowadays the current value is 0.016 degrees. As the tilt increase we will have warmer summers and colder winters and if we have less tilt will lead to cooler summers and milder winters.

When landmasses move and mountains grow over geological time, they cause changes in climate long-term. The sizes of landmasses can determinate the amount of heat that the surface will absorb. We can say that changes in the sun's energy output would cause some of the climate change, since the sun is the fundamental source of energy of our climate system. Latest studies of the solar activity have shown that a cooling trend has been noticed since 1960, but at the same time that global temperature has been warming. This means that the sun has actually contributed to the cooling trend in the last decades since warming sun and climate have been moving in opposite directions. Volcanic eruptions can also lead to climate changes; eruptions send ash and sulfuric acid into the atmosphere, which increases planetary reflectivity causing atmospheric cooling. It is said that a massive volcanic eruption can actually cool the Earth for one or two years which can have a great impact around the world. Certain gases in the atmosphere block heat from escaping, these gases are often called “Green House Gases” which include nitrous oxide, water vapor, carbon dioxide, methane and sulfur hexafluoride.

There are many substances that could act as greenhouse gases however; two of the most important are water and carbon dioxide. Water vapor is the most abundant greenhouse gas in the atmosphere, the vapor increases when the Earth’s atmosphere warms creating precipitation making this some of the most important mechanisms of the greenhouse effect. The nitrous oxide is a powerful greenhouse gas created by soil cultivation, mostly the use of commercial fertilizers, combustion of fossil fuel, biomass burning and the production of nitrous acid. Another gas that leads to the greenhouse effect is methane; this gas is caused by both human activities and natural resources. The increasing amount of fossil fuels like oil and coal has accumulated a higher amount of carbon dioxide of the atmosphere over the last decades. This happens when the oil burning process combines carbon with oxygen in the air, making carbon dioxide. Methane is a hydrocarbon gas created by decompositions in landfills, agriculture and domestic livestock. Scientist says that methane on a molecule for molecule basis is far more active than carbon dioxide but is less abundant in the atmosphere. Chlorofluorocarbons are another type of gases that contribute to this dangerous effect. Sulfur hexafluoride comes entirely from industrial processes. Lately these types of gases have been strictly regulated because they have the ability to destruct the ozone layer.

Scientists have estimated the contribution of solar radiation, greenhouse gases and dust and they have reached a level of credibility that greenhouse gases contribute the most to the warming of the Earth. Moreover scientists have noticed that when models are run only with natural influences such as volcanic eruptions or changes in solar radiation there are slight fluctuations in the climate compared to the normal conditions. Scientists have agreed that the addition of human distributions such as sulfate, ozone and most of the greenhouse gases lead to a drastic change from normal conditions, which makes clear that humans have helped with the development of this atmospheric change.

Climate change has been a critical issue with a lot of controversy over the last decades. Some people do not rely on scientific studies showing that human actions such as deforestation increases the amount of greenhouse gases like carbon dioxide causing climate changes that can become permanent with very dangerous effects. Individuals who are against the scientific community show their denial with skepticisms refuting the scientific findings as with levels of uncertainty. Some skeptics are considered since they raise questions and doubts about conclusion errors or uncertainties that are unfortunately unattainable in science. Scientists have stated that human activities have increased global warming over the last decade and these activities are contributing to the increase of sea levels, hurricanes and other climate disasters. Some deniers have said that global warming is natural, they support their thinking since certainty past temperatures have been higher and lower than today and carbon dioxide concentrations have also varied.

Scientists clarify that changes in the orbit of the Earth probably caused those changes in climate, which changed the distribution of sunlight over the planet, causing more carbon dioxide, but the amount of today’s carbon dioxide on earth released by human activities is far from the amounts in the previous seven hundred thousand years. In reality global warming is to a great extent caused by human activity, which has been proven by extensive scientific research, including agricultural practices as destroying forests altering the global warming situation. Most of the scientists agree the main cause of the drastic increase in global warming is due to the human expansion in green house gases. As a result some islands and countries are being in danger over the last years with higher seal levels and extreme weather events such as droughts, floods and storms.

Essentially, most of these problems can greatly decrease by efforts of people all over the world maybe starting by diminishing the use of industrial gases. We also must take into account that some countries cannot commit as easily because of economic issues, they cannot invest in modern energy efficiency equipment that is environmental friendly but they could help in a free way by decreasing the amounts of oil used in fuels. If everyone helps in the most convenient way we can achieve a better environment and protect our planet of dangerous disasters. Climate changes are very serious and have direct influences on our planet. Therefore, if everyone is more cautious about the environment and help in the easiest way we can reduce global warming while creating a healthier world with a more secure future without unwanted disasters.

End of Fabiana’s Section

The effects of climate change can be extremely detrimental to humans and the environment. Many people do not accept the fact that it is a big issue. Already we are seeing the severity of the effects of climate change all over the world. From temperature change, to serious illnesses, climate is affecting our planet in more ways than one, and for people to recognize this, they need to understand the effects climate change is having on our environment. The Environmental Protection Agency has provided much needed and up to date information to help better understand climate change and the effects it has on the planet overall.

Perhaps the most apparent of the effects is temperature change. In The United States alone, average temperatures of the states have been rising since 1901, but within the last thirty years or so, the increases have been more severe and are accelerating at a quicker rate (EPA). According to a chart on the EPA website, the parts of the U.S. that have seen the most temperature increase are several parts of the North, and Southwestern regions (EPA). The decade from 2000-2009 was the hottest that has ever been recorded worldwide (EPA)! With the rising temperatures, there is obviously going to be a major impact on humans and the environment. If the planet continues warming, we can expect that there will be more storms, heat waves, and droughts (EPA). This indicates that more people and wildlife will be harmed because of such events. Once these things occur, more tragic things can occur because of them, such as the spreading of deadly diseases, wildfires, water and food shortages, and much more (EPA).

Related to the temperature, is precipitation. Due to the massive changes we have seen in the temperatures worldwide, rates of precipitation have been severely affected. Like temperature, precipitation has increased since 1901 (EPA). It has been changing at a rate of about 6% per century in the lower 48 states of the U.S. and 2% per century globally. This may not seem like a big amount, but in retrospect, it is quite a large amount and it is affecting our planet in a negative way. Precipitation rates have increased substantially worldwide, which is leading to natural disasters such as floods, tsunamis’, and hurricanes to occur more frequently.

Another serious effect of climate change is the rise in sea levels. Globally, sea levels have risen to more than per decade in recent years (EPA). The most substantial sea level rise on U.S. coastlines has occurred on the Mid-Atlantic Coast and parts of the Gulf Coast (EPA). The main contributor to sea level rise is glacier and ice melt. Part of the Artic remains frozen all year around, but this area has become substantially smaller in recent years. In September of 2007, the Artic had the least amount of ice its ever has, since then the amount of ice has been getting smaller and smaller (EPA). The amount of sea the Artic has in 2009 was 24% below the average amount of ice from the years of 1979 to 2000 (EPA). The Artic is not the only source of ice contributing to sea level rise. Glaciers have been noticeably getting smaller since the 1960’s, but the rate at which they are melting has sped up drastically. Globally, glaciers have lost more than 2,000 cubic miles since 1960 which has contributed greatly to the sea level rise (EPA). Along with glaciers, lake ice is melting faster. In the U.S. lakes are freezing later and melting earlier (EPA).

Changes in the climate have a huge impact on human health. The likelihood of contracting certain diseases and being susceptible to other dangers rely very heavily upon changes the climate experiences. Things such as extreme temperatures can cause death, changes in ecological aspects of the climate can impact the frequency of contracting a deadly disease because of the effect it has on certain parasite (EPA). Warmer temperatures can also affect the amount of air and water pollution in the environment which can lead to a whole host of other hazards that can harm human health (EPA). Within the past three decades there have been 6,000 deaths in the U.S. alone due to heat related issues (EPA). With the rising temperatures, the more extreme heat waves and droughts will become which will have a direct impact on human health. More hurricane’s and extreme weather events are expected to increase in number (they already are) as well as in severity (EPA). These issues can cause other problems such as the increase in likeliness that more people will contract serious diseases such as malaria, yellow fever and encephalitis (EPA). Another effect climate change has on human health is the change in air quality. Respiratory issues will only be worsened by the downgrade in air quality, and people who do not already have respiratory issues now have a higher risk of developing one (EPA). Obviously there are serious threats to human health because of climate change and they will only be exacerbated by the ongoing process of the Earth’s climate changing.

Another effect of climate change is the impact that it can have on our food supply. Agriculture is easily damaged by climate change and the increase in severe weather is certainly not helping. Many people might think that the increase in temperature would be a good thing for food production because the growing season would last longer, but this is overshadowed by the drastic effects the heat waves, droughts, and floods can have on our food supply (EPA). Specifically the things that are most affecting agriculture worldwide are: changes in temperature (increase), increase in precipitation and fluctuations in the amount of rain fall, increased levels of carbon dioxide in the atmosphere, increase on pollution, and majorly the increase of extreme weather incidents such as floods, heat waves, and droughts (EPA).

Not only is our agriculture sensitive to climate change but so are our forests. Perhaps one of the most important elements of our environment, trees take carbon dioxide out of the atmosphere and replace it with oxygen. Obviously this is extremely important because they provide Earth with the oxygen we need to live as well as take out excess carbon dioxide out of the environment which is responsible for most of the climate change we are seeing. Like our agriculture, forests are being damaged by many of the same things (EPA). Effects that climate change on has on forests can lead to other things such as a decrease in water quality, damages to wildlife, and effected rates of the amount of carbon dioxide they store (EPA). The rising temperatures also increase the risk for more forest fires as well as the risk for trees to contract serious diseases that wipe out entire species of tree (EPA).

Perhaps even more sensitive to climate change, are animals and other wildlife. Disturbances in the climate can lead to imbalances in ecosystems which can lead to a whole host of issues for many animals (EPA). Animals have adapted to their specific climates over time, and the climate change that our planet is experiencing can greatly affect these animals and their ecosystems. Already, many species of animals are at risk for extinction due to changes in the climate (EPA). More specifically, aquatic animals and plants are being harmed by the rise in sea levels and increase in salt concentration (mainly along the coasts) (EPA). Also, both the north and south poles are experiencing major changes due to the rise in temperature which is proving to very damaging to certain animals and ecosystems (EPA).

Overall climate change is affecting pretty much every aspect of our planet. From tiny organisms that play a vital role in an ecosystem to extreme weather events such as heat waves, climate change is proving to be a very challenging obstacle. Human activities are exacerbating the process and it is important for us to realize the severity of this issue and the drastic effects that in can have on our planet so that we can become more aware of the risk we face and the challenges that it produces.

The issue of climate change is backed up by many years of research and many reliable sources, but people still brush climate change aside as though it is not a big deal. So, why is there skepticism if there is such valid evidence proving that the seriousness of climate change exists? We read the Tragedy of the Risk Perception Commons, a document written by Dan Kahan and his colleagues, which suggested and evaluated reasons for insignificant concern. The paper discusses risk perception, specifically that regarding climate change, and the psychologists who wrote the paper explain their theories for the discrepancy between actual risk and risk perception.

These psychologists use the term Public Irrationality Thesis, abbreviated PIT, which means that a population bases its opinions on heuristic substitutes, instead of analyzing factual data at face value. PIT can be seen in a simple example. If a person looks out their bedroom window every morning, and notices that the weather outside seems rather consistent, rather warm, possibly with some rain from time to time, but no extreme heat or drought, why should they believe that the earth’s climate is changing? How could the world around them be overheating with such drastic affects? What this naïve person does not realize, is that slight increases over a long period of time will add up. Even an increase of one degree every twenty years, though seemingly insignificant, builds substantially over time. By this rationale, think of how much the earth could have heated up over the past millennium alone.

Controversy over climate change has impacted public comprehension and assessment of risk. The study attributes the disagreement to “limited popular knowledge of science, the inability of ordinary citizens to assess technical information, and the resulting widespread use of unreliable cognitive heuristics to assess risk” (2 Kahan). Some people have limited science knowledge, and assume that the experts would warn them if the danger were as pending as it is. Since no one around them is actively concerned about the problem, it must not be a big deal. This is not good. If we let the problem go, like the person who stares out their window assuming that the world will always be as they see it now, then global warming will increase, bringing temperature up and precipitation down faster and faster with time. The biggest temperature increase has occurred within the past ten years; overlooking this fact could be detrimental to our environmental security.

Cultural cognition theory says that individuals can be expected to form perceptions of risk that relate to and reflect the values that they share with others. The Red Scare that occurred after World War II is a good example of cultural cognition because at first only a few people were scared of the idea of Communism and then this fear spread across the United States. As people became more aware of Communism, the idea that it was going to take over and corrupt the U.S. and its government overwhelmed our nation (Red Scare). Realistically, Communism is not the worst thing out there, but the vast amount of hysteria and paranoia that were produced because of it made it seem like it was in fact the worst thing out there. Many of the effects that climate change is having on our environment are much more dangerous than something like Communism, but many people do not accept the dangers that climate change is posing.

Cultural cognition allows people to feel connected with other members of their culture. People focus on what they have in common with others, and their culture’s value system lays out a template for what is acceptable or unacceptable, casual or pending danger. Cultural cognition leads to cultural polarization, which means that those “predisposed by their values to dismiss climate change became more dismissive” (Kahan 2). This makes sense. If there is a strong sense of unity and community, a threat to the values held by that community will be viewed as an attack, and the members of said community will fight against their opposition, no matter how much evidence supports the opposing claim.

In their paper, Kahan and his colleagues present a scale of labels for different perceptions. They look at Hierarchal Individualists, who tieauthority to social rankings and are more concerned with climate change, versus Egalitarian Communitarians, who favor less regimented social organization and greater attention to securing individual needs. Hierarchal people believe that discipline and respect lead to success and are essential, that rules need to be strict, because a new generation of disrespect can tear things apart. Individualists believe in improving lives for individuals, that they themselves must work hard to succeed and survive. Egalitarians believe that the government should take more responsibility for its people; we need a “fairness revolution” to equally distribute resources. They believe that we need to be more aware math and science wise in order to prevent problems that could seriously affect us all. Communitarians believe in emphasizing the connection between the individual and the community. No one claims private ownership of any possessions, but everything they own is held in common (Kahan). Essentially, Egalitarian Communitarians should be more aware of science issues, and thus more concerned about the effects of these issues. Kahan’s study created a survey to evaluate the correlations between risk perceptions and knowledge of science and numeracy.

After reading the *Tragedy of the Risk Perception Commons*, we composed and distributed a survey of our own using questions taken from the original survey. Unfortunately, our participant population was rather homogenous; all were college freshmen here at Holy Cross, specifically from the Mulledy dorm. Not only were our participants of a similar age, and educational level, but Mulledy houses the Natural World cluster, whose goal focuses primarily on studying the world around us. This probably skewed our results to favor a population with a solid understanding of math and science. However, this still allowed us to compare a population’s knowledge with their risk perception.

The survey that we conducted was based upon the original survey in *The Tragedy of the Risk-Perception Commons.* The questions were either very similar or identical to the original survey. The types of questions asked were set up to categorize our participants into the groups that were discussed previously in the paper (hierarchical, individualistic, communitarian, and egalitarian). The questions evaluated people on their math numeracy and science literacy, their perceptions of risk on environmental issues, and on their societal views as well.

Overall in the math and science questions the majority of the participants answered the questions correctly. An example of a math question that was asked in our survey as well as the original survey is: Imagine that we roll a fair, six-sided die 1,000 times. (That would mean that we roll one die from a pair of dice.) Out of 1,000 rolls, about how many times do you think the die would come up as an even number? 90.2% of the participants in the survey answered this question correctly. As for the rest of the math questions, the majority of the participants answered the questions which lead us to believe that they had a high sense of numeracy. The science questions were asked in true or false form, and example of one of these is: It is the father’s genetic information that decides whether the baby is a boy or a girl. 78% of the participants answered this question correctly. The majority of the participants answered the rest of the science questions correctly as well which demonstrated that most of the people that took our survey have a high level of science literacy as well as math numeracy. Finally, the last section of our survey dealt with risk perception. A list of nine environmental factors were given, and participants were asked to rate them on a scale from 1-10 (10 being the highest risk). Interestingly, climate change and air pollution were both rated at about an average of 7 for the entire sample size. When we originally saw the prompt for the project we wanted to focus on climate change and air pollution because we ourselves found these to be major environmental concerns. We found it interesting that most of our participants also found climate change and air pollution to be major concerns.

Our survey reflected the results of the original hypothesis, though the original survey concluded otherwise. According to our survey results, people who got the most answers wrong considered climate change and air pollution to be the risks of least concern. The original survey concluded the inverse to be true, the PIT prediction matched our results, but their actual results found that there was a very small affect on perceived risk. On average, people from our survey who had full marks on the science aspect had a higher risk perception average. Interestingly, those who marked desertification with a risk factor of nine had eight or more responses that fell in the nine or more bin. Desertification was the least recognized or understood risk, so those who considered it a bigger risk seem to assume that all risks listed are of equal severity.

The statement perception section of our survey allowed us to make some fair conclusions about the perceptions of our participants. The questions were statements about societal views which we asked our participants to rate on a scale of one to five to indicate how much they agreed or disagreed with certain statements. We used some of the statements from the original risk perception survey, including statements such as “An intact family is the basis of a functioning society,” “Preserving citizens' personal freedom is more important than other goals such as minimizing terrorism or violent crime,” “Important decisions about our future should be made by experts rather than the general public,” “All workers in a firm should have input into important decisions that can affect their jobs,” and “Preserving citizens' personal freedom is more important than other goals such as minimizing terrorism or violent crime.” These statements, depending on how strongly our participants agreed, indicate how they should fall on the perception scale with the four categories mentioned earlier. We found that most of our participants like to work with other people, are family oriented, and believe that hard work is rewarding. They believe that the needs of the many outweigh the needs of the few and will sacrifice independence for security. They believe that we do not choose friends to use them, experts may be more knowledgeable about some issues though people know what they want and still believe they should have a say, they respect, and want clear instructions authority, and want a say in what decisions will directly affect them. They are torn about a call for a “Fairness Revolution,” which was an indication or Egalitarianism.

Early in our project, we presumed that our survey group would be homogenous, based upon their age, location, education, and interests. After examining the responses from our survey, we conclude that we surveyed a group consisting mainly of Egalitarian Communitarians. These people surveyed have a pretty strong understanding of science, value environmental risks to be concerning, and support the ideas of people working hard in order to aid the success of society and of that society benefiting all of its members in return. Our participants’ responses matched the hypothesis of the original survey, stating that less science literacy leads to a lower perception of risk, and high science literacy to a higher perception of risk. Since our participants are from a relatively concentrated pool, their perceptions are not affected negatively by cultural polarization. Here on campus, students are driven to learn, and apply what they know without bias, so that they can learn and think beyond the confines of cultural standards and values.

Fabiana’s Sources

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