

# Final project

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1. Data Loading and Cleaning

2. Plot

## 2020

## 2021

## 2022

## Map

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```
## new screenshot for shiny
import matplotlib.pyplot as plt
import matplotlib.image as mpimg

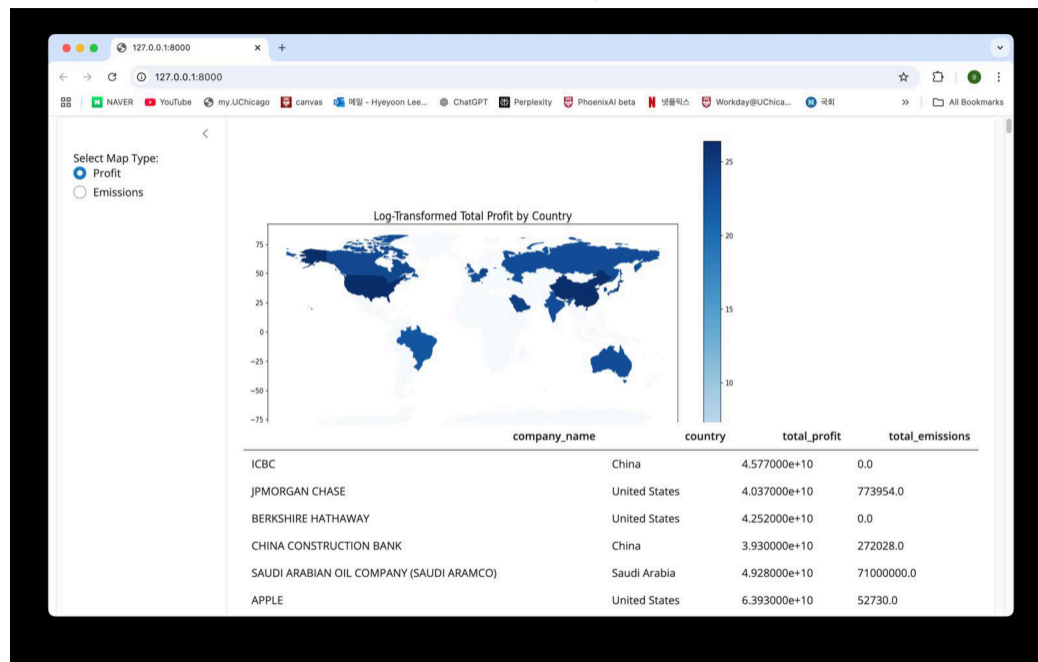
# File paths for the images
profit_map_path = "/Users/joying/Documents/GitHub/final-project/picture/PHOTO-2024-12-07-14-56-45.png"
emission_map_path = "/Users/joying/Documents/GitHub/final-project/picture/PHOTO-2024-12-07-14-56-45.png"

# Display the profit map
profit_map = mpimg.imread(profit_map_path)
plt.imshow(profit_map)
plt.axis("off") # Hide axes
```

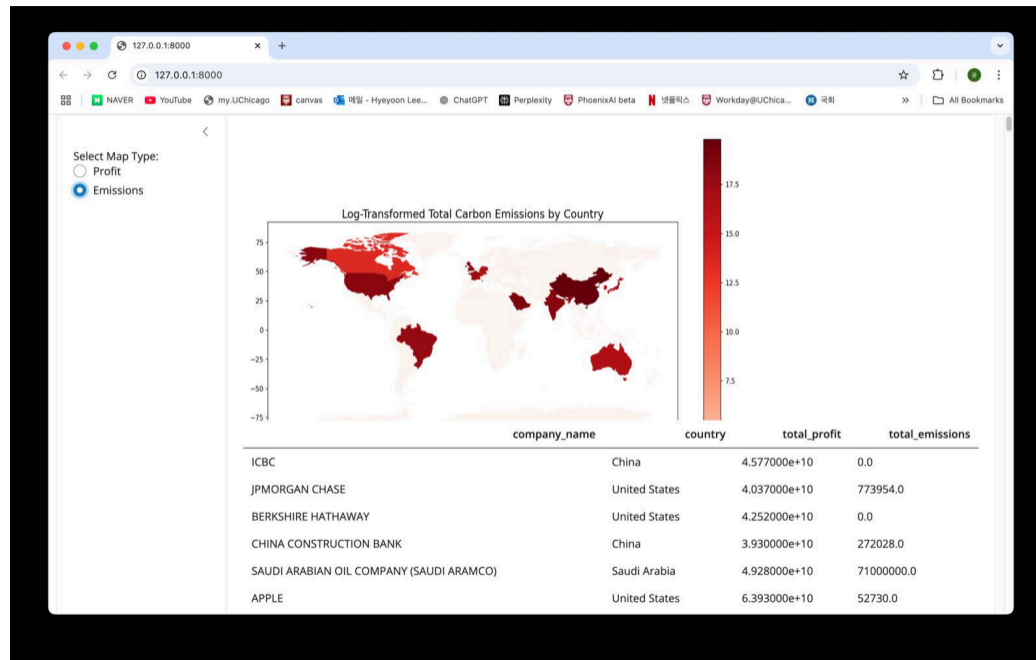
```
plt.title("Profit Map")
plt.show()

# Display the emission map
emission_map = mpimg.imread(emission_map_path)
plt.imshow(emission_map)
plt.axis("off") # Hide axes
plt.title("Emission Map")
plt.show()
```

## Profit Map



## Emission Map



## Write-Up

### Research Question

This project investigates the relationship between corporate profitability and carbon emissions (Scope 1, 2, and 3) from 2020 to 2022. The goal is to analyze how emissions efficiency varies by industry, explore shifts in emissions and profitability over time, and provide actionable insights to guide businesses and policymakers toward low-carbon practices.

### Key Questions:

- Which industries achieve high profitability with low emissions, and which struggle to reduce emissions while maintaining profits?

- How do emissions and profitability trends evolve from 2020 to 2022?
- What are the policy and business implications of these findings?

## Approach and Coding Methodology

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### Datasets:

- **Source:** Public Profit and Emissions Database (2020–2022)
- **Variables:** Firm-level Scope 1, 2, and 3 emissions, profitability.

### Data Preparation:

- Cleaned and standardized datasets by:
  - Removing non-numeric characters (e.g., "\$", ",").
  - Resolving missing values.
  - Standardizing column names.
  - Merging annual datasets.

### Visualization:

- Static visualizations (scatter and bar charts) via Altair.
- Dynamic dashboard (Shiny app) for interactive exploration.

### Challenges:

- **Inter-industry Comparisons:** Emissions baselines differ (e.g., Banking vs. Oil & Gas).
- **Shiny App Performance:** Filtering large datasets required optimization.

## Key Findings

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### 2020: Baseline Year

- **High Emission Industries:** Utilities and Oil & Gas dominate emissions (>160M tons CO<sub>2</sub>e).

- **Low Emission Industries:** IT Software, Banking, and Pharmaceuticals lead in profitability with minimal emissions.

## 2021: Post-Pandemic Recovery

- **Rising Emissions:** Transportation and Mining saw increases due to demand recovery.
- **Persistent Trends:** Oil & Gas remained a high-emission, high-profit sector.

## 2022: Shift Toward Sustainability

- **Decarbonization Efforts:** Utilities began adopting renewable energy.
- **Profitability Gaps:** Low-emission industries solidified their economic viability.

## Shiny App Description

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The Shiny app provides interactive visualizations of: - **Profit Map:** Log-transformed total profits by country. - **Emissions Map:** Log-transformed total emissions by country. Users can filter and explore trends interactively.

## Policy Implications and Recommendations

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- **Low-Emission Industries:** Showcase profitability of sustainable practices.
- **High-Emission Sectors:** Require significant investments in renewables and carbon capture.
- **Policy Measures:**
  - Decarbonization incentives: Subsidies for green technologies.
  - Carbon pricing: Stricter taxation to reduce emissions.

## Directions for Future Work

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- Conduct industry-specific studies to uncover tailored solutions.
- Integrate policy metrics (e.g., carbon tax rates) for a comprehensive analysis.

## Extra Credit

Sentiment Polarity: 0.012540584415584425

Sentiment Subjectivity: 0.43852813852813854

This article discusses global financial negotiations at the COP29 climate summit in Baku, focusing on helping low-income countries adapt to climate change. The mention of “trillions” highlights the urgency and scale of financial support required. From the sentiment analysis, the tone is generally neutral (polarity: 0.0125) with some subjectivity (subjectivity: 0.4385), reflecting partial interpretation by the reporters regarding the summit’s objectives.