**1. Comprehensive Project Report**

**Title:**

**Global CO₂ Emissions Analysis (1750 – 2022)**

**Organization Context:**

Maven Environmental — a U.S.-based non-profit organization dedicated to environmental awareness and climate data transparency.

**1. Project Overview**

This project explores over **250 years of global CO₂ emissions data** to understand regional contributions, temporal trends, and relationships between emissions, population, and temperature change. The objective was to build an **interactive dashboard** that allows the public to visualize patterns and identify key global drivers of carbon emissions.

**2. Objectives**

1. **Profile and QA the data**
   * Validate and clean the dataset for accuracy and consistency.
   * Prepare data types, parameters, and filters for analysis.
2. **Prepare and Visualize the data**
   * Build insightful visuals (line, map, and scatter plots) showing emission trends, regional patterns, and population relationships.
3. **Develop an Interactive Dashboard**
   * Combine multiple visuals into a cohesive, user-friendly dashboard with filters and parameters.

**3. Data Summary**

* **Dataset:** Global CO₂ Emissions (1750 – 2021)
* **Records:** 50,599
* **Fields:** 79
* **Structure:** Single table CSV

Each record represents emission and related metrics for a specific country and year, including:

* Total CO₂ emissions (tons)
* CO₂ per capita
* CO₂ from various fuel sources
* Population
* Temperature change indicators

**4. Tools & Technologies**

* **Tableau Desktop / Tableau Public** — for data connection, visualization, and dashboarding
* **Excel / CSV** — for initial inspection and data extraction
* **Data Source:** visualizing\_global\_co2\_data.csv

**5. Methodology**

**Objective 1 – Data Profiling & Preparation**

* Connected to the CSV data source and extracted the dataset.
* Filtered out records not at the **country level** and excluded NULL ISO codes.
* Converted all CO₂-related fields to **Number (Whole)** and **Continuous measures**.
* Created a **Top N parameter** (integer, default = 10) for dynamic filtering of top emitters.
* Identified the **largest contributors**:  
  🇺🇸 United States, 🇨🇳 China, 🇷🇺 Russia, 🇩🇪 Germany, 🇬🇧 United Kingdom.

**Objective 2 – Visualization Development**

Built three core visualizations:

1. **Line Chart** – % of Total CO₂ Share by Year
   * Displays emission trends for the top N countries (parameter-driven).
   * Excludes null values and regional aggregates.
2. **Map View** – CO₂ Per Capita (2021)
   * Country-level color mapping with divergent color scale.
   * Fixed null and region errors for accuracy.
3. **Scatter Plot** – CO₂ vs. Population (2021)
   * Bubble size = Temperature Change from CO₂
   * Added **linear regression trend line** for correlation analysis.
   * Colored by CO₂ Per Capita using a **divergent scale**.

**Objective 3 – Dashboard Creation**

* Combined all three sheets into an **interactive dashboard**.
* Included:
  + Title, **Top N parameter**, and **Country filter** (in-context).
  + Consistent color theme using CO₂ Per Capita scale.
  + Aligned layout for visual clarity and storytelling flow.
* Enhanced usability with responsive filters and refined formatting.

**6. Key Findings & Insights**

* **Regional Disparities:**
  + **Africa** and **South America** show **low CO₂ per capita**, emphasizing limited industrial output.
  + **APAC** and **Europe** have much higher emissions intensity.
* **Country Highlights:**
  + **China’s** CO₂ output has surged in recent decades but aligns proportionally with population growth.
  + **United States** shows disproportionately high emissions relative to population size.
  + **India** exhibits growth in emissions following its population curve — yet remains below U.S. levels on a per-capita basis.
* **Historical Trends:**
  + Global emissions rose sharply post-Industrial Revolution and again after 1950s industrial expansion.

**7. Conclusion**

The interactive dashboard successfully visualizes over two centuries of emission data, making global CO₂ dynamics accessible and comparable. It highlights ongoing disparities between developed and developing nations and reinforces the importance of global cooperation in reducing emissions.