

South America: Heating up?

Surface Temperature Change in South America (1961-2024)

Climate change is one of the most pressing challenges of our time, with global temperatures rising at an unprecedented rate. While we often hear about warming trends in broad, global terms, the reality is that temperature increases vary dramatically by region, with some areas experiencing far more severe changes than others. This project aims to make those differences clear by zooming in on South America, a continent that's already dealing with intense heat. By visualizing how surface temperature changes have evolved across South American countries over time, we hope to reveal which nations are most affected by global warming and how these patterns have shifted in recent decades.

I. Design Decisions & Rationale

We chose a sliding bar chart to allow effective and efficient comparison of temperature changes across South American countries and years. The bars are ordered hierarchically, making it easy to compare values quickly and to distinguish which countries are warming or cooling. The year slider enables users to quickly explore temporal trends, revealing how surface temperature change evolves over time. Scrubbing through time, it becomes clear that after 1999, Suriname becomes the country with the greatest increase in temperature, and it stays at that spot until the present. This consistent spot as the country with the greatest temperature change is concerning, as South America is already one of the hottest continents.

We also considered representing the data in a line plot, but displaying all countries simultaneously produced visual clutter, making year-by-year comparisons difficult. In contrast, the bar chart emphasizes differences between countries within each year and avoids overcrowding.

We also added summary statistics, which we display above the chart: average change, highest warming, and number of countries warming. These update interactively as the year changes, allowing users to gain key insights without manually scanning the bars. We also added a brushing tool, and when countries are selected, their statistics appear, replacing the previous statistics. This allows for aggregate summary statistics to be easily calculated, such as the average temperature change among the 3 countries with the most temperature change for that year. We considered adding a fourth statistic, the number of countries that are cooling. However, we chose to limit it to three statistics in order to maintain the clearest readability and prevent visual overload.

A tooltip reveals each country's name, year, and temperature change on hover, improving accessibility without adding visual clutter. We also incorporated a brushing tool, which allows users to select multiple countries directly on the chart. When countries are brushed, their corresponding statistics appear, replacing the default summary. This allows for aggregate summaries to be calculated dynamically, such as showing the average temperature change among the three countries with the largest temperature increases in that year. We also considered using a dropdown or multi-select menu that would allow users to manually choose specific countries for comparison. However, we found that this approach was slower and less intuitive than directly brushing bars on the chart, since users could not visually select regions of interest at a glance.

Another alternative we considered was a click-to-focus interaction, where clicking a bar would highlight that country's data and display its individual statistics. While this method effectively isolates one country, it limits multi-country comparisons that brushing supports, and doesn't provide immediate aggregate summaries.

For color encoding, we used red for warming and blue for cooling to align with intuitive and conventional temperature associations. We did consider using a bright pink and a brighter blue instead, but found that red ultimately looked better as it better resembled the intuitive color for an increase in temperature.

II. Development Process

Our development process began with a group meeting where we brainstormed ideas. Because we were all interested in climate change, it was easy to agree on our dataset. We started by making two static visualizations, each exploring the dataset. Our initial plan was to create a line plot showing temperature increases for each country over time, allowing users to select countries of interest. We aimed to include as much data as possible. Nam handled the data cleaning, and Ann created the initial base of the line plot we submitted for the checkpoint.

After attending our discussion session, we realized that the goal was not simply to display all available data but to highlight insights through interaction. We found that our original line plot was overly dense, so we decided to focus on a specific continent, South America, to make country-level temperature changes more interpretable. Since South America is one of the hottest continents, emphasizing which country is experiencing the most change felt especially meaningful.

We divided the work as follows: Ann built the foundation of the sliding bar chart, Rita implemented the brushing tool, Nam added the dynamic statistics, and Julia designed the title,

subtitle, and color scheme. Julia did the write-up, and Nam, Ann, and Rita provided edits. Our group collaborated closely across three meetings, each lasting over an hour, during which we exchanged ideas and iterated on feedback. The total estimated hours were Ann: 11, Nam: 7, Rita: 8, and Julia : 7. The most time consuming aspect of development was debugging; both Ann and Rita encountered bugs that each required over two hours to resolve.