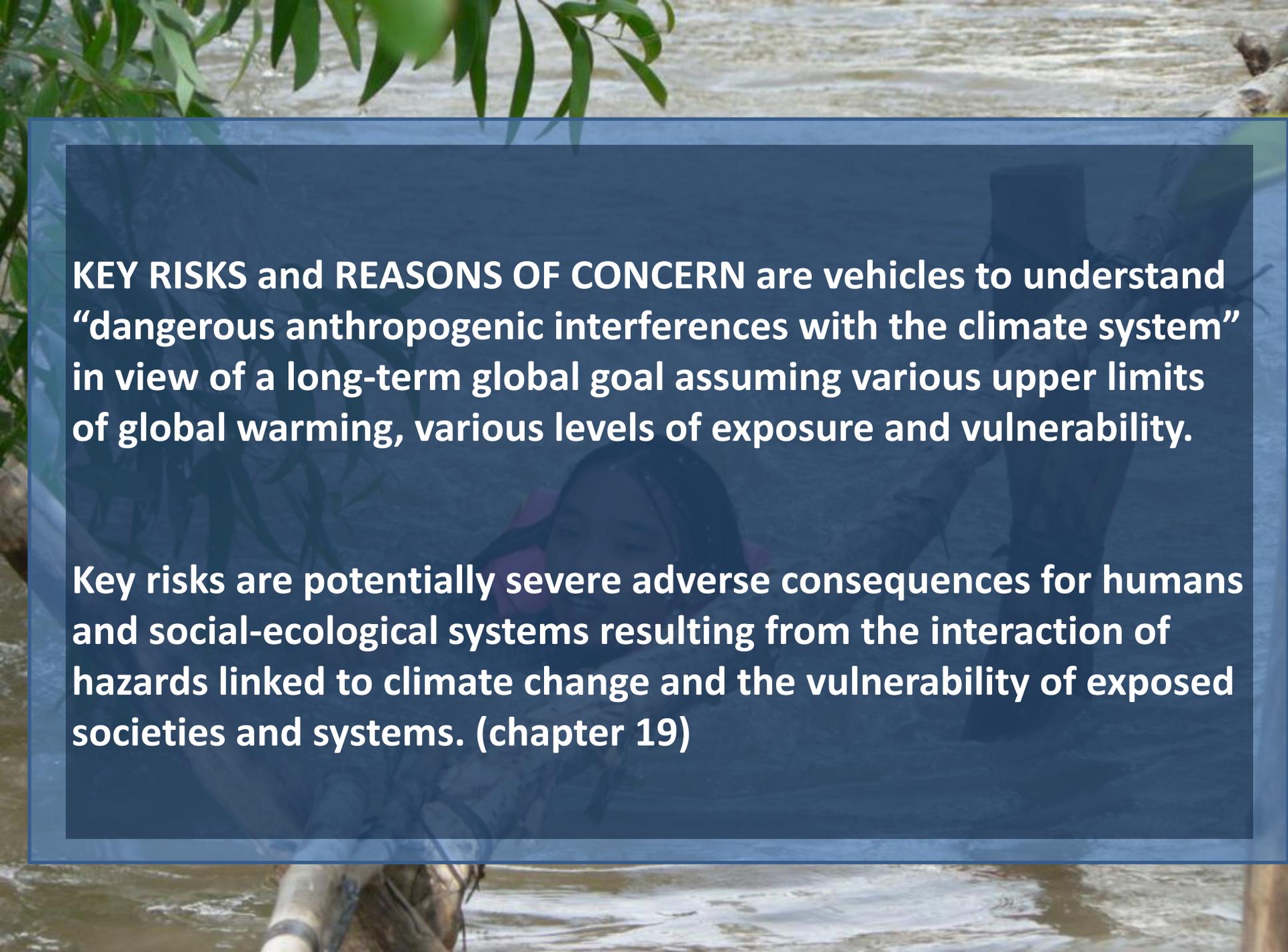


Human interferences with the climate system

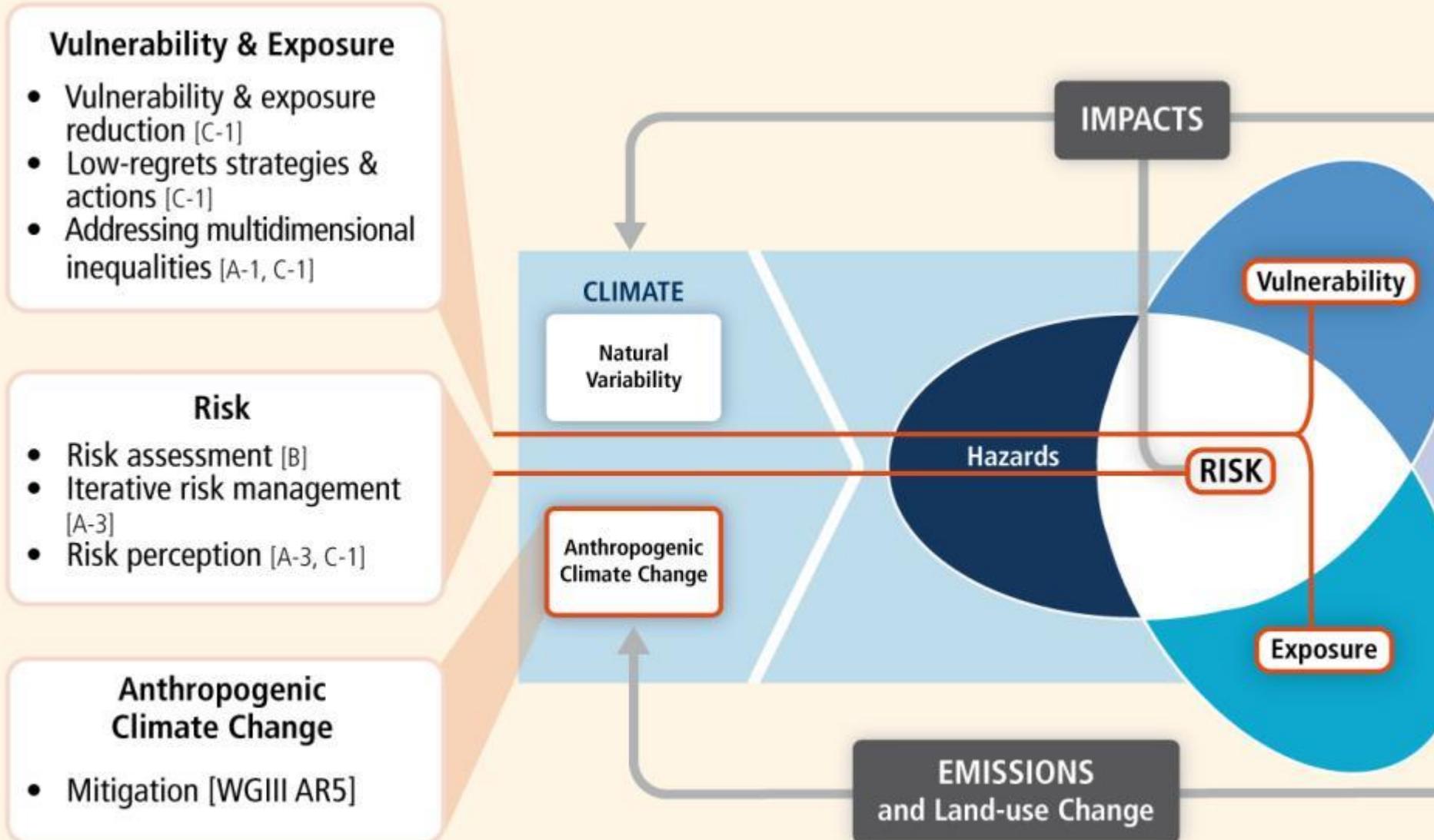


Joern BIRKMANN, Lead-Author Chapter 19



KEY RISKS and REASONS OF CONCERN are vehicles to understand “dangerous anthropogenic interferences with the climate system” in view of a long-term global goal assuming various upper limits of global warming, various levels of exposure and vulnerability.

Key risks are potentially severe adverse consequences for humans and social-ecological systems resulting from the interaction of hazards linked to climate change and the vulnerability of exposed societies and systems. (chapter 19)



An aerial photograph of a city skyline, likely Santiago, Chile, with a large mountain in the background. The image is overlaid with a semi-transparent orange gradient at the bottom. The text 'Criteria - Key Risks' is written in white, bold, sans-serif font, underlined, and positioned in the lower-left quadrant of the image.

Criteria - Key Risks

Risks are considered „key“ due to high hazard or high vulnerability

CRITERIA

- 1) Magnitude** – Risks are key if associated harmful consequences have a large magnitude, determined by a variety of metrics (e.g. human mortality or morbidity, economic loss, loss of cultural importance...)
- 2) Probability that significant risks will materialize and their timing** – e.g. high probability that the hazard due to climate change will occur under circumstances where societies or social-ecological systems exposed are highly susceptible....
- 3) Irreversibility and presistence of conditions that determine risks** – e.g. Underlying drivers and root causes of these risks cannot rapidly be reduced.
- 4) Limited ability to reduce the magnitude and frequency or other characteristics of hazardous climate events and trends and the vulnerability.**
– e.g. risks which are already projected to be large during next few decades under a range of Representative Concentration Pathways (RCPs) and SSPs

How did we assess and select Key Risks?

Chapter 19 - synthesis function

- Key RISKS were primarily identified by the different chapters
- based on the selection criteria defined before.

Within an iterative process more than 80 key risks were identified by various chapters.

Key risks provided by chapters represent the issues most pressing to each set of experts.

This list /table was condensed (avoid repetition etc.) and distributed to the different chapters again and 8 core risks were identified.

Key Risks - Examples



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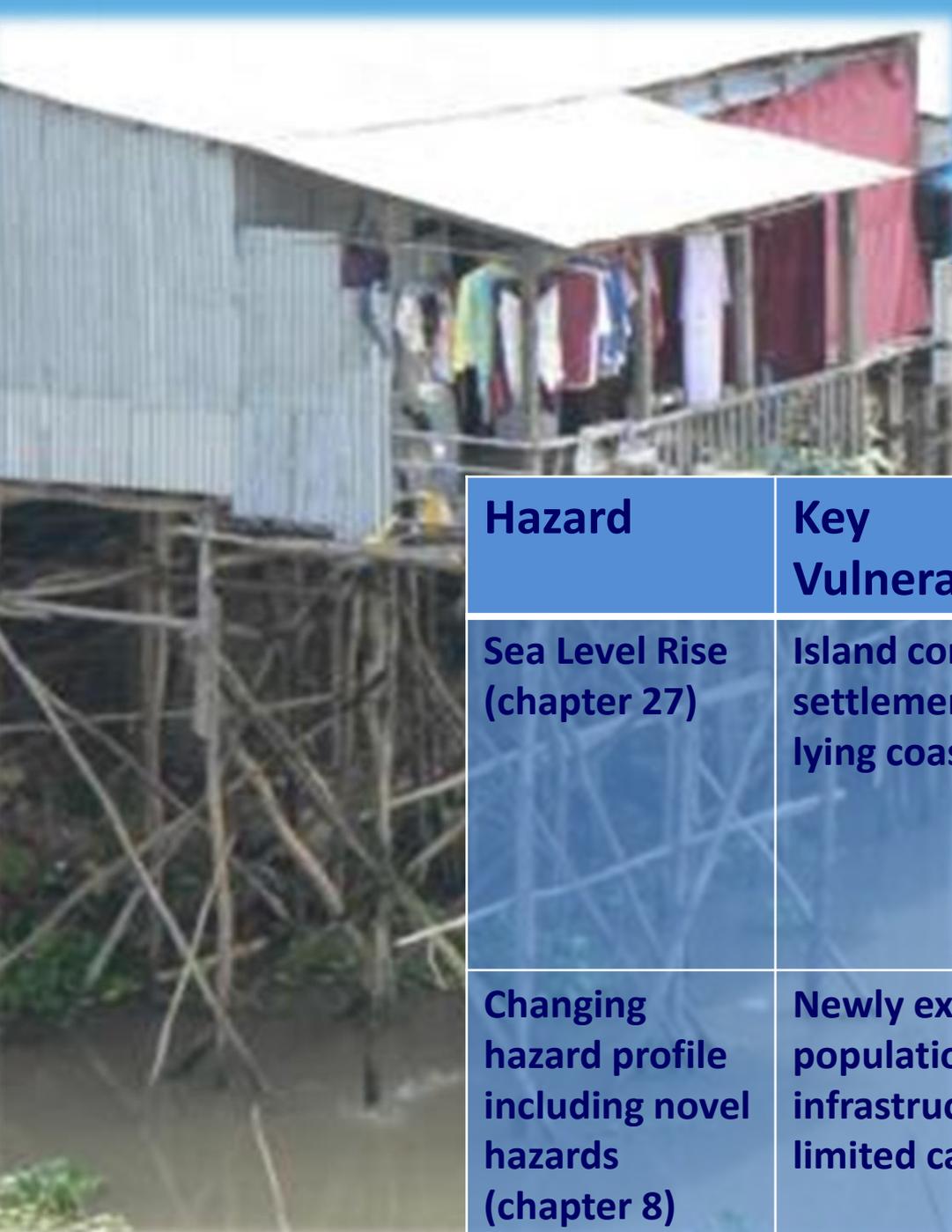
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Risk of death, injury, ill-health, or disrupted livelihoods in low-lying coastal zones and small island developing states and other small islands, due to storm surges, coastal flooding, and sea-level rise. [RFC 1-5]

Risk of severe ill-health and disrupted livelihoods for large urban populations due to inland flooding in some regions. [RFC 2 and 3]

Systemic risks due to extreme weather events leading to breakdown of infrastructure networks and critical services such as electricity, water supply, and health and emergency services. [RFC 2-4]

Risk of loss of rural livelihoods and income due to insufficient access to drinking and irrigation water and reduced agricultural productivity, particularly for farmers and pastoralists with minimal capital in semi-arid regions. [RFC 2 and 3]



Hazard	Key Vulnerabilities	Key Risks
Sea Level Rise (chapter 27)	Island communities, settlements in low-lying coastal zones	Global Mean SLR is likely to increase by 0.35 to 0.70m for RCP 4.5 during the 21st century, threatening low-lying coastal areas
Changing hazard profile including novel hazards (chapter 8)	Newly exposed population and infrastructure with limited capacities	Risks from failure within coupled systems; shock from unanticipated risks

Multi-Dimensional Vulnerability



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Social
vulnerability



Economic
vulnerability



Environmental
vulnerability

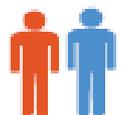


Institutional
vulnerability

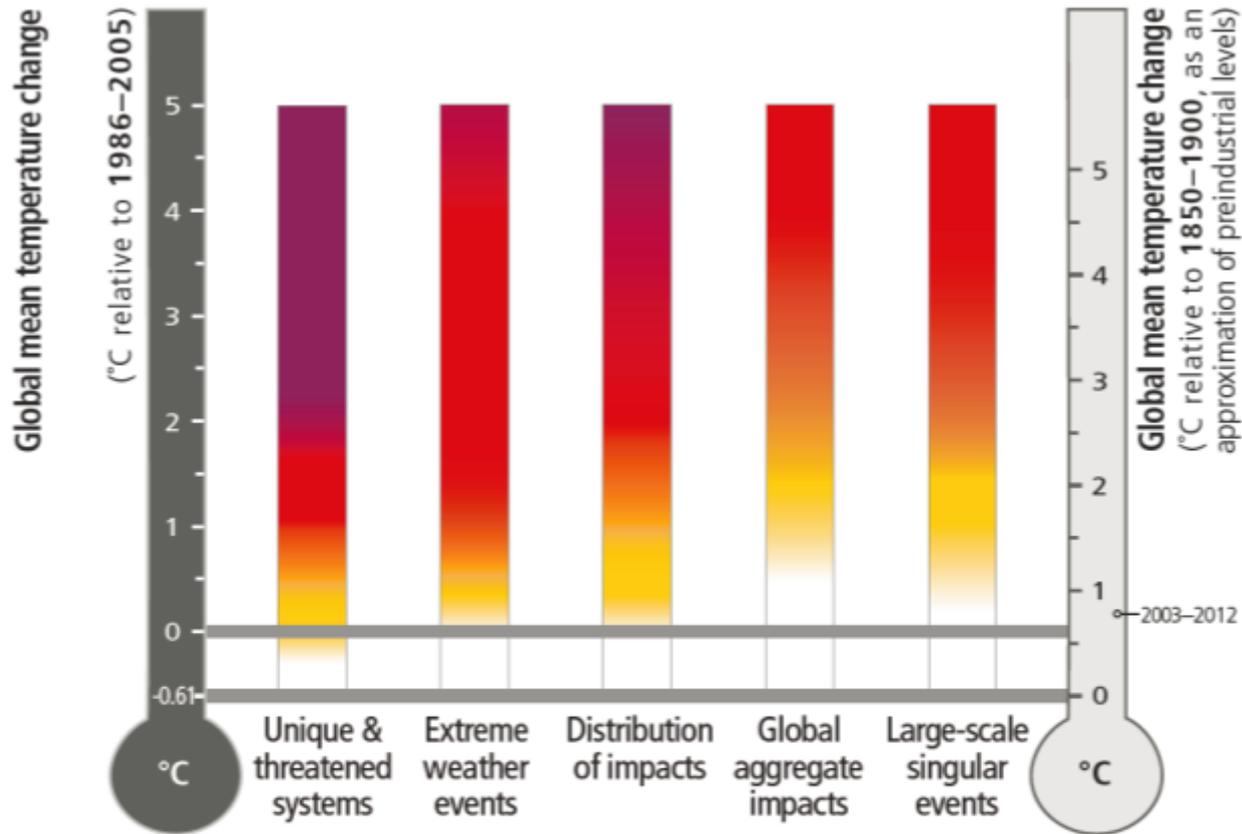


Exposure



Hazard	Key vulnerabilities		Key risks
<p>Sea level rise, coastal flooding including storm surges</p> <p>(WGI AR5 Sections 3.7.1 and 13.5.1; WGI AR5 Table 13-5; Sections 5.4.3, 8.1.4, 8.2.3, 8.2.4, 13.1.4, 13.2.2, 24.4, 24.5, 26.7, 26.8, 29.3.1, and 30.3.1; Boxes 25-1, 25-7)</p>	<p>High exposure of people, economic activity, and infrastructure in low-lying coastal zones and Small Island Developing States (SIDS)</p>		<p>Death, injury, and disruption to livelihoods, food supplies, and drinking water</p>
	<p>Urban population unprotected due to substandard housing and inadequate insurance. Marginalized rural population with multidimensional poverty and limited alternative livelihoods</p>		<p>Loss of common-pool resources, sense of place and identity, especially among indigenous populations in rural coastal zones</p>
	<p>Insufficient local governmental attention to disaster risk reduction</p>		

Further Aggregation



Level of additional risk due to climate change

Undetectable

Moderate

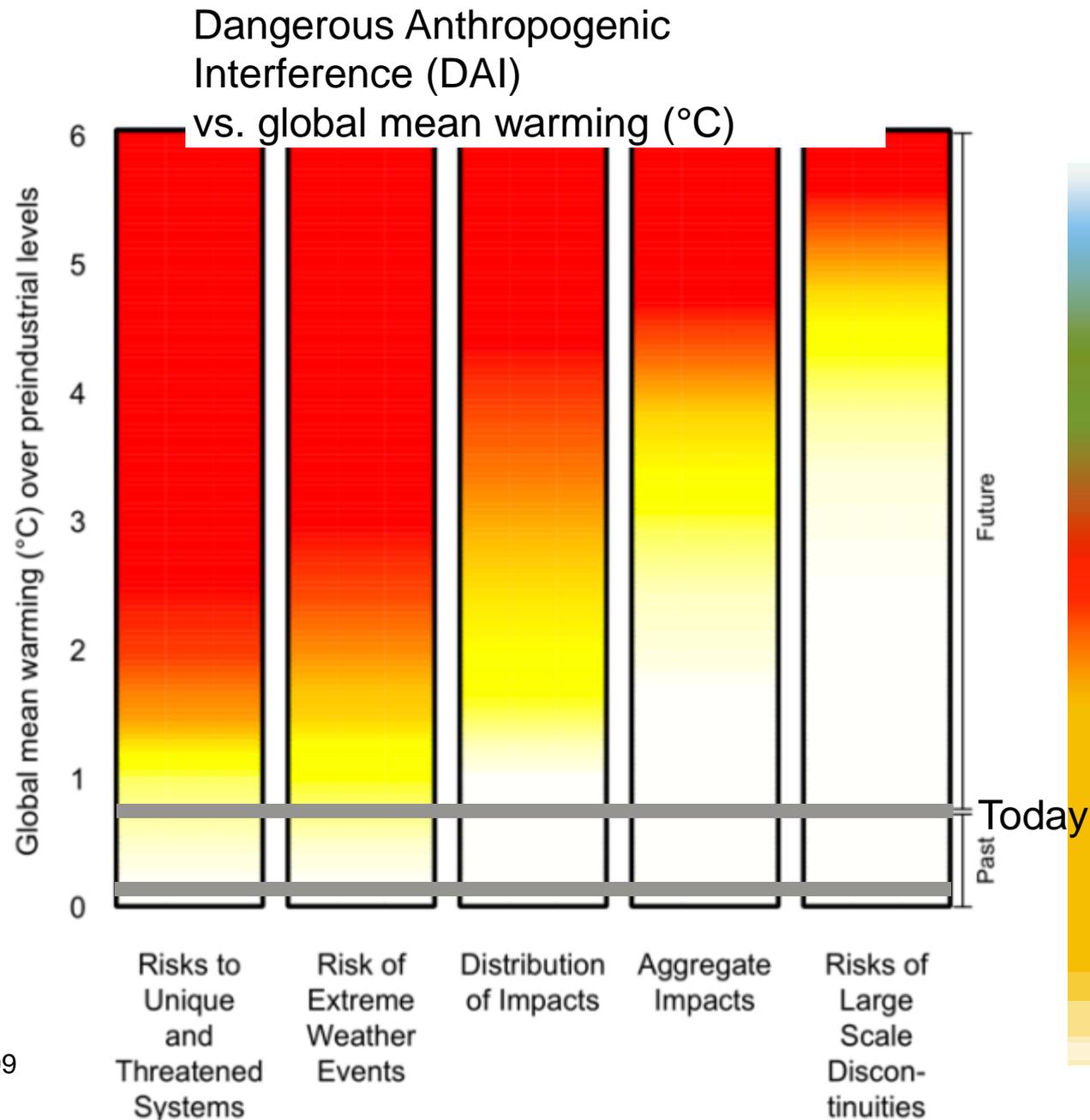
High

Very high

Reasons of Concern

Knowledge TAR 2001

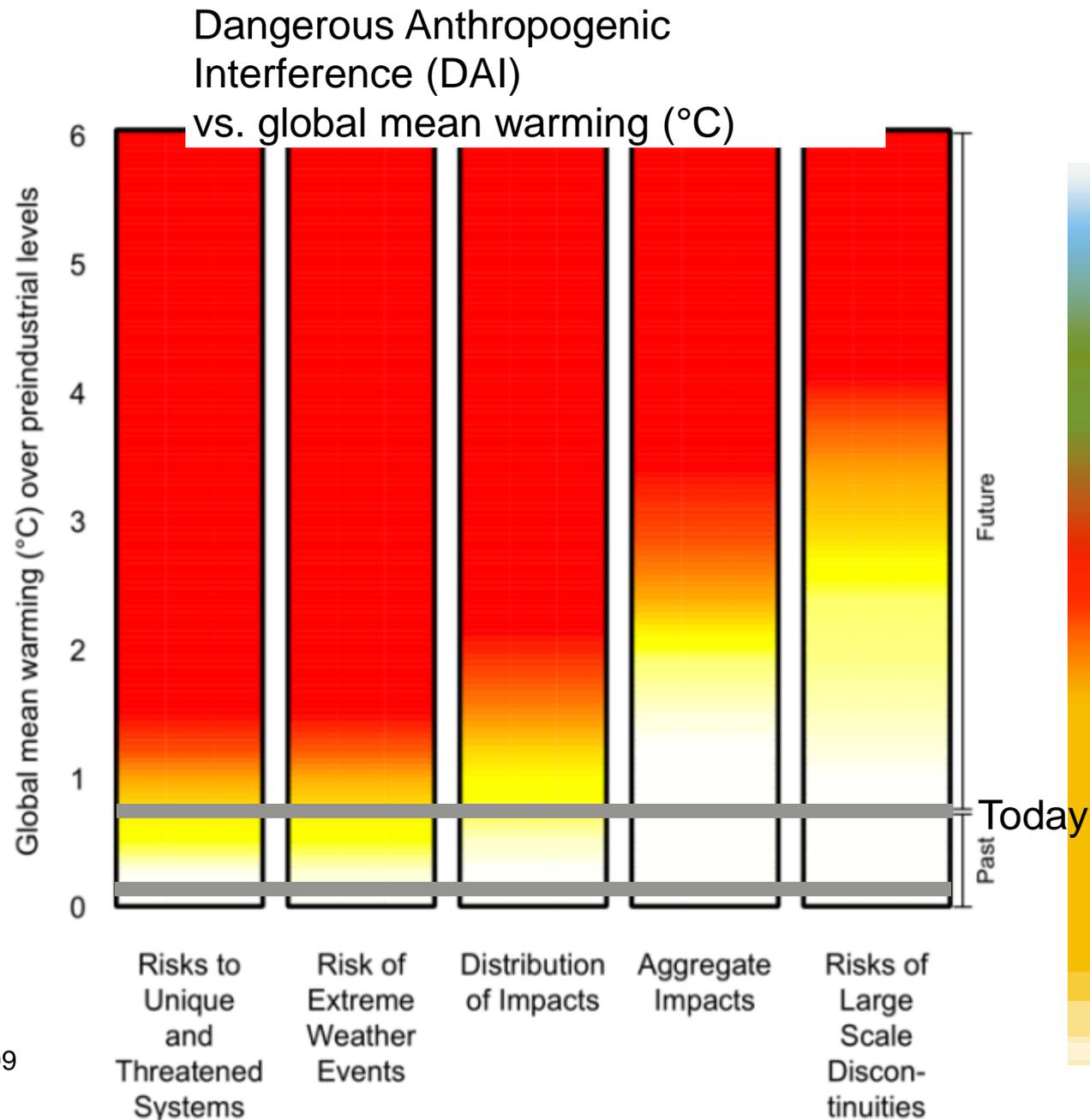
Smith et al., 2009. PNAS u. Fischlin, 2009



Reasons of Concern

Knowledge AR4 2007

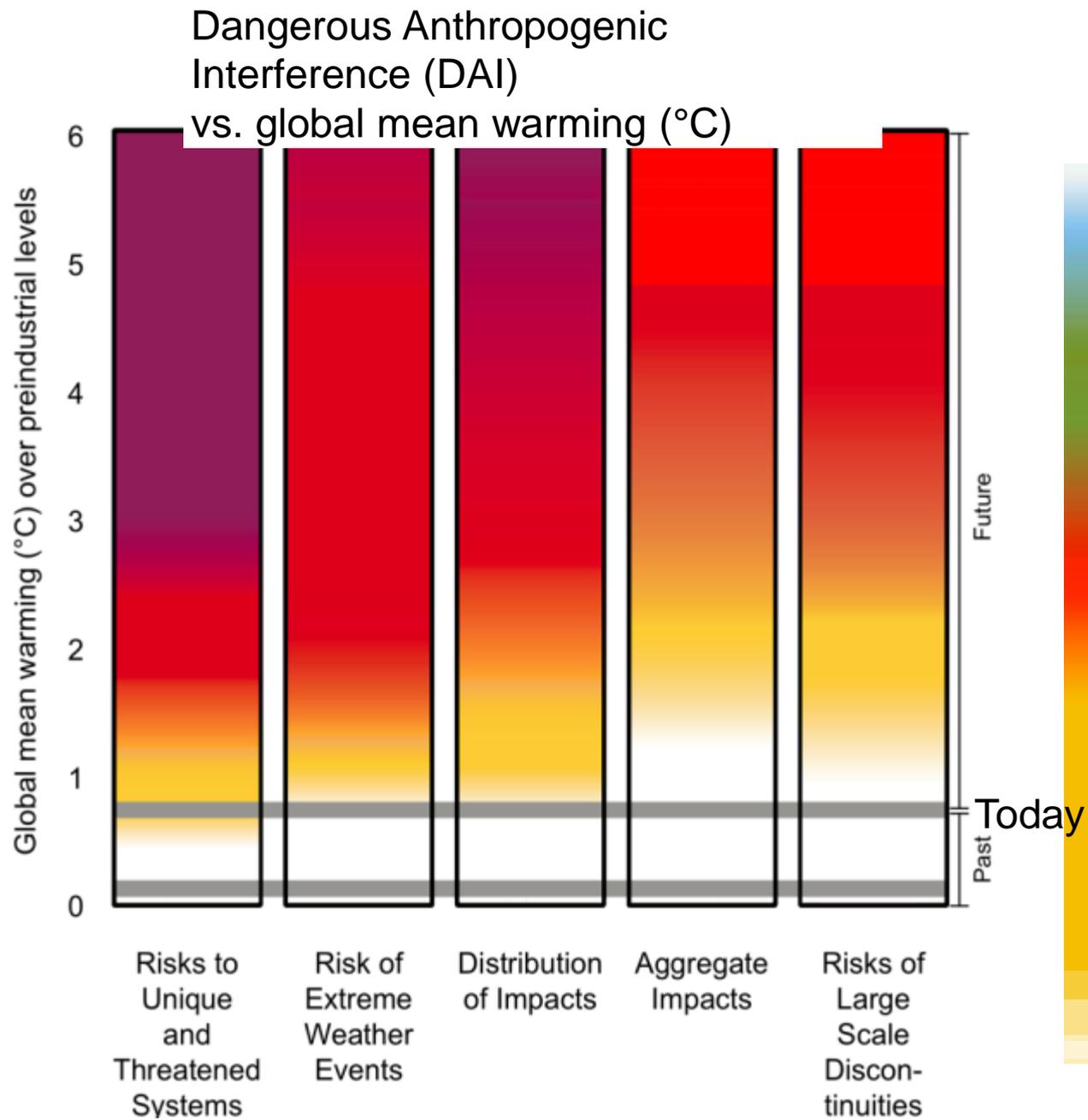
Smith et al., 2009. PNAS u. Fischlin, 2009



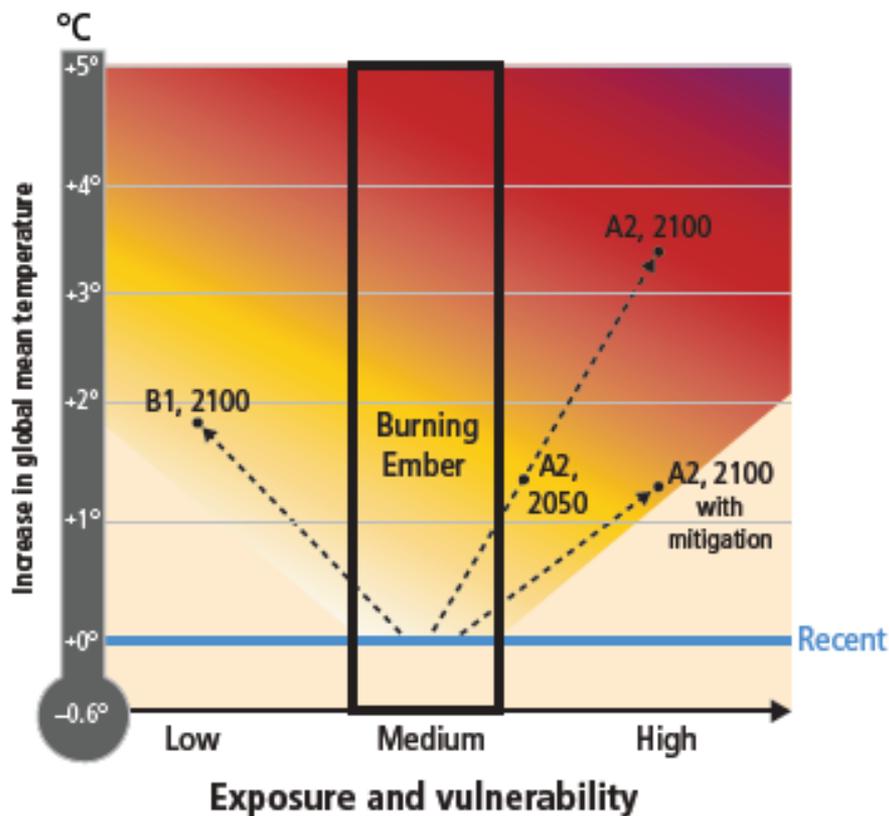
Reasons of Concern

Knowledge AR5 2014

Smith et al., 2009. PNAS u. Fischlin, 2009



Level of Risks



Level of risk

White	White to yellow	Yellow	Yellow to red	Red	Red to purple	Purple
Neutral		Moderate		High		Very high

Risks associated with the Reasons for Concern (RFC) depend on the level of climate change and exposure and vulnerability of society.

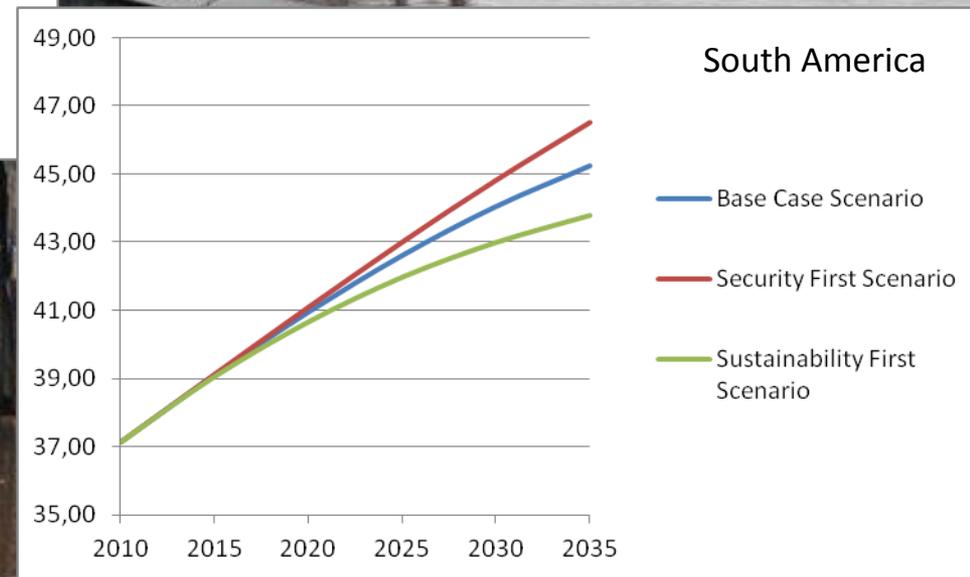
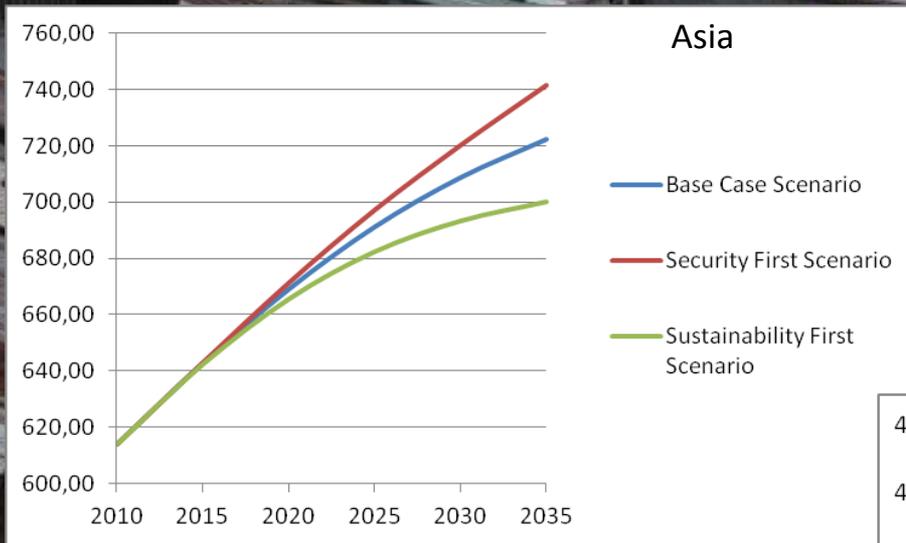
Arrows and dots illustrate the use of SRES scenario-based literature; evolution of climate and socio-economic conditions over time. (IPCC 2014)

Exposure Today and Tomorrow

Asia



Increasing Exposure to Floods, Droughts, Cyclones and Sea Level Rise



Source: Birkmann, J.; Cutter, S.; Rothman, D.; Welle, T.; Garschagen, M.; van Ruijven, B.; O'Neill, B.; Preston, B.; Kienberger, S.; Cardona, O.; Siagian, T.; Hidayati, D.; Setiadi, N.; Binder, C.; Hughes, B.; Pulwarty, R. (2013) Scenarios for vulnerability: opportunities and constraints in the context of climate change and disaster risk. *Climatic Change*

Concluding Remarks



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Beside the key question of the degree of global warming and its implications for extremes – it is equally important to account for dynamics of exposure and vulnerability.

Past trends and scenarios for future development trends indicate that in most regions we experience an increase in exposure to climatic hazards.

Risks of severe harm and loss due to climate change-related hazards and various vulnerabilities is particularly high in large urban and rural areas in low-lying coastal zones (high confidence)

Global mitigation and adaptation goals should be evaluated regarding the development of „risk levels“.