Risks from a temporary overshoot and from the lack of formal and robust SRM governance

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Managing the risks of lack of governance around solar radiation modification

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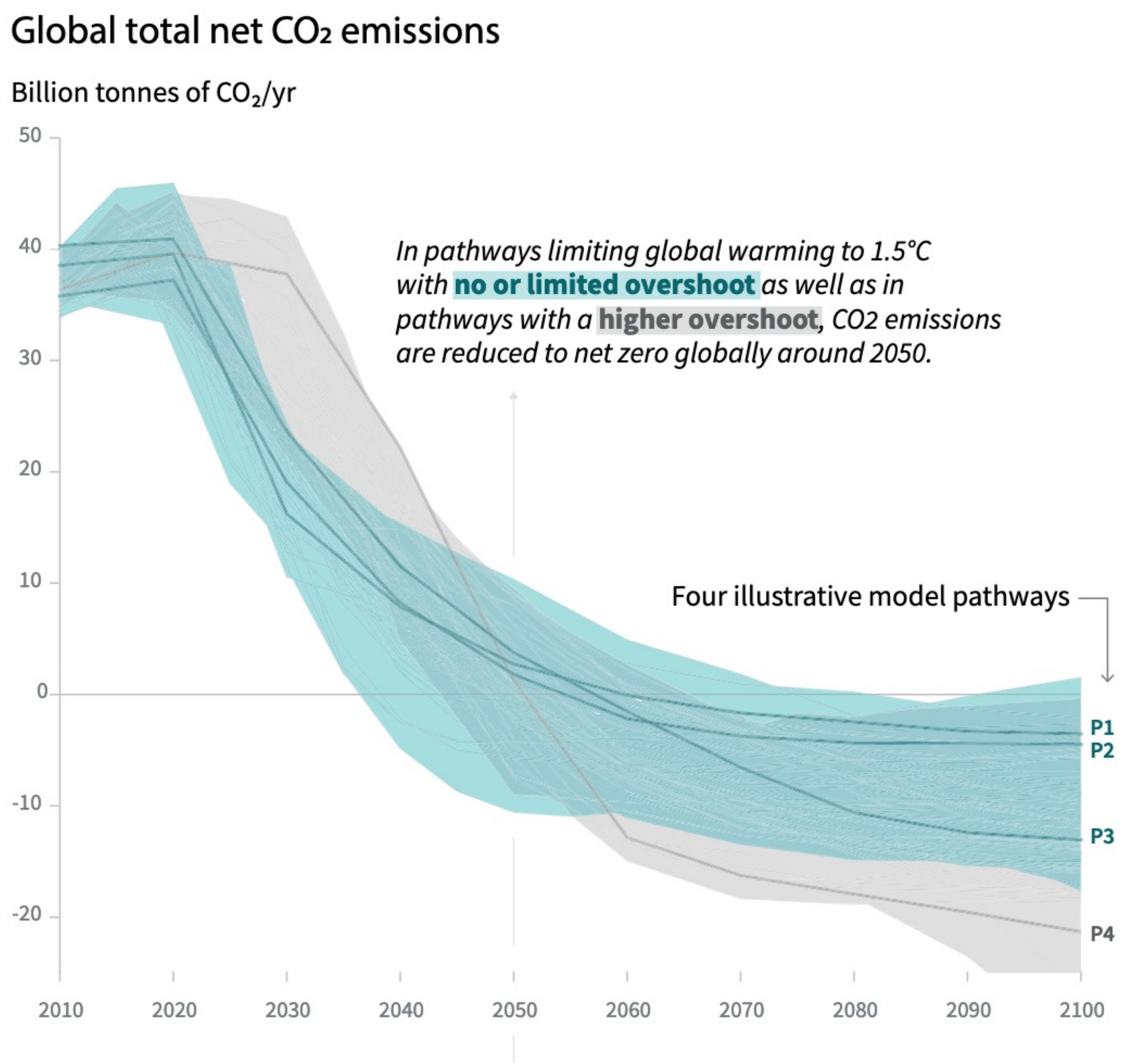
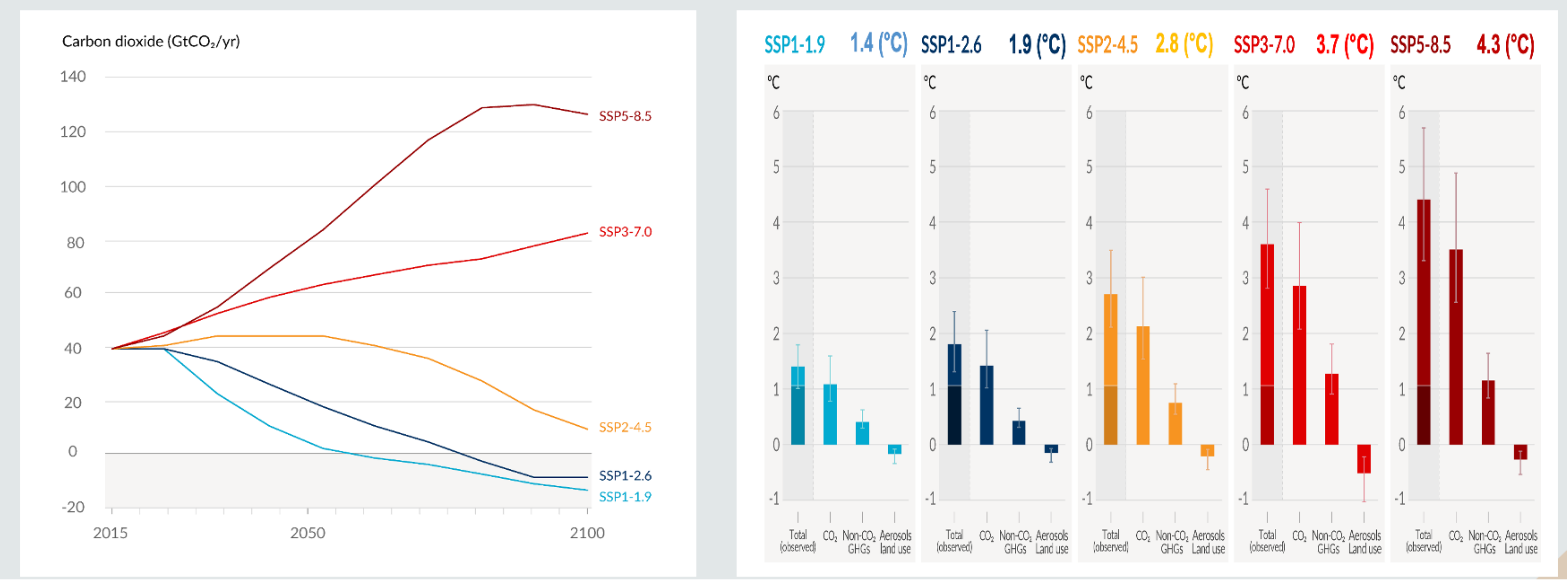
INTERGOVERNMENTAL PANEL ON climate change



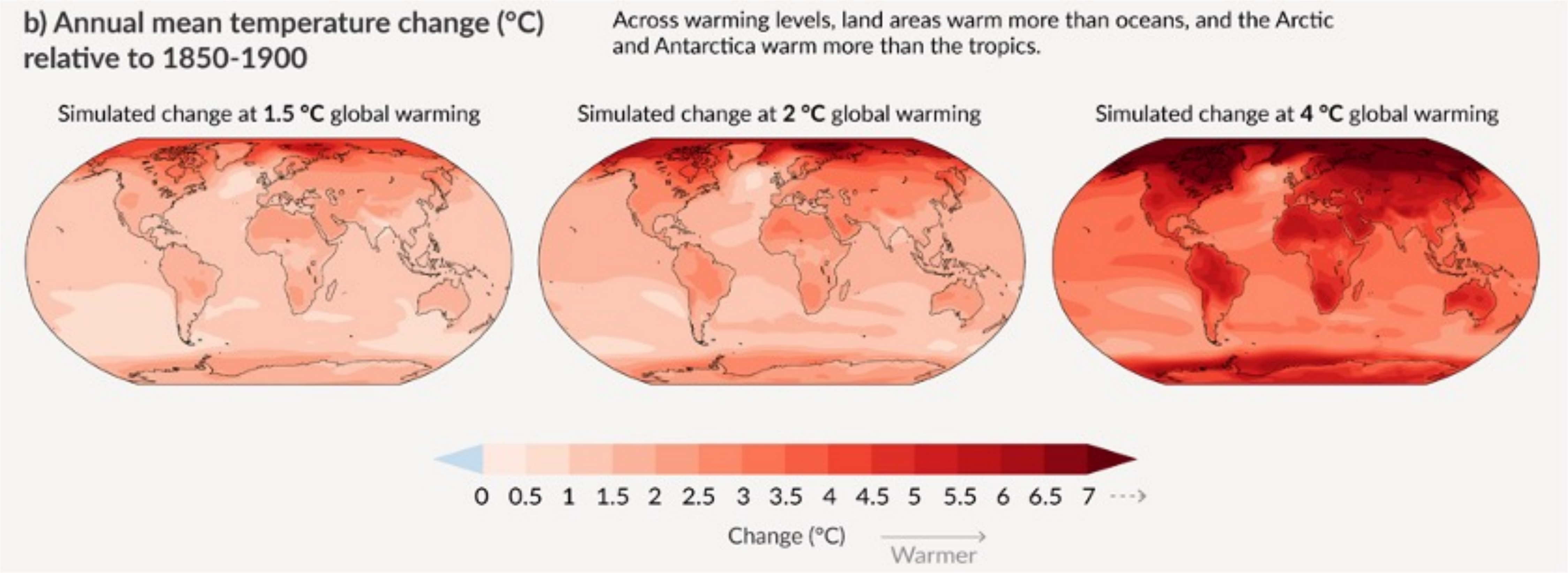
- *Global net anthropogenic CO_2 emissions in pathways limiting global warming to 1.5°C with no or limited overshoot (shown in blue) and pathways with higher overshoot (shown in grey)*

- **Temperature overshoot**: exceedance of a specified global warming level, followed by a decline to or below that level during a specified period of time (e.g., before 2100). The overshoot duration can vary from one pathway to the next but in most overshoot pathways in the literature and referred to as overshoot pathways in the AR6, the overshoot occurs over a period of at least one and up to several decades. (*WG I Glossary*)

IPCC WGI Report: The Physical Science Basis

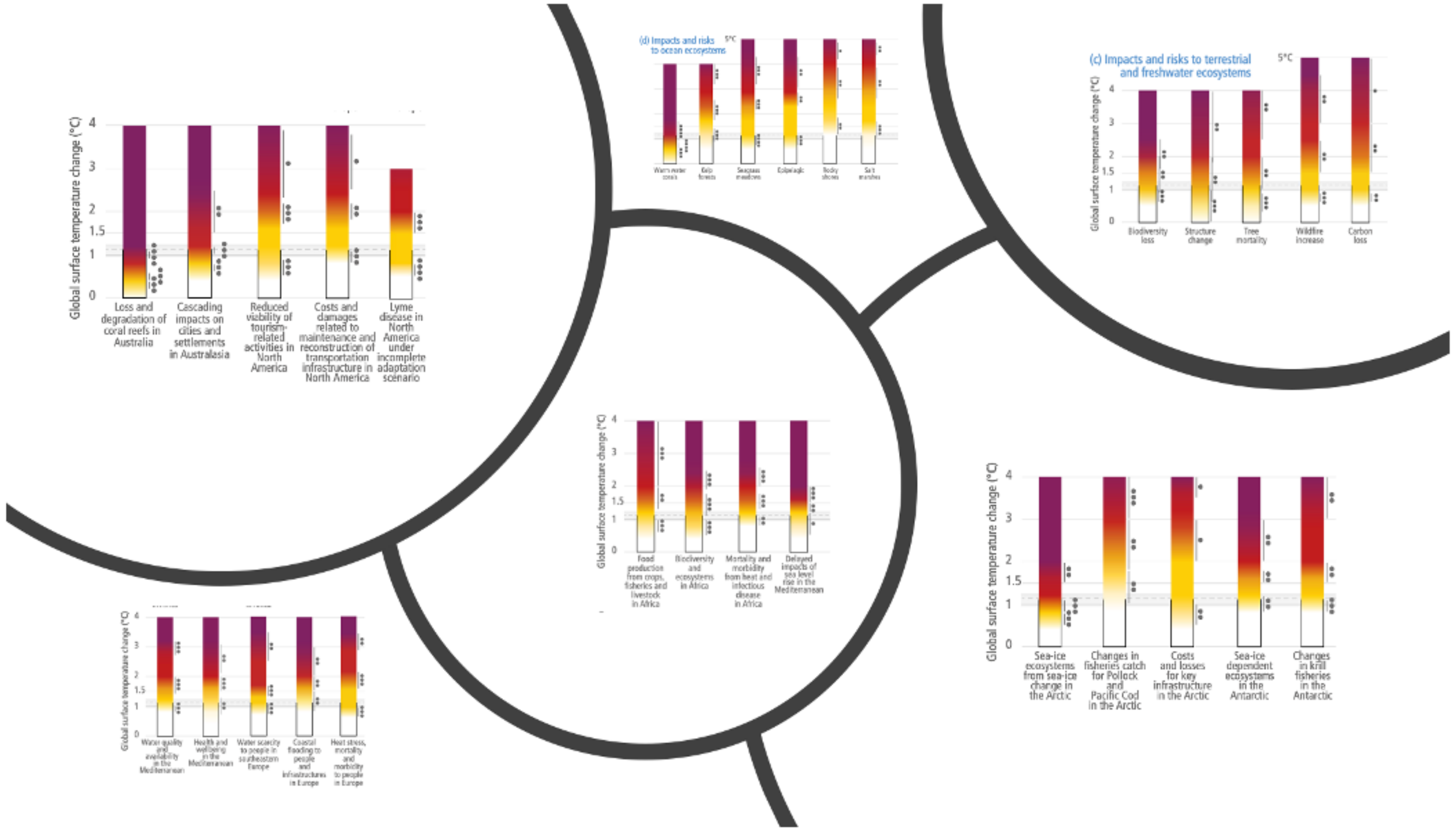


IPCC WGII Report: Climate Change Impacts, Adaptation and Vulnerability



- Many changes in the climate system become larger in direct relation to increasing global warming.
- It is very likely that heavy precipitation events will intensify and become more frequent in most regions
- mid-latitude and semi-arid regions and the South American Monsoon region are projected to see the highest increase in the temperature of the hottest days, at about 1.5 to 2 times the rate of global warming
- the Arctic is likely to be practically sea ice free in September at least once before 2050 under the five illustrative scenarios considered

Examples of irreversible changes that are projected to occur once global temperatures reach a particular level



- Species extinction is irreversible
  - at ~1.6°C, >10% of species are projected to become endangered as compared with >20% at ~2.1°C (median) representing high and very high biodiversity risk, respectively
- Above 1.5°C during an overshoot period this century, will result in irreversible impacts on certain ecosystems with low resilience, such as polar, mountain and coastal ecosystems
- In Amazonia, and in some mountain regions, cascading impacts from climatic (e.g., heat) and non-climatic stressors (e.g., land-use change) will result in irreversible and severe losses of ecosystem services and biodiversity at 2°C warming level and beyond.

Solar Radiation Modification - SRM

Source: Graphic prepared by Isabelle Rodas for Nicholson, S. (2013). "The Promises and Perils of Geoengineering," in Erik Assadourian et al., Worldwatch Institute: State of the World 2013.

- Does not stop atmospheric CO_2 concentrations from increasing
- Supplement to deep mitigation, for instance overshoot scenarios
- Potential to offset warming and reduce some of the global risks of climate change
  - temperature rise, sea-ice loss, and frequency of extreme storms and heatwaves in some regions
- Large uncertainties and knowledge gaps exist in relation to:
- technological maturity, physical understanding, potential impacts and challenges of governance

SRM Research

Use of SRM would create its own risks and would only make any sense in a world experiencing or expecting severe climate change impacts. As such, consideration of SRM takes place in a risk–risk context (whereby the risks of application are judged against the risks from climate change without SRM). Considering the impacts of SRM in isolation can be misleading, as SRM's sole *raison d'être* is reduction or avoidance of climate impacts stemming from elevated greenhouses gas concentrations.

To be relevant, assessment of SRM therefore needs to enhance our understanding of potential effects across a multitude of socially relevant parameters, rather than a single one.

Honegger, M., Michaelowa, A. & Pan, J. Potential implications of solar radiation modification for achievement of the Sustainable Development Goals. Mitig Adapt Strateg Glob Change ***26,*** *21 (2021). https://doi.org/10.1007/s11027-021-09958-1*

SRM Governance and Research

- Due in part to limited research, there is low confidence in projected benefits or risks to crop yields, economies, human health, or ecosystems. Large negative impacts are projected from rapid warming for a sudden and sustained termination of SRM in a high-CO_2 scenario.

- Co-evolution of SRM governance and research provides a chance for responsibly developing SRM technologies with broader public participation and political legitimacy, guarding against potential risks and harms relevant across a full range of scenarios.

- WG II, Chapter 16, Executive Summary, page 16-7

SRM governance

Several possible institutional arrangements have been considered for SRM governance:

- United Nations Framework Convention on Climate Change (UNFCCC/SBSTA)
- United Nations Convention on Biological Diversity (UNCBD)
- World Meteorological Organization (WMO)
- UNESCO
- UN Environment

Reasons for states to join an international governance framework:

- prevention of unilateral action by others
- benefiting from research