C3A Annual Symposium
December 2-6, 2024
World Bank Paris

SESSION 3: Tipping finance, economics and society amid the climate crisis

C3A, a World Bank program funded by the Climate Support Facility

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Session 3

Tipping finance, economics and society amid the climate crisis

Chair: Simon Sharpe
C3A, S curve economics

Tim Lenton
Exeter University

Luiz Pereira Da Silva
Getúlio Vargas Foundation

Stephane Straub
World Bank, Chief Economist, infrastructure

Vera Songwe
Co-chair of the HLEG on Climate Finance

University of Exeter | Global Systems Institute

Tipping points

Tim Lenton

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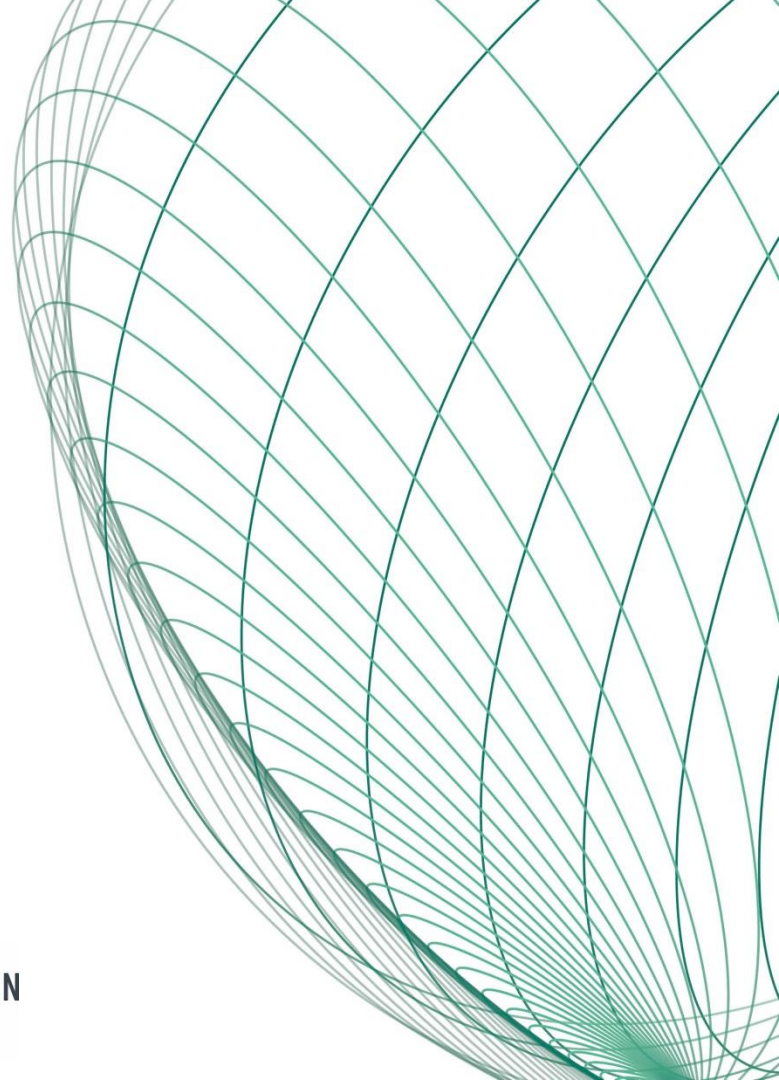
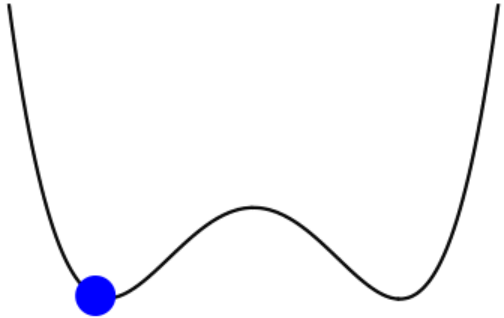


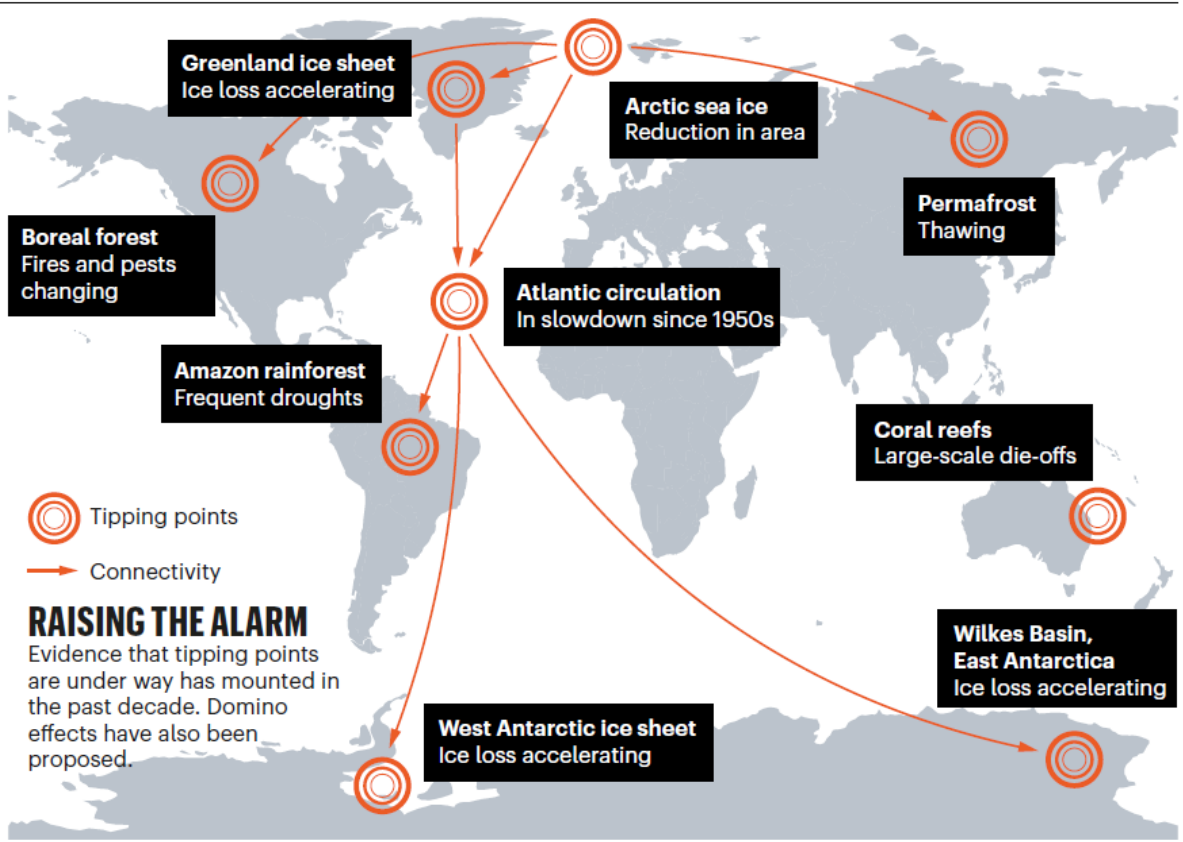
exeter.ac.uk/gsi

EARTH COMMISSION
GLOBAL COMMONS ALLIANCE

Passing a tipping point

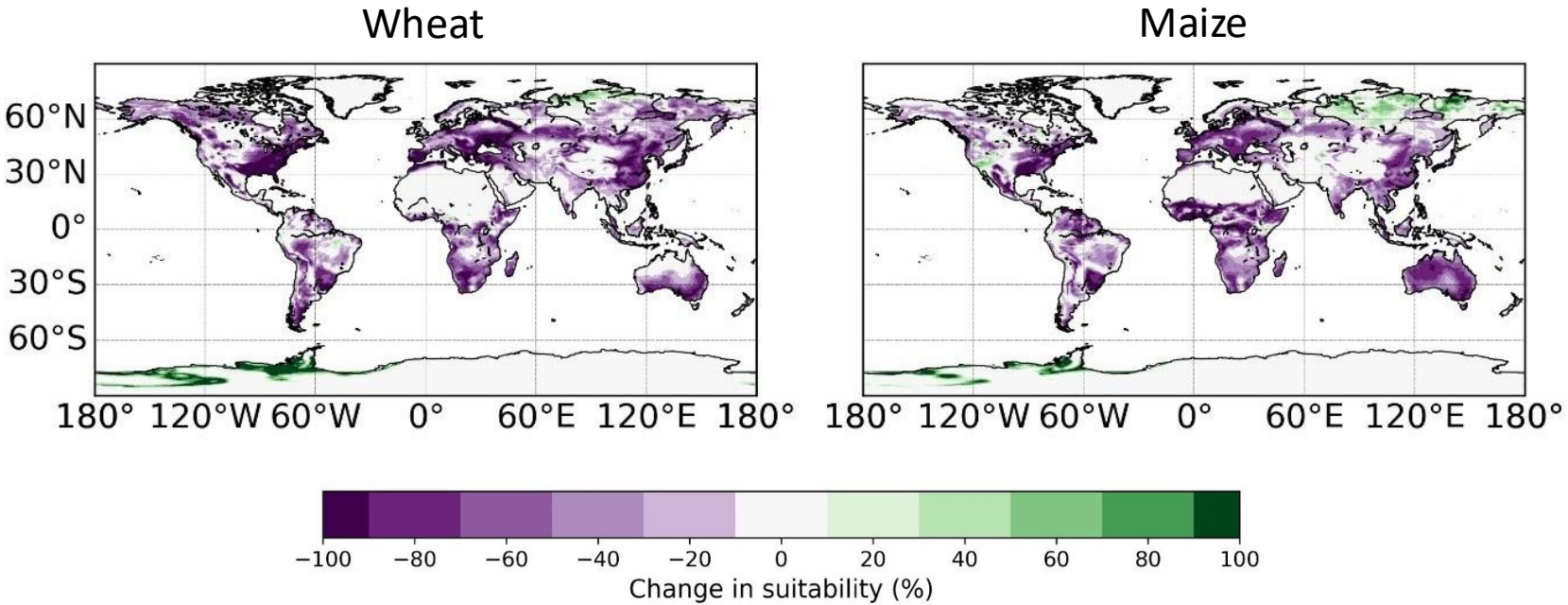


Thanks to Chris Boulton for the animation



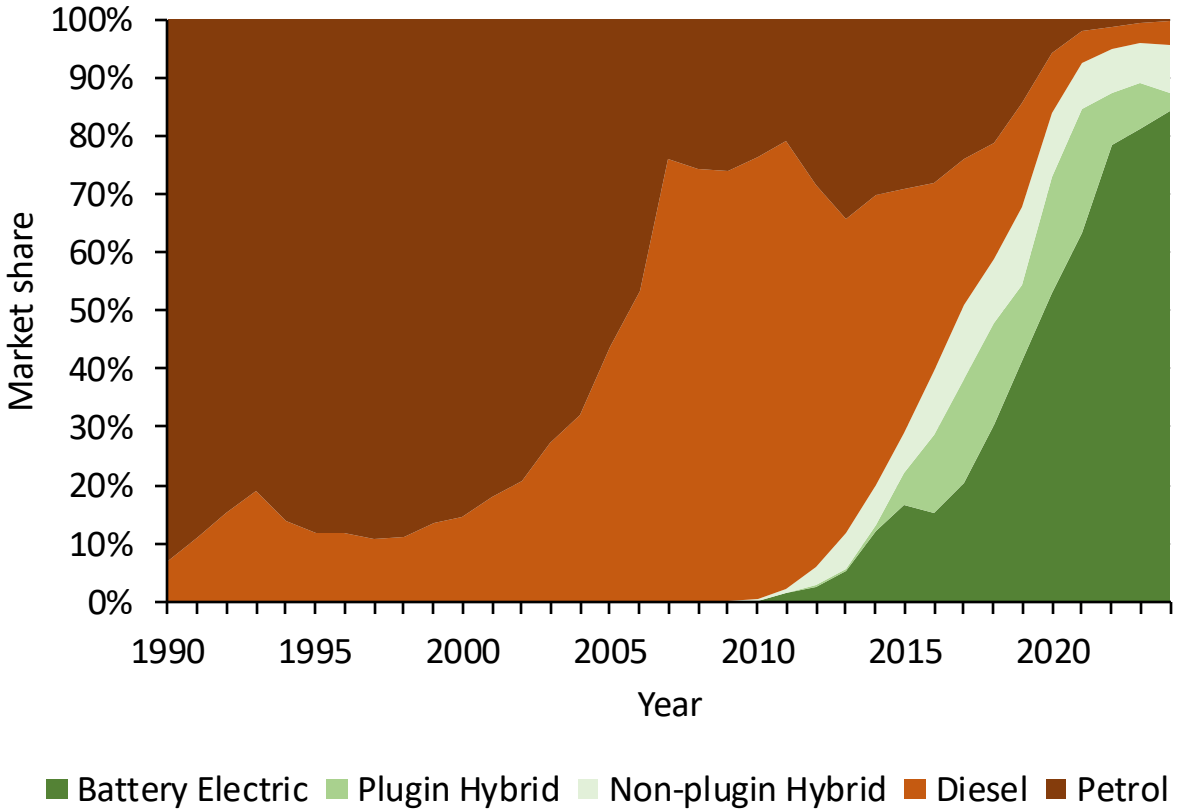
Lenton et al. (2019) *Nature*

Change in suitability for growing staple crops



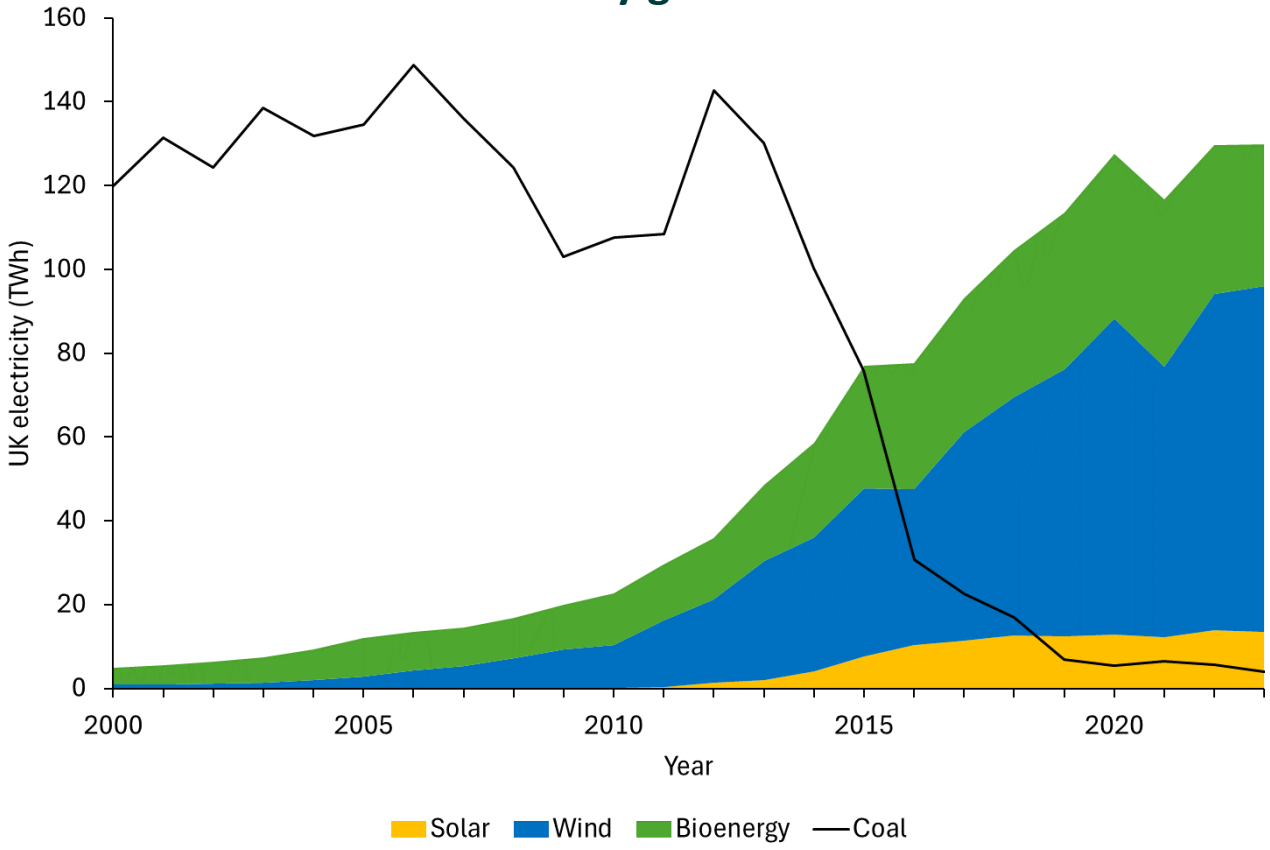
Lenton et al. (contribution to OECD report 2022)

Norwegian car sales



Inspired by Robbie Andrew, data from SVV/OFV

UK electricity generation



Updated from Sharpe & Lenton (2021) *Climate Policy*

Summary

- *How significant are tipping points for the pace of change in the climate system?*
  - Very significant – and they pose existential risks to e.g. food production
- *What grounds are there for believing that tipping points also exist in economic systems?*
  - Ample grounds – a century of research, plus recent examples

global-tipping-points.org

To find out more: tippingpoints@exeter.ac.uk

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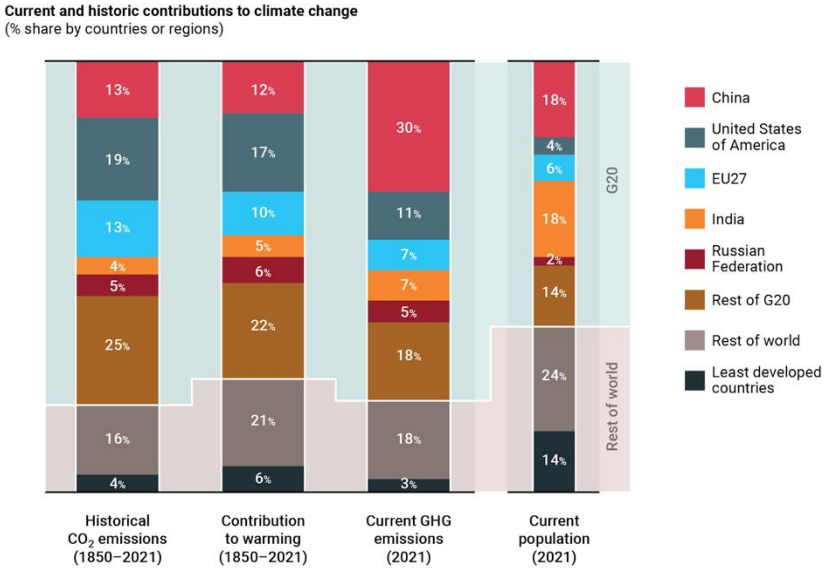
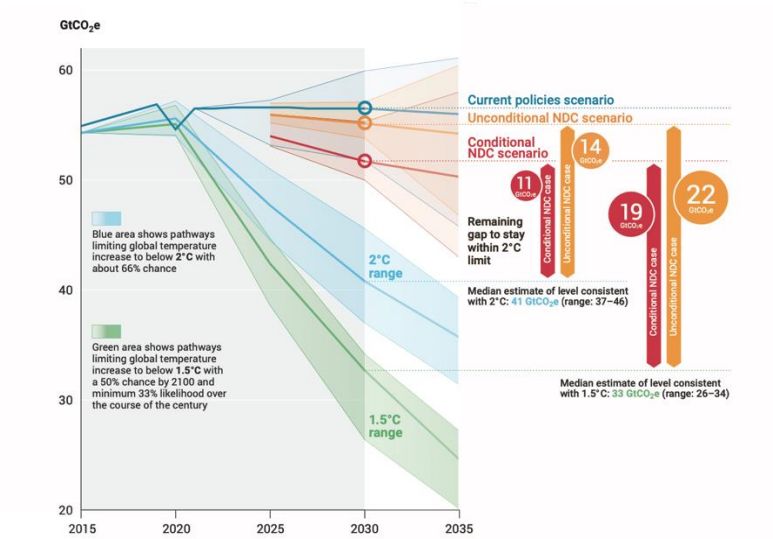
Global Contributions to Climate Change and Emission Pathways: Historical, Present, and Future Scenarios – Vera Songwe

Least Developed Countries (LDCs): Contribute only 3-4% to both historical and current global emissions, despite representing 14% of the population.



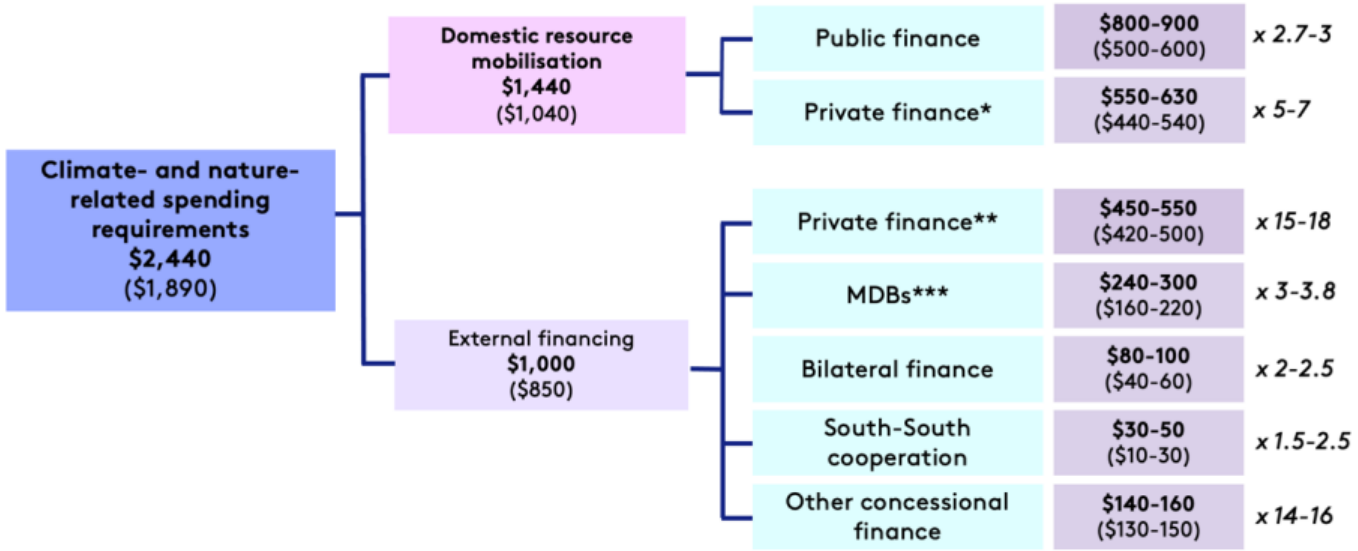
Source: Emissions Gap Report 2023

Emissions Gaps and Scenarios: How Far We Are from Meeting 1.5°C and 2°C Climate Targets.



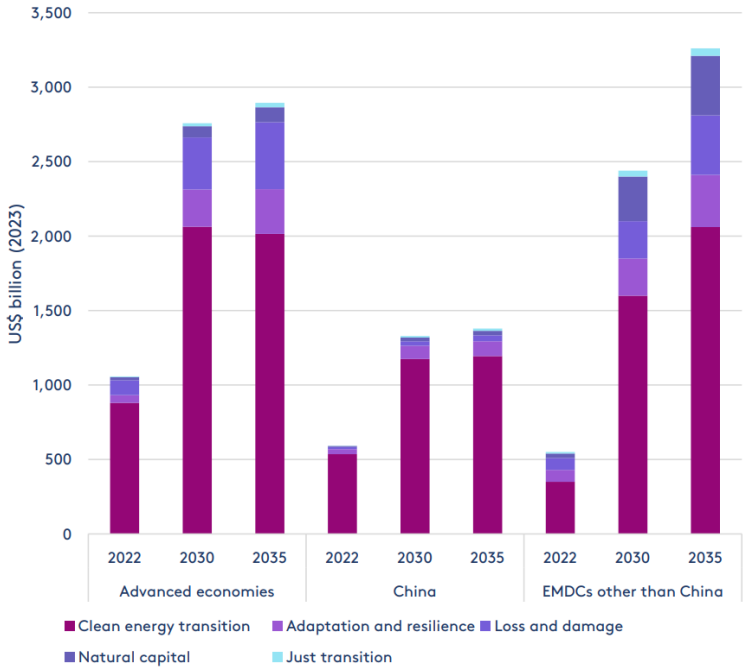
Source: Emissions Gap Report 2023

Mobilising the necessary financing for the green transition ($ bn/yr by 2030, increment from current in parentheses)

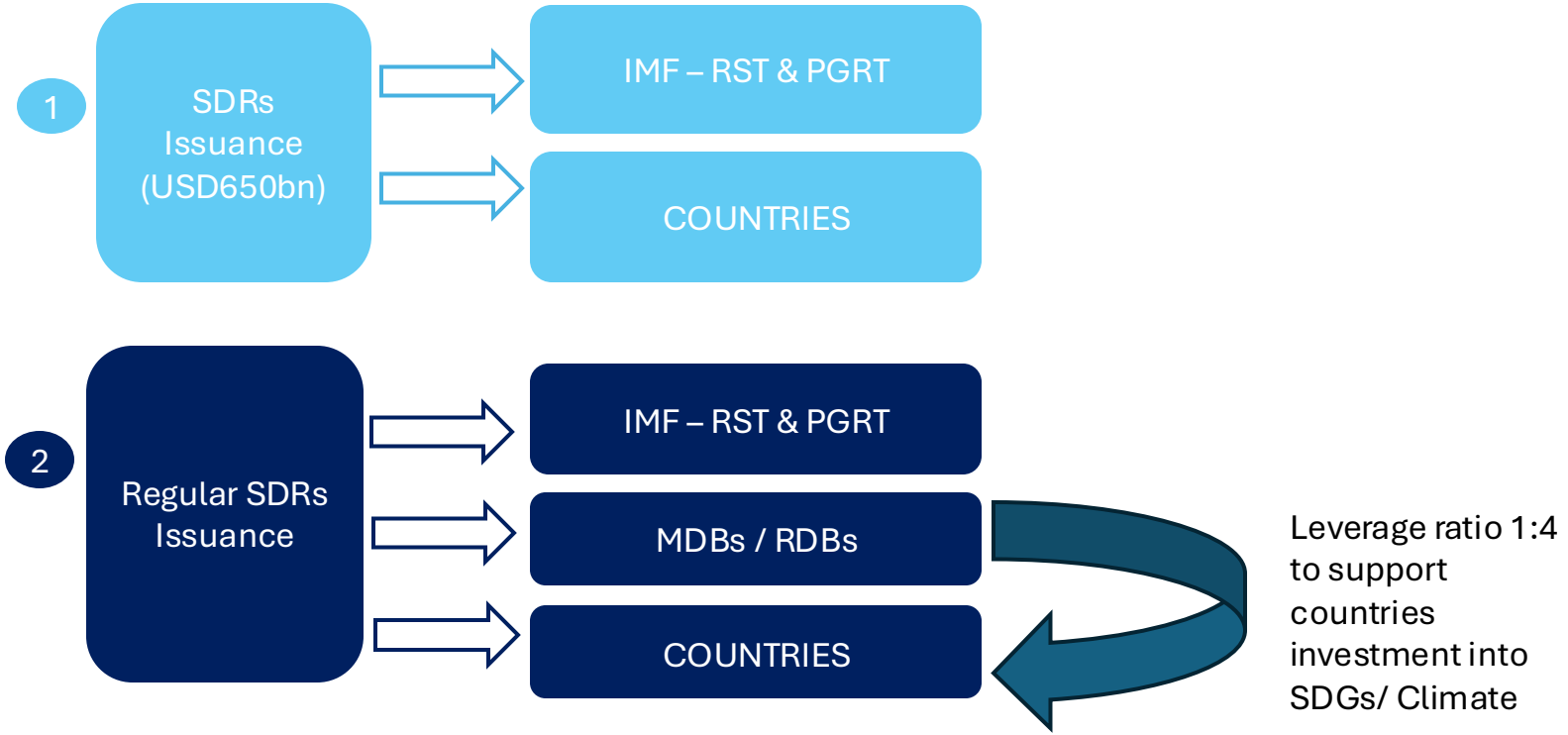


Notes: *Includes household savings. **A significant proportion of this private finance would be directly and indirectly catalysed by MDBs, other development finance institutions and bilateral finance. ***Includes multilateral climate funds.

Total climate investment needs by economic regions for 2030 and 2035

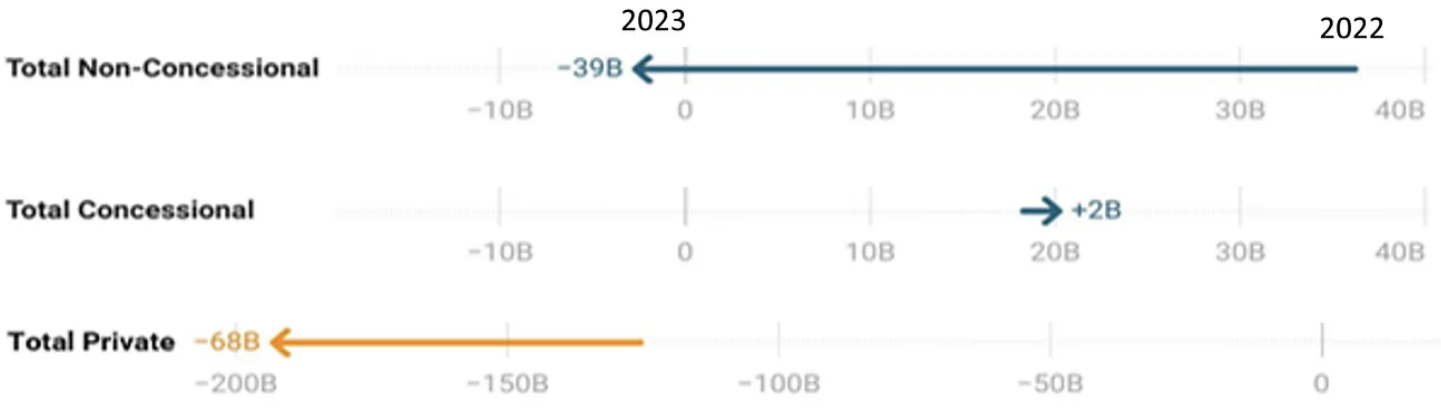


Unlocking Global Liquidity: Strategic Deployment of SDRs Through IMF and Development Banks



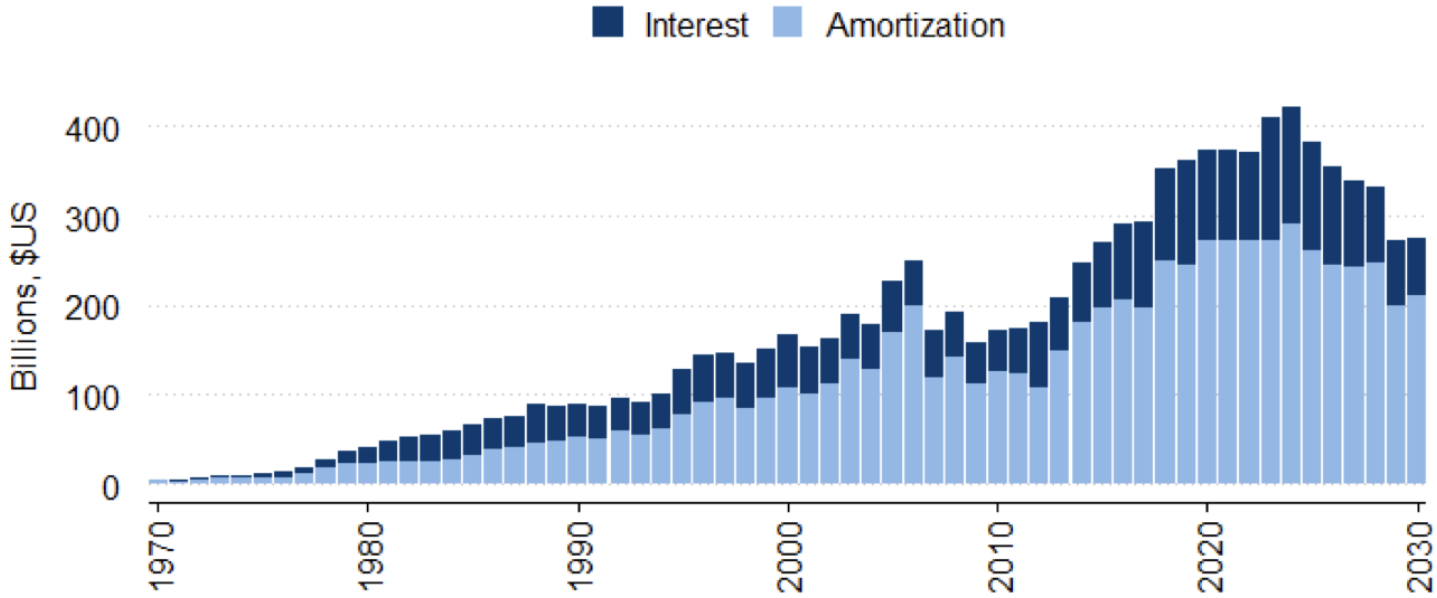
Capital Outflows Surge in 2023: A Snapshot of Developing Countries' Financial Trends

Figure ES1: Capital outflows from developing countries intensified during 2023 (shown in billion US$)



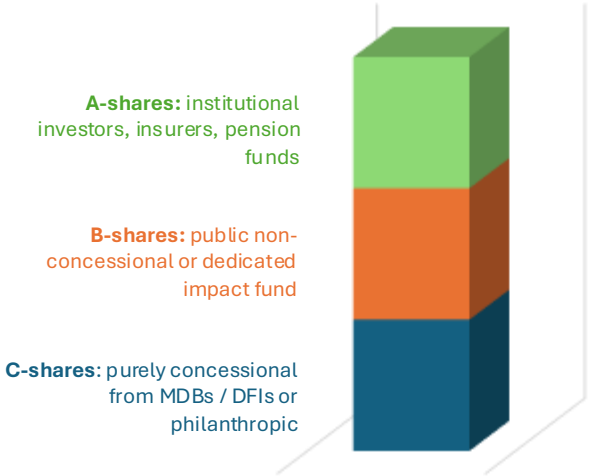
Source: IEG Core team estimates (Figure 1)

Rising Debt Service Burden: Trends in Interest and Amortization Payments (1970–2030, USD Billions



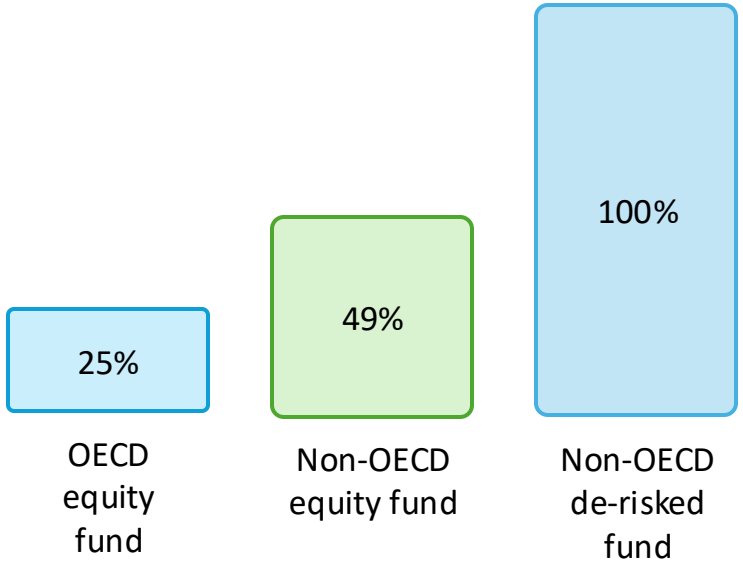
Source: Kharas & Rivard, 2024. PPG debt service, current US$, data excludes China

De-risked blended funds regarded as “securization”



Typical blended finance fund’s “tranchage”

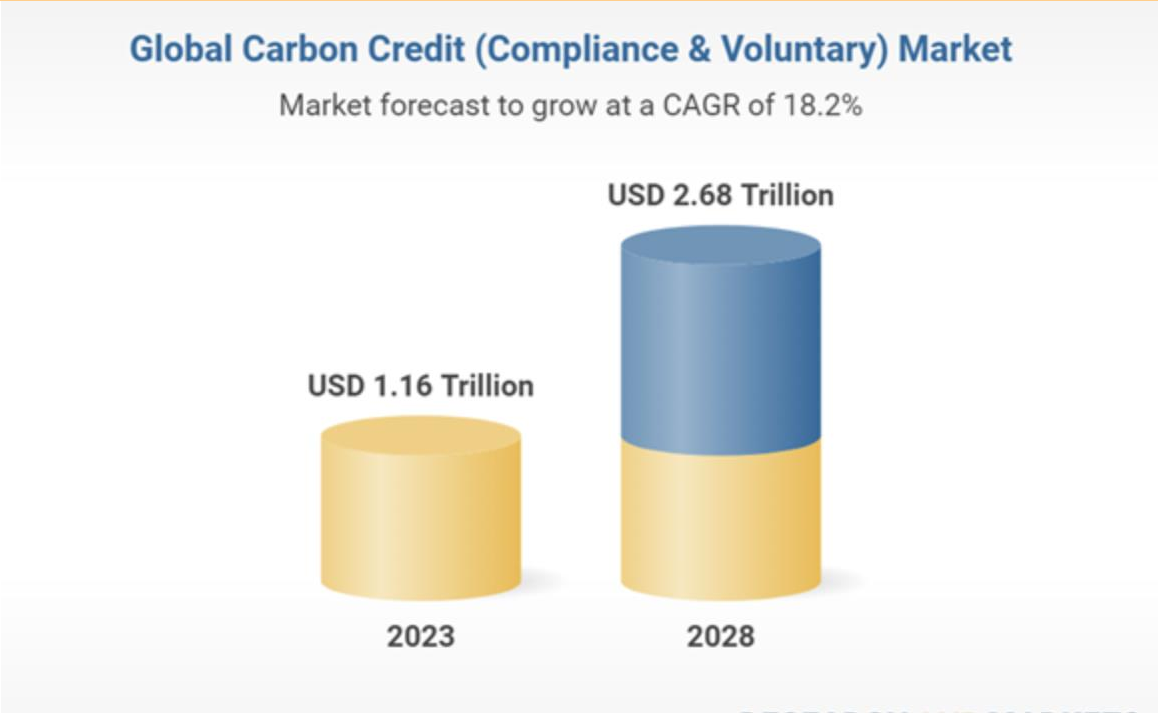
Capital provision for insurers, imposed by Solvency II, when they invest in…



The insurer has to keep a capital buffer twice more important … when the fund is de-risked !!

Source: 4P presentation

Carbon Market VCM vs compliance



Forecasted market growth 2023–2028, source: Global Carbon Credit Market: Analysis by Traded Value, Traded Volume, Segment, Project Category, Region, Size and Trends with Impact of COVID-19 and Forecast up to 2028

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Climate Change and Challenges for Financial Sector Stability and Macroeconomic Policies

Luiz Awazu Pereira da Silva
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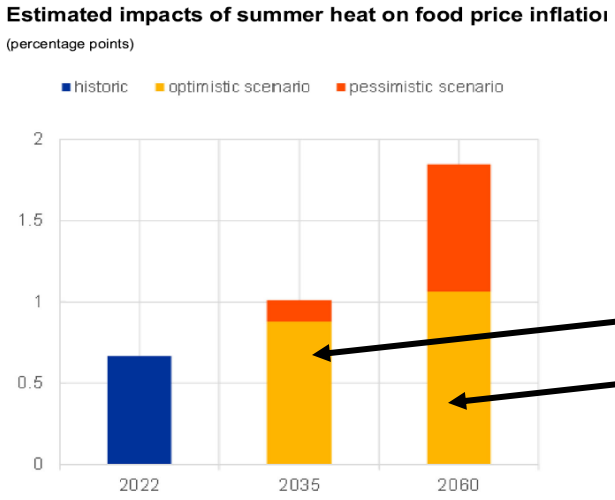
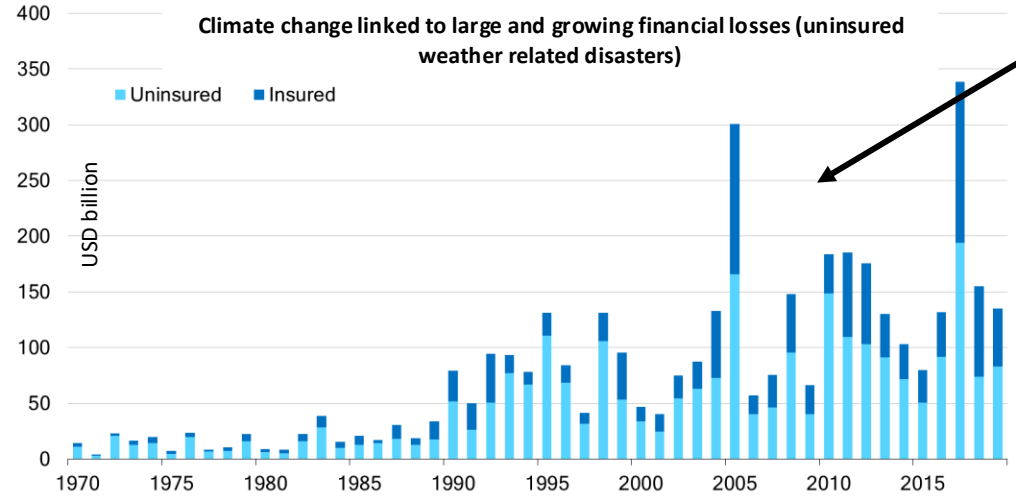


Source: Kuik Friderike, Christiane Nickel, Miles Parker and Wolfgang Modery" The price of inaction: what a hotter climate means for monetary policy" ECB Blog, 18 December 2023

Estimated with a global panel regression approach, using monthly prices and high-resolution climate data. Cumulative deviation of food inflation from baseline after 12 months due to extreme June/July/August temperatures are shown. Projected temperatures of a 2022-like summer in future climate models.

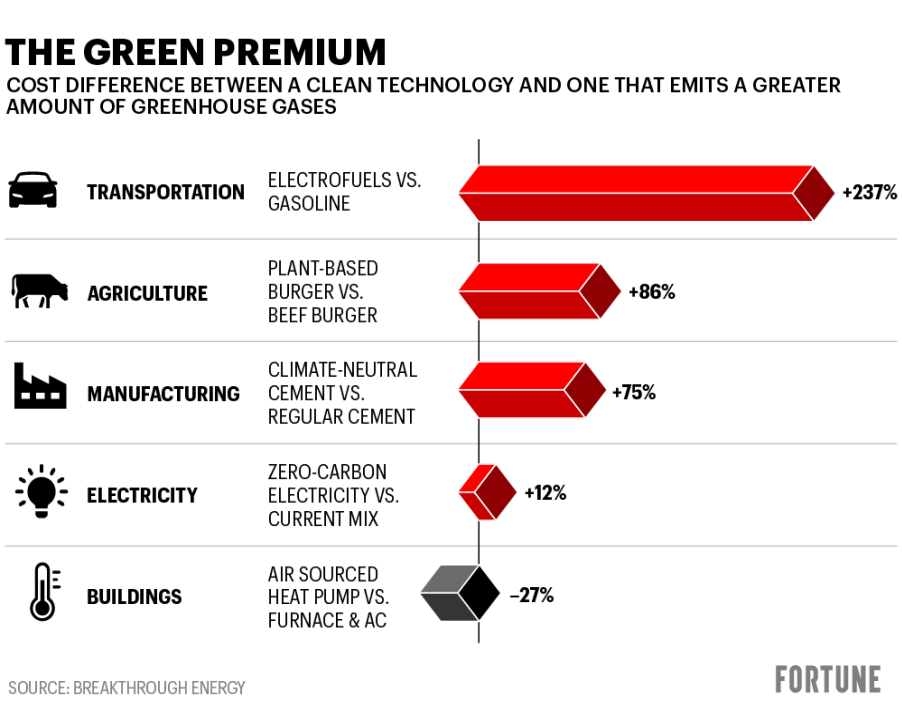
- Impact on Price Stability – Global warming increases probability of lower yields in agriculture; higher food prices; transmit into higher cost of production and end up in:
  - 1% higher inflation (2035) and
  - 2% higher inflation (2060)



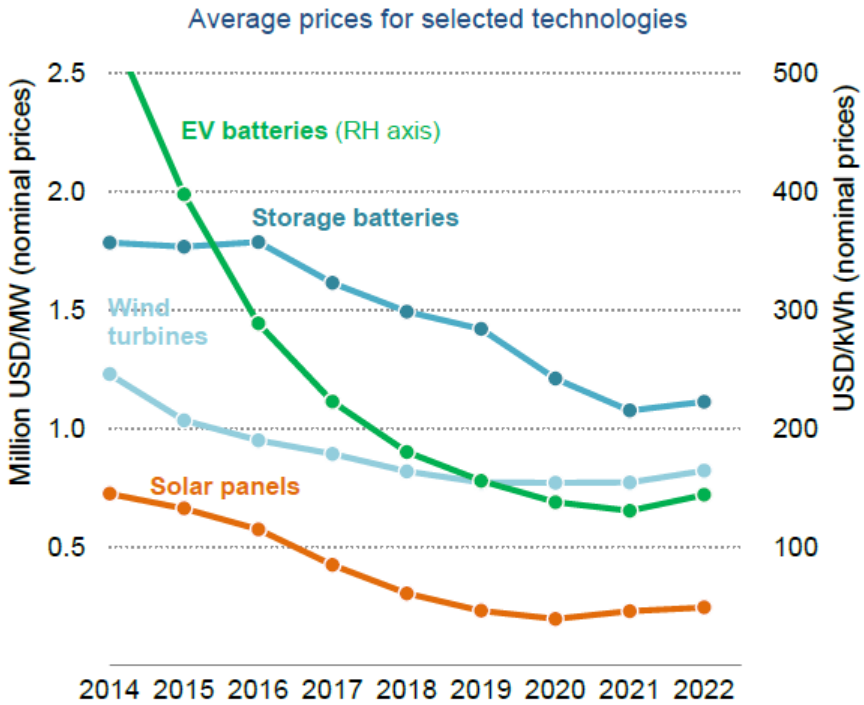
Source: Swiss Re Institute

- Impact on Financial Stability – Losses for Banks and Insurance sectors. Natural disasters caused uninsured capital losses of:
  - More than $5,2 trillion since 1980, 70% uninsured.
  - 30% of climate disaster damages insured over the past decade, insurance cies disbursed $135 billion
  - Cumulative shortfall in covering damages of $1.3 trillion
  - Some regions of the world without insurance now (too much CC risk)

More inflationary pressure: Cost of renewable energy production is falling but transition to Net Zero will entail higher costs for a while, given current production costs using low carbon technologies



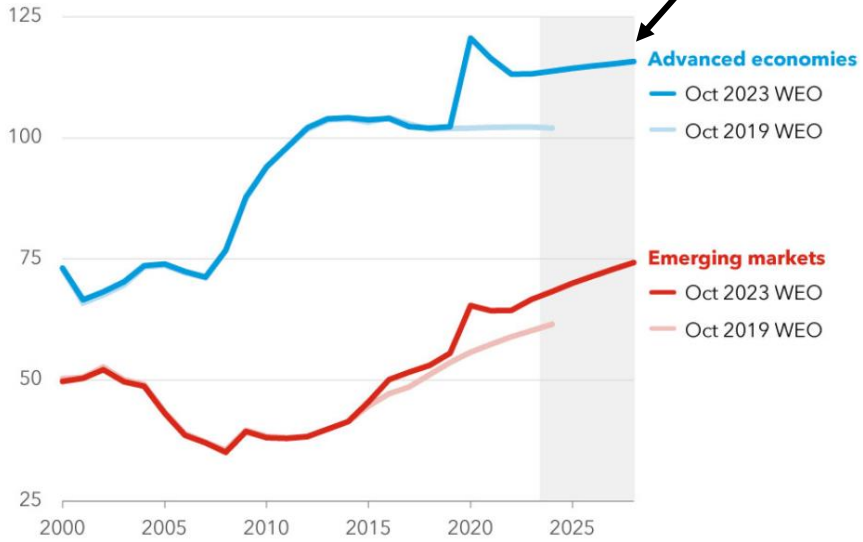
The Green Premium is a measure of the added costs of doing eco-friendly business
Source: https://www.facebook.com/accuratstudio/videos/the-green-premium/552282032421190/?locale=ms_MY&_rdr



Source: World Energy Outlook 2023
https://www.iea.org/reports/world-energy-outlook-2023
International Energy Agency (2023)

Shrinking fiscal space with more fiscal pressure: currently, higher debt with higher service cost, in the context of high fiscal deficits in the US and EU

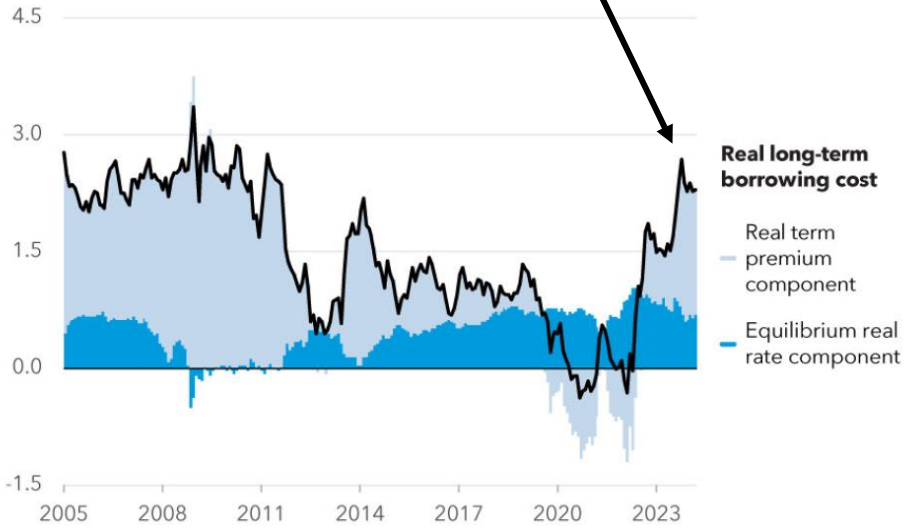
General government gross debt
(percent of fiscal year GDP)



Source: IMF World Economic Outlook.

IMF

Long-term borrowing cost drivers
(percent)

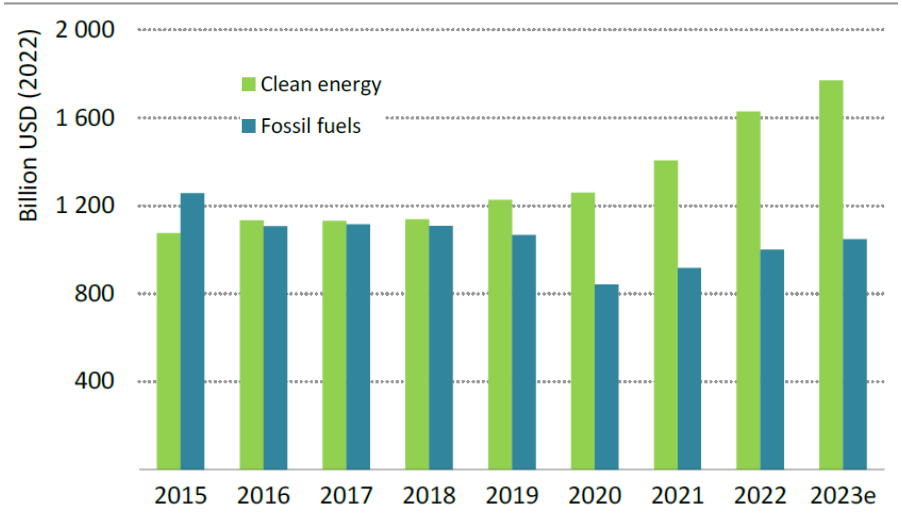


Sources: Bloomberg Finance L.P.; US Federal Reserve; Haver DLX; and IMF staff calculations.
Notes: The estimates of equilibrium real interest rate are based on the methodology proposed in Michael Abrahams, Tobias Adrian, Richard K. Crump, Emanuel Moench, Rui Yu, "Decomposing Real and Nominal Yield Curves," Journal of Monetary Economics, Vol. 84, Dec. 2016, pp. 182-200. The cost of long-term borrowing considered here corresponds to the level of real interest rate expected to prevail over a ten year period, starting five years from now.

IMF

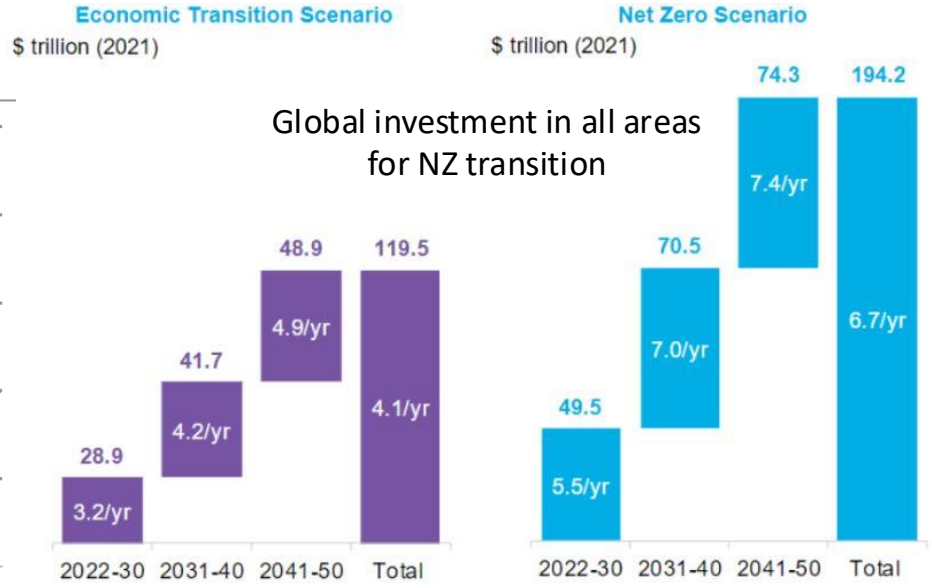
Fiscal pressure: transition to NZ will require massive new investments in clean energy (best estimates: 2% to 4% of global GDP per year); how to finance that? Share of public/private?

Global investment in clean energy and fossil fuels
2022-23: about $1.6 trillion clean energy



Source: World Energy Outlook 2023
https://www.iea.org/reports/world-energy-outlook-2023
International Energy Agency (2023)

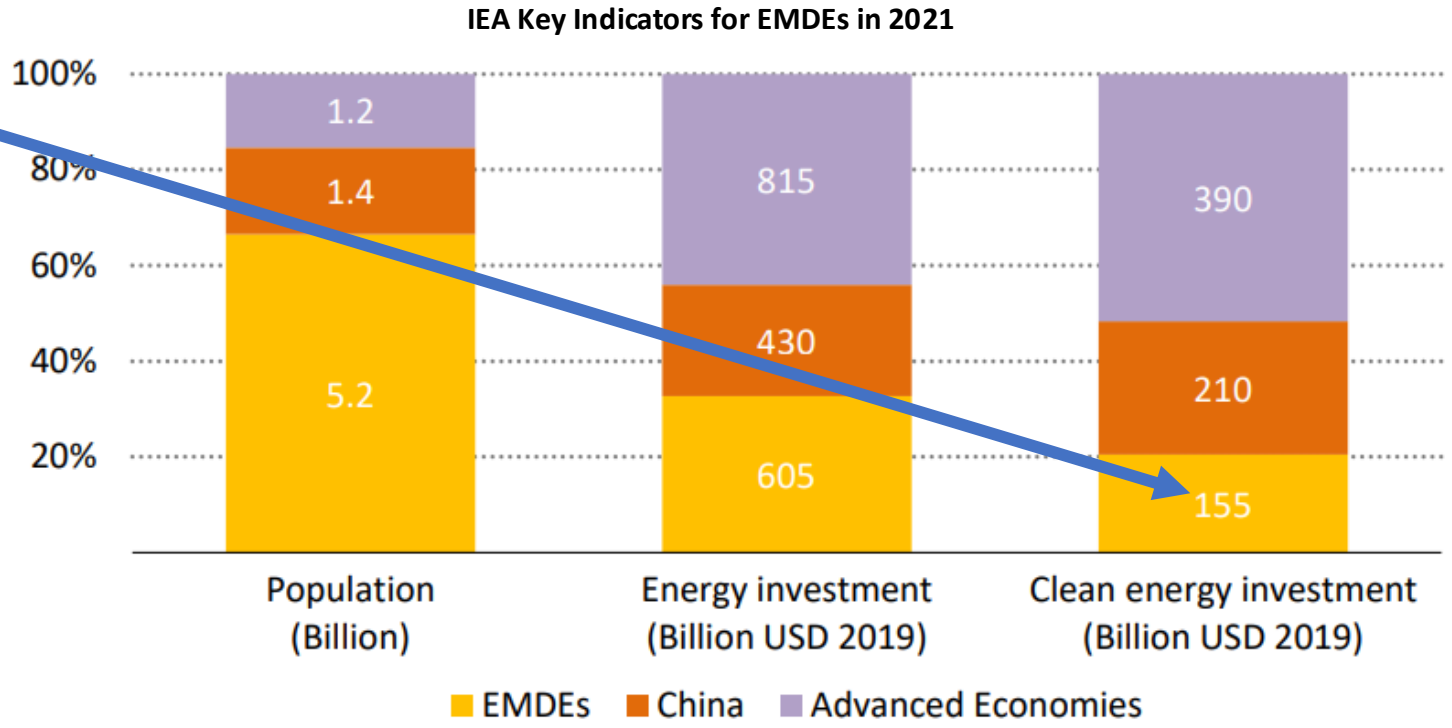
Global investment in all areas for NZ transition



The numbers inside the bars show the annual investment in each decade. The numbers above the bars show the total investment in each decade. Economic Transition Scenario assumes no new policy action. Net Zero Scenario assumes global net-zero emissions by 2050.
Source: Bloomberg https://about.bnef.com/blog/the-7-trillion-a-year-needed-to-hit-net-zero-goal/

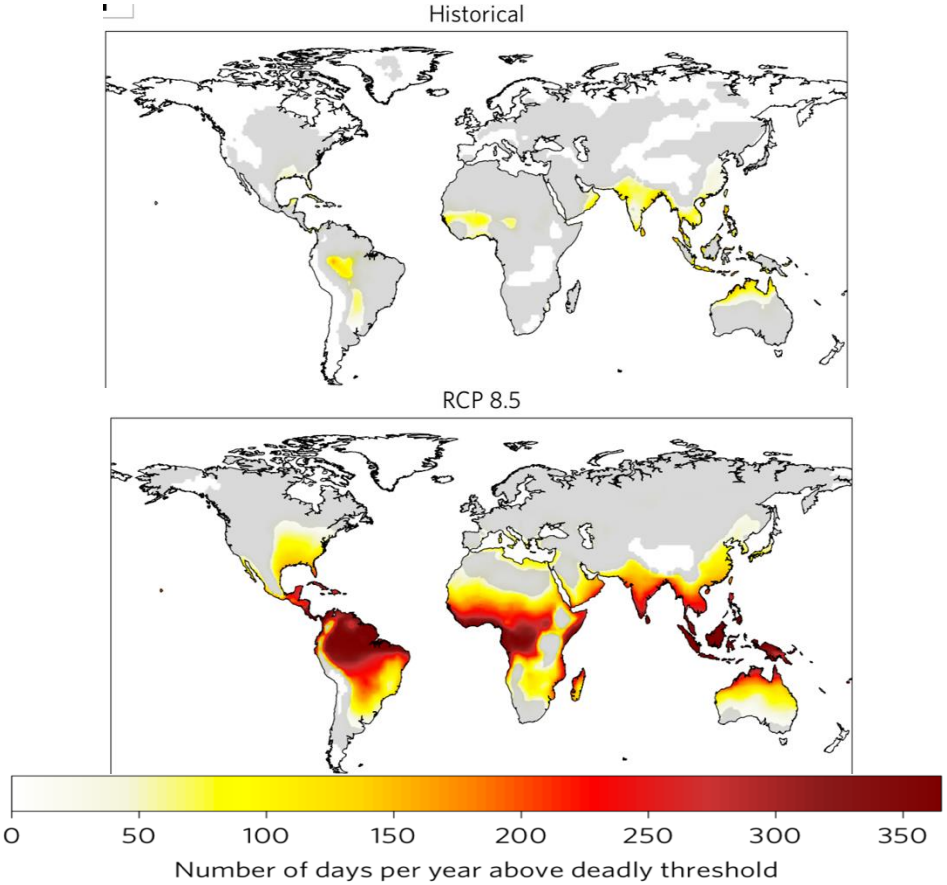
Challenge of Political Economy: Not enough clean energy investment where it counts in the developing world

- Emerging market and developing economies account for 2/3 of world's population but only 20% of global clean energy investment
- So green financing mobilization and direction needs to go the developing countries using all existing and new mechanisms
- **<u>Risk is that developing world adopts growth models with developed world (our) high carbon footprint</u>**



Source: *IEA World Energy Investment 2021 Special Report*

Challenge of Political Economy: GHG emissions affect poor countries first→ higher costs for agriculture, higher inflation → potential massive destruction and "climate" migration



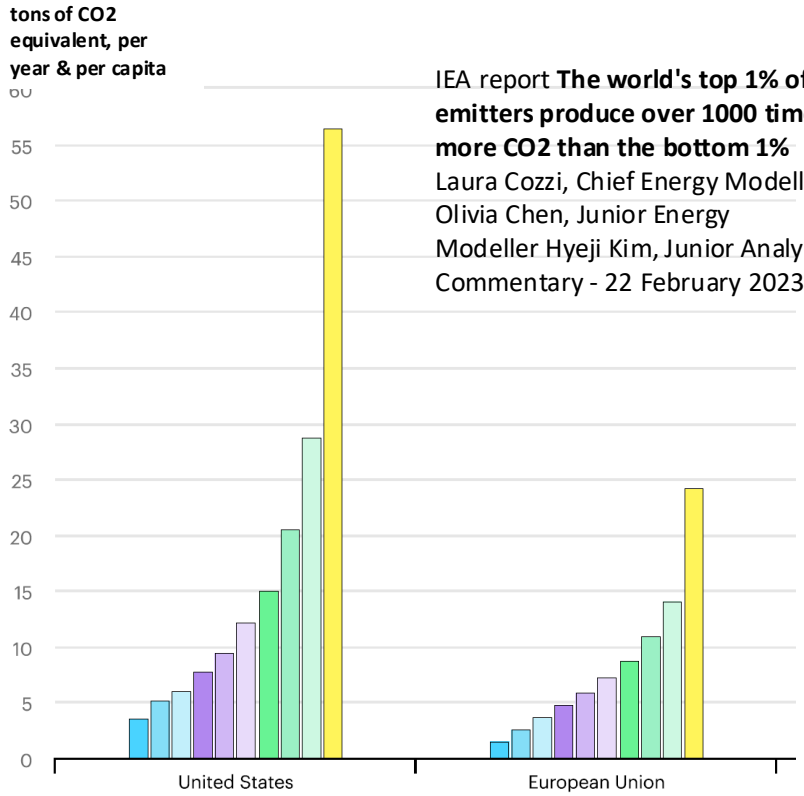
- **Number of days in the 2000s, with deadly temperatures for human life (yellow spots):**
  - 13.2% of the planet's land area where 30.6% of the population resides…
  - was exposed to 20 or more days when temperatures and humidity surpassed the threshold beyond which such conditions become deadly.

- **Number of days in 25-50 years, with deadly temperatures (yellow & red spots) for human life:** by the end of the century, in a BAU scenario, entire regions of the world would be inhabitable.

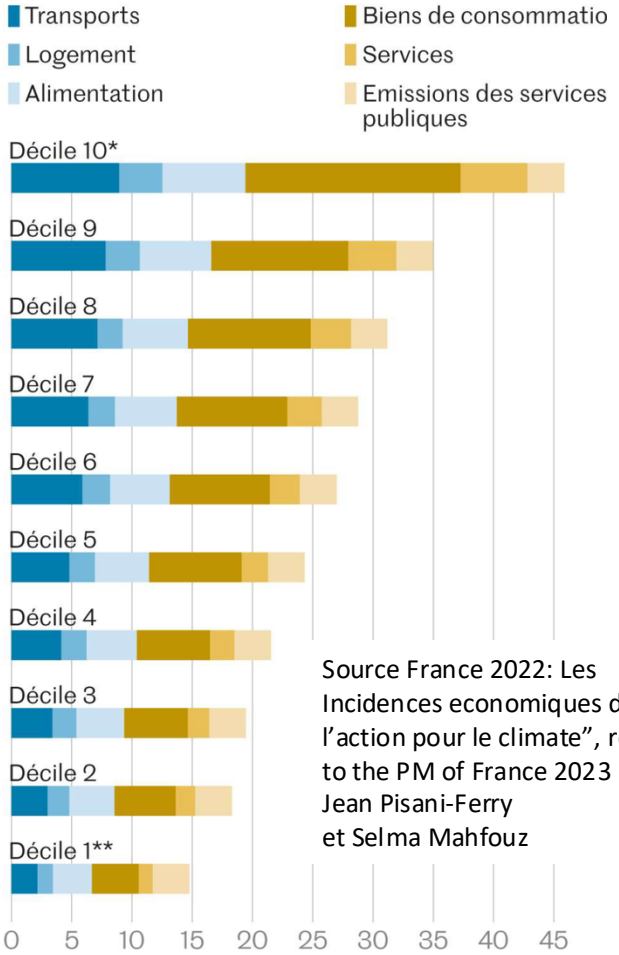
- Source: Mora et al, "Global Risk of Deadly Heat", *Nature Climate Change*, vol 7, issue 7, June 2017
- Groundswell, Preparing for internal climate migration, World Bank Group, 2018
- Internal displacement monitoring centre database 2017

Challenge of Political Economy: “fairness”, social justice
average emission of GHG by decile of the distribution of income

Climate policies, if redistributive effects are not considered, can trigger social protests (eg “yellow vests”, etc)



IEA report **The world's top 1% of emitters produce over 1000 times more CO2 than the bottom 1%**
Laura Cozzi, Chief Energy Modeller
Olivia Chen, Junior Energy Modeller Hyeji Kim, Junior Analyst
Commentary - 22 February 2023



Source France 2022: Les Incidences economiques de l’action pour le climate”, report to the PM of France 2023 by Jean Pisani-Ferry
et Selma Mahfouz

Policy Questions: Adequacy between CC impacts and macro policy responses

- Monetary Policy response
  - IT regimes know well treatment of supply shocks ("look trough") and negative demand shocks (accommodate)
  - What about frequent, large, persistent supply shocks (reversal of China effect during Great Moderation)? Tightening MP → trade-off with financial stability (asset valuation effect for banks, credit contraction) and long-term growth
- Fiscal policy response
  - Fiscal consolidation is standard response to high debt → less space for investment in NZ transition → less space for ensuring financial stability
  - What about space to address new CC risks especially political economy risks (redistributive impacts); + of Trump policies effect (protectionism, stopping immigration, deregulation, etc) → macro-political (ins)stability?

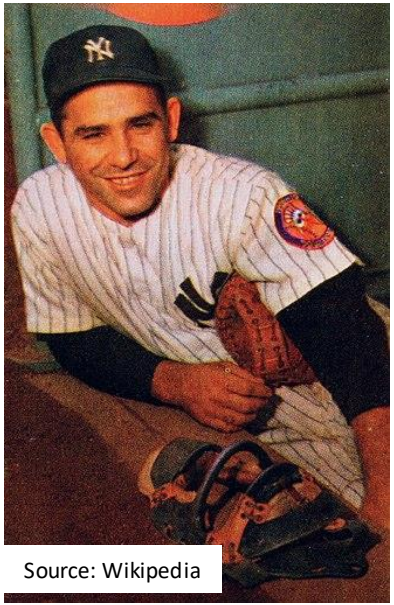
New Policy Issues for CBs

- **PI (1): Revisit IT regime to "adaptive" IT for a "hotter world"** Higher than 2% inflation target? and/or tolerance band to accommodate climate shocks/deviations?; credibility issue; time-horizon issue; critical issue of communication with markets (timing/rationale), see Blanchard, AIT and IIT
- **PI (2**): CC-related Basel-type regulation on CC-risks; CC-related disclosure on CC-risks (IFRS); CC-related LOLR-insurance-type under new institutional arrangement (moral hazard?)
- **PI (3)**: CC-related macro-prudential frameworks and standard adoptions (IFRS);
- **PI (4):** revisit CB MP operational framework (eg., "greening", including reserves, collaterals and APPs-QEs); critical issue of communication with markets (timing/rationale)
- **PI (5):** support "green" finance directly or indirectly: conditional / direct lending; Paris-2oC or NZ-compatible financial portfolio design; "green"-ESG bond issuances and market conditions

New Fiscal Policy Issues for Govts and Treasuries

- **PI (1**): Pooling risk, globally (ideal, SDRs, CAT bonds,) or regionally (Draghi report, Euro-bonds); cooperation creating CC-related regional/global fund for "green" R&D and "green" investment; expand MDBs capital; expand ODA for NZ transition
- **PI (2):** Revisit tax frameworks globally and locally; more progressive income and wealth tax; carbon taxation (regional/global); and trading ETS, etc
- **PI (3):** Revisit debt/insurance frameworks globally and locally; pooling of risk and improve volume and quality of debt issuance
- **PI (4):** CC-related financial engineering usage of balance sheet of public sector to diversify CC-risk; guarantees for "green bond" issuance for sub-IG issuers (developed & developing world)
- **PI (5):** Use new technologies, digital ID, AI to improve FP & para-FP targeting/efficiency

Thank you



Source: Wikipedia

“It’s tough to make predictions, especially about the Future”

“It ain't over 'til it's over”

Yogi Berra

WORLD BANK GROUP

Tipping finance, economics and society amid the climate crisis: The infrastructure perspective

Stephane Straub
Chief Economist for Infrastructure, The World Bank
C3A, Paris, December 6, 2024

World Bank vision: A world free of poverty on a livable planet

- We have a reasonable prior that in many cases there is an infrastructure gap
  - 2.2 billion people still lacked safely managed drinking water services, 3.5 billion people to safely managed sanitation, and 2 billion to basic hygiene services in 2022
  - 2.1 billion people lacked access to clean cooking fuels and technologies in 2021
  - 685 million people still lacked electricity access in 2021
  - One billion people live more than two kilometers away from an all-season road
  - Only 51.6 % of world's urban population had convenient access to public transport in 2022
  - 1.19 million people died in 2021 in road crashes because of lack of safe roads
  - 2.6 billion people still do not use the internet in 2023
- Keep also in mind that we lack good data on quality and affordability of services (some of those not accessing services live in proximity of networks)

The infrastructure challenge

- If we are serious about ending poverty, we need to address these gaps. Large investments are taking place or are being planned:
  - Mission 300: provide electricity to 300 million people in Sub-Saharan Africa by 2030
  - Large scale railways and road corridors investments: Example is Middle Corridor in ECA
  - Large investment to bridge digital divide, rollout 5G, develop AI, data centers
- In the context of an existential climate crisis, this raises two main challenges:
- The first one is a **flow problem**:
  - Infrastructure sectors (energy, transport, water and sanitation, digital) represents over approx. 2/3 of global GHG emissions (depending how we count scope 1 to 3).
  - They are also some the fastest-growing: since 1990 industrial processes grew by 203%, electricity and heating by 84%, and transportation by 78%.

	2023 vs 1990	2023 vs 2005	2023 vs 2022
Power Industry	+96%	+36%	+2%
Industrial Combustion and Processes	+91%	+41%	+2%
Buildings	+1%	+3%	+1%
Transport	+78%	+26%	+4%
Fuel Exploitation	+48%	+23%	+2%
Agriculture	+20%	+15%	0%
Waste	+56%	+37%	+2%
All sectors	+62%	+28%	+2%

Source: EDGAR - Emissions Database for Global Atmospheric Research, European Union

The infrastructure challenge

- We have a couple of broad solutions for the flow problem:

1. **Electrifying end uses** (EVs, heating, etc.) while decarbonizing electricity production through a push towards renewables.
2. Relying on **structural changes** to our way of life:
    - Densifying cities
    - Energy demand management
    - Consuming less (flights…)
    - Push for energy efficiency, etc.

- Some from directed technological change, some from market / price signals
- Problem: what becomes more efficient tends to give rise to **rebound** effects

The infrastructure challenges

The second problem, often overlooked, is a **stock problem**:

- Building the supporting hard infrastructure (roads, energy grid, pipe networks, etc.) relies on materials that have high carbon footprint (cement, steel, aluminum, etc.)
- According to some estimates, replicating infrastructure stocks coverage levels of rich countries using current technologies would cause approximately 350 Gt CO2 from materials production
- The current 2024 carbon budget for a likelihood of 83% to stay under 1.5 °C is 100 Gt CO2, with estimated exhaustion in 2029. For 2 °C it is 750 Gt.

The infrastructure challenges

We also need to produce solutions to the **stock problem**:

- Developing zero-carbon materials to replace our usual cement, steel, aluminum, etc.
- Problem: at this point they are still vastly more expensive
- Technical / engineering solutions exist (CCS, green hydrogen, etc.), but the economic part related to incentives and market design is less clear

So, my question is: **how do we tip the scale in favor of a world where we provide infrastructure where it is needed, while being environmentally virtuous?**

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THANK YOU

Stephane Straub
Chief Economist for Infrastructure
The World Bank

Session 3

Tipping finance, economics and society amid the climate crisis

Chair: Simon Sharpe
C3A, S curve economics

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