

## Project 2 Proposal

### Broad Research Questions & Potential Visualization Tasks:

- 1) We know that energy consumption causes greenhouse gases which includes CO<sub>2</sub>, and which in turn contributes to the rise in temperature of the atmosphere. We intend to see to what extent do they affect each other, as in increase in energy consumption in 2000 caused CO<sub>2</sub> emissions to increase in 2000 but temperature (avg) were not observed until next year.
- 2) How bad is the scenario and three variables and how has it come to this (how was it in the past).
- 3) Predictions of how it would change in the coming years.

### Datasets

- 1) CO<sub>2</sub> emissions: <http://data.worldbank.org/indicator/EN.ATM.CO2E.KT?view=chart>
- 2) Energy consumption: <http://data.worldbank.org/indicator/EG.USE.PCAP.KG.OE?view=chart>
- 3) Temperature: <https://www.kaggle.com/berkeleyearth/climate-change-earth-surface-temperature-data>

### How Visualizations Might Look Like:

- 1) Visualization #1: A world map with a control board that has (a) a slider to change the year and (b) buttons to choose between temperature and CO<sub>2</sub> emissions.
  - a) If user chooses temperature, the map will become a heatmap which shows the average temperature of each country in the selected year.
  - b) If user chooses CO<sub>2</sub> emissions, we will draw a circle centered at each country. The size of the circle is the amount of CO<sub>2</sub> emitted by the country in that selected year.
- 2) Visualization #2: Similar to visualization #1, we will have a control board that has (a) a slider to change the year and (b) scales for different sources of energy such as oil, coal, and nuclear. When user has selected a year, the main container (above the control board) will display the top 20 countries which emit the most CO<sub>2</sub> in the selected year. The scales will also change to indicate how much oil, coal, and nuclear energies were consumed in that year. Bubbles or clouds will be used to indicate the amount of CO<sub>2</sub> emitted by each country. They will rise from the country names (which are listed horizontally) to represent carbon being emitted. In the background, the sea level will increase if temperature increases, and decrease if temperature decreases.
- 3) Visualization #3: On top is a closed cycle among temperature - energy consumption - CO<sub>2</sub> emissions. Below that, we will give a few icons for our proposed solutions (plant

more trees, reduce energy consumption, etc.). When the user clicks on a button, the corresponded indicator in the cycle will be destroyed, and the cycle will be broken.

### **Interactions**

- 1) Visualization #1 and #2 change when the time slider changes (the two visualizations will not be changed by the same slider).
- 2) User chooses year and country. The visualization will change correspondingly.
- 3) In the world map: when a country is selected, zoom into and center at that country.

### **Importance And Interestingness**

- 1) Indicates that one is causing the other and how badly it can affect us ( try to predict in coming years what will be the rise in temp given carbon emission given energy consumption (avoid talking in terms of numbers).
- 2) Is there an “inescapable cycle” of the rise of temperature - energy consumption - CO2 emissions - temperature?

### **Visualization Tasks**

- 1) Analyze:
  - a) Discover: Is there a connection between energy consumption and carbon emissions? Carbon emissions and temperature? Temperature and energy consumption?
  - b) Present: Show the unbreakable cycle among temperature - energy consumption - CO2 emissions.
  - c) Enjoy: Propose a few possible solutions to break the mentioned cycle. Let user explore and decide how feasible these solutions are.
- 2) Query:
  - a) Identify: Which countries use the most energy? And which countries emit the most CO2 into the air?
  - b) Compare: We show the difference in amount of energy consumption or carbon emissions among 20 countries.

### **Visual Encodings / Interaction Idioms**

- 1) Marks
  - a) Color: different energy sources in visualization #2 will be displayed using different colors.
- 2) Channels:
  - a) Color: Heatmap is used to display the temperature of the world in visualization #1.
  - b) Size: in visualization #2, the size of the bubbles indicate the amount of CO2 emitted by a country.