

Final Assignment: CO2 Emissions

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

Looking at CO2 emissions often reflects population size, as the most populous countries typically rank highest in terms of CO2 emissions globally. However, how do these comparisons appear when we adjust the parameter per capita?

Per capita emissions represent the emissions of an average person in a country or region, calculated as the total emissions divided by the population. The world's largest per capita CO2 emitters are, in many cases, also the major energy-consuming countries per capita. Figure 1 illustrates the relationship between these two factors.

CO2 emissions per capita vs Energy consumption per capita vs GDP per capita (2021)

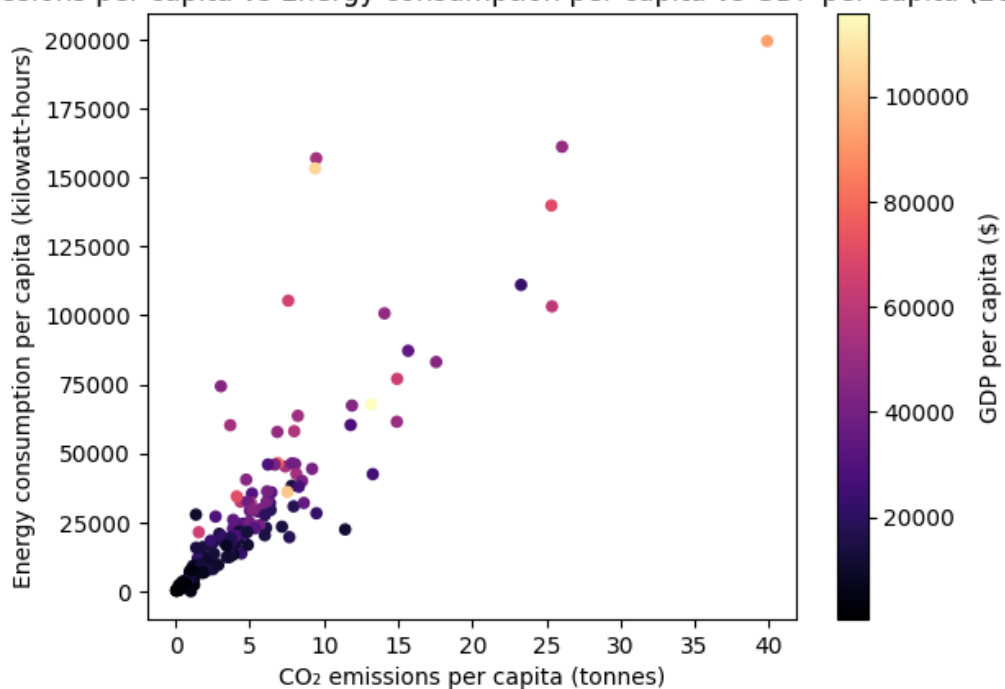


Figure 1

There is a strong relationship between economic growth and income levels in a country with the CO2 emissions per capita produced. In Figure 1, we can clearly see that countries with low GDP per capita produce much less CO2 compared to countries with high GDP. Additionally, the majority of countries with the highest CO2 emissions fall within the high-income classification (Figure 2)

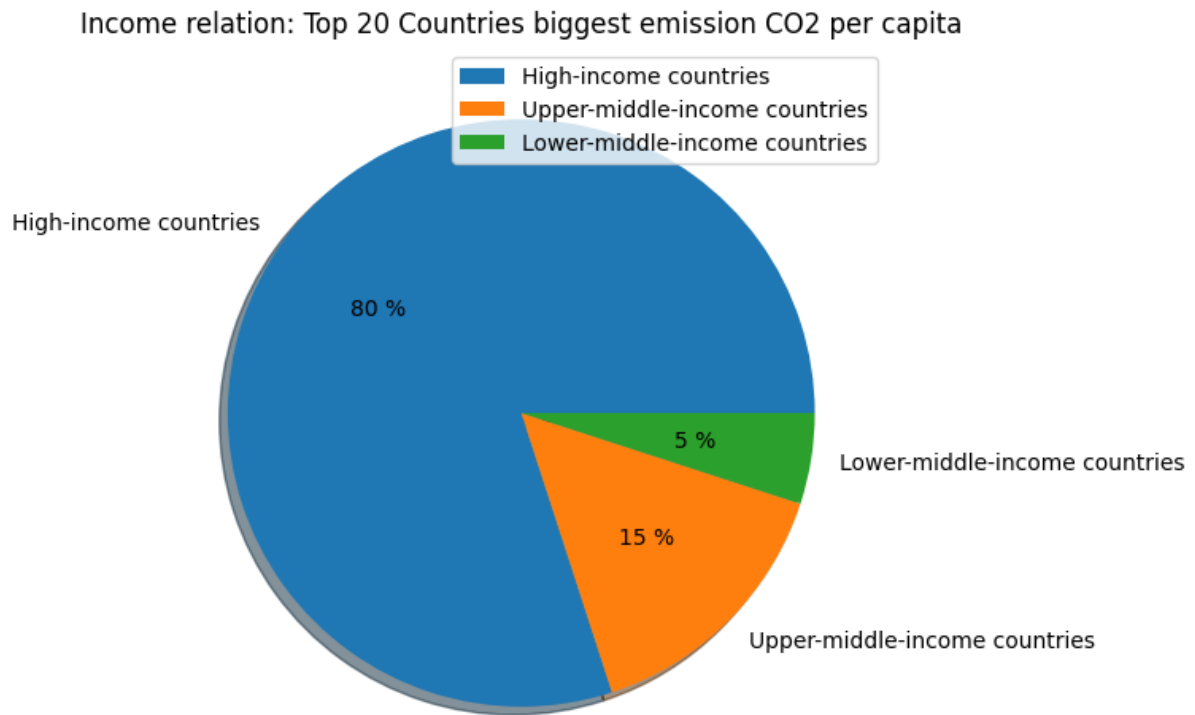


Figure 2. The World Bank creates a yearly classification of countries by income, for all countries with population over 30,000

We would expect this to be the case: inhabitants of countries with high standards of living would have higher energy consumption and a bigger impact on CO2 emissions per capita.

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

To understand which countries are making the biggest strides in decreasing CO2 output, we need to examine the relative change in emissions over the years. The highest percentage decrease, from 2000 to 2022, belongs to Curacao, Aruba, and Ukraine (See Figure 3).

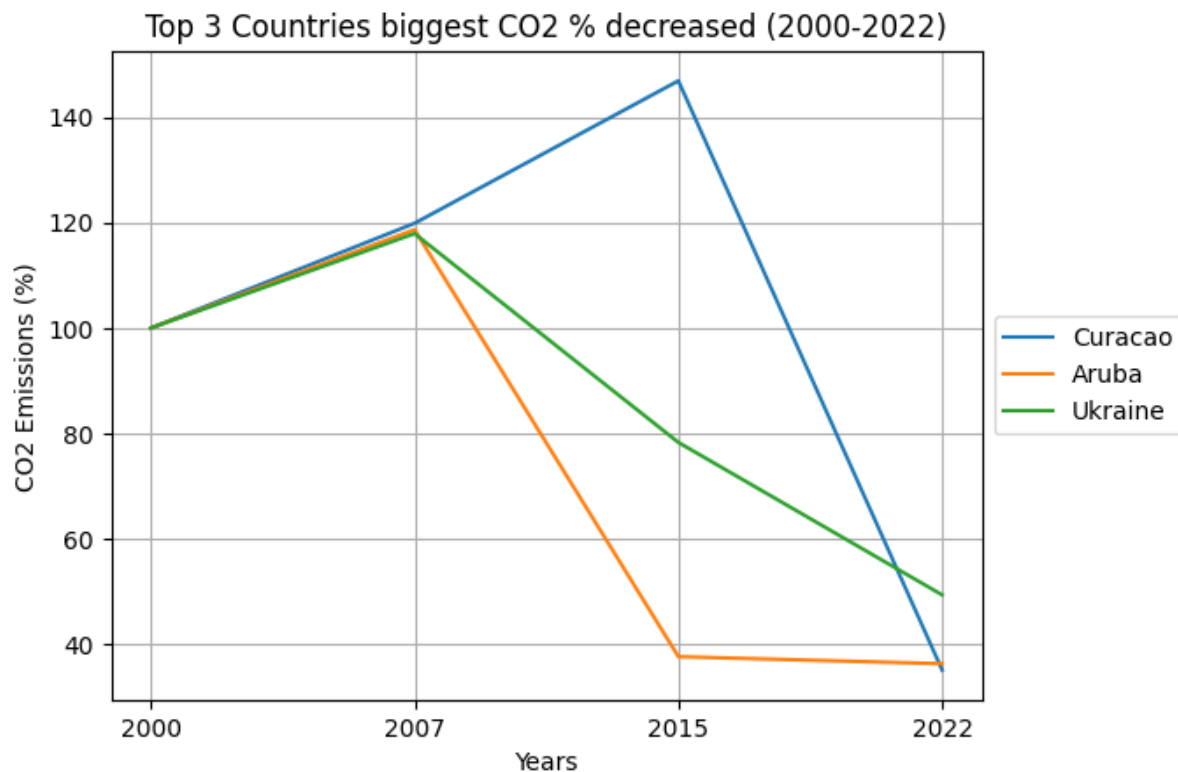


Figure 3.

Which non-fossil fuel energy technology will have the best price in the future?

For the world to transition to low-carbon electricity, energy from these sources needs to be cheaper than electricity from fossil fuels.

Fossil fuels have historically dominated the global power supply because, until very recently, electricity from fossil fuels was far cheaper than electricity from renewables. However, this has dramatically changed; the prices of new renewables have become cheaper within the last decade. This trend is illustrated in Figure 4.

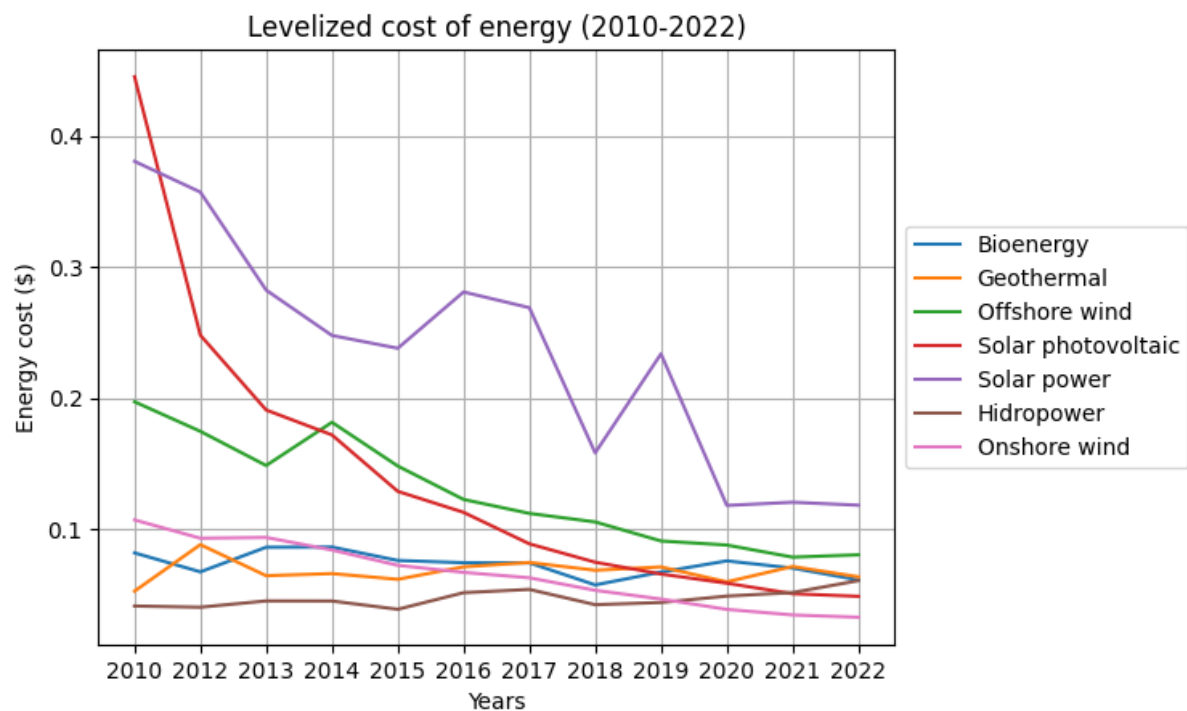


Figure 4 It is measured in US\$ per kilowatt-hour.

If we want the world to be powered by safer and cleaner alternatives, we must ensure that these alternatives become cheaper in the future. The Figure 5 presents a prediction model for the cost of renewable energies from 2023 to 2033, using information from the previous 10 years, with solar energy emerging as the cheapest option.

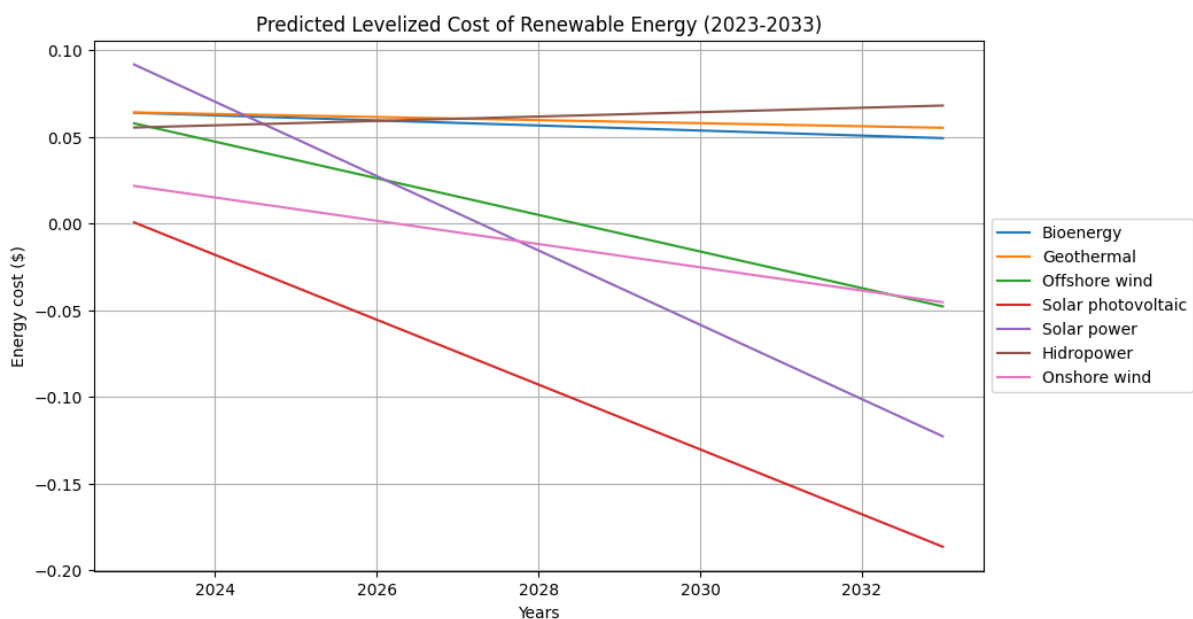


Figure 5 It is measured in US\$ per kilowatt-hour

Appendix

Data CO₂ emissions source: Global Carbon Budget (2023); Population based on various sources (2023) – with major processing by Our World in Data. “Annual CO₂ emissions (per capita) – GCB” [dataset]. Global Carbon Project, “Global Carbon Budget”; Various sources, “Population” [original data].

Data energy consumption per capita source: U.S. Energy Information Administration (2023); Energy Institute - Statistical Review of World Energy (2023); Population based on various sources (2023) – with major processing by Our World in Data

Data GDP per capita and income classification source: World Bank (2023) – with major processing by Our World in Data

Data top countries decreasing CO₂ source: Global Carbon Budget (2023) – with major processing by Our World in Data. “Annual CO₂ emissions – GCB” [dataset]. Global Carbon Project, “Global Carbon Budget” [original data].

Data non-fossil fuel energy technology prices source: International Renewable Energy Agency (2023) – with minor processing by Our World in Data. “Bioenergy” [dataset]. International Renewable Energy Agency, “Renewable Power Generation Costs” [original data].