The RCP/SSP Framework

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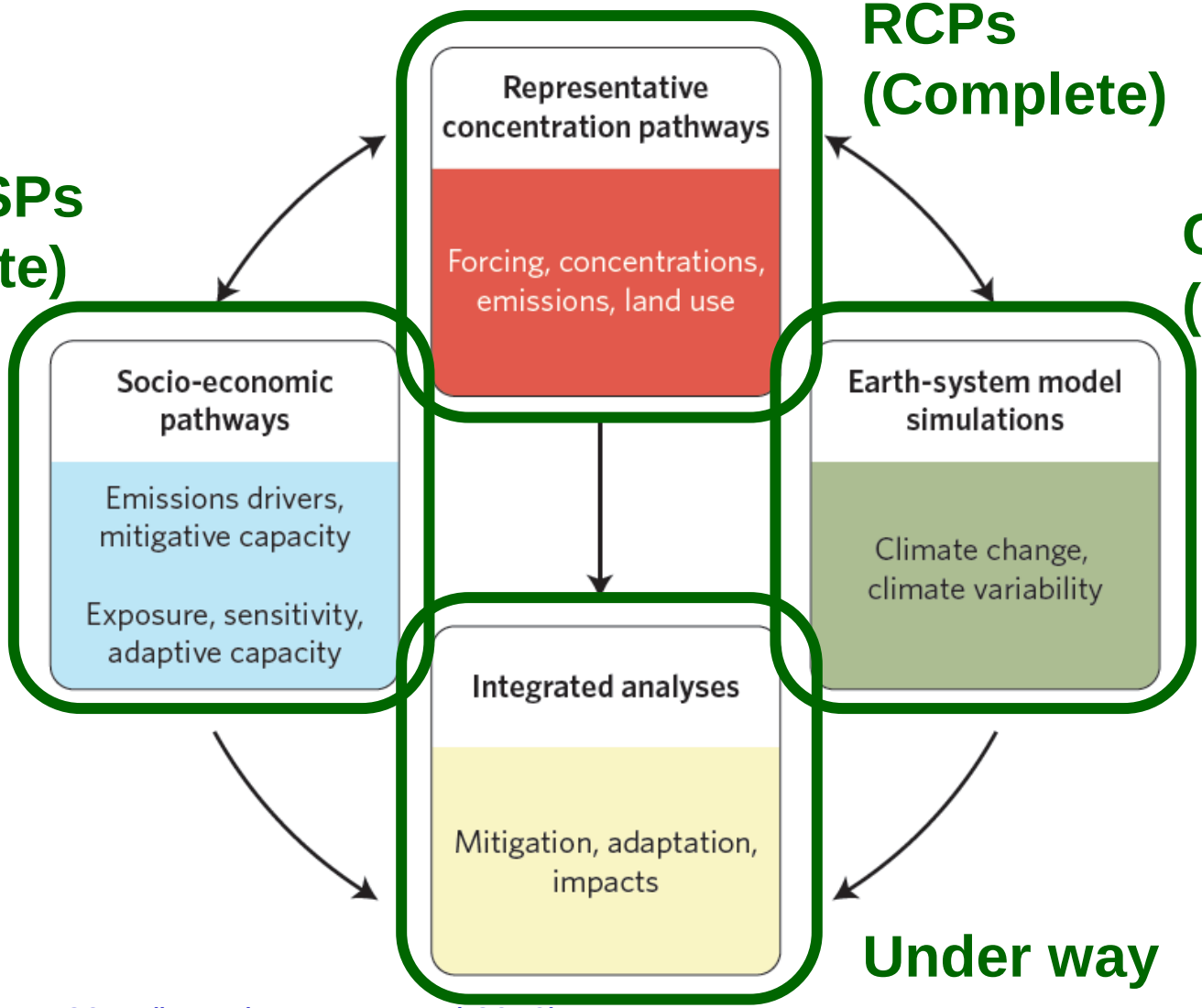
The Parallel Process



RCPs (Complete)

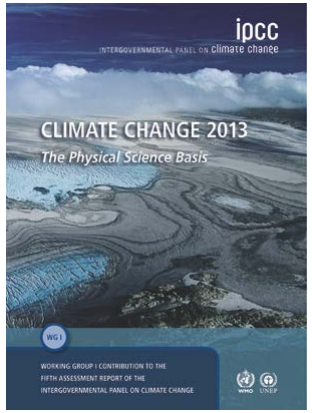
Basic SSPs (Complete)

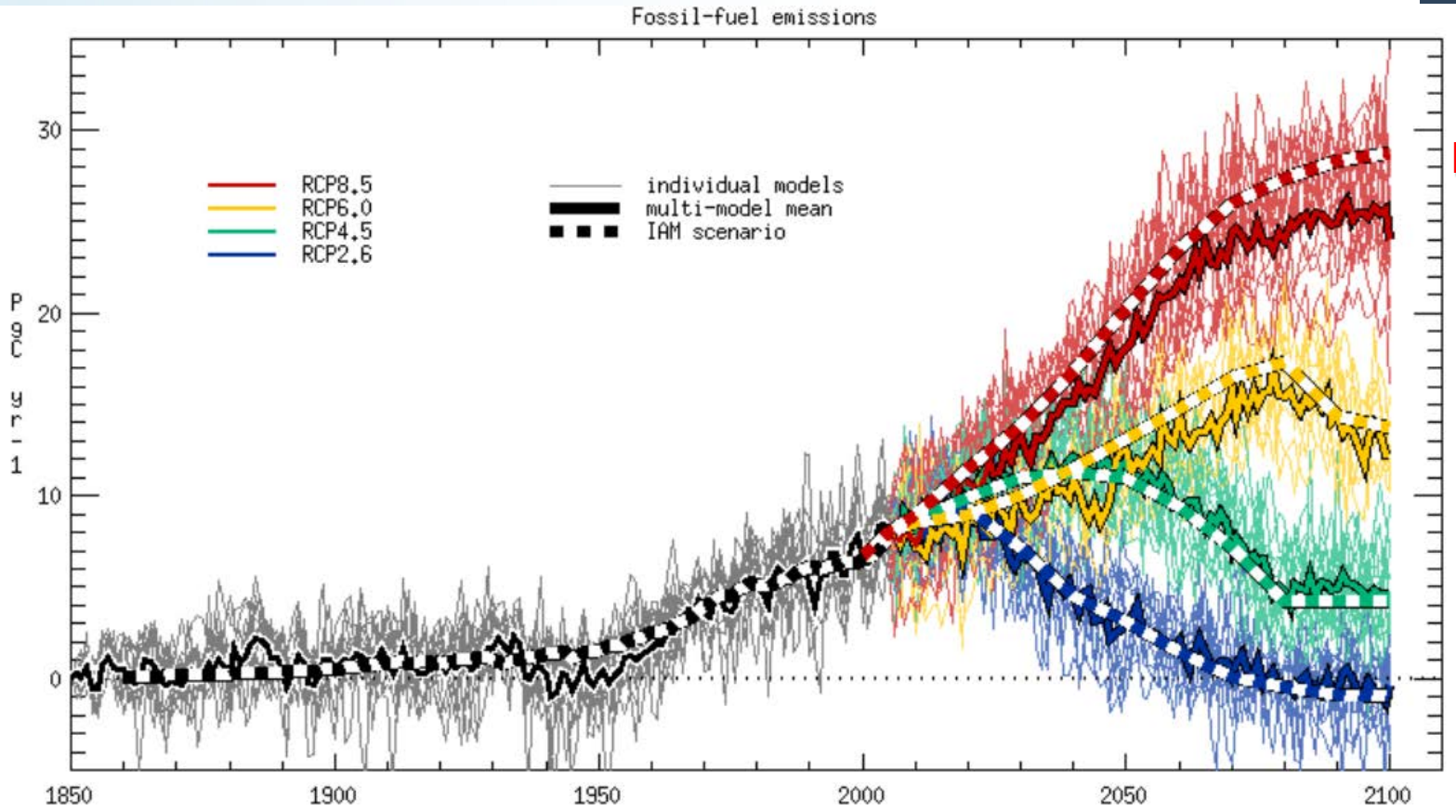
CMIP5 (Complete)

Under way

O'Neill & Schweizer, 2011 (based on Moss et al 2010)

Representative Concentration Pathways (RCPs)





MESSAGE (IIASA)

AIM (NIES)

GCAM (PNNL)

IMAGE (PBL)

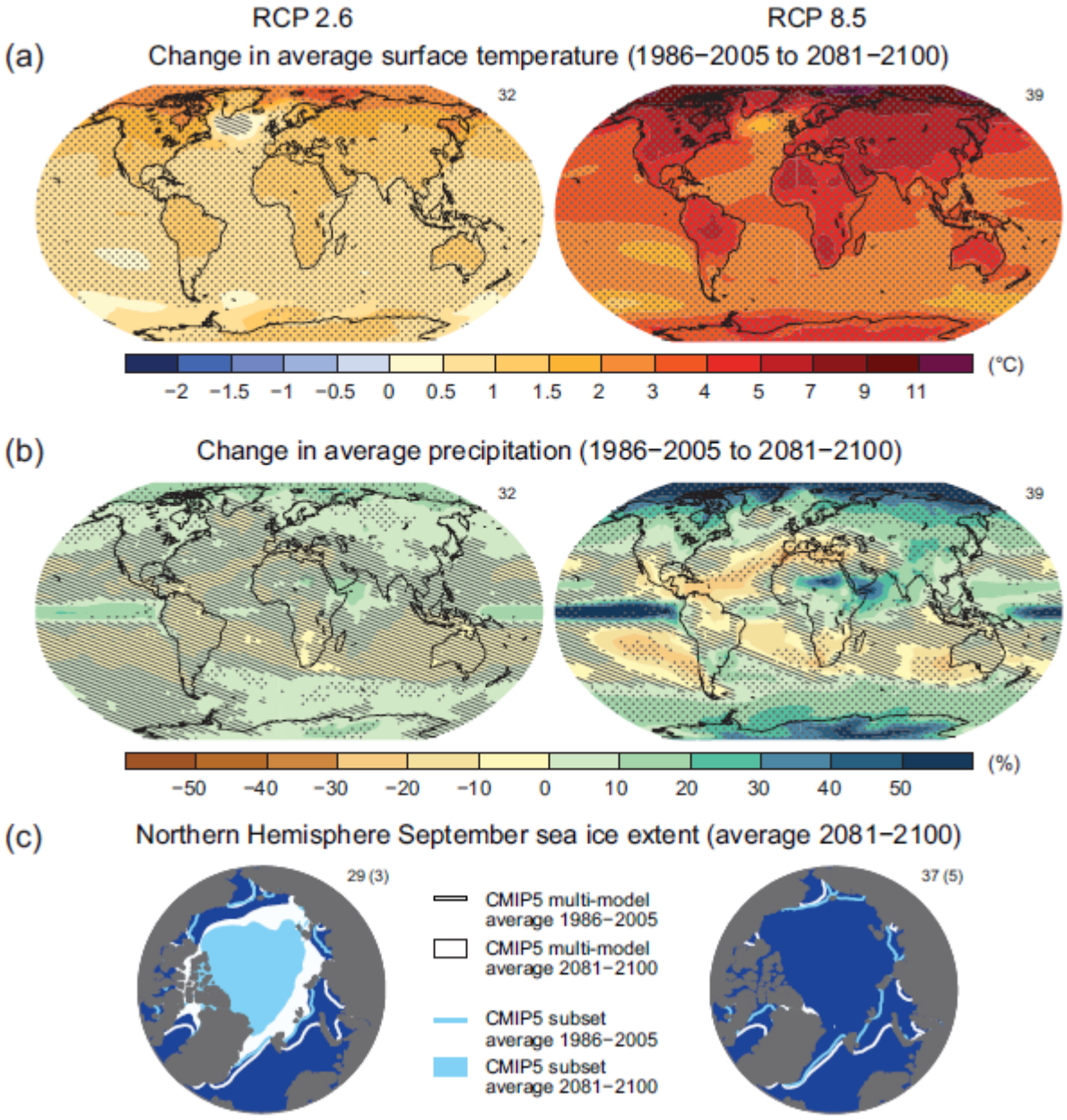
van Vuuren et al, 2011; Jones et al, 2013

RCPs were assessed by IPCC WGI

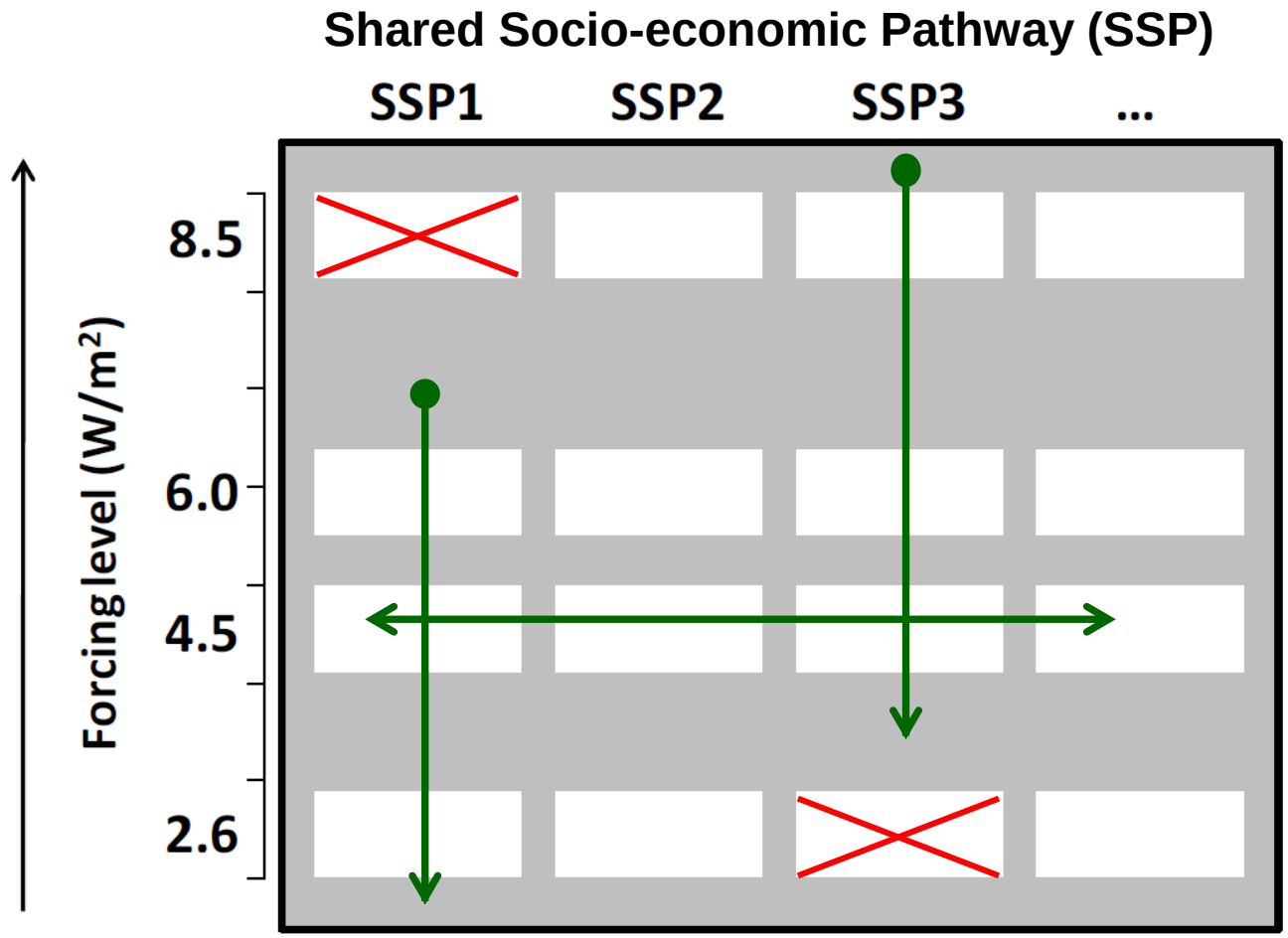
Temperature change

Precipitation change

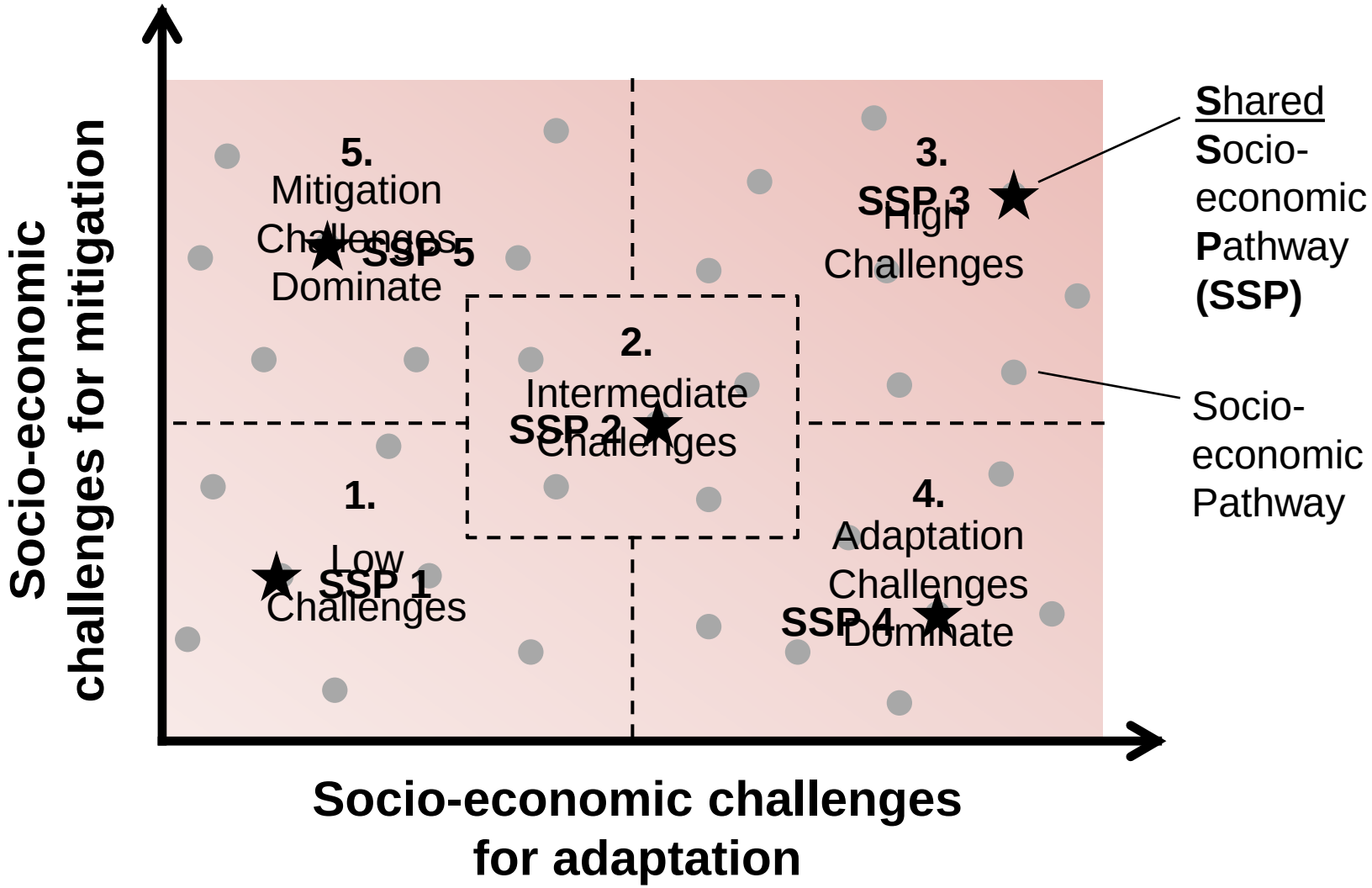
Sea ice extent



RCP/SSP Framework Matrix Architecture

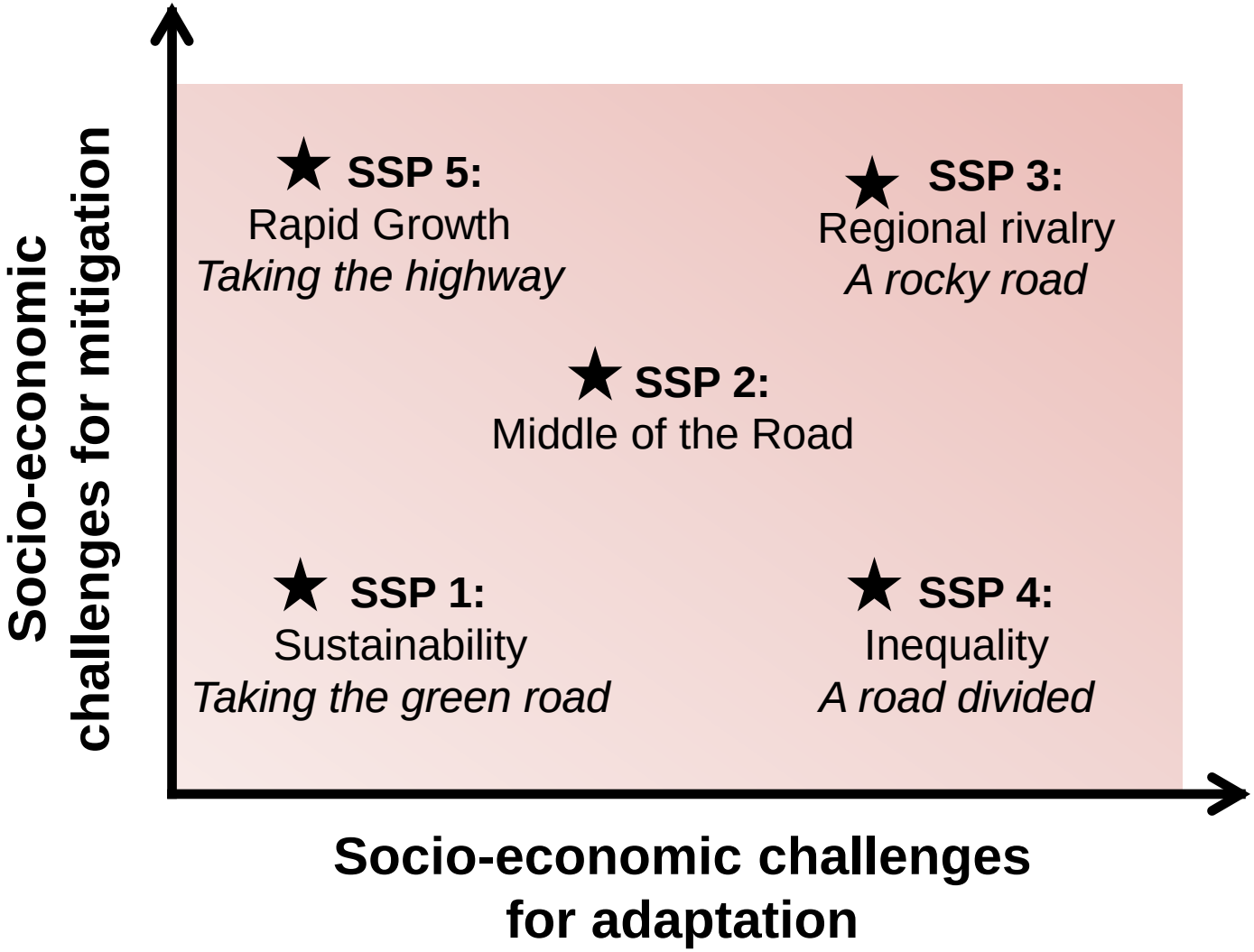


Purpose two: New shared pathways

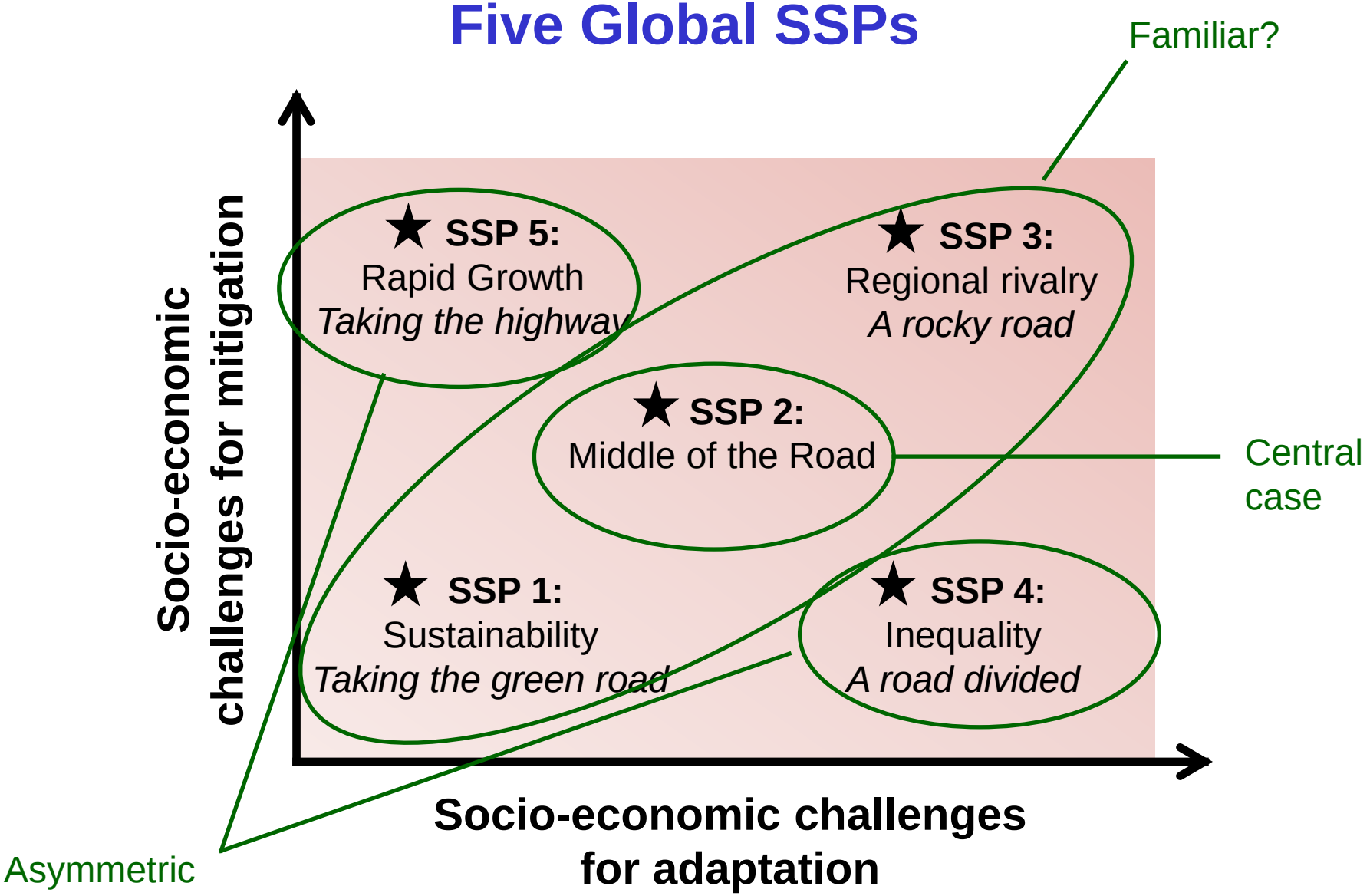


Adapted from O'Neill (2012)

Five Global SSPs



Five Global SSPs



Adaptation challenges

↓

Exposure
Sensitivity
Adaptive Capacity

↓

Average Wealth
Extreme Poverty
Governance
Water Availability
Innovation Capacity
Coastal Population
Educational Attainment
Urbanization
…
Quality of Healthcare
Availability of Insurance

Mitigation challenges

↓

Baseline(no-policy) emissions
Mitigation capacity

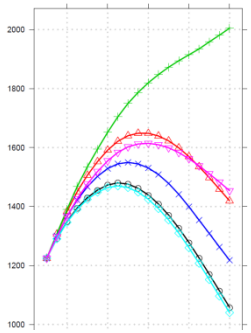
↓

Population
Carbon Intensity
Agricultural Productivity
Energy Intensity
Energy-related Tech. Change
CCS availability
…
Effectiveness of Policy Institutions
Energy Tech. Transfer
Diet

Schweizer & O'Neill, in prep.

What's in an SSP

Narrative



Quantitative elements

Population
Urbanization
Rates of technological change
Income
Human Development Index
Income distribution
Etc.

Presentation by
Bas van Ruijven

Presentation by
Detlef van Vuuren

SSP 4: Inequality

Narrative: This pathway envisions a highly unequal world, both within and across countries. A relatively small, rich global elite is responsible for much of the emissions and is able to mitigate at low cost. This elite also emerges in developing countries, and is highly globally connected and mobile. The larger, poorer part of the population contributes little to emissions,but is vulnerable to the impacts of climate change. This vulnerable group exists in both developing and industrialized countries, and is concentrated in rural areas and large mega-cities. Those mega-cities with a large fraction of relatively poor and less educated people lack the capacity to protect themselves from extreme weather events. Access to high quality education, health services and family planning is also limited, leading to high population growth in low-income countries. In industrialized countries, economic uncertainty for most of the population leads to relatively low fertility and low population growth. Urbanization is high, induced by the large income differences, but takes place in an unorganized way that leads to large slums in developing countries.

In economic terms, this is a mixed world: as inequality increases within all regions, it is not clear beforehand how the diverging growth rates would aggregate to averages. Economic growth is probably medium/high in industrialized countries, low-income countries have low economic growth (though at the same time a rapidly rising elite) and middle-income income countries have medium growth, also driven by the increasingly rich elite groups.

This is a world with low social cohesion. Poor people have the hope, and sometimes the opportunity, to become a member of the elite, but are mostly trapped in their conditions. Governance is dominated by regulatory capture: the government works for the elite, by the elite. Challenges to adaptation are high due to the relatively low incomes and education of large proportions of the population in all regions, as well as to poorly functioning institutions for all but the elite, and lack of investment in reducing vulnerability.

With respect to energy and emissions, a main characteristic is that global elite emits very much, but is capable of changing its patterns, whereas the poor do not emit that much and, hence, there is hardly any transformation needed for them. Actions are taken to control local pollution only in the interests of the elite, likely to live largely in urban areas. As an example, power production could be moved out of city areas to reduce urban air pollution, while there would be little regard for the environmental consequences of land use in rural areas. Overall air pollution levels would thus remain relatively high compared to other SSPs.

SSP 4: Inequality, continued

▪ ▪ ▪ In this world, global energy corporations use investments in R&D as a hedging strategy against perceived or potential resource scarcity and the option that climate policy will be imposed. Their main aim is to remain global players in energy supply, also under changing circumstances. This leads to the development of low-cost renewables, CCS-ready power plants and energy-efficient technology. Some of these technologies, like energy efficiency or renewables, may be applied without climate policy, as a response to resource scarcity. Hence, the mitigation challenges are low due to some combination of 1) low reference emissions and/or 2) a high latent capacity to mitigate.

A typical example of hedging against resource scarcity could be a strong push for bio-energy by global energy corporations. In the absence of sustainability regulations, large energy corporations would acquire the necessary land-resources in developing countries to grow energy-crops, while reducing options for adaptation for local communities and for nature conservation.

Another example of a typical climate measure under this pathway could be geo-engineering, where the elite decide on this measure without concern for the potential negative effects for others. This would only be plausible, however, if the elite were able to insulate themselves against the detrimental effects of these measures.

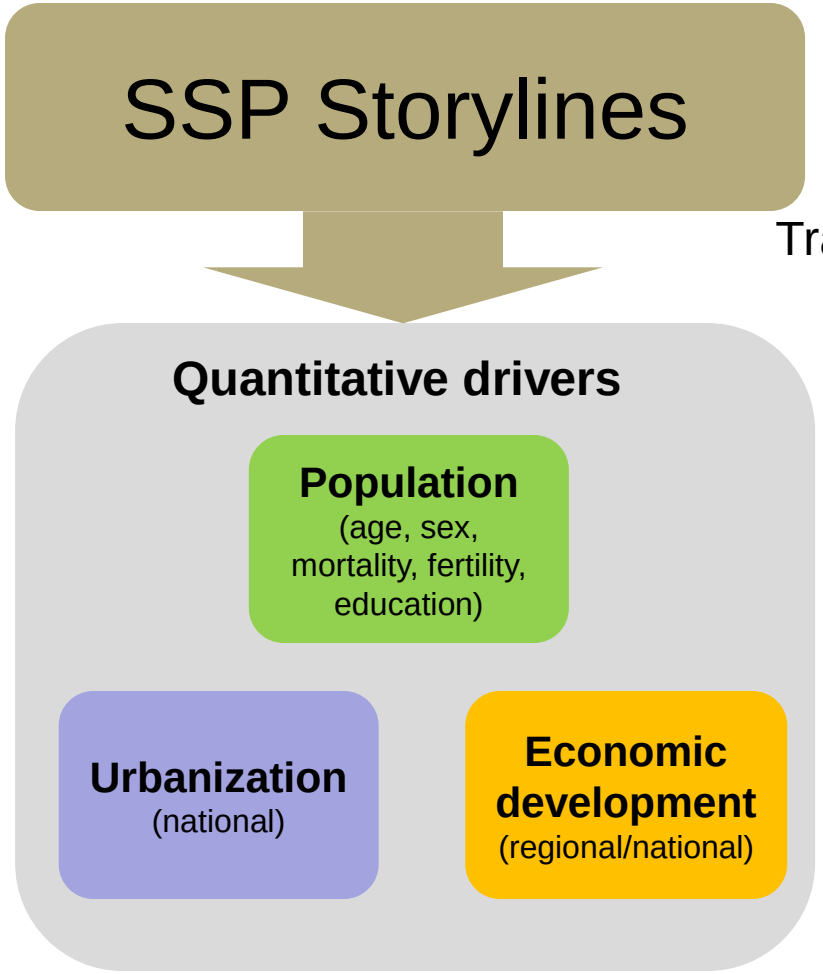
Land ownership is unevenly distributed and land use management is also left to the global elite. Productive areas of the world would be dominated by industrialized agriculture and monocultural production. Crop yields would be typically high in large-scale industrial farming, but low for small-scale farming. Food trade is global, but access to markets is limited, increasing vulnerability for non-connected population groups.

Basic SSP elements (see workshop documents)

Table 1: Summary of assumptions regarding Demographic and Human Development elements of SSPs.

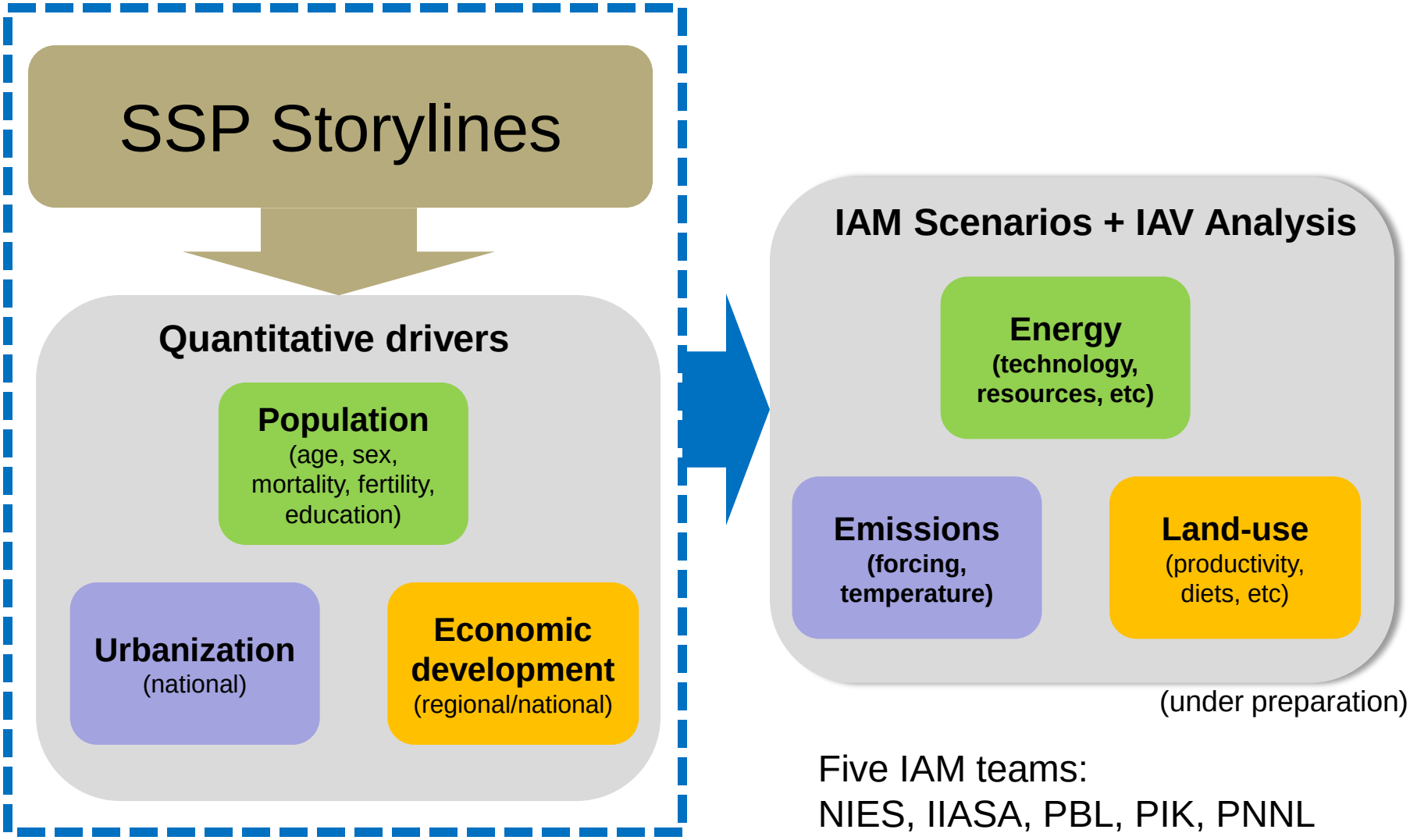
	SSP1			SSP2			SSP3			SSP4			SSP5		
	Country Income Groupings														
SSP element	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High	Low	Med	High
Demographics															
Population															
Growth	Relatively low			Medium			High		Low	Relatively high		Low	Relatively low		
Fertility	Low	Low	Med	Medium			High	High	Low	High	Low	Low	Low	Low	High
Mortality	Low			Medium			High	High	High	High	Med	Med	Low		
Migration	Medium			Medium						Medium			High		
Urbanization															
Level	High			Medium			Low			High	High	Med	High		
Type	Well managed			Continuation of historical patterns			Poorly managed			Mixed across and within cities			Better mgmt. over time, some sprawl		
Human development															
Education	High			Medium			Low			v.low/ unequal	Low/ unequal	Med/ unequal	High		
Health investments	High			Medium			Low			v.low/ unequal	Low/ unequal	Med/ unequal	High		
Access to health facilities, water, sanitation	High			Medium			Low			Low	Low	Med	High		
Gender equality	High			Medium			Low			v.low/ unequal	Low/ unequal	Med/ unequal	High		
Equity	High			Medium			Low			Medium			High		
Social cohesion	High			Medium			Low			Low, stratified			High		
Societal participation	High			Medium			Low			Low			High		

Quantification of key SSP elements (drivers)



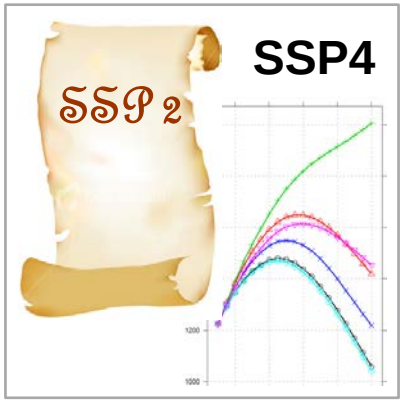
Translation into set of harmonized assumptions
+
Alternative models:
Population: IIASA
Urbanization: NCAR
GDP: OECD, PIK, IIASA
+
Various rounds of internal review
(early feedback from users)

Quantification of extended SSPs



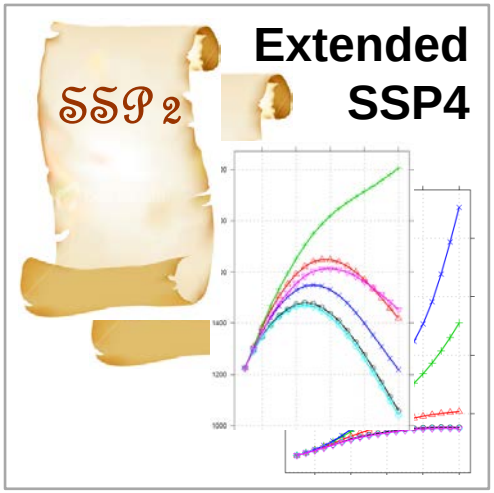
Five IAM teams:
NIES, IIASA, PBL, PIK, PNNL

Basic vs Extended SSPs

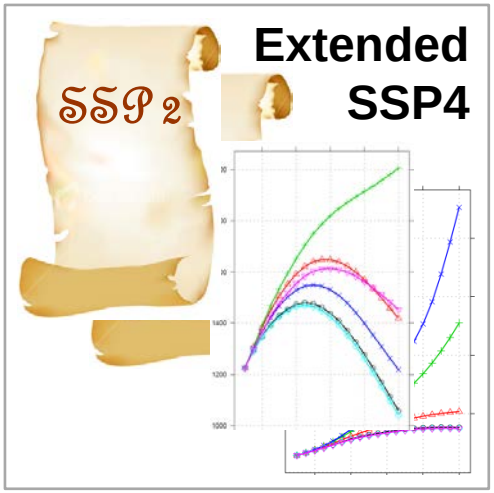


Information sufficient to locate SSP in Domain 4 of the challenges space

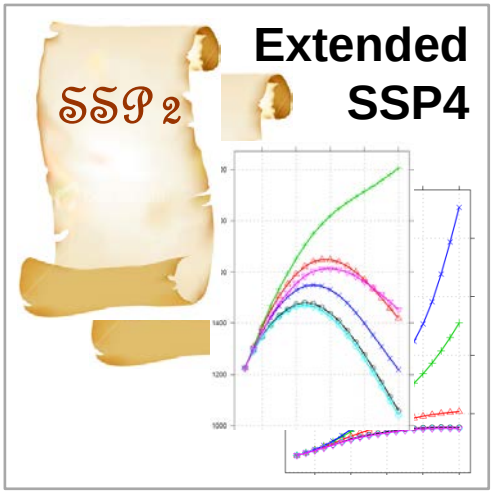
Regional Extension



Sectoral Extension



Global Extension



Arctic Scenarios within the context of the SSPs

- Review existing SSP elements/characteristics and extend them wherever necessary
  - Demographic and Human Development elements
  - Economy & Lifestyle and Policies & Institutions elements
  - Technology and Environment & Resources elements
- Top-down vs Bottom-up scenario design
  - Identify main building blocks of Artic storylines
  - What are plausible developments in the Artic consistent with the SSP elements?
- Which SSPs and RCP levels (climate outcomes) are most relevant for Artic scenarios?

Workshop Documents

- SSP narratives (main characteristics)
- Background reading on SSP/RCPs
  - The Boulder SSP Workshop Report provides some background on the overall SSP process, initial storylines/characteristics, some guidance for the use of the SSPs, and plans of the community
  - Van Vuuren et al: Describes the overall scenario matrix of the RCP/SSP framework
  - O'Neill et al: Description of the main concepts of SSPs
  - Links to SSP special issue and Moss et al (2011) for a summary of the parallel process
- Background document on global and Arctic scenarios and characteristics

International Committee On New Integrated Climate change assessment Scenarios (ICONICS)

http://www.isp.ucar.edu/iconics

SSP database:

https://secure.iiasa.ac.at/web-apps/ene/SspDb