



Recommendation 5: Forward-looking Physical & Transition Risk Indicators

OECD work on monitoring exposure to climate-related hazards

G20 DGI-3 Global Conference

14 June 2023 in Washington D.C., USA

Session II



Recommendation 5: forward-looking physical & transition risk indicators

- **Policy Driver:** Quantify and monitor forward looking risk to help prioritize and develop support for climate action.
- **Statistical Outputs:** Forward looking physical and transition risk indicators (risk to populations, economic growth, financial markets, profits, ecosystems, etc..)

Methodological Framework	IAG Leads / Stakeholders
✓ SNA, BPM, SEEA-CF, SEEA-EA	IMF
✓ NGFS Climate Scenarios	ECB / OECD / BIS (IFC) / FSB Secretariat / World Bank
✓ Ongoing analytical work by the ECB and FSB related to climate-related financial risks	Network for the Greening of the Financial System IPSASB UNCEEA



Timeline Recommendation 5

REC 5: Forward Looking Physical and Transition Risk Indicators

TASK	RESPONSIBILITY	MODALITY	TYPE OF ENGAGEMENT	CY2023				CY2024				CY2025				CY2026				CY2027			
				Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1. Governance: Establish Task Team.	DGI Secretariat, IAG Lead Agencies	Invitation Letter	Consultation	X																			
2. Design: IAG Lead Agencies and other relevant stakeholders develop a concept note on the indicators.	IAG Lead Agencies	Virtual	Consultation		X																		
3. Design: IAG Lead Agencies organize a workshop with G20 and participating economies to discuss the concept note; agree on action plan.	IAG Lead Agencies, G20 and participating economies	Virtual	Workshop			X																	
4. Design: IAG Lead Agencies conduct a survey seeking feedback from G20 and participating economies on the concept note.	IAG Lead Agencies, G20 and participating economies	Survey	Consultation			X																	
5. Design: IAG Lead Agencies draft methodological framework and reporting templates based on feedback received.	IAG Lead Agencies	Virtual	Consultation			X	X	X	X														
6. Process: Interested G20 and participating countries develop experimental estimates.	G20 and participating economies	DGI Reporting Template	Data Submission						X	X													
7. Process: IAG Lead Agencies organize a workshop with G20 and participating economies to discuss experimental estimates and update the methodological framework, indicators and reporting templates.	IAG Lead Agencies, G20 and participating economies	In-person	Workshop							X													
8. Process: IAG Lead Agencies guide G20 and participating economies to compile the forward looking physical and transition risk indicators.	IAG Lead Agencies, G20 and participating economies	Virtual	Consultation								X	X	X	X	X	X	X	X					
9. Process: G20 and participating economies compile and submit forward looking physical and transition risk indicators using draft reporting templates.	G20 and participating economies	DGI Reporting Template	Data Submission							X	X	X	X	X	X	X	X	X					
10. Design: IAG Lead Agencies organize a workshop with G20 and participating economies, for countries to share their experiences, finalize the methodology, compilation and dissemination guidance.	IAG Lead Agencies, G20 and participating economies	In-person	Workshop															X					
11. Disseminate: G20 and participating economies and IAG Lead Agencies disseminate forward looking physical and transition risk indicators per country commitments.	IAG Lead Agencies, G20 and participating economies	DGI Reporting Template	Data Dissemination															X	X				



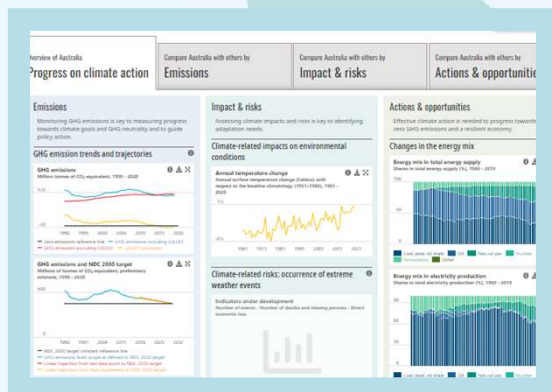
BETTER POLICIES FOR BETTER LIVES



International Programme for Action on Climate (IPAC) to help countries progress towards net-zero and strengthen their climate action

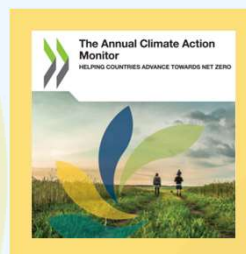


CLIMATE ACTION DASHBOARD Selected core indicators



↑ **Climate action indicator set**
Core & complementary indicators

Annual CLIMATE ACTION MONITOR



Digest of progress towards climate goals

COUNTRY NOTES



- Policy advice
- Good practices
- Environmental Performance Reviews
- Economic surveys
- In-depth energy reviews



online platform for
**DIALOGUE & MUTUAL
LEARNING**



IPAC conceptual indicator framework



Pressure

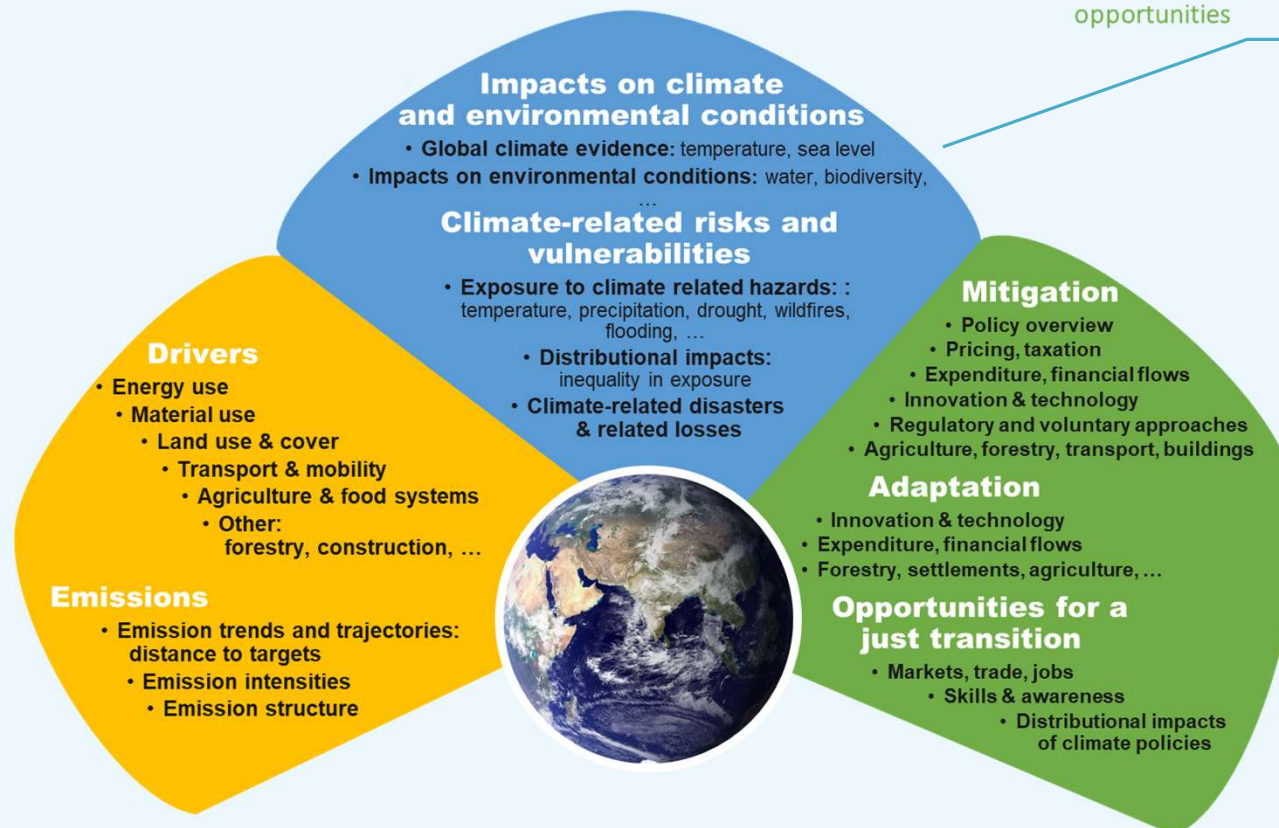
Emissions & drivers

State

Impacts & risks

Response

Policies, actions, opportunities



Improved knowledge to stimulate effective mitigation policies and guide adaptation

Measurement challenges
Capture of country-specific characteristics
Relevance for international work

Internationally comparable indicators for climate-related hazards on a national and subnational level using high-resolution geospatial data sources



Wildfire, South Africa



Flood town, Bern, Switzerland



Drought



Flooding, Bradford, United Kingdom



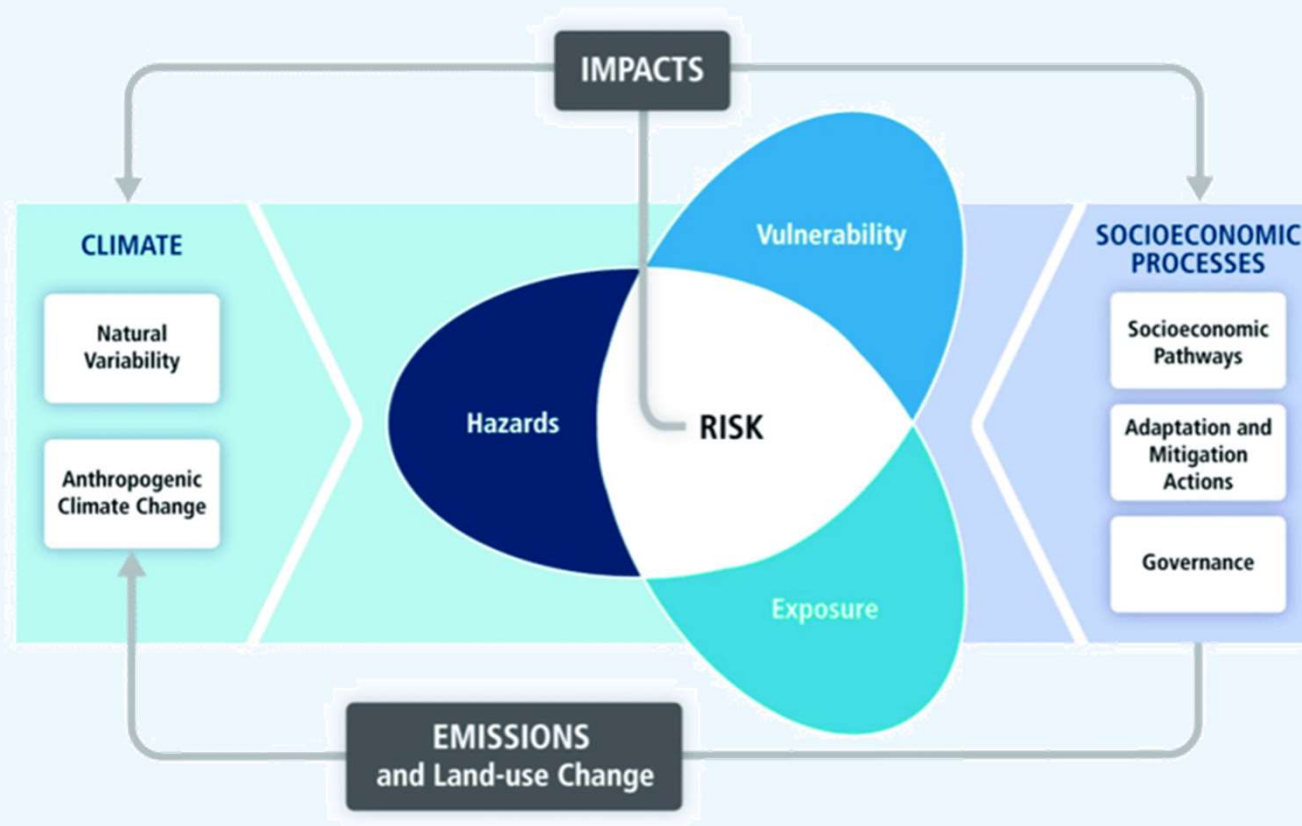
Hurricane, Wyoming, United States



Air pollution due to wildfires, New York City



The IPCC concept of risk is used as the underlying framework for assessing hazards



Source: IPCC 2014 & IPCC 2022



Exposure to climate-related hazards

Overview and key features



Extreme temperature



Extreme precipitation



Drought



Wildfire



Wind threats



River flooding



Coastal flooding

Source: [Maes, M., et al. \(2022\)](#).

Percentage of population exposed to n number of hot days ($T_{max} > 35^{\circ}\text{C}$)

Percentage of population exposed to n number of tropical nights ($T_{min} > 20^{\circ}\text{C}$)

Percentage of population exposed to n number of days identified as a hot day and a tropical night
Population weighted average of the number of days per year with strong, very strong and extreme heat stress

Percentage of population exposed to n number of icing days ($T_{max} < 0^{\circ}\text{C}$)

Percentage of cropland exposed to n number of days when the total daily precipitation amount is above the 99th percentile

Average cropland soil moisture anomaly

Percentage of population located in areas at risk of burning

Percentage of forested areas at risk of burning

Percentage of population exposed to violent storms per year

Percentage of built-up area exposed to violent storms per year

Percentage of population exposed to cyclone wind threats with a 50-, 100-, 250- and 500-year return period

Percentage of built-up area exposed to cyclone wind threats with a 50-, 100-, 250- and 500-year return period

Percentage of population exposed to river flooding with a 10-, 20-, 50- and 100-year return period

Percentage of built-up area exposed to river flooding with a 10-, 20-, 50- and 100-year return period

Percentage of cropland exposed to river flooding with a 10-, 20-, 50- and 100-year return period

Percentage of population exposed to coastal flooding with a 10-, 25-, 50- and 100-year return period

Percentage of built-up area exposed to coastal flooding with a 10-, 25-, 50- and 100-year return period

Percentage of cropland exposed to coastal flooding with a 10-, 25-, 50- and 100-year return period

• Internationally comparable indicators

• Global geographic coverage

• Time series

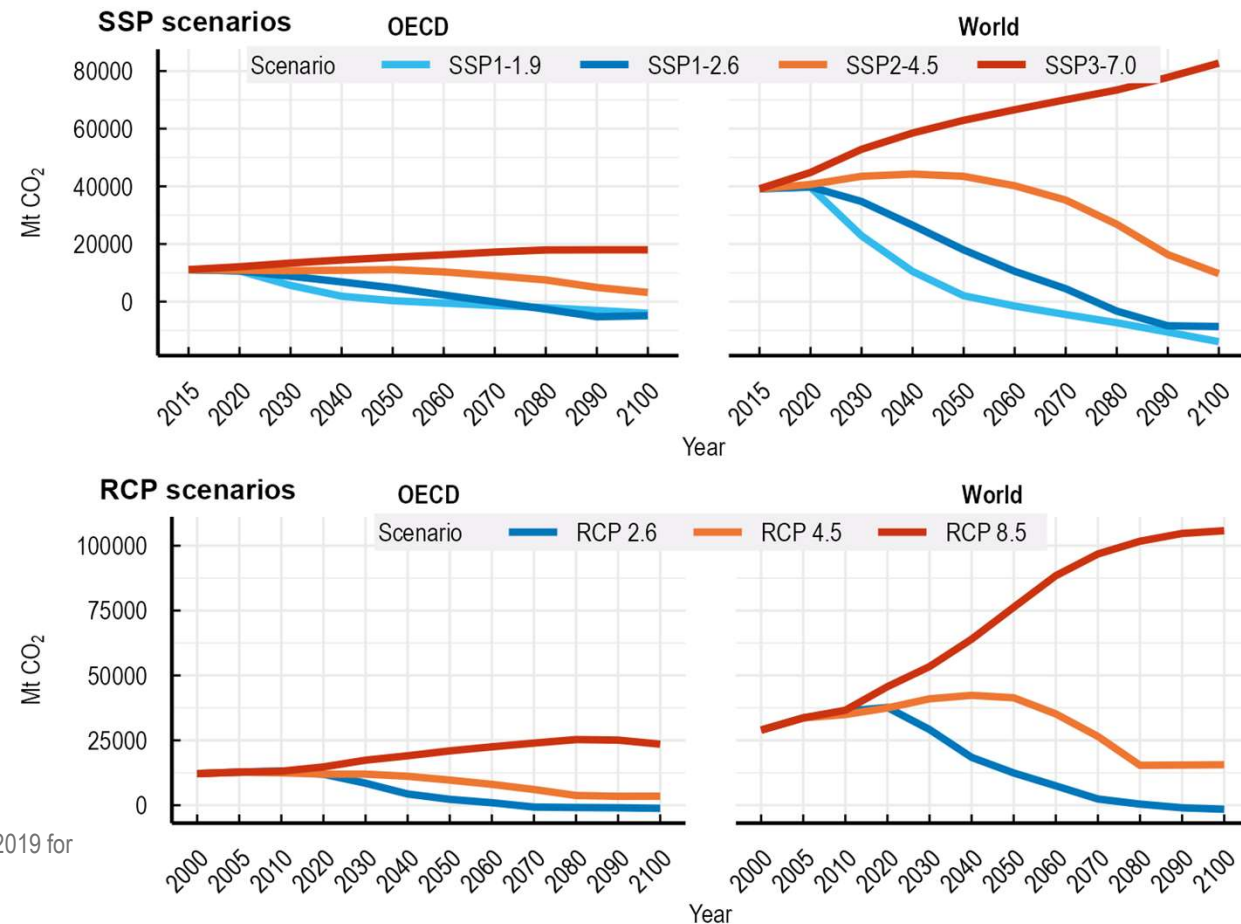
• Timeliness

• Sub-national detail

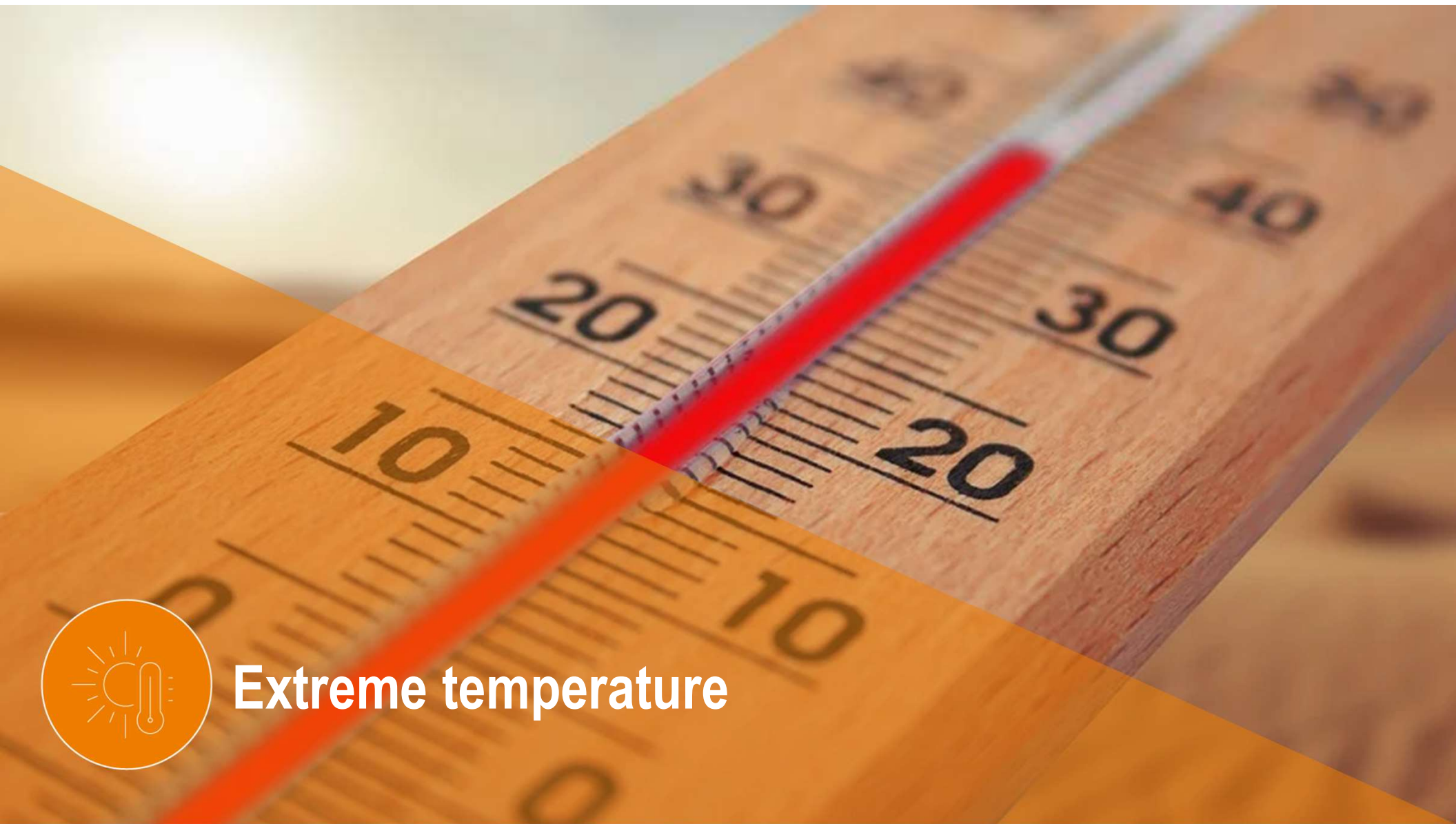


Climate scenarios cover a broad range of CO₂ emission pathways

- Climate scenarios represent different plausible **pathways of socio-economic development**, e.g. population growth, economic activity, energy intensity and land use change



Source: Data obtained from Riahi et al., 2017, Rogelj et al., 2018 and Gidden et al., 2019 for the SSP scenarios and van Vuuren et al., 2007, Clarke, 2007 and Riahi, Grübler and Nakicenovic, 2007 for the RCP scenarios.

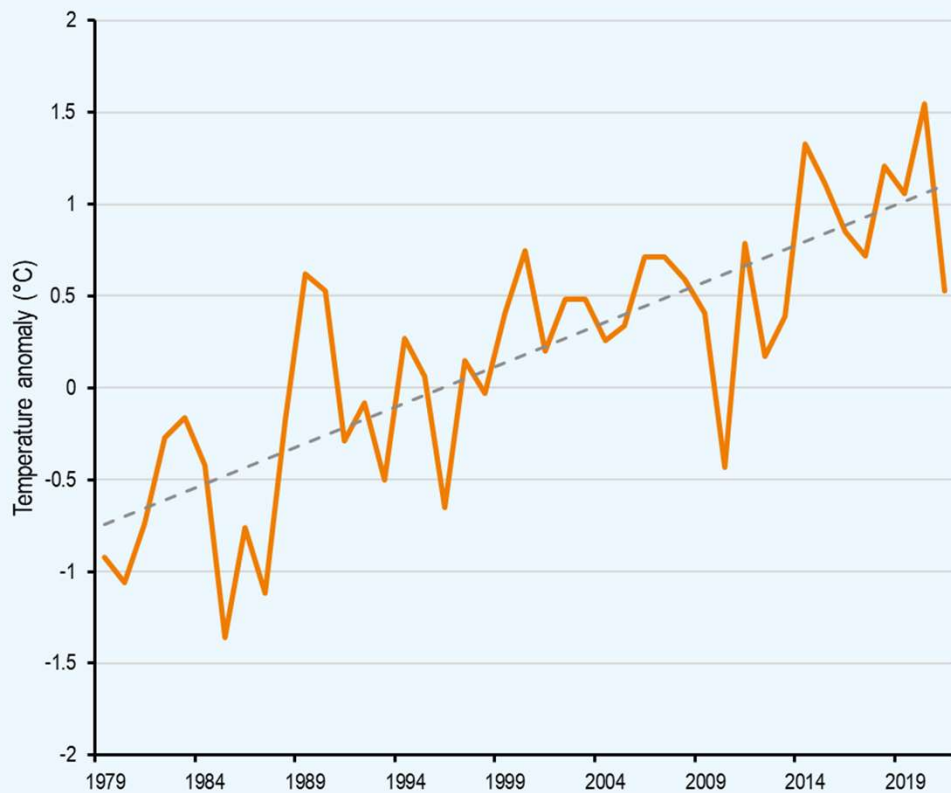


Extreme temperature



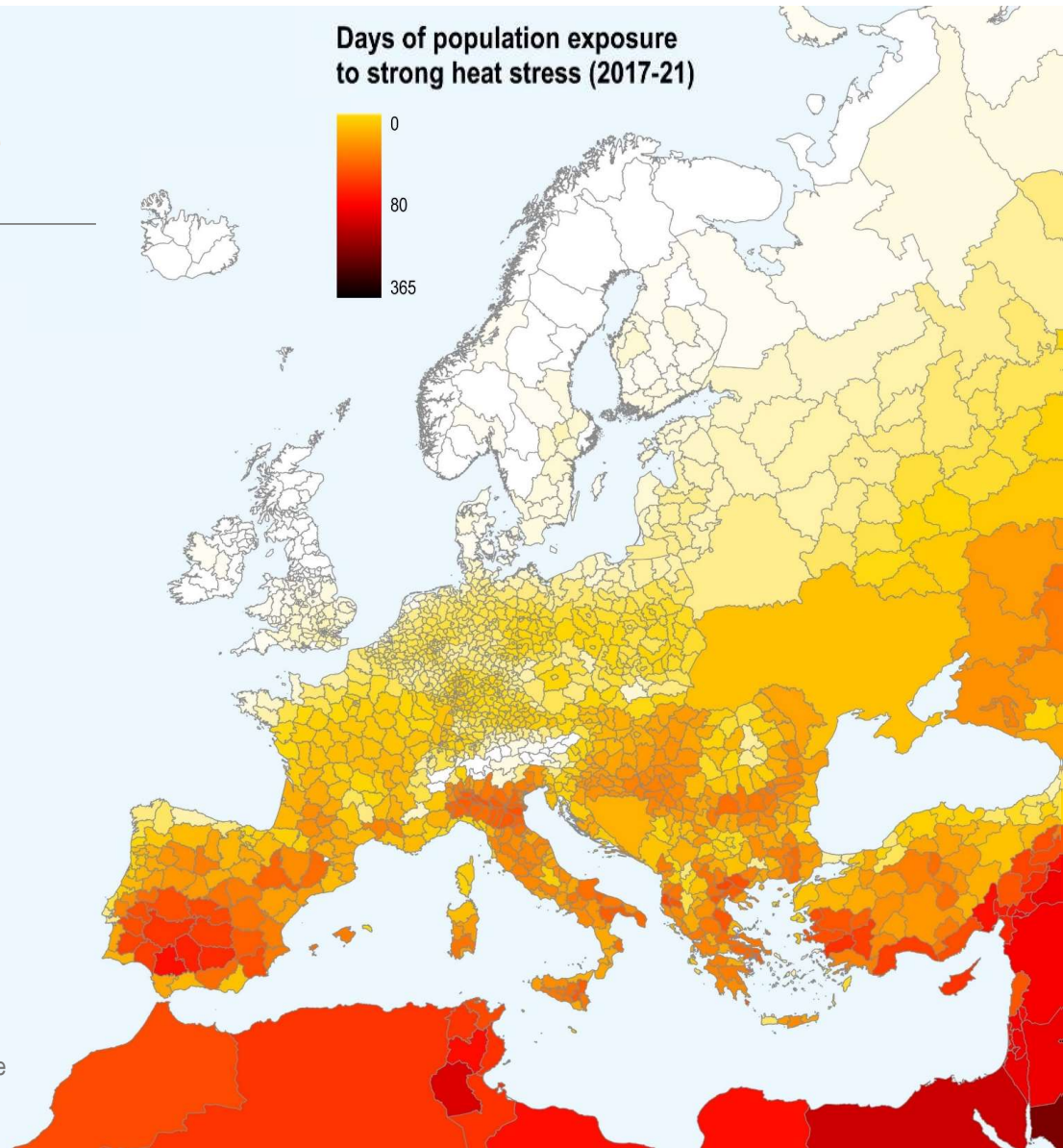
Extreme temperature

Population exposure to heat (Days of population exposure to strong heat stress, 2017-21)



Source: OECD and IEA calculations using temperature data from ERA5 reanalysis (Copernicus Climate Data Store) and methodology from Maes, M., et al. (2022), [“Monitoring exposure to climate-related hazards: Indicator methodology and key results”](#), OECD Environment Working Papers, No. 201.

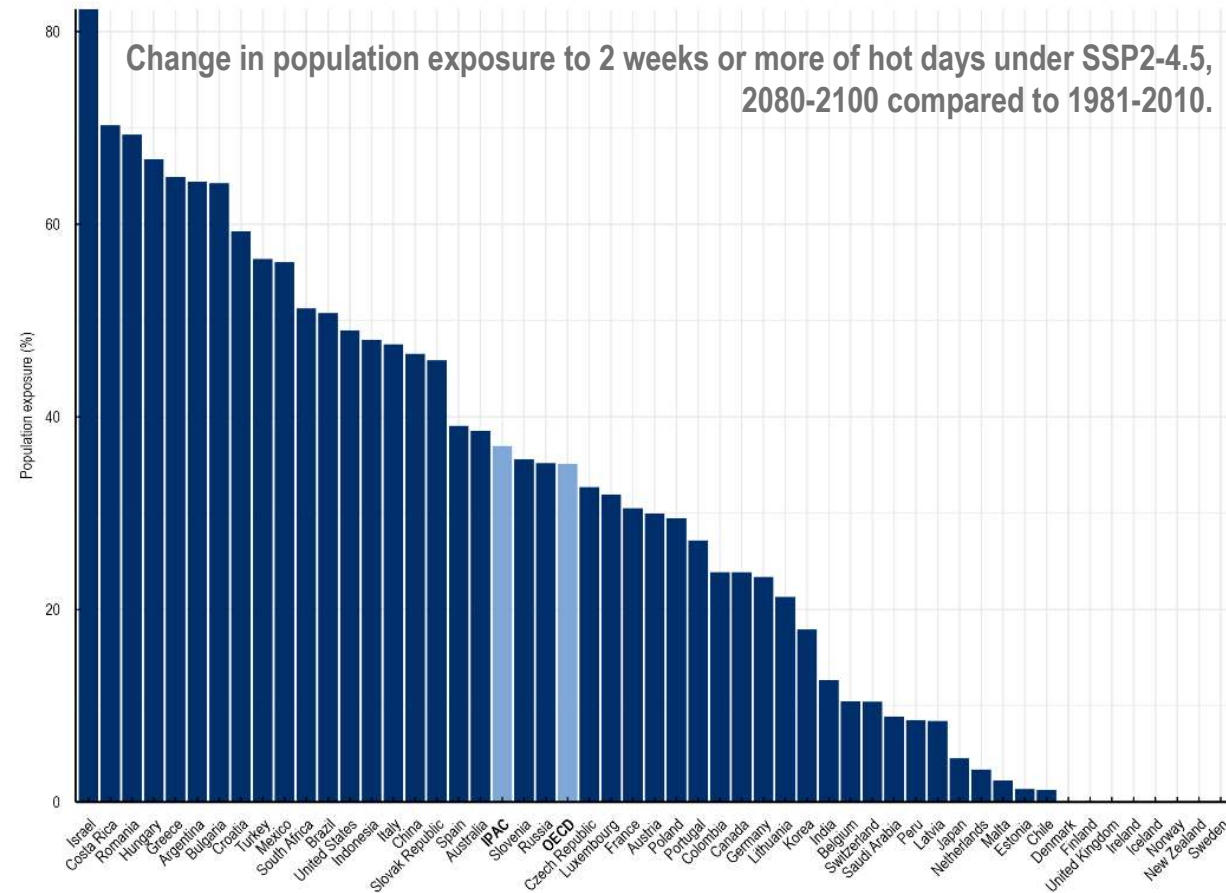
Days of population exposure to strong heat stress (2017-21)





Extreme temperature: forward-looking indicators

- Population exposure varies between countries.
- Countries such as Israel, Costa Rica, Romania and Hungary have more than 60% of the population exposed compared to the reference period (1981-2010).



Source: OECD calculations using population grids from the EU JRC Global Human Settlement Layer (GHSL) and ensemble mean projected hot day index from the World Bank Climate Change Knowledge Portal.

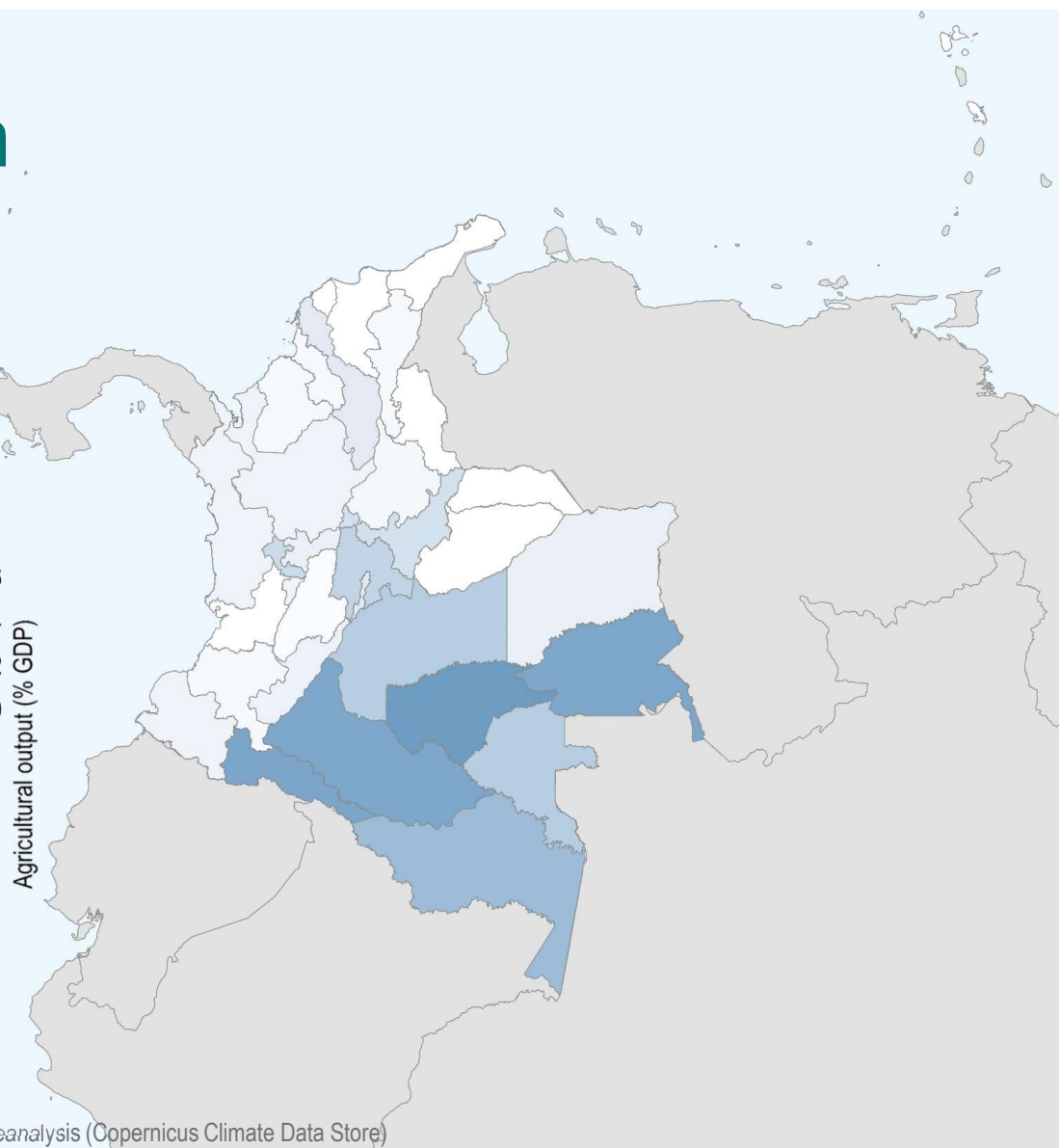
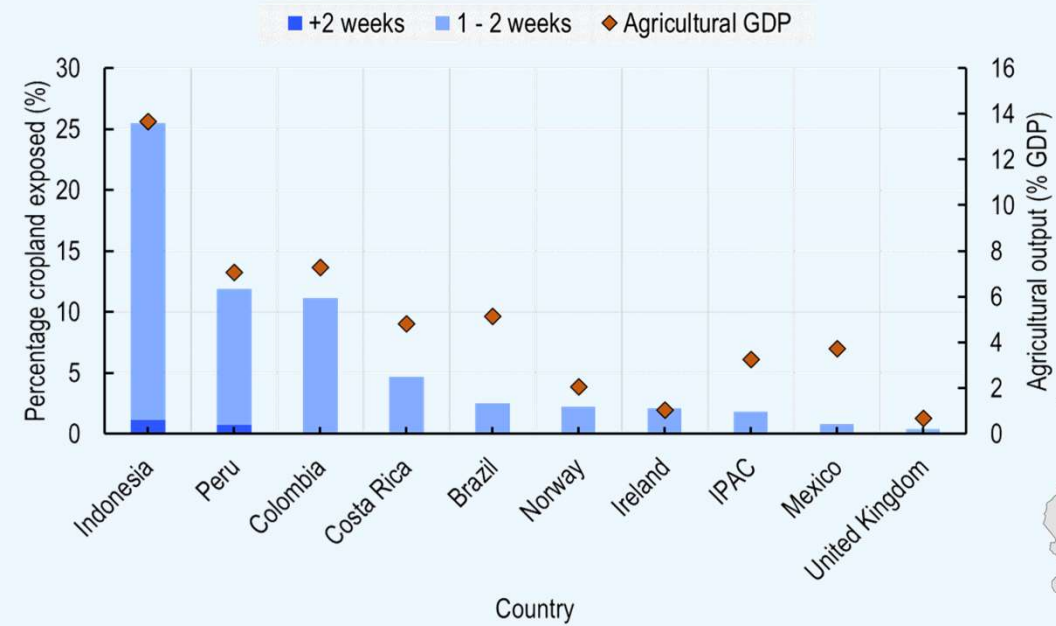


Extreme precipitation



Extreme precipitation

Annual average percentage of cropland exposed to one week or more with extreme precipitation, 2017-21



Source: [Maes, M., et al. \(2022\)](#). OECD & IEA calculations using daily precipitation amount from ERA5 reanalysis (Copernicus Climate Data Store)

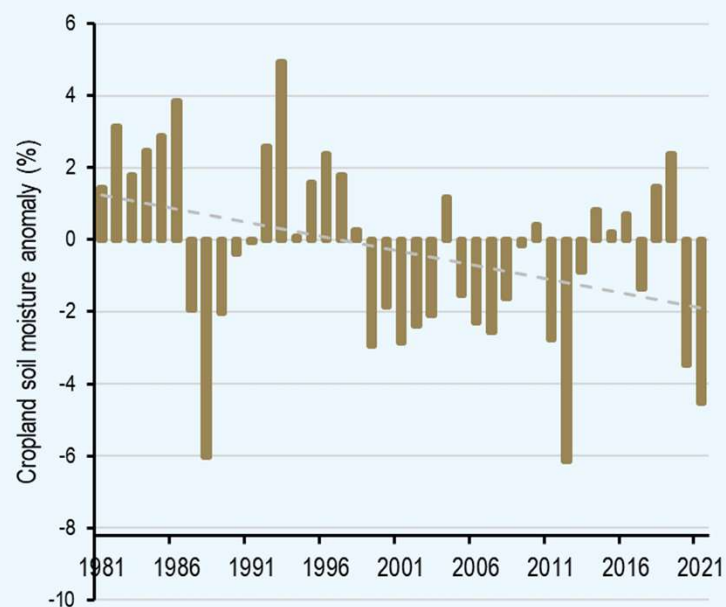


Extreme drought

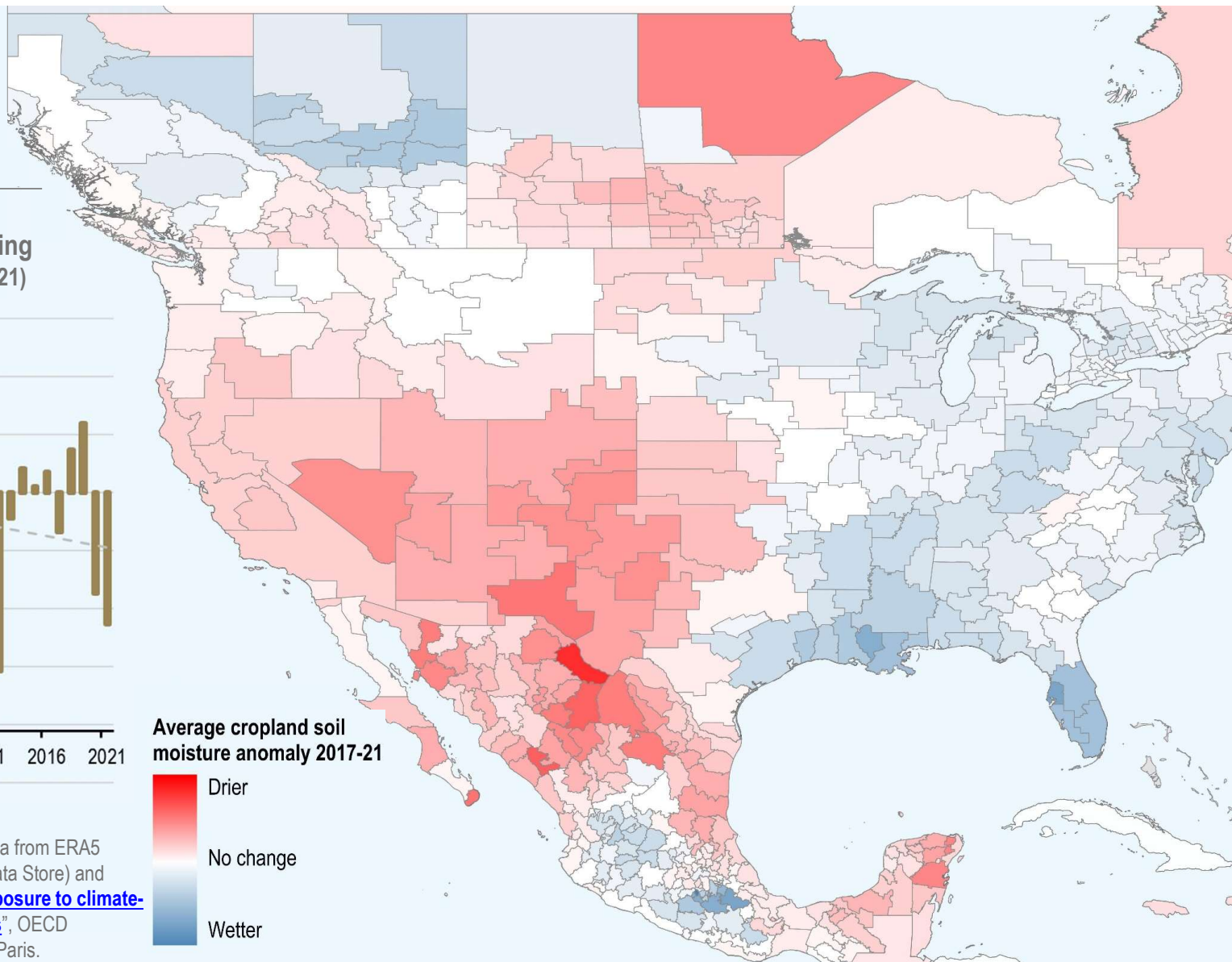


Drought

Agricultural drought is increasing
(OECD America average, 1981 - 2021)



Average cropland soil
moisture anomaly 2017-21



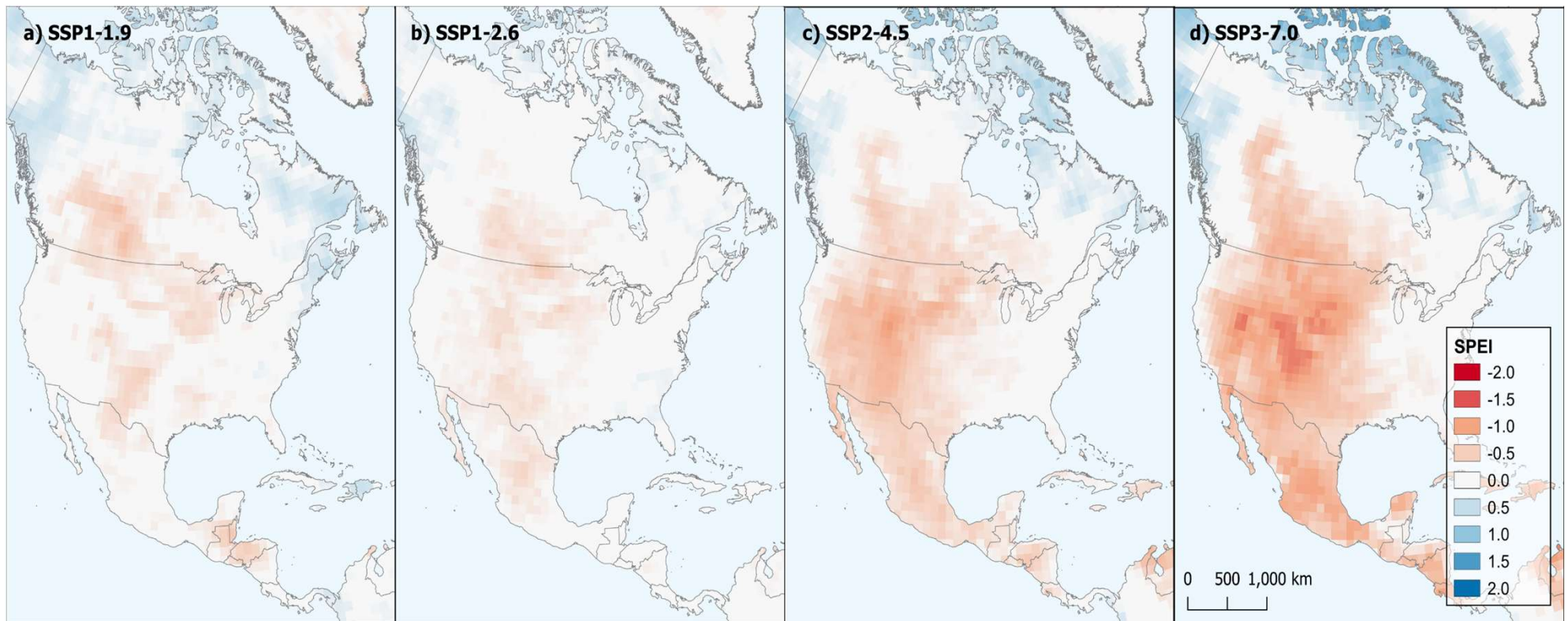
Source: OECD calculations using soil moisture satellite data from ERA5 reanalysis, land cover gridded data (Copernicus Climate Data Store) and methodology from Maes, M., et al. (2022), "[Monitoring exposure to climate-related hazards: Indicator methodology and key results](#)", OECD Environment Working Papers, No. 201, OECD Publishing, Paris.



Drought: Forward-looking indicators

Large parts of North America will be impacted by severe drought conditions under less optimistic climate change scenarios

Annual SPEI index 2080-2099



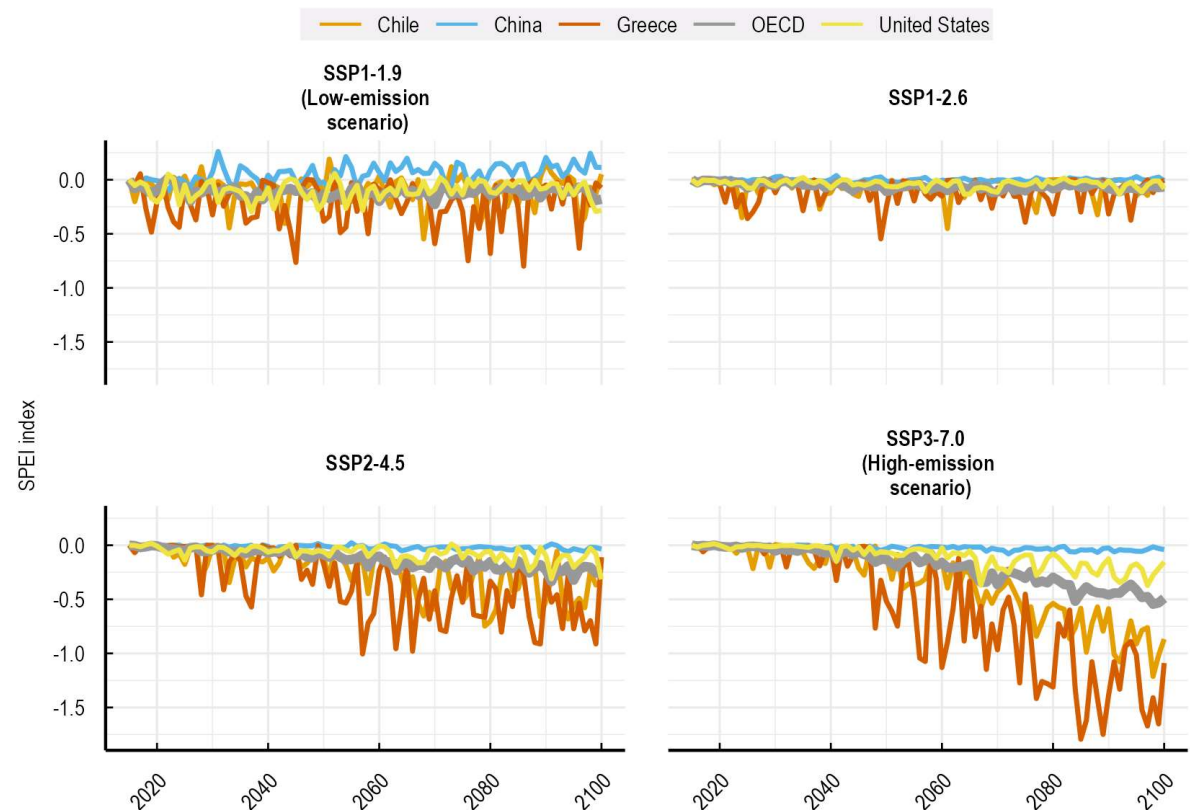
Source: Visualization of the ensemble mean projected Standardized Precipitation Evapotranspiration Index (SPEI) from the World Bank Climate Change Knowledge Portal.



Drought: Forward-looking indicators

- High-emission climate scenarios impose severe agricultural drought conditions from some countries.

Time series of the SPEI of cropland for a selection of countries, incl. OECD aggregate



Source: Visualization of the ensemble mean projected Standardized Precipitation Evapotranspiration Index (SPEI) from the World Bank Climate Change Knowledge Portal.

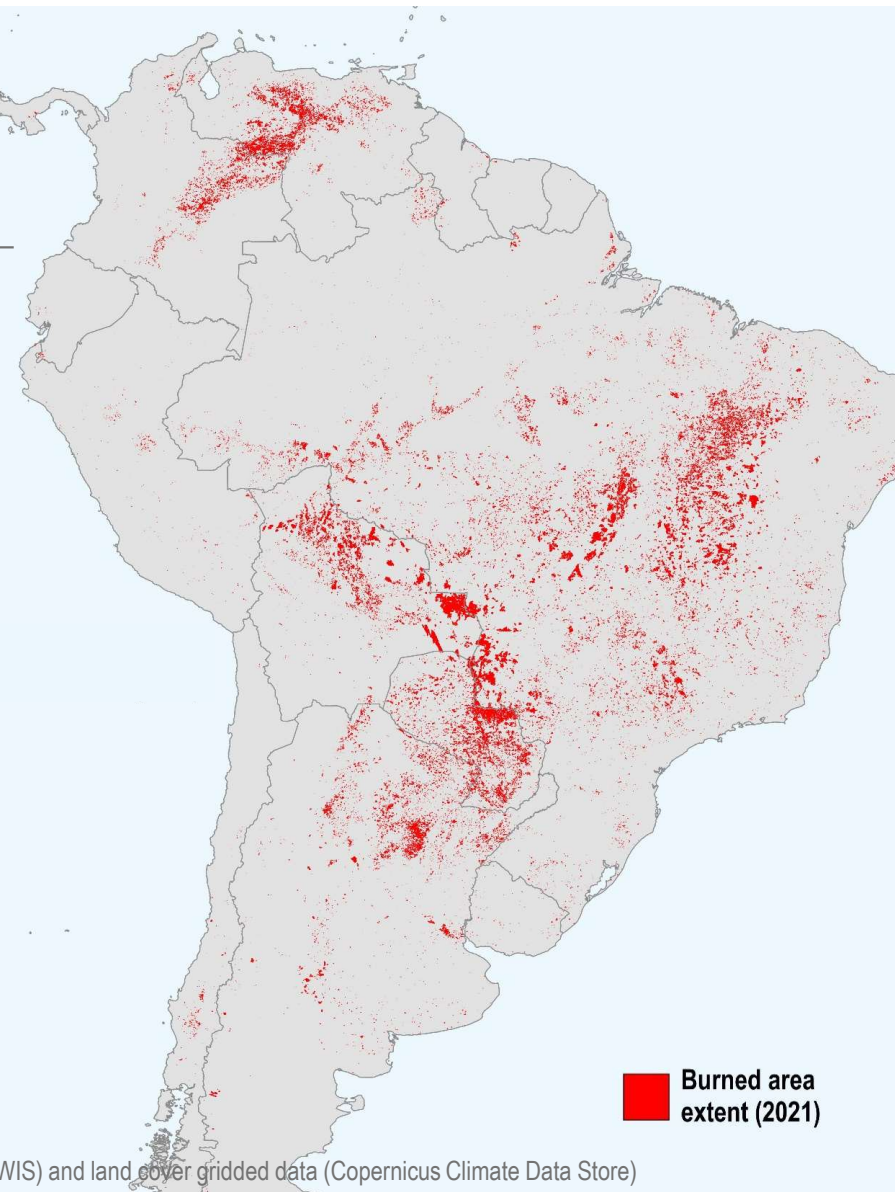
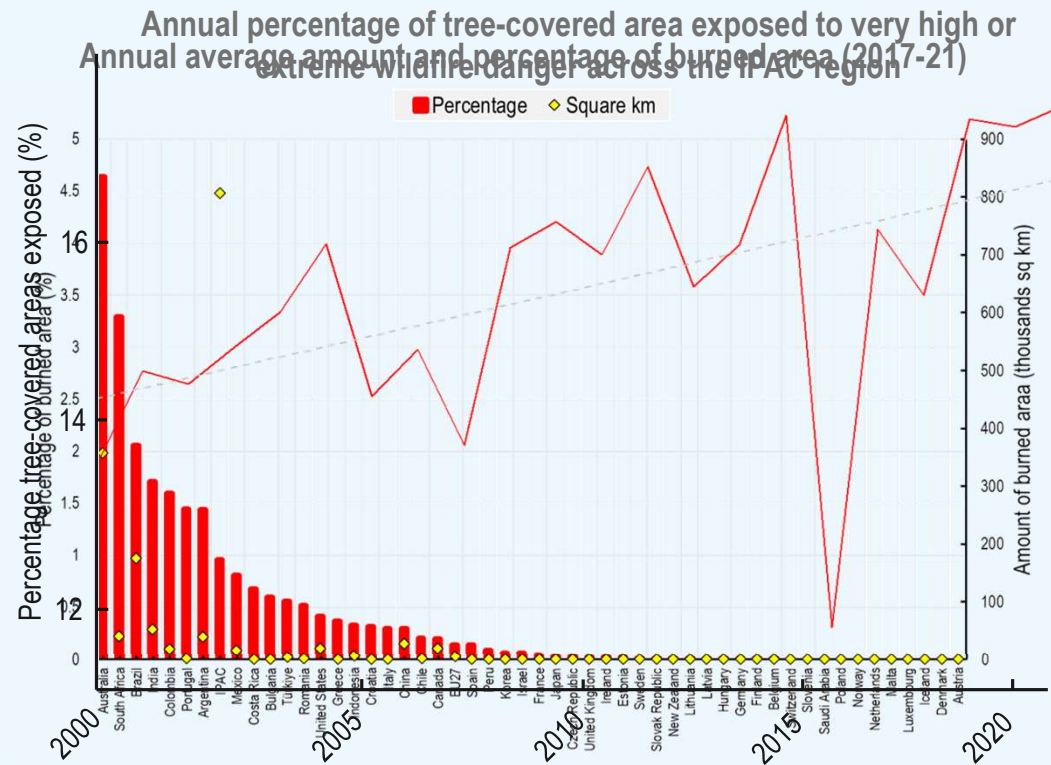


Wildfire



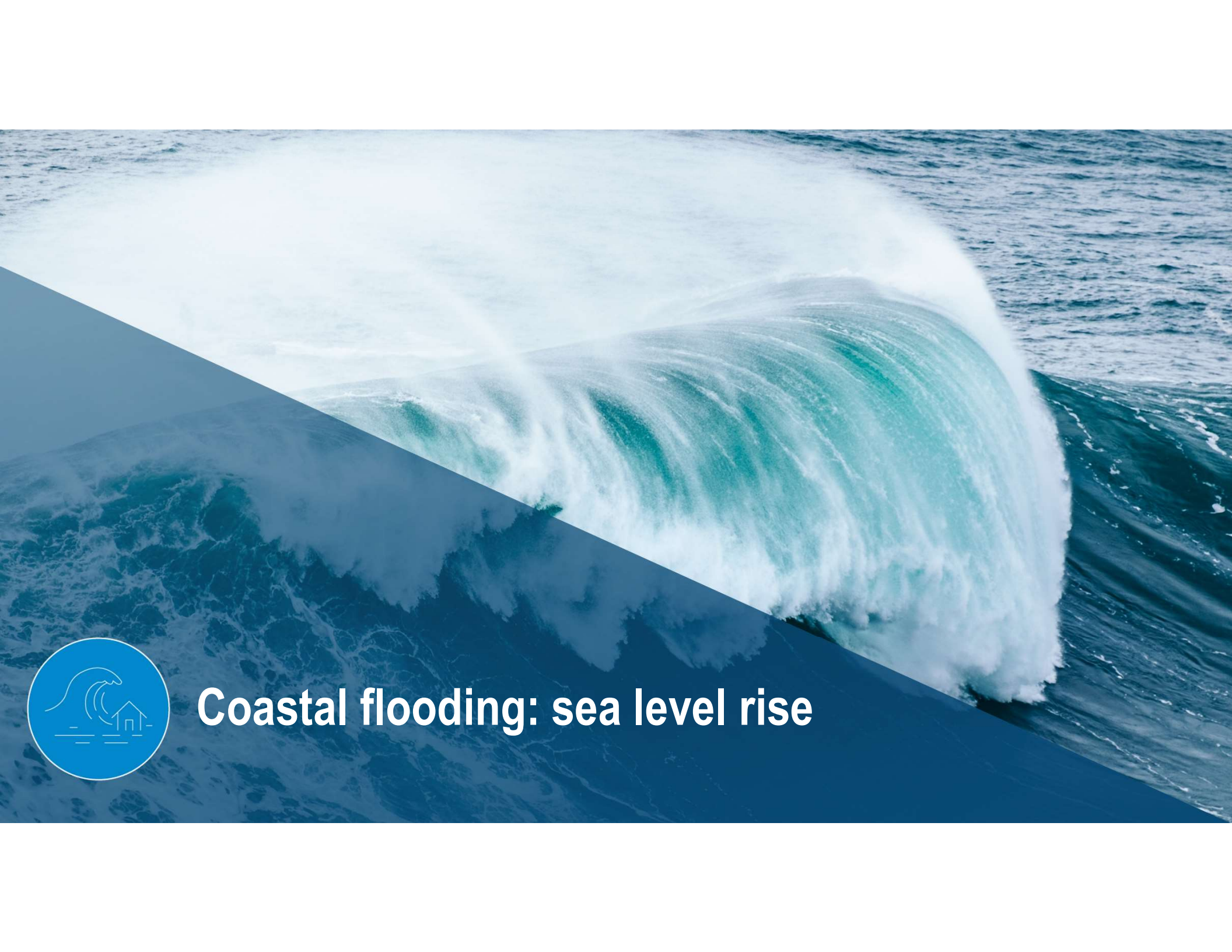
Wildfire

- Over the past five years, 15% of fire events globally occurred in only four countries, i.e. Argentina, Australia, Brazil and India.



Burned area
extent (2021)

Source: [Maes, M., et al. \(2022\)](#). OECD calculations using burned area extent from the Global Wildfire Information System (GWIS) and land cover gridded data (Copernicus Climate Data Store)

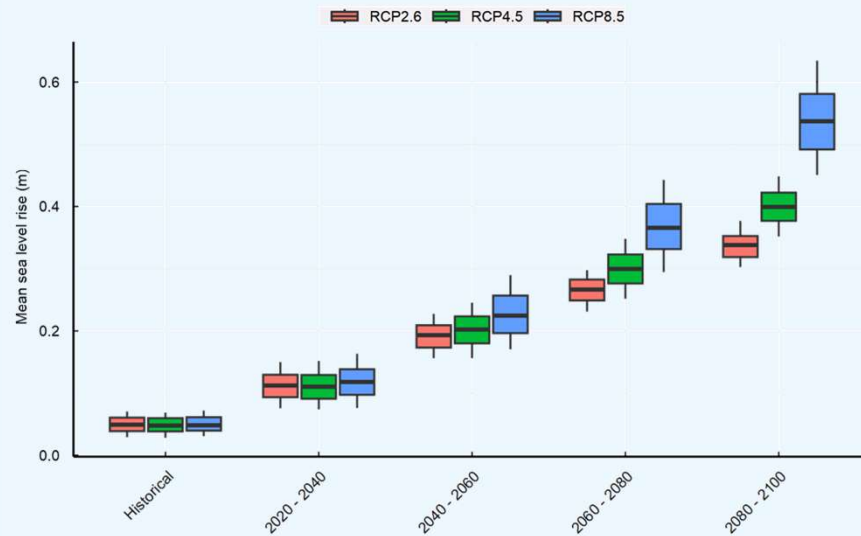


Coastal flooding: sea level rise

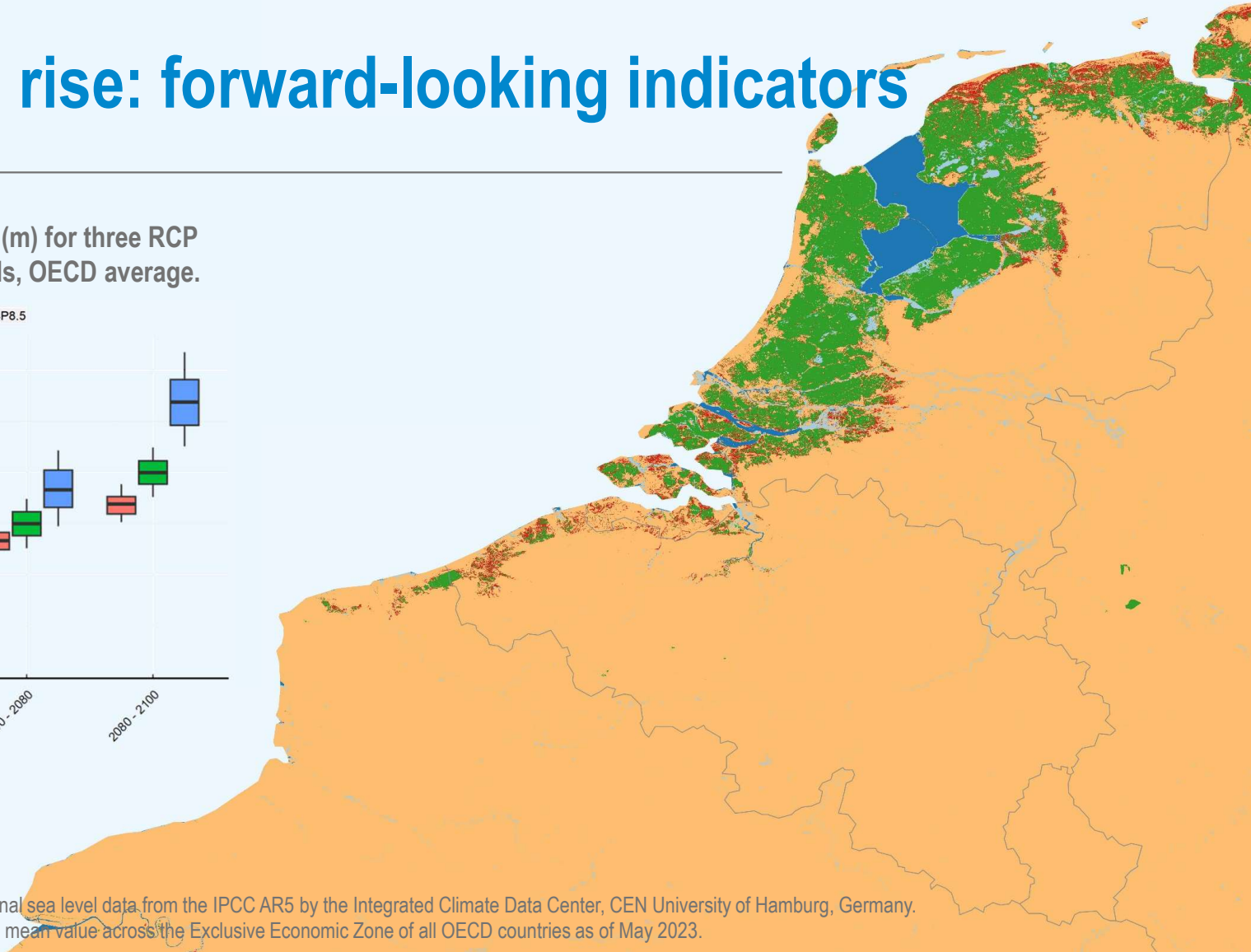


Sea level rise: forward-looking indicators

Total mean ensemble sea level height (m) for three RCP scenario's during different time periods, OECD average.



Source: OECD calculations using Church et al. (2013) regional sea level data from the IPCC AR5 by the Integrated Climate Data Center, CEN University of Hamburg, Germany.
Note: Relative sea surface height is calculated based on the mean value across the Exclusive Economic Zone of all OECD countries as of May 2023.





Discussion and ongoing OECD work (2023 - 2024)

- Hazards do not represent disasters but can inform us of the potential risk of a disaster occurring.
- Data visualisation: IEA-OECD Climate Hazard Exposure Tracker, forthcoming in July 2023
- Development of **forward-looking indicators** for climate-related hazards (2030-2100), possibly for
 - Hot days
 - Universal Thermal Climate Index (UTCI)
 - Icing days
 - SPEI
 - Fire Weather Index
 - Sea level rise
- Measure **exposure of vulnerable population groups** to climate-related hazards
- Assess **exposure of the manufacturing industry** to climate-related hazards (incl. case studies on the European manufacturing and the global steel sector)



Thank you for your attention!

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IPAC programme



Working Paper on
climate hazards



OECD Data Explorer

