

# JOINT GLOBAL CHANGE RESEARCH INSTITUTE



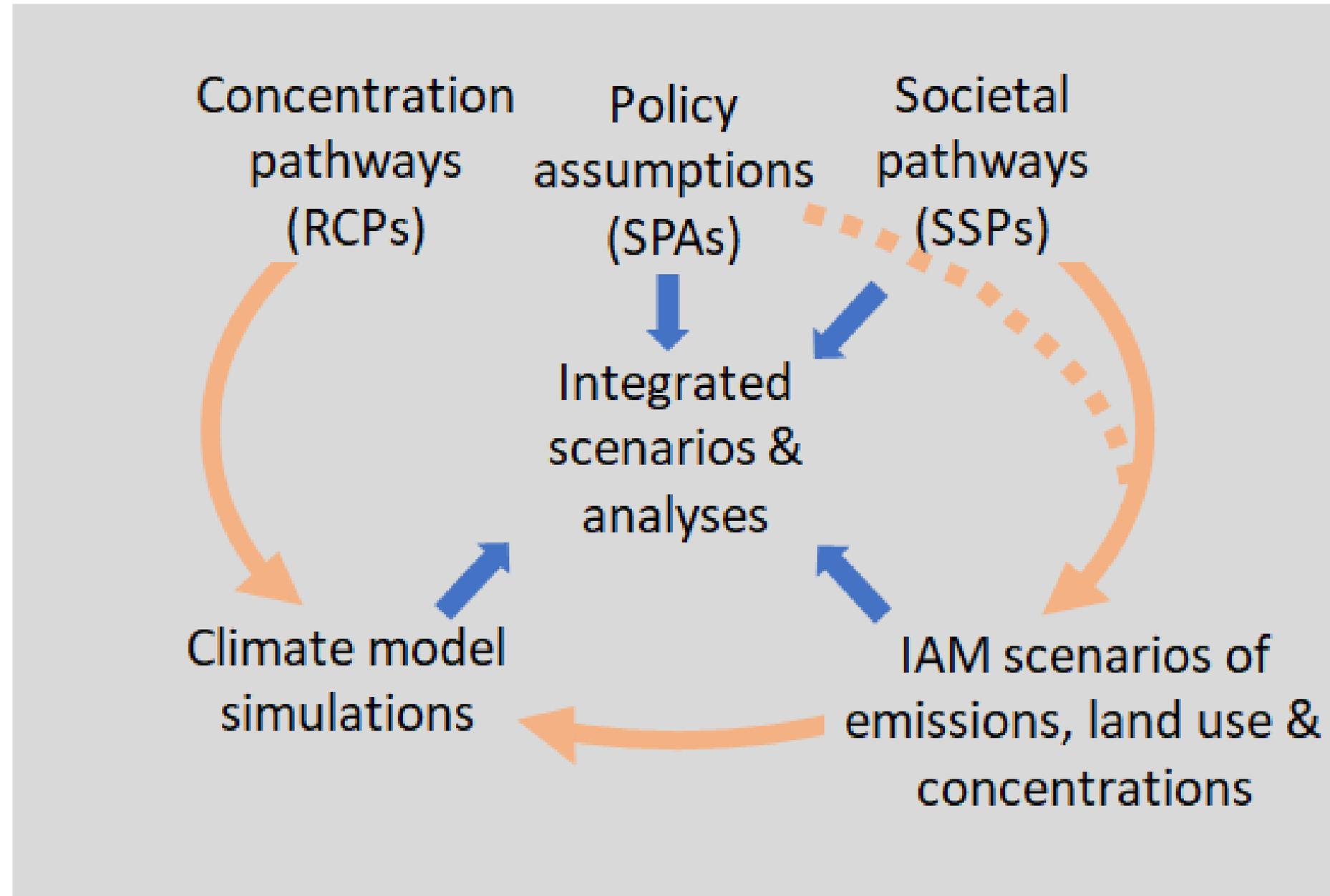
# The SSP-RCP scenario framework: status and next steps

February 27, 2023

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# The SSP-RCP scenarios framework

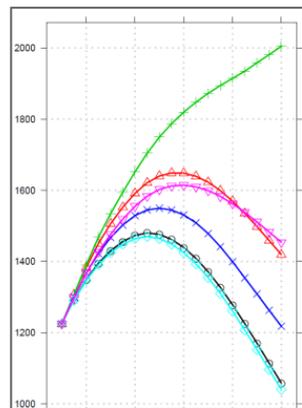


# Shared Socioeconomic Pathways (SSPs)



## Narrative

Qualitative description of broad patterns of development  
Logic relating elements of narrative to each other



## Quantitative elements

National:  
Population  
Education  
Urbanization  
GDP

## SSPs

- 1: Sustainability
- 2: Middle of the Road
- 3: Regional Rivalry
- 4: Inequality
- 5: Fossil-fueled Development

SSP narratives, quantitative elements: **2017 special issue of *Global Environmental Change*.**

SSP Database, hosted by IIASA.

# SSP Narratives

## SSP3: Regional Rivalry

Multi-pole Cold War

Conflict, focus on security

Barriers to trade, migration

Little investment in health, education

Slow technological progress

Weak institutions

Slow income growth

## SSP5: Fossil-fueled development

Rise of the global middle class

Rapid technological progress

Large investments in human well being (health, education)

Well functioning institutions

Rapid economic growth

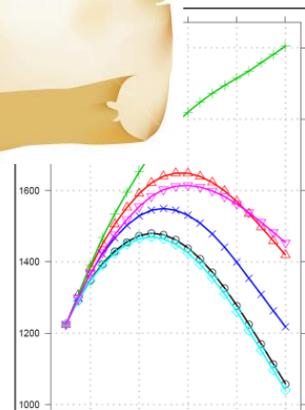
Fossil-centered energy system

# SSP-based emissions scenarios

SSPs 1-5

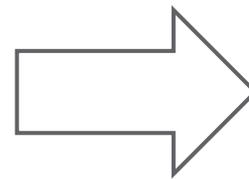
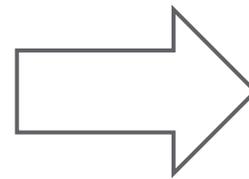


Narratives

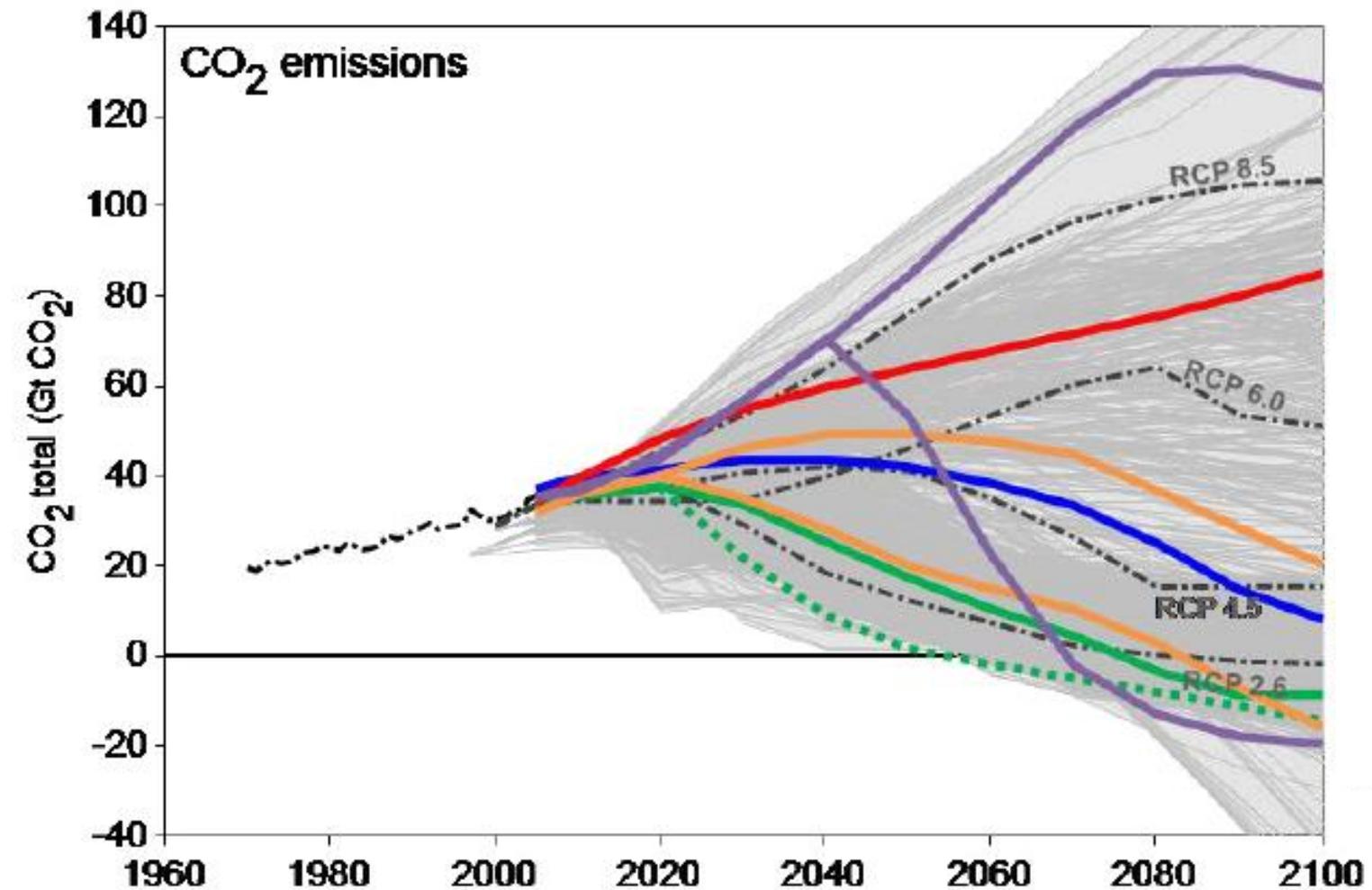


Quantitative Elements

Mitigation Policies



IAM scenarios:  
Energy, Land use, Emissions

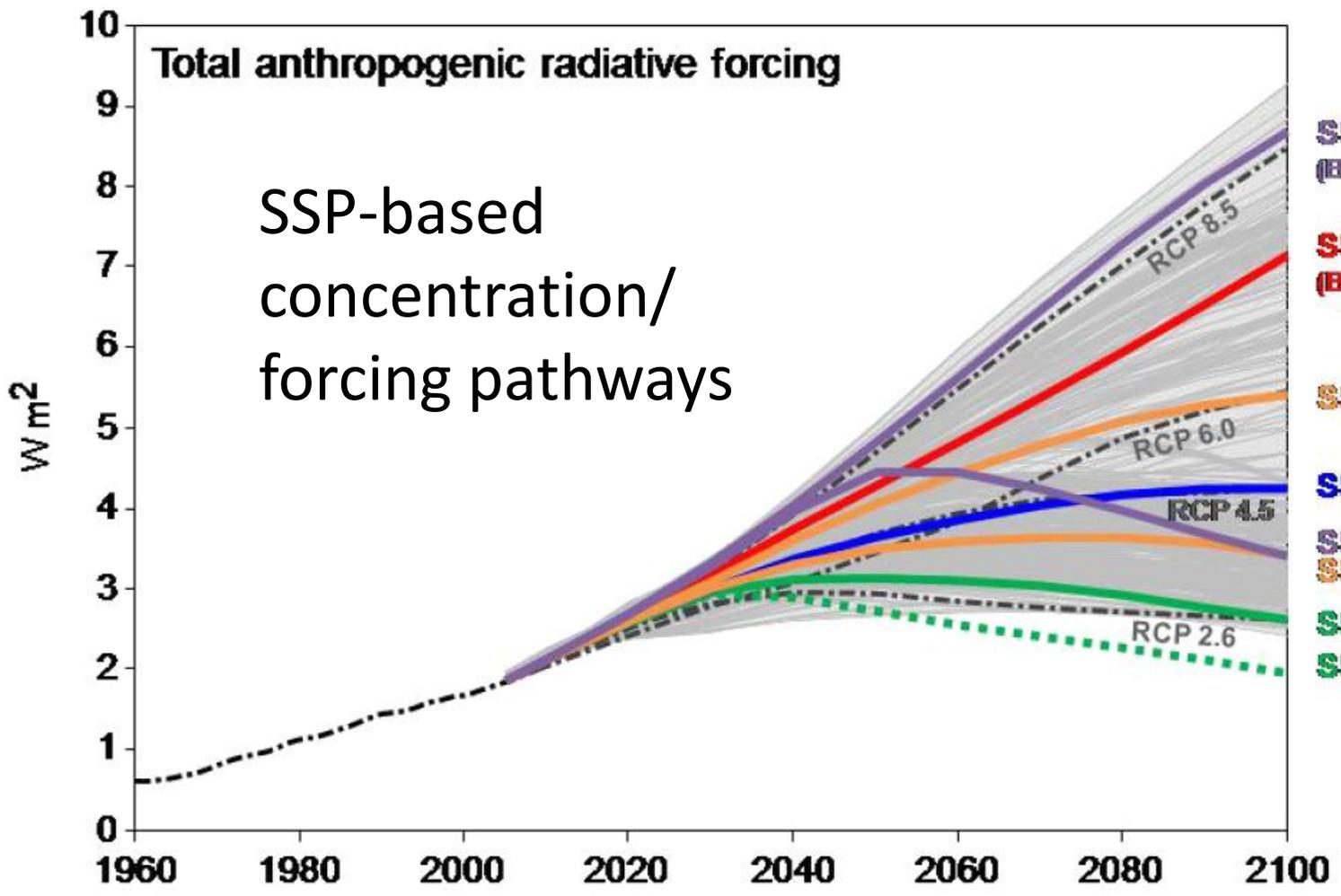


# Representative Concentration Pathways (RCPs)

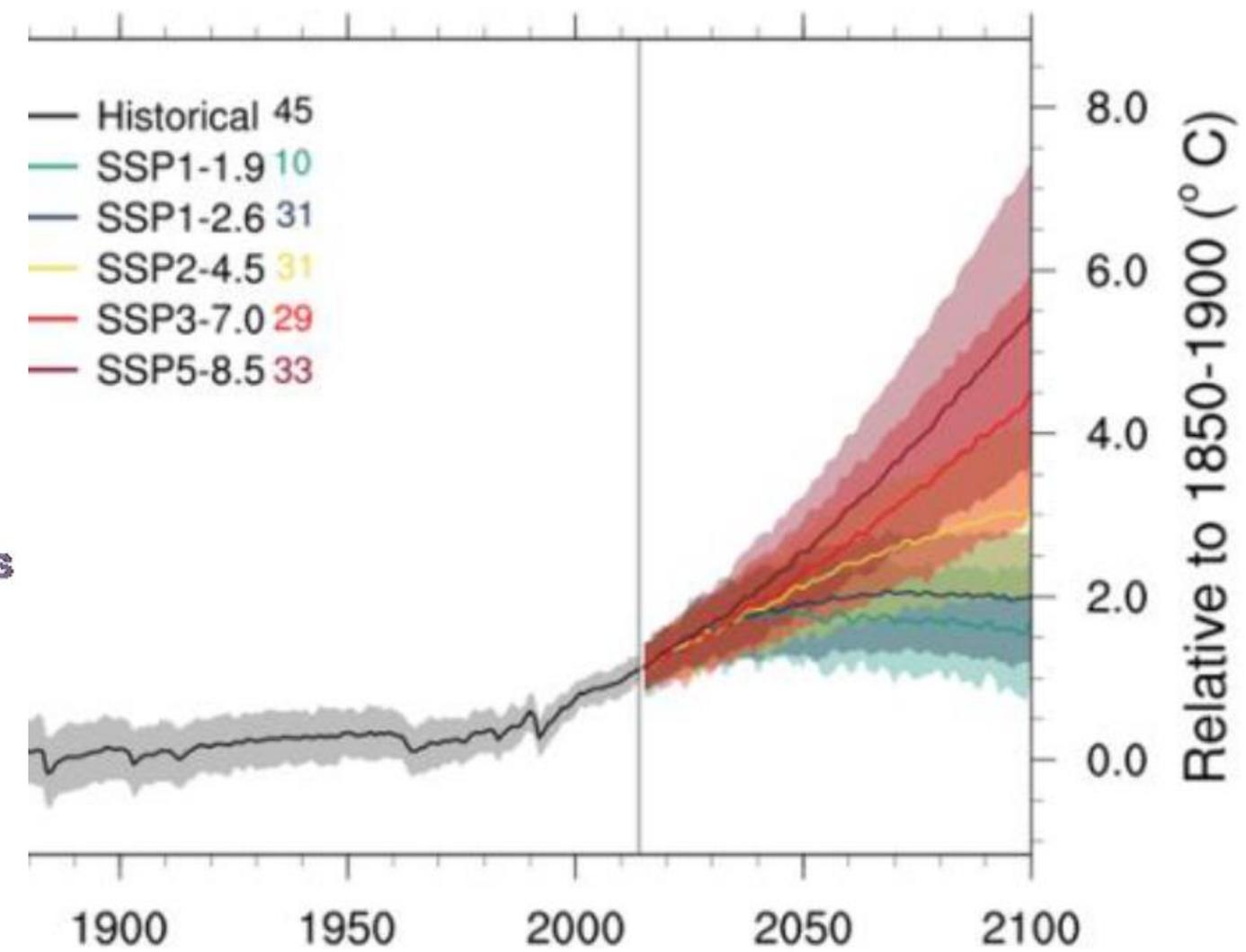
Radiative forcing  
(from concentrations)



Climate System Changes  
(CMIP6)



O'Neill et al., 2016; Riahi et al., 2017.

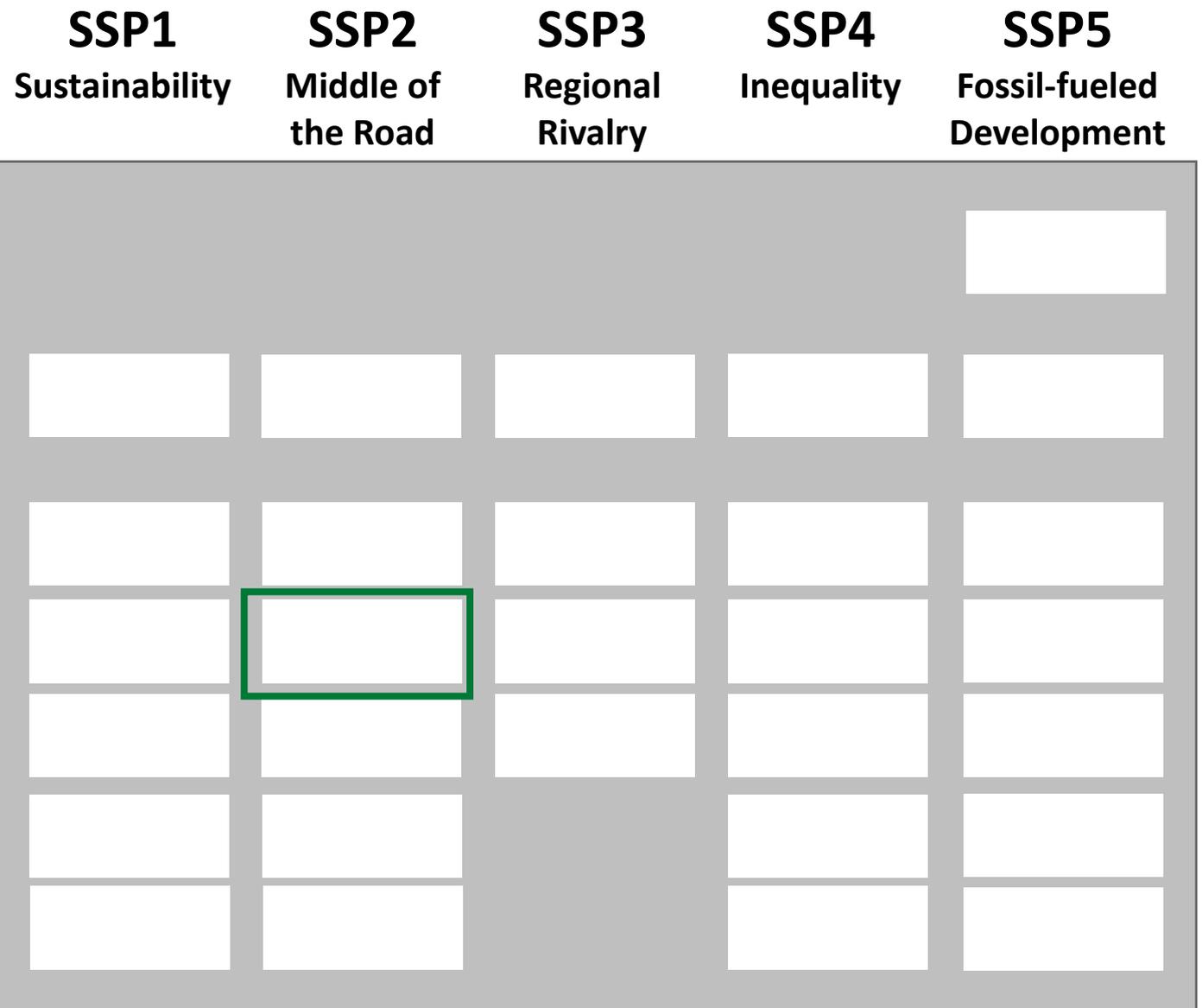


Year

Tebaldi et al., 2020.

# The “matrix architecture”

## Shared Socioeconomic Pathways



 Original RCP levels

Climate

2100 forcing level (W/m<sup>2</sup>)

8.5

7.0

6.0

4.5

3.4

2.6

1.9

# SSP use

## Wide use

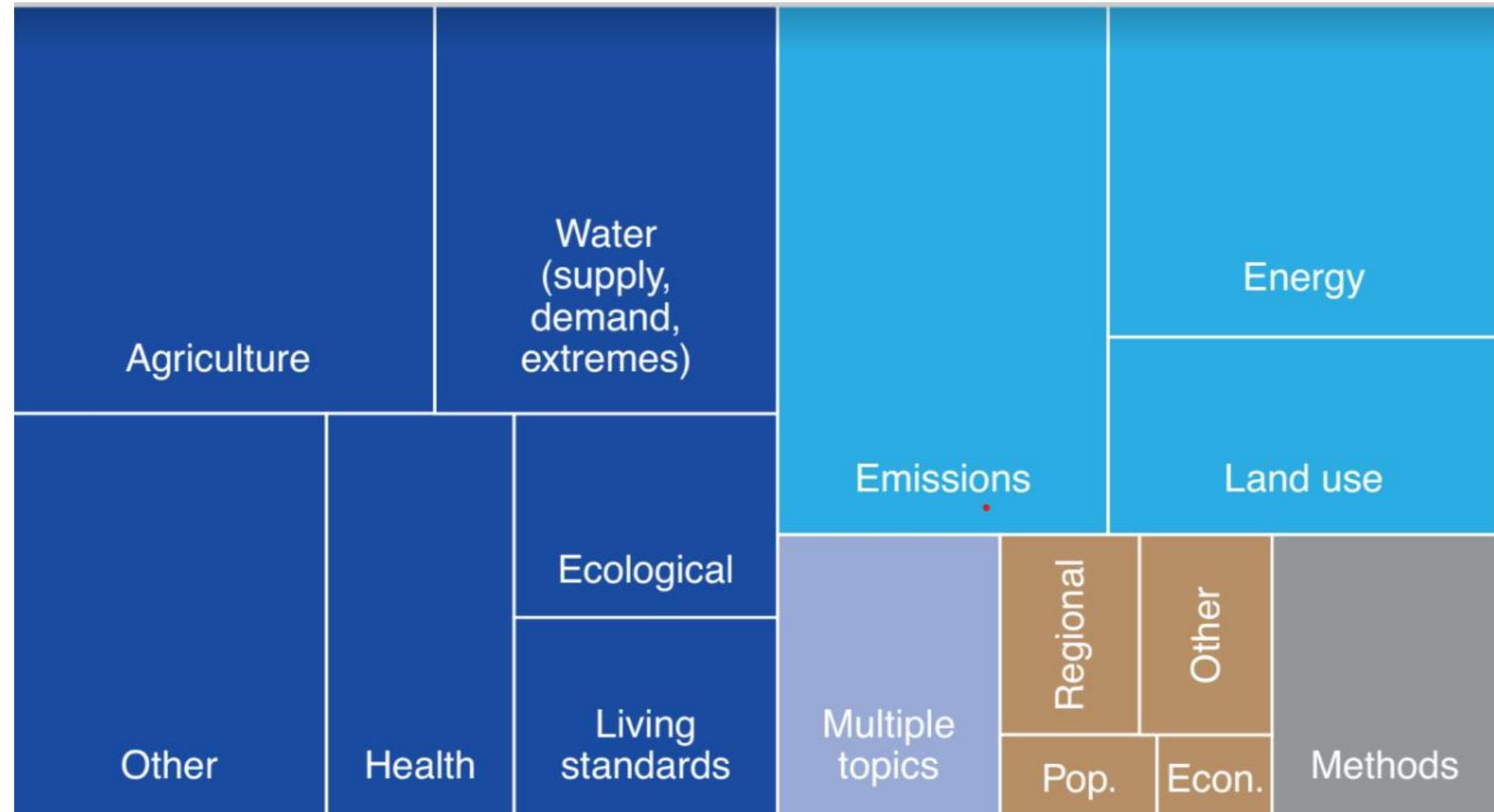
~2200 total papers  
2014-2021 using  
SSPs

## Diverse fields

Impacts, emissions,  
extensions

## Prominent use in assessments

IPCC, IPBES, US  
NCA, UNEP GEO



Areas of rectangles proportional to numbers of papers in each category. Pure climate modeling applications not included. As of end 2019.

# Many extensions

## Quantitative elements

Spatial population

Income distribution

Infrastructure (roads)

Urban land

Governance

Regions

Europe

US regional

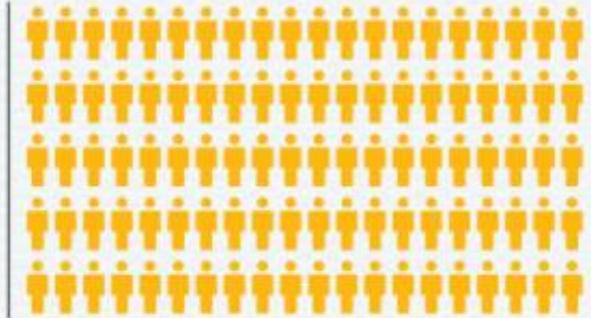
CCRAF

AgMIP

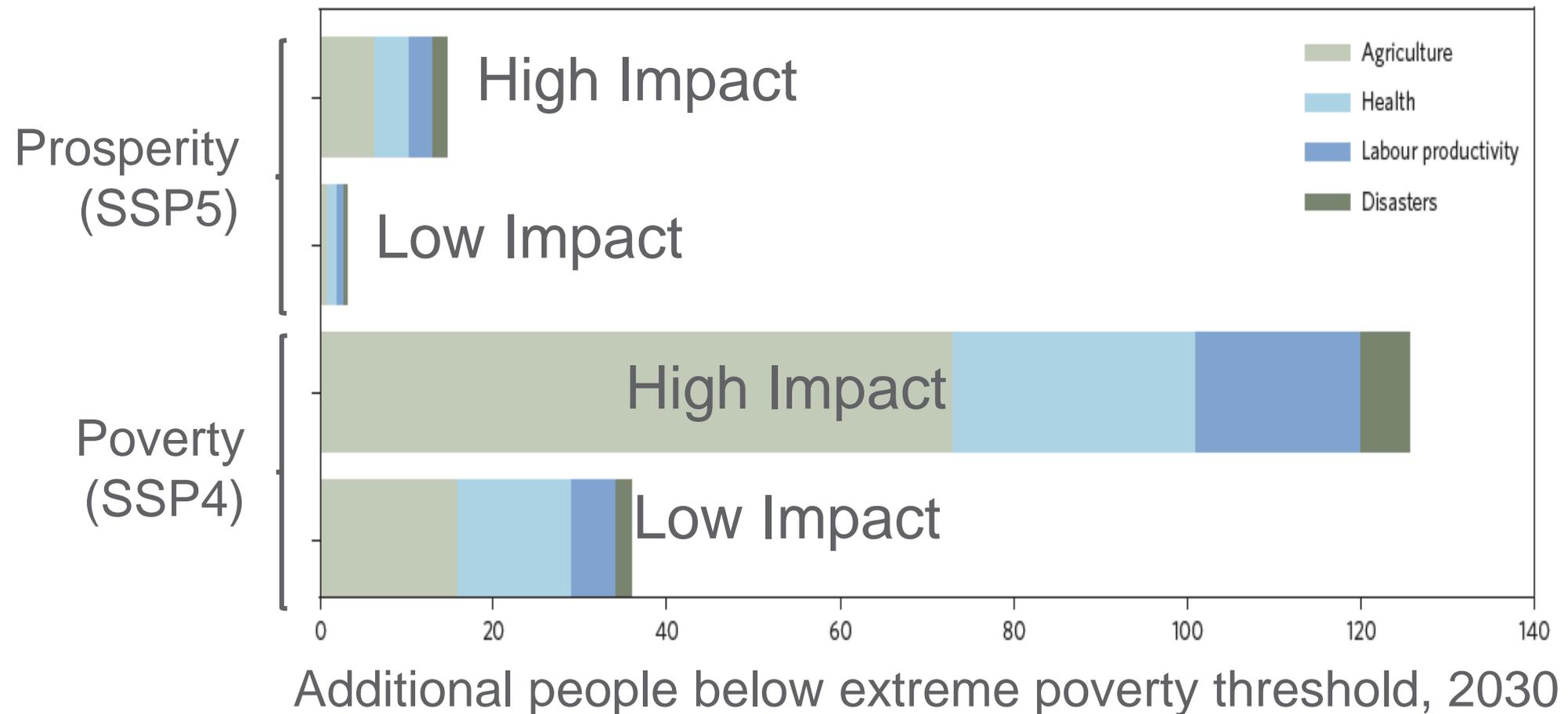
Demog.  
Educ.  
Sectoral shift



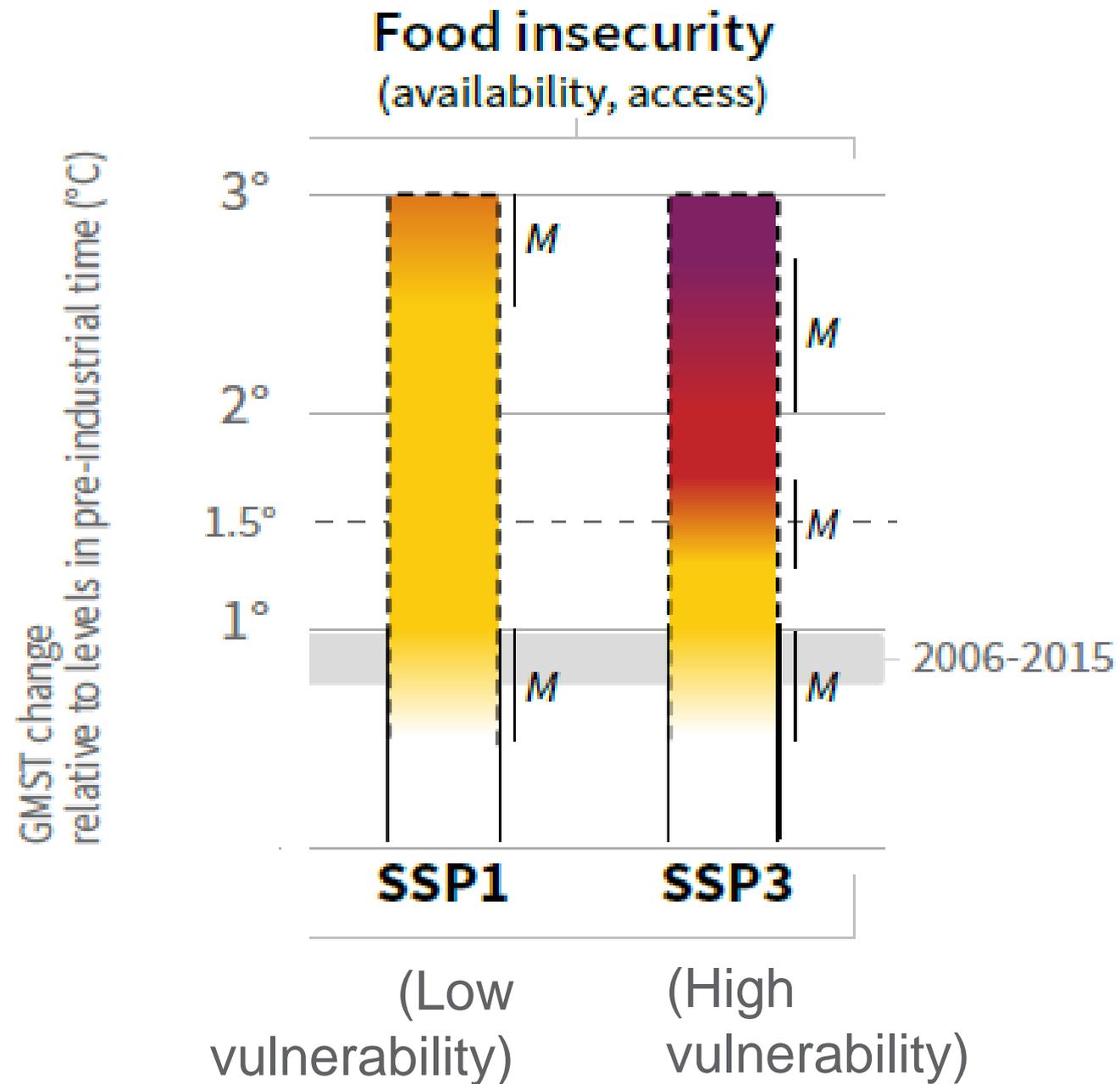
Climate Change could result  
in **MORE THAN 100 MILLION**  
additional people living in **POVERTY**  
by **2030**



Hallegatte & Rozenberg, 2017.



# IPCC food security risk assessment



IPCC Special Report on Climate Change and Land (2019)

# Ongoing and future work

## Extensions to the framework

Further work in income distribution, spatial vulnerability, determinants of biodiversity

## Updating SSPs

Base year, near-term outlook (is high scenario too high?)

## Additional “reference” scenarios

Impacts and/or policy in the reference scenario

## Adding or removing scenarios

High scenario too high? No “degrowth” scenario?

## Scenarios of outcomes

## CMIP7 and the role of climate model emulation

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**Thank you**

