SUMMARY

The 3D visualization shows the rise in temperature, precipitation, and CO2 emissions in 2022 compared to 1981 and the 2D graph illustrates the same data for each year between 1981 and 2022 for different nations.

Following is the list of datasets we used:

1. https://power.larc.nasa.gov/data-access-viewer/
2. https://disc.gsfc.nasa.gov/information/glossary?keywords=giovanni%20measurements&title=Giovanni%20Measurement%20Definitions%3A%20Precipitation
3. https://www.worldeconomics.com/Indicator-Data/ESG/Environment/Temperatures/
4. https://ourworldindata.org/co2-emissions#how-do-we-measure-or-estimate-co2-emissions
5. https://disc.gsfc.nasa.gov/datasets/LANDMET_ANC_ST_1/summary?keywords=Land%20use
6. https://en.wikipedia.org/wiki/List_of_countries_by_carbon_dioxide_emissions#Maps_and_charts
7. https://www.kaggle.com/search?q=temperature+of+all+countries+in%3Adatasets

With this data visualization, we aim to contribute to the Sustainable Development Goal of Climate Action by contrasting the increase in CO2 emissions, temperature, and precipitation between 1981 and 2022. Our goal is to gain insight into the CO2 emissions produced by each country on a yearly basis between 1981 and 2022, then analyze how these emissions have affected temperature and precipitation changes in that country, so that necessary steps can be taken to reduce the CO2 emissions, and ultimately, to maintain temperature and precipitation levels.

The effects of CO2 emissions are similar to those of glass in a greenhouse: it traps heat and warms up the interior. Although CO2 only makes up 0.01% of the Earth's atmosphere, it has a significant impact on the amount of heat retained by the planet's surface. The rise of annual CO2 emissions from 11 billion tons per year in the 1960s to 36.6 billion tons in 2022 is a matter of serious concern.

While there are many factors that influence CO2 emissions in the atmosphere, the Industrial Revolution has had the biggest impact, with CO2 emissions increasing by 6 billion tons annually by 1950. The Paris Agreement, whichh was signed by almost 200 countries in 2015, pledged to reduce global average temperatures by "well below" 2 degrees Celsius above pre-historic levels and aimed to keep it below 1.5 degrees Celsius.

However, global average temperatures have already risen by around 1.1 degrees Celsius and are on track to reach at least 3 degrees Celsius this century as greenhouse gas emissions continue to increase. According to scientists, this would result in increasingly severe weather and sea level rises, potentially making parts of the world uninhabitable, fueling hunger and migration.

We would like to propose some actions in the form of solutions to reduce CO2 emissions and maintain temperature and precipitation level. The solutions are listed as follows:

1. Industries should take energy efficiency measures
2. Companies should reduce methane emissions
3. Changing power sources for example shifting from coal fired power plants to wind power or solar power is a necessary step
4. Industries should measure their carbon footprints
5. Switching to energy efficient alternatives for example shifting to electrical appliances rather than fossil fuel based materials
6. Use of renewable energy should be encouraged in companies
7. Reducing carbon footprints and minimizing waste
8. Encouraging industrial carbon capture, utilization and storage (CCUS) usage

The amount of carbon dioxide and other greenhouse gases we are emitting currently and in the coming decades will determine how much warming earth is going to experience in the future. Today, our activities like burning fossil fuels and clearing forests is adding about 11 billion metric tons of carbon (equivalent to a little over 40 billion metric tons of carbon dioxide) to the atmosphere each year. Therefore, it is important to get started as soon as possible with a goal of limiting carbon emissions and maintaining a sustainable environment in order that we can all live together.

Following is the list of tools we used to build our visualization:

1. Python
2. Flourish Studio
3. Matlab
4. Matplotlib