OESTERREICHISCHE NATIONALBANK
EUROSYSTEM

Some basic economics of climate change

Introduction to a webinar series

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Outline

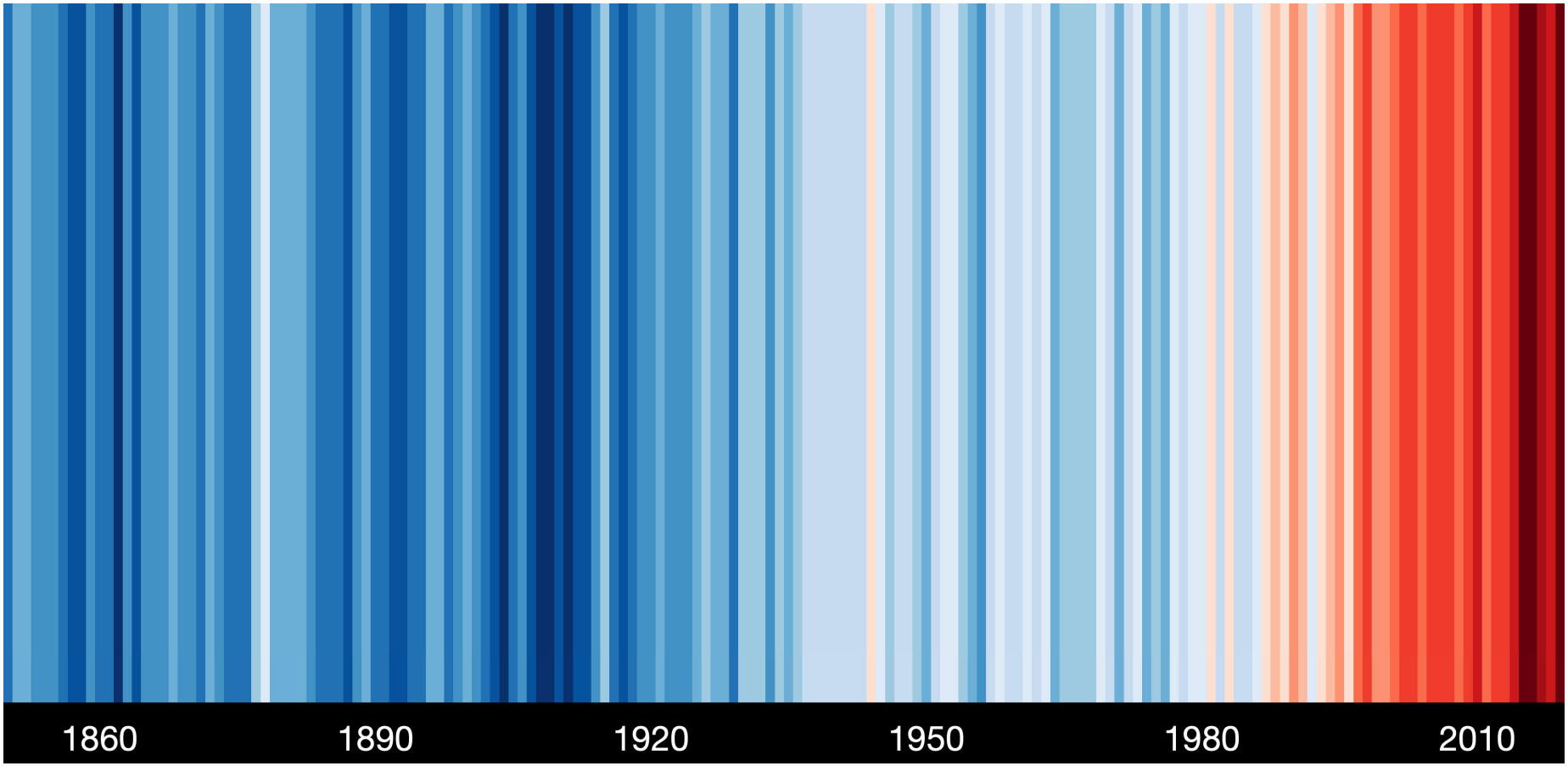
1. **Stylized facts on CC**
2. **Physical damage and risks**
3. **Economics of CC**
4. **Paris Agreement**
5. **Climate policies & carbon price**

Opinions expressed do not necessarily reflect the official viewpoint of OeNB or Eurosystem.

Igor's presentation:

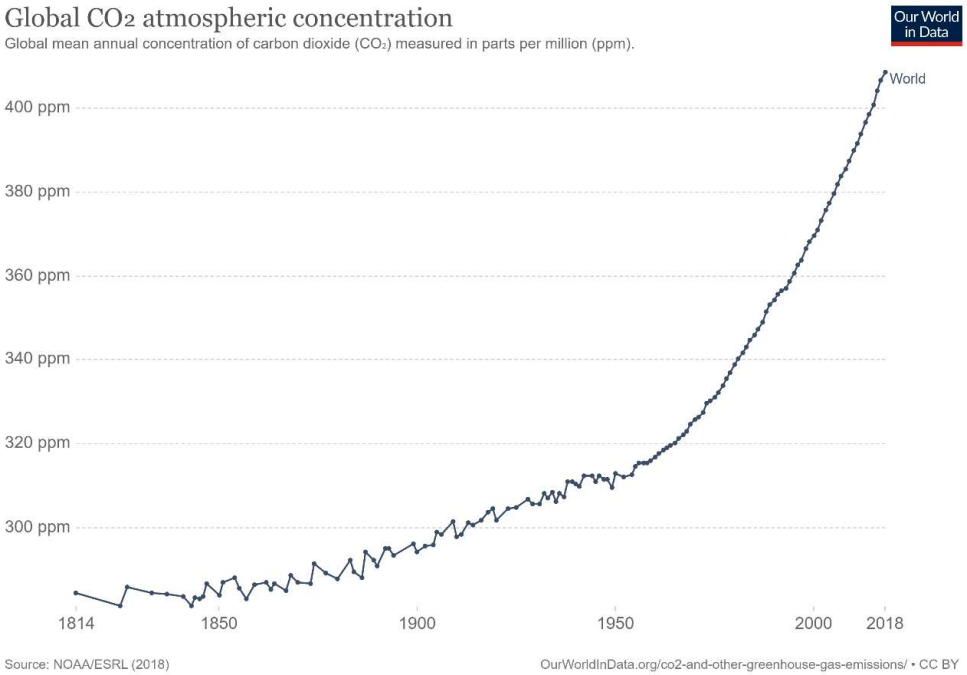
1. National efforts to reduce emissions, their asymmetry
2. Carbon leakage, emissions embodied in trade, border carbon adjustment
3. Transition risks with the focus on the countries of Eastern Europe.

Globally average temperatures rose +1°C since pre-industrial level

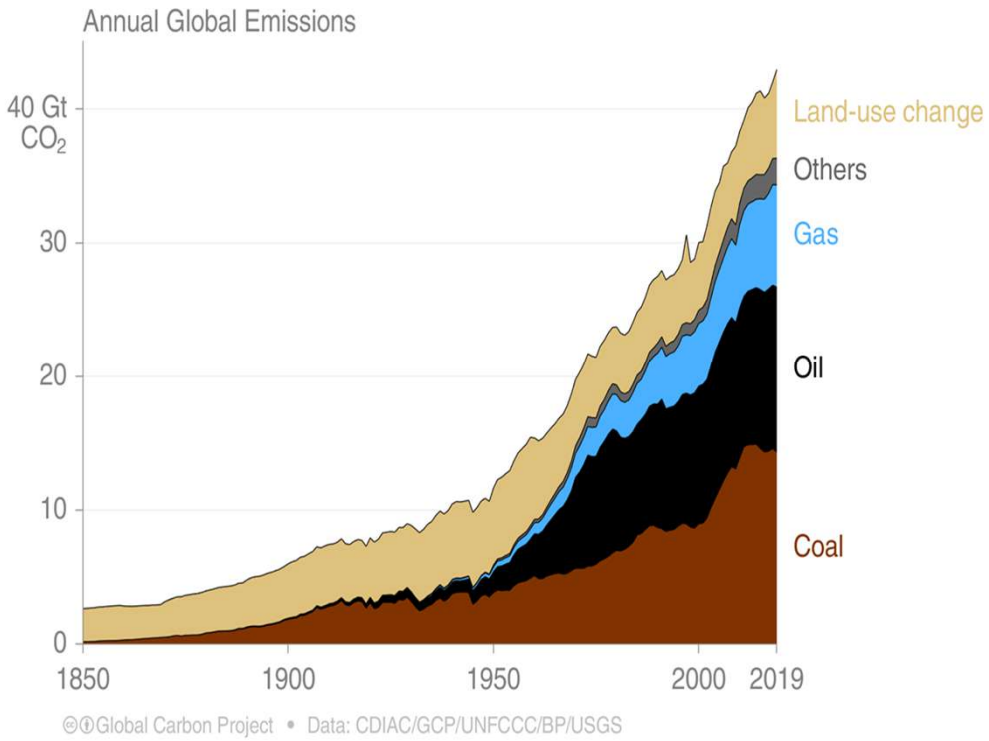


Man made green house gas effect

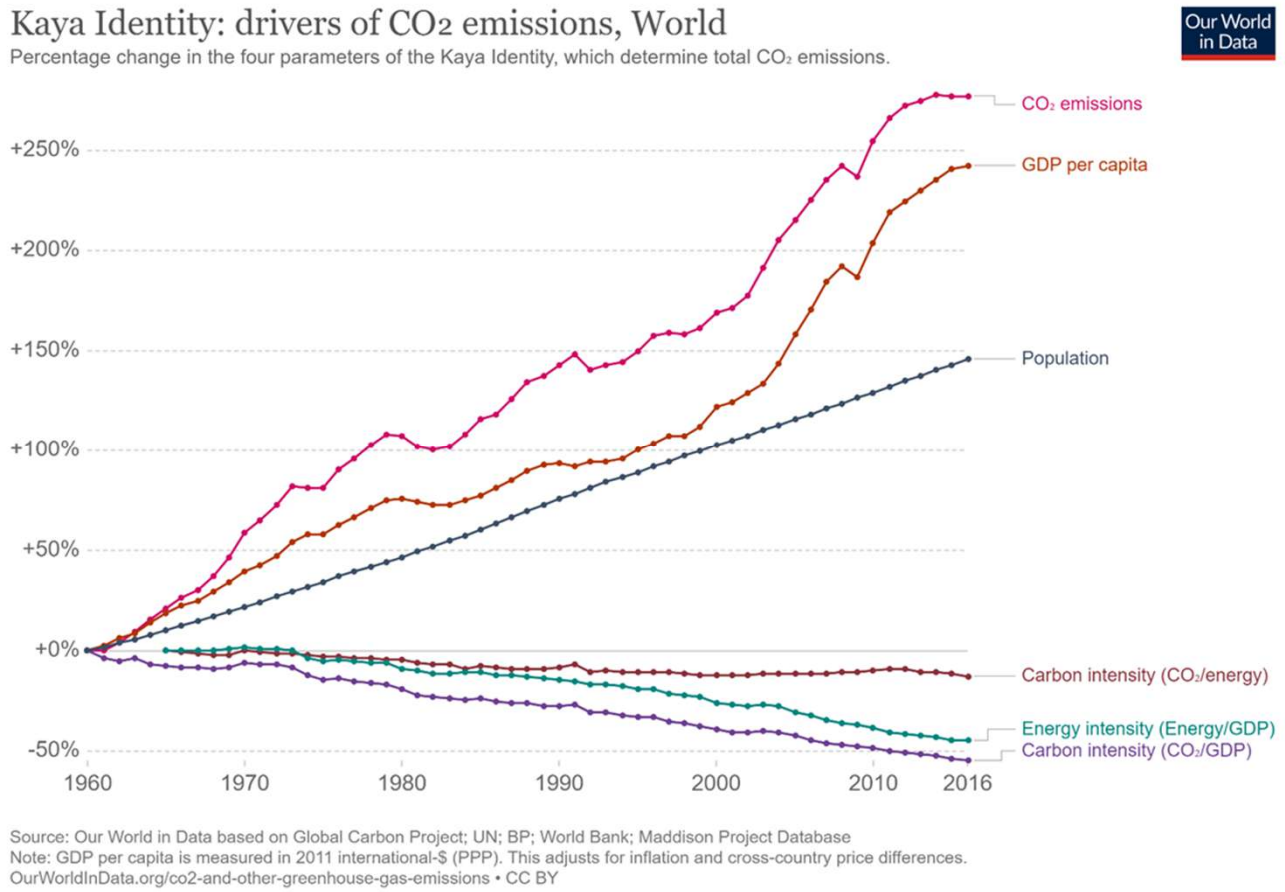
2021: CO2 concentration 50% > industrial level



Exponential fossil-fuelled growth

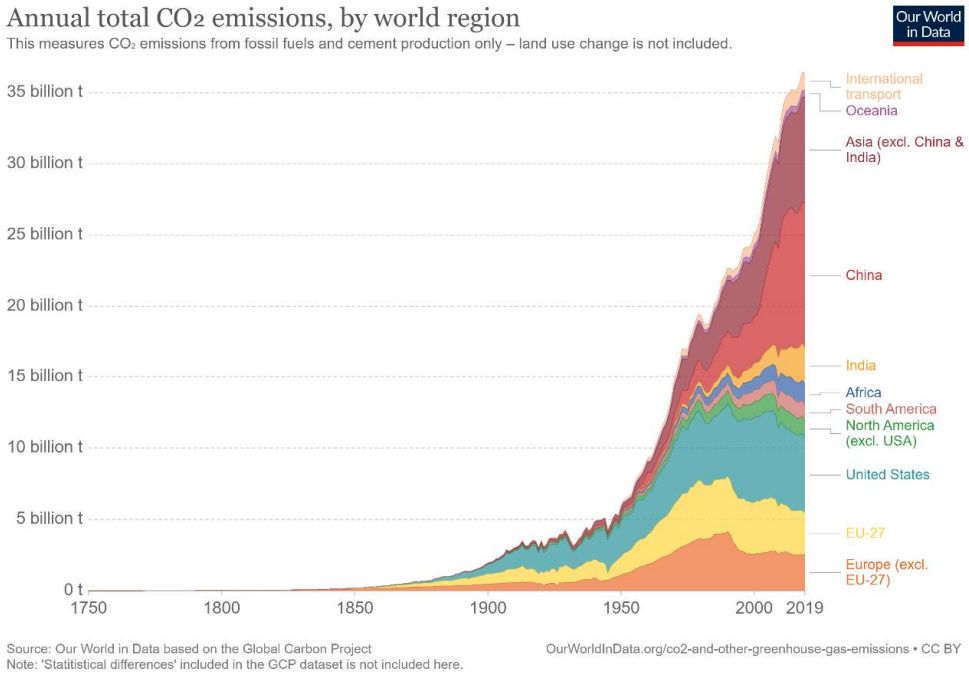


Worring but also some hopeful trends

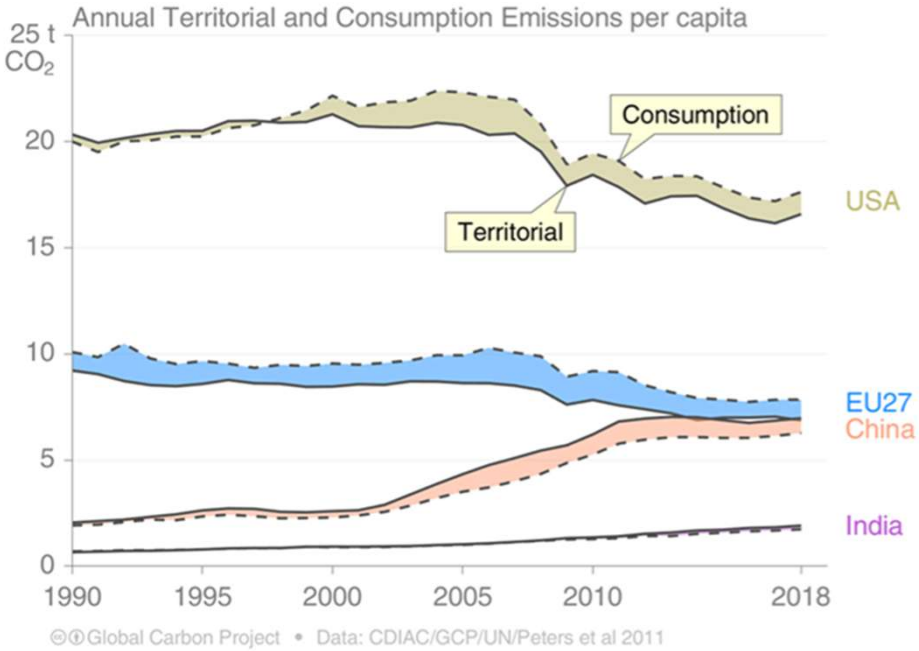


Various dimensions of international climate justice

Historical vs. actual emissions

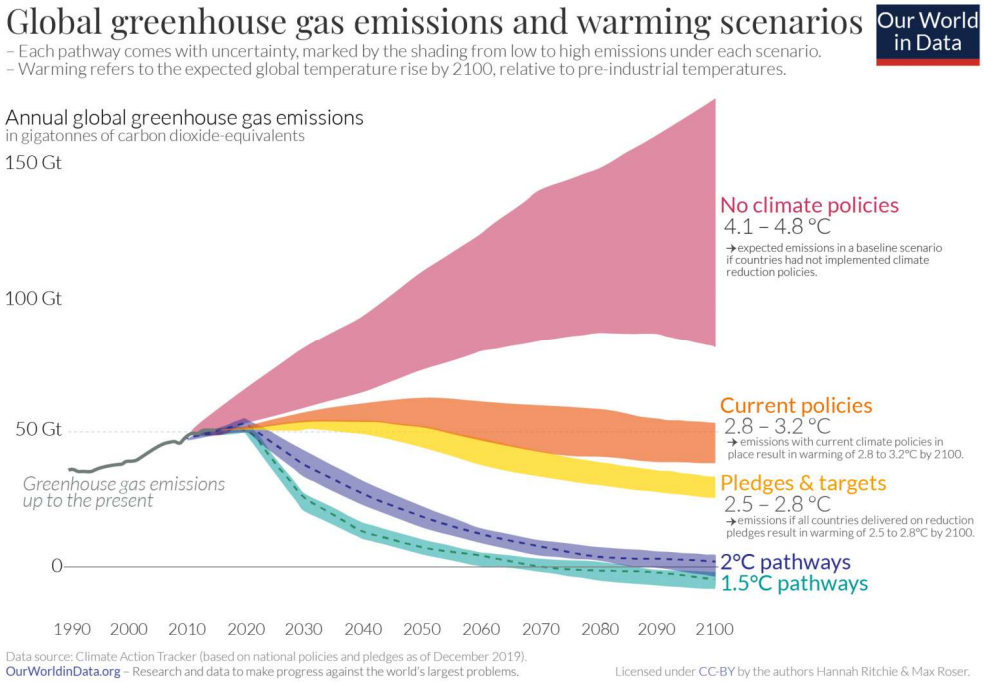


Production vs. (traded) consumption

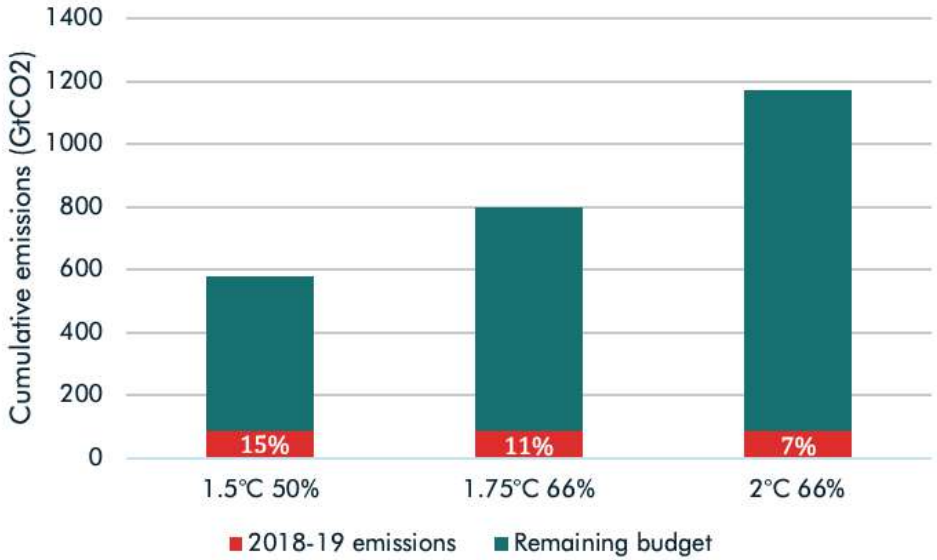


Unprecedented temperature rise – climate sensitivity of GHG emissions

+3° not seen since in 2.5 million years



Carbon budget left (1/3 of total)



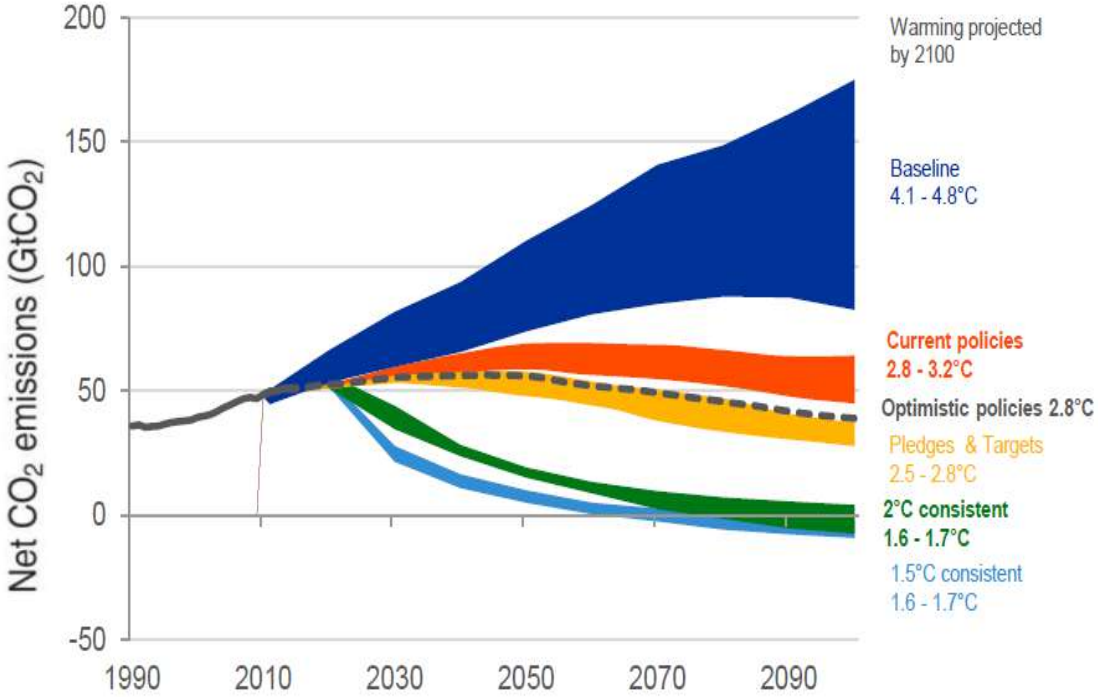
Source: IPCC

Physical damage

Russia 2020

Ukraine 2020

Climate related financial risks depend on CO2-pathway



Source: Climate Action Tracker, Warming Projections Global Update. December 2019 projections.

Physical risks

Risks arising from climate and weather-related events

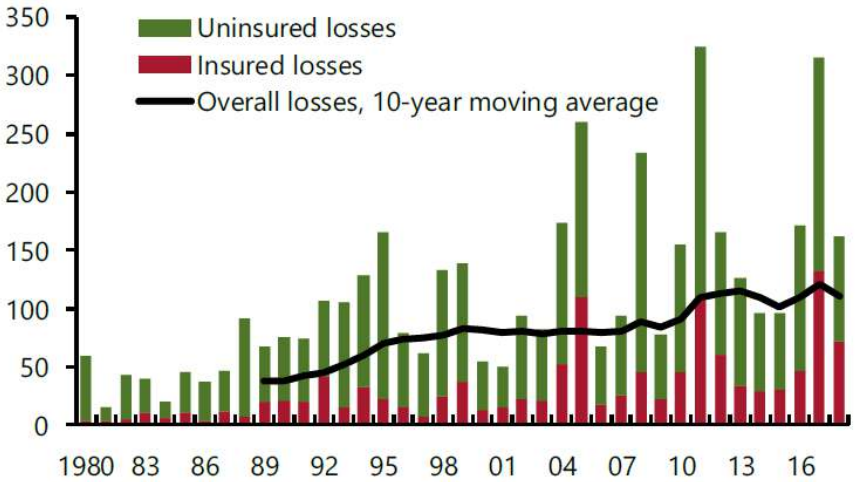
No clear-cut trade-off

Transition risks

Risks arising from the process of the adjustment towards a lower-carbon economy

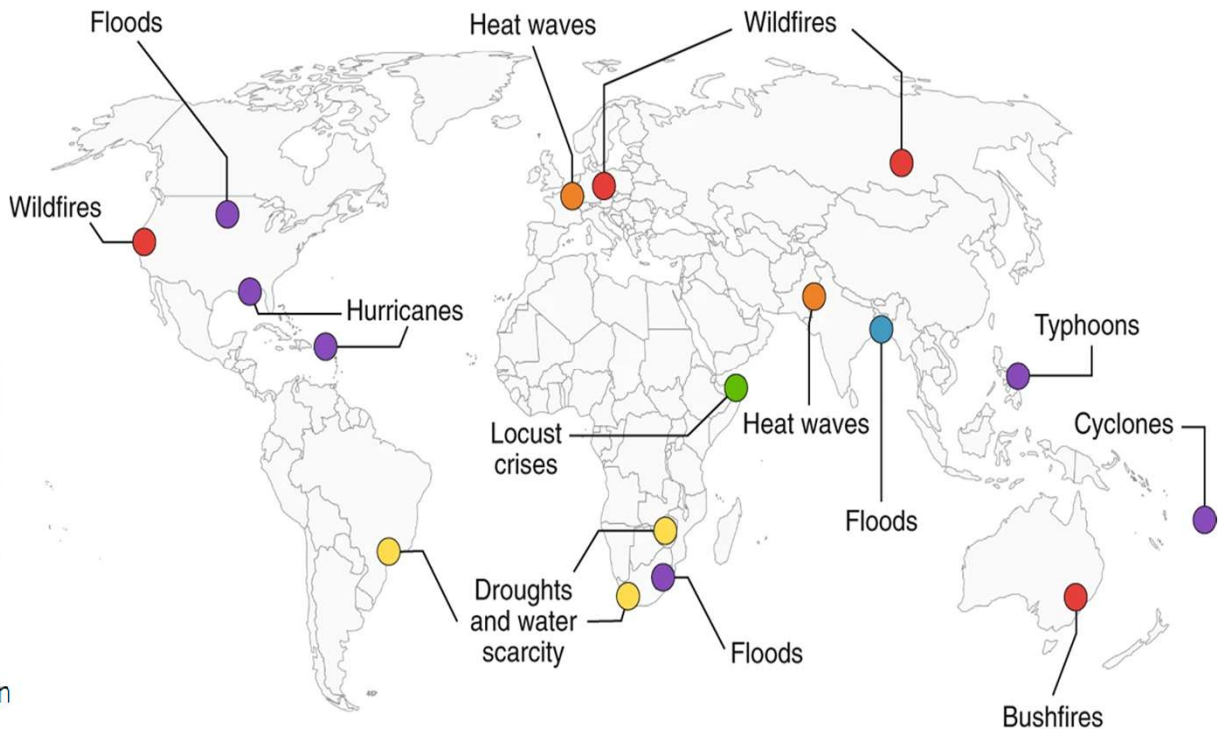
Physical risks are rising

2. Insured and Uninsured Losses for Natural Loss Events Worldwide 1980—2018
(Billions of 2018 US dollars)

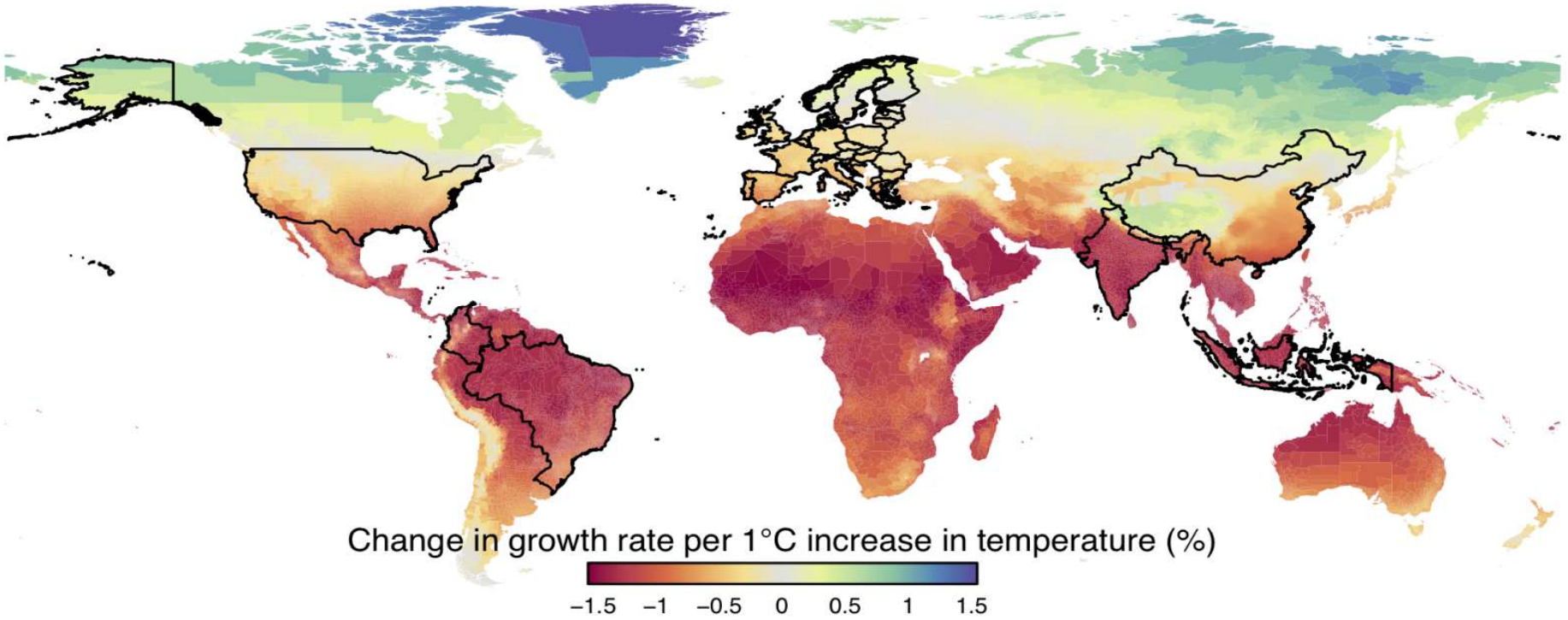


Source: NaCatSERVICE

- Spikes in uninsured and insured losses have been larger in recent years amid more frequent catastrophic events.
- Overall losses have surpassed $300 bn globally in 2011 and 2017.



Economic costs of climate change bigger in low-income regions



Global damage in % of GDP BAU Scenario (~4-6°C until 2100):

Burke: 25%-points (productivity); **Nordhaus**: ~5%-points; **Stern**: up to 20%-points;

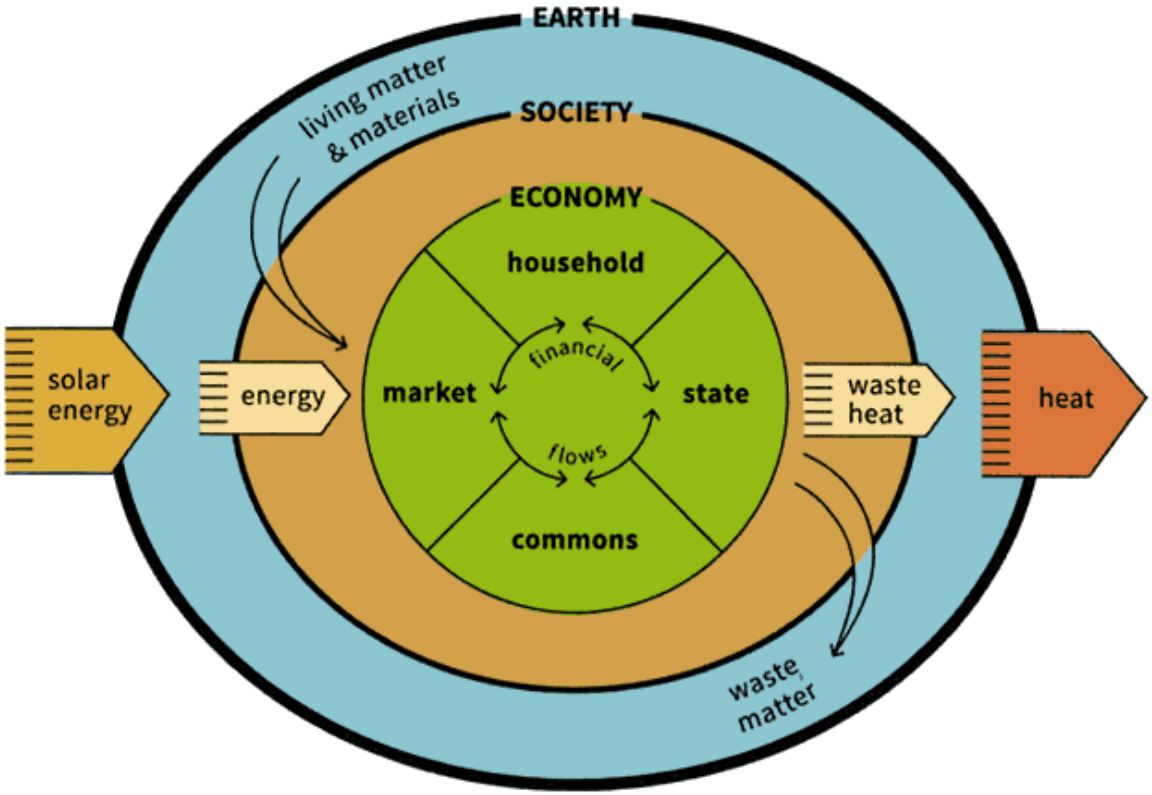
How to deal with prediction uncertainty? – three strategies

Alarmists	Mainstream	Lukewarmers
• Climate catastrophe • Migration waves • Civil wars • Extinction is likely • When we know its too late • Irreversible & existential • De-growth necessary • Rationing and conscription	• Broad consensus: ~97% of climate scientists • Science is never „settled“ • Tipping points and doom loops • No historic evidence available – experiment • Huge uncertainty – unknown unknowns • Fat tail events • Mitigation is key	• Growth & innovations will solve the problem • Nuclear energy is part of the solution • Hydrogen • Carbon capture & storage • Geo-engineering (ocean fertilization, space mirrors) • Adaptation is key

→ **Hope for the best but prepare for the worst!**

→ **Climate action = insurance**

The embedded economy

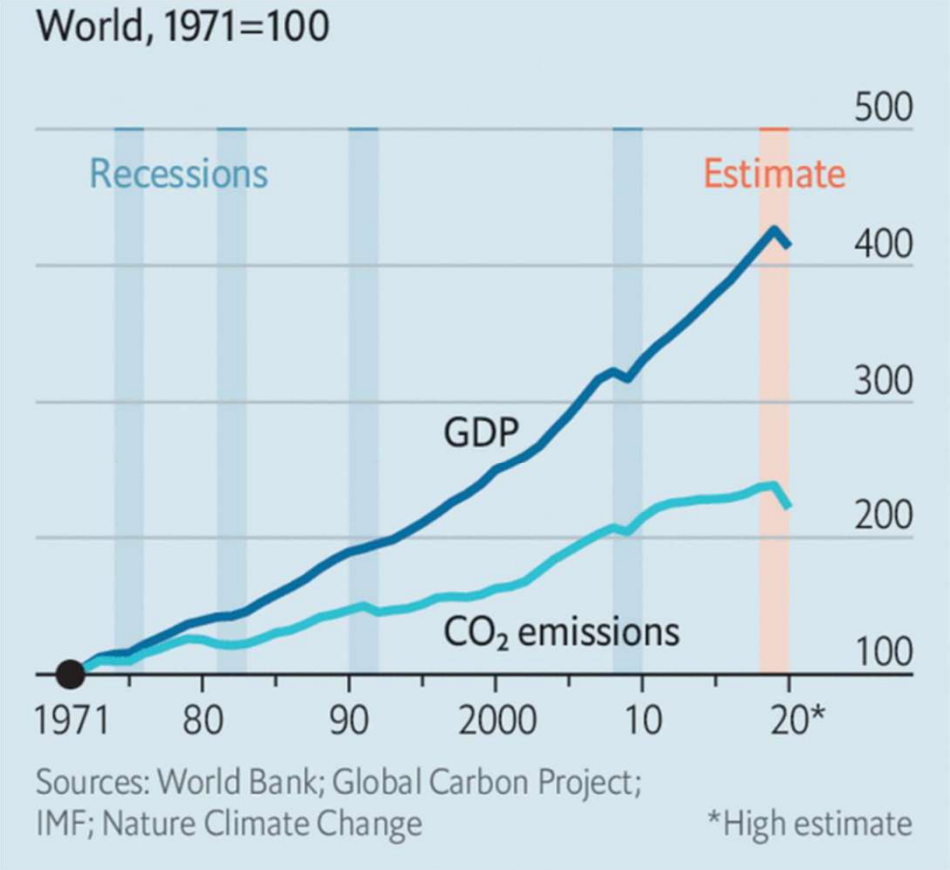


Sustainable development is development that meets the needs of the present without compromising the ability of **future generations** to meet their own needs.

(Brundtland Report, 1987)

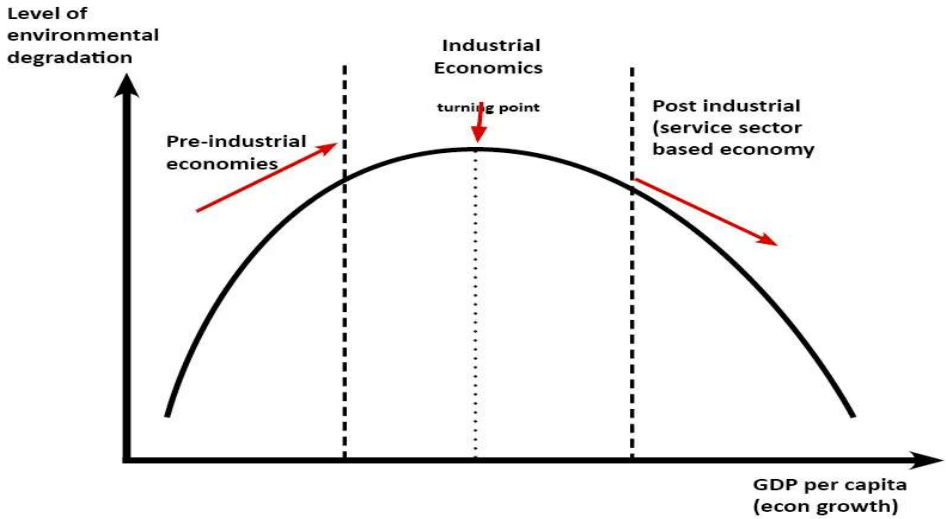
Source: Kate Raworth and Marcia Mihotich

COVID shock → biggest CO2-cut in history (-8%)



The Economist

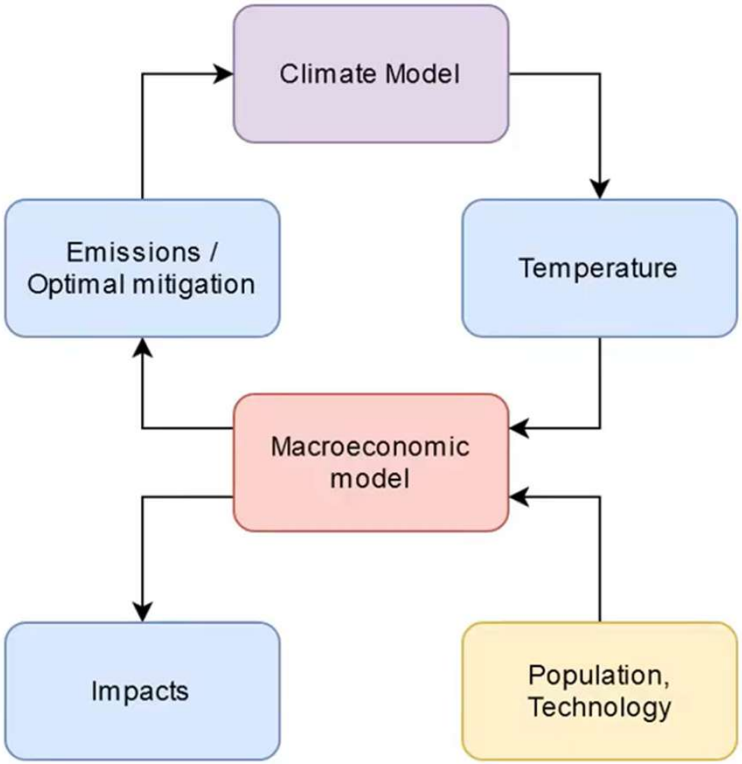
- But comparable economic costs
- Similar drop needed every year!
- Better decoupling growth and emissions (environmental Kuznets curve)



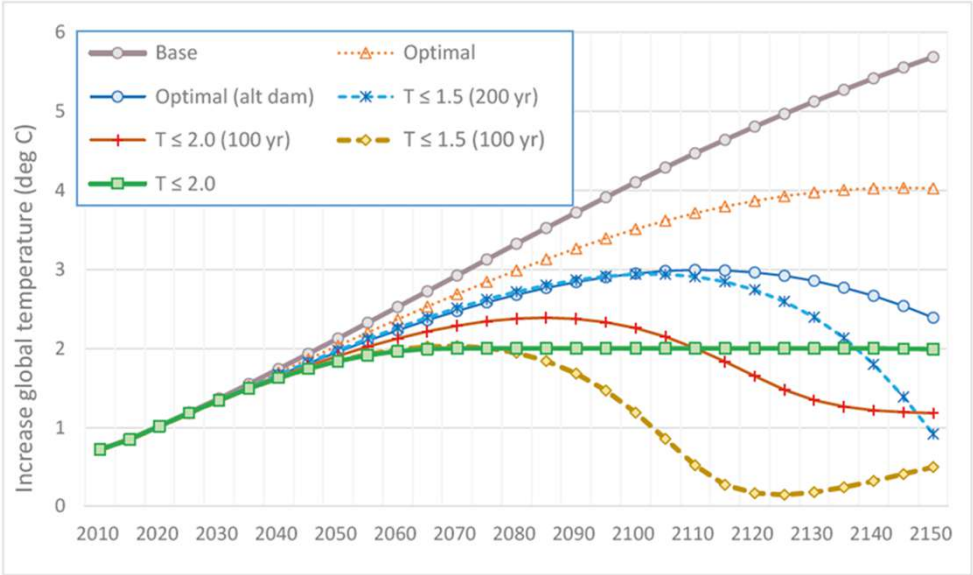
- So far little evidence

Integrated Assessment Models: Costs of carbon vs. abatement

Top-down: maximize welfare (Nordhaus)



Model assumption → normative results



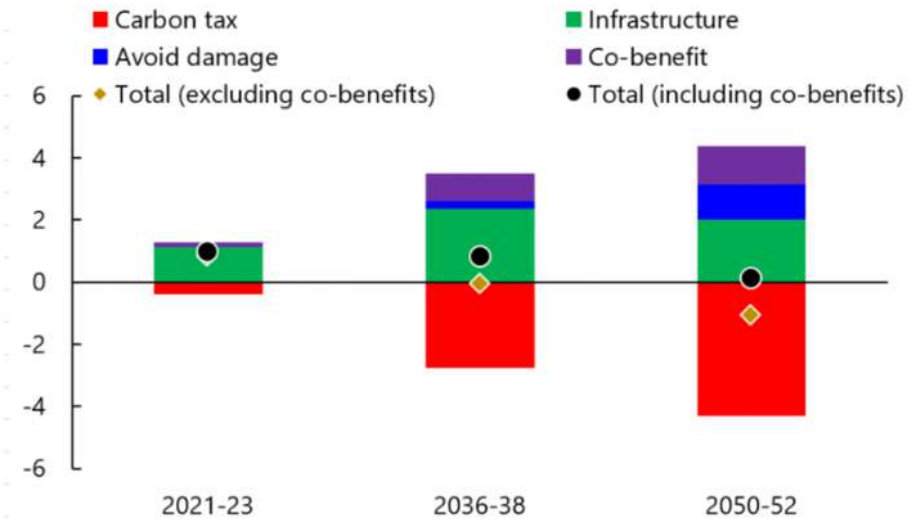
Social cost of carbon depends on damage function, **discount rate**, climate sensitivity, etc.
→ optimal average temperature: 3.5°C (?)

Low-carbon transition investment pays off (in the short and very long run)

An affordable cost

The right climate policy mix boosts global GDP in the first 15 years of the economic recovery from the COVID-19 crisis. Costs of transitioning to a zero-carbon economy are moderate thereafter.

(deviation from baseline, percent of GDP)

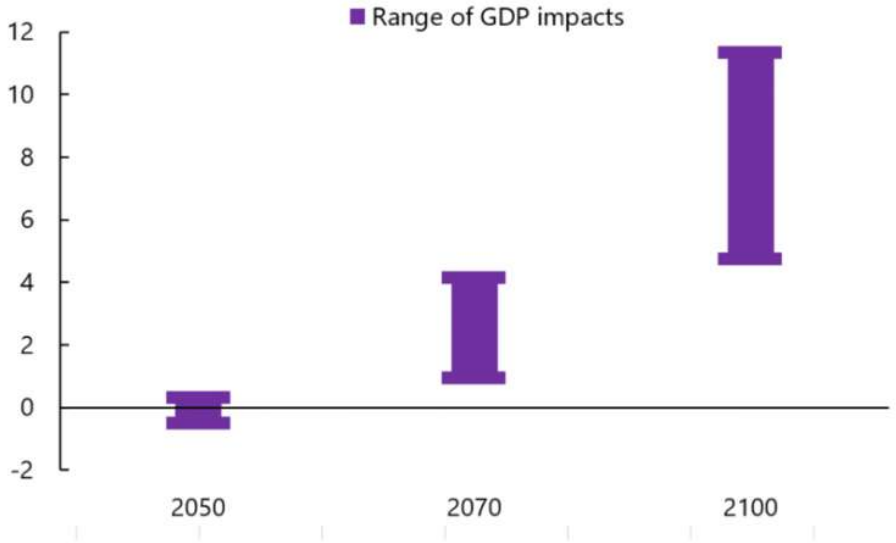


Source: IMF staff calculations for Chapter 3 of the October 2020 WEO.

Long-term real GDP gains

The climate change mitigation strategy raises global output well above its current course from mid-century onward by limiting damages from climate change.

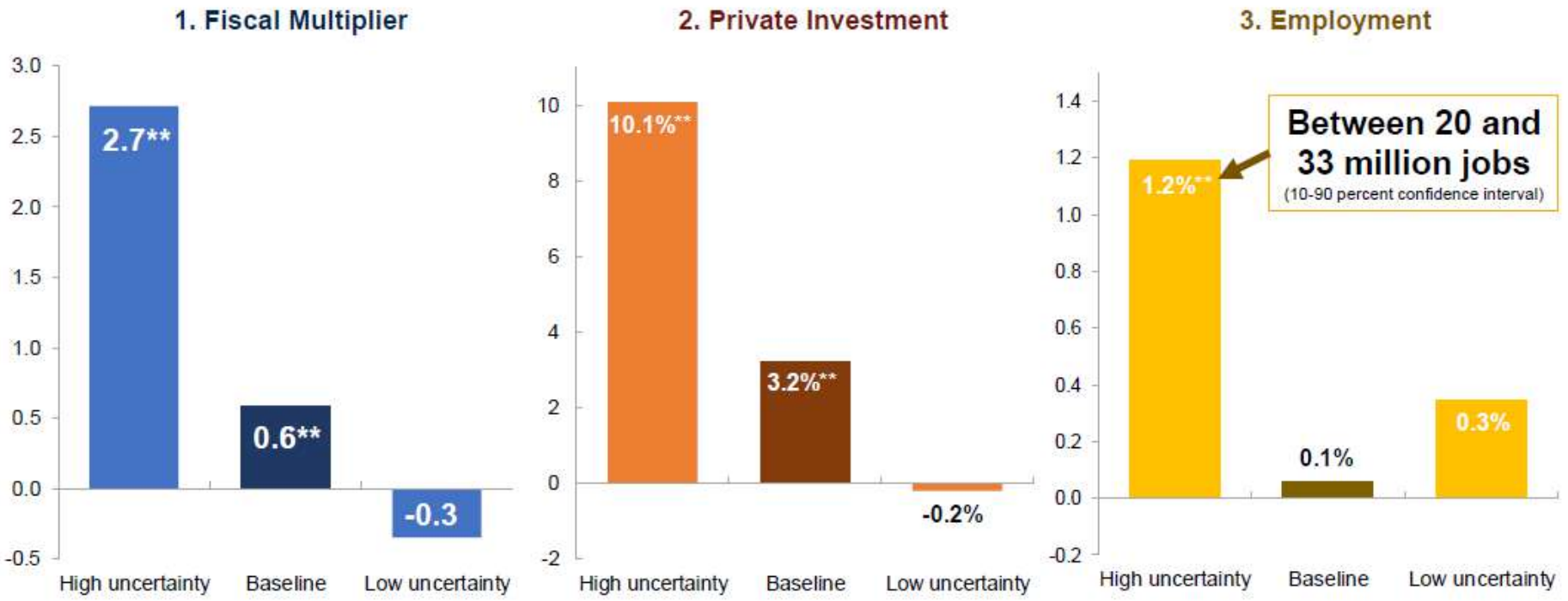
(deviation from baseline, percent)



Source: IMF staff calculations for Chapter 3 of the October 2020 WEO.

In uncertain times public investment pays off

Two-year-ahead macroeconomic effects of a one-percent-of-GDP unexpected increase of public investment (AEs and EMEs)



Source: IMF staff estimates. Note: Panel 1: two-year fiscal multipliers of public investment; Panel 2: semi-elasticity of private investment to public investment; Panel 3: semi-elasticity of employment to public investment. ** stands for a statistically significant coefficient at two standard deviation confidence interval.

IMF | Fiscal Affairs — Fiscal Monitor

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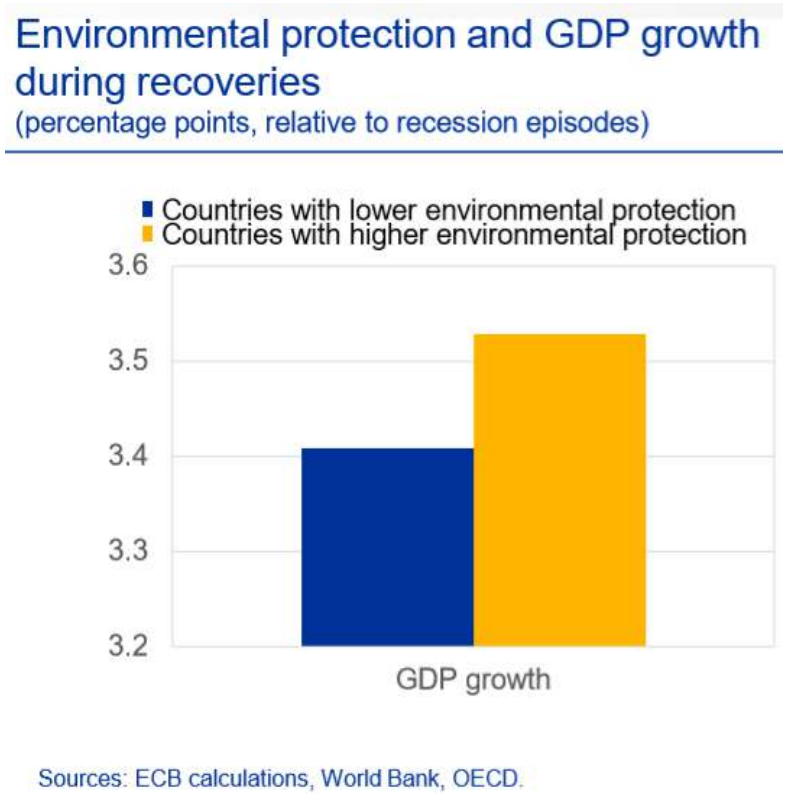
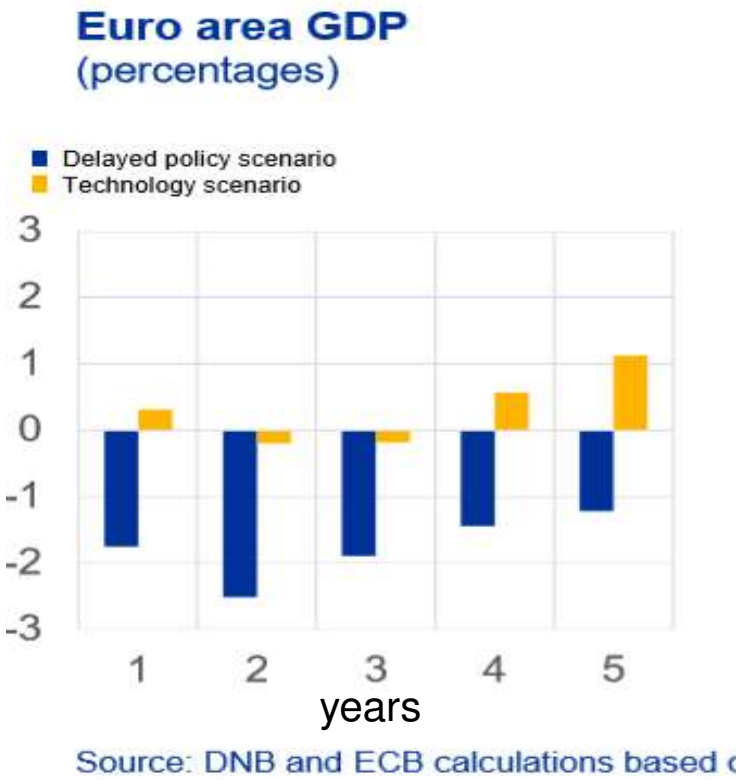
„Greener“ economies recover faster, delayed transition exacerbates costs

Two years after a recession…



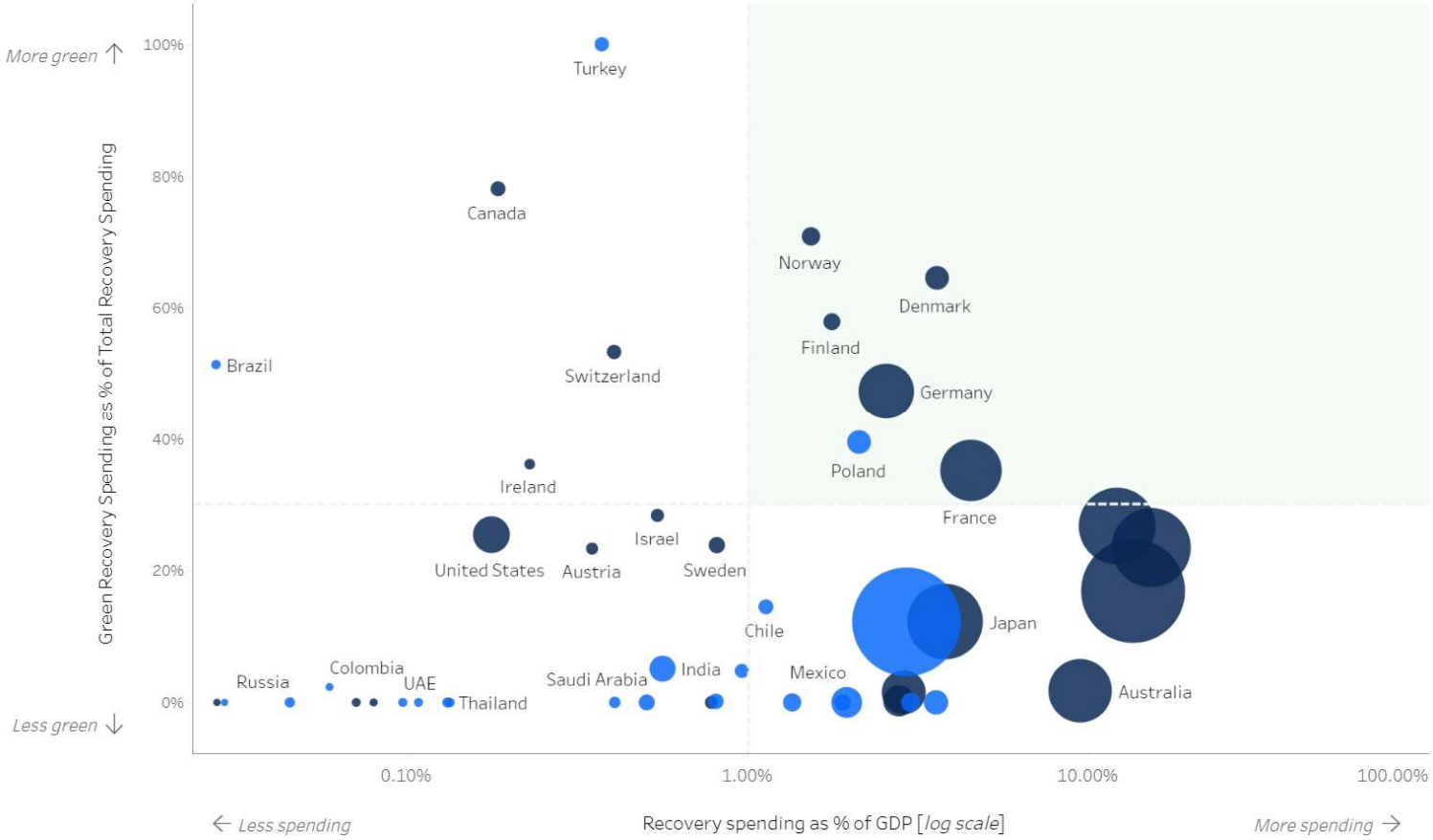
Sources: ECB calculations, World Bank, OECD.

Five years after sharp increase in carbon prices



Source: DNB and ECB calculations based

COVID-19: Only few countries with high green share of recovery spending



Source: Global Recovery Observatory

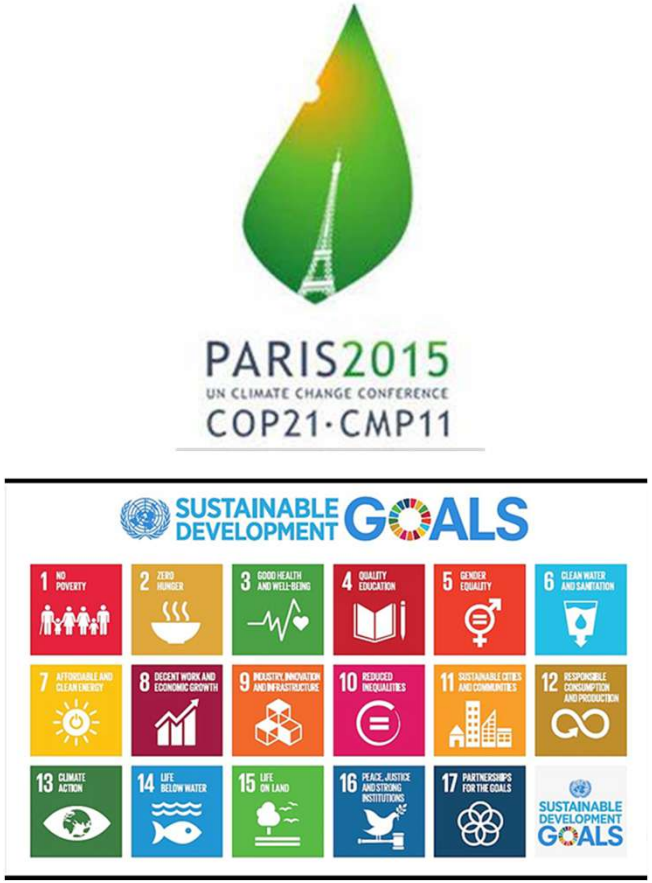
Political economy of climate change – various dilemmas

- "Climate change is the greatest and widest-ranging **market failure** ever seen" (Stern report, 2006) → prices do not reflect social costs
- Atmosphere is the biggest public good → **tragedy of the commons** (Hardin, 1968)
- **Tragedy of the horizon** (Carney, 2015) → impacts mainly future generations, but contemporaries have little interest in solution
- Some perceive themselves as **winners** of climate change or **losers** of mitigation

➢ Ostrom (2009) tragical parables oversimplify → **polycentric approach**:

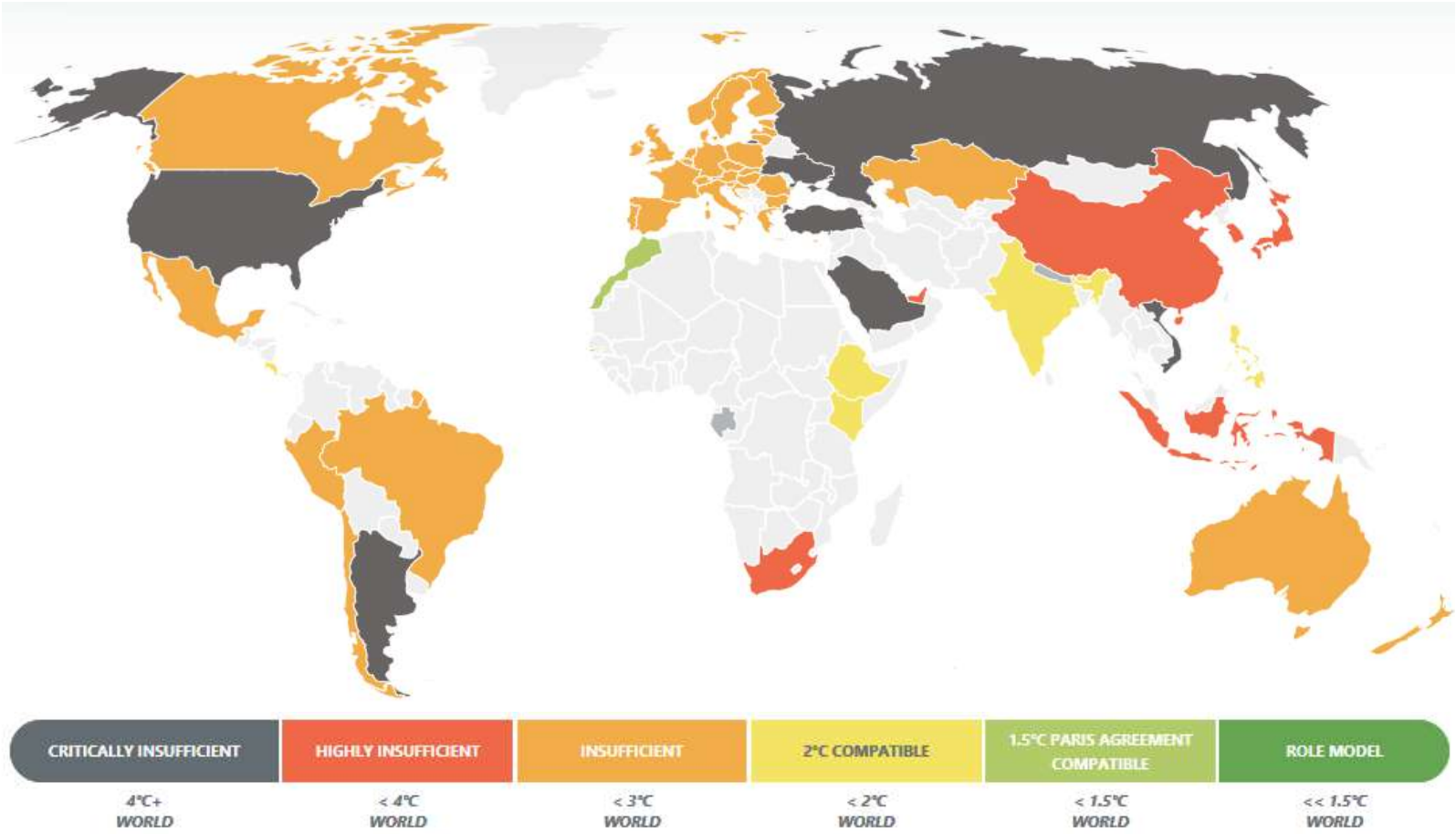
1. Strong **commitment**
2. Actors (including financial sector) **align efforts**
3. **Learning** from each other

Paris Agreement 2015: learning from (failed?) predecessors



- Legally binding **universal agreement**
- **Ambitious global long-term goals**
  - Well-below 2°C – ideally 1.5°C
  - Peaking GHG emissions asap
  - **Climate neutrality 2nd half of century**
  - Making financial flows consistent
- **Nationally Defined Contributions** – 5-year ambition cycle
- Enhanced transparency
- Mitigation and adaptation
- Support for poor and vulnerable countries
- → **Currently 191 countries signed**

Paris 2015: country commitments are not enough (yet)

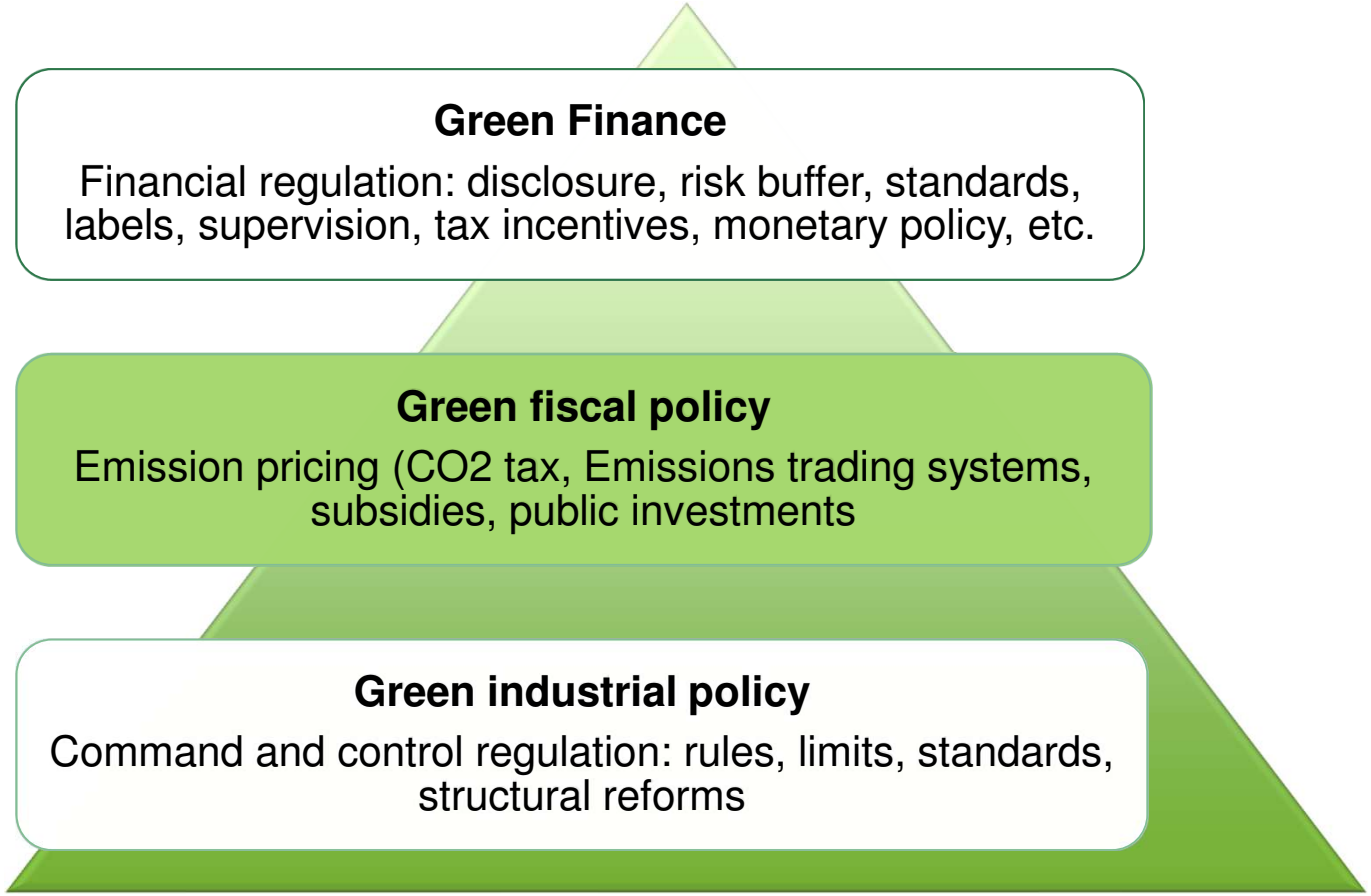


Is transition feasible? …Easter Parade on Fifth Avenue, New York

1900: Where is the car?

1913: Where is the horse?

Hierarchy of climate policy (rising level of abstraction)



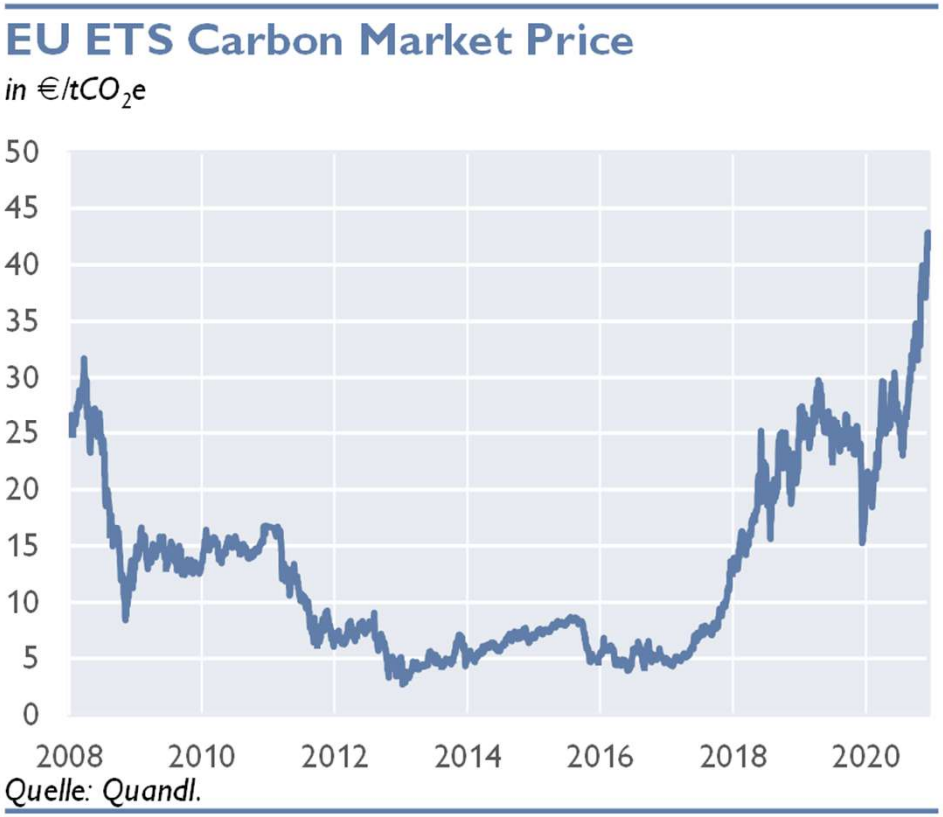
The two main approaches to carbon pricing

Carbon Tax

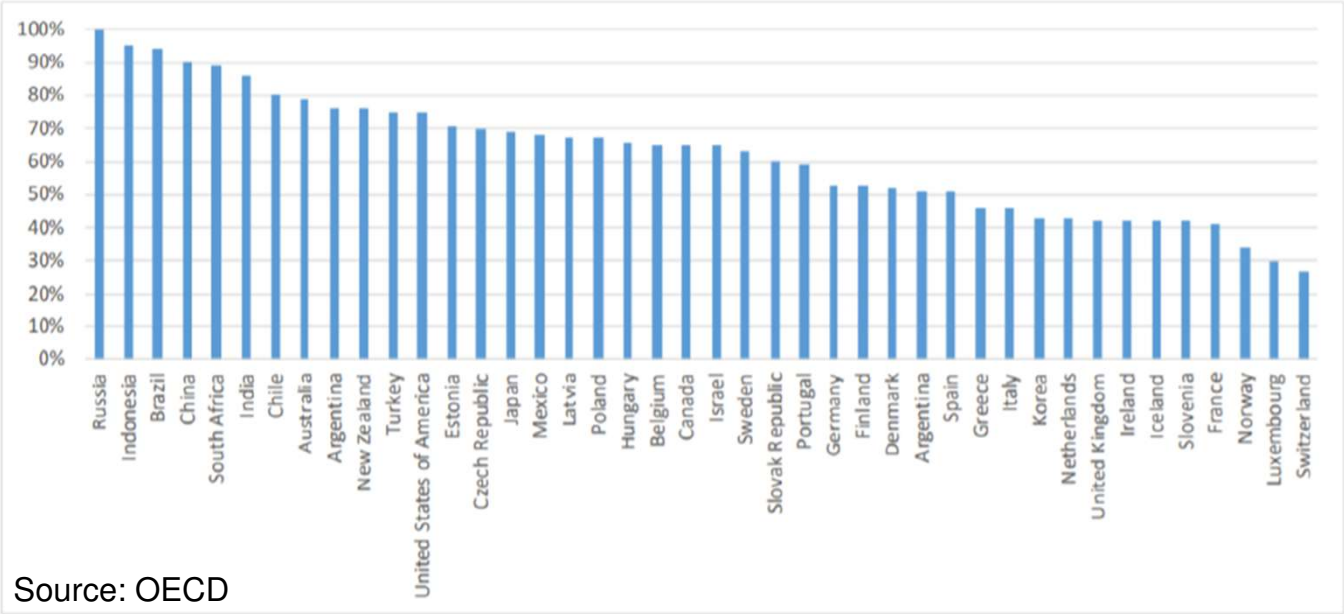
- **Price set directly on carbon** → tax rate on GHG emissions
- **price fixed – not the emission volume**
- ~**30 different schemes** implemented
- Huge **range**: 1$ in Poland → $119 in Sweden

Emission Trading Systems (cap-and-trade)

- **Maximum level of emissions** fixed (c**ap**) → **allowances** to industries → **traded to a market price**
- ~**31 ETS schemes** implemented. **Not all industries** included.
- Large **range**: $1 in Kazakhstan → ~ $45 EU



Carbon pricing gap (compared to 30 €/t CO2)

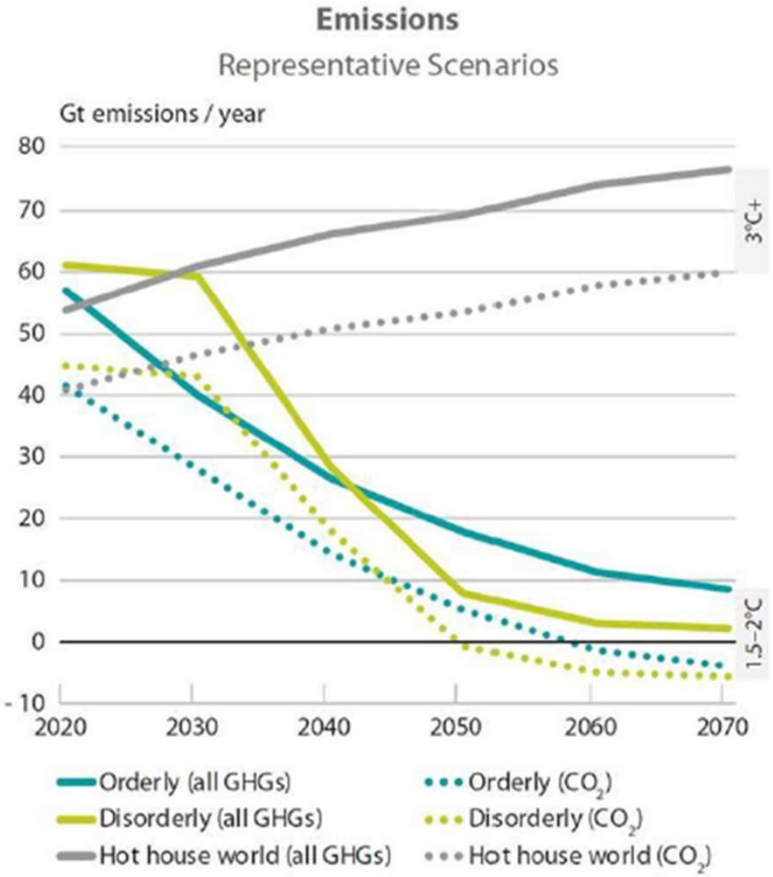


Source: OECD

- **Only 22% of global emissions priced**
- **< 5%** of global prices consistent with Paris Target
- Global **average price ~$2/t**
- In 2019, **governments raised $45 billion** from carbon pricing
- But $540 bn in **fossil subsidies** (IEA, 2013)

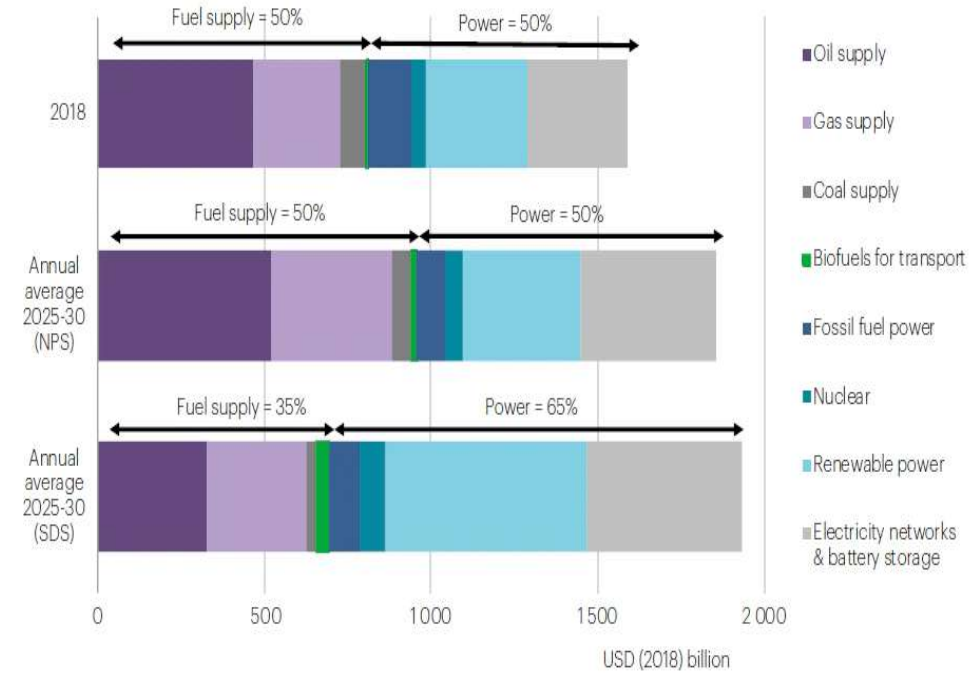
Distributional issues → compensate poorer households
Competitiveness issues → Border adjustment mechanism or carbon club (Nordhaus)

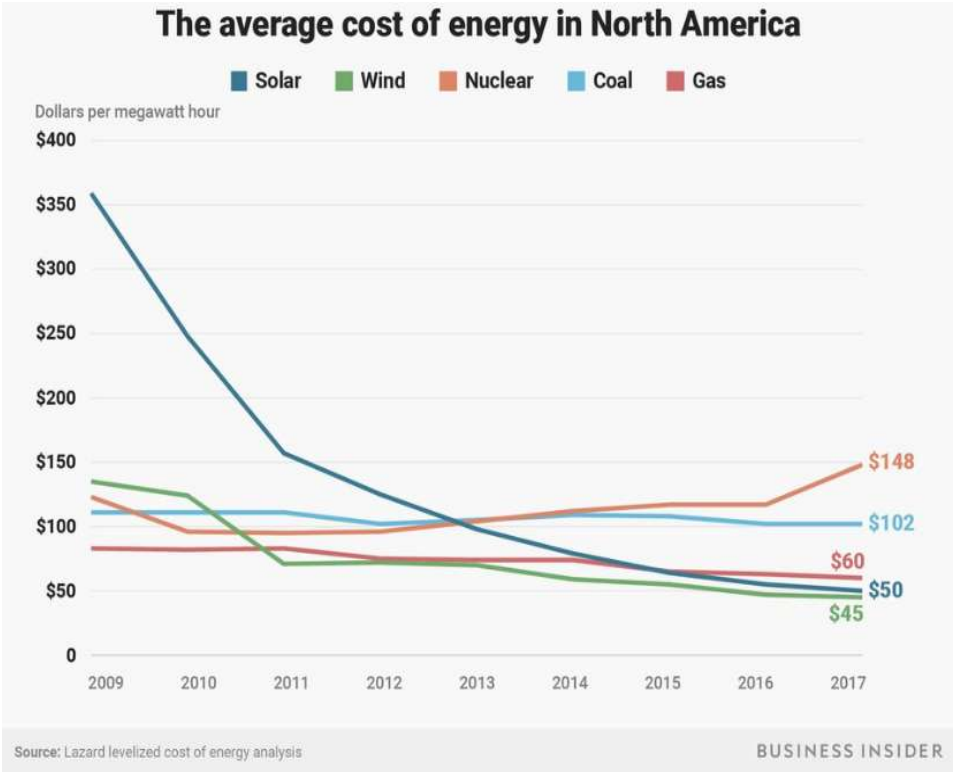
Scenarios: orderly, disorderly or no transition



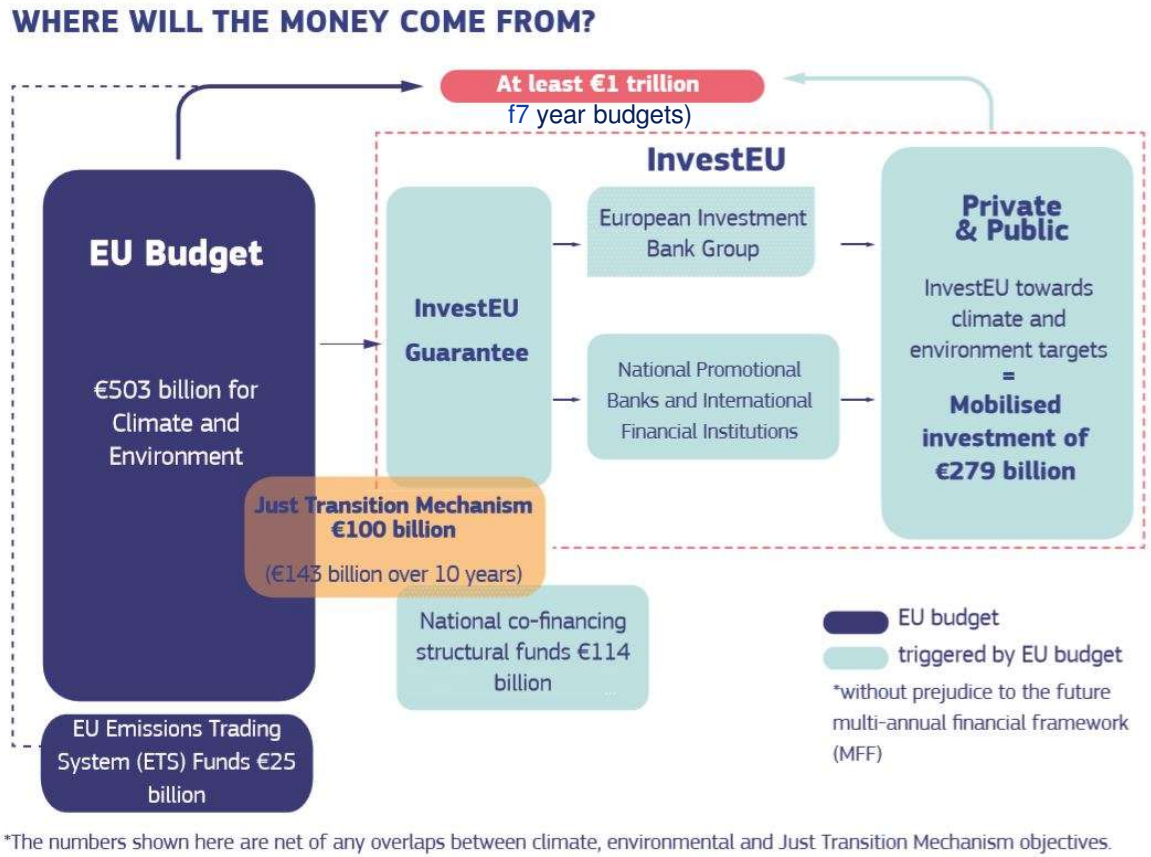
Global (public and private) investment need: > $1.2 tr p.a. (IEA)

Global energy supply investment by sector in 2018 compared with annual average investment needs 2025-30 by scenario





Example: European Green Deal



Ambitious targets:

- Net-zero in 2050
- 55% emissions cut by 2030

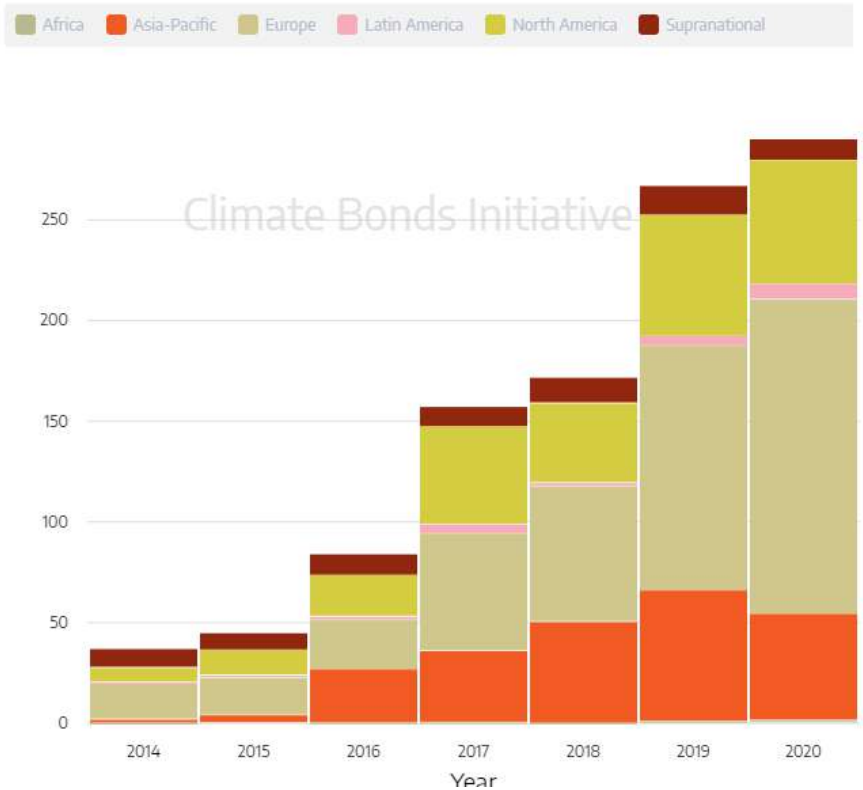
Amply finance:

- € 1 tr until 2030 leveraged from budget 2021-2027
- + € 1 tr from EIB (partly overlapping)
- + COVID-19 Recovery plan: At least € 277 bn NextGenerationEU fund → climate action

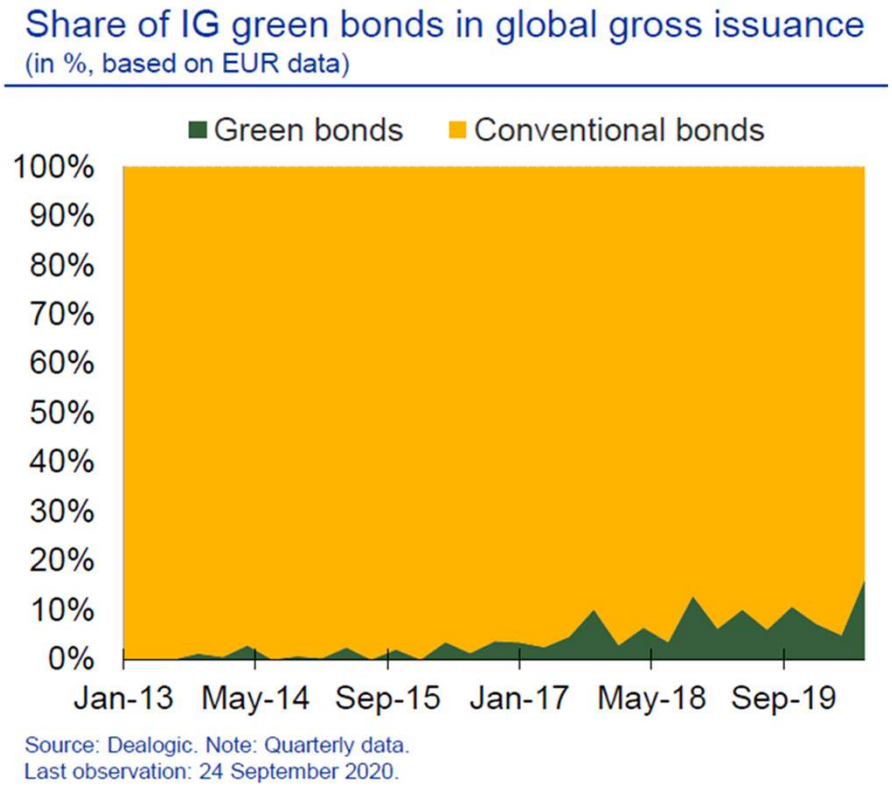
→ € 350 bn p.a. extra (private & public capital mobilized

Green bonds – growth story since 2007 (USD 1 tr accumulated)

…public and private issuers



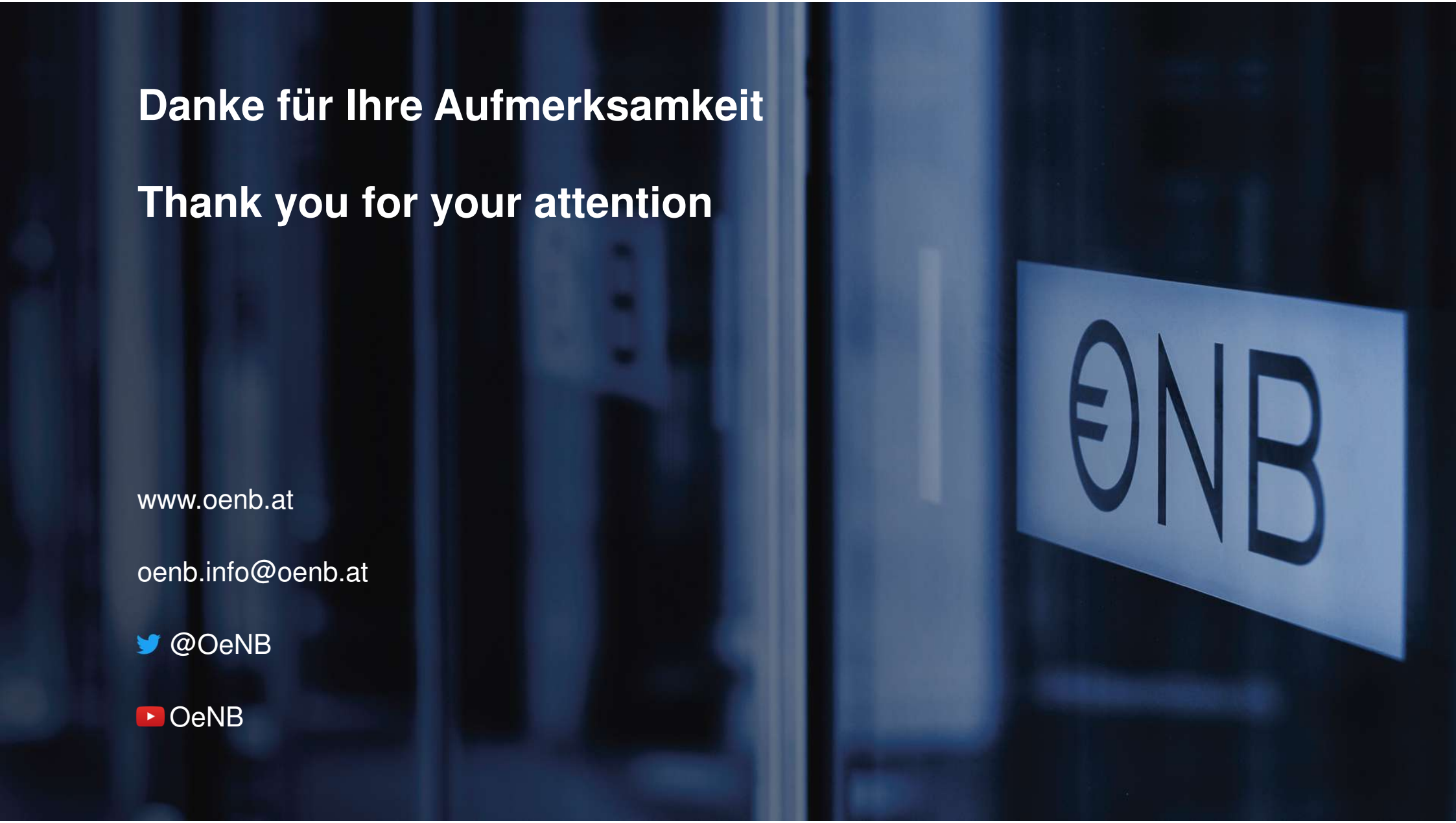
…led by Europe (in euros)



A few important public and private initiatives

Key take-aways

1. Climate change is man made
2. Huge cost uncertainties → low carbon transition = insurance
3. Paris agreement copes with free rider problem
4. Lack of carbon price is a critical market failure
5. Climate change and action imply (financial) risks and opportunities
6. Colossal investment needs (private & public)
7. (Smooth) transition pays off economically
8. COVID-19 offers an opportunity for accelerated transition
9. Decisive decade of climate action
10. No policy actor can hide away



Danke für Ihre Aufmerksamkeit

Thank you for your attention

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