

Next generation of Integrated Assessment Models to ethically inform decision support

Prof.dr.ir Jan Kwakkel

This has quickly become the key issue at COP27 – and the most difficult to resolve

By Rachel Ramirez, CNN
Updated 9:30 PM EST, Mon November 7, 2022



COP26: Did India betray vulnerable nations?

By Navin Singh Khadka
Environment correspondent, BBC World Service

16 November



India is being criticised for hindering efforts to meet the 1.5C target

The Glasgow climate deal has put India and China in the spotlight after they opposed a commitment to "phase out" coal while negotiating the final agreement.

Instead, countries agreed to "phase down" coal, causing disappointment and concern over whether the world can limit the average global temperature rise to 1.5C.

"China and India will have to explain themselves and what they did to the most climate-vulnerable countries in the world," said the COP26 president, Alok Sharma. Mr Sharma also called the deal "historic" and said it "keeps 1.5C within reach".

Earlier drafts of the agreement contained an commitment to phase out unabated coal (unabated refers to coal that is burned without carbon capture and storage technology, which advocates say significantly decreases emissions).

Thou Shalt Use RCP8.5

Governments are mandating the use of outdated climate scenarios as scientists stand by silently

ROGER PIELKE JR.
OCT 9, 2023

104 32 Share



Let us leave RCP8.5

traipse.flare.0d@iclo

In 2010, the North Carolina Coastal Res recommending that the state use a rang

DE WEEK IN WETENSCHAP

Een valse tegenstelling in het KNMI-filmpje over de klimaatscenario's



€ jaar 40 graden en dertig tropische dagen, als we 'in zelfde mate als nu' doorgaan?

PREMIUM | Het beste van De Telegraaf

Lees voor

Nederland krijgt nattere winters en drogere zomers

Experts over meest gebruikte klimaatscenario KNMI: 'Een onwaarschijnlijke toekomst'

Door KLEIS JAGER
09 okt. 2023 in BINNENLAND



Ons land krijgt te maken met steeds zwaardere weersomstandigheden, waarschuwt het KNMI. Het meteorologische instituut publiceerde nieuwe scenario's die de gevolgen van klimaatverandering voorspellen. De toon is aan de alarmistische kant.



Integrated Assessment Models (IAMs)

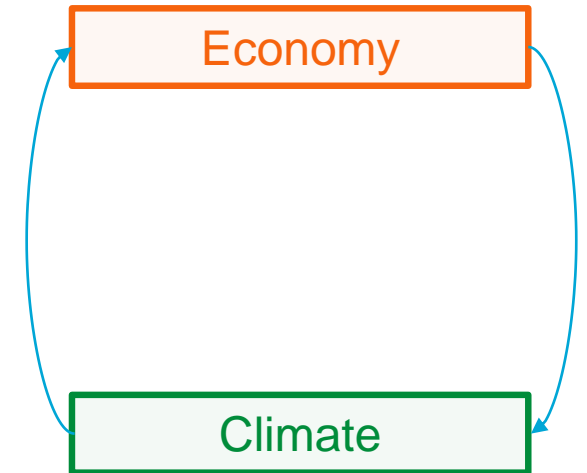
Integrated assessment models (**IAMs**) **combine** models of the Earth's **climate system** with models of **economic and social systems** to provide **insights** into the potential **impacts of climate change** and the **costs and benefits** of different **policy** responses.

Why IAMs:

IAMs are frequently used in Intergovernmental Panel on Climate Change (**IPCC**) reports and have a **significant impact** on **policy decisions**, climate neutrality targets, adaptation plans, and climate legislation

Aggregate cost benefit models

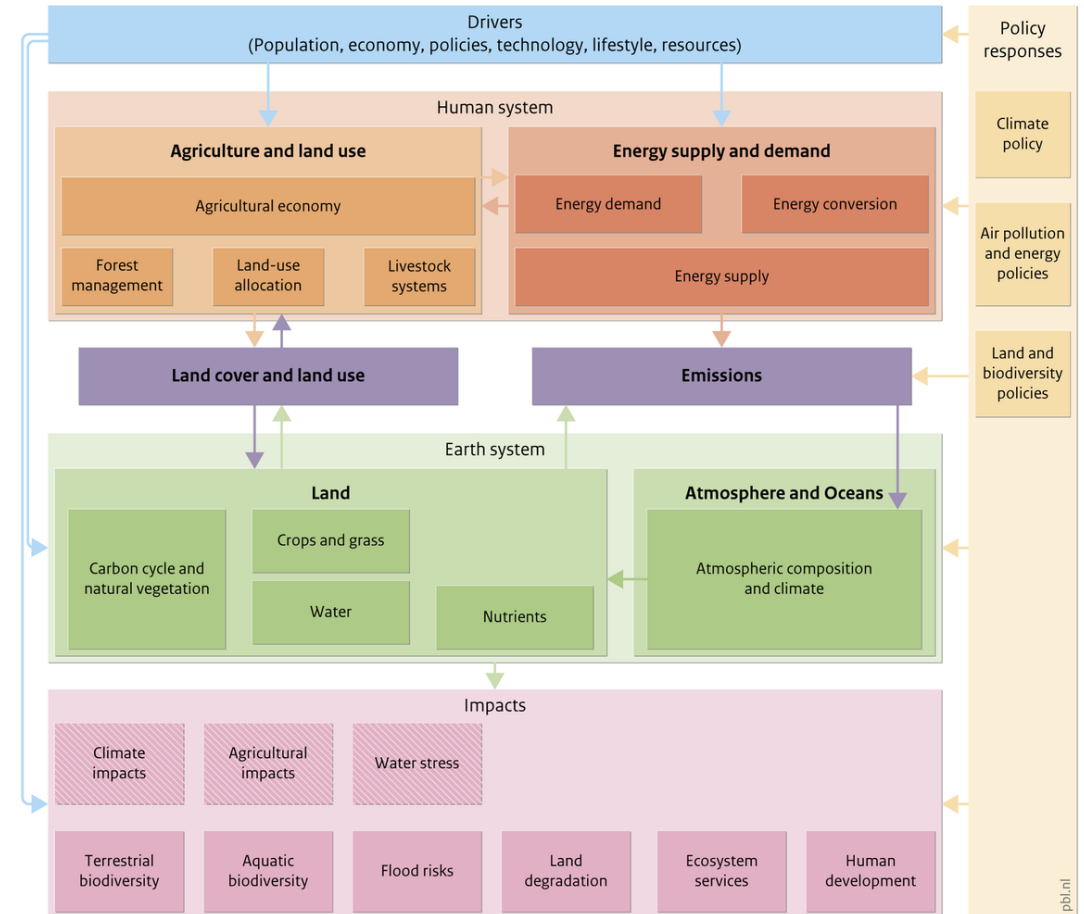
- Basic idea
 - Climate change damages the economy
 - Mitigation is a net cost to the economy
 - Economic activity results in emissions
 - High-level aggregate top-down representation of the economic and climate systems
 - What is the optimal way of balancing costs and damages?
- Examples
 - DICE, RICE, FUND, PAGE
- Main use
 - Identify cost-optimal abatement pathways
 - Calculate the social cost of carbon



Process based models

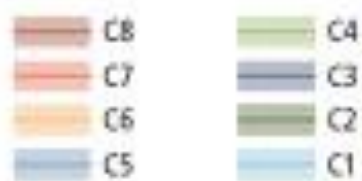
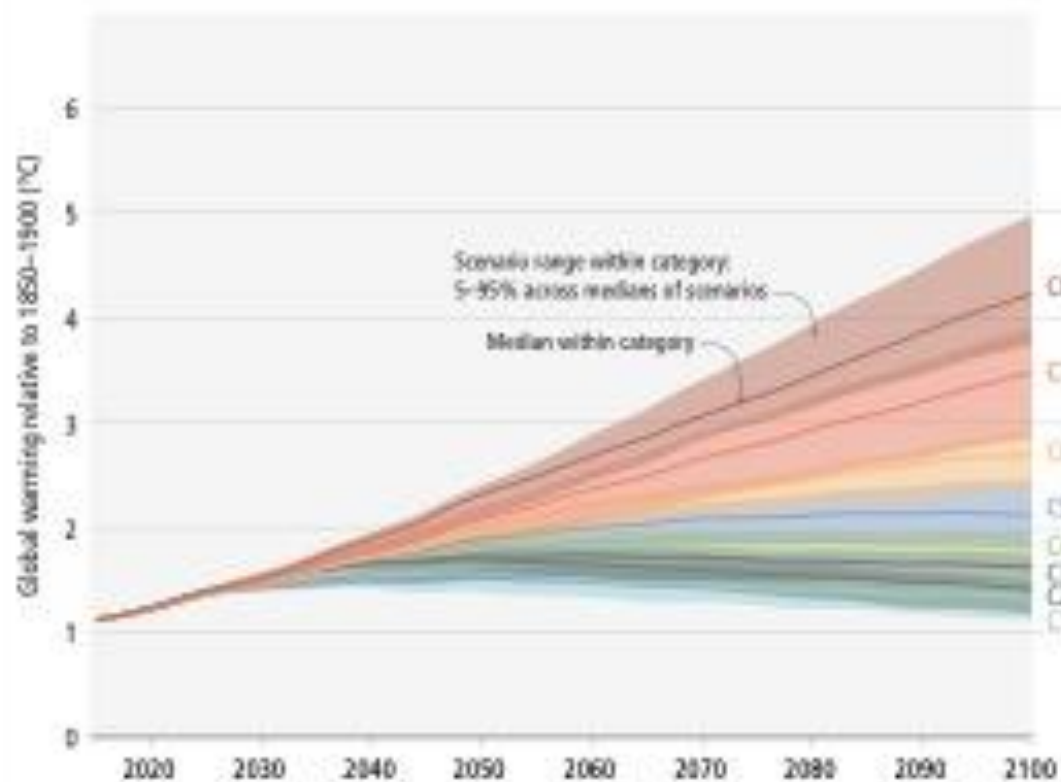
- Basic idea
 - Detailed description of processes resulting in emissions
 - Detailed bottom-up representation of biophysical and socio-economic processing, but no feedback from climate damages
 - What-if analysis and goal finding
- Examples
 - IMAGE, MESSAGE, GCAM, WITCH
- Main use
 - provide emission scenarios for future climate change projections
 - evaluate efficient mitigation strategies
 - A major workhorse in climate change research

IMAGE 3.0 framework

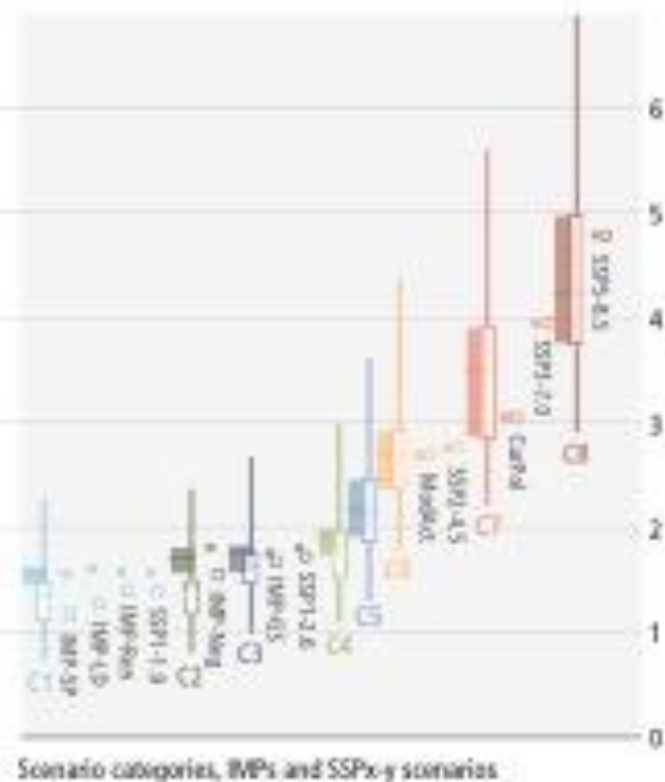


The range of assessed scenarios results in a range of 21st century projected global warming.

a. Median global warming across scenarios in categories C1 to C8



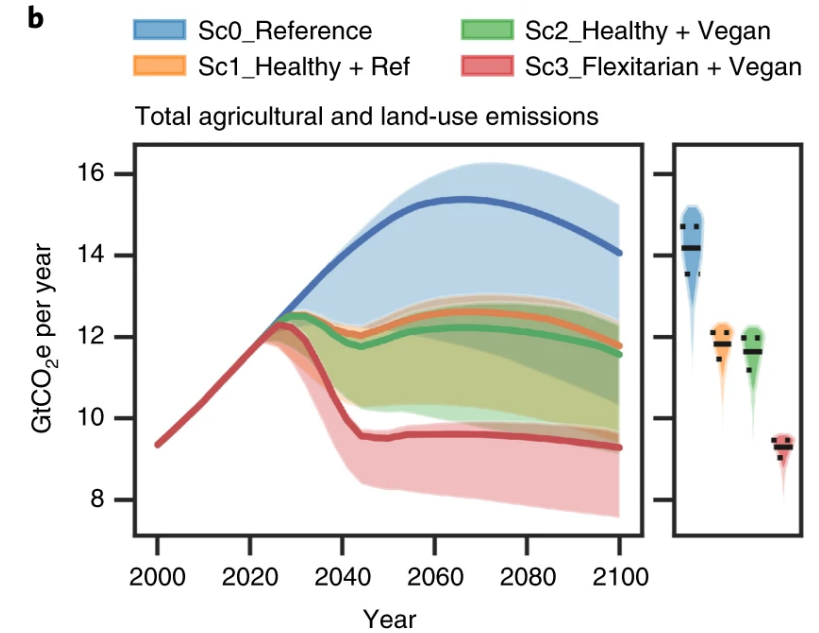
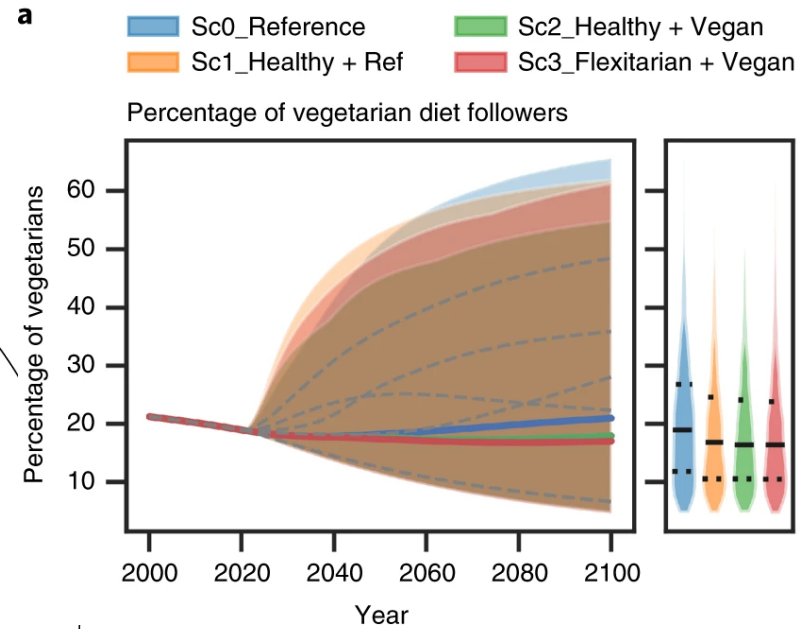
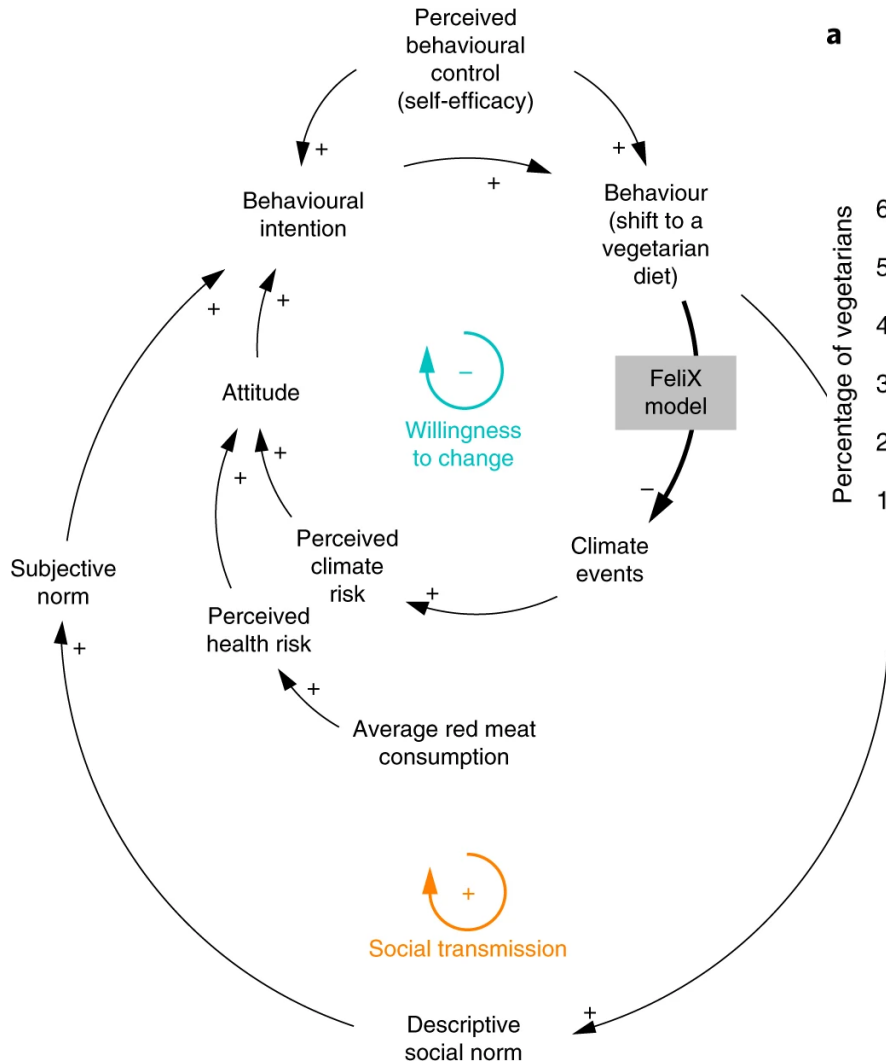
b. Peak and 2100 global warming across scenario categories, IMPs and SSPx-y scenarios considered by AR6 WGI



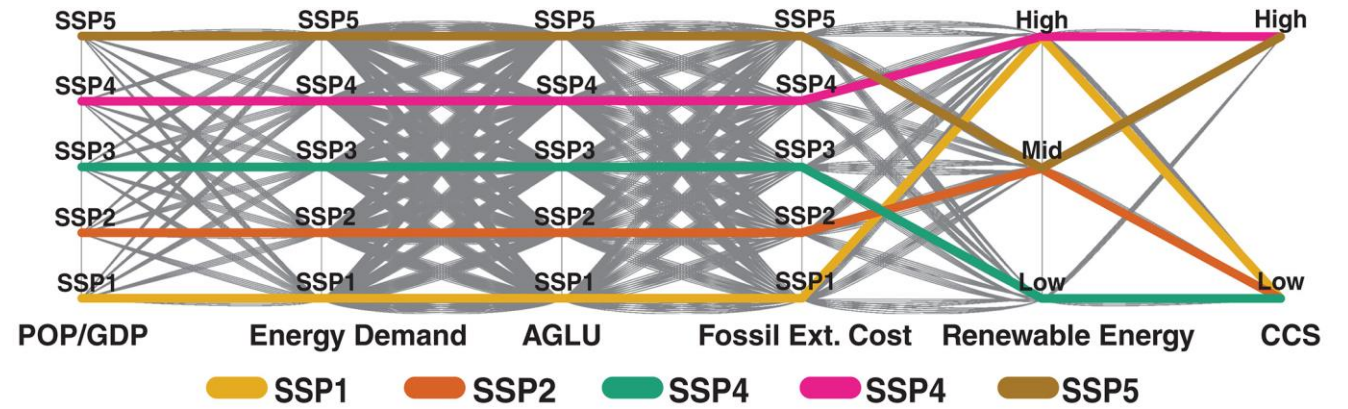
Some common problems

- Limited consideration of uncertainty (IPCC, AR6, WG3, technical summary)
- Social planner assumption (Balint, 10.1016/j.ecolecon.2017.03.032)
- Perfect foresight
- Focus on static mitigation pathways (Marangoni et al., 2021)
- Fail to represent human behavior adequately (Peng et al., 2021)
- Fail to account for ethical considerations (Jafino et al. 2021)
- Ignore the socio-political aspects of technological transitions in favor of naive techno-economically optimal transition pathways (Rosenbloom 2017).
- Science-driven global scenarios lack saliency in lower-level decision-making (O'Neill et al., 2020).
- Undue attention to highly implausible scenarios (Hausfather and Peters, 2020)

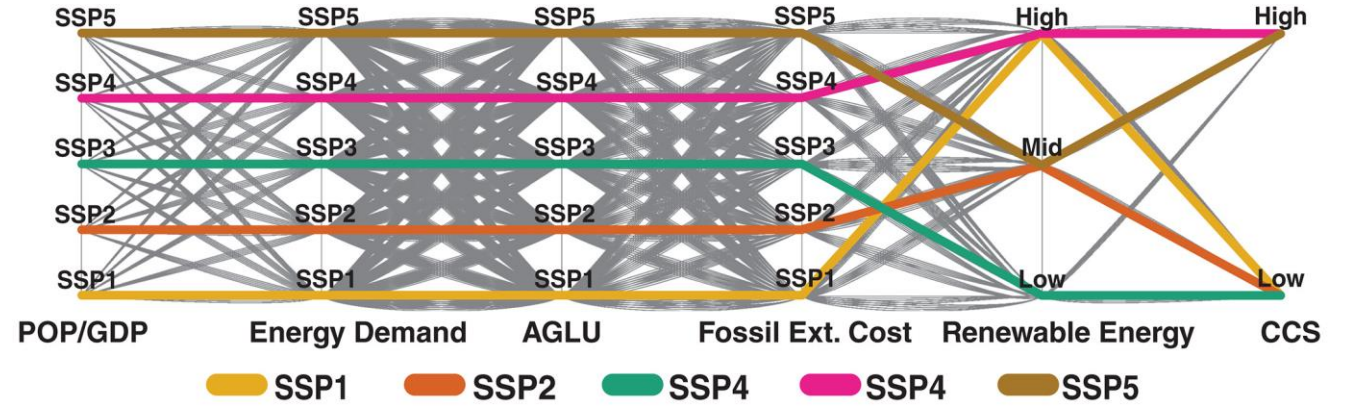
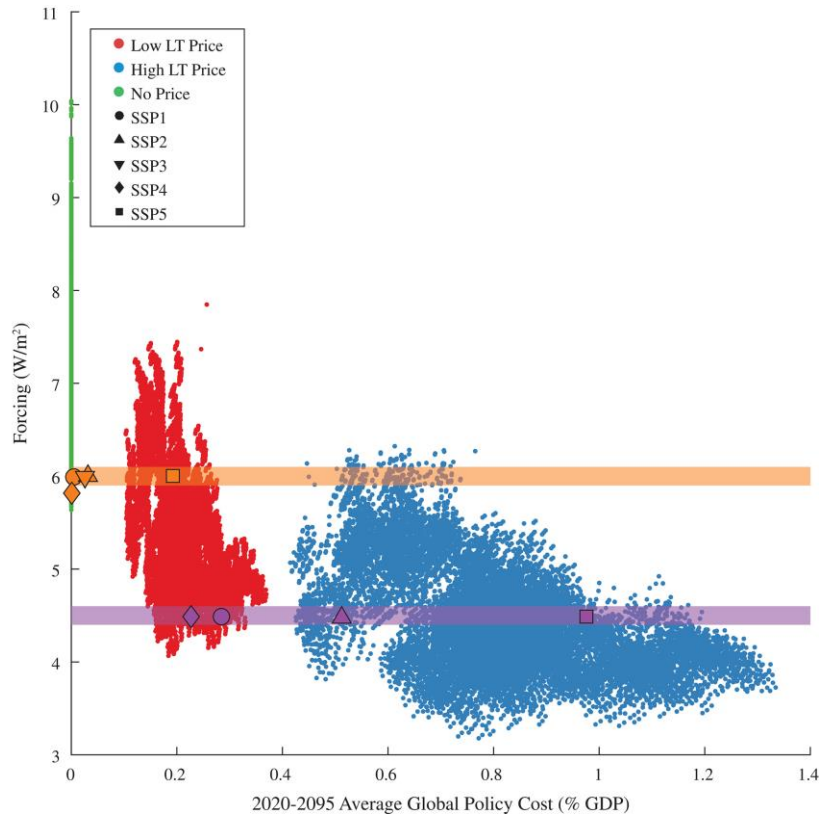
Coupling IAMs with other models



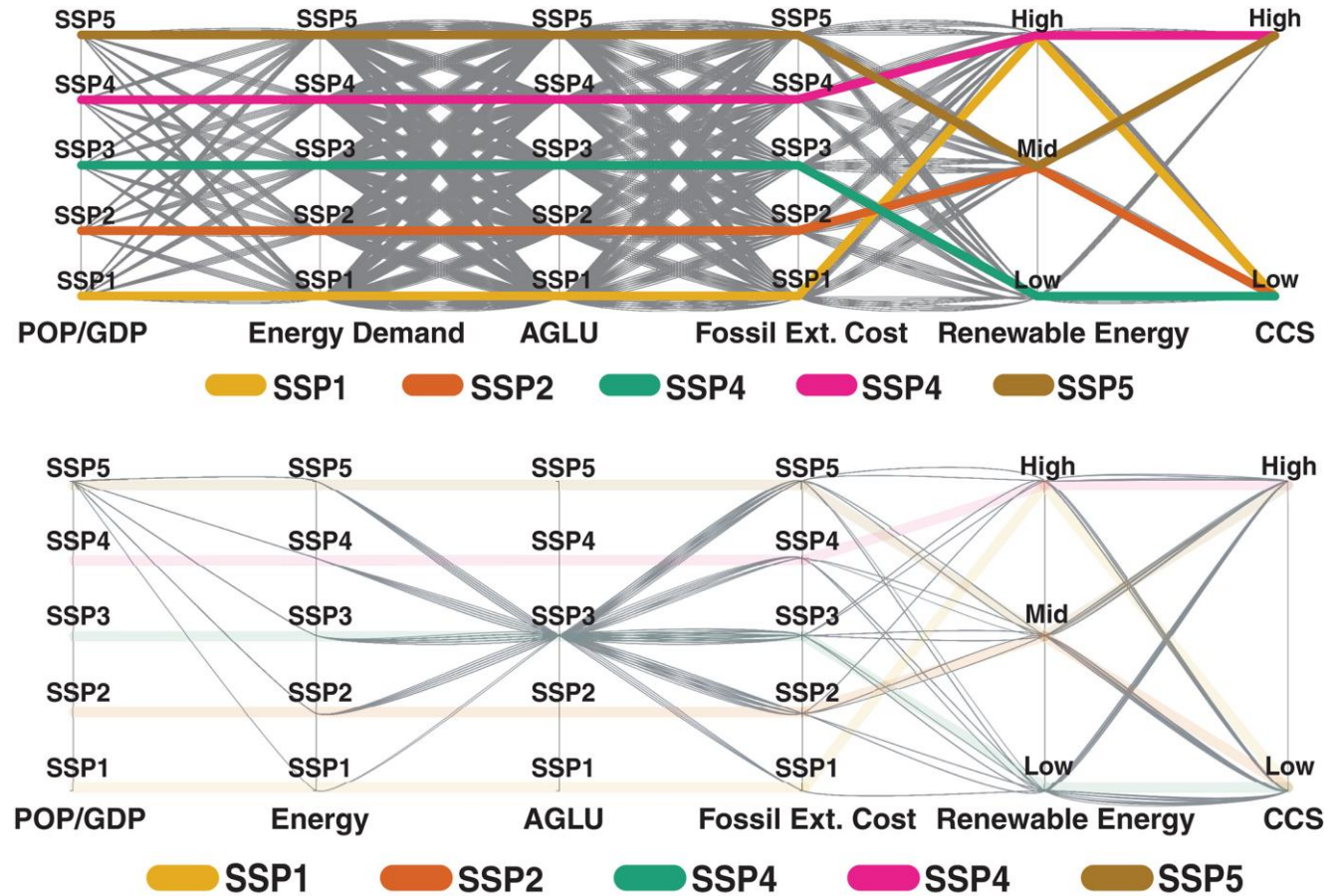
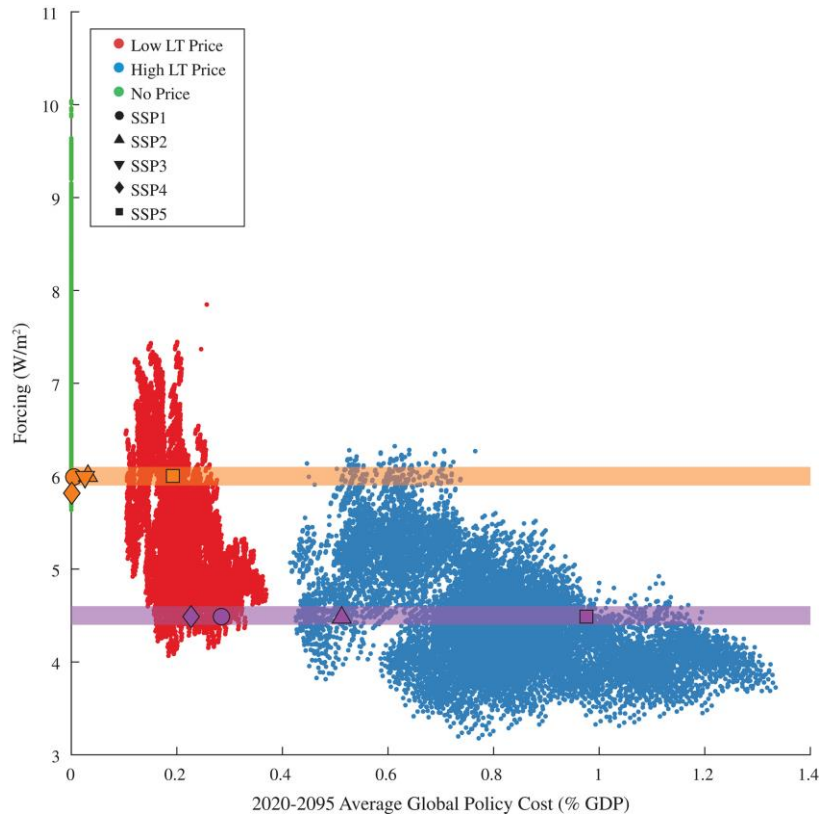
Moving away from storyline and simulate



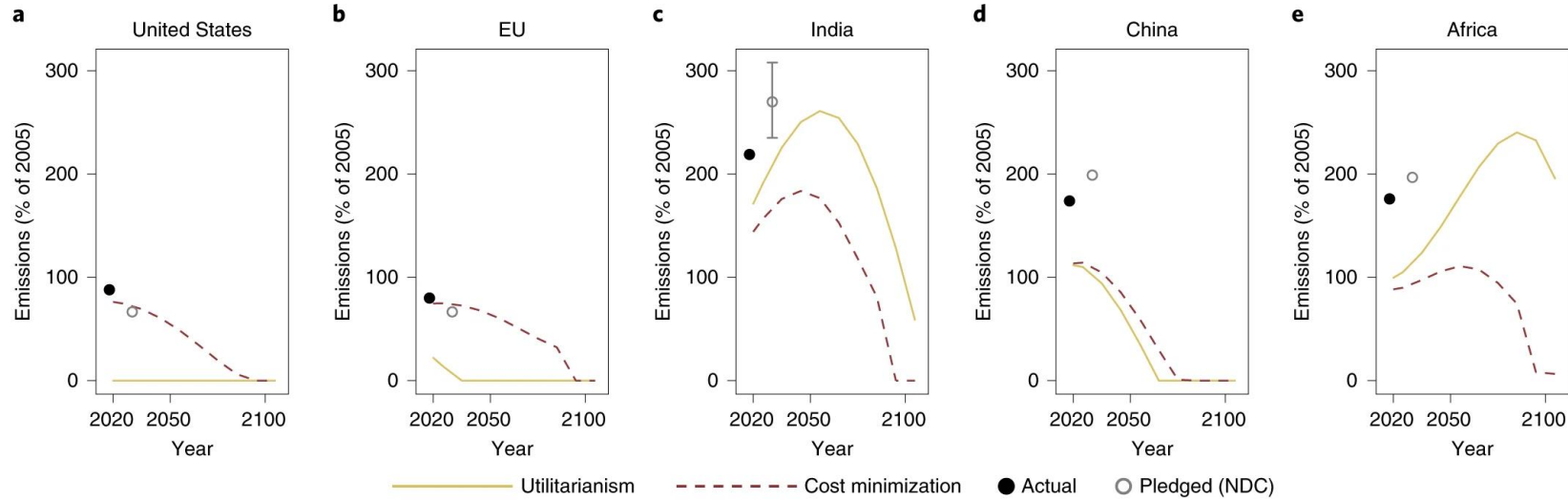
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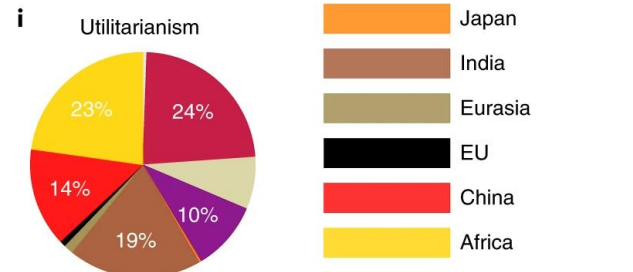
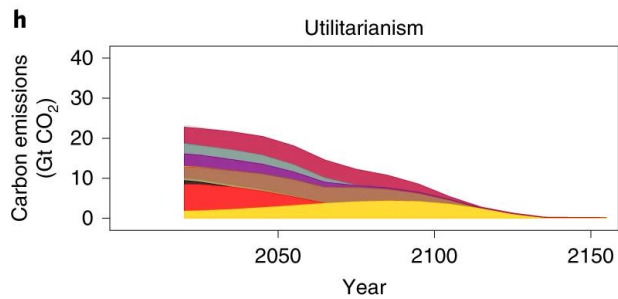
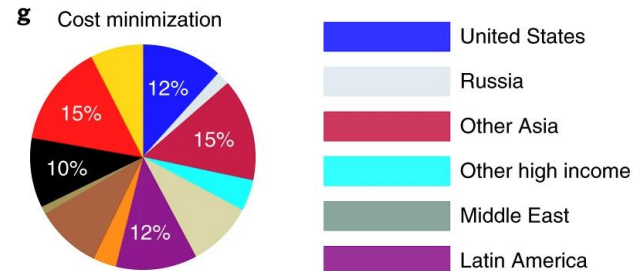
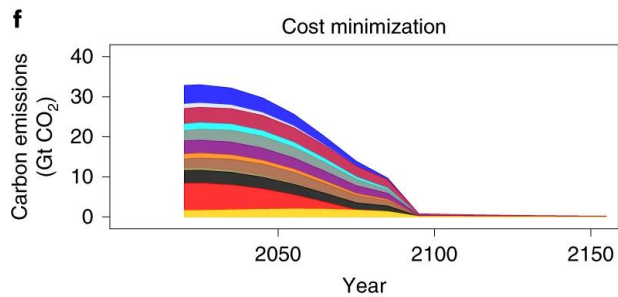
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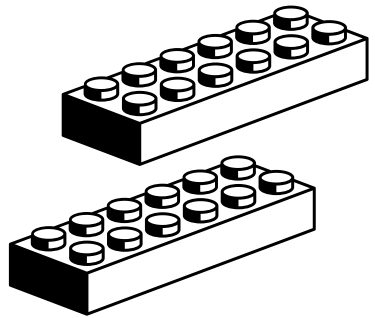
IAM sensitivity to normative assumptions



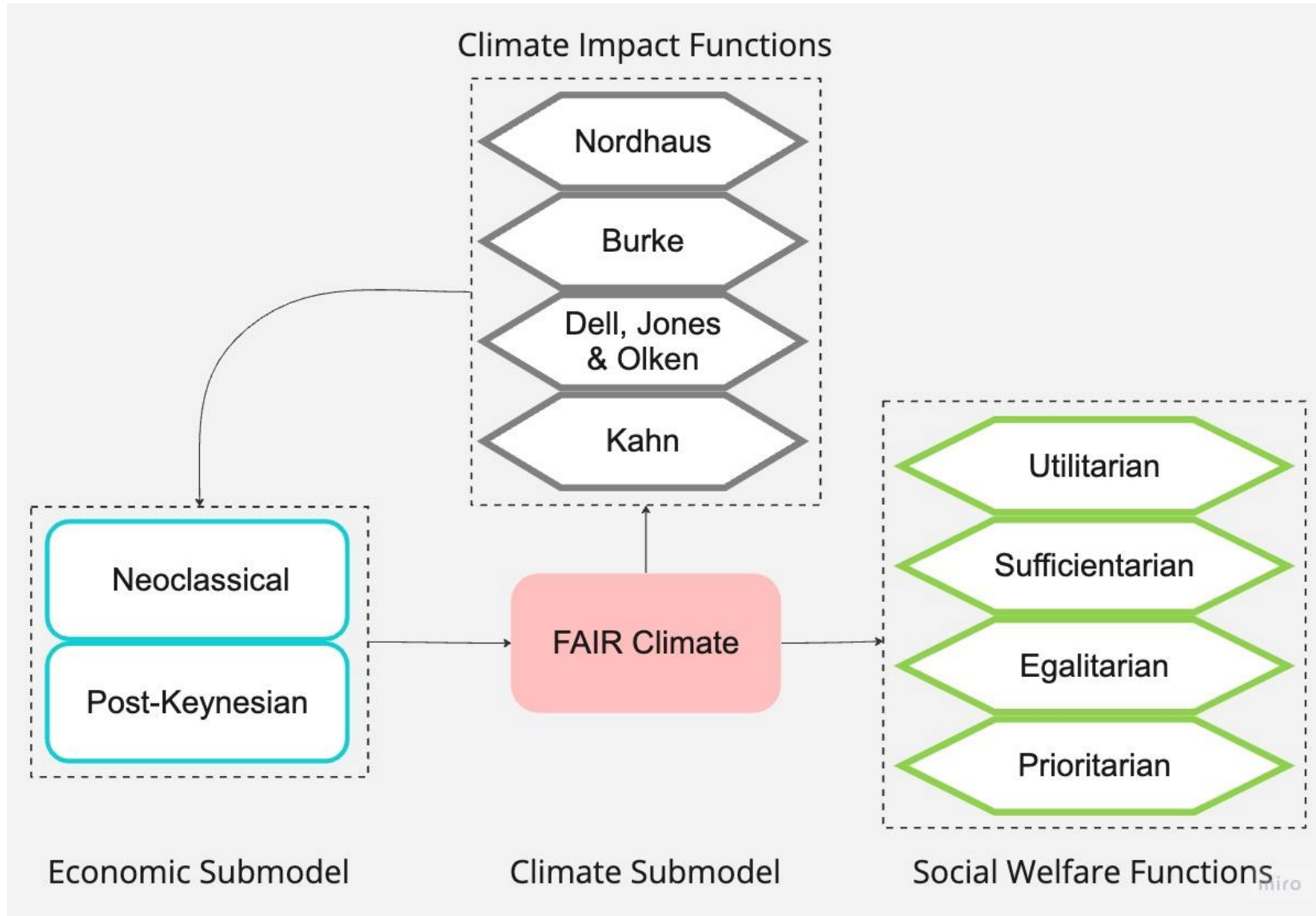
- 2 optimizations were performed to identify optimal abatement pathways using the RICE IAM
 1. Least cost
 2. Utility maximization
- Shifting from 1. to 2. effectively doubles the mitigation targets for the global north

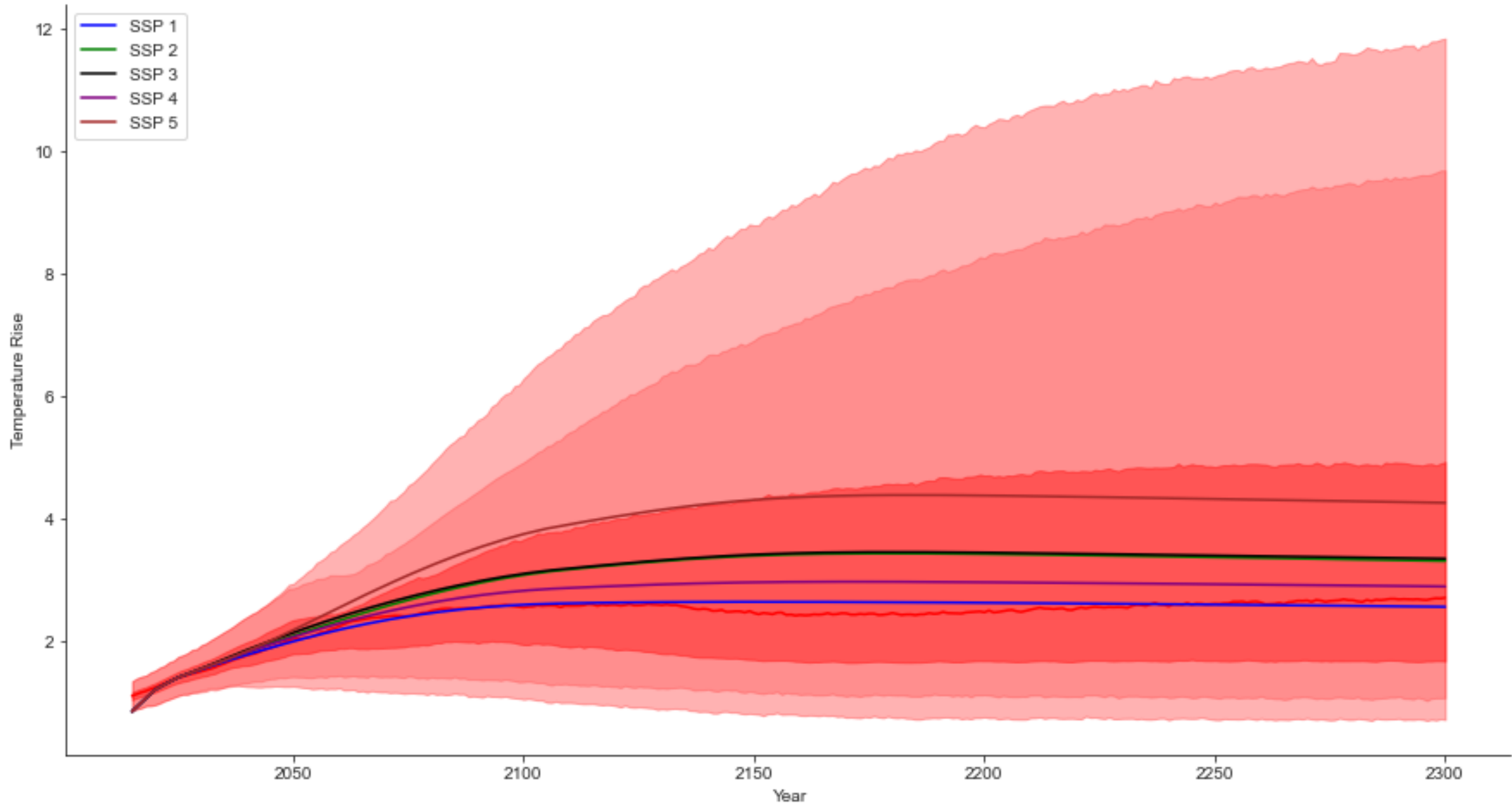


JUSTICE framework



Allows **exploration** of *Normative Uncertainty*.





Take home message

- IAMs are critical in information public deliberation and decision-making on climate action
- IAMs have many shortcomings
- There are ample promising research avenues to overcome the shortcomings