

Data Visualization Final Project Proposal

Group_A_Carbon Emission

Weiwen Dai: wd2366@columbia.edu

Xueer Luo: xl3276@columbia.edu

Qichen Xie: qx2235@columbia.edu

Jin Liu: jl6276@columbia.edu

1. Research Question:

From the start of the 21st century until 2019, there was a notable rise in global greenhouse gas (GHG) emissions, primarily due to the increase in CO2 emissions from emerging economies such as China. This led to a significant increase in atmospheric concentrations of GHGs, exacerbating the natural greenhouse effect and potentially threatening life on Earth. Despite a decline in emissions due to the COVID-19 pandemic in 2020, climate change remains a pressing issue.

To address this issue, countries are developing national emissions inventories and proposing and implementing actions to mitigate GHG emissions. However, CO2 emissions, the primary cause of global warming, continue to increase worldwide despite such efforts.

As a result, we want to find out the relationship between carbon emissions and global temperature trends over time and how have different countries contributed to this trend.

2. Dataset Introduction:

We would like to use the Emissions Database for Global Atmospheric Research (EDGAR) to research our topic. To be specific, EDGAR is a multipurpose, independent, global database of anthropogenic emissions of greenhouse gases and air pollution on Earth. And the EDGAR dataset also provides independent emission estimates.

To provide an accurate and consistent estimate of GHG emissions for each country, the EDGAR uses a robust methodology based on the latest IPCC guidelines and recent activity data. The latest update, released in October 2021, includes data on fossil CO2 emissions for each country from 1970 to 2020, while national emissions data for other GHGs are available for 1970 to 2018.

To be specific, there are 8 datasets in our research:

Dataset name	Description
fossil_CO2_totals_by_country	Total fossil CO2 emissions by country
fossil_CO2_by_sector_and_country	Fossil CO2 emissions by sector and country
fossil_CO2_per_capita_by_country	Fossil CO2 emissions per capita by country
fossil_CO2_per_GDP_by_country	Fossil CO2 emissions per GDP by country
GHG_totals_by_country	Total greenhouse gas (GHG) emissions by country

GHG_by_sector_and_country	GHG emissions by sector and country
GHG_per_capita_by_country	GHG emissions per capita by country
GHG_per_GDP_by_country	GHG emissions per GDP by country
CO2_LULUCF_macroregions	CO2 emissions from land use, land-use change and forestry (LULUCF) by macro-region

Each dataset contains the following columns:

Column Name	Data Type	Description
Country	character	Name of countries
Sector	character	Industry each observation pertains
Substance	character	Specific gas that is being measured
Macro-region	character	Geographical region
Year	character	Year of collecting records

3. Visualization Types:

There are several types of visualizations that can be used to describe global carbon emissions. Here are a few examples:

- i. Line charts: These can be used to show trends in carbon emissions over time, for example, to compare emissions from different countries or regions. Line charts can also be used to show changes in emissions intensity (i.e., emissions per unit of GDP or per capita) over time.
- ii. Bar charts: These can be used to compare carbon emissions across different countries or regions in a given year. Bar charts can also be used to show the relative contributions of different sectors or industries to carbon emissions, such as transportation, electricity generation, and manufacturing.
- iii. Maps: These can be used to show the spatial distribution of carbon emissions across the world. Maps can also be used to show the relative contributions of different countries or regions to global emissions.
- iv. Sankey diagrams: These can be used to show the flow of carbon emissions through different stages of the economy, such as production, consumption, and disposal. Sankey diagrams can also be used to show the relative contributions of different fuels (e.g., coal, oil, natural gas, renewables) to carbon emissions.
- v. Bubble charts: These can be used to show the relationship between carbon emissions and other variables, such as GDP, population, or energy consumption. Bubble charts can also be used to show changes in emissions intensity over time, with bubble size representing total emissions and color representing emissions intensity.