

Climate adaptation in mountains: from baseline and planning to implementation

Christian Huggel

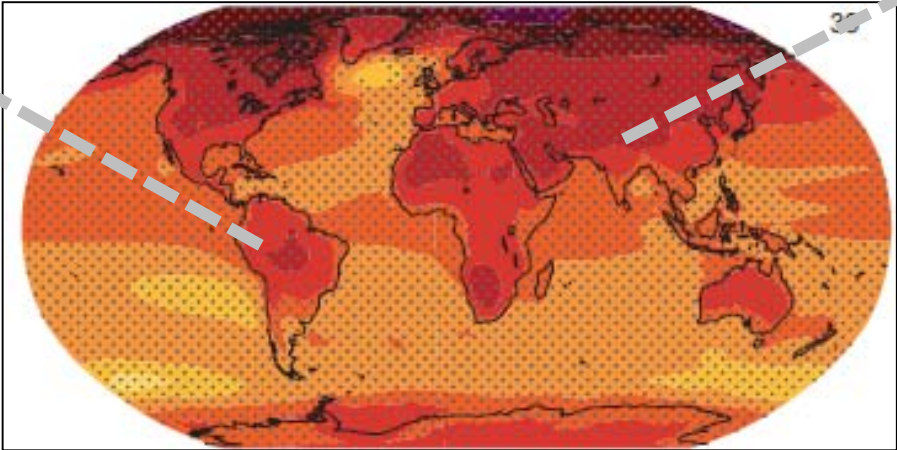
University of Zurich, Switzerland

Lead Author IPCC WGII AR5

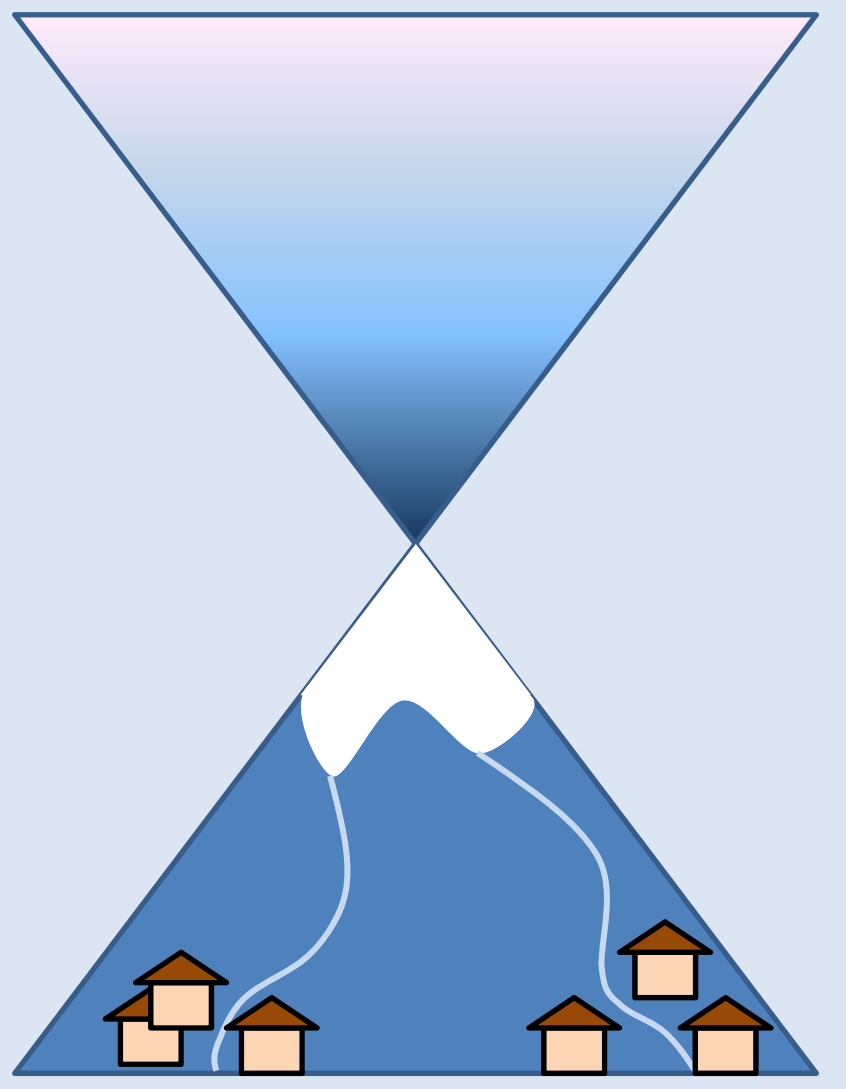
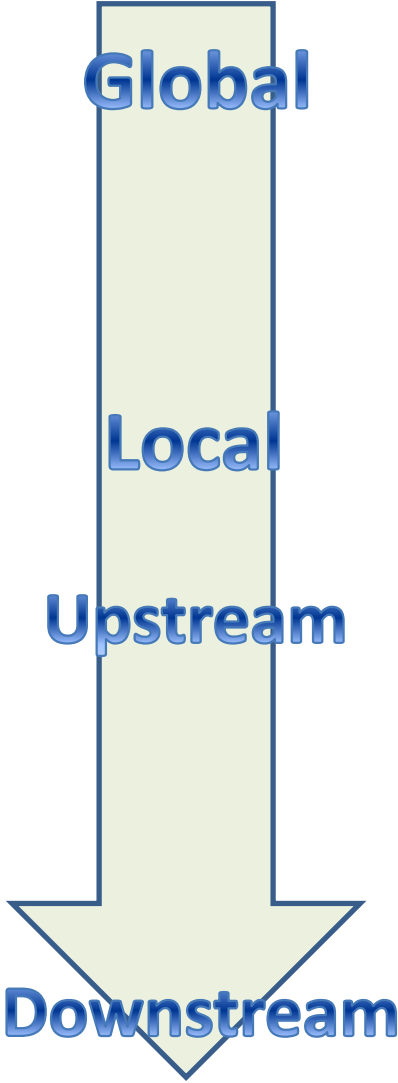


University of
Zurich^{UZH}

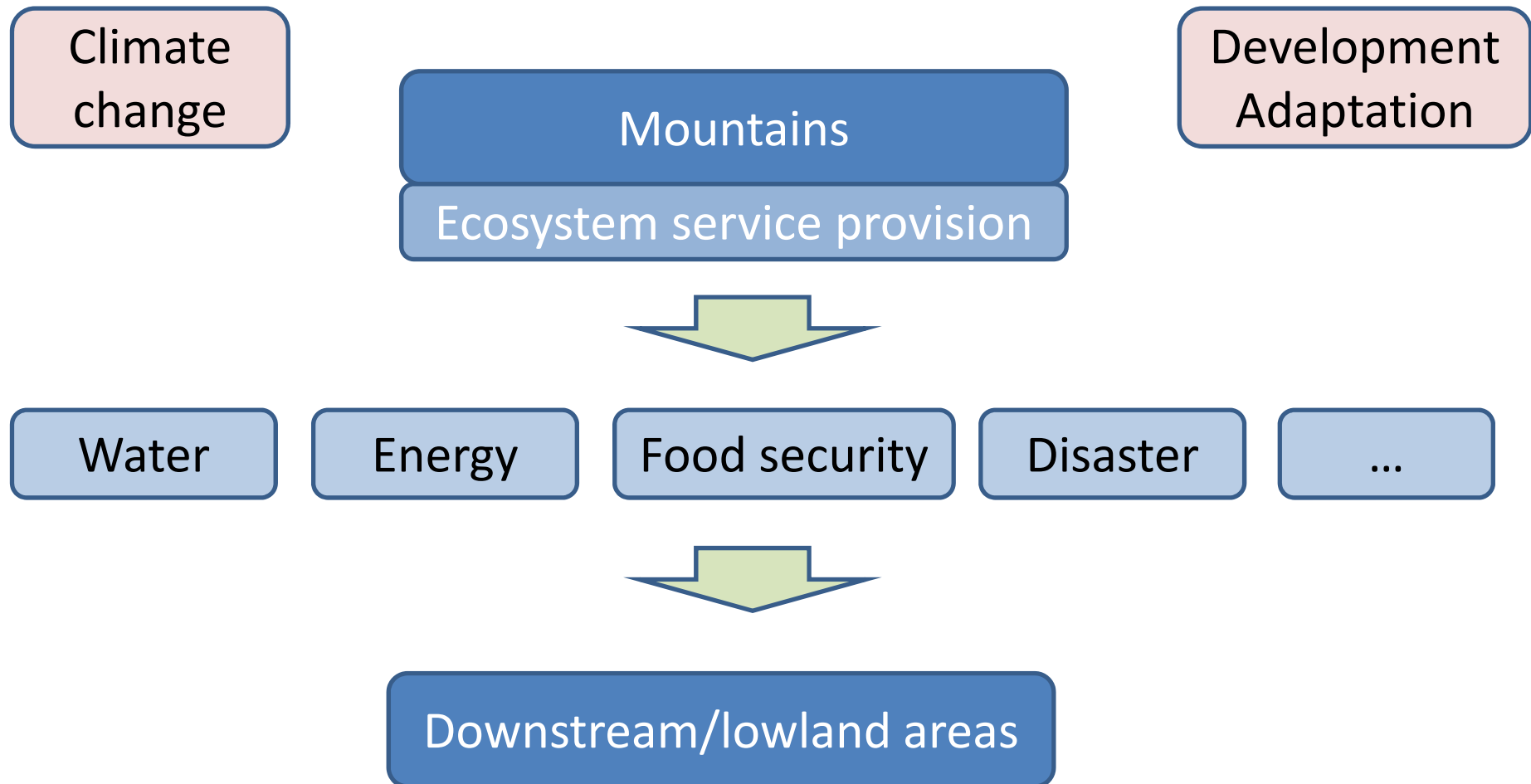
Global climate change – local and downstream impacts



Global climate change – local and downstream impacts

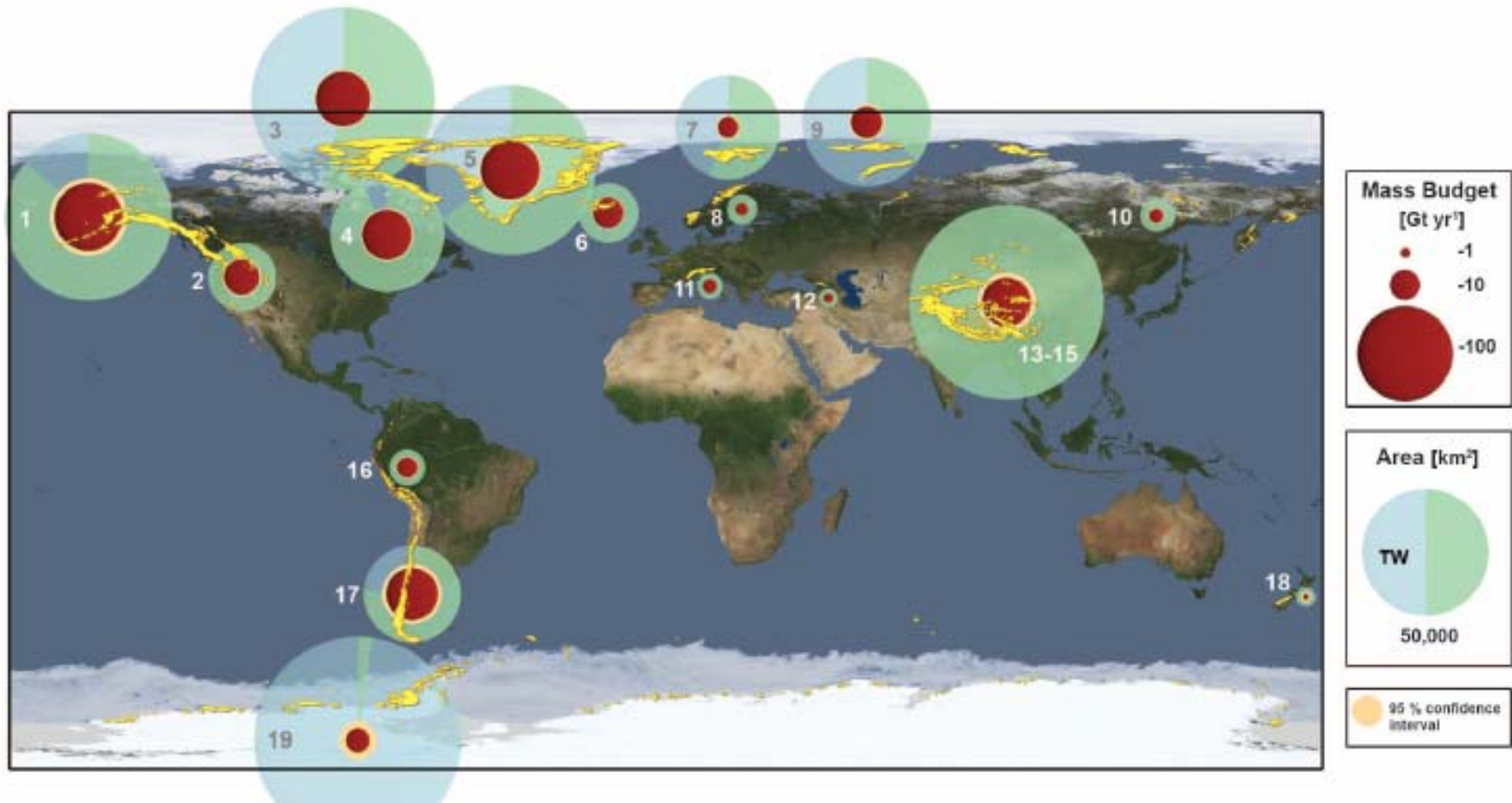


Global climate change – local and downstream impacts



State and future of the mountain cryosphere

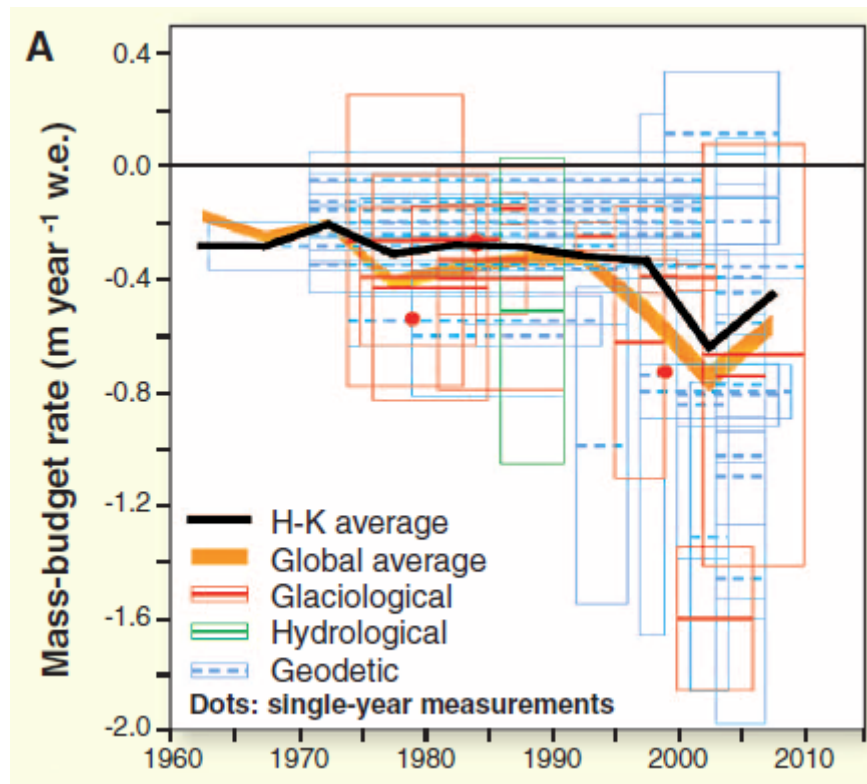
Recent observed glacier changes



Gardner et al., 2013

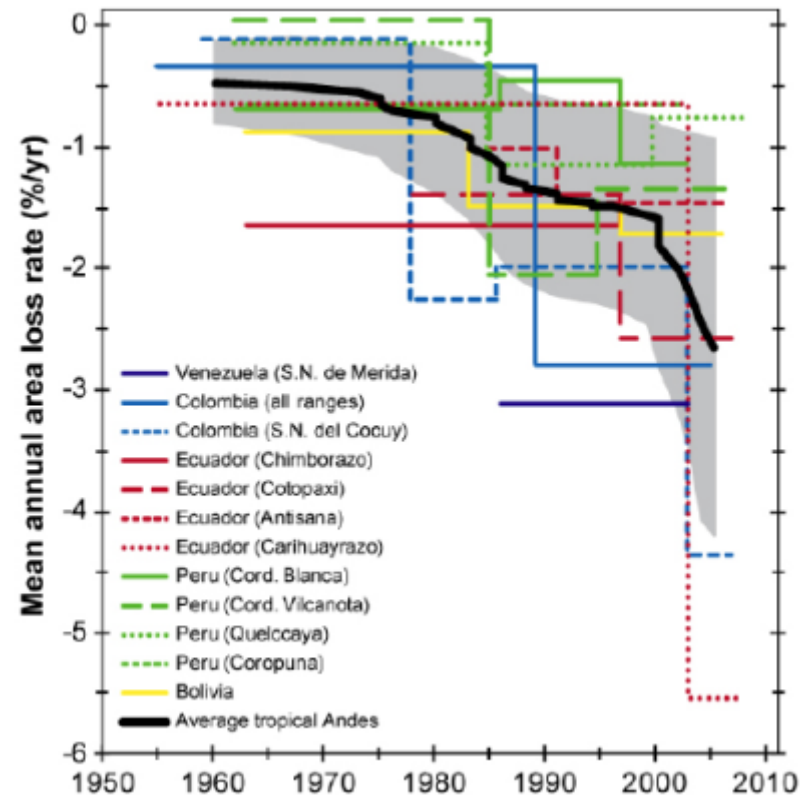
State and future of the mountain cryosphere

Himalayas



Bolch et al., 2012

Tropical Andes

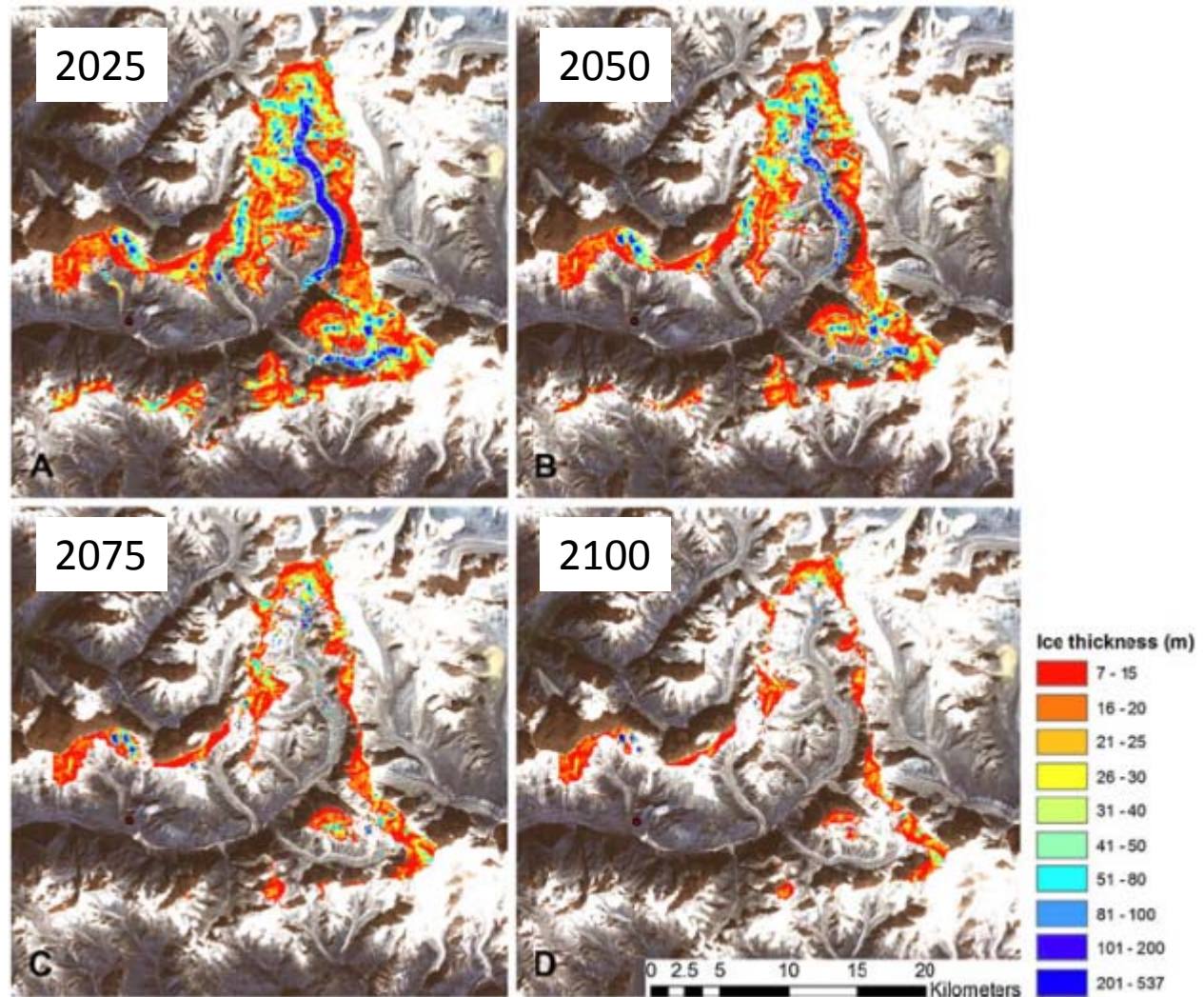


Rabatel et al., 2013

State and future of the mountain cryosphere

21st century projected glacier changes

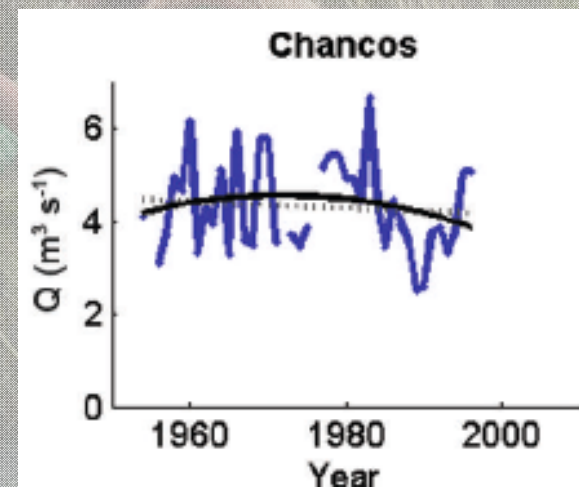
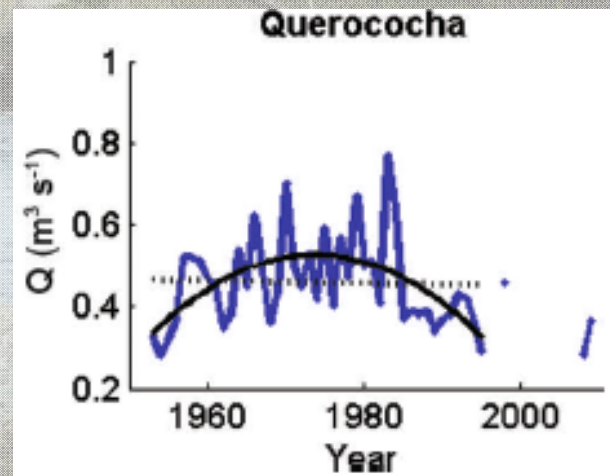
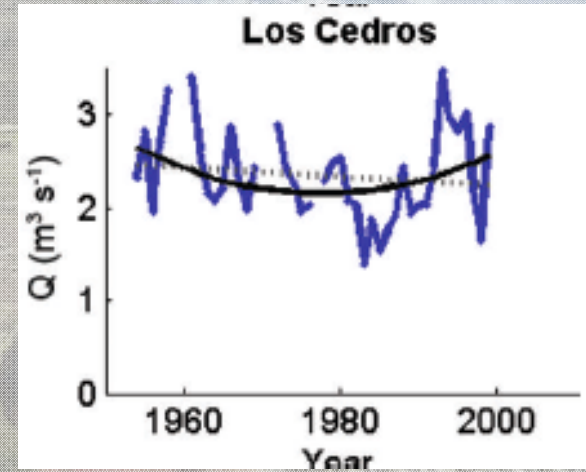
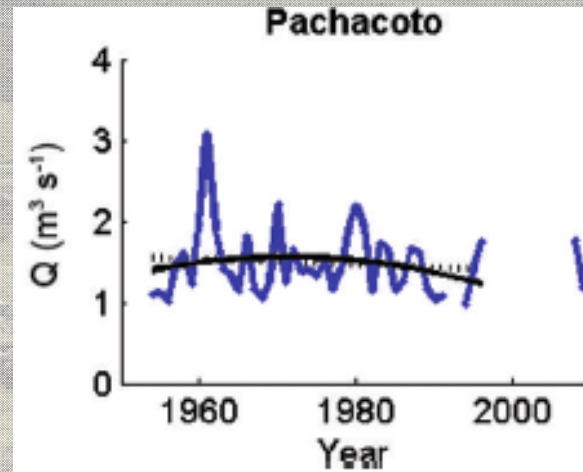
Langtang, Nepal



Immerzeel et al., 2012

Glacier / snow melt and changing river runoff

„Peak water‘ passed in a majority of catchments in the Andes of Peru



Glacier / snow melt and changing river runoff

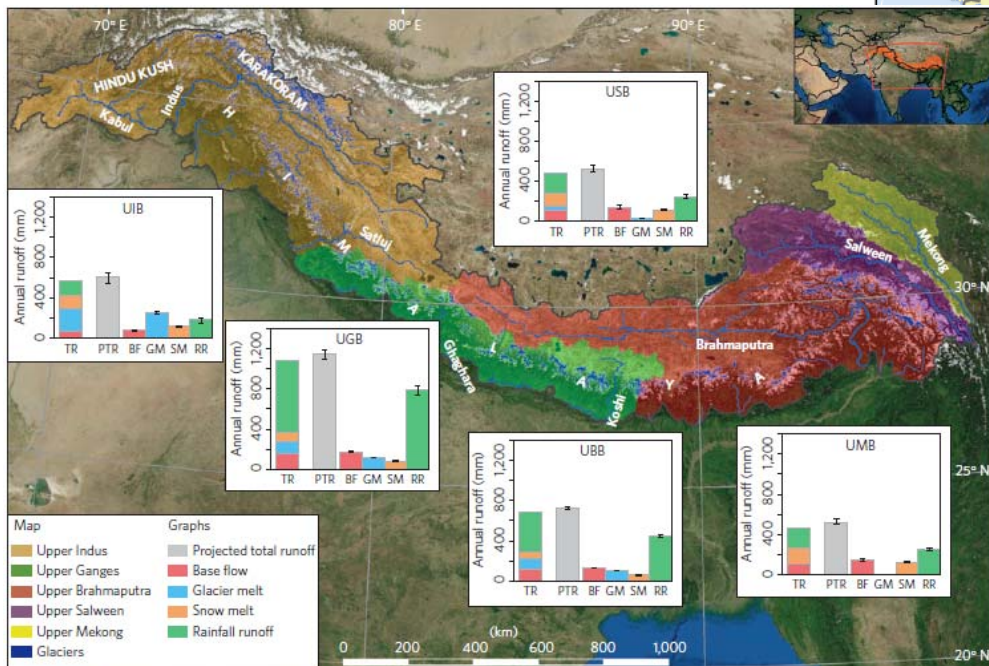
HKH region:

Demand increase may be a more important driver of change (and adaptation) than climate related drivers, but uncertainties are considerable

Inter-annual shifts in runoff and water availability are likely important



NAS, 2012



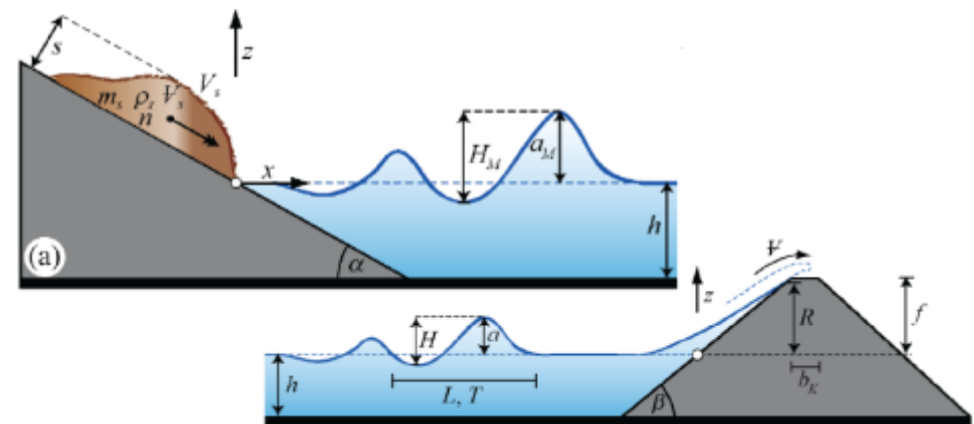
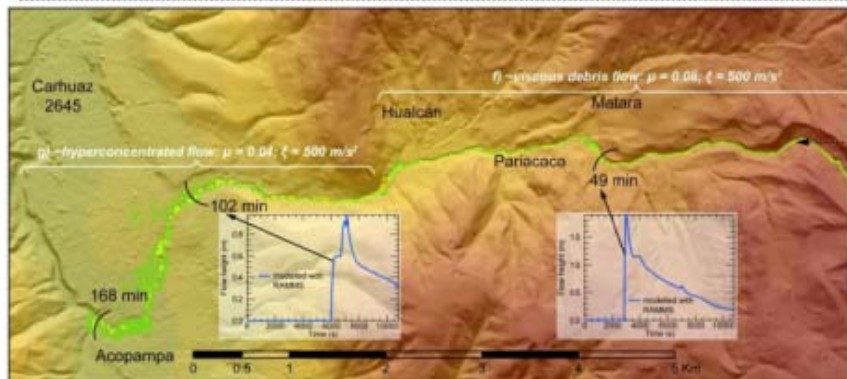
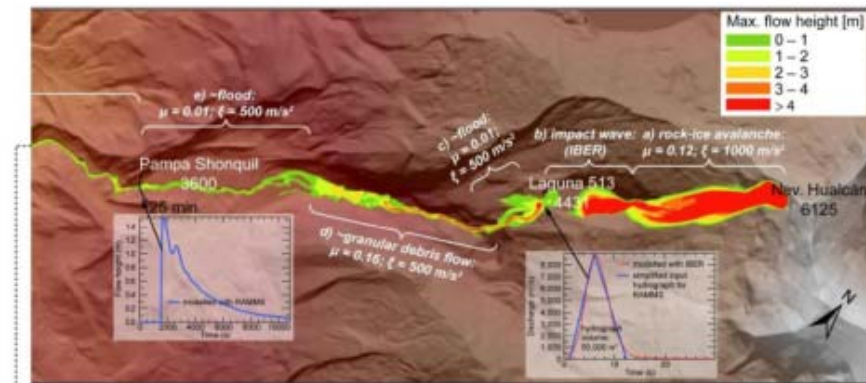
Lutz et al., 2014

Climate related risks

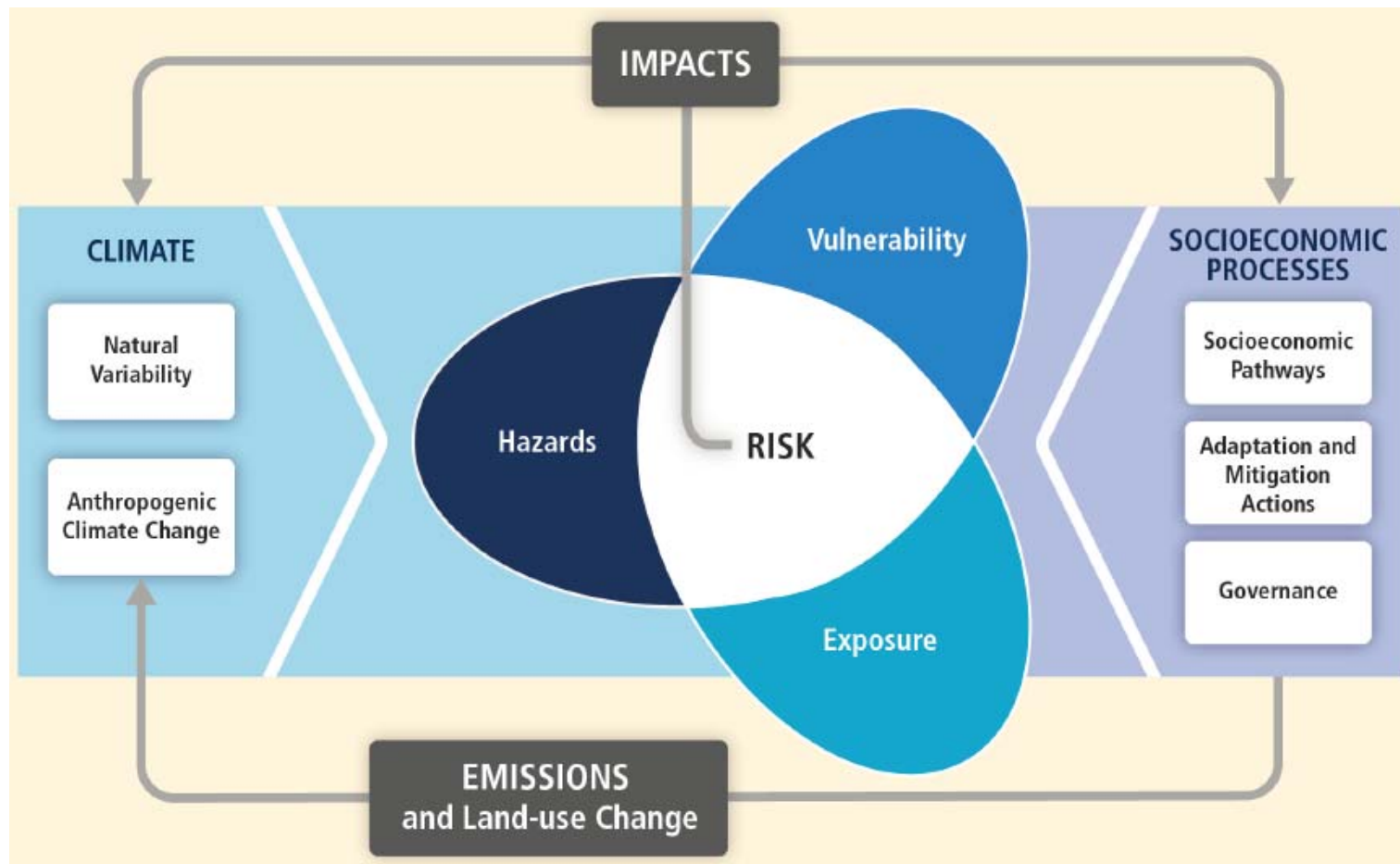


Climate related risks

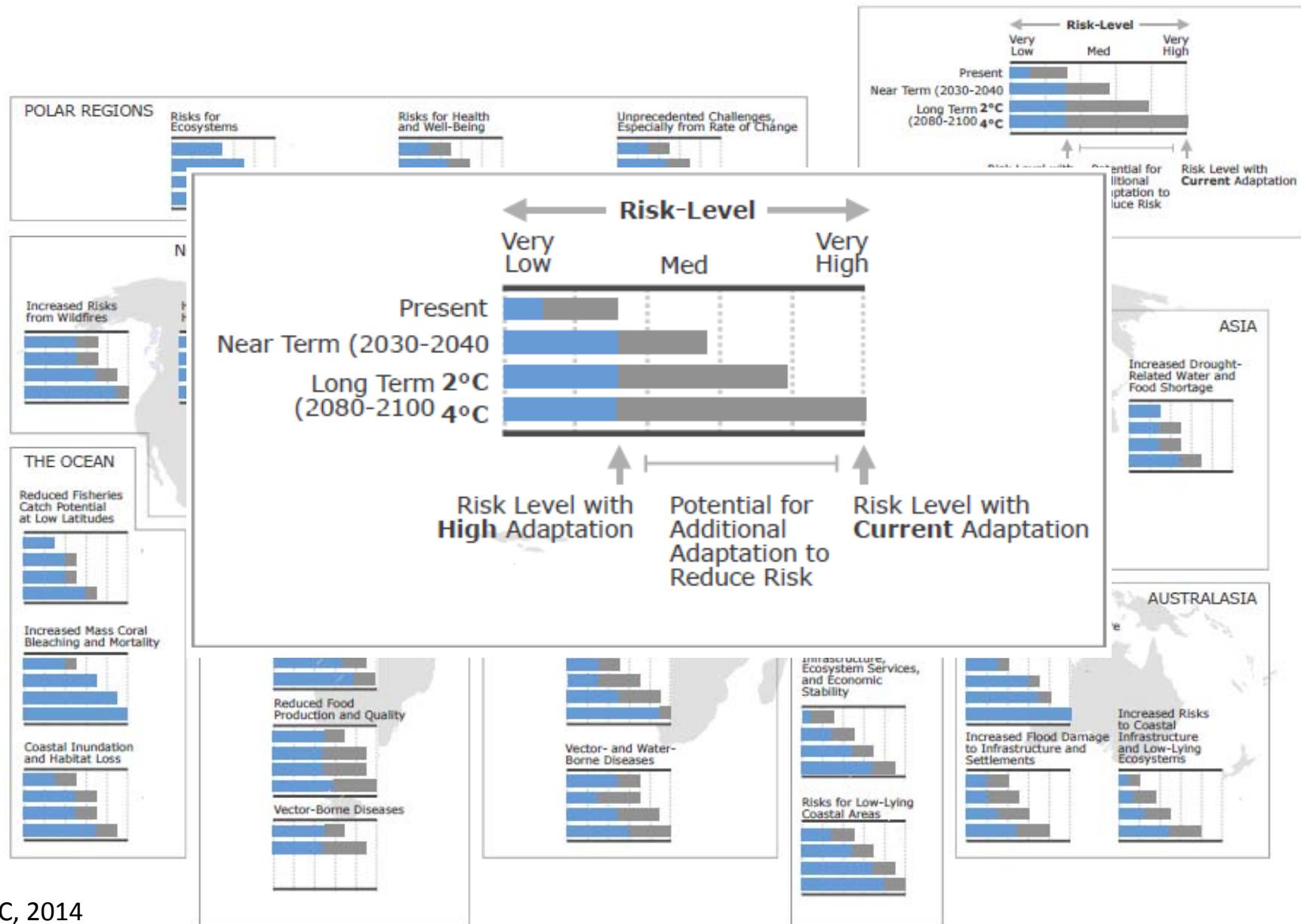
E.g. glacier lake outburst floods:
 Recent progress in coupled process modeling (avalanche impacting lake, wave and flood generation),
 downstream community impact



The IPCC AR5 risk framework

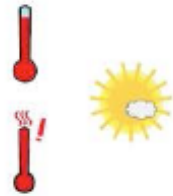



Risk and adaptation



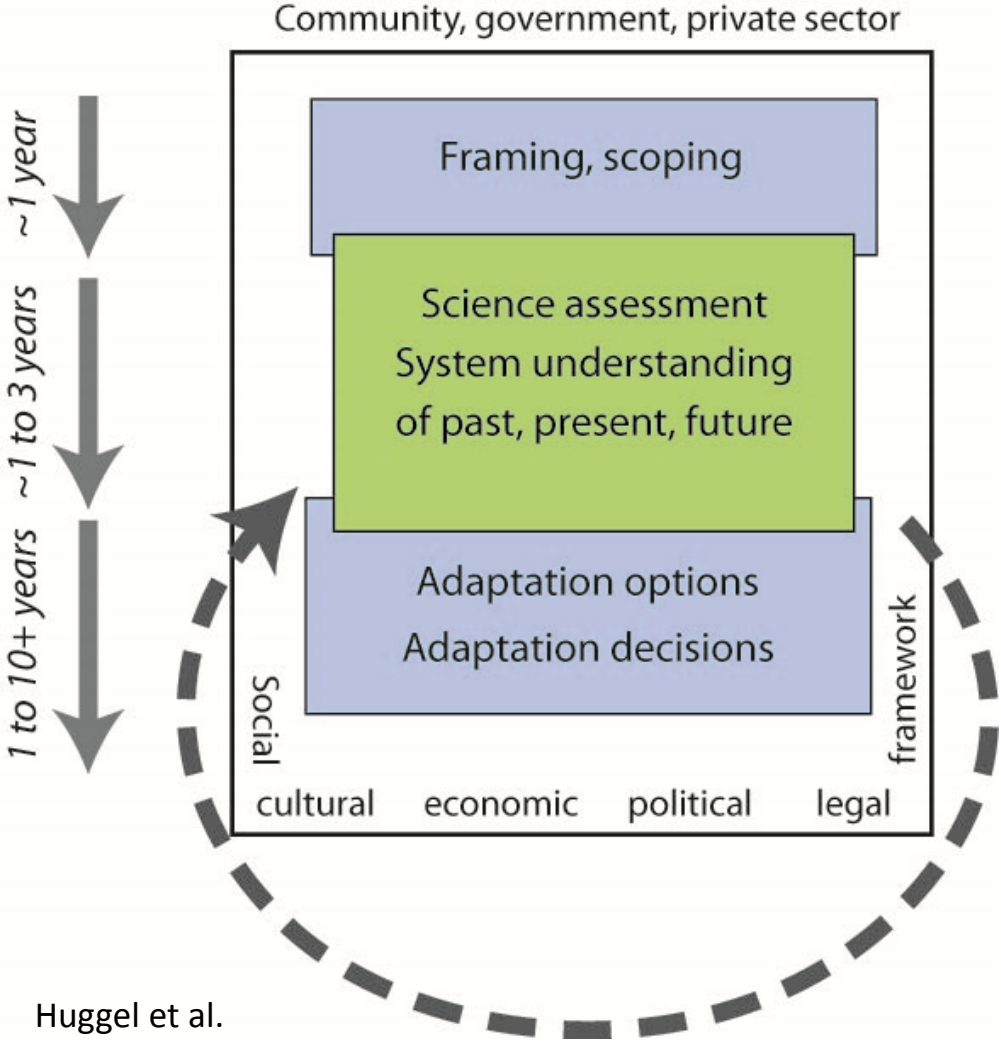
Risk and adaptation

Some of the key risks in Asia:

Key risk	Adaptation issues and prospects	Climatic drivers	Supporting ch. sections	Timeframe	Risk for current and high adaptation																			
<p>Increased risk of drought-related water and food shortage causing malnutrition (<i>high confidence</i>)</p> <p style="text-align: center; border: 1px solid black; padding: 5px;">Water and food shortage</p>	Disaster preparedness including early-warning systems and local coping strategies.		24.4.6.2, 24.4.6.3, 24.4.6.5	<table border="1"> <thead> <tr> <th></th> <th>Very low</th> <th>Medium</th> <th>Very high</th> </tr> </thead> <tbody> <tr> <td>Present</td> <td colspan="3">[Bar chart showing low risk]</td> </tr> <tr> <td>Near-term (2030-2040)</td> <td colspan="3">[Bar chart showing medium risk]</td> </tr> <tr> <td rowspan="2">Long-term (2080-2100)</td> <td>2°C</td> <td colspan="2">[Bar chart showing medium risk]</td> </tr> <tr> <td>4°C</td> <td colspan="2">[Bar chart showing high risk]</td> </tr> </tbody> </table>		Very low	Medium	Very high	Present	[Bar chart showing low risk]			Near-term (2030-2040)	[Bar chart showing medium risk]			Long-term (2080-2100)	2°C	[Bar chart showing medium risk]		4°C	[Bar chart showing high risk]		
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<p>Mountain-top extinctions in Asia (<i>high confidence</i>)</p> <p style="text-align: center; border: 1px solid black; padding: 5px;">Species mountain top extinction</p>	Adaptation options are limited. Reducing non-climate impacts and maximizing habitat connectivity will reduce risks to some extent, while assisted migration may be practical for some species.		24.4.2.4, 24.4.2.5	<table border="1"> <thead> <tr> <th></th> <th>Very low</th> <th>Medium</th> <th>Very high</th> </tr> </thead> <tbody> <tr> <td>Present</td> <td colspan="3">[Bar chart showing low risk]</td> </tr> <tr> <td>Near-term (2030-2040)</td> <td colspan="3">[Bar chart showing medium risk]</td> </tr> <tr> <td rowspan="2">Long-term (2080-2100)</td> <td>2°C</td> <td colspan="2">[Bar chart showing medium risk]</td> </tr> <tr> <td>4°C</td> <td colspan="2">[Bar chart showing high risk]</td> </tr> </tbody> </table>		Very low	Medium	Very high	Present	[Bar chart showing low risk]			Near-term (2030-2040)	[Bar chart showing medium risk]			Long-term (2080-2100)	2°C	[Bar chart showing medium risk]		4°C	[Bar chart showing high risk]		
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Adaptation: from planning to implementation

A concerted science – policy – practice process



Adaptation: from planning to implementation

Multi-purpose, multiple benefit/sectors:
A pilot experience from the Andes of Peru



Glacier Lake 513, Peru
GLOF in 2010



Adaptation: from planning to implementation

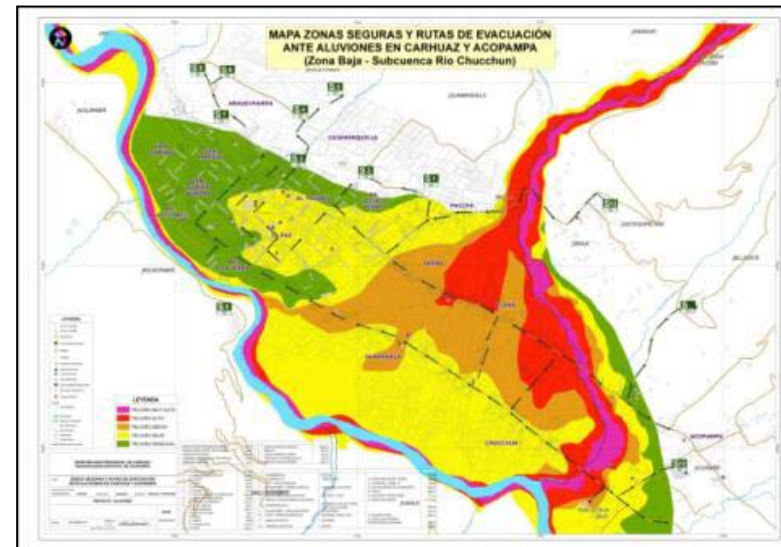
Early warning system
Including technical, institutional, social
components

Vulnerability reduction



Hazard/risk zoning (land-use planning)

Exposure reduction

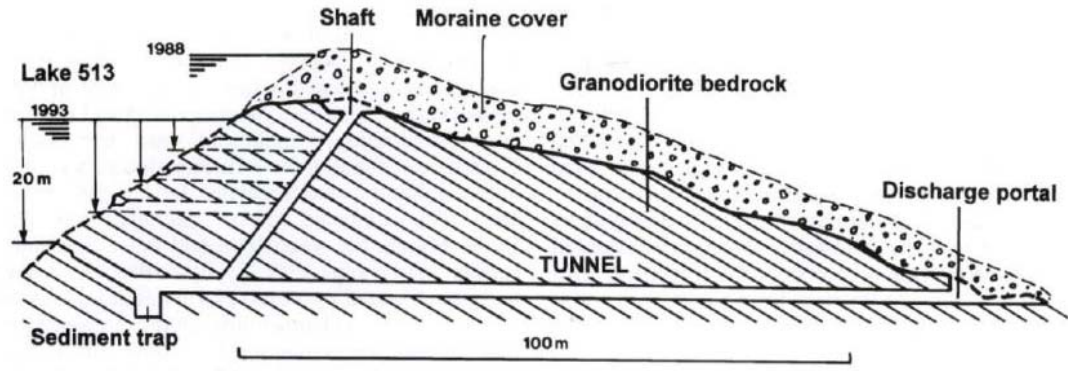


Adaptation: from planning to implementation

Lake level reduction (tunnel):

- 1) Hazard reduction
- 2) Water retention

Hazard / impact reduction



Reynolds, Portocarrero

Water retention (for irrigation, households, etc, during dry season):
Social, technical, financial, legal, nature conservation issues



Adaptation: from planning to implementation

Capacity building as a fundamental aspect of adaptation
(e.g. at postgraduate university level)



E.g. Indo-Swiss Capacity Building Programme
Indian Himalayan Climate Change Adaptation Program (IHCAP)

Points for the discussion

- Ecosystem service provision (e.g. water, biodiversity, energy, food security), including supply and demand
- Upstream – downstream
- Disaster (frequency, intensity, downstream impact)
- Migration
- Data availability in mountain regions

What issues?

Points for the discussion

How to address them?

- Mainstreaming mountain issues into major thematic areas
- Payment for ecosystem services (or other forms of incentives, resource transfer)
- Monitoring (natural and social environments) and data availability/sharing
- Multi-sector/disciplinary, multi-actor/institutions approaches
- Capacity building, strengthen platforms of exchange and learning

Points for the discussion

- Multilateral programmes (e.g. UNESCO, UNEP, REDD, NAPA, etc)
- Bilateral programmes (e.g. SMD4GC, ...)
- Regional, national initiatives (e.g. SAARC: Road Map for ensuring food/water/energy security for South Asia)

Programmes