The Climate Crisis and Global Inequality

Online Master on Degrowth 2022

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What is inequality?

Different types of inequality

Inequality of what?

- Climate change impacts and vulnerability
- Income, wealth, infrastructure, capabilities, resource use
- Responsibility for ecological damage (e.g. emissions)

Types of variables:

- Stock (e.g. wealth, C02 level of the atmosphere)
- Flow (e.g. income, annual emissions)

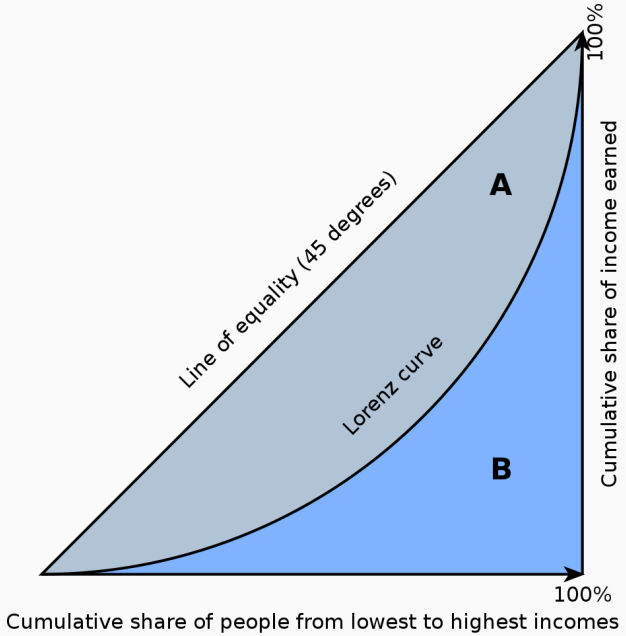
Inequality amongst whom?

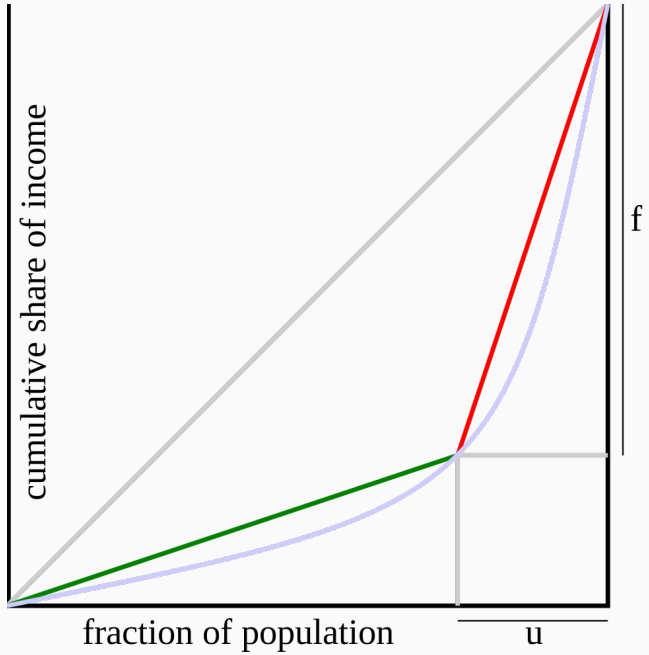
- Between nations
- Between individuals (within nations or global)

Measuring inequality

The Gini Coefficieng G is a measure of inequality of a variable x amongst n people. The fraction of people u owns a cummulative share of f.

$$G = \frac{A}{A+B} = \frac{\sum_{i=1}^{n} \sum_{j=1}^{n} |x_i - x_j|}{2n^2 \bar{x}}$$

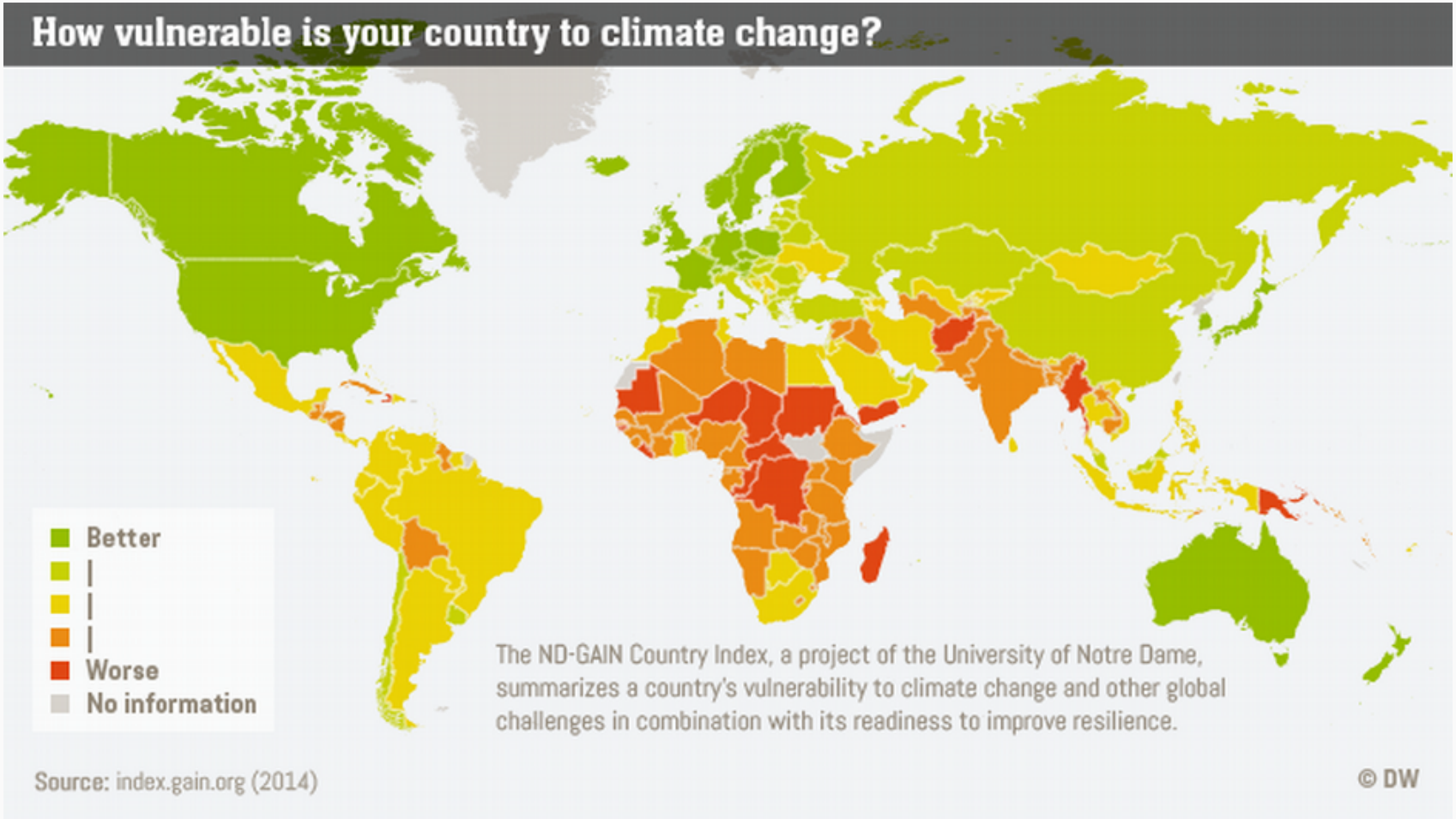




Source: `https://en.wikipedia.org/wiki/Gini_coefficient`

Visualizing inequality

Vulnerability to climate change

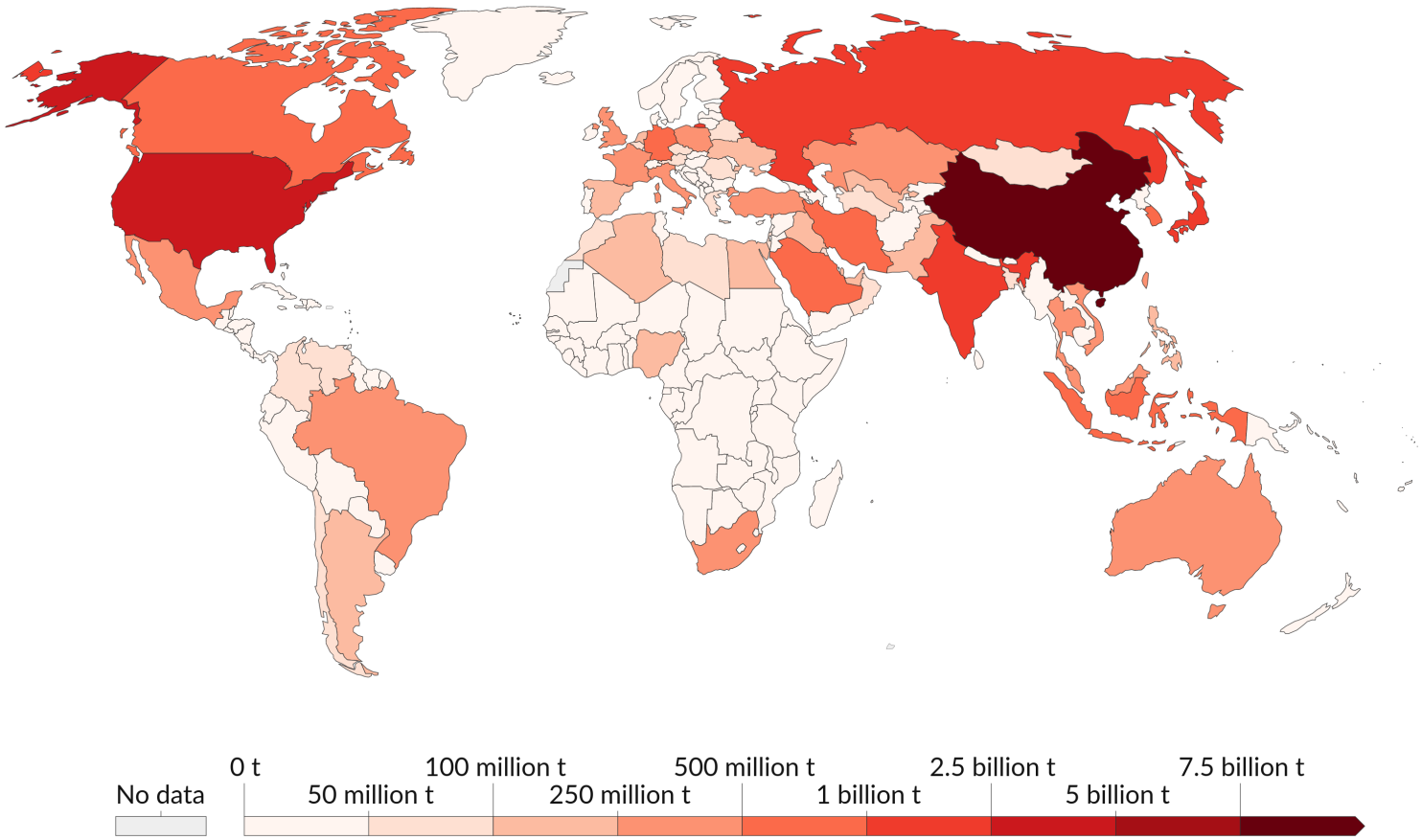


Annual CO2 emissions

Annual CO_2 emissions, 2020

Carbon dioxide (CO_2) emissions from the burning of fossil fuels for energy and cement production. Land use change is not included.

Our World in Data



Source: Global Carbon Project

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions/ • CC BY

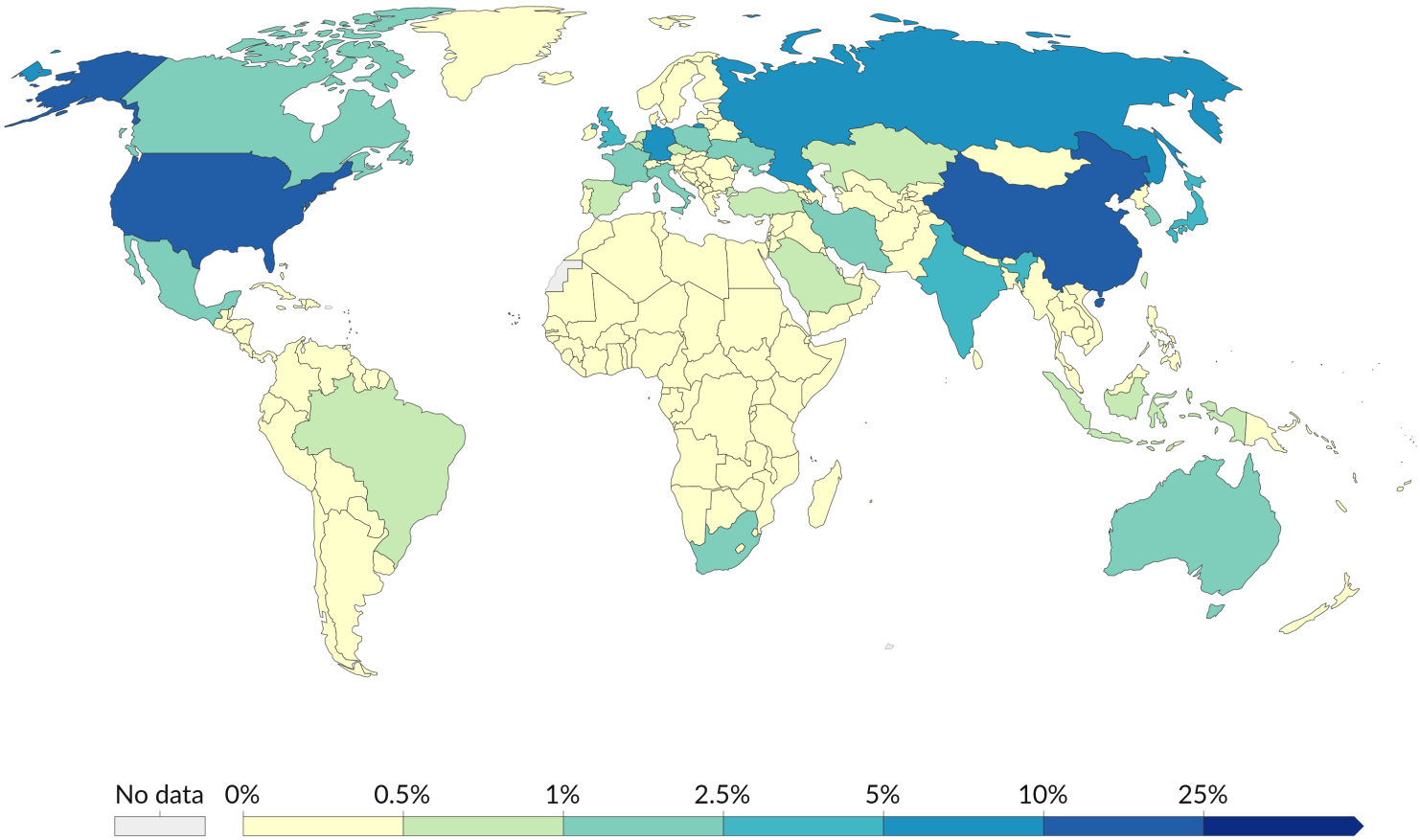
Note: CO_2 emissions are measured on a production basis, meaning they do not adjust for emissions embedded in traded goods.

Cummulative CO2 emissions

Share of global cumulative CO_2 emissions, 2020

Each country or region's share of cumulative global carbon dioxide (CO_2) emissions. Cumulative emissions are calculated as the sum of annuals emissions from 1750 to a given year.

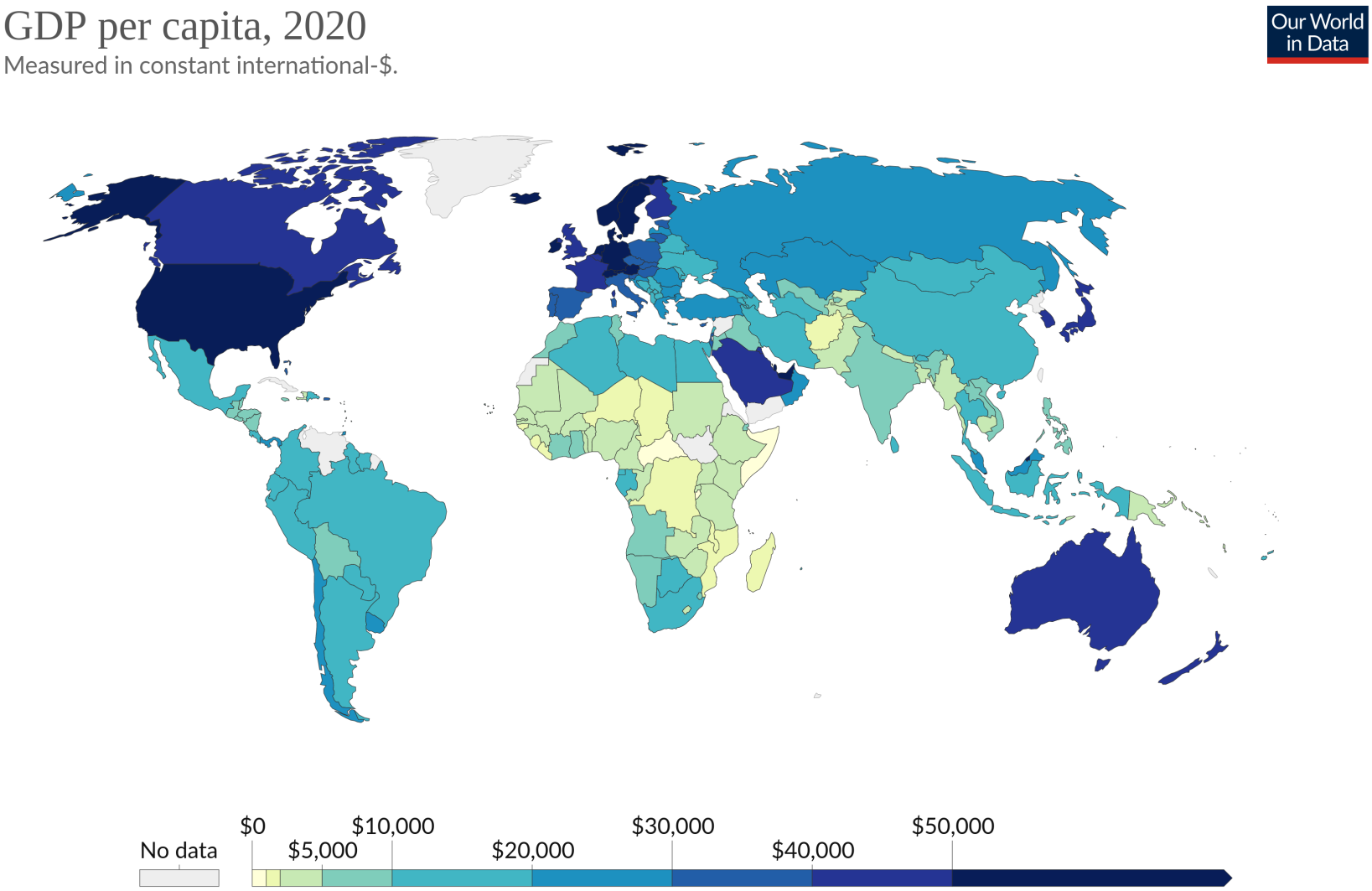
Our World in Data



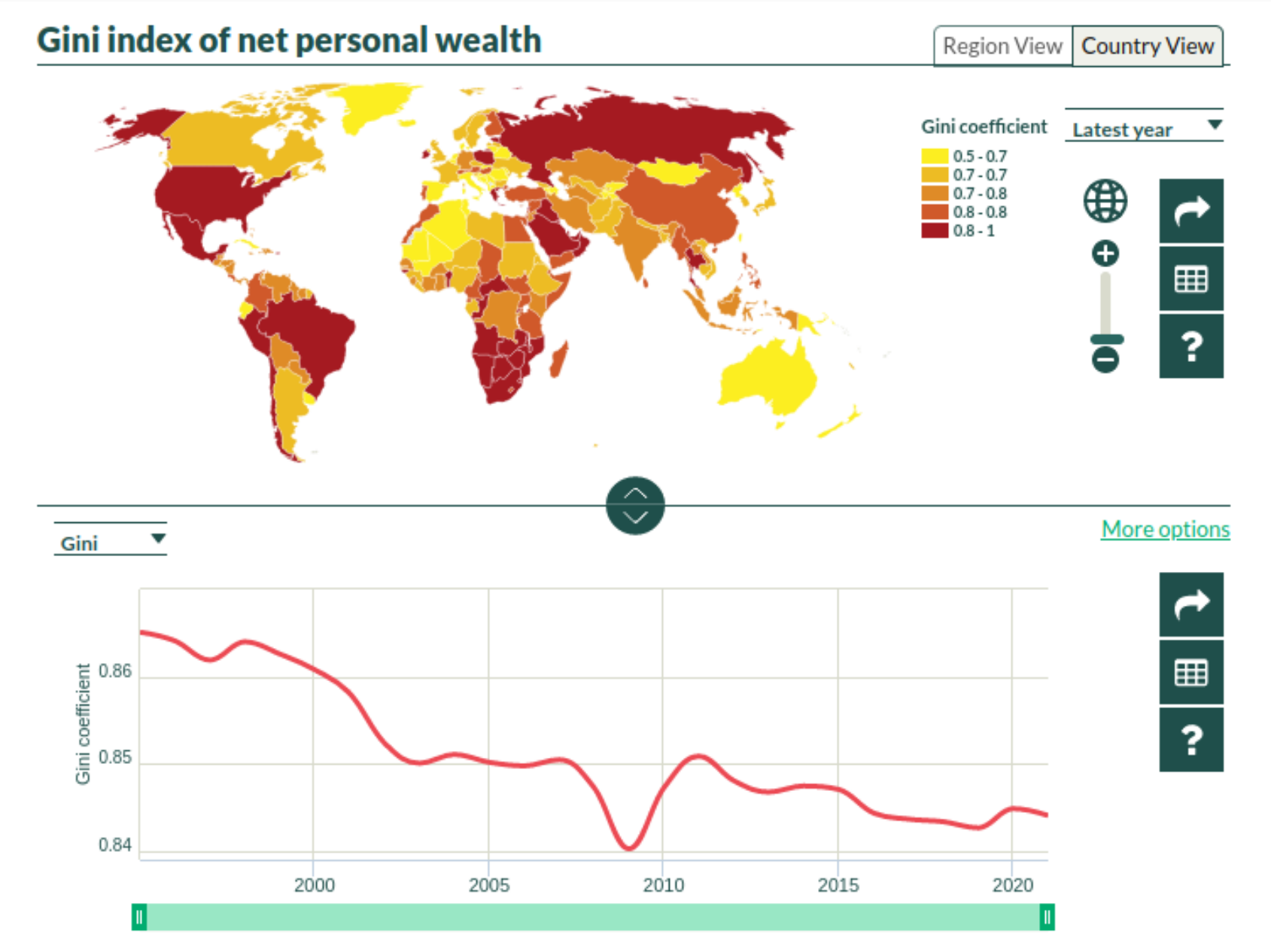
Source: Our World in Data based on the Global Carbon Project

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY

GPD per capita

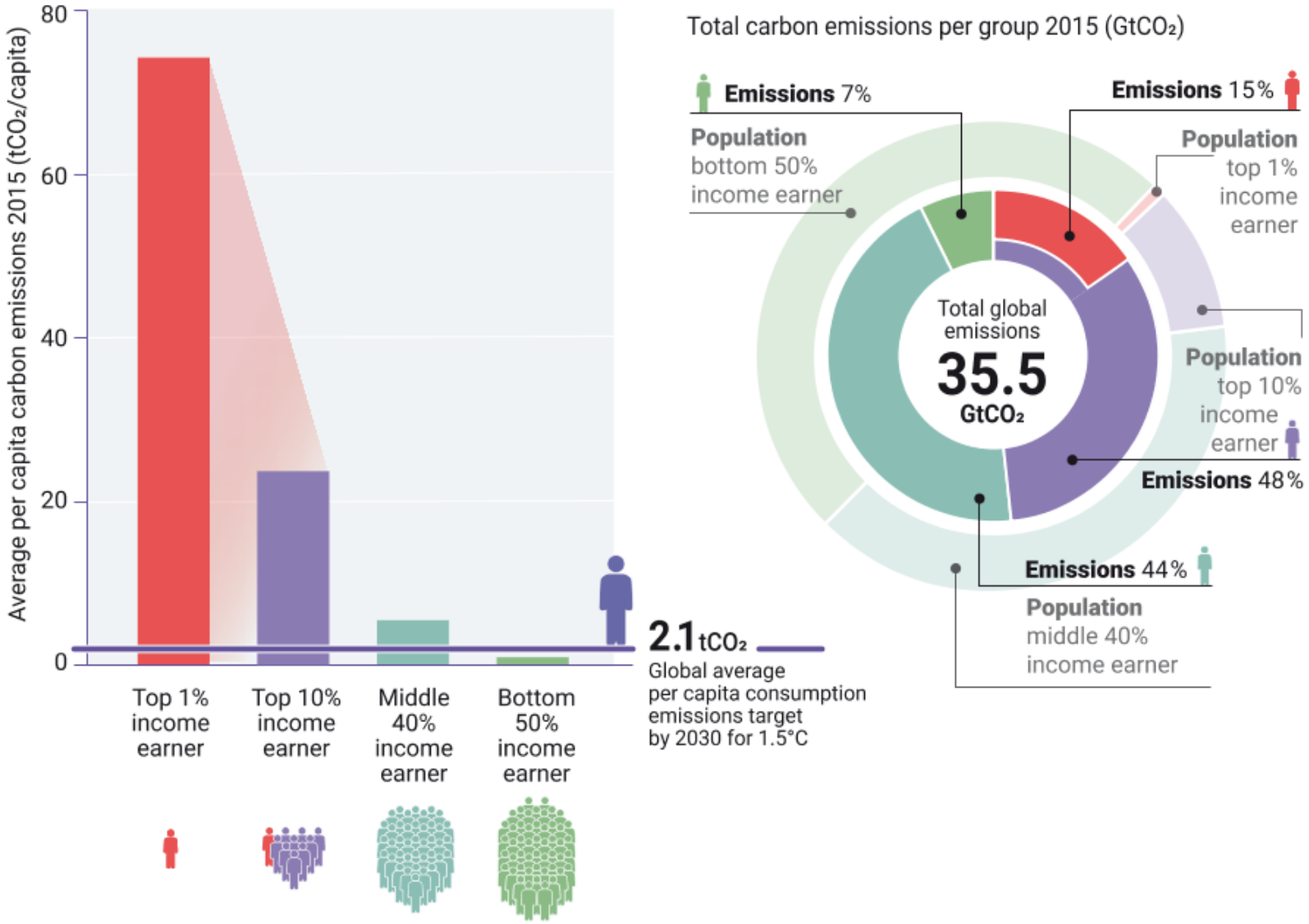


Wealth inequality (Source: wid.world)



Emissions by income group [Capstick et al., 2020]

Figure 6.1. Per capita and absolute CO_2 consumption emissions by four global income groups in 2015



Climate-inequality models

What can be modeled?

Possible questions:

- **What is the situation?** Analysis of distributional data like shown above.
- **What could be the situation?** Analysis of hypothetical distributional data. E.g. energy demand if all income where equal [Oswald et al., 2021].
- **What should happen?** Normative models on climate justice, calculating fair shares. E.g.: `https://climateactiontracker.org/methodology/cat-rating-methodology/fair-share/`
- **What will happen?** Simulation models with disaggregated populations.
  - Aggregate income groups [Budolfson et al., 2021]
  - Individuals or households (agent-based models, next class)

Inequality and the IPCC

The 2018 IPCC report on 1.5°C [Masson-Delmotte et al., 2018] regards inequality through the sustainable development goals (SDGs), discussing trade-offs and co-benefits between the goals of climate mitigation, income growth, poverty reduction, etc.

The 2021 IPCC report on the physical science basis of climate change [Masson-Delmotte et al., 2021] shows regional distribution of climate impacts. The rest of the 2021 report is yet to be released.

What is missing: No matter the policy, limited carbon budgets imply an extremely low budget per person in poorer countries. High inequality implies a higher level of technological improvements that would be necessary to achieve decent living standards for all, and thus makes just mitigation more difficult (if not impossible).

Modeling exercise

Link to the repository:
`https://github.com/JoelForamitti/ses_modeling_course`

Link to open the interactive notebooks in the browser:
`https://mybinder.org/v2/gh/JoelForamitti/ses_modeling_course/HEAD`

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