

GLOBLE CO₂ EMMISSION

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Introduction

Carbon dioxide (CO₂) emissions have become a critical concern for the modern world due to their direct impact on global warming, the greenhouse effect, and widespread climate change. As industrialization and energy consumption continue to grow, especially in rapidly developing economies, the concentration of CO₂ in the atmosphere has reached alarming levels. This poses significant threats to ecosystems, human health, and long-term economic stability. Therefore, managing and reducing CO₂ emissions is not just an environmental necessity, but also a socio-economic imperative.

The goal of this project is to analyze CO₂ emissions from a global perspective and identify the countries that need to take urgent action in reducing their emissions. The project emphasizes the importance of adopting sustainable practices that balance economic growth, environmental protection, and social well-being—commonly referred to as the “sustainability triangle.” In line with this, we aim to explore how nations can meet developmental and energy demands while minimizing their carbon footprint.

To support this analysis, we have created a series of informative visualizations using relevant datasets. These visualizations focus on key factors such as CO₂ emissions, population growth, total energy consumption, renewable energy usage, and other environmental and economic indicators. Through these plots, we aim to draw connections between human activity and environmental impact, and provide insights into the underlying patterns and potential solutions.

This report investigates several critical questions: Which countries contribute most to global CO₂ emissions? How does population size correlate with emissions? What role does renewable energy play in reducing environmental harm? How can sustainable development be achieved without compromising economic goals? By answering these questions, we strive to propose actionable strategies for emission reduction and sustainable development.

Ultimately, the objective of this project is to support global efforts in climate action by presenting data-driven insights and promoting a balanced approach toward development.

We believe that the findings of this study will contribute to understanding the global landscape of emissions and guiding effective policymaking for a sustainable future.

Discussion

THE SUM OF CO2 EMISSION BY COUNTRY

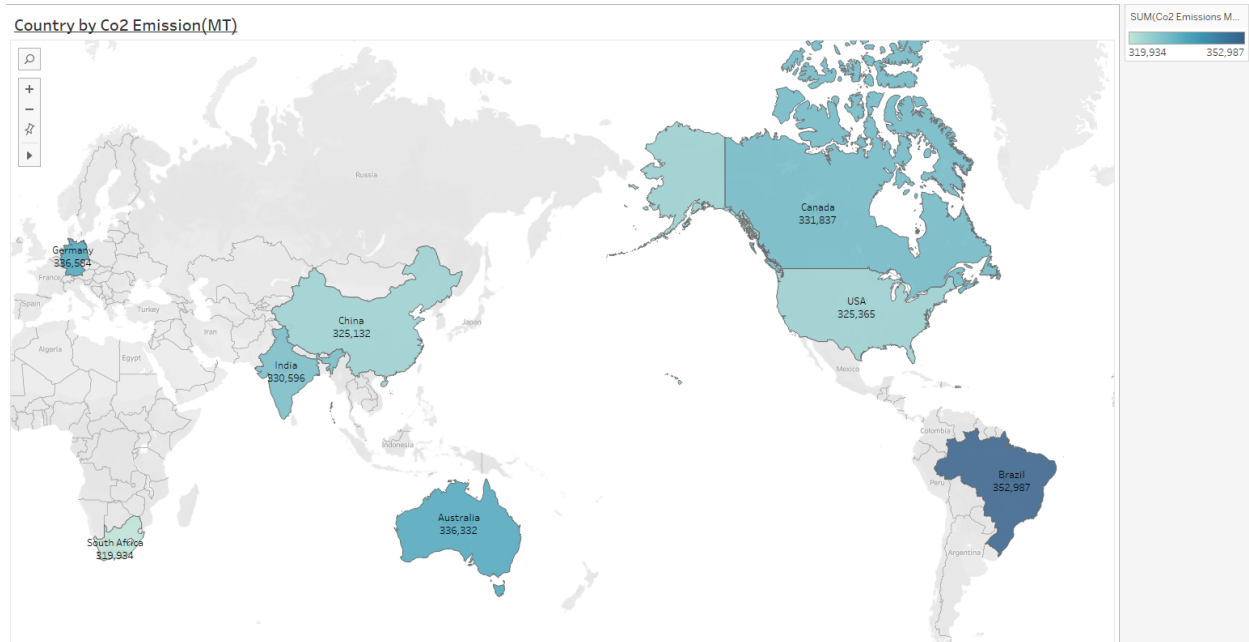


FIGURE 1: THE SUM OF CO₂ EMISSION BY COUNTRY FROM 2000 TO 2022

Figure 1 presents the sum of CO₂ emissions by country over the period 2000 to 2022. The data shows that Brazil has the highest total emissions, reaching 352,987 metric tons (MT). Germany follows with 336,584 MT, and Australia ranks third with 336,332 MT.

A key observation is that Germany, despite having a significantly smaller land area compared to Brazil and Australia, exhibits remarkably high CO₂ emissions. This indicates that industrial activity, energy consumption, and transportation are likely contributing heavily to the country's emission levels.

These figures underscore the urgency for effective national policies aimed at reducing CO₂ emissions, particularly in countries with high emissions relative to their geographic size.

THE CO2 EMISSION OF COUNTRIES BY SECTOR

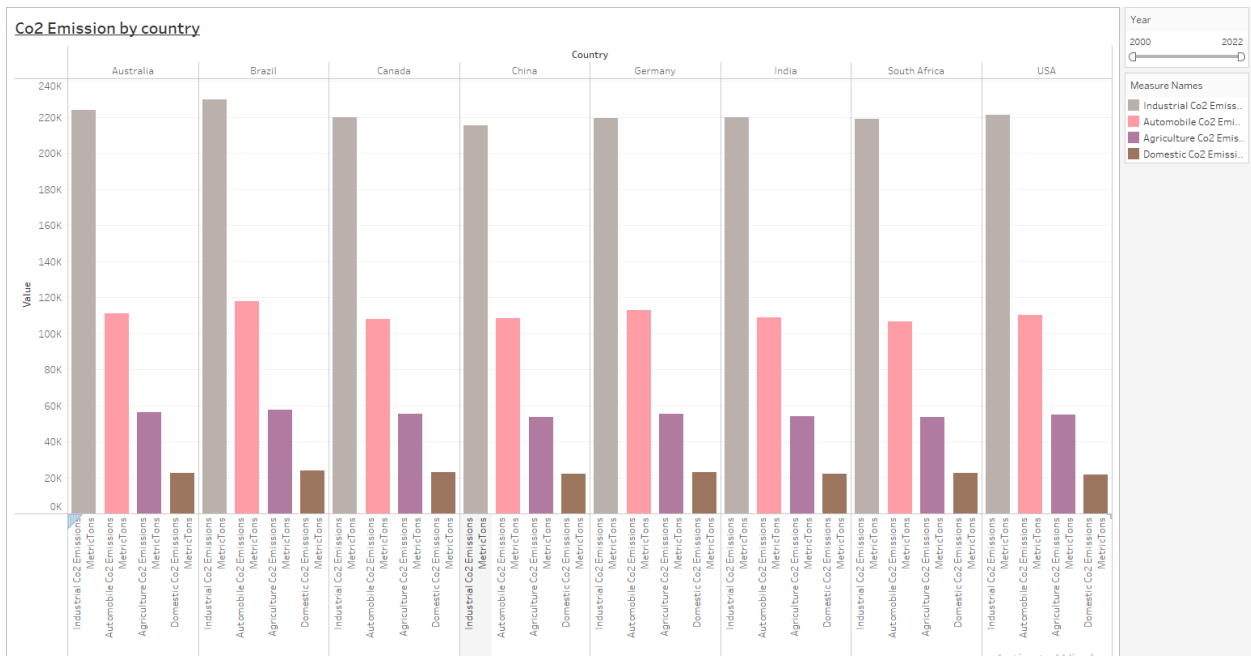


FIGURE 2 : THE CO2 EMISSION OF COUNTRIES BY SECTOR

Figure 2 provides a detailed breakdown of CO₂ emissions by sector across countries, offering further insight into the overall emissions presented in Figure 1. This sectoral analysis highlights the primary sources contributing to total national emissions, allowing for a deeper understanding of each country's emission profile.

Across all countries analyzed, the industrial sector emerges as the largest contributor to CO₂ emissions, significantly surpassing other sectors. This is followed by emissions from the automobile (transportation) sector, which also shows considerable impact, particularly in highly urbanized and developed countries. The agricultural sector ranks third, contributing moderately to emissions, while the domestic or residential sector consistently accounts for the smallest share of total emissions.

These findings emphasize the need for targeted emission reduction strategies, especially in the industrial and transportation sectors, which dominate national emission profiles. Investments in cleaner technologies, sustainable transportation, and energy-efficient manufacturing are crucial. Understanding sector-specific contributions also supports more effective policy development tailored to the unique emission patterns of each country.

THE GDP PER CAPITA OF YEAR BY COUNTRY

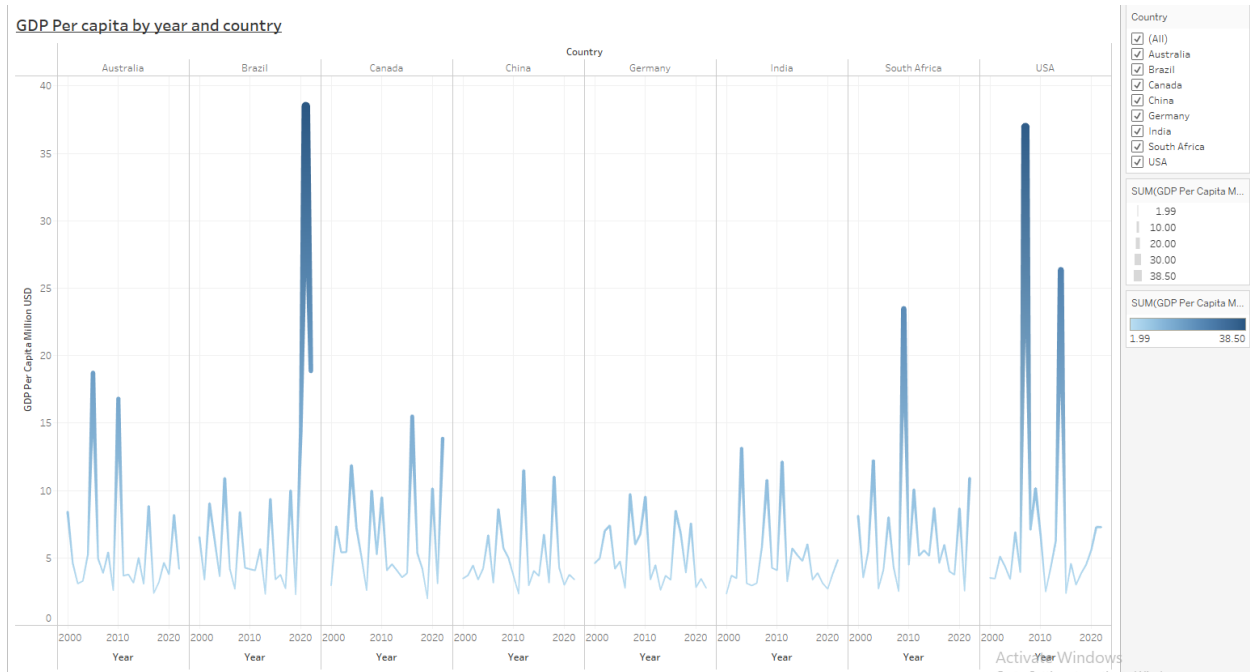


FIGURE 3: THE GDP PER CAPITA OF YEAR BY COUNTRY

Figure 3 illustrates the GDP per capita trends by country over a range of years, with both the thickness and color intensity of the lines representing the magnitude of GDP per capita, measured in million USD. This visual representation enables a comparative view of economic performance across countries over time.

The chart reveals several noticeable spikes in GDP per capita for specific countries. Brazil shows a significant increase around 2019, suggesting a short-term economic boost or currency effect. The United States displays two prominent spikes, one near 2008, possibly reflecting pre-recession growth, and another around 2013, indicating economic recovery. Additionally, South Africa demonstrates a sharp rise in 2010, which may be linked to post-recession recovery or national economic events, such as the FIFA World Cup held that year.

Overall, the visualization highlights fluctuations in economic output per person, influenced by global and domestic events. These trends underscore the importance of understanding macroeconomic cycles and their impact on national prosperity.

THE AVERAGE RENEWABLE ENERGY PERCENTAGE OF COUNTRIES WITH SUM OF ENERGY CONSUMPTION

Figure 4 presents a comparative visualization of countries based on their renewable energy usage and total energy consumption. The height of each bar represents the average percentage of renewable energy in a country's energy mix, while the color intensity indicates the total energy consumption—darker bars correspond to higher consumption levels.

Germany leads with the highest average renewable energy percentage, followed by China and the United States, each approaching around 50%. Despite this, countries with the highest total energy consumption—Brazil, Australia, and Germany—still show room for improvement in their renewable energy share.

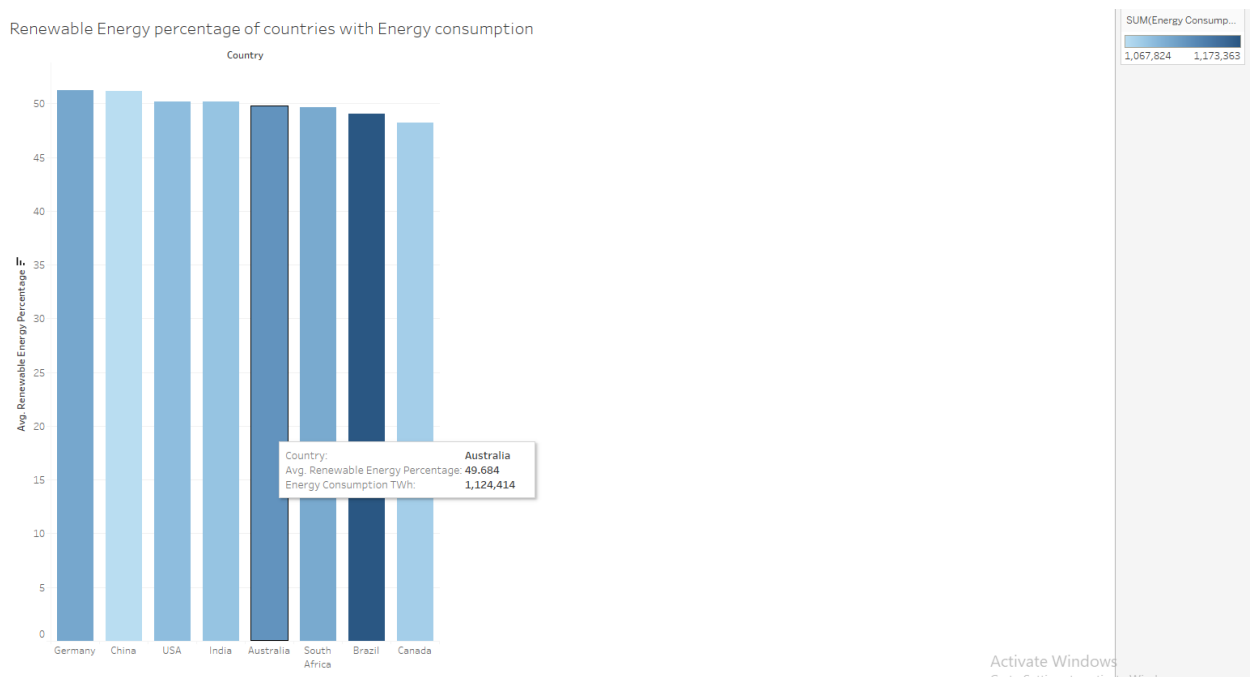


FIGURE 4: THE AVERAGE RENEWABLE ENERGY PERCENTAGE OF COUNTRIES WITH THE SUM OF ENERGY CONSUMPTION

Given the significant energy demands of these nations, increasing their renewable energy contribution to around 80% should be prioritized to enhance sustainability and reduce carbon emissions. This highlights the urgent need for targeted policies and investments in renewable infrastructure, particularly in high-consumption countries.

Thank You!

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