

Framing of vulnerability and risk for assessing progress in vulnerability reduction

Basic Risk Formula



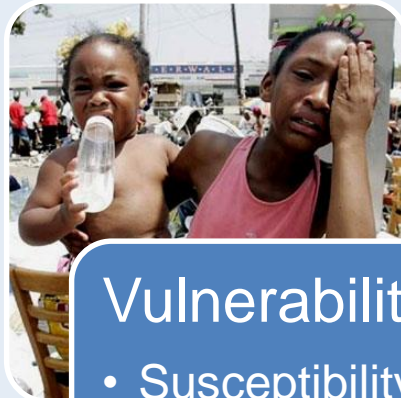
Event

- Probability
- Magnitude



Exposure

- Physical protections
- Other



Vulnerability

- Susceptibility
- Capacity



Loss

- Damage
- Valuation

Risk = Probability x Consequence

For exposed and vulnerable communities, even non-extreme weather and climate events can have extreme impacts

- Africa's largest recorded cholera outbreak
- over 90,000 affected
- over 4,000 killed
- began following onset of seasonal rains
- vulnerability and exposure increased risk



Who and what are most vulnerable?

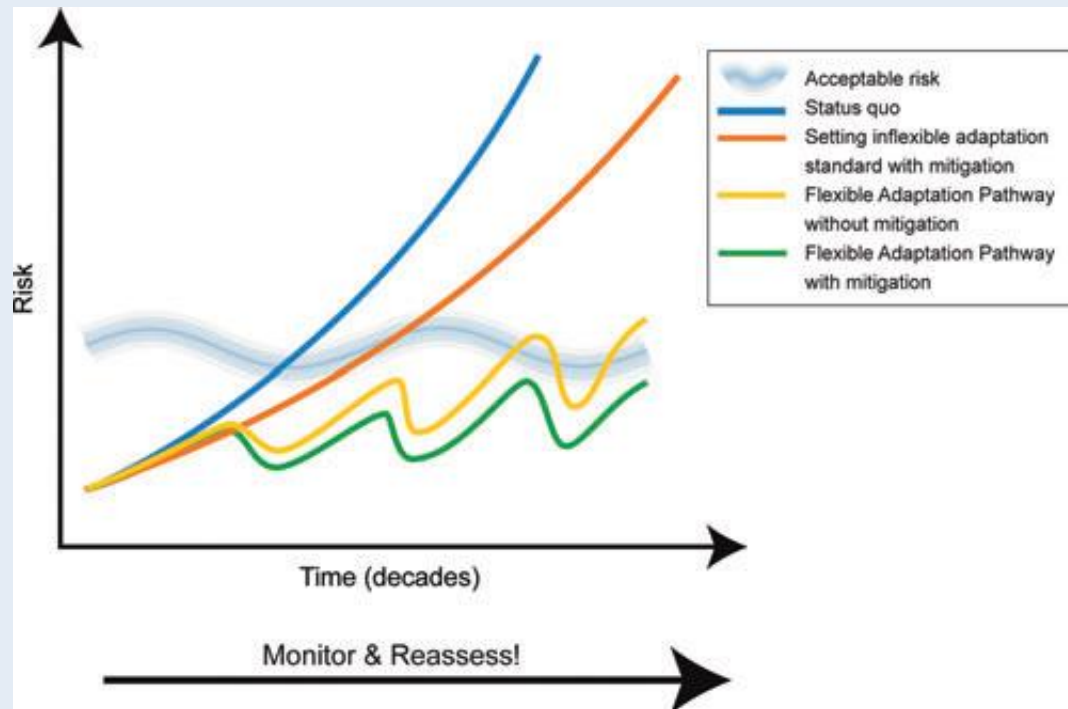
- **Who is vulnerable?**
 - Older adults
 - Women
 - Children
 -
- **What is vulnerable?**
 - Cultural monuments
 - Supply chains
 -
- **Emerging vulnerabilities**

Measuring vulnerability reduction

- Depends on baseline
- Absolute numbers
- Proportion of population at risk (e.g. aging)
- Areal extent of vulnerability (e.g. water security)
- Risk reduction

What drives adaptive capacity?

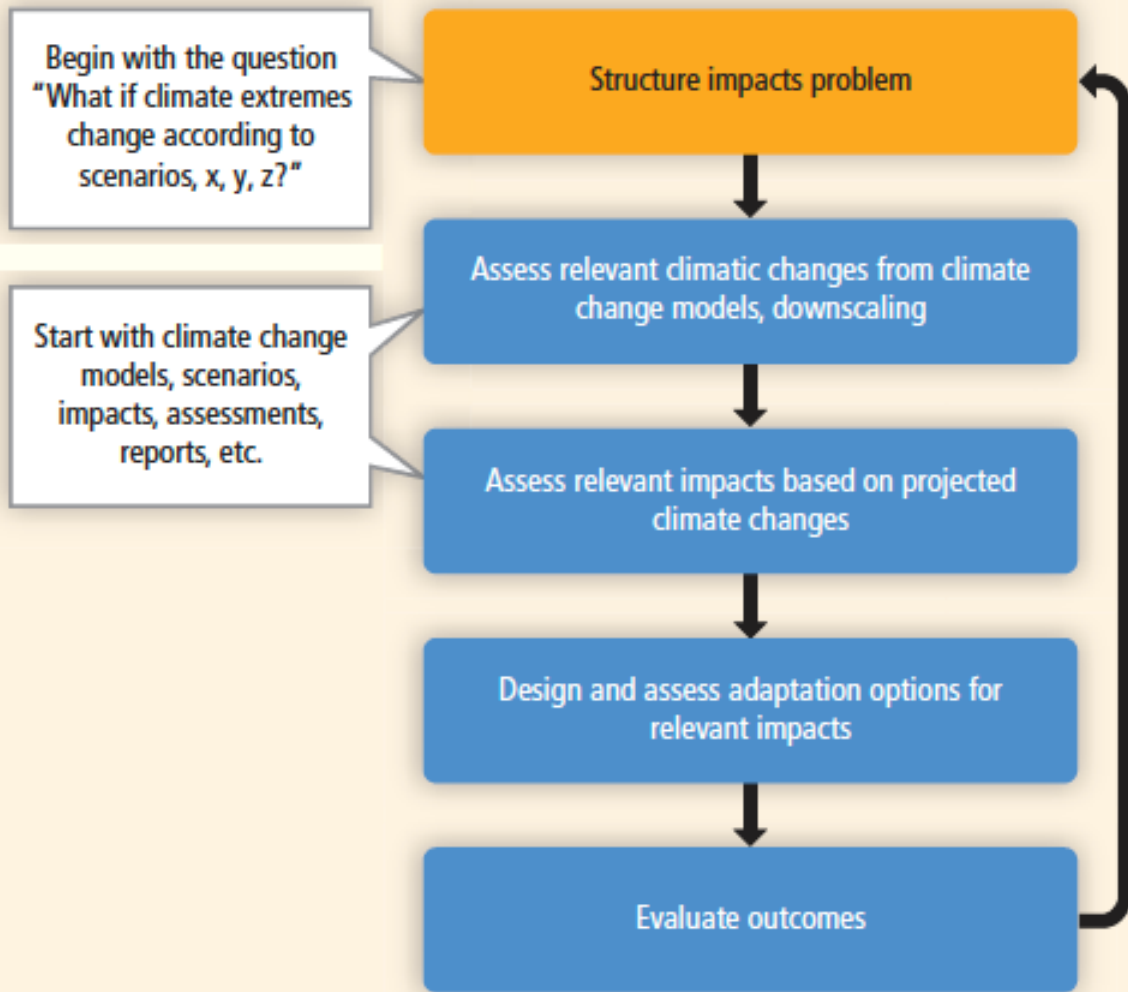
Flexible risk management approach



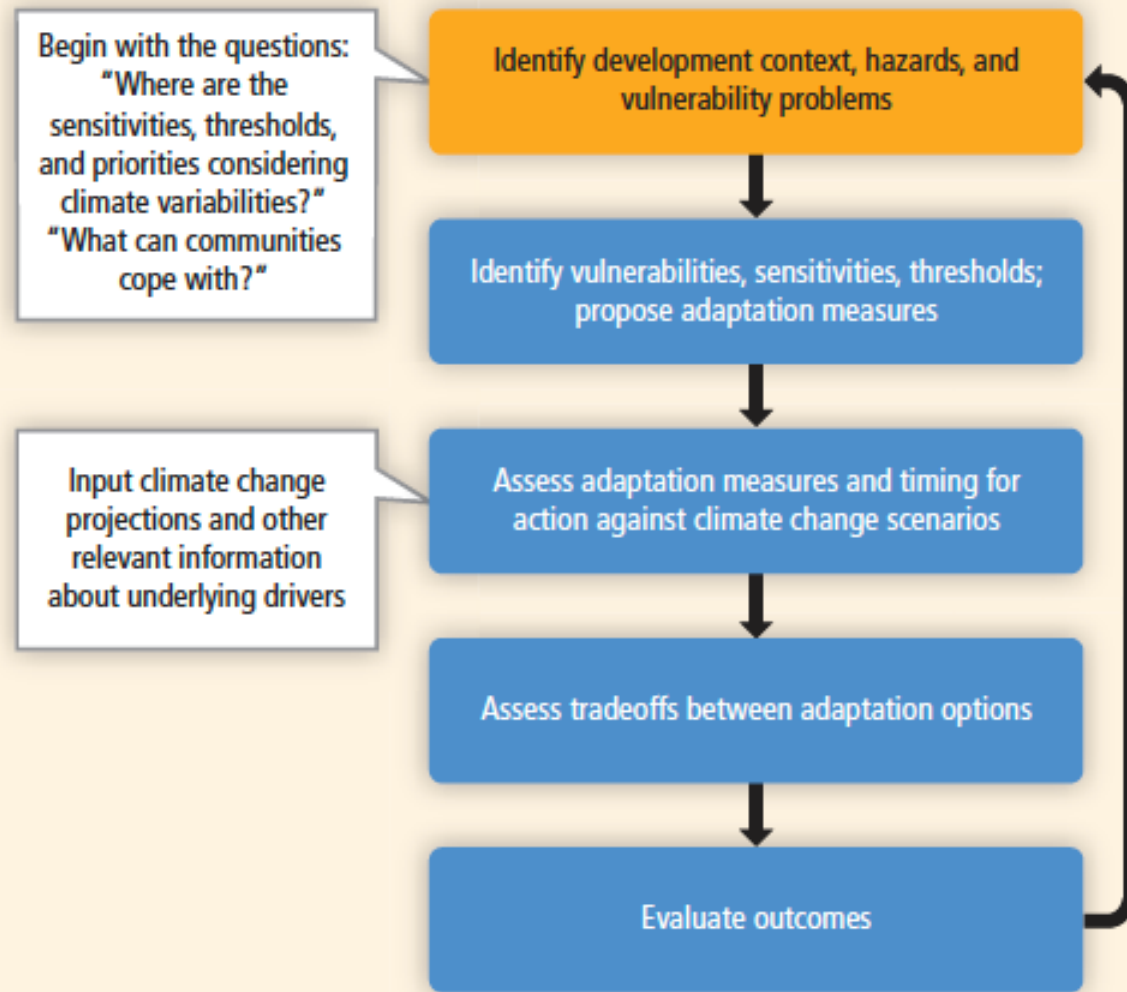
Yohe and Leichenko 2010

- At any point in time, risks associated with hazards depend markedly on interactions between components of risk
- Can start with hazards or vulnerability
- Be mindful of feedbacks:
 - Exposure over time (or lack thereof) can feed back into vulnerability
 - Implications for adaptive capacity, development, & resilience

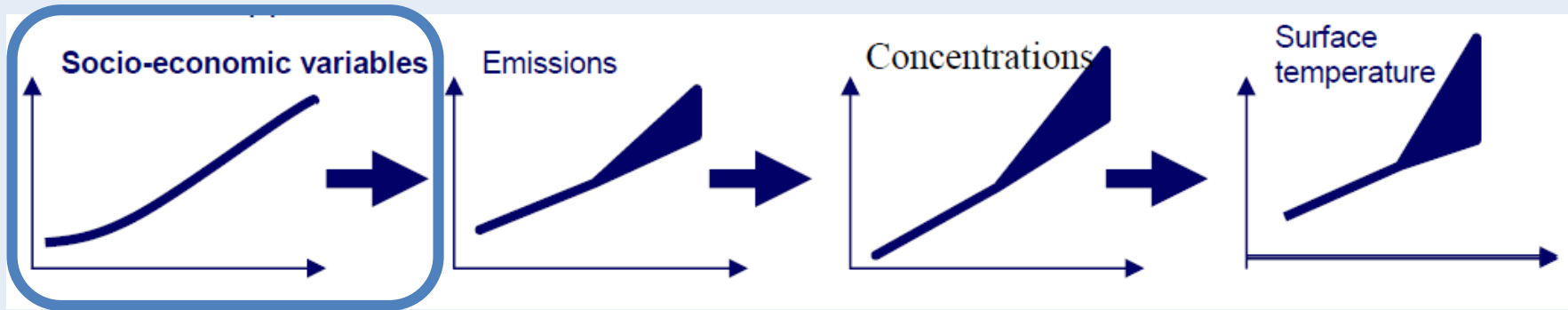
"Climate Models, Scenarios, Impacts-First"



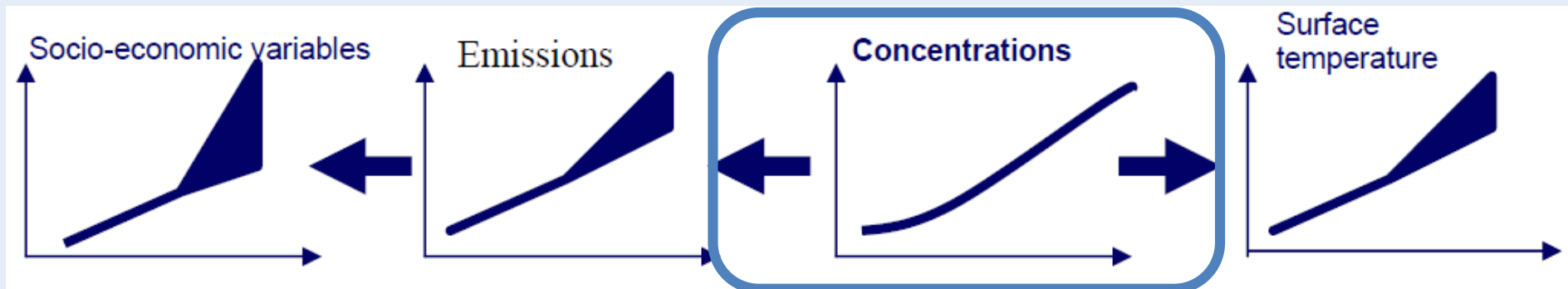
"Vulnerability, Thresholds-First"



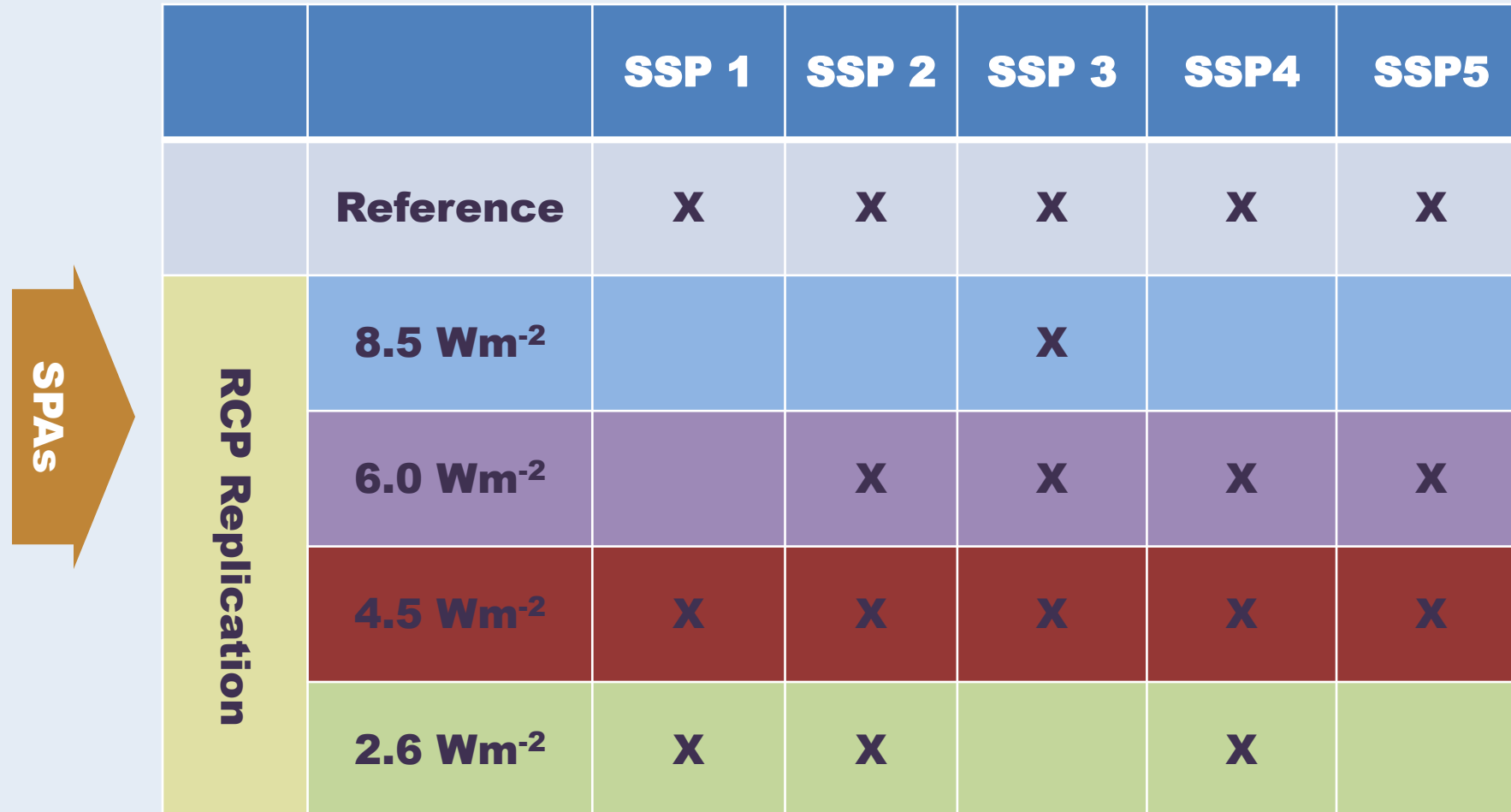
SRES vs new scenario process



- Demographic
- Economic
- Technological
- Global vs. local focus



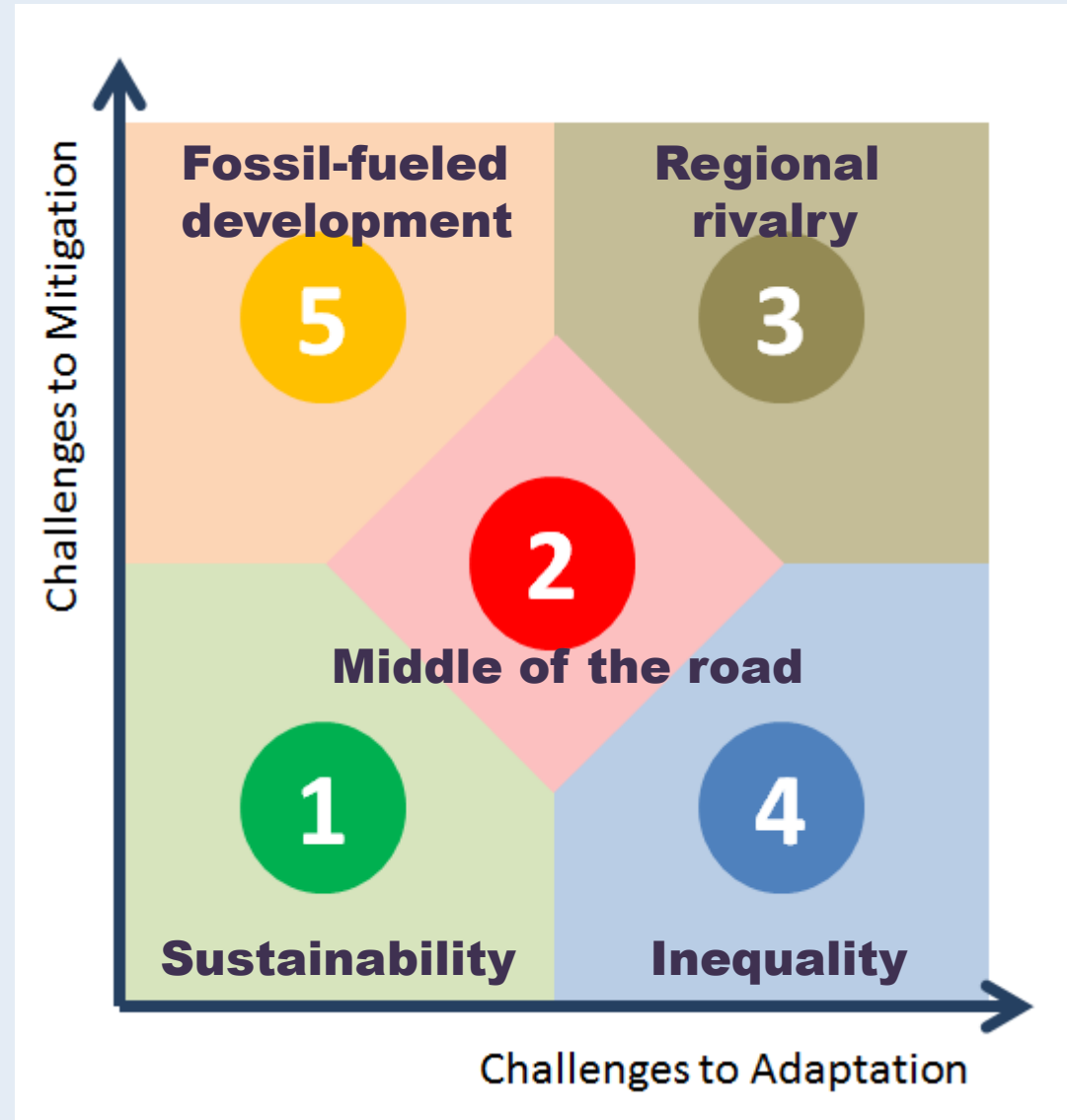
Scenario matrix architecture



The diagram illustrates the scenario matrix architecture. It features a large orange arrow on the left pointing right, labeled 'SPAs'. To the right of this arrow is a vertical yellow bar labeled 'RCP Replication'. The main matrix is a grid with 7 columns and 5 rows. The columns are labeled 'Reference', 'SSP 1', 'SSP 2', 'SSP 3', 'SSP 4', and 'SSP 5'. The rows are labeled 'Reference', '8.5 Wm⁻²', '6.0 Wm⁻²', '4.5 Wm⁻²', and '2.6 Wm⁻²'. The cells in the matrix contain 'X' marks indicating the presence of a scenario in a specific row and column.

		SSP 1	SSP 2	SSP 3	SSP 4	SSP 5
	Reference	X	X	X	X	X
RCP Replication	8.5 Wm ⁻²			X		
	6.0 Wm ⁻²		X	X	X	X
	4.5 Wm ⁻²	X	X	X	X	X
	2.6 Wm ⁻²	X	X		X	

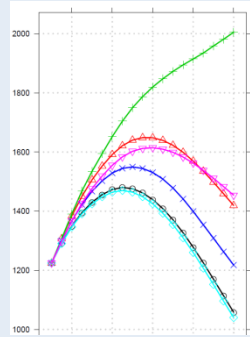
Shared socioeconomic pathways



SSP components



Narrative



Quantitative elements

Population

Urbanization

Rates of technological change

Income

Human Development Index

Income distribution

Etc.

Does not include:

- typical model output such as emissions, land use, climate change
- climate policy (mitigation or adaptation)
- not influenced by climate change

SSP elements

Key determinants of adaptation challenges:

Determinant:	SSP variable:
Average wealth	GDP projection
Poverty	Income distribution
Quality of governance	Governance
People in coastal zones	Spatial population projection
Urbanization	Urbanization
Education	Education
Innovation	Innovation
Quality of healthcare	Health projections

Storyline

IAM elements

IAD elements



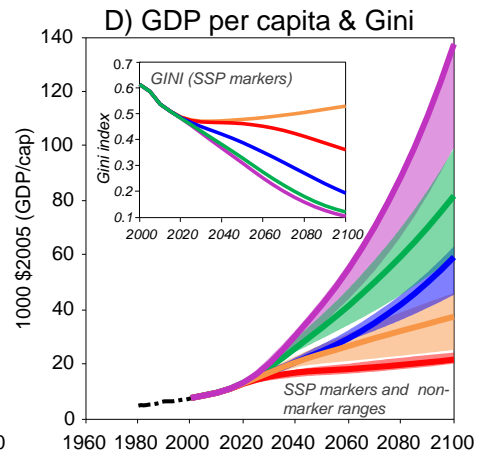
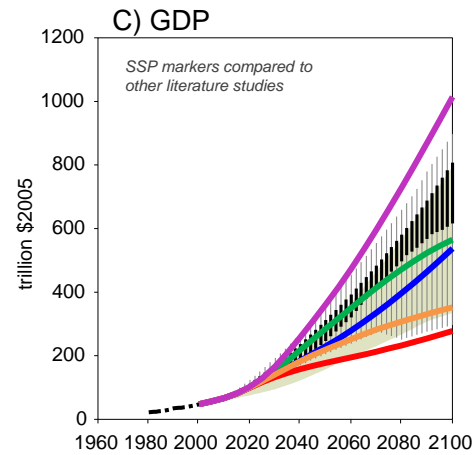
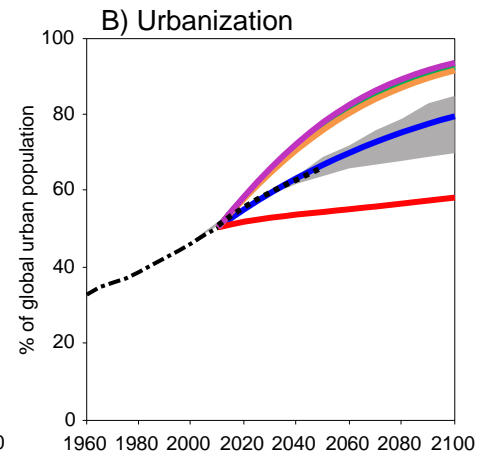
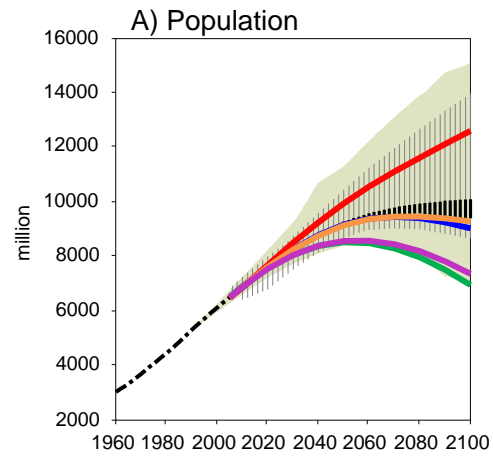
SSP1: World is shifting gradually but dramatically toward a more sustainable path, emphasizing more inclusive development that respects perceived environmental boundaries



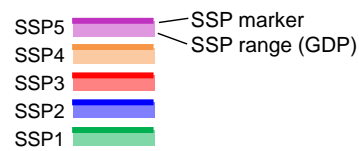
SSP2: World experiences moderate progress towards a multitude of goals and interests. Global and national institutions make slow progress towards achieving sustainable development goals.



SSP3: Growing interest in regional identity & concerns about competitiveness & security push countries to increasingly focus on domestic and regional issues. Global institutions are relatively weak, with uneven coordination and cooperation for addressing environmental concerns



SSP projections



Historical development

Other major studies

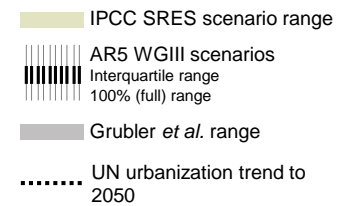


Table 3. Different drivers of heat-related mortality and how they could change under three socio-economic pathways (SSPs). Cells marked with green indicate a lowering of the health impacts and red an increase.

Drivers	SSP2	SSP1	SSP3
Population	Medium	Low	Low
Age-structure		Larger proportion of elderly	Smaller proportion of elderly
Chronic disease prevalence		Higher, better care	Higher, poor care
Urbanization	Medium	High	Low
Access to indoor cooling	Medium	High	Low
Urban planning	Continuation of historical patterns	Well managed	Poorly managed
Heatwave Early Warning System		Medium	High
Societal participation	Medium	High	Low
Equity	Medium	High	Medium

