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Addressing Inequality Under Climate Change:
Issues in Measurement and Policy

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• Economic inequality remains very large globally & is on the rise in major economies

• Climate change tends to exacerbate economic inequality trends

• How to address inequality on a warming planet?
Global economic inequality today

**Figure 1** Global income and wealth inequality, 2021

**Interpretation:** The global 50% captures 8% of total income measured at Purchasing Power Parity (PPP). The global bottom 50% owns 2% of wealth (at Purchasing Power Parity). The global top 10% owns 76% of total Household wealth and captures 52% of total income in 2021. Note that top wealth holders are not necessarily top income holders. Incomes are measured after the operation of pension and unemployment systems and before taxes and transfers. **Sources and series:** wir2022.wid.world/methodology.

Source: Chancel et al. 2022
Inequality is rising since the 1980s at different speeds: policy matters

Source: Chancel et al. 2022
How does climate change intersect with economic inequality?
Many forms of environmental inequalities

- Pollution ultimately about winners and losers (Boyce, 2002)
- Different dimensions: impacts, contributions, capacity to act.
- Different scales: global, national, local.
- Different metrics: monetary, physical, socio-demographic.

⇒ Burgeoning field in quantitative social sciences. Yet environmental/carbon inequality is still missing from most official statistics.
Next slides draw on recent work on climate inequality


The Triple Climate Inequality Crisis

Global carbon inequality: Losses vs. emissions vs. capacity to finance

Source: Chancel, Bothe and Voituriez (2023)
Unequal losses
Climate change tends to exacerbate inequality between countries

GDP change relative to no climate change scenario (1991-2010)
Source: Diffenbaugh and Burke (2019)
Poorest groups tend to be more exposed and more vulnerable within countries

Image source: AFP/AsianAge
Bottom 40% estimated to lose 70% more than average in developing countries

Climate-induced income loss for bottom 40% by 2030

Source: Hallegatte & Rozenberg (2018)
Effects of heat exposure on mental health
Marginal effect of heat exposure (>30°C) on the prob. of reporting mental health issues (in p.p.)
Source: Obradovich et al. (2018)
Standard approaches to measuring climate risk can lead to mistargeting.

Economic value at risk of flooding
Source: Rentschler, Salhab, and Jafino (2022)
Factoring in poverty is key to effective risk assessment

Population share exposed to flood risk & below $1.90 threshold

Source: Rentschler, Salhab, and Jafino (2022)
Unequal losses: summing up

- Need for more granularity (spatially & across the distribution).
- Need for more combination of monetary and non-monetary metrics $\Rightarrow$ interdisciplinarity.
- Challenge ahead: real time estimates & forecasts; joint distribution of consumption, income, capital.
Unequal contributions
The Triple Climate Inequality Crisis: Unequal Contributions

Global carbon inequality:
Losses vs. emissions vs. capacity to finance

Source: Chancel, Bothe, and Voituriez, 2023
Unequal historical emissions between countries

**What has been emitted (1850-2020)**

- North America (27% of the total)
- Europe (22%)
- China (11%)
- South S.E. Asia (9%)
- Russia Cent. Asia (9%)
- Other East Asia (6%)
- Latin America (6%)
- MENA (6%)
- Sub Sah. Africa (4%)

**Remaining budget...**

- To stay below +2°C: 900 billion tonnes CO2
- To stay below +1.5°C: 300 billion tonnes CO2

**Interpretation:** The graph shows historical emissions by region (left bar) and the remaining global carbon budget (center and right bars) to have 83% chances to stay under 1.5°C and 2°C, according to IPCC AR6 (2021). Regional emissions are net of carbon embedded in imports of goods and services from other regions. **Source and series:** Chancel (2021). Historical data from the PRIMAP-hist dataset.

**Historical emissions vs. remaining carbon budget**
Inequalities in average emissions between regions

Average per capita emissions across regions, 2019
Inequalities in emissions between world individuals

Shares of emissions by group (% total)

Global GHG emission shares by group according to various studies
Reducing emissions at the top can free up significant development space

Source: Authors based on Bruckner et al. (2022)
Large shift in between vs. within carbon inequality since 1990

Figure 6A. Global carbon inequality: within vs. between Theil decomposition, 1990-2019

Notes: Personal carbon footprints include emissions from domestic consumption, public and private investments as well as imports and exports of carbon embedded in goods and services traded with the rest of the world. Modeled estimates are based on the systematic combination of tax data, household surveys and input-output tables. Emissions split equally within households. Benchmark scenario. Error bars show estimates for extreme scenarios values. Source and series: Author, see Methods and Supplementary Information.
Unequal decarbonization dynamics

Growth in emissions by global emitter group (1990-2019)

**Source:** Chancel 2022
How to distribute emissions across individuals?

• Direct emissions are relatively straightforward to attribute. What about those associated with production processes?

• Carbon footprinting relies on two key criterion: comprehensive attribution (direct+indirect) exclusive attribution (no double counting). (IPCC 2022, Working group III, Annex I p. 1796)

• Standard approach: distribute all emissions to consumers (Chakravarty et al., 2009; Chancel and Piketty, 2015; Hubacek et al., 2017; Lenzen et al., 2006; Pottier, 2022).

• What about role of investments? Or limited information or agency of consumers?
Consumption approach: US top 10% ~ 50tCO2e/cap

Per capita emissions by group in the US (consumption approach), 2019

Source: Chancel and Rehm 2023
Ownership approach: US top 10% = 100tCO2e/cap

Per capita emissions by group in the US (ownership approach), 2019

Source: Chancel and Rehm 2023
Direct emissions are dwarfed by asset ownership at the top

Breakdown of emissions by wealth group in the US, 2019
(Ownership approach)

Source: Chancel and Rehm 2023
Ownership emissions intensity appears to rise with wealth

![Graph showing ownership emissions intensity vs wealth percentile group](chart.png)

Emissions intensity of assets, US, 2019

**Source:** Chancel and Rehm 2023
Mixed approach: US top 10% ~ 70tCO2e/cap
• Mixed approach used in global carbon inequality trends presented above (from "Global Carbon Inequality over 1990-2019", *Nature Sustainability*).
Unequal contributions: summing up

- Consumption approach useful, but not sufficient
- Better measuring emissions associated with wealth is key
- Incidence of carbon taxes and regulations: still a lot of work to be done
Unequal capacities
The Triple Climate Inequality Crisis: Unequal Capacities

Global carbon inequality:
Losses vs. emissions vs. capacity to finance

- **Relative Losses**
- **Emissions**
- **Capacity to finance (wealth ownership)**

Share of world total

- **Bottom 50%**: 75% Relative Losses, 12% Emissions, 2% Capacity to finance
- **Middle 40%**: 41% Relative Losses, 22% Emissions, 22% Capacity to finance
- **Top 10%**: 76% Relative Losses, 48% Emissions, 3% Capacity to finance

Source: Chancel, Bothe, and Voituriez, 2023
Wealth inequality is extreme everywhere

**Figure 4**
*The extreme concentration of capital: wealth inequality across the world, 2021*

*Source: Chancel et al. 2022*

*Interpretation:* The Top 10% in Latin America captures 77% of total household wealth, versus 22% for the Middle 40% and 1% for the Bottom 50%. In Europe, the Top 10% owns 58% of total wealth, versus 38% for the Middle 40% and 4% for the Bottom 50%. **Sources and series:** wir2022.wid.world/methodology.
Global climate finance gap: under funding of green vs. over funding of brown sectors

- Annual current climate finance: $\sim 1\%$ global GDP ($1.3tn$) (CPI 2023)

- Annual climate finance needs $\sim 5-6\%$ global GDP ($8tn$) (CPI 2023)

- Annual fossil fuels investments: $\sim 0.8\%$ global GDP ($1tn$) (CPI 2023); Annual fossil fuels subsidies: $\sim 1\%$ global GDP ($1.3tn$) (IMF 2023)
Adaptation finance gap: a fraction of the climate finance gap

- Adaptation finance needs in Global South: \( \sim 0.15\% \) global GDP ($200bn)
- Current adaptation finance in Global South: \( \sim 0.05\% \) GDP ($60bn)
Bridging the adaptation gap

**Figure E:** Filling the adaptation funding gap in developing countries

**Notes:** A relatively modest progressive wealth tax on global centimillionaires could fill the adaptation funding gap. See Figure 38 for more information.

**Source:** Chancel, Bothe, and Voituriez, 2023
Going beyond adaptation finance

- Climate finance needs in Global South by 2030: \( \sim 1-2\% \) global GDP / year

- This is equivalent to a 0.5% annual wealth tax on assets of Global North (or 3% income tax)

- Current development aid from Global North: 0.1% of Global North’s wealth (\( \sim 0.5\% \) of its income) / year
What role for public vs. private actors in the transition?

Source: Chancel, Piketty, Saez and Zucman 2022
Unequal capacities: summing up

• Statistical agenda: Better real-time monitoring of intersections between inequality of losses, contributions, and capacities is paramount ⇒ UN SNA revision + academic initiatives.

• Economic policy agenda: Mitigation and adaptation underfunded by and large. How to scale-up climate finance & what breakdown between public vs. private?

• Investment choices made now will not only define ecological state of the world, they will also impact future economic inequalities.