

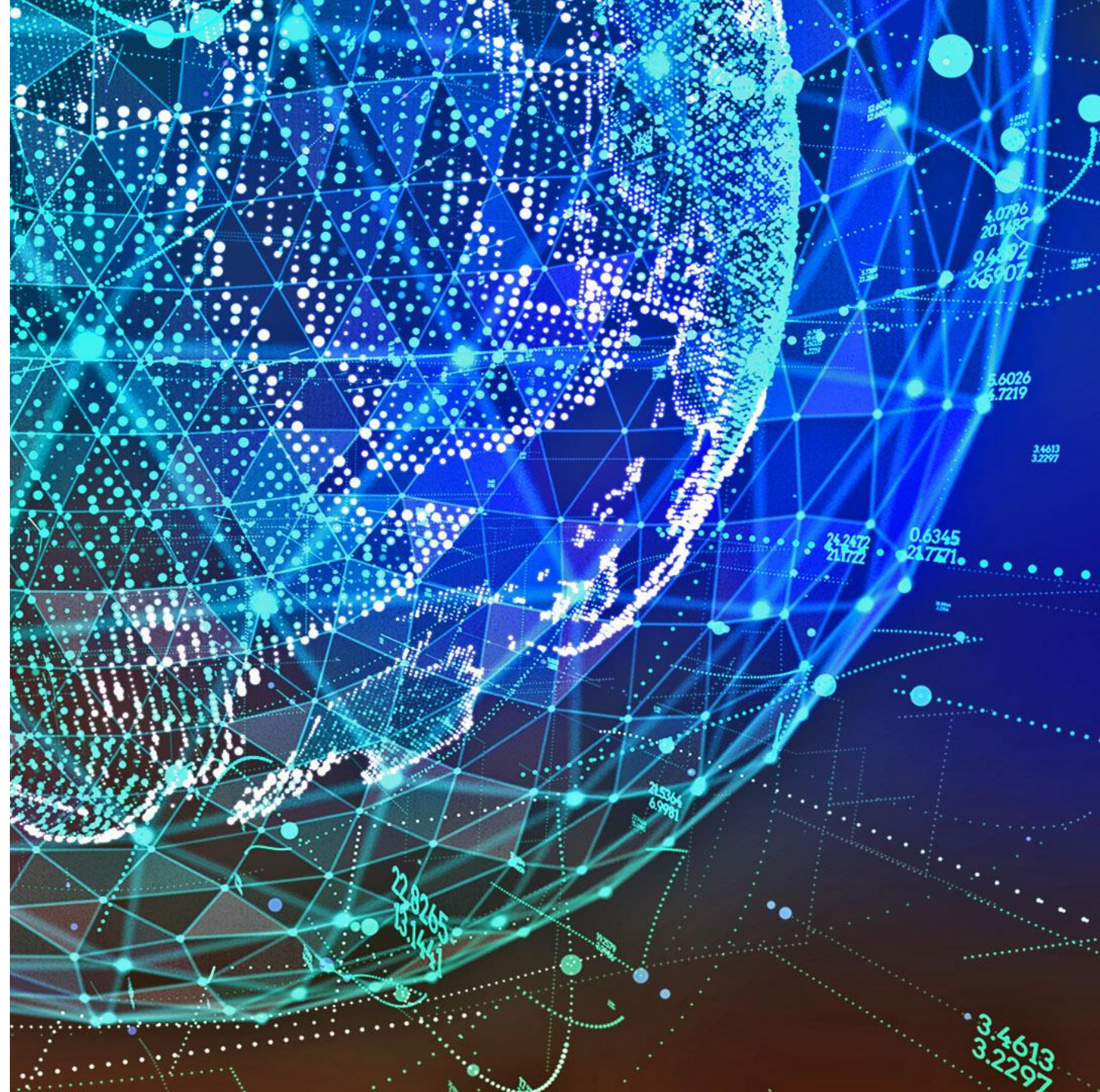
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Scenarios for CMIP7: Status and Next Steps

April 24, 2024

Brian O'Neill (PNNL), Claudia Tebaldi
(PNNL), Detlef van Vuuren (PBL)

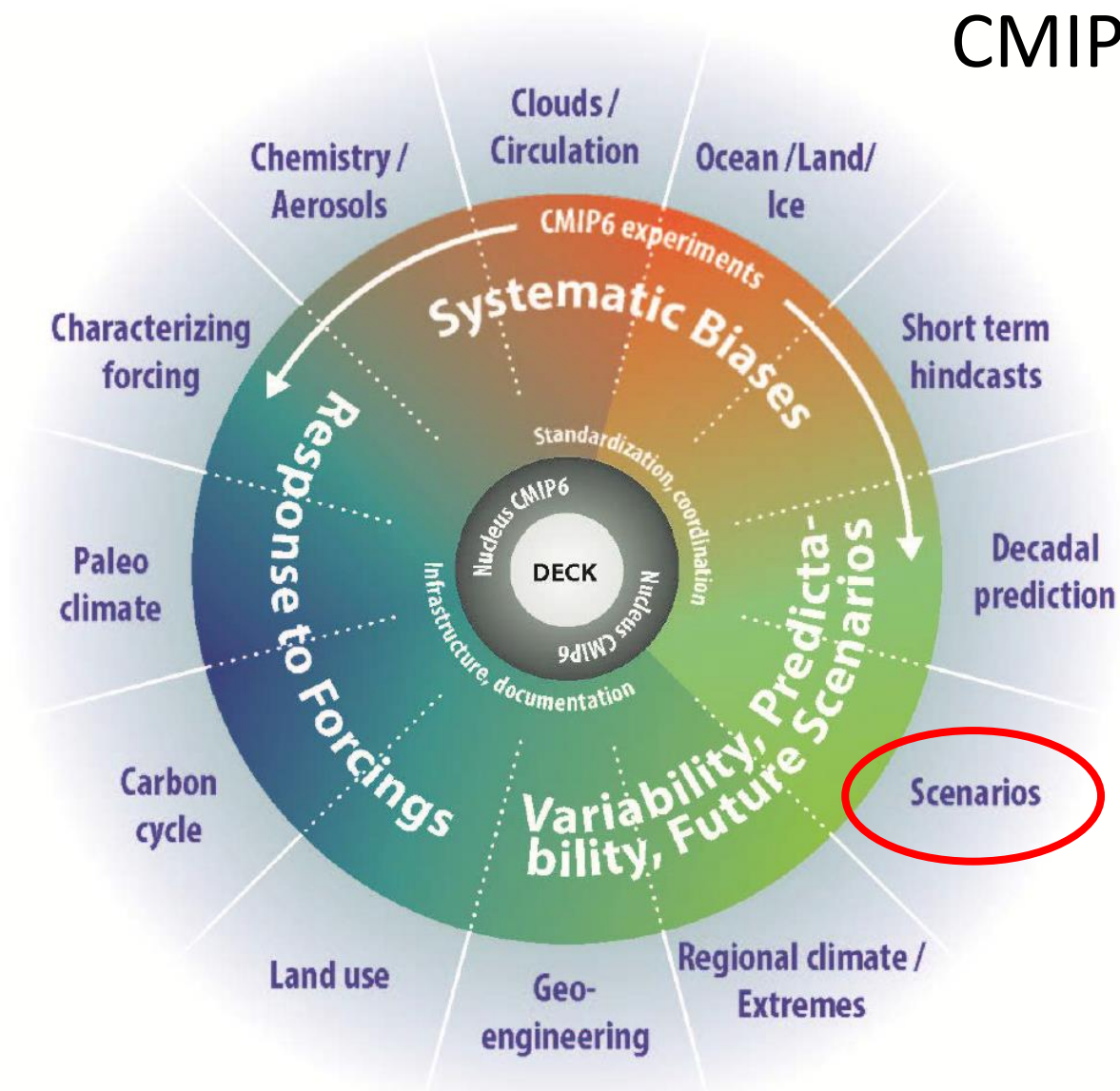


ScenarioMIP

CMIP-endorsed MIP responsible for ESM simulations of plausible alternative futures of emissions and land use

21-member Scientific Steering Committee

~75-member Advisory Group



ScenarioMIP goals (and scenario criteria)

Service

Facilitate integrated research across the climate science, IAV, and IAM communities

Science

Provide a basis for addressing targeted science questions about the climate system

Policy

Provide policy-relevant information, including to support IPCC assessments

ScenarioMIP Design Summary (CMIP6)

Tier 1

SSP5-8.5

SSP3-7

SSP2-4.5

SSP1-2.6

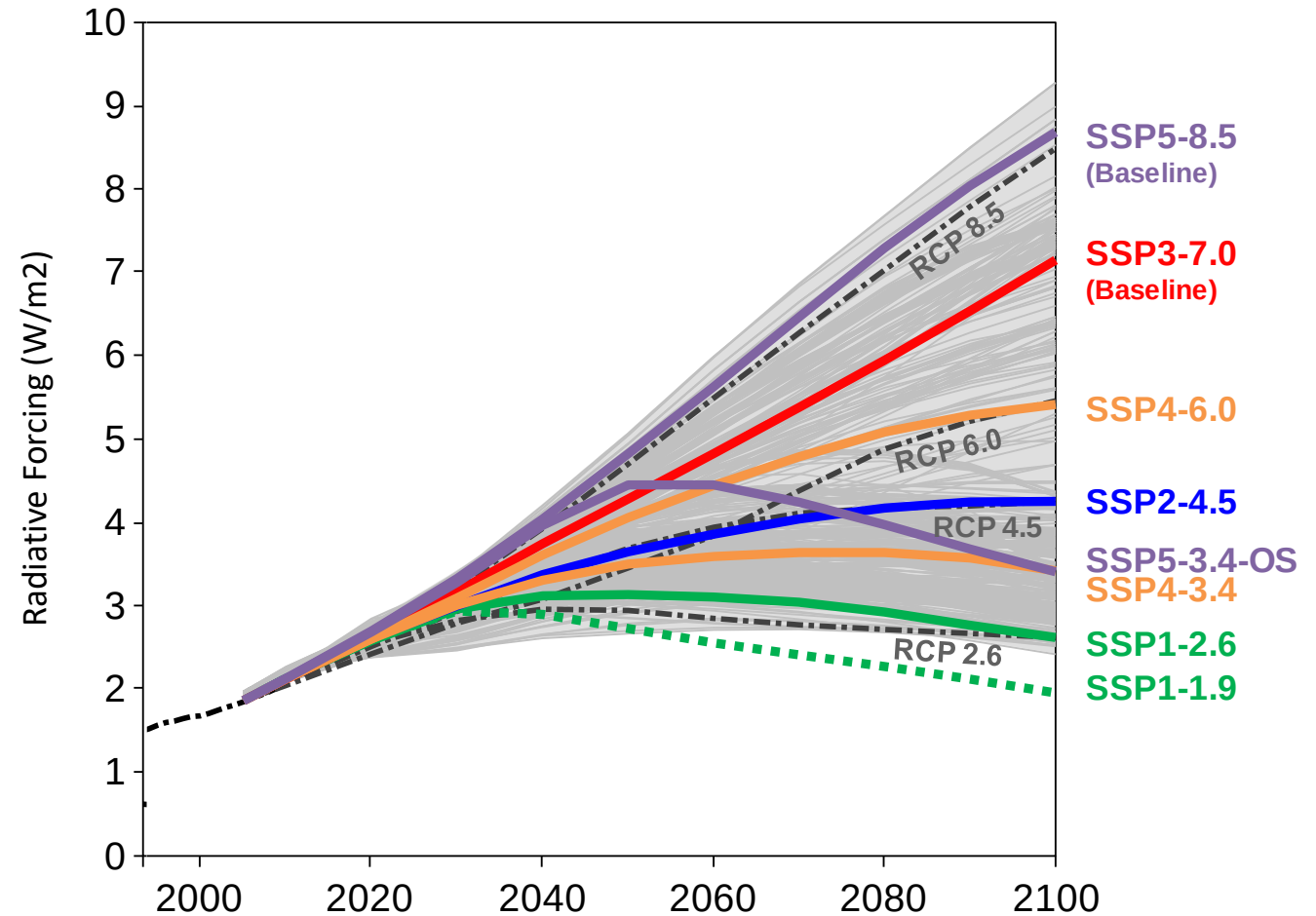
Tier 2

SSP1-6.0

SSP4-3.4

SSP1-1.9

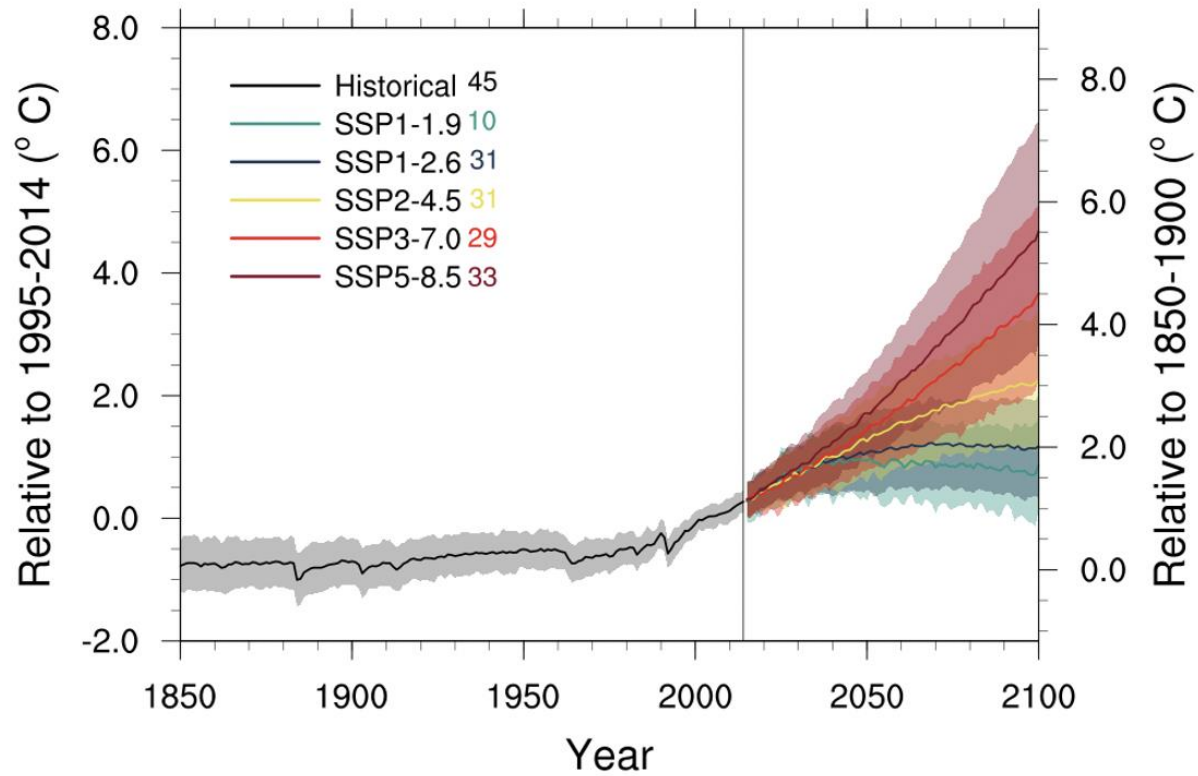
SSP4-3.4 Overshoot
SSP3-7 ensemble
Long-term extensions



O'Neill et al., 2016.

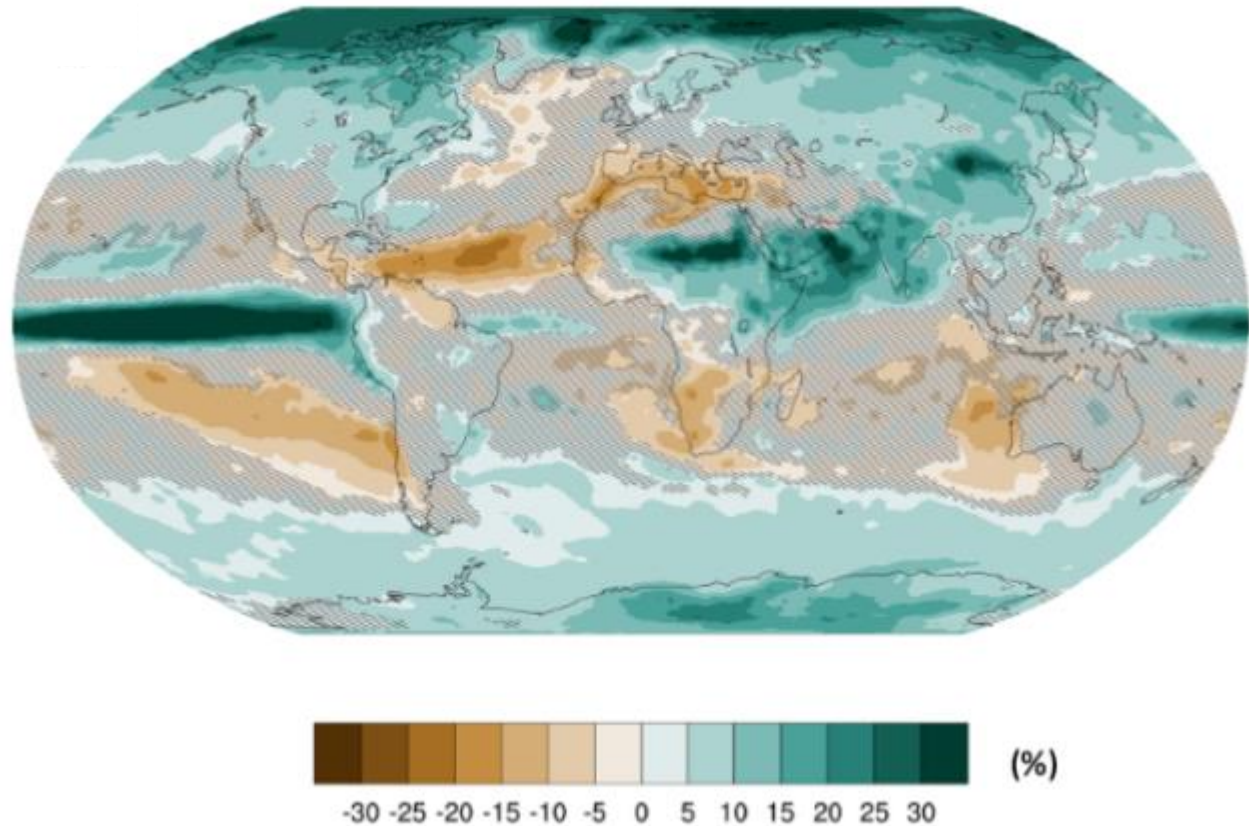
ScenarioMIP ESM simulations (CMIP6)

TAS, global



SSP4-3.4 PR change

2081-2100 relative to 1995-2014



ScenarioMIP process (CMIP7)

June '23	Reading (UK) workshop and report	Jan '24	First draft proposal by SSC
Sept '23	Public webinar and review period for the report	Feb '24	Review by Advisory Group (and revisions)
Fall '23	Expansion of SSC, creation of Advisory Group	April '24	Public review (and revisions)
Fall '23	Creation of task forces Low scenarios High/middle scenario Extensions CDR in ESMs/IAMs	June '24	Submission to GMD

Key design feature: CO₂ emissions-driven ESM runs

Previous CMIP phases used concentration-driven simulations

- CO₂ concentrations will be provided for ESMs that can't run emissions-driven scenarios

- Non-CO₂ greenhouse gases and air pollutants will be run in concentration-driven mode

Scenarios defined in terms of emissions pathways, not radiative forcing levels

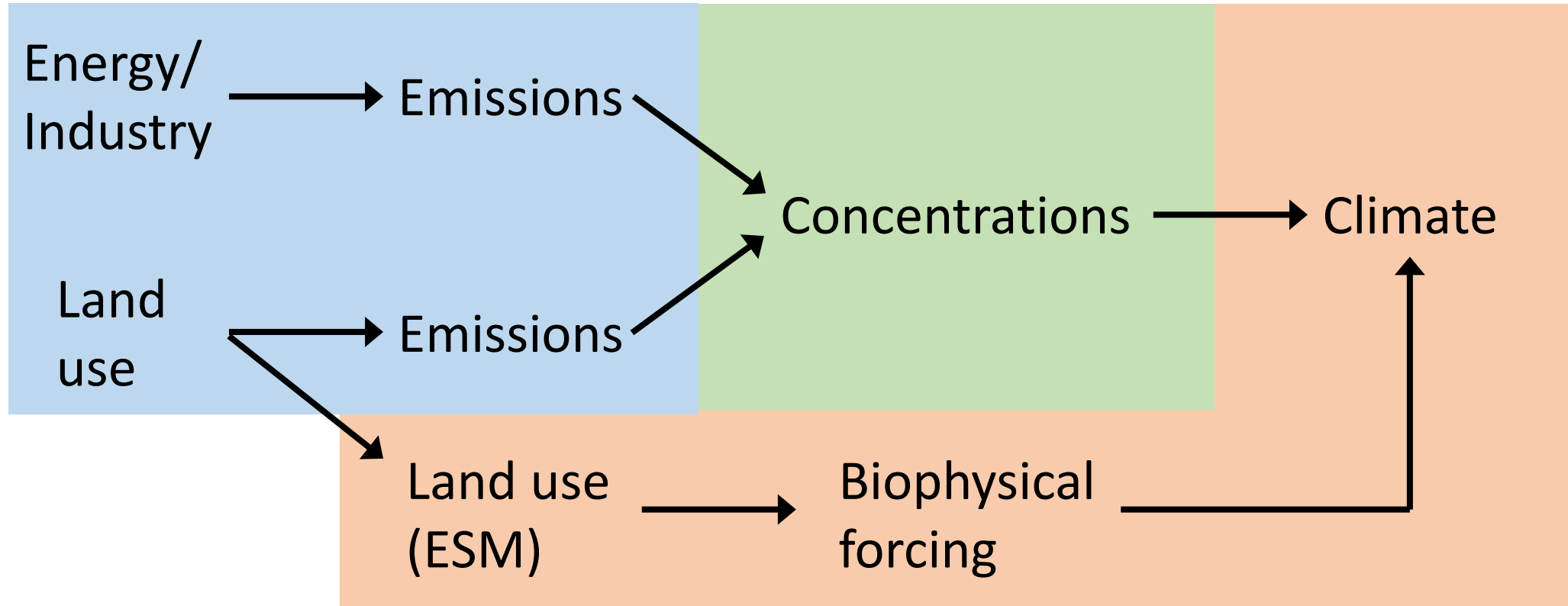
CO₂ emissions-driven approach addresses new science questions

Concentration-driven scenarios

IAMs

SCMs

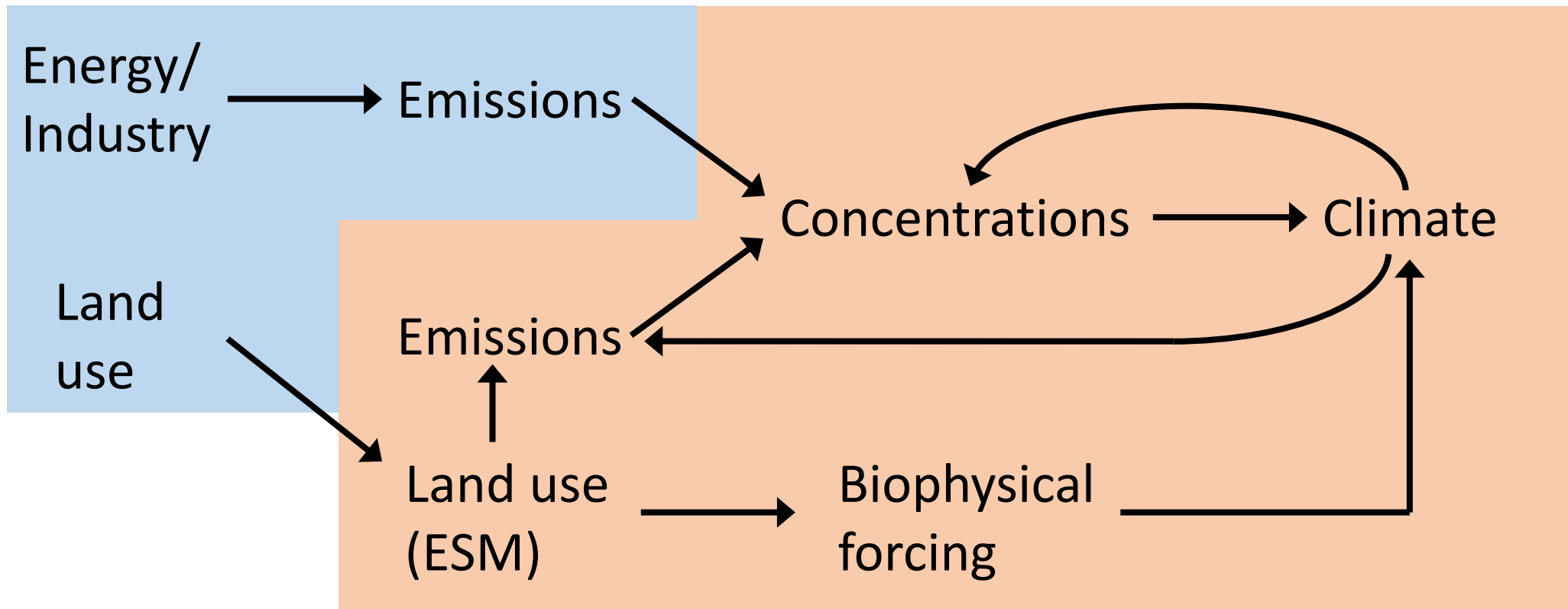
ESMs



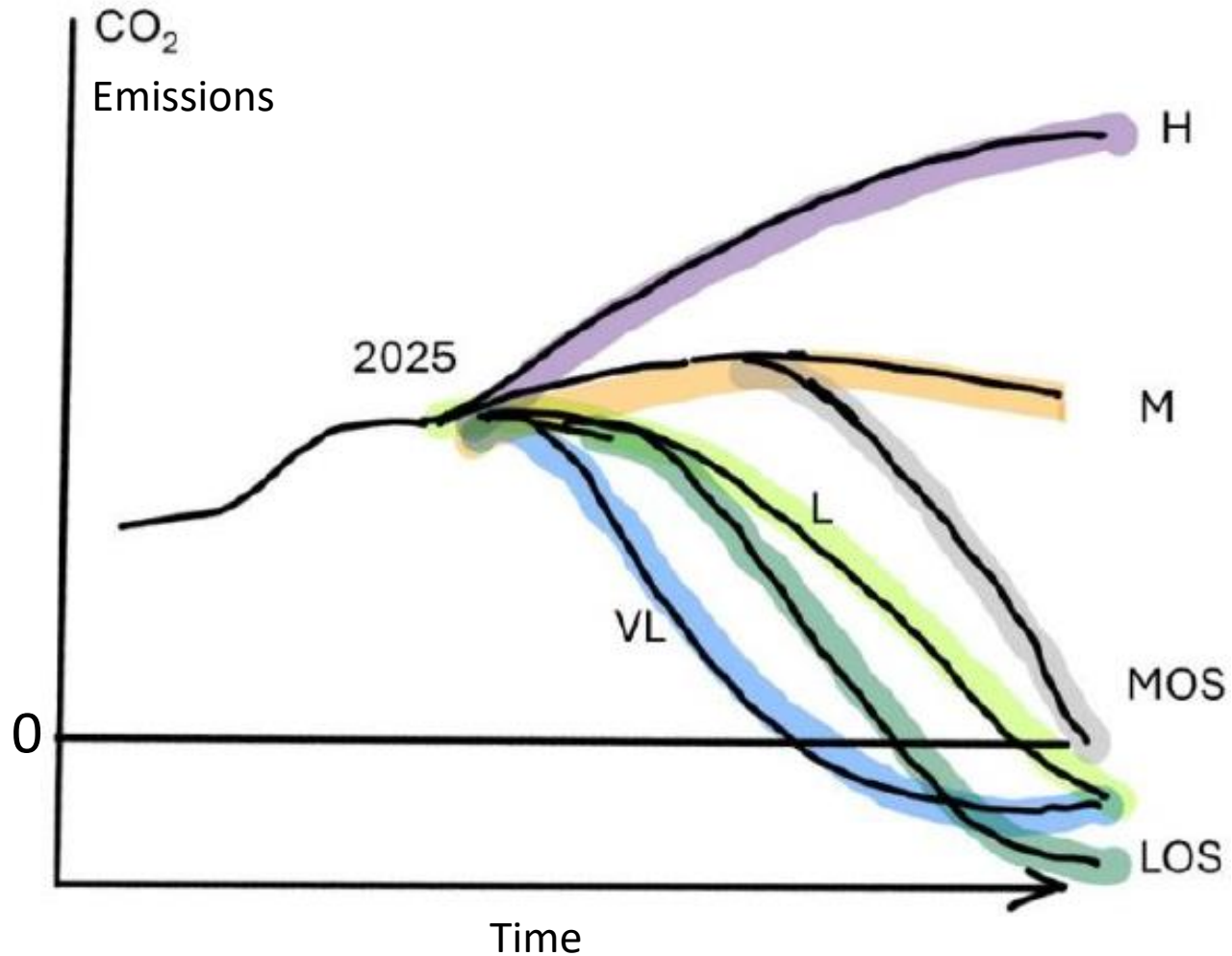
Emissions-driven scenarios

IAMs

ESMs



An initial design



Policy failure, unfavorable trends

Current policies

Delayed policies

Paris Agreement

Key issues considered

Plausibility

High scenario: SSP3/5? Necessary at all?

Low scenarios: Definition of plausibility?

Delayed mitigation scenario

How delayed? Overshoot?

Low scenarios

Do we need three? Can ESMs resolve the differences?

Scenario priorities for ESMs

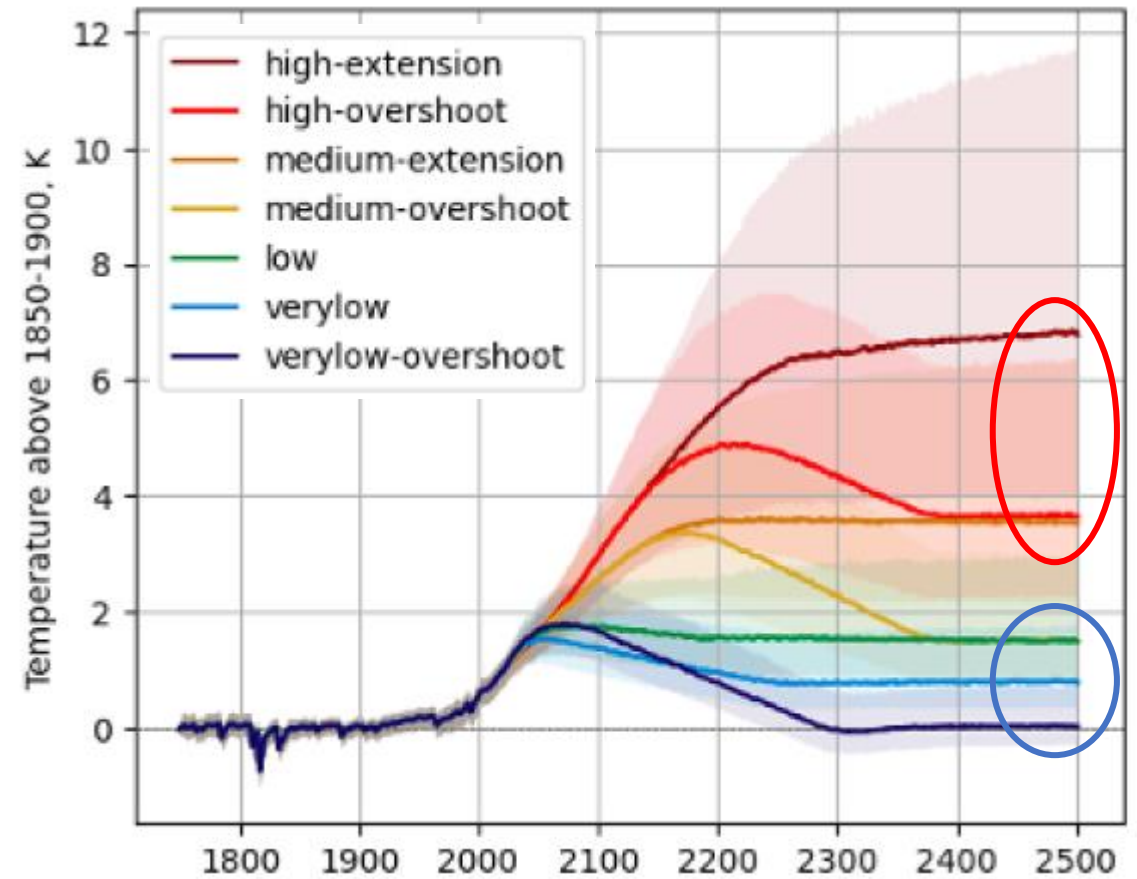
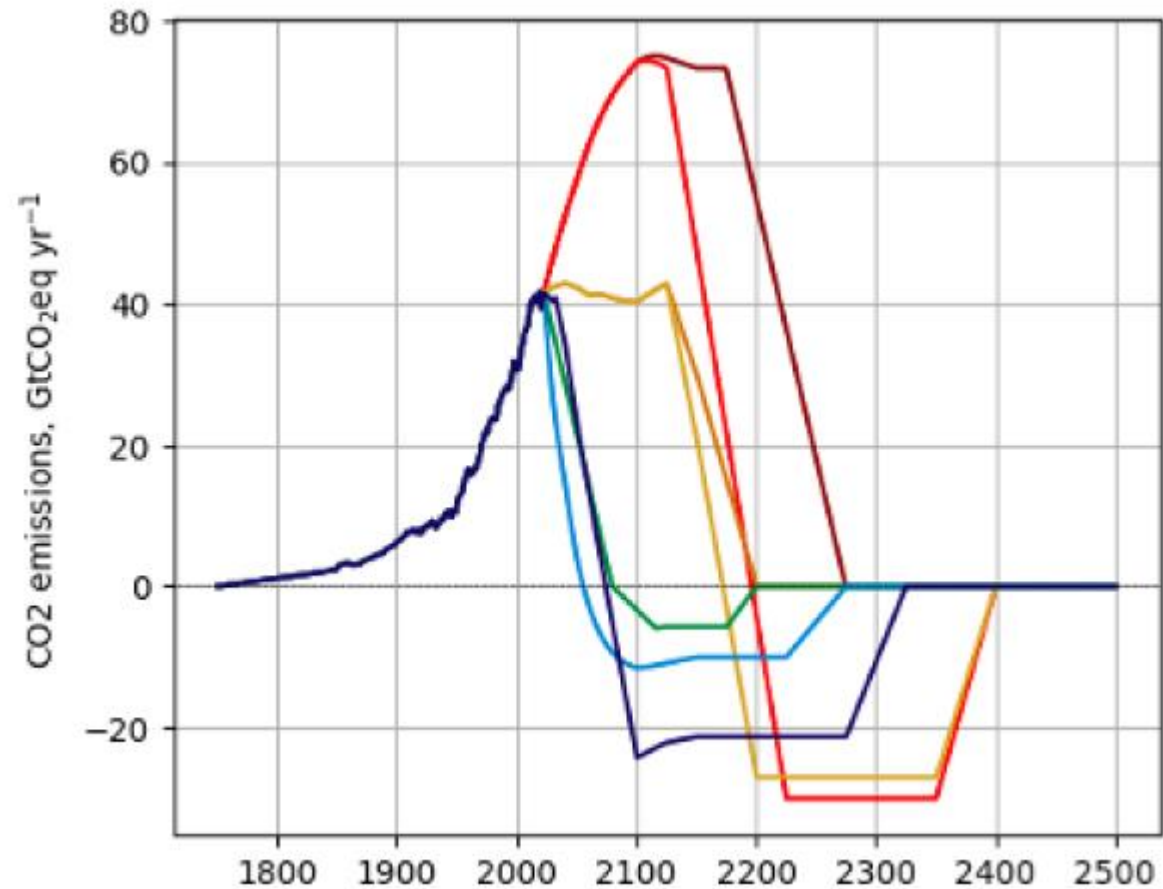
Tier 1? Tier 2?

Equity

Extensions beyond 2100

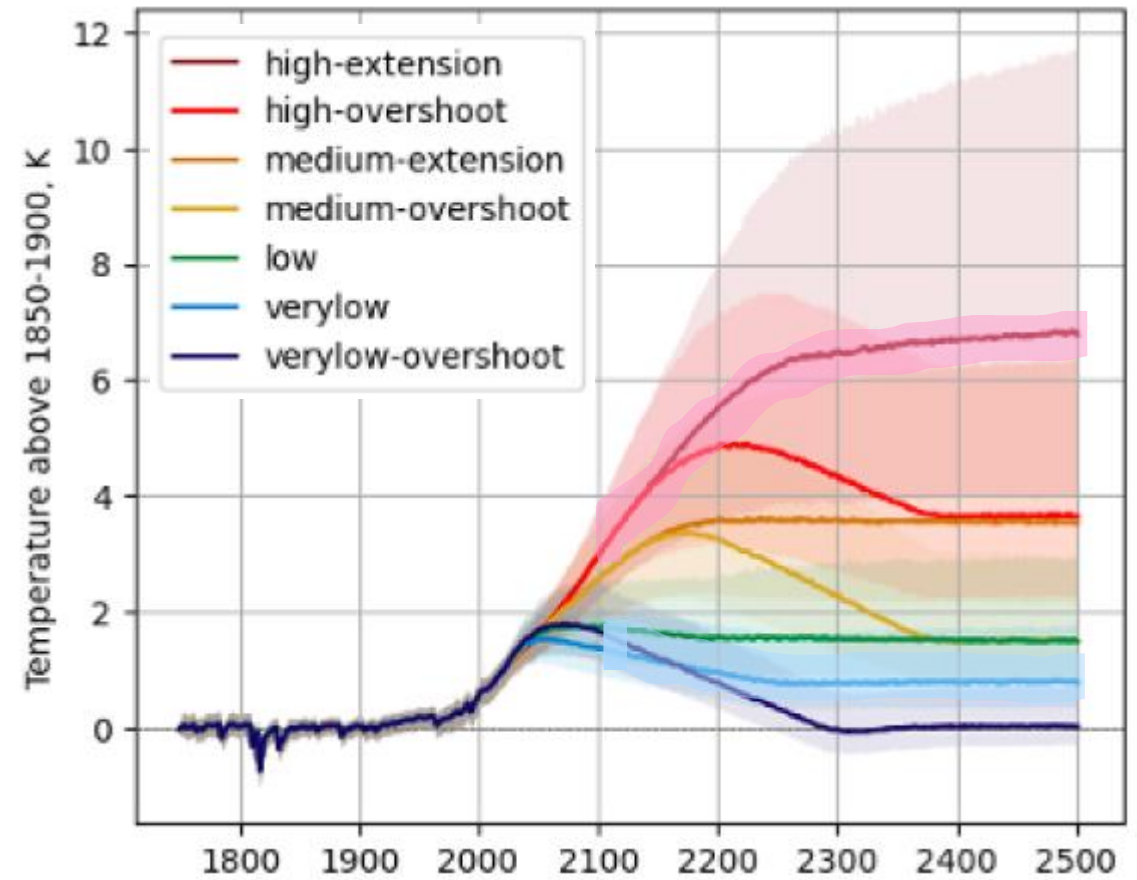
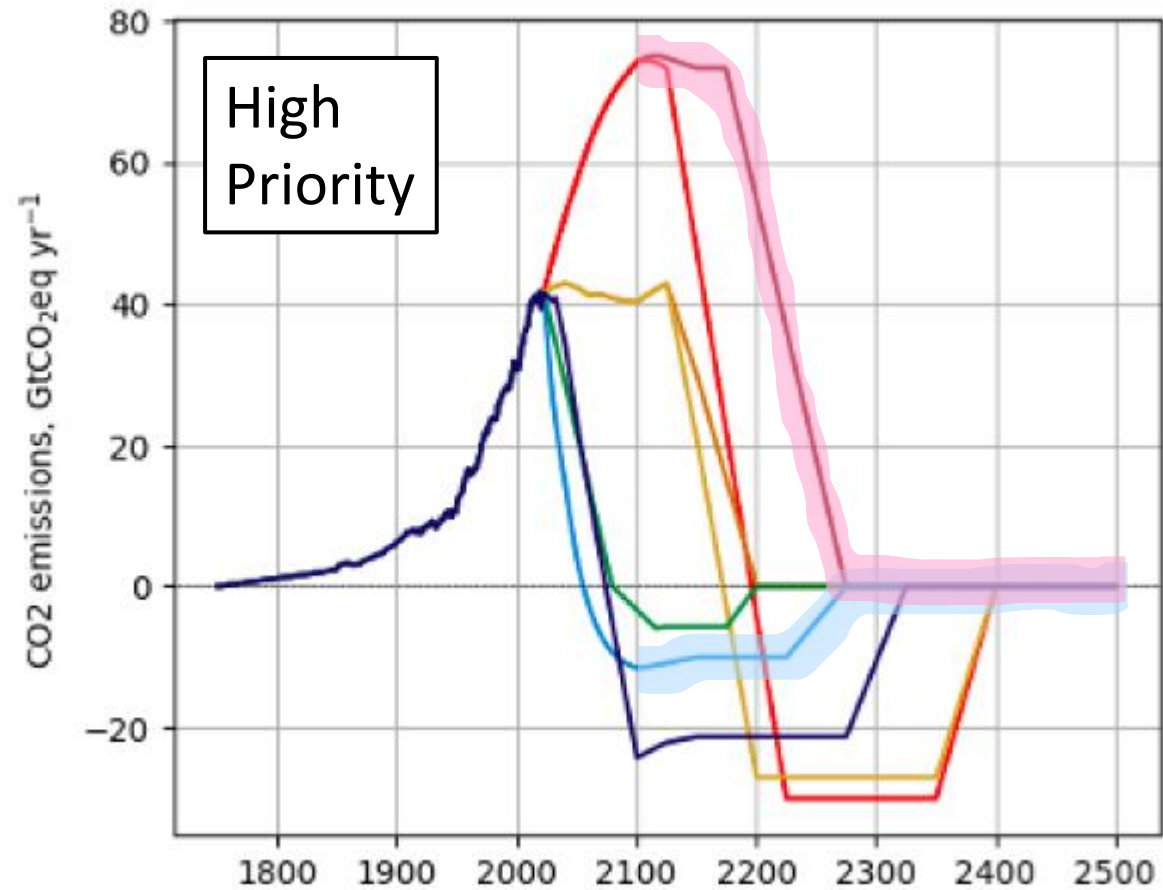
Temperature stabilization beyond 2300

Long-term extensions (illustration)



FaIR simple climate model, illustrative only (courtesy C. Smith, B. Sanderson)

Long-term extensions (illustration)



FaIR simple climate model, illustrative only

Key issues considered

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Scenario priorities for ESMs

Tier 1? Tier 2?

Equity

Extensions beyond 2100

Temperature stabilization beyond 2300

Role of other MIPs

AerChemMIP, LUMIP, ...

Ensemble sizes

Representation of CDR

Only reforestation in ESMs

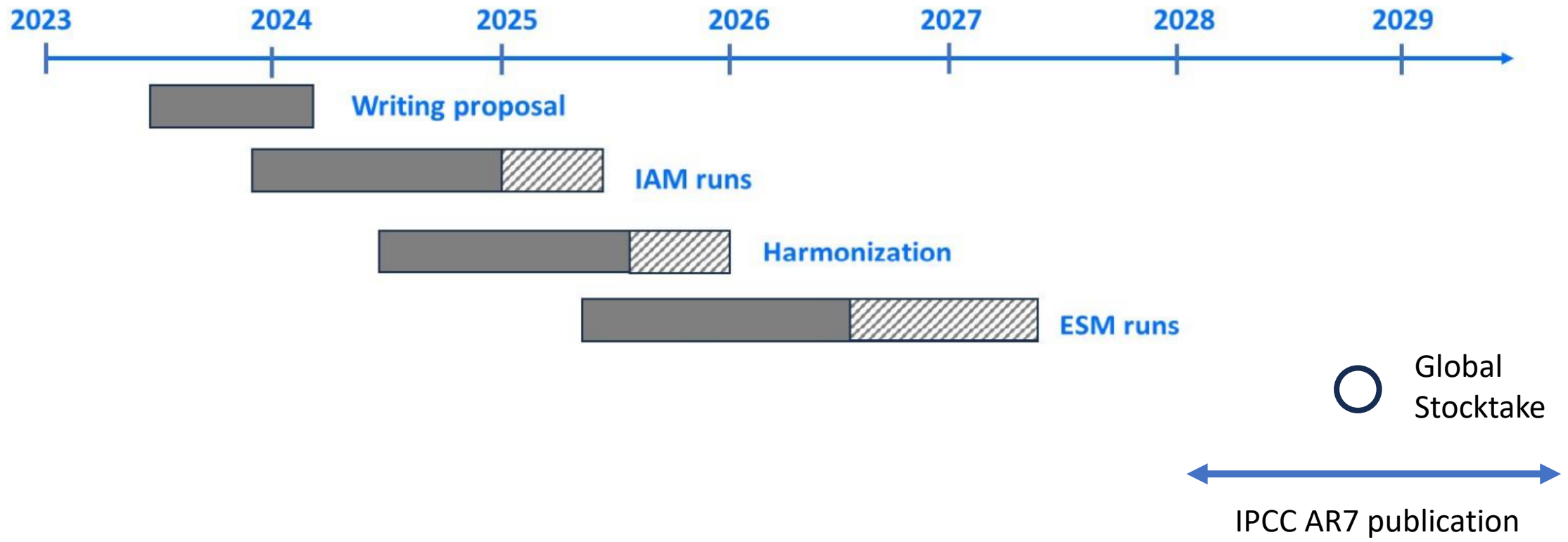
Aerosol assumptions for high scenario

Continuity with CMIP6

Role of 4xCO₂

Timeline

Ambitious timeline



Public review period: April 15 – May 13, 2024

Report draft and review template:

<https://wcrp-cmip.org/scenariomip-cmip7-proposal/>

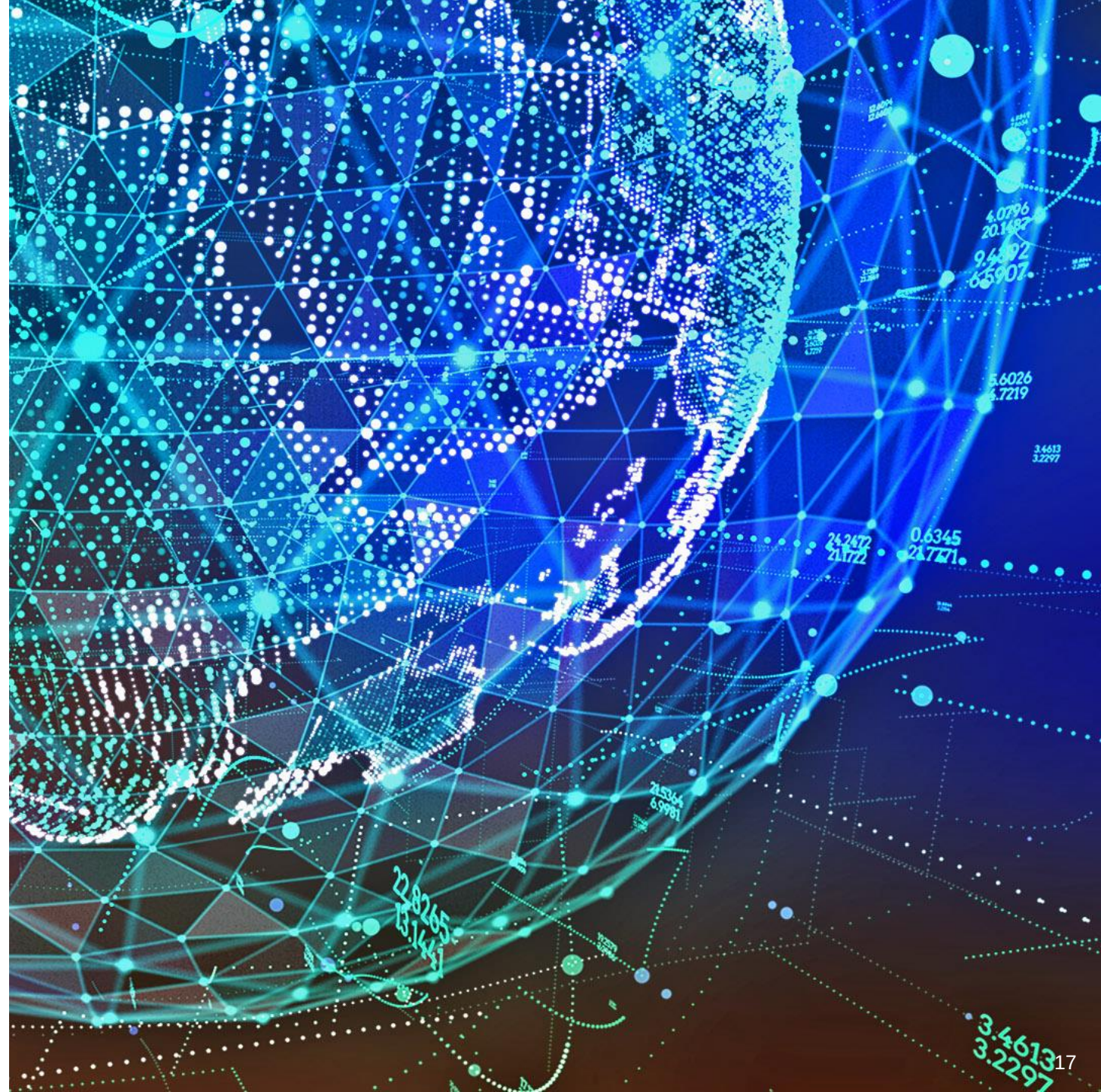
(or just go to ScenarioMIP home page and you will find it)



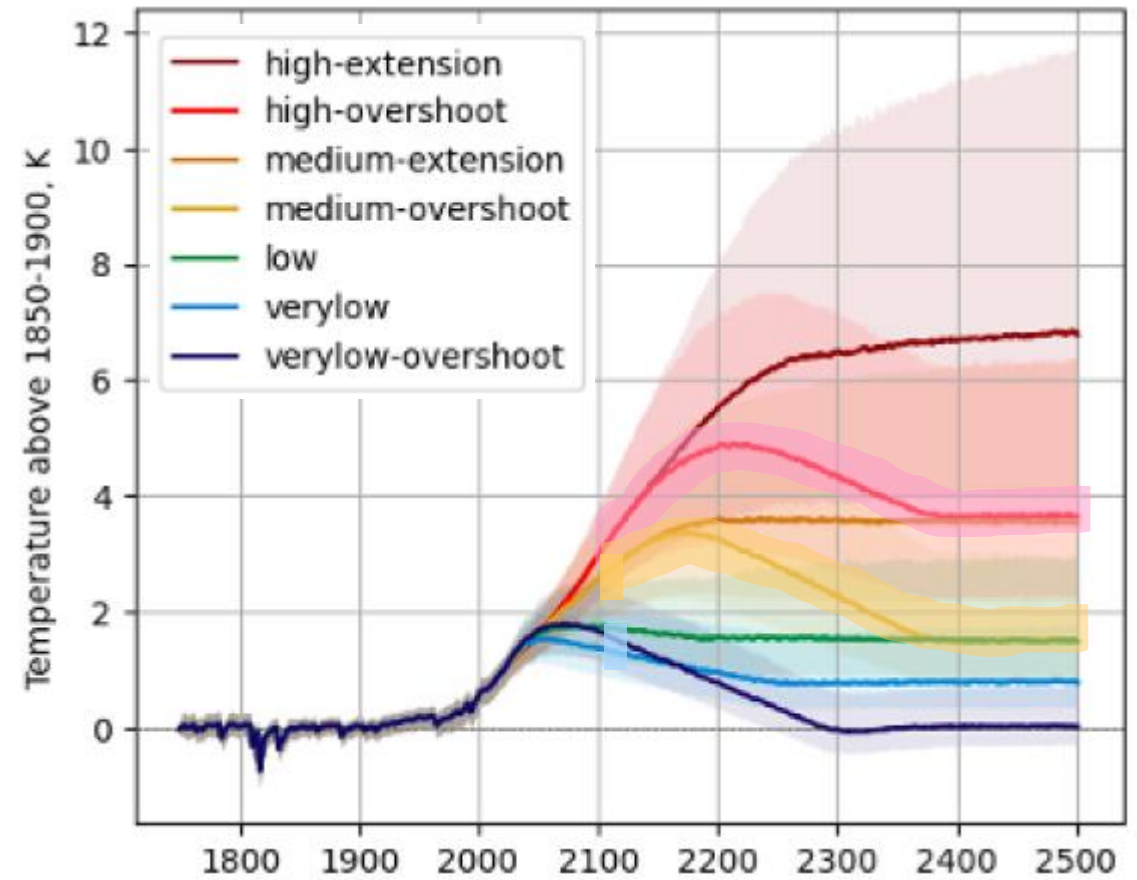
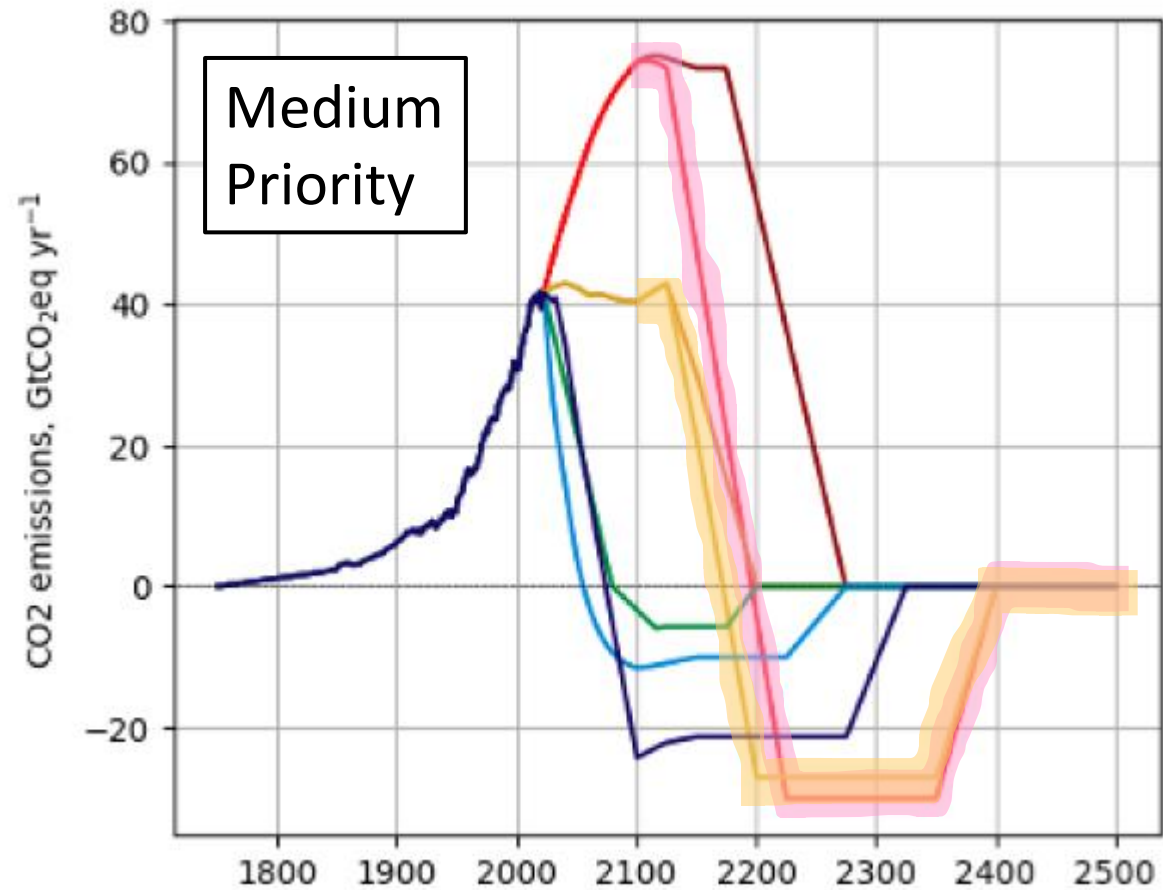
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Thank you

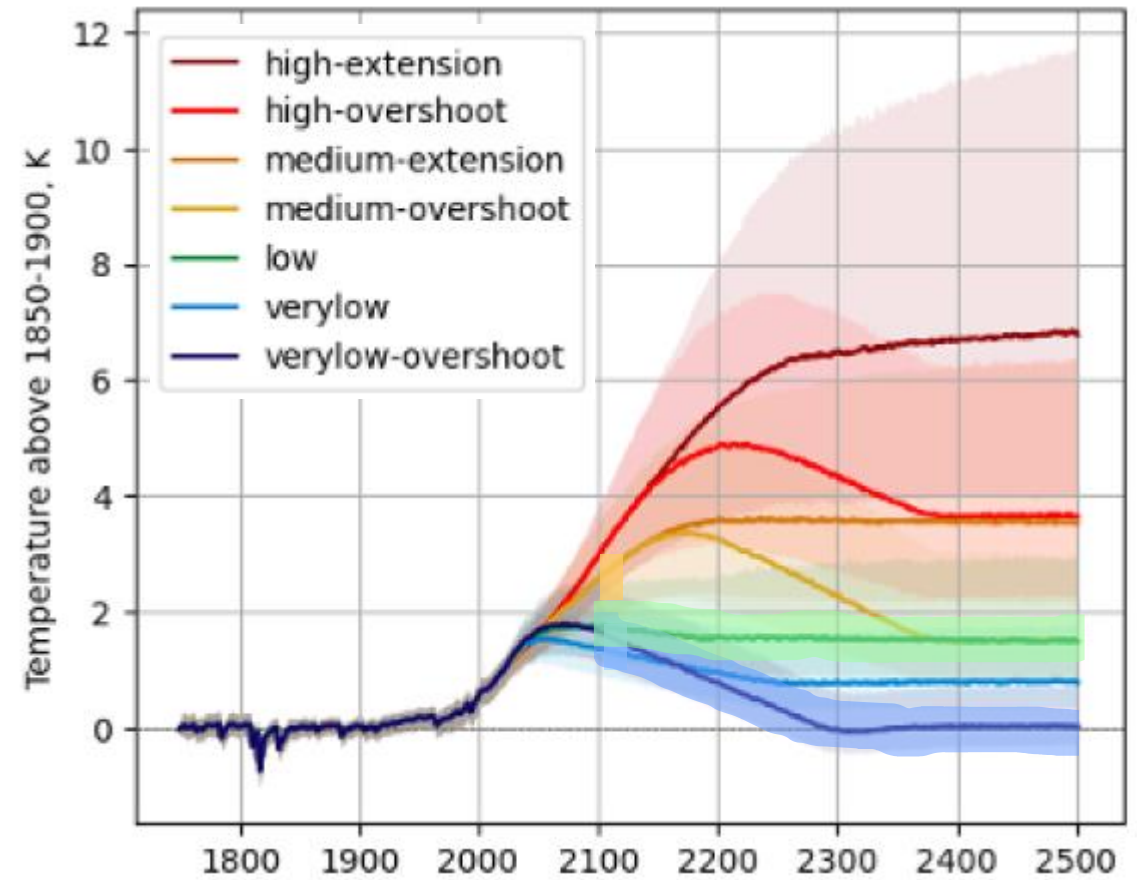
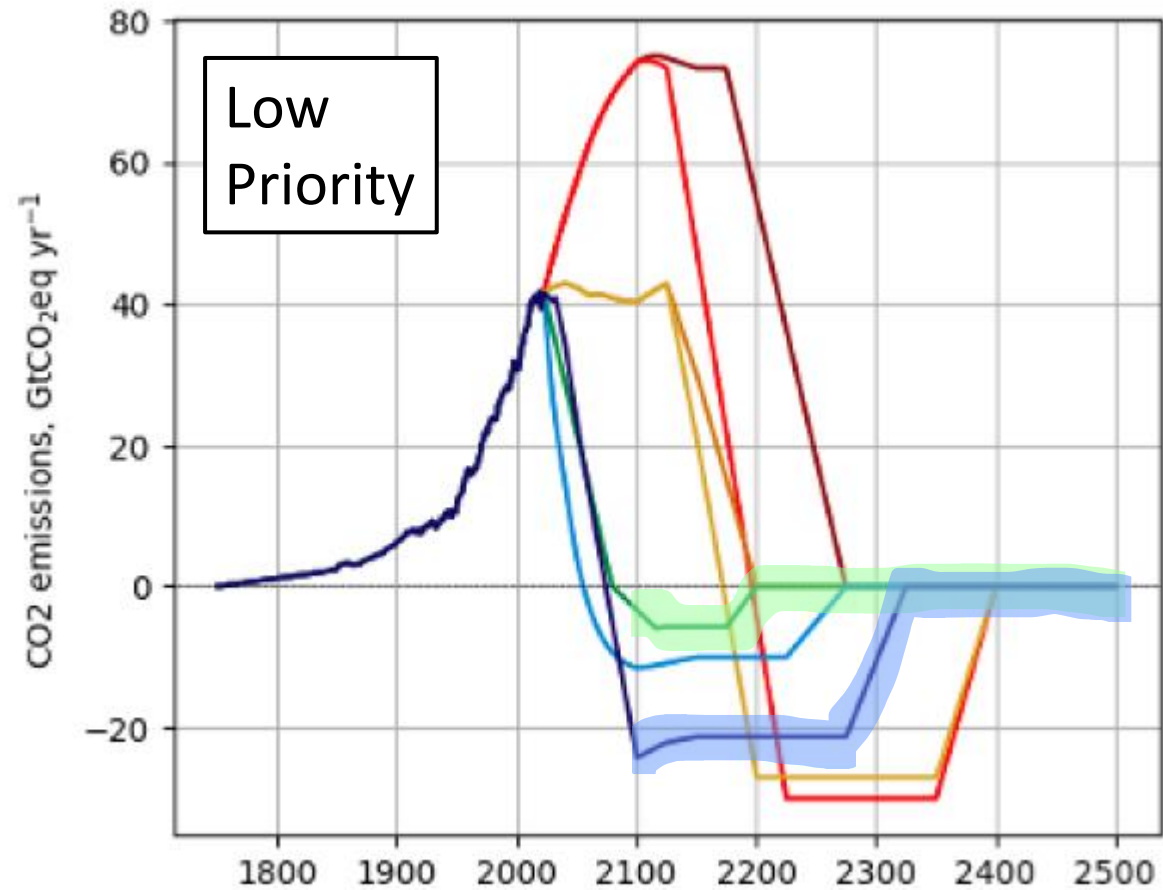


Long-term extensions (illustration)



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