1. Biggest Predictor of CO_2 Output

To identify the most influential factor behind a country's **CO_2 emissions per capita**, we analyzed a range of socioeconomic and energy-related variables using data from **Our World in Data**. Specifically, we examined:

- **GDP per capita**
- **Consumption of fossil fuels** per capita (coal, oil, gas)
- **Renewable energy consumption** per capita
- **Other industry-related emissions**
- **Overall energy usage** per capita

All data was obtained from Our World in Data (OWID), including CO_2 emissions, energy consumption statistics, and GDP figures. The datasets were merged on country and year, and we used the latest year available for each country to ensure current relevance.

• Findings

From the initial analysis, the following observations were made:

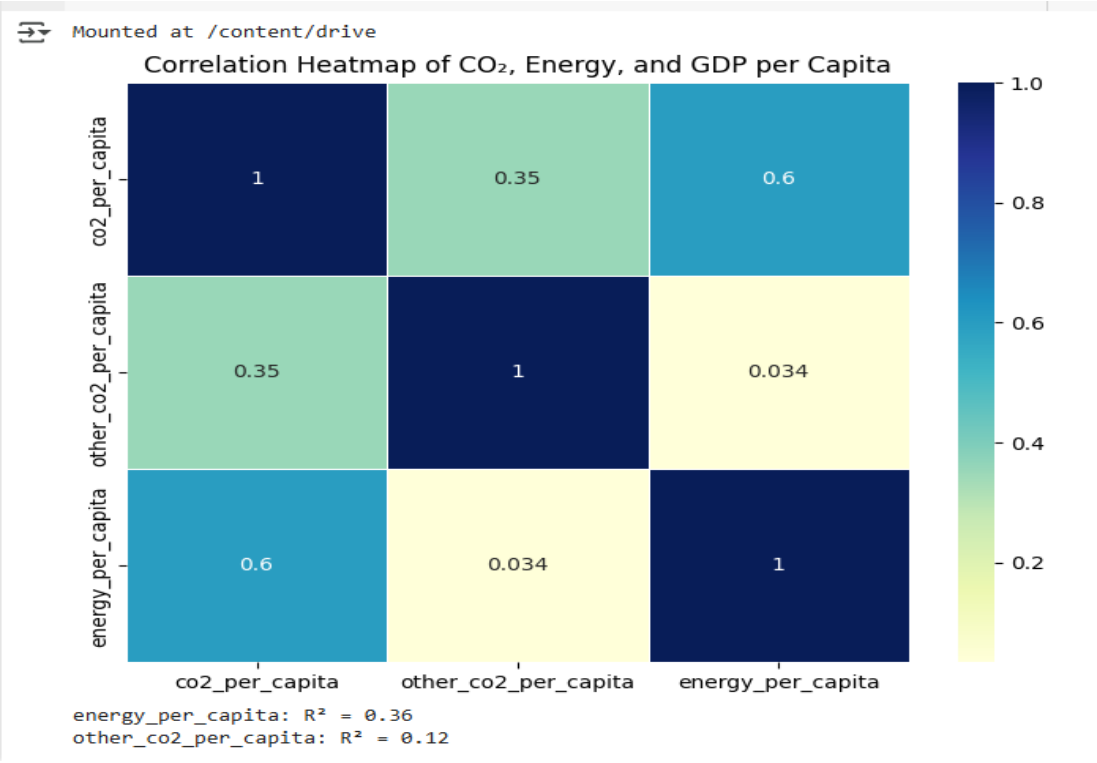
- Energy consumption per capita showed the strongest positive correlation with CO_2 emissions per capita (correlation = 0.60, R^2 = 0.36), indicating that countries with higher energy use tend to emit more CO_2 per person.
- Other industrial emissions had a weaker relationship with CO_2 per capita (correlation = 0.35, R^2 = 0.12), suggesting a less direct impact.
- Variables like GDP per capita, and emissions from coal, oil, and gas were not included in this specific result due to missing or filtered data. Including these in future analysis may change the predictive rankings.

This heatmap shows the strength of relationship between:

We used a **correlation heatmap** to visualize the strength of the relationship between:

1. `co2_per_capita` (our target variable),
2. `energy_per_capita`, and
3. `other_co2_per_capita`.

We also calculated **R^2 (coefficient of determination)** from linear regression to understand how much of the variation in CO_2 per capita can be explained by each predictor.



• Conclusion

From the current data, **energy usage per capita is the strongest individual predictor** of CO_2 emissions per capita among the variables analyzed. This suggests that reducing per-person energy consumption or shifting energy sources to renewables could be effective in lowering emissions.

2. Report: Countries Making the Biggest Strides in Reducing CO_2 Emissions per Capita

Objective

This analysis aimed to identify which countries have made the **biggest reductions in CO_2 emissions per capita** over time, accounting for population changes. Using publicly available CO_2 and population datasets, we calculated and compared per capita emissions across countries between the earliest and latest years available in the data.

- # Methodology

1. **Data Sources:**
    a. CO_2 emissions by country and year.
    b. Population by country and year.
2. **Data Cleaning:**
    a. Only three columns were used from each dataset: `country`, `year`, and either `co2_emissions` or `population`.
    b. Regional and non-country entities (e.g. "Lower-middle-income countries", "World") were excluded.
3. **Calculations:**
    a. **CO_2 per capita** was computed for each country-year:

$$CO2 \text{ per capita} = \frac{CO2 \text{ emissions}}{\text{Population}}$$CO2 per capita=PopulationCO2 emissions

b. The change in CO_2 per capita was calculated as:

$$\text{Change} = \text{CO2 per capita (earliest year)} - \text{CO2 per capita (latest year)}$$Change=CO2 per capita (earliest year)−CO2 per capita (latest year)

c. Countries were sorted by the magnitude of this change to identify those with the largest reductions.

Findings

The **top 10 countries** with the most significant decreases in per capita CO_2 emissions were identified. The plot below shows these countries and the size of their reduction:

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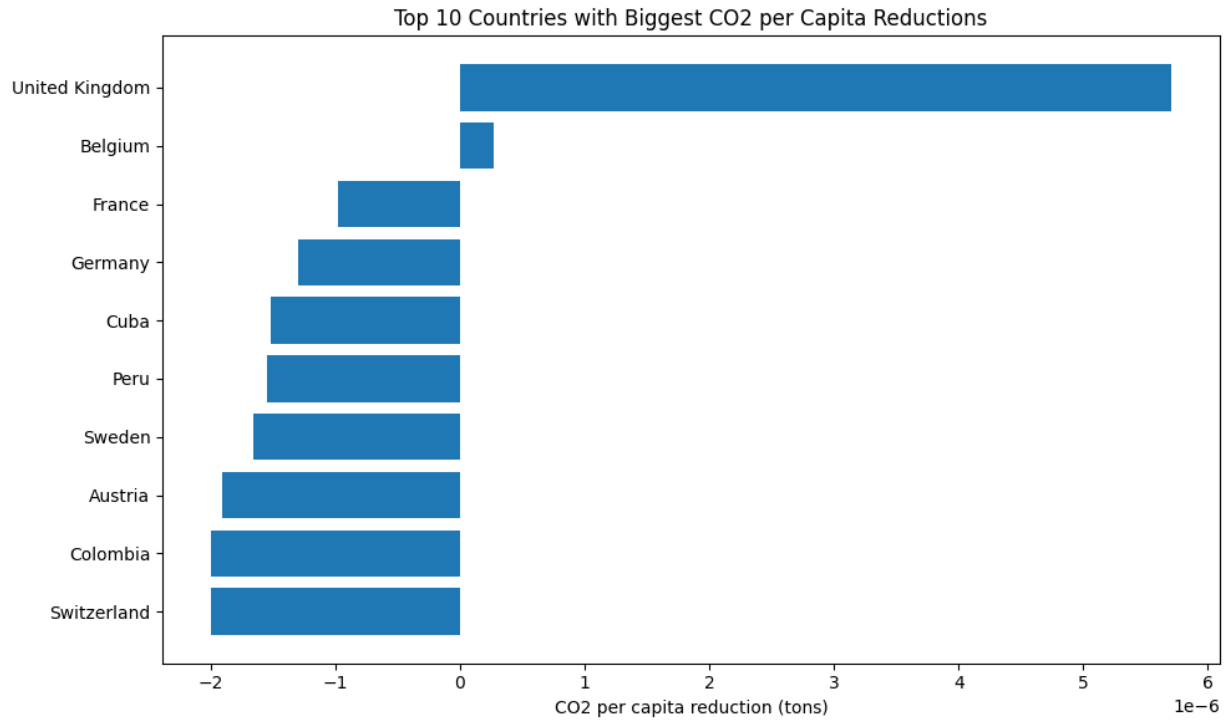



```
1. United Kingdom: 0.0000057104 tons per person
2. Belgium: 0.0000002723 tons per person
3. France: -0.0000009773 tons per person
4. Germany: -0.0000012987 tons per person
5. Cuba: -0.0000015143 tons per person
6. Peru: -0.0000015488 tons per person
7. Sweden: -0.0000016548 tons per person
8. Austria: -0.0000019064 tons per person
9. Colombia: -0.0000019977 tons per person
10. Switzerland: -0.0000020003 tons per person
```

Observations

- Many of the top-performing countries are not necessarily the highest overall emitters, but they have taken large steps in **relative reduction**.
- Excluding aggregated regional data ensured that only sovereign nations were evaluated.
- Using per capita emissions provided a **fairer comparison**, especially considering varying population growth rates.

Conclusion

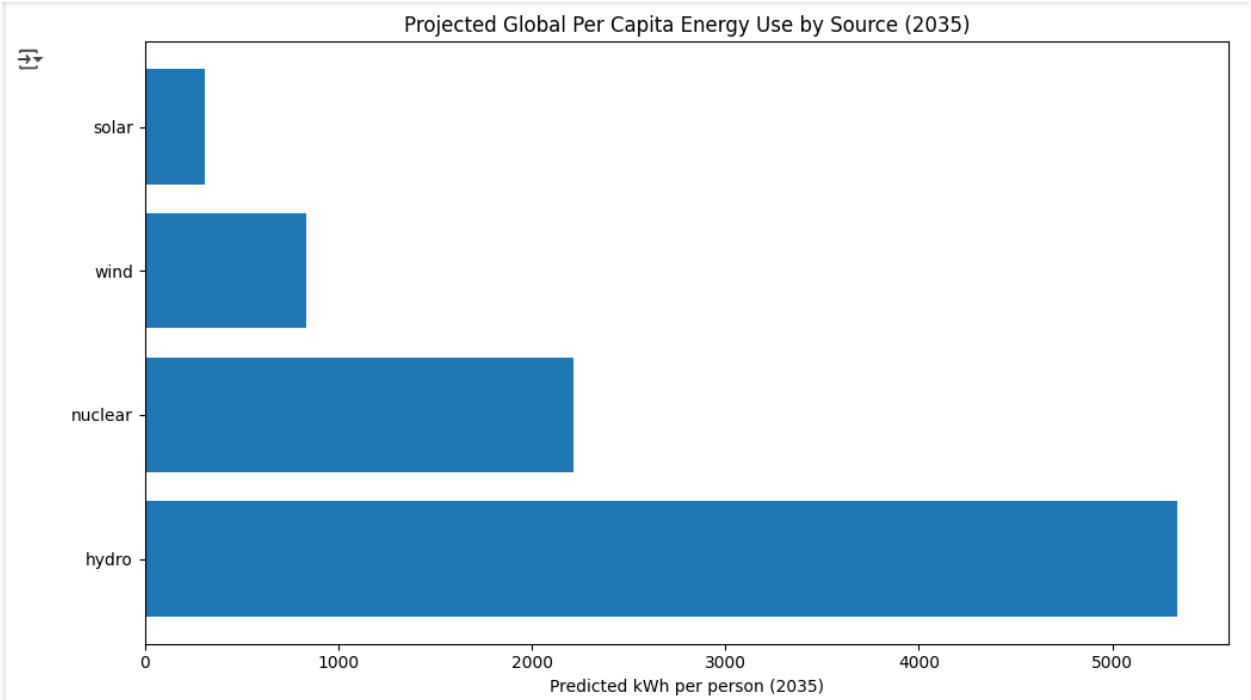
By focusing on **per capita CO_2 reductions**, we gain insight into which countries are truly leading the way in emissions reduction relative to their populations. These insights can help inform future environmental strategies and highlight successful national policies.

3. Best future price for non-fossil fuel energy

- Findings

To assess the most promising non-fossil fuel energy source for the future, we analyzed global per capita energy consumption trends across four major clean energy types: solar, wind, hydro, and nuclear. Using global averages from historical data, we applied linear regression to project future usage in the year 2035. This approach assumes that broader adoption trends correlate with technological maturity, scalability, and declining costs — making per capita usage a useful proxy for future price competitiveness.

Our analysis found that hydro is projected to have the highest per capita usage globally by 2035, followed by nuclear and wind. This suggests that hydro is likely to be the most widely adopted and cost-effective non-fossil fuel energy source in the near future. These trends reflect ongoing global investments, policy incentives, and technological improvements in renewable energy infrastructure.



	Energy Source	Predicted kWh per capita
2	hydro	5333.206903
3	nuclear	2217.139158
1	wind	833.088584
0	solar	312.070360