Project Title: Global CO2 Emission Analysis

Executive Summary

This project analyzes CO_2 emissions across countries and continents to uncover environmental patterns, track emission trends over time, and identify top contributors to global pollution. Using Excel for initial cleaning and Tableau for visual storytelling, I created a dynamic dashboard that allows users to explore emissions by year, region, and emission source. The goal was to support climate-awareness initiatives and empower decision-makers with actionable environmental insights.

Project Objective

To analyze global CO_2 emission data in order to identify top emitting countries, track emission growth or decline over time, and categorize emission sources to help guide global sustainability goals.

Business Questions

- Which countries and continents contribute most to global CO_2 emissions?
- How have emissions changed globally over the past decades?
- What are the main sources of CO_2 emissions (e.g., coal, oil, gas, cement)?
- Which countries have reduced or increased their emissions significantly?
- How do emissions per capita compare across nations?

Tools & Technologies

- Excel: Data cleaning, source formatting
- Tableau: Interactive dashboard design, geospatial mapping, trend visualization

Dataset Information

- Source: Global fossil fuel emission data from 1750 to 2021.
- Size: 50599 rows across multiple years
- Key columns: country, year, co2, co2_per_capita, coal_co2, gas_co2, oil_co2, cement_co2, other_industry_co2, population

Sample Data Dictionary:

Column	Description
co2	Total CO_2 emissions in million tonnes
coal_co2	Emissions from coal consumption
co2_per_capita	Emissions divided by country population
year	Calendar year
country	Country name

Data Cleaning Process

Performed using Excel:

- Removed null values for co2 and country
- Filtered out aggregates like “World” or “Asia” for country-level analysis
- Created calculated fields for regional aggregates and percentage contributions
- Grouped emission types (coal, oil, gas, cement) for stacked visuals
- Added emission growth rate column for advanced filtering

Exploratory Data Analysis (EDA)

Key patterns discovered during analysis:

- China, USA, and India are consistently the top 3 emitters
- Europe shows a declining trend in emissions since early 2000s
- Per capita emissions are highest in oil-producing countries (e.g., Qatar, Kuwait)
- Coal is still the dominant source in Asia, while gas and oil dominate in the West
- Some countries (e.g., Germany, UK) have significantly reduced their emissions

Country	CO_2 Emissions (2022)	Change Since 2000	Main Source
China	10.2B tonnes	+180%	Coal
USA	5.0B tonnes	-15%	Oil & Gas
Germany	0.7B tonnes	-35%	Mixed

Key Insights

- Top 5 emitters contribute over 60% of global CO_2 emissions
- European countries have seen consistent decline in emissions since 2000
- Coal remains the most carbon-intensive source, especially in emerging economies
- China and India continue to increase emissions due to industrial growth
- CO_2 per capita reveals disproportionate emission impact in smaller countries

Challenges & How I Solved Them

- Issue: "Country" column contained aggregate values (e.g., continents, world)

✅ Filtered out all rows where entity = "World", "Africa", etc.

- Issue: CO_2 values in millions not clearly labeled

✅ Formatted metrics in Tableau with clear unit annotations

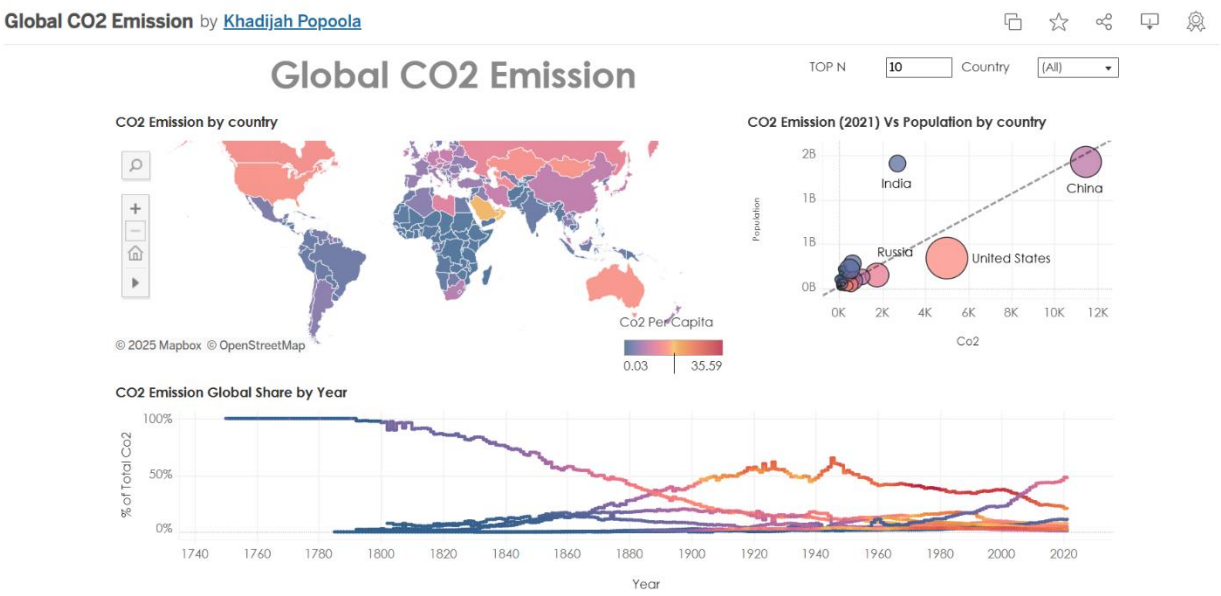
- Issue: Population-based calculations were inconsistent in some early years

Restricted per capita analysis to years with complete population data (2000–2022)

Dashboard or Visual Output

Created an interactive Tableau dashboard with:

- World map showing total CO_2 by country (color scale)
- Line chart of emissions by year (global and country-level)
- Top 10 emitters and per capita charts
- Filters for Year, Region, Country, and Source Type



Business Recommendations

- Invest in clean energy in top emitting nations, especially in coal-dependent regions
- Encourage international collaboration to support emission decline strategies
- Emphasize per capita emissions for more equitable policy decision-making
- Countries with rising emissions should explore tech-based carbon offset strategies