

# Global Climate Dashboard

<https://public.tableau.com/app/profile/rahul.i5816/viz/GlobalClimateDashboard/Dashboard1>

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## ABSTRACT

As technology progresses, our ability to keep a record of data also improves. This is abundantly clear when observing climate data for the world. Although certain geographical regions have their own patterns, in general the global climate for each country has seen a clear increasing trend in temperature over the years. When observing the trends over the years, there is more variation in temperatures in earlier entries. As the data approaches modern day, it steadies out, but overall the temperatures are falling on an increasing trendline.

**Keywords:** Geographic Characteristics, Visualization

## 1 INTRODUCTION

My dashboard acts as an interactive medium to examine the climates at various different geographical regions. In specific, the user is given the ability to filter the information to a granularity of up to individual cities. The trends can then be examined starting from November of 1743 and up to September of 2013. In addition, the map of cities can also be filtered to display only when within a range of specified average temperatures. The user can select the range between  $-3.37^{\circ}\text{C}$  and  $29.15^{\circ}\text{C}$

## 2 DESCRIPTION

The dashboard itself is hosted on tableau public. It utilizes two distinct worksheets that combine to provide the user with the relevant information.

On the left half of the dashboard, there is a world map. By default, water is displayed as blue, with land-masses displayed white, with borders being gray lines.

Below the map are two sliders, allowing the user to filter the data to their specifications. Specifically, there is a slider for the Year Range, spanning November 1, 1743 through September 1, 2013, and there is a Average Temperature slider, spanning  $-3.37^{\circ}\text{C}$  through  $29.15^{\circ}\text{C}$ . Both of these sliders include two handles, such that all of the measures between both sliders are shown, and all of the measures outside of the sliders are hidden.



Figure 1: Year Range and Average Temperature Sliders

In addition to the sliders, to the left of the map is a key for the colormap used to display the climate data. Lower temperatures are displayed as blue, while middle temperatures are yellow, and the highest temperatures are red. Each country on the map is assigned a color based on the average temperature in the year range

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selected by the user. Furthermore, the map contains dots representing various cities. These dots can be clicked by the user to display a tooltip with additional information. The user can zoom in and out of the map using the scroll wheel, so that the borders between geographical regions are easier to see.

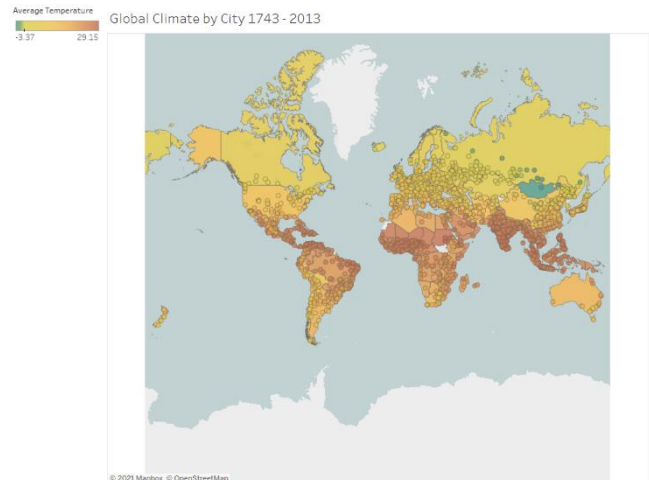


Figure 2: World Map with Dots for Cities

On the right half of the dashboard, there is an interactive line graph. The x-axis represents the range of years, while the y axis represents the average temperature. This line graph can be filtered using the Year Range slider under the world map as well. In addition, clicking on a country or city's dot will show the average climate for that country. Both of these filtering methods can be used simultaneously to inspect specific details and identify trends and patterns in the data.

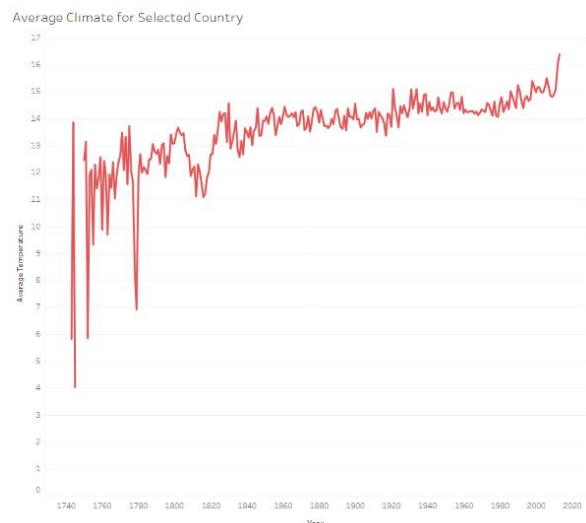


Figure 3: Line Graph Showing Average Temperature within Year Range

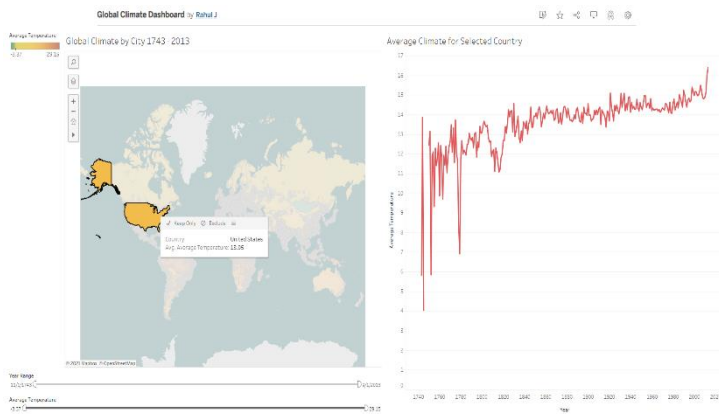


Figure 4: Tooltip and Dynamically Updating Line Graph

### 3 IMPLEMENTATION

The dataset used in the dashboard comes from Sohel Rana on Kaggle.com [1]. Rana provides multiple variations of the dataset – global land temperatures by country, by state, by major city, and by city. For my visualization, I wanted to convey the most information possible and give the user the choice to view as much detail as desired, so I therefore chose to implement the dataset with the most entries: global land temperatures by city.

The actual dashboard itself was created and published on Tableau public. It utilizes two worksheets, each corresponding to one half of the dashboard. For the first worksheet, it grabs the data from the GlobalLandTemperatureByCity.csv file. The file is formatted like a standard csv file, with the first line being the headings, and the rest being the individual values, separated by commas. The headings or columns provided by the dataset are Date, Average Temperature, Average Temperature Uncertainty, City, Country, Latitude, and Longitude. In terms of this application, the most relevant columns are the Date, Average Temperature, City, and Country. The Latitude and Longitude are calculated automatically by Tableau based on the City and Country names, so it is unnecessary to implement the columns from the dataset. From there, I created a filter for the Year Range, which filters the date. I also applied the average of the "Average Temperature" column as a color value to each country. It then automatically applies the appropriate color to each country using a colormap. The color map I used utilizes the built-in Temperature Diverging palette. It starts with a blue(#529985) and transitions from yellow to a dark orange(#c26b51). Using contrasting colors is important so that the user can easily differentiate adjacent regions with similar colors. Clicking on a country or city will highlight that specific selection and show a tooltip with that region's average temperature within the year range.

For the second worksheet, I utilize the same dataset, and the Date and Average Temperature columns. The filters for this worksheet are linked to the other worksheet, however. This allows the user to click on the map or adjust the sliders to filter the data. In terms of displaying the data, I chose to utilize a line graph. On the x axis, it displays the year range, and on the y axis, it displays the average temperature. Hovering over the line graph allows the user to view the exact Average Temperature value at that year in a tooltip. The year range dynamically updates based on the slider in the other worksheet. When a user clicks on a city or a country, that country's average temperature is displayed. This allows the user to easily compare trends between geographical regions.

### 4 CONCLUSION

This dashboard provides the user with a visual representation of global climate data. Although the data ends in 2013, it is still a useful tool for analyzing trends and patterns. It is clear from the data that with older entries, and there being fewer entries overall in the past, the average temperatures fluctuate extremely. But as technology improves, and as more entries and cities are added to the dataset, there are less spikes in the line graph. It is also clear that the average climate follows an increasing trendline regardless of which filters are applied to the data.

Given more time, I would have implemented more features into the dashboard, namely a way to filter by state or continents. I would have also included additional data if possible, so that the user can see more up-to-date information. The biggest challenge I faced while implementing the dashboard was finding a dataset large enough, with enough detail. Although I did find many such datasets on the internet, I found that actually downloading them in a format that would be recognized by Tableau was more difficult than expected. Furthermore, another challenge I faced was linking the two worksheets together. Although I was able to link some filters for them, I faced difficulty filtering the line graph based on cities. Due to this, I had to compromise and have the line graph only show the information at the country level.

### REFERENCES

- [1] S. Rana, "Global Climate Change :Earth Surface Temperature," Kaggle, 16-Sep-2020. [Online]. Available: <https://www.kaggle.com/sohelranaccselab/global-climate-change?select=GlobalLandTemperaturesByCity.csv>.