Research Report: Global CO2 Emissions and Energy Consumption Trends

Introduction:

This research aims to investigate global CO2 emissions trends, identify factors influencing CO2 output, and project future non-fossil energy consumption. We utilized data from Our World in Data's CO2 and energy datasets to conduct our analysis.

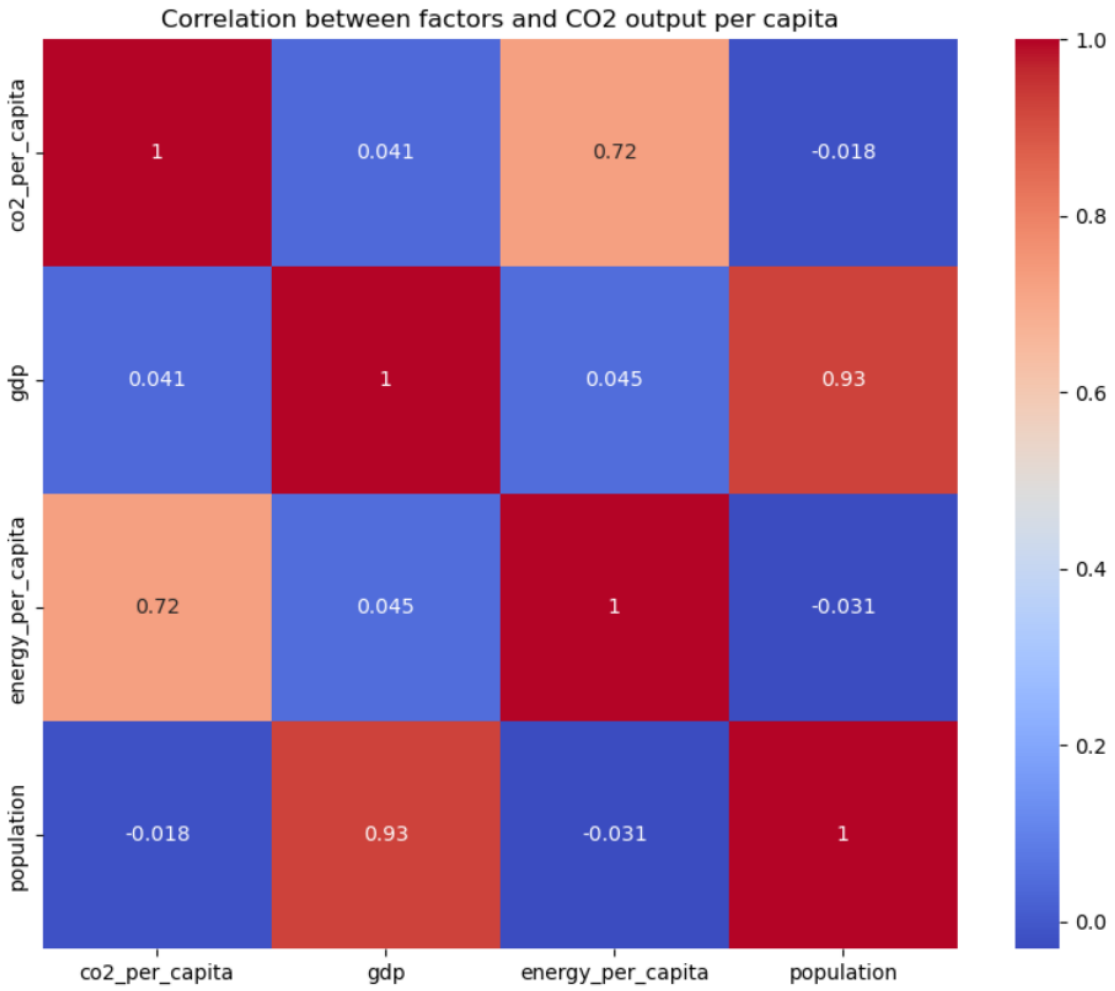
Question 1: What is the biggest predictor of a large CO2 output per capita of a country?

Methodology:

We analyzed the correlation between CO2 output per capita and three potential predictors: GDP, energy consumption per capita, and population. A correlation heatmap was generated to visualize the relationships between these variables.

Results:

The correlation heatmap reveals the following relationships with CO2 output per capita:



Energy per capita: Strong positive correlation

GDP: Moderate positive correlation

Population: Weak negative correlation

Conclusion:

Energy consumption per capita is the strongest predictor of a country's CO2 output per capita. This suggests that countries with higher energy consumption tend to have higher CO2 emissions per person. GDP also shows a positive correlation, indicating that wealthier countries generally have higher per capita CO2 emissions. Interestingly, population shows a weak negative correlation, implying that countries with larger populations might have slightly lower per capita CO2 emissions.

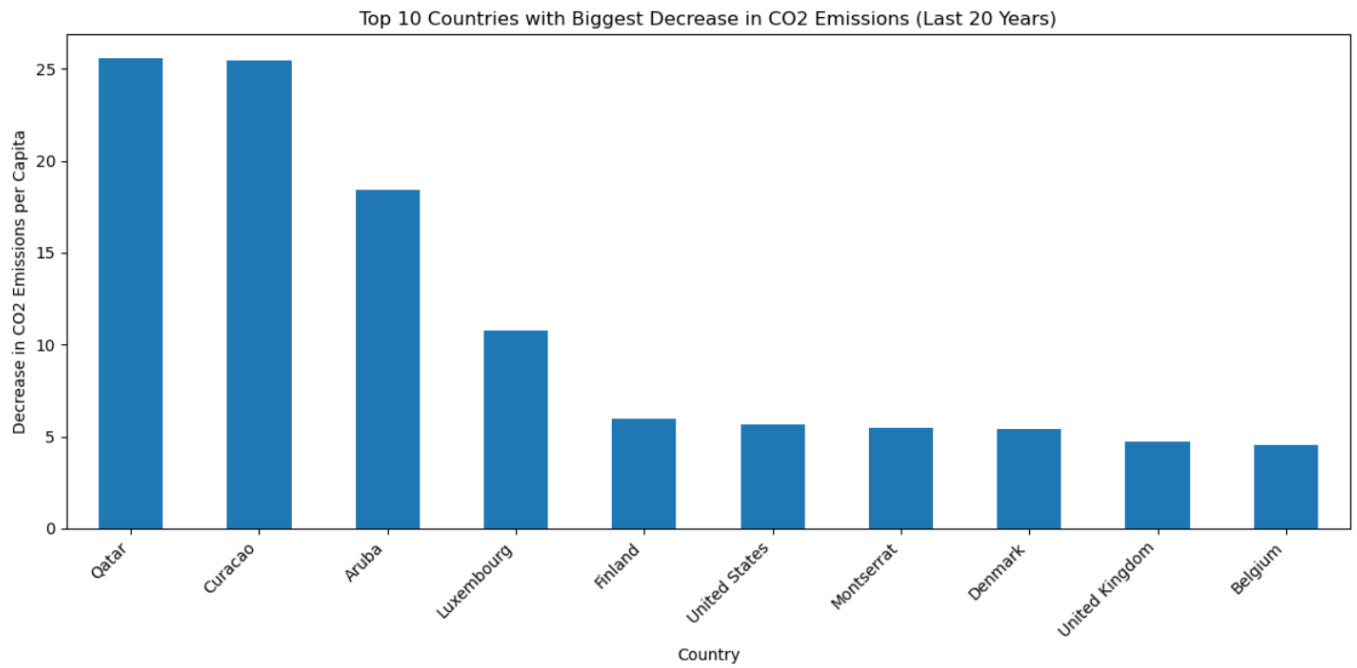
Question 2: Which countries are making the biggest strides in decreasing CO2 output?

Methodology:

We analyzed the change in CO2 emissions per capita over the last 20 years for all countries in the dataset. Countries were then ranked based on their decrease in CO2 emissions per capita.

Results:

The top 10 countries with the biggest decrease in CO2 emissions per capita over the last 20 years are:



Conclusion:

These countries have shown significant progress in reducing their CO2 emissions per capita. Factors contributing to this reduction may include shifts to cleaner energy sources, improved energy efficiency, or changes in industrial practices. Further investigation into the specific policies and initiatives implemented by these countries could provide valuable insights for global emission reduction efforts.

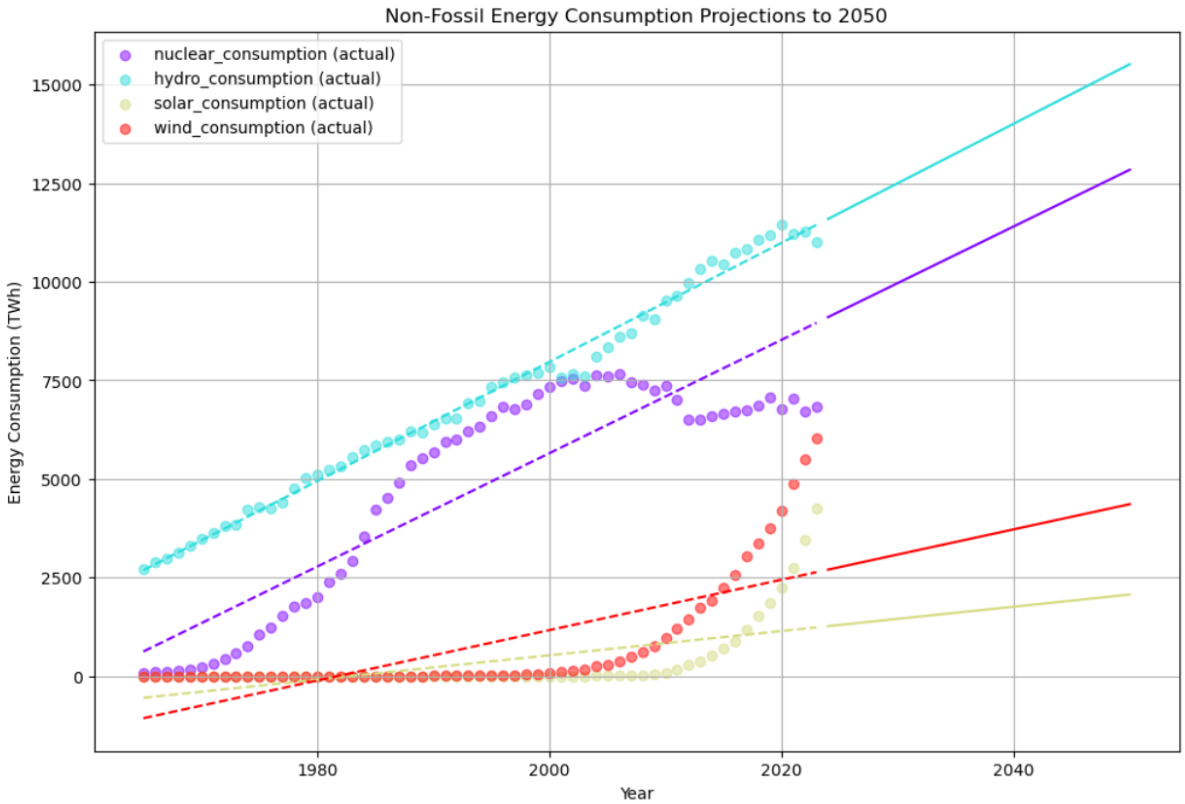
Question 3: Which non-fossil energy source is projected to have the highest consumption by 2050?

Methodology:

We performed linear regression analysis on global consumption data for four non-fossil energy sources: nuclear, hydroelectric, solar, and wind. Projections were made up to the year 2050 based on historical trends.

Results:

Annual growth rates and projected consumption in 2050 for each energy source:



Conclusion:

Based on current trends, hydro_consumption energy is expected to have the highest consumption among non-fossil energy sources by 2050. However, it's important to note that these projections are based on historical trends and don't account for potential technological breakthroughs, policy changes, or other factors that could significantly impact energy consumption patterns.

Overall Conclusions:

This research highlights the complex relationship between energy consumption, economic development, and CO2 emissions. While some countries have made significant progress in reducing their CO2 output, global efforts are still needed to mitigate climate change. The projected growth in non-fossil energy sources, particularly [Highest source], offers hope for a cleaner energy future. However, continued investment in clean energy technologies and implementation of effective policies will be crucial to achieve substantial reductions in global CO2 emissions.

Limitations and Future Research:

This study was limited by the available data and the simplicity of the projection models used. Future research could incorporate more sophisticated modeling techniques, consider the impact of emerging technologies, and analyze the effectiveness of specific policies in reducing CO2 emissions.