

## Project Report 2: Visualizing Agri-Food CO<sub>2</sub> Emissions

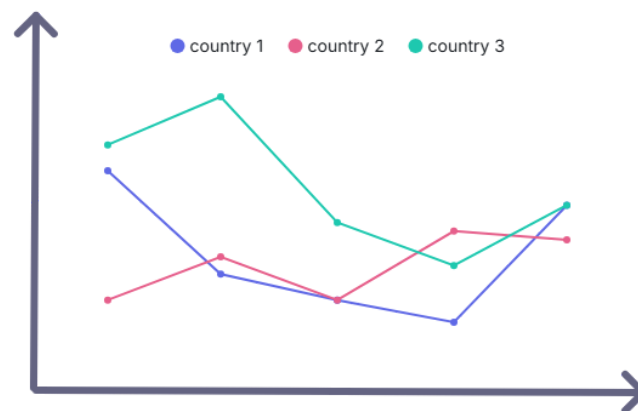
### 1. Sketches of the Design Alternatives:

Before designing the prototype, I had brainstormed some alternative sketch ideas for presenting the agri-food CO<sub>2</sub> emissions data set. I experimented with layouts centered on both a grid-based dashboard and a narrative layout where the user scrolls through visual sections. For the charts, I explored some visual encoding options:

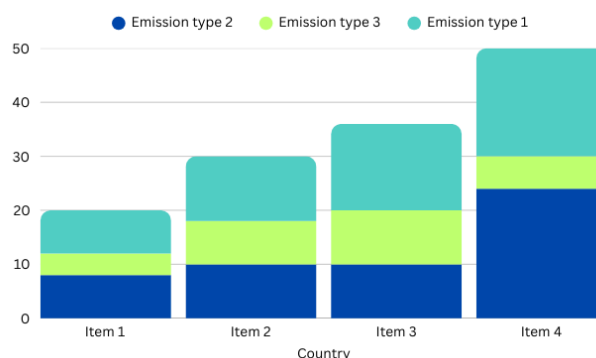
- A choropleth map to present total emissions or per capita emissions by country and also for average temperature by country throughout the years.



- A line graph to show trends in total emissions over time for selected countries.



- A stacked bar graph to show emissions by categorized groups: Agricultural, Processing, Transport, Household etc.

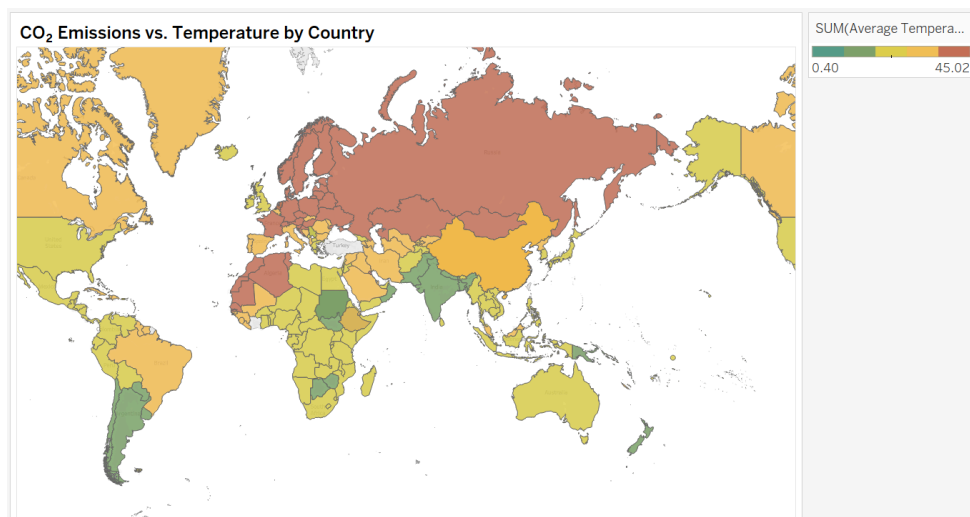
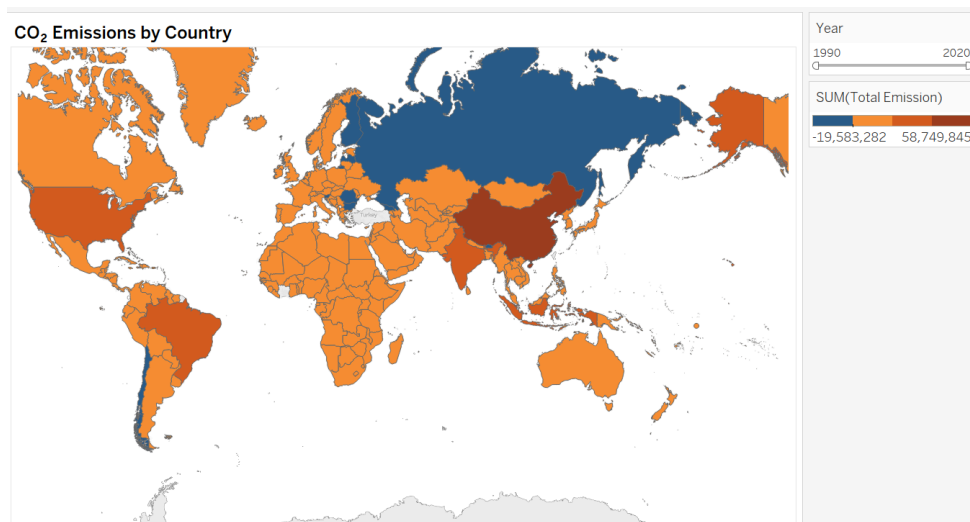


These charts helped me to decide which types of charts are most appropriate to the types of questions my users (environmental science faculty and students) will be asking.

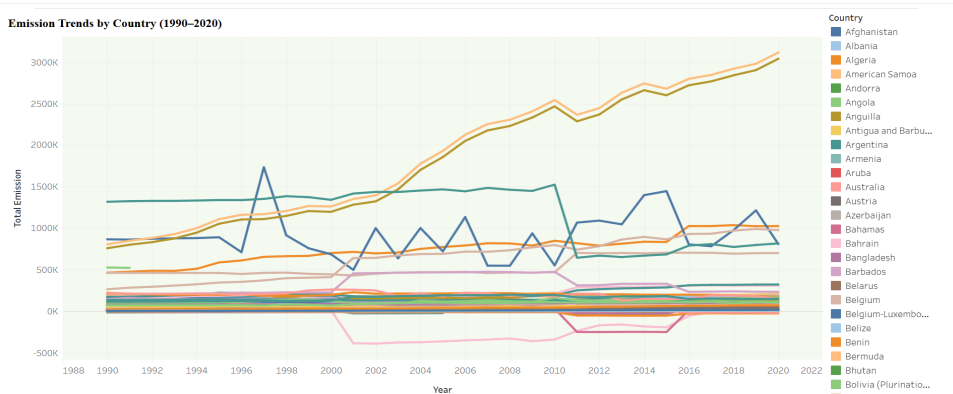
## 2. Screenshot/Link to Current Stage of the Prototype:

Here, I have created an interactive dashboard on Tableau Public. It includes:

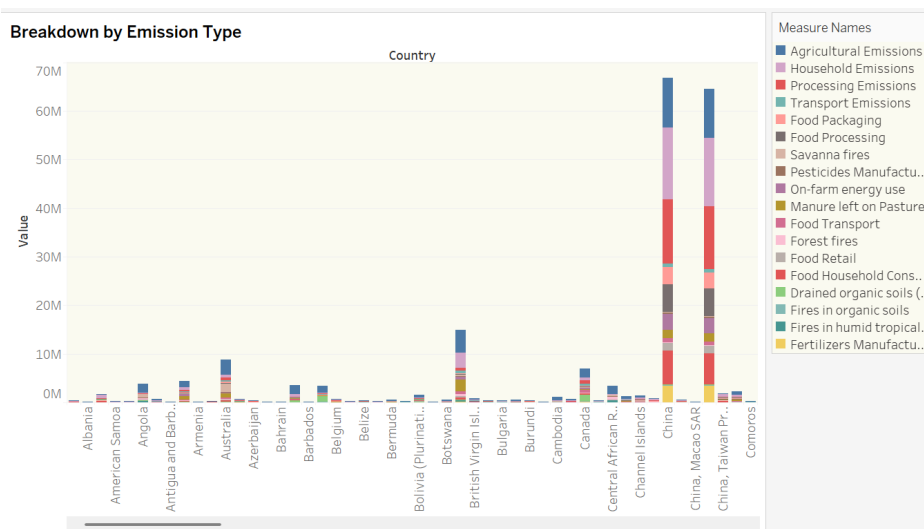
- A choropleth map of total country-specific emissions, filtered by year. Also, another choropleth map for country-specific average temperature, emission per capita and total population. Upon hovering the cursor over the country on the map the user will be able to see the detail information of these.



- A line graph to compare the trend of years of emissions. Here the user can choose a specific country to see that specific detail.



- A stacked bar graph showing the decomposition of emission categories. Users also can choose to see any specific emission from the list.



Current stage of the prototype - [Tableau Dashboard](#)

### 3. Visual Encodings Reasoning and Interaction Design:

The graphs that I selected help to solve the most important tasks outlined in Report 1:

- The choropleth map allows users to instantly visualize spatial trends in emissions by country. This allows for quick comparisons across regions and allows outliers, temperature difference or high-emission countries to stand out. Using a year filter, users can view how emissions, temperature and population alter geographically over time.
- The line chart is the best for representing trends over time. It allows one to pick one or more countries and watch their emissions go up or down through the years. This makes it easier to find long-term trends, impacts of policies, or changes in agricultural practices.

- The stacked bar chart groups emissions according to source categories, i.e., household or agricultural emissions. This view enables users to compare the contribution of each sector to a nation's overall emissions. It is especially useful in determining the most carbon-emitting activities and their variation between countries or over time.

I included interactive filters where users can select a particular country or year, and also hover tooltips that show precise values for emissions, population, or temperature. The map and scatter plot also employ color encoding to visualize emission intensity or temperature, which enables users to quickly interpret patterns. These visual encodings are easy to understand for students and beneficial for professors preparing materials or research.

#### 4. Reflection

##### Challenges and How I Coped with Them:

One of the hardest parts was that the map would not display at first because Tableau was not reading the country names. I corrected this by changing the geographic role of the 'Area' field to 'Country/Region.' Further the dataset contained some incorrectly spelled country names. I manually corrected those. The second challenge was making a stacked bar chart with multiple categories of emissions. My data were in wide format, so I used Tableau's "Measure Names" and "Measure Values" in order to create the visualization without reshaping the data. Lastly, because of the complex visualization my animation did not work which I have added in the dashboard.

##### Group Meeting Feedback:

I received constructive feedback from the group meeting. One of the peers commented that the scatter plot could be improved by using color to represent emission intensity so I then changed it to a choropleth map. Another commented that a tooltip with all the values like population and temperature would make it easier for users to read the data. I have updated my dashboard according to the comment I got from the group meeting.

##### Useful Materials:

ChatGPT provided assistance in arranging the interactivity and visualization design in tableau as I was a new user of it.

##### Conclusion:

In general, this stage enabled me to move from planning to a working prototype that captures the tasks described above. The dashboard now offers a functional way in which university-level users can explore agri-food CO<sub>2</sub> emissions by country, over time, and by category, and I will continue to improve it based on user feedback.