Global Greenhouse Gas Emissions

Data Visualisation Exercise

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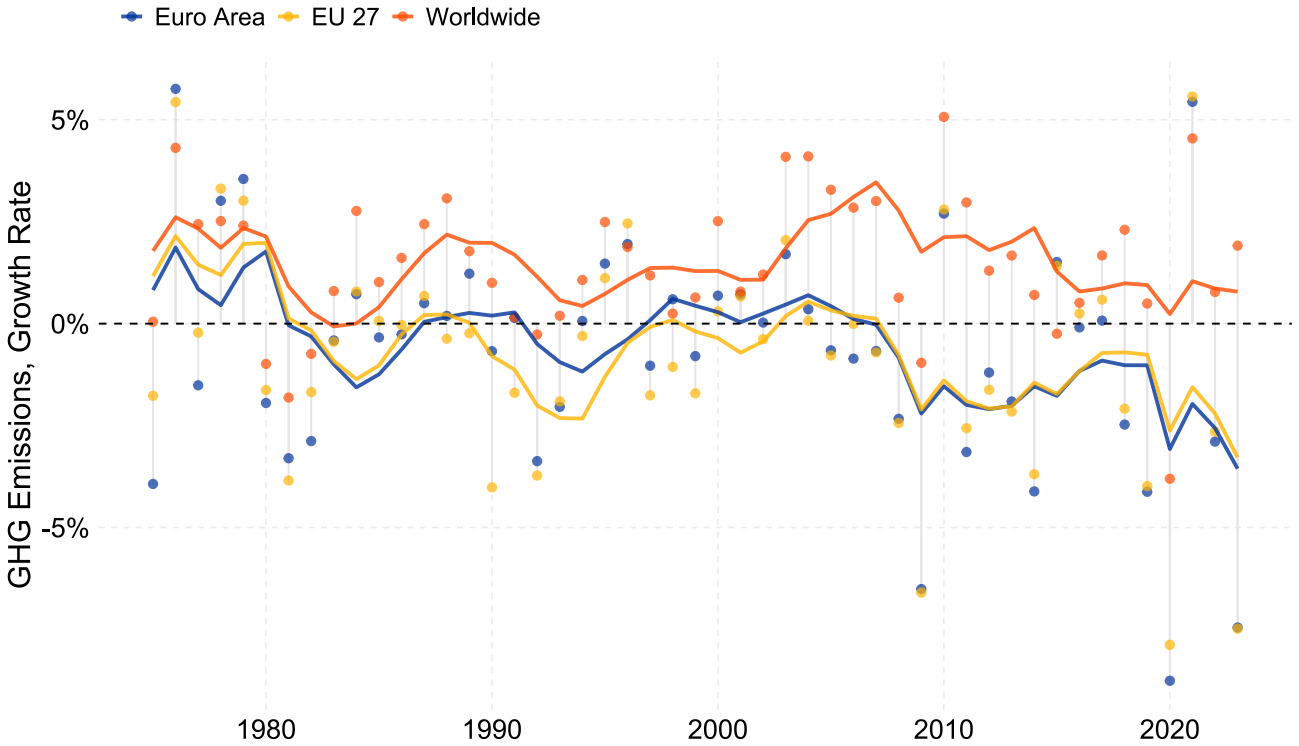
This report analyzes global greenhouse gas (GHG) emissions using data from the Emissions Database for Global Atmospheric Research (EDGAR) GHG emissions files[1,2]. Information on countries' income-groups was obtained from the World Bank API[3].

The analysis was conducted in R version 4.4.2[4], using a number of additional packages for data preparation and visualisation[5–14], and compiled into a reproducible PDF report with Quarto. The code to reproduce this PDF document, together with an HTML version and all required files, is available at valentink.quarto.pub/ghg.

Chart 1: **Evolution of GHG growth in the euro area, European Union (EU27) and worldwide.**

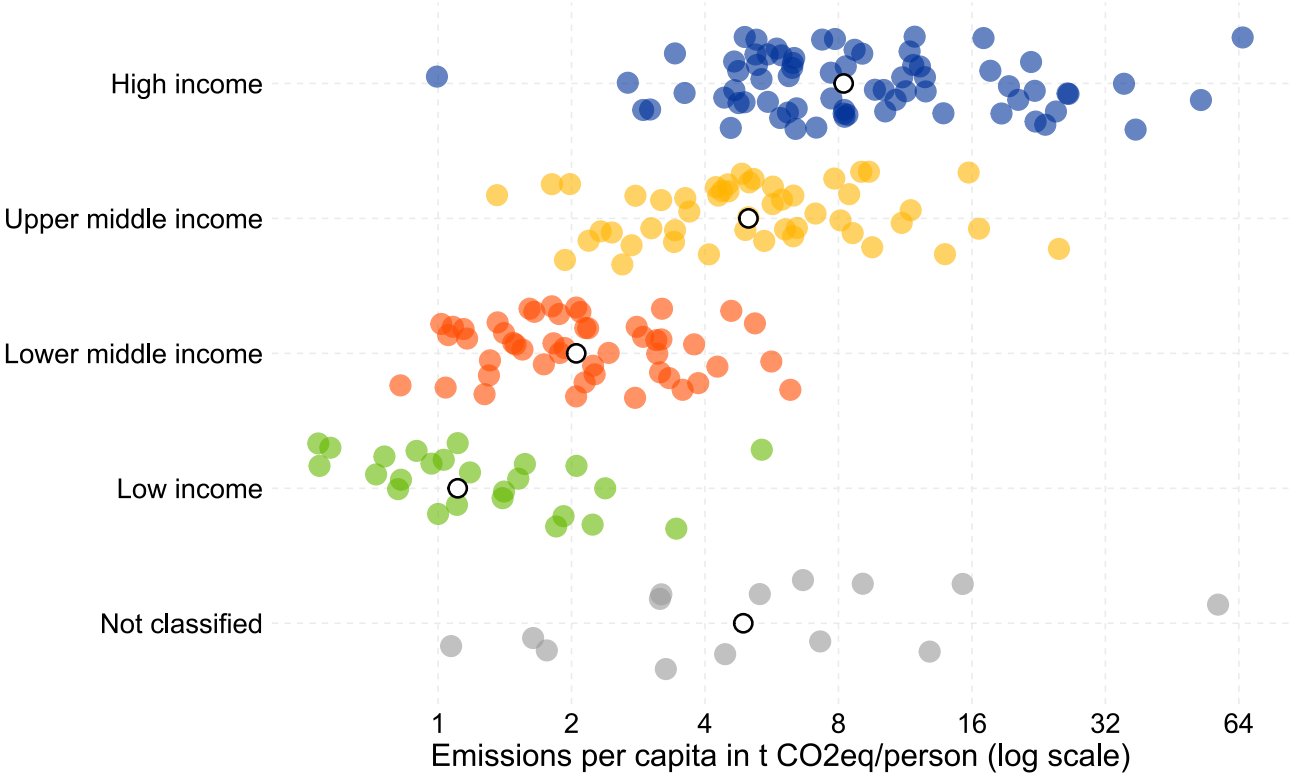


Notes: Growth rate of GHG emissions over time, in percent. Each lines shows the 5-year leading moving average, colored by region, with points indicating the underlying year-on-year growth rates. GHG emissions include CO2 (fossil only), CH4, N2O and F-gases.
Sources: EDGAR[2] and own calculations.

Main insights:

- Global deceleration, but still growing: Over the last 15 years, GHG emissions growth rates have decelerated across all regions. However, global emissions grew by 1.9% in 2023 and the global 5-year moving average (MA) remains positive throughout the period, reflecting continued emissions growth worldwide.
- Negative growth in EU and EA: The 5-year moving average for emissions growth has been negative in the EU and EA since 1981, for 2023 we observe a change of 1.9%.
- Impact of global crises: Significant global reductions were observed only during major crises, such as the global financial crisis and COVID-19 pandemic. In 2020, GHG emissions decreased by -3.8% worldwide and even stronger in the European Union (-7.9% and the Euro Area (-8.8%).

Chart 2: **Comparison of countries' GHG emissions per capita aggregated according to the World Bank income groups.**



Notes: Emissions per capita in 2023, in tons of CO2eq/person (log scale). Individual countries are sorted and colored by income group, with black circles denoting the median value for each group. GHG emissions include CO2 (fossil only), CH4, N2O and F-gases.
Sources: EDGAR[2], World Bank[3], and own calculations.

Main insights:

- Per capita emissions across income groups: Median per capita emissions increase steeply with income, from 1.11 t CO2-eq per person in low-income countries, to 2.05 in lower-middle income, 5.01 in upper-middle income, and 8.22 in high-income countries.
- Stark differences: All low and lower-middle-income countries fall below the high-income median of 8.22 t CO2-eq per person and – except for one outlier – per capita emissions across high-income countries are above the median of the lower-middle income group (8.22 t CO2-eq per person).
- Variation increasing with income: Upper-middle and high-income groups exhibit broader within-variation in emissions.

Chart 3: **Contribution of individual countries and continents to total world GHG emissions.**

Notes: Contributions of countries to total global GHG emissions in 2023. The size of each rectangle, relative to the full area, reflects each country's contribution, sorted and colored by continent.
Sources: EDGAR[2] and own calculations.

Main insights:

- Continents: Asia is the largest contributor to global GHG emissions in 2023, accounting for 59.6%, followed by the Americas (19.7%), Europe (13.1%), and Africa (6.2%). Oceania contributes the least at 1.3%.
- Country-level contributions: Individual countries play a disproportionate role, with China contributing 30.8%, followed by the USA (11.5%), India (8%), Russia (5.2%), and Brazil (2.5%).
- Political implications: Decisions by the top-emitting countries, especially China, the USA, and India, are crucial for any effective global mitigation strategy. Coordinated international policies targeting high-emission regions could lead to significant reductions, given their outsized impact on total emissions.

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