Final Project - Climate Change: Report

05-499 Data Visualizations

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I. INTRODUCTION

Climate change is one of the most pressing and dividing issues facing our society today. It has been an ongoing controversy among political realms but we choose to avoid including political stances within our narrative and instead have a purely informational notebook that explores the various factors and events behind global warming. We were motivated to tackle this subject for a number of reasons. First and foremost, it is a topic that is of great importance to us as it is to the rest of the world solely because of the implications it may pose if not properly addressed. However we also felt as though climate change is often presented in a very broad manner, and frequently does not give a wide enough view of all the factors that contribute to the changes that are taking place in the world. We felt that this lack of elaboration applied to two areas specifically. First, we felt as though, when discussed in academic setting, climate change is generally always presented as a current day issue. While this is true, to present it solely as such leaves out valuable context regarding how changes to our climate have progressed and worsened over the years, as well as how our response to climate change has evolved through the years. Although we did not focus on the global response to climate change, we felt that it was important to address the history and context of climate change over the years for what we did address, namely human factors that are actively contributing to the worsening of our climate. Having a more comprehensive understanding of this can help us recognize how ongoing and severe of an issue climate change is, and why immediate action is so necessary because without it there is nothing to indicate that the trends of the past will not continue in the future. The second way in which we feel climate change discourse is too broad is that it often fails to address the many of its

different specific causes. Global warming is too often attributed to either just greenhouse gases and fossil fuel usage. While this is not a false statement, it fails to examine a narrower view of the numerous human causes that lead to fossil fuel consumption, as well as additional causes of global warming that do not contribute to fossil fuel consumption. We hope that our project can provide a deeper look into at least three of these specific human causes, which will ideally result in further interest in the others, including but not limited to energy production, agricultural activity, deforestation, industrial activity, Earth's own feedback loop, and variations in the Sun's intensity.

II. RELATED WORK

Much of our research centered around looking into the many factors attributed to causing climate change, as prior to this project we both had somewhat of a limited understanding of the extent to what and how many causes were encompassed by this category. It was important to us that we had a substantial base amount of research to give us a more comprehensive understanding of the factors that we wished to elaborate on before creating visualizations about them.

Most of our research came from reputable climate change organizations or sites, such as the United Nations Framework Convention on Climate Change (UNFCCC) or the Intergovernmental Panel on Climate Change, as well as a couple of scholarly articles. Additionally, at the beginning of this project we looked into a number of sites that dealt with global response to climate change, including Climate Action Tracker and the International Energy Agency, as at the time we had been intending to include related information in our project. Although we did not end up using this information for the topic of our visualizations, it nonetheless gave us valuable insights and context for what countries were doing based on threats to the environment as well as their own responsibility in causing these threats. It was only after we had done this initial research that we felt comfortable moving forward with our project.

III. METHODS

After we had decided on a direction for our project and had done substantial background research, we focused on planning our project's outline as well as our plans for our visualizations. Our methodology included

first constructing an outline for the full narrative of our project; we knew what we wanted to accomplish and what narrative we wanted to create, but we still had to carefully craft it through a logical progression of visualizations that achieved our goals and met our vision. After we had separated our project outline into different sections, each with a specific purpose and flow within the project, we began brainstorming visuals that would best help us communicate our narrative and important conclusion for each section. After discussing and outlining ideas for graphs, we drew out sketches for how we envisioned our visualizations to turn out, and once we were satisfied with these we then looked for datasets on the topic in question that would also fit the dataset that we had envisioned. On multiple occasions we found datasets that may not have been cohesive enough with the sketches we had drawn out, upon which we had to make revisions to our plans for the visualizations. Only after these plans had been finalized did we move forward with the implementation of these visuals.

IV. RESULTS

We wanted to make sure that our visualizations were both educational and captivating. Because of this, we made it a priority to implement a number of interactive or animated visualizations. We felt as though these would provide the perfect medium for exploring the history and progression of climate change throughout the years, as differences between years could be either animated or controlled by the user. Our outline included four primary sections; an introduction and background section, one each for energy consumption and fossil fuels, agricultural activity, and deforestation, and finally a short conclusion. While our introduction section was primarily written content, we included a visualization mapping the rise in global temperature levels since the middle of the 20th century to give an overview of the most widely known effect of climate change and set the scene for our future visualizations. This was followed by two similar visuals that showed an animation of the increase of energy consumption by country and fossil fuel emissions by country respectively, from the 20th century to the 21st century. This was followed by our agricultural section, which offered a number of visualizations showcasing the increase in agricultural and meat processes over the years, one of which being interactive. Finally, our deforestation

section showcased a choropleth that allowed the user to scroll through periods of time in five-year intervals and view the levels of deforestation by country on a world map. Our data was primarily retrieved from datasets from Datahub and Our World in Data.

V. DISCUSSION

We ultimately hope that our visualizations are able to introduce our audiences to new insights about climate change that they may not have been previously aware of. Going into the project it was expected that our audience would be aware of the primary causes of global warming as well as the most notable effects; that the use of fossil fuels was leading to an increase in greenhouse gases in our atmosphere, which consequently is resulting in a steady increase in the world's temperatures that could lead to other detrimental effects and natural disasters. However as stated in our introduction section, we anticipate that a substantial portion of our audience will not be familiar with an in-depth view of more specific human impacts on the environment. We hope that they are now able to draw correlations between global energy consumption and fossil fuel emissions, as well as having a much better understanding of how factors such as agriculture, meat production, and deforestation can affect climate change. This will ideally lead to further discourse, questions, and discovery on the topic.

VI. FUTURE WORK

We view our presentation as a look into a few of some of the significant human factors that cause climate change, however it is by no means an all-encompassing report on every one of these factors. There are many areas that apply to climate change that we considered for this project but did not get the chance to explore. For a more detailed evaluation, this project could be comprehensively extended by including visualizations and analyses for areas such as the consumption of goods, industrial activity, activity on the Sun and the Earth's feedback loop. Additionally the topics we covered could be examined at an even further depth, which could lead to questions over the makeup of energy consumption in America, or the leading causes of and most effective preventative measures against emissions as a result of fossil fuels.