

Scenario integration

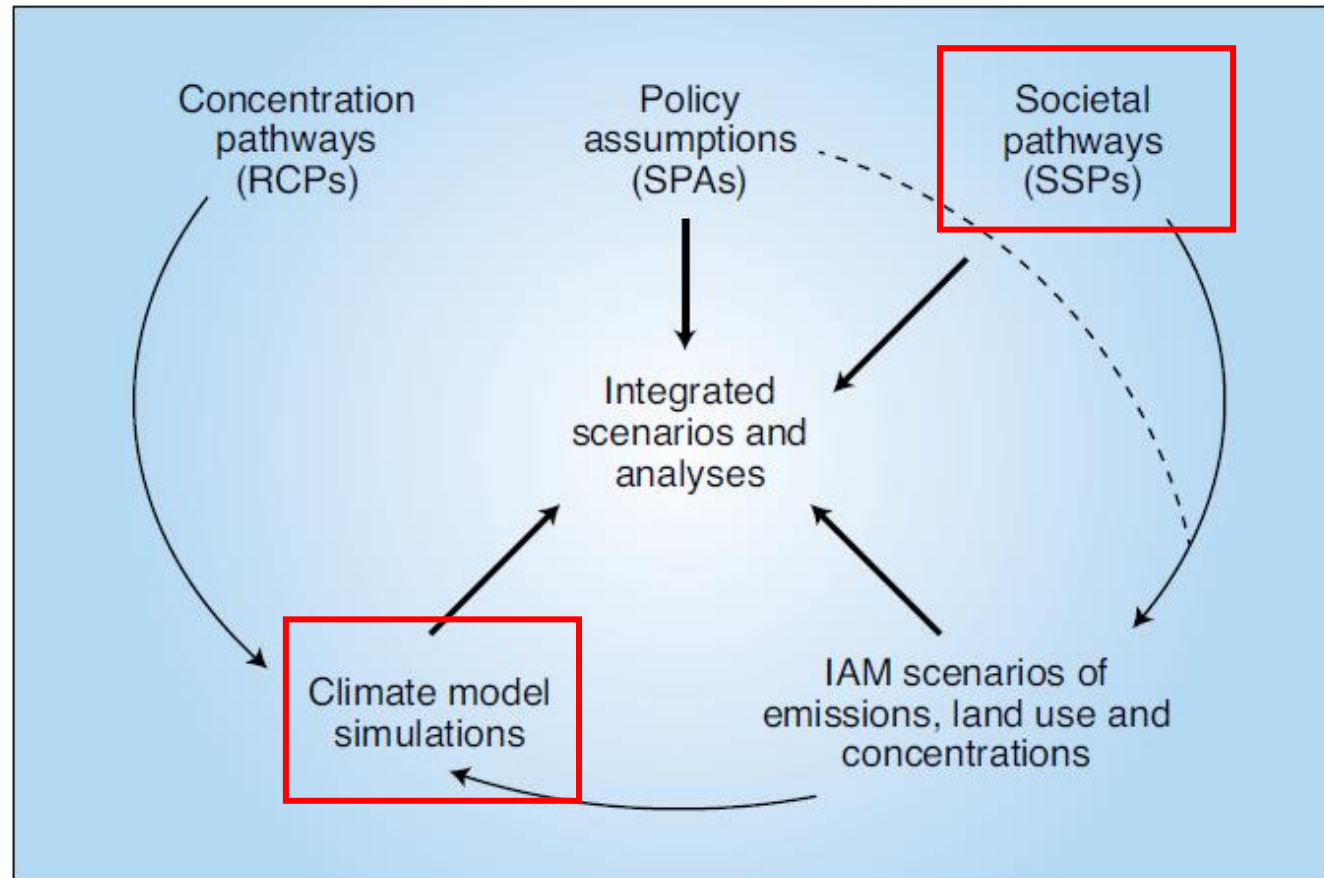
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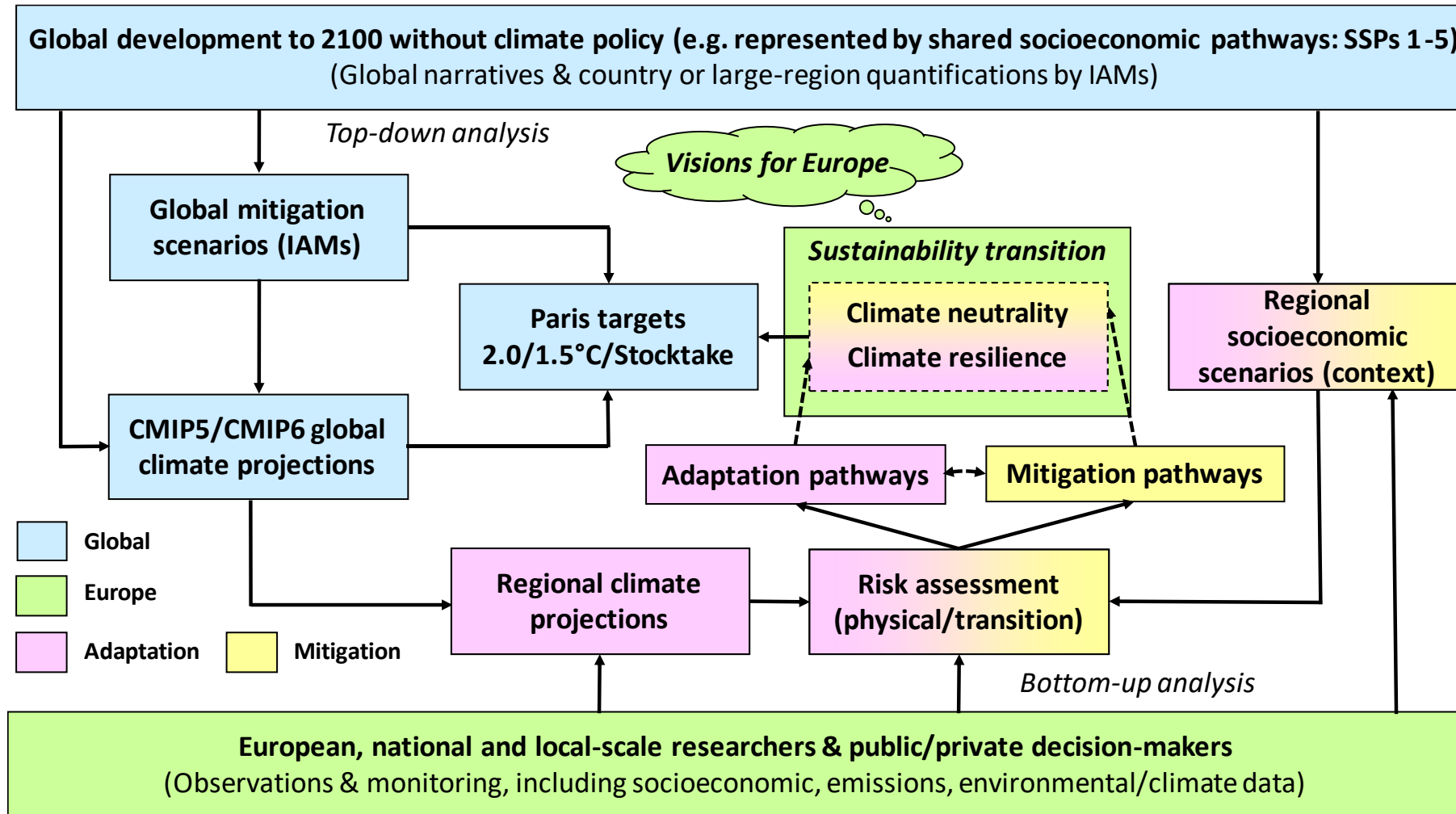
Suomen ympäristökeskus
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Integrated scenarios in the global SSP framework

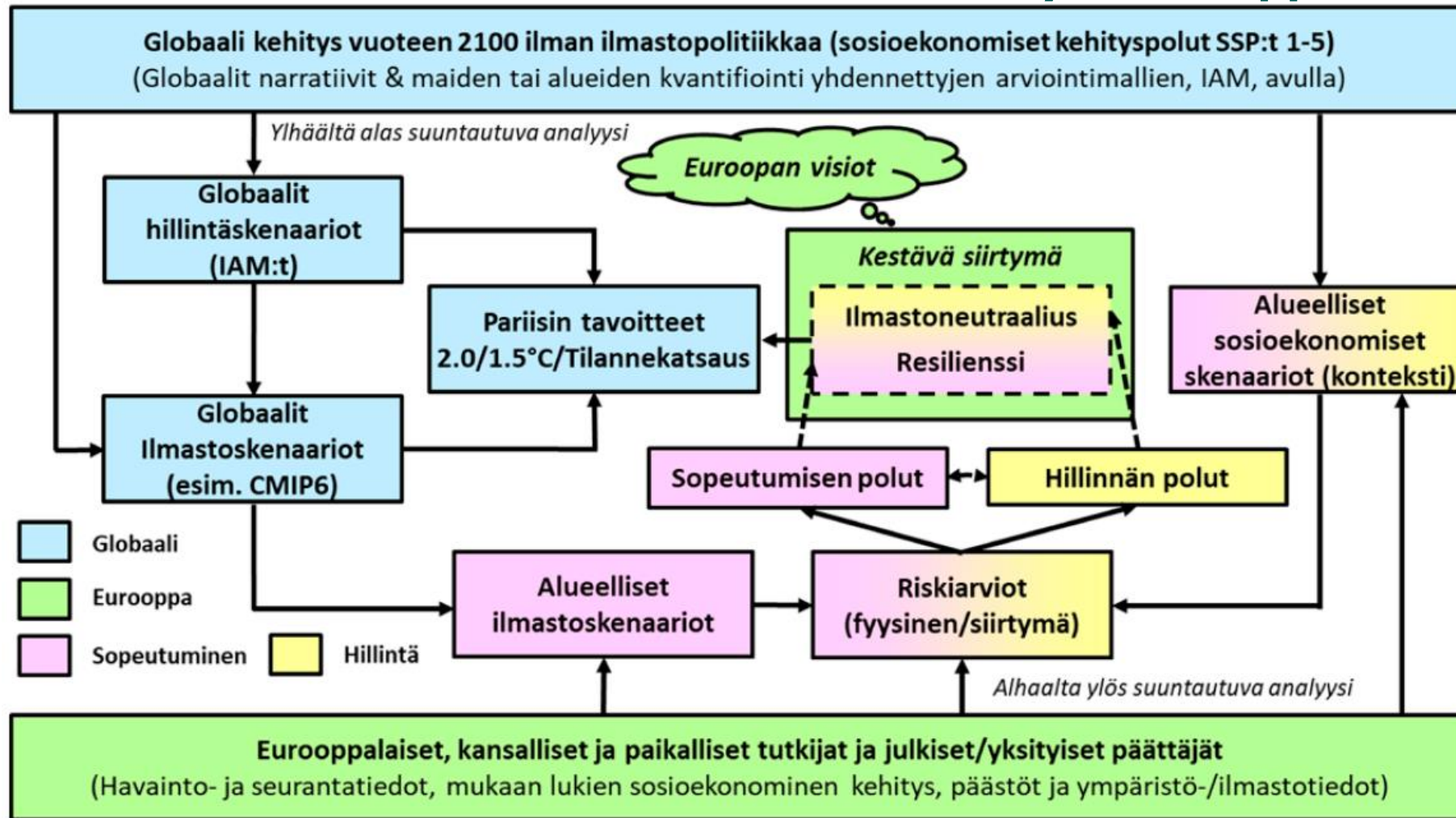


Source: O'Neill et al. (2020)

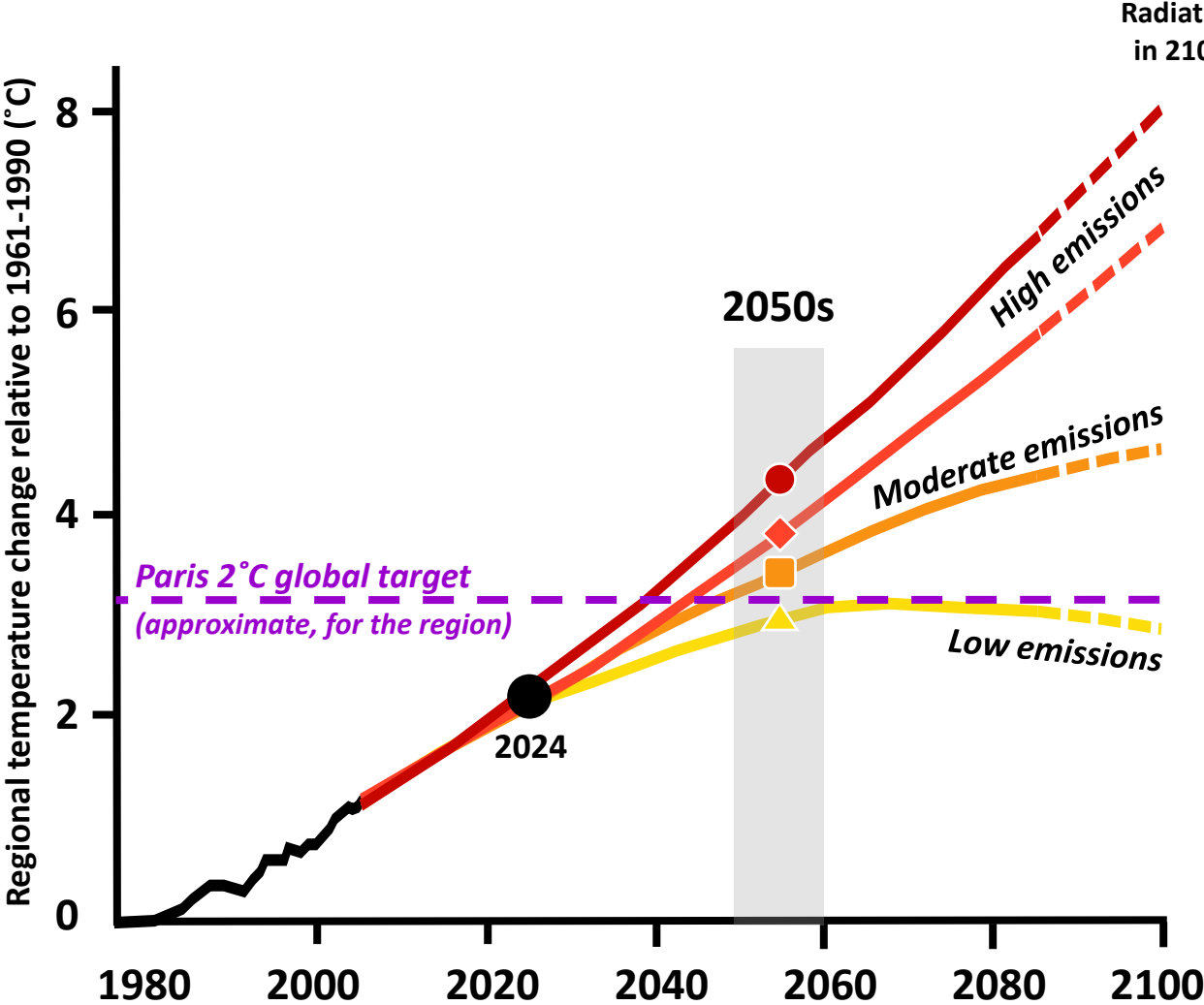
Relationships between top-down and bottom-up climate change analyses serving policy from a regional perspective with a focus on Europe



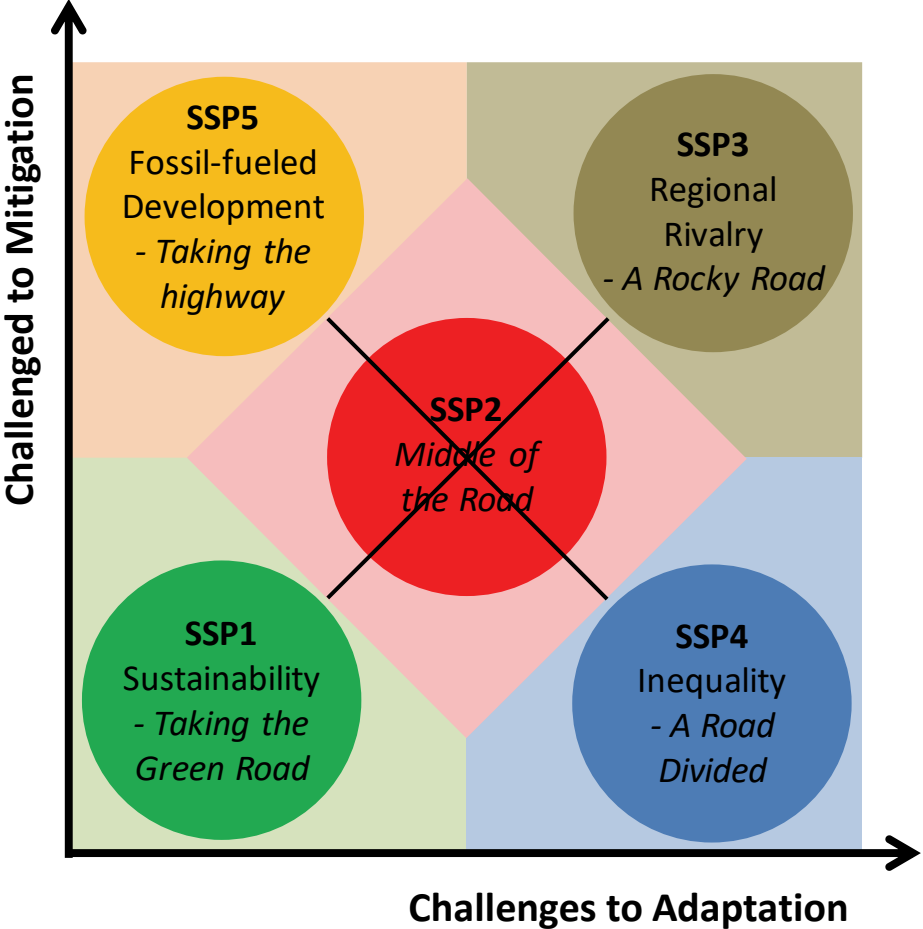
Ylhäältä alas ja alhaalta ylös suuntautuvien analyysien väliset suhteet alueellisesta näkökulmasta keskittyen Eurooppaan



Regional climate projections

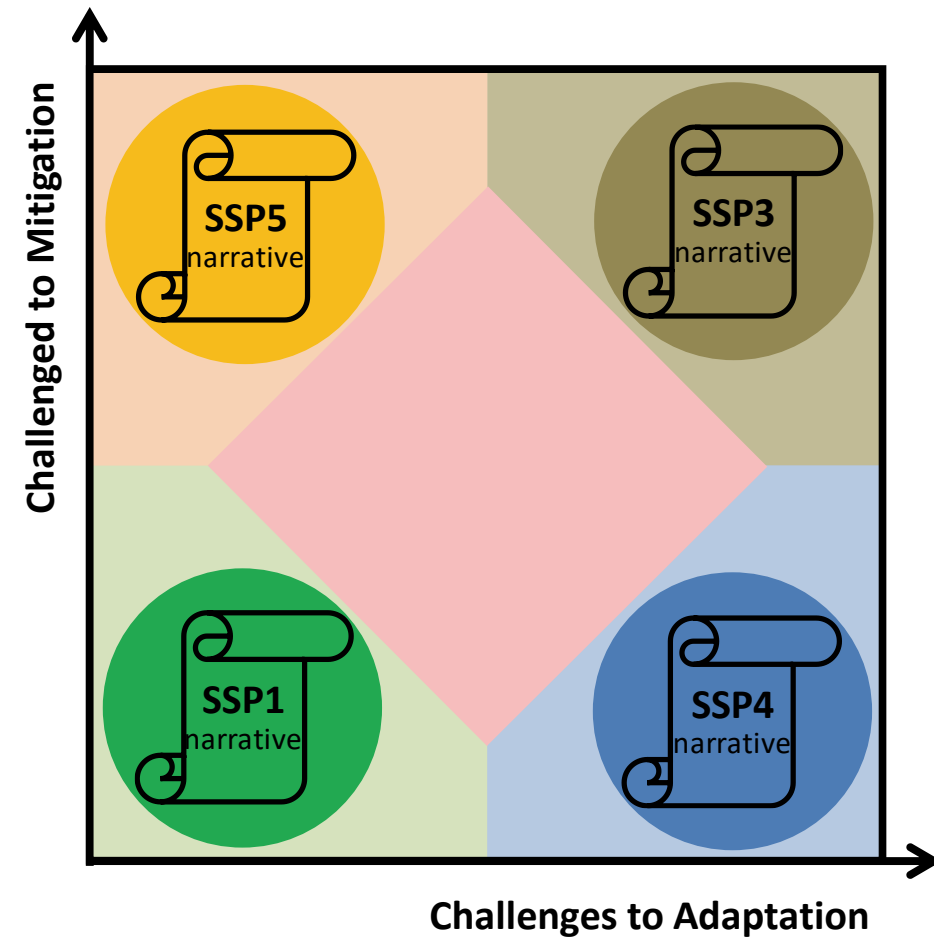
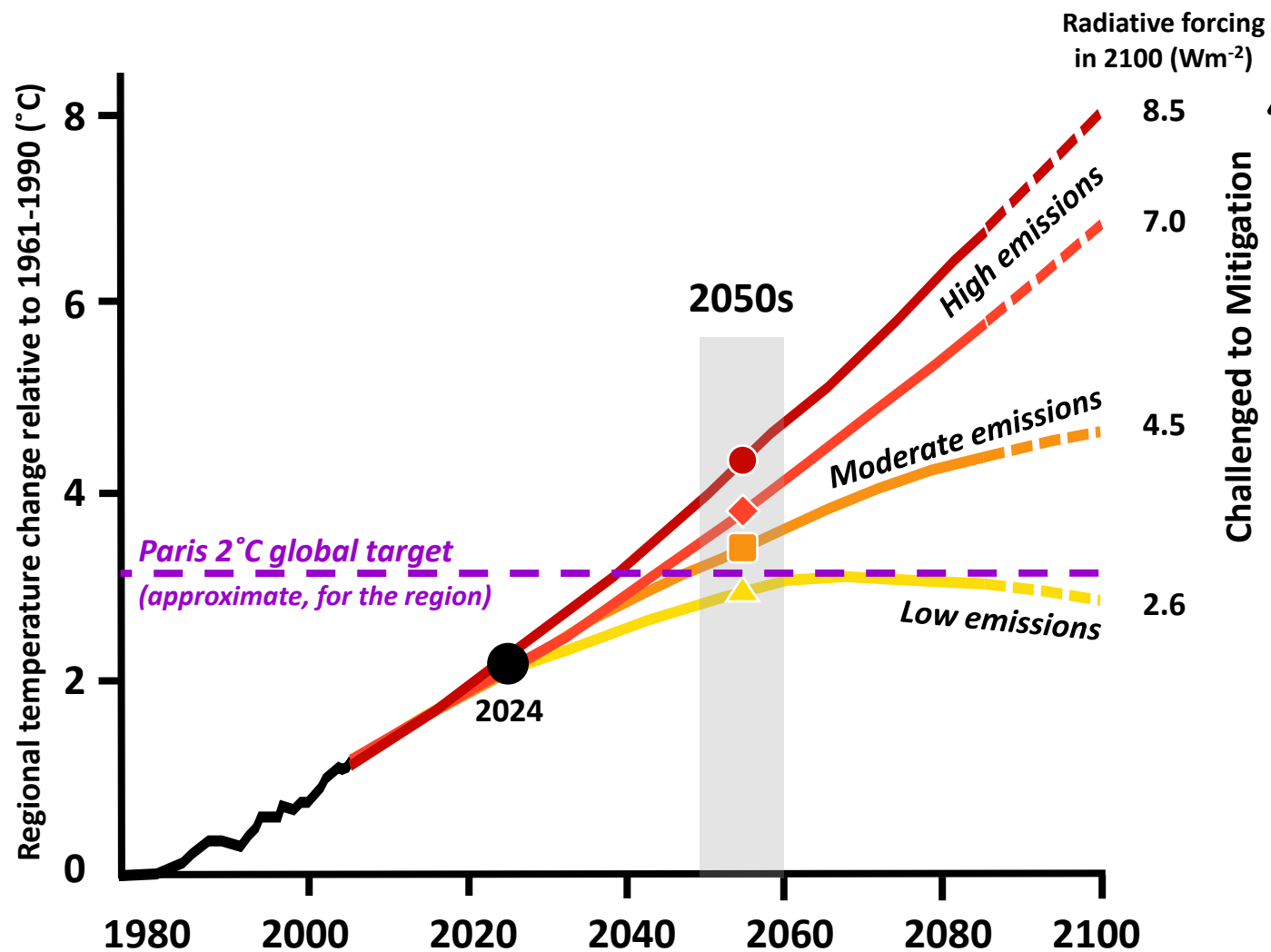


Radiative forcing
in 2100 (Wm^{-2})

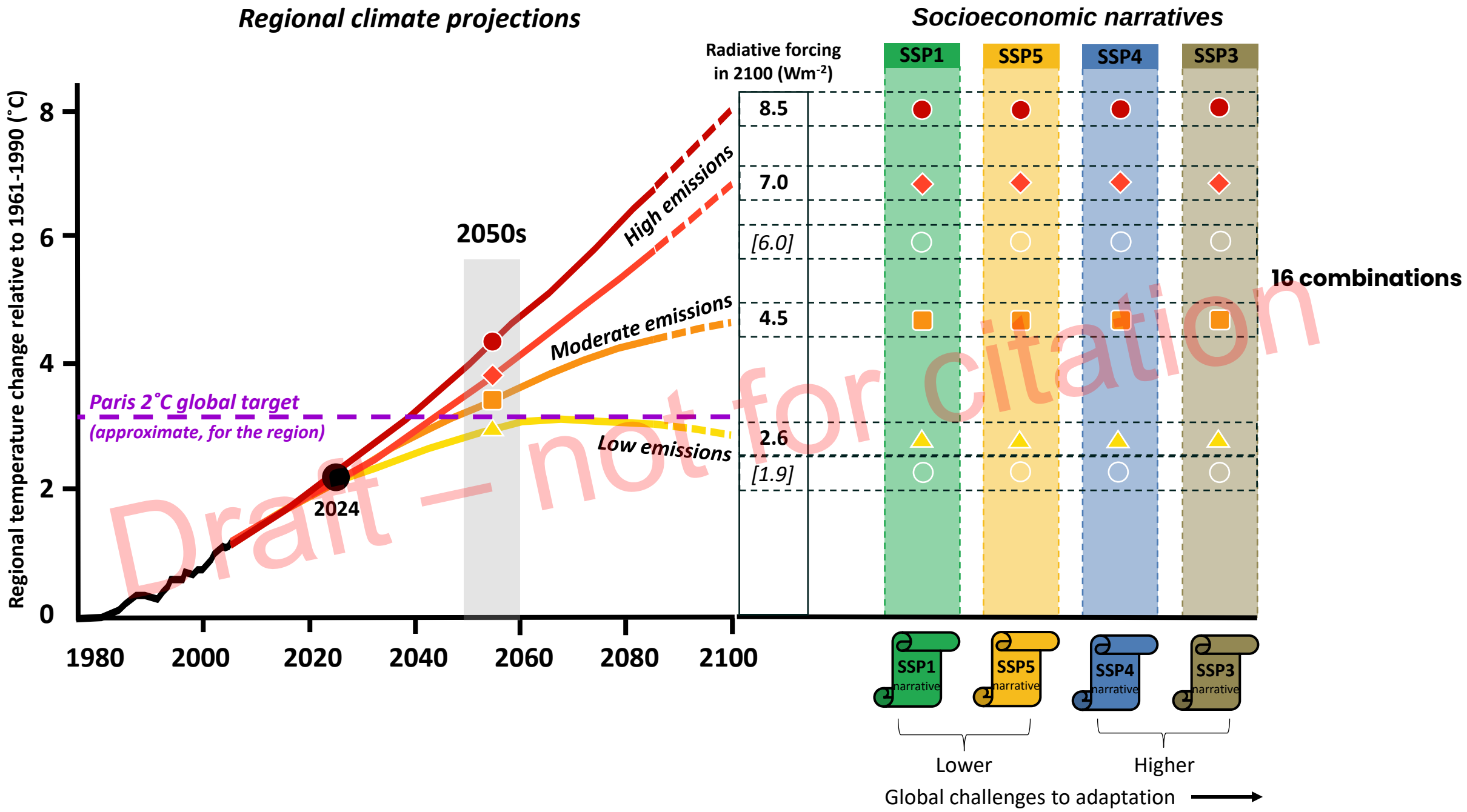


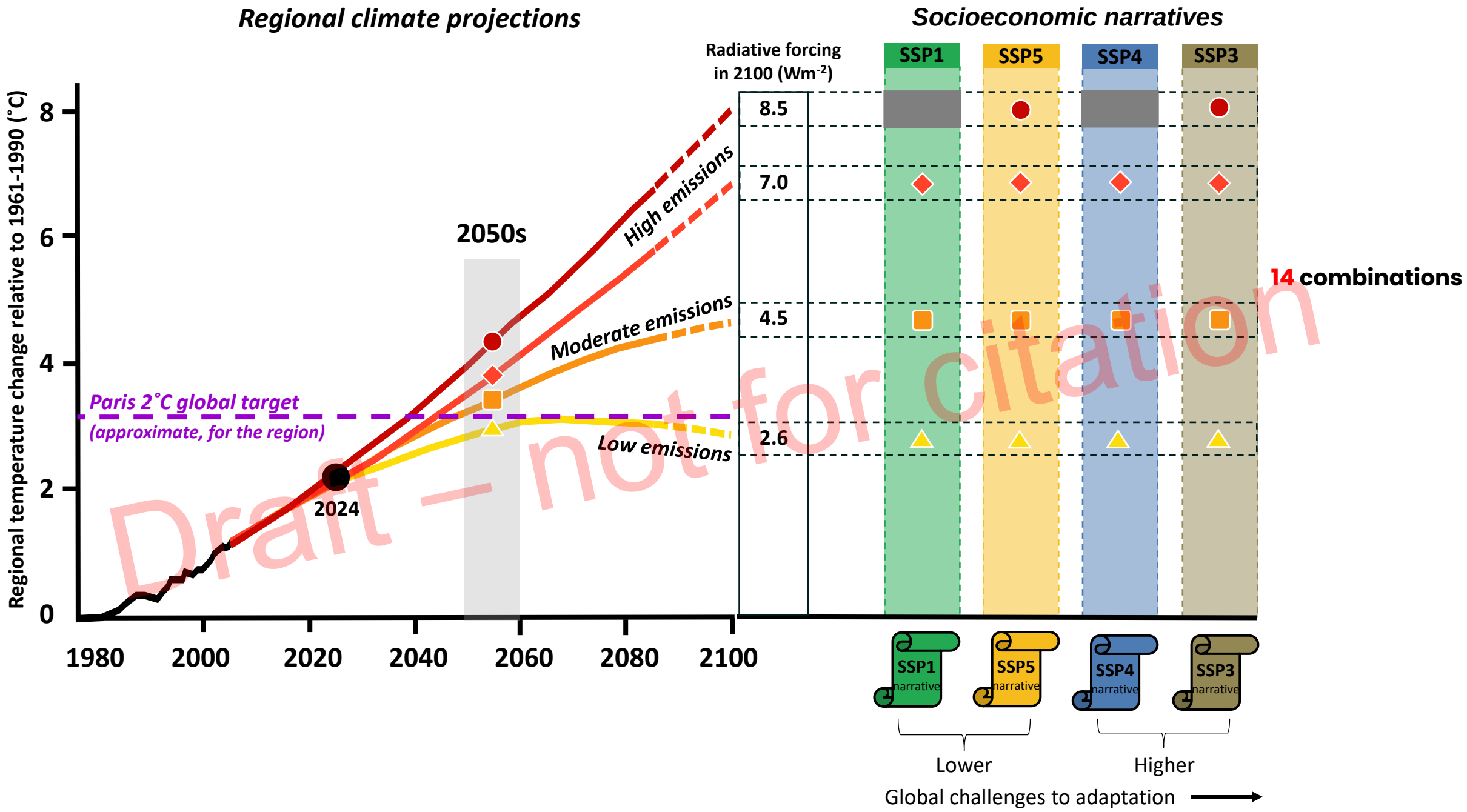
Based on O'Neill et al. (2014) and Frame et al. (2018)

Regional climate projections

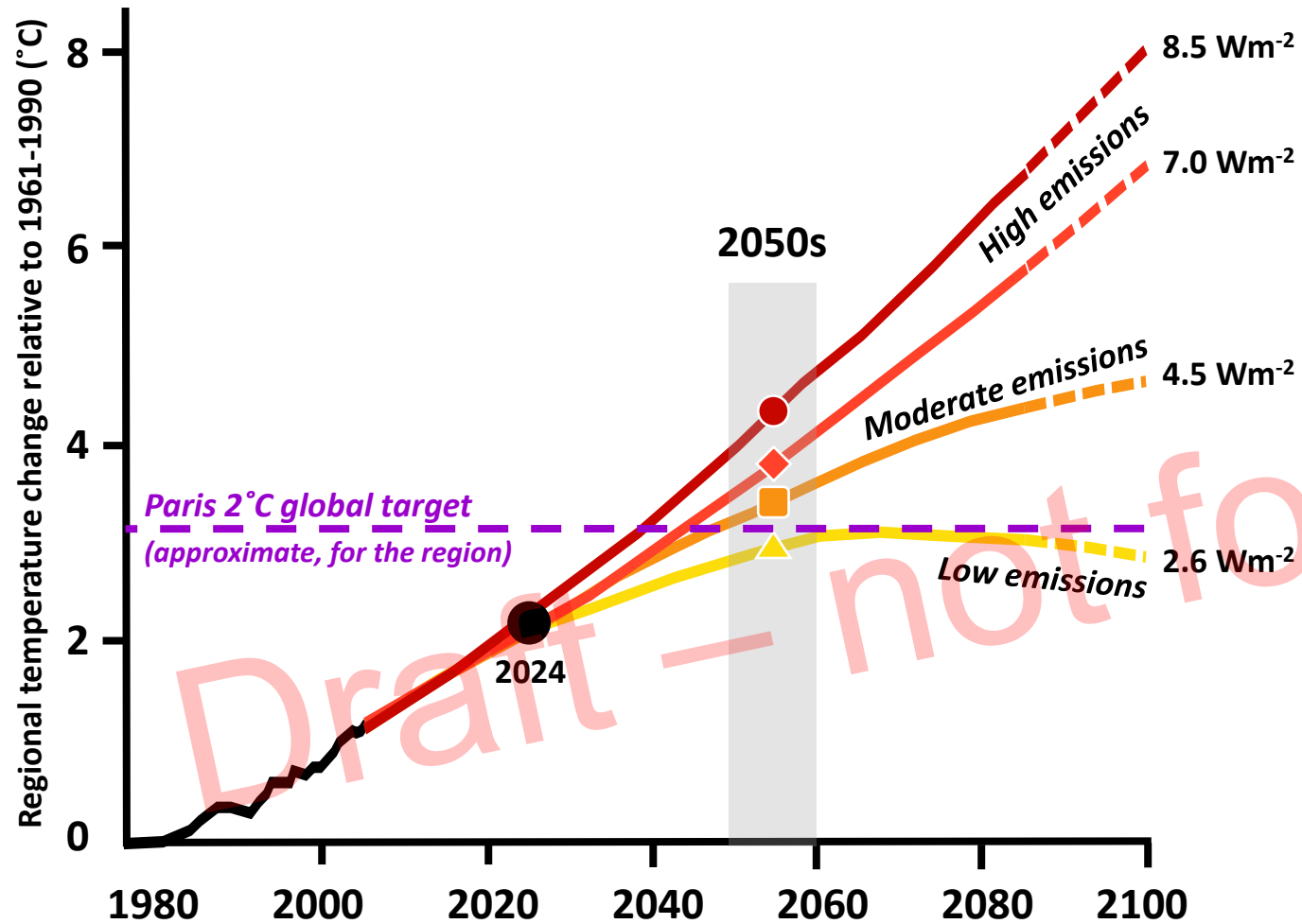


Based on O'Neill et al. (2014) and Frame et al. (2018)

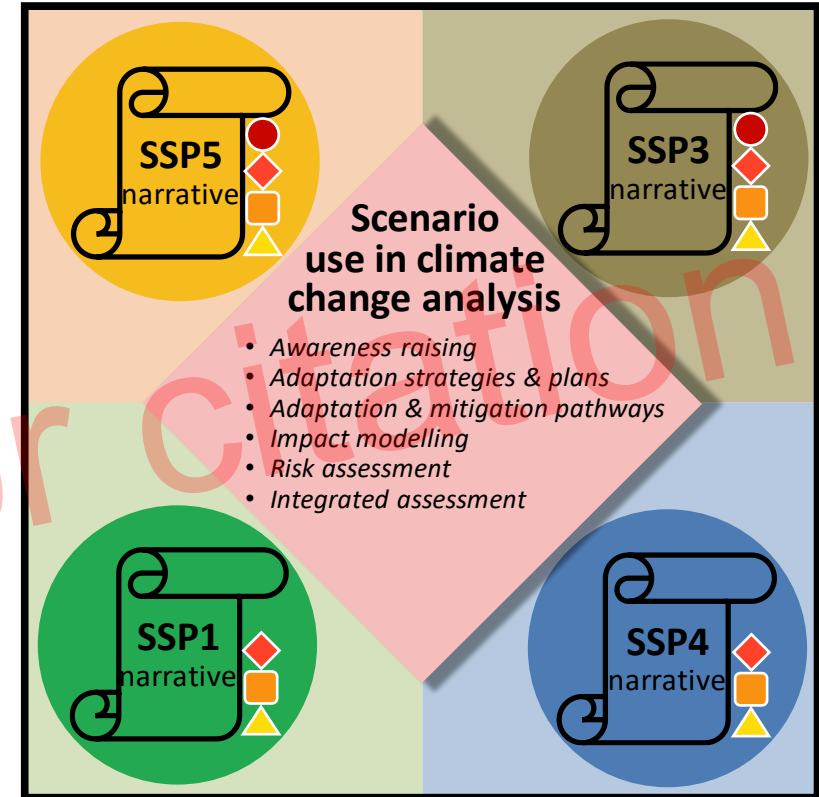




Regional climate projections



Integrated scenarios (2050s)



Selecting scenario combinations

Criterion	Rationale guiding choice (FINSCAPES examples)
Number	- how many available combinations - selection of single scenario not normally recommended - even number (e.g. 2 or 4) avoids selecting only the middle case (e.g. SSP2) - missing options (e.g. climate projections for forcing of 6.0 W/m² and 1.9 W/m²)
Time horizon	2050s defined by stakeholders (adaptation planning) - pathways more clustered than at end of century
Longer-term perspective	- sectors with long lead-times (forestry, infrastructure) - avoid lock in and possible near-term maladaptation
Priority systems	- system-specific driving variables - important uncertainties to capture with multiple scenarios
Analytical focus	- relative importance of climate or socioeconomic dimensions - need for other scenario elements (e.g. sea level, air pollution) - specific focus or broad assessment
Precaution or inevitability	- planning for unavoidable changes (low-end scenarios) - high-end scenarios to identify threshold impacts to avoid
Plausibility	exclude implausible cases (e.g. high forcing in low fossil worlds; Paris compliance in high fossil worlds)
Tiered approach	- Tier 1: core set used in common across an assessment - Tier 2: additional scenarios for specialist needs

Table 1: Some criteria influencing scenario selection for use in climate change analysis

Criterion	Rationale for scenario choice, with reference to FINSCAPES
Number	The use of a single scenario is not normally recommended. Some decisions are made on the basis of "official projections", "most likely futures" or "business-as-usual scenarios". However, while a single specification of the future may be preferred to no scenario at all, the central principle of scenario analysis is that it can offer plausible alternative pathways when confident predictions are not available. It has also been argued that use of an odd number of scenarios may tempt analysts to select only the middle case. In fact, an early decision in the FINSCAPES project was to exclude the intermediate case, SSP2.
Time horizon	In FINSCAPES, socioeconomic narratives are for the 2050s. On this time scale differences are smaller and overlaps larger between the four climate projections than for later periods; hence fewer projections may suffice to cover the range.
Longer-term perspective	This may also be required: (a) to advise sectors with climate exposure over long lead-times, such as forestry and the built environment; (b) to avoid maladaptation, by acknowledging that changes in climate can be expected to continue well beyond planning horizons and ensuring that actions targeting conditions in the 2050s are also flexible enough to accommodate changes beyond that time.
Priority systems	FINSCAPES scenarios are targeted for use in managing key regional systems identified by stakeholders. The primary socioeconomic drivers of exposure and sensitivity to climate change may differ between systems, and this may influence the scenario narratives that are most interesting to explore.
Analytical focus	This may determine the relative importance of the climate and socioeconomic dimensions. For example, a study of the risk of hydro-power dam failure due to high peak river discharge might prioritise a range of climate projections of extreme precipitation over those related to societal change. On the other hand, the implications of dam failure might require alternative estimates of people and infrastructure exposed to catastrophic flooding combined with a single high-end climate projection.
Precaution & inevitability	Different scenarios can frame different aspects of uncertainty. For example, a socioeconomic narrative emphasising inequality might aid precautionary planning of human security and social justice across a range of climate projections, including those describing extreme weather events that could affect the most vulnerable. In contrast, other scenarios might inform on exposure and vulnerability to climate changes that are unavoidable; for example, using projections assuming "Paris-compliant" emissions in combination with different socioeconomic narratives.
Plausibility	Some combinations can be excluded on grounds of plausibility. For example, SSP1 and SSP4 paths are not capable of generating the highest emissions and radiative forcing, so such climate projections should not be associated with those narratives (Figure 9). However, the time horizon is important here too. For example, while climate projections associated with low radiative forcing by 2100 are unlikely to be realised in societies still reliant on fossil fuels but with ineffective mitigation technology, the scenario combination may still be plausible in the 2050s.
Tiered approach	A possible approach to scenario selection is to prioritise a core set of a few first-tier scenarios to be used in common in an assessment, but also to allow for a second tier of additional scenarios that may be required for specific purposes.

Scenario application

Suitability of scenarios:

- Qualitative narratives
 - Direct use (e.g. for awareness raising; adaptation-stories)
 - Conversion to simple directional trends

	2018 situation ^a	SSP1: Taking the green road	SSP3: A rocky road	SSP4: A road divided	SSP5: Taking the highway
A. Diet					
Meat and dairy-based	M	↘	↗	↗	→
Plant-based	M	↗	↘	→	→
Health concerns	M	↗	→	↘	→
Sustainability concerns	M	↗	↘	↘	↘
B. Food industry					
Trade liberalisation	M	↗	↘	↗	↗
Foreign ownership	L	→	→	↗	↗
Market power	L	→	↗	↗	→
Export orientation	L	→	↘	↗	↗
C. Agriculture and horticulture					
Role of large farms	M	→	→	↗	↗
Role of small farms	M	→	→	↘	↘
Output prices	M	→	↗	→	↘
Input prices	M	→	↗	→	↘
Coupled subsidies ^b	H	↘	→	↘	↘
Decoupled subsidies ^c	H	↘	↘	↘	↘
Effectiveness of A-E policy	M	↗	↘	→	→
D. Technology					
Productivity ^d	M	↗	↘	↗	↗
IT utilisation	L	↗	→	↗	↗
New products and methods	M	↗	↗	↘	↗
E. Environment					
Agricultural GHG emissions	H	↘	→	↘	→
Water pollution	M	↗	↘	↘	↘
Biodiversity					

Source: Lehtonen et al. (2021)

Scenario application

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 - Conversion to quantitative trends
 - Conversion to another medium (e.g. art)

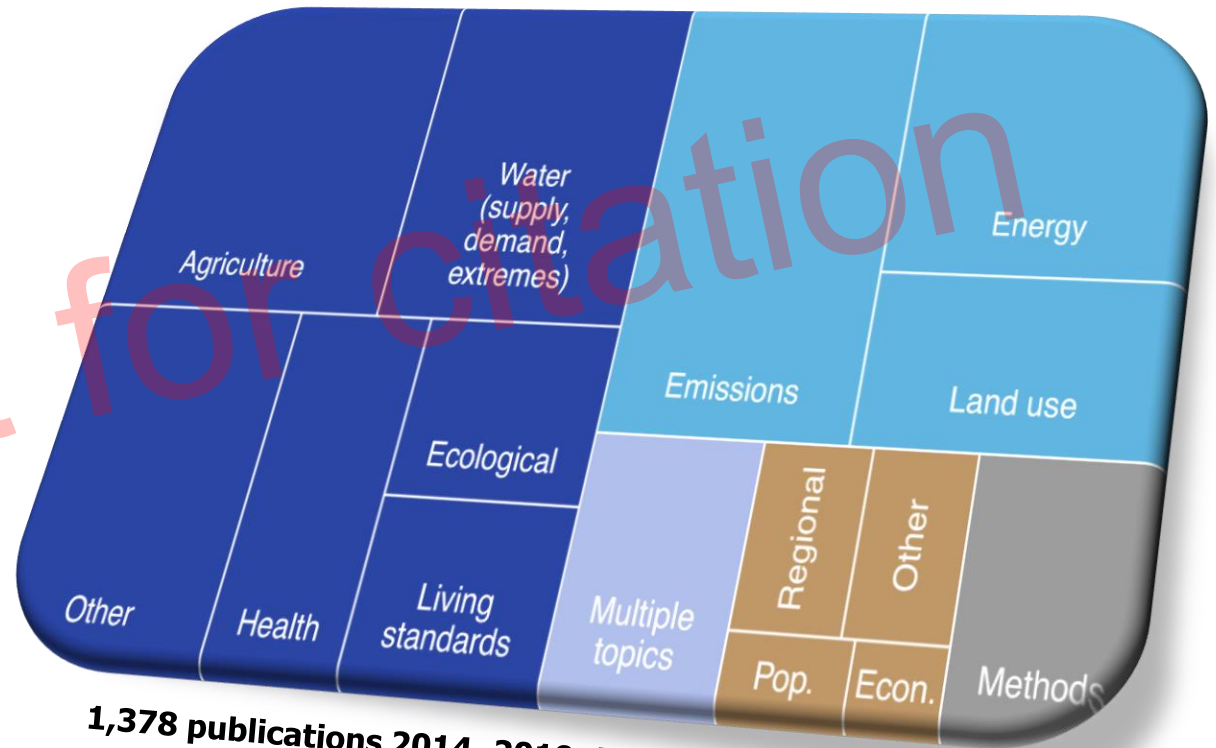
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Scenario application

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 - Conversion to simple directional trends
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- Quantitative projections
 - Availability of desired variables for modelling
 - Spatial scale and resolution
 - Extreme value analysis
 - Probabilistic representation (model ensemble methods)
- Evaluation of utility
 - Reported use of the scenarios (literature)
 - Legitimacy (survey)
 - Uptake of approach by others
 - Demand for new scenario exercises



1,378 publications 2014–2019 that use or develop SSPs

Source: O'Neill et al. (2020)

Conclusions

FINSCAPES scenarios:

- SSP narratives released today in Finnish
- Some regional climate projections already available
- Integrated scenarios yet to be selected
- Guidance material on scenario co-development & use to be drafted
- Once available

The proof of the pudding
will be in the eating





Thanks for listening



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Notice

Colleagues are welcome to incorporate these slides into their own presentations, assuming they are correctly acknowledged. However, the authors would also appreciate being informed prior to the extensive use of this material in public meetings

