SIXTH ASSESSMENT REPORT
Working Group II – Impacts, Adaptation and Vulnerability

ipcc
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

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Mountains as pivoting points for climate impacts, adaptation and vulnerability

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Swiss NGO DRR Platform I 22 March 2022


[Alessio Soggetti – Unsplash]


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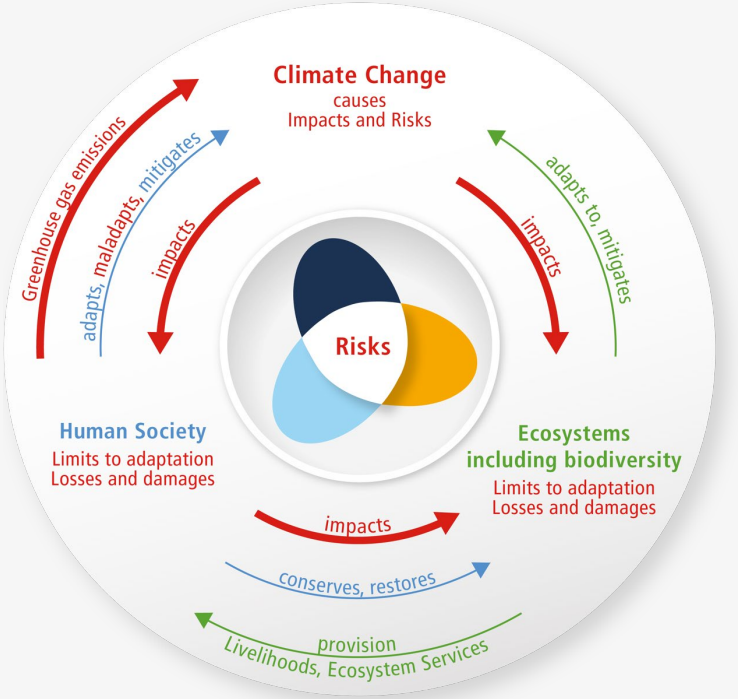
New understanding of interconnections



The risk propeller shows that risk emerges from the overlap of:

- Climate hazard(s)
- Vulnerability
- Exposure

...of human systems, ecosystems and their biodiversity

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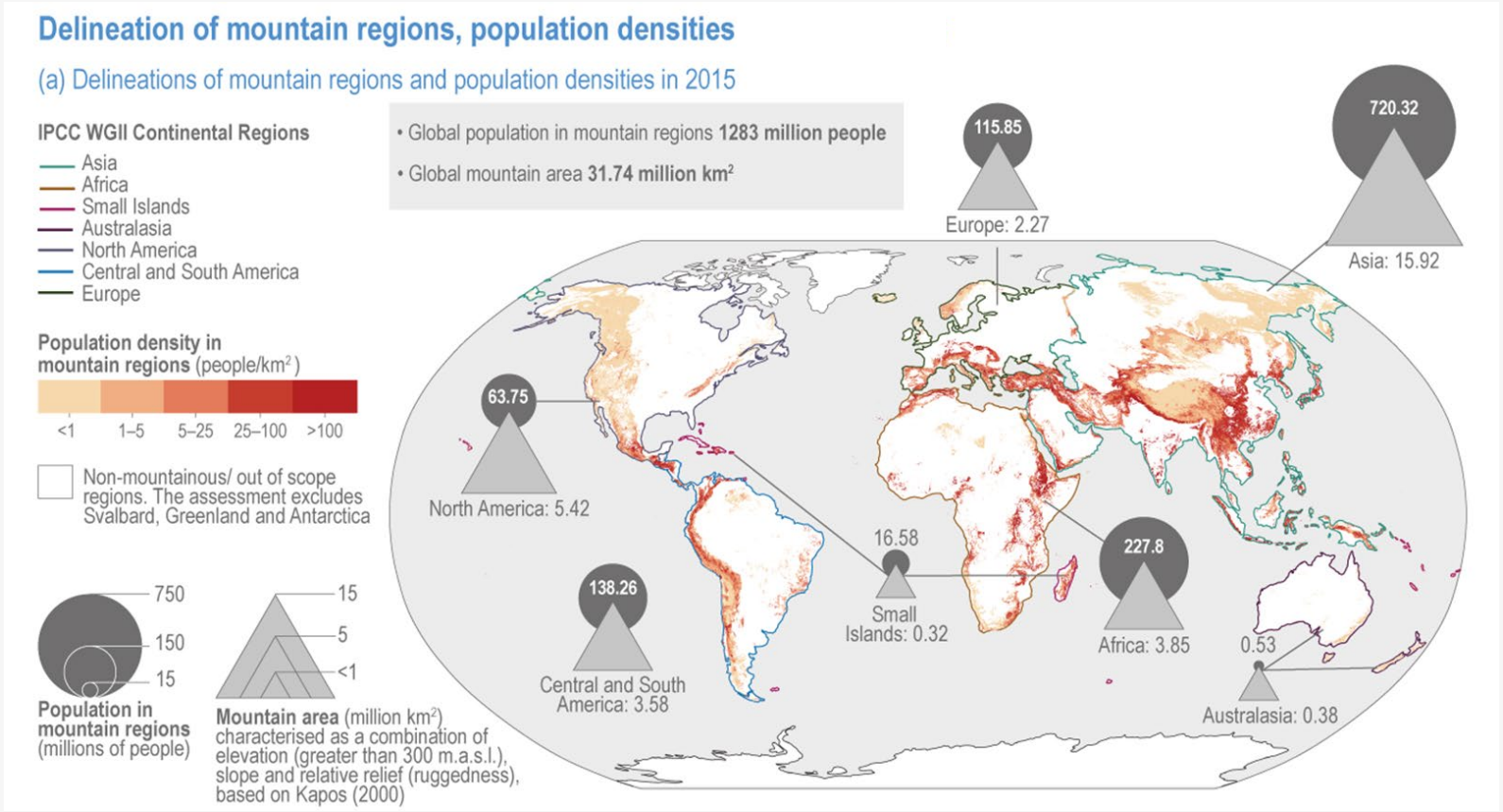
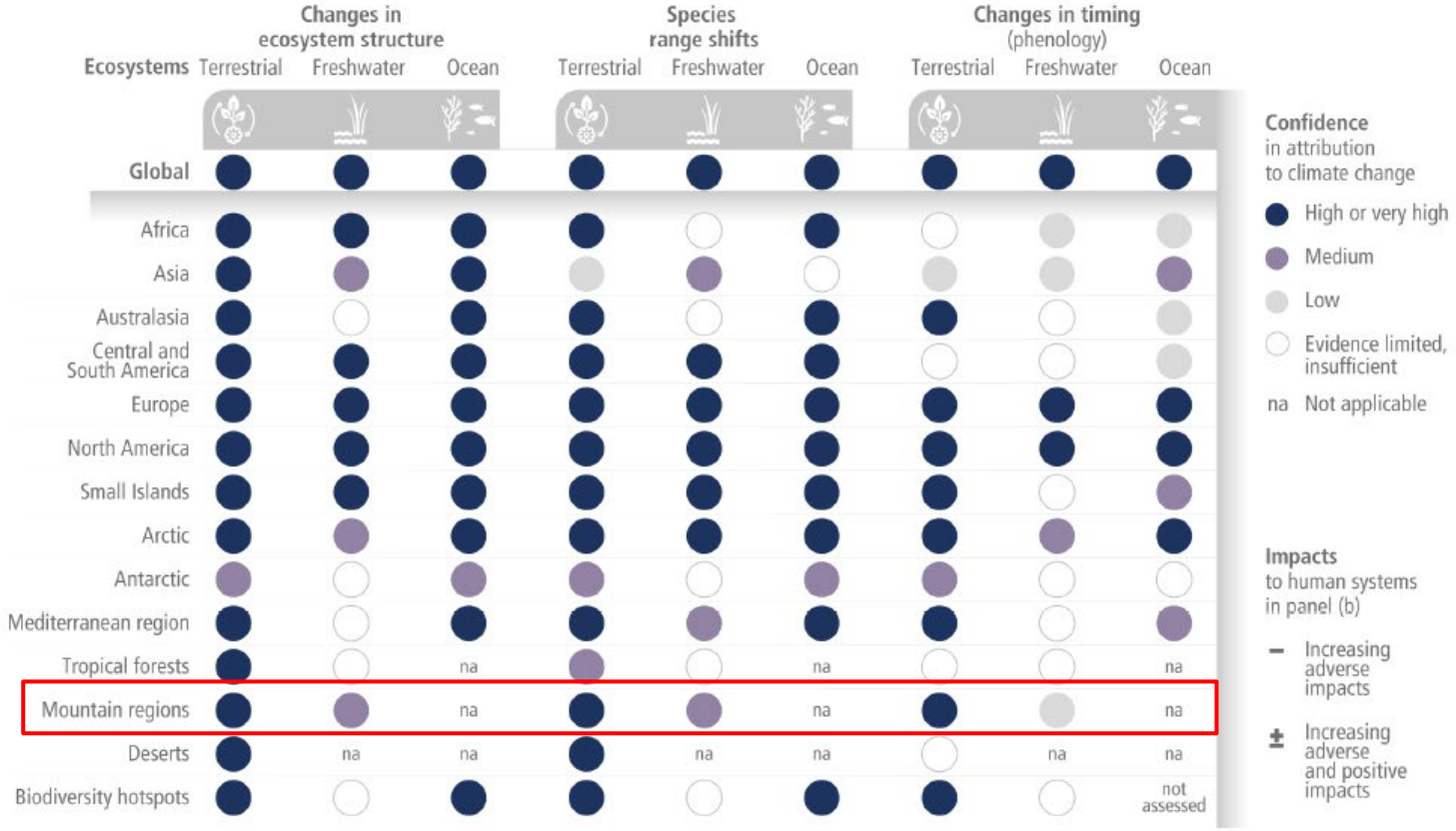


Approved IPCC WGII AR6 - Figure CCP5.1 (Adler *et al.* 2022) – subject to final copyedits

Figure SPM.2
(IPCC, 2022)

Impacts of climate change are observed in many ecosystems and human systems worldwide

(a) Observed impacts of climate change on ecosystems



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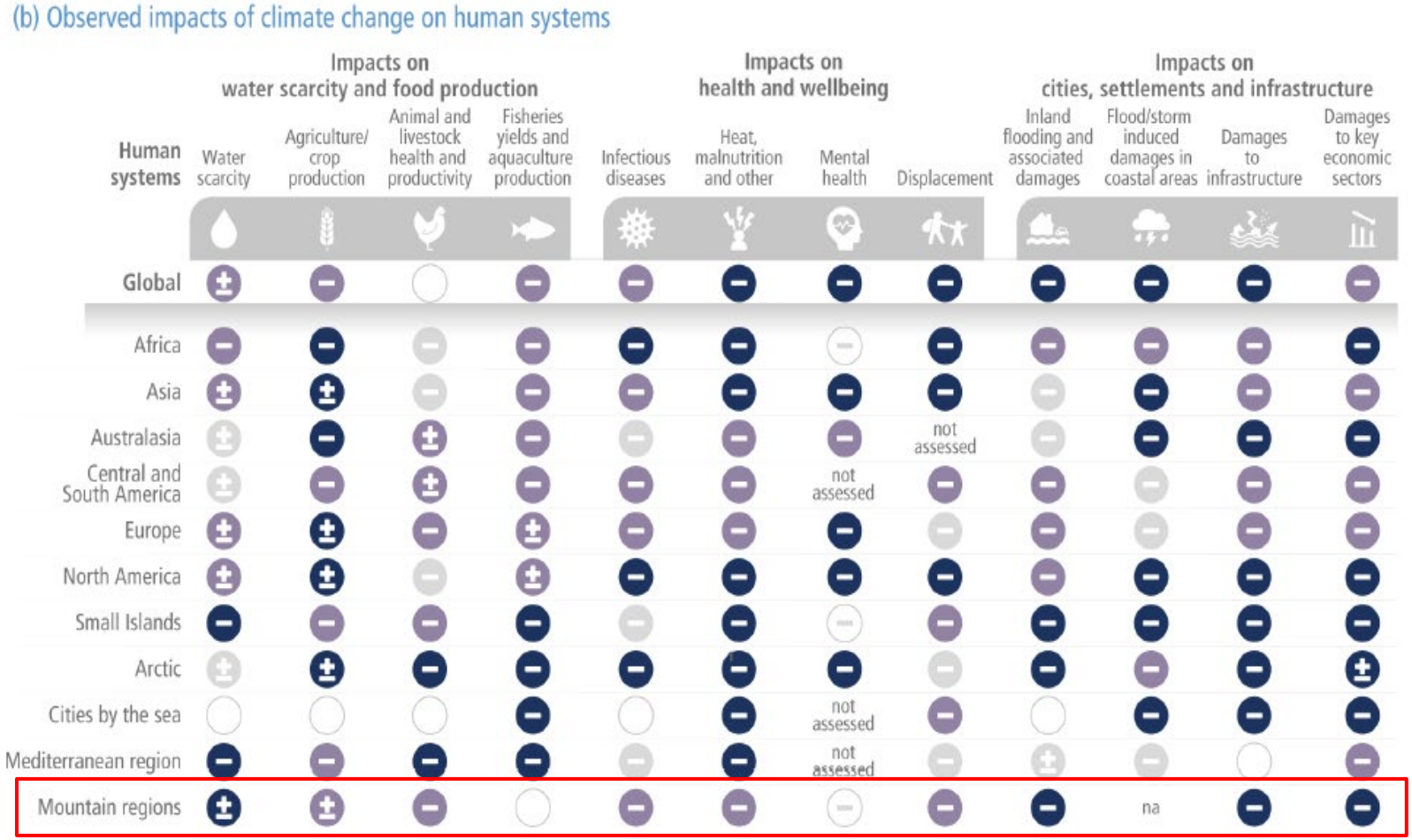

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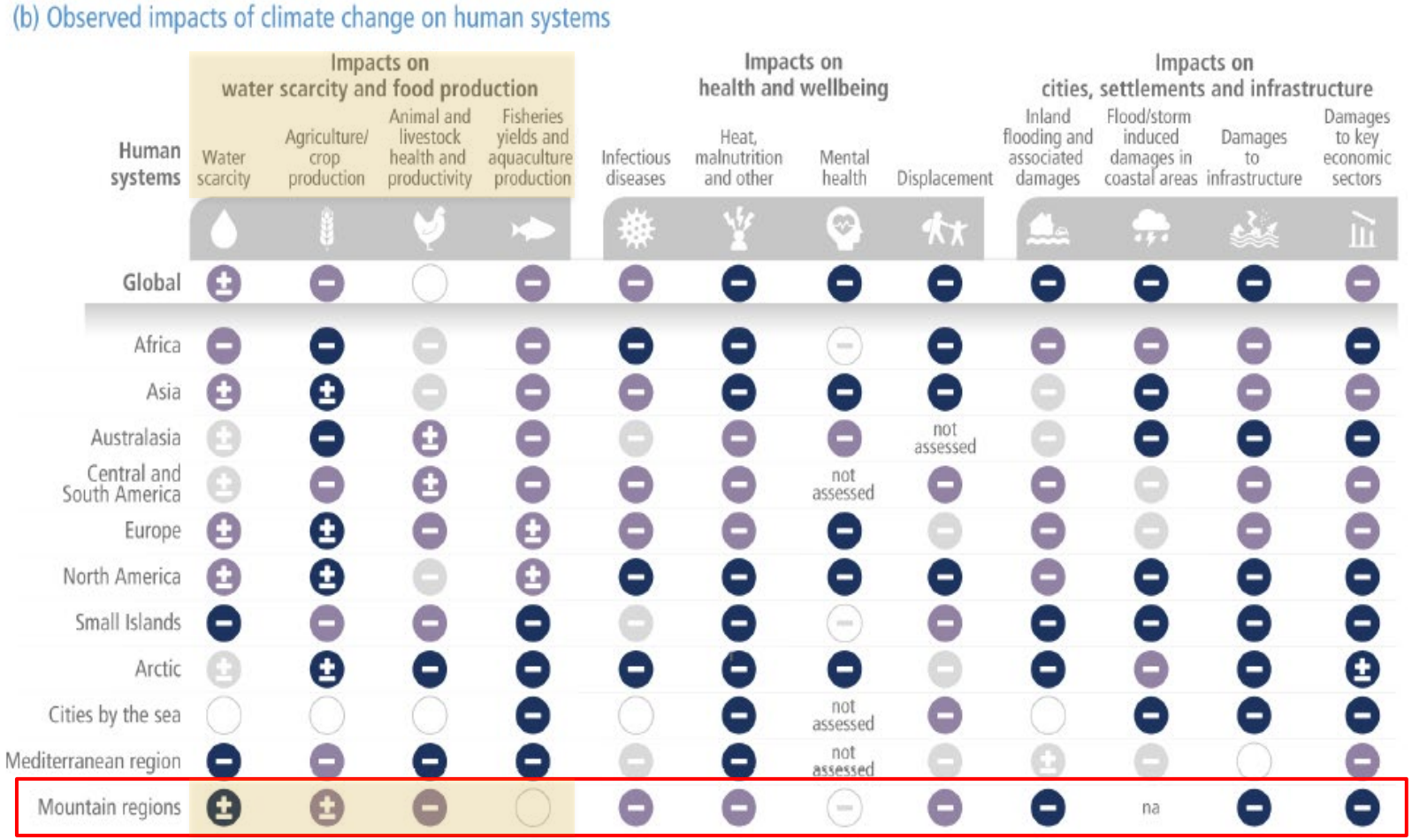

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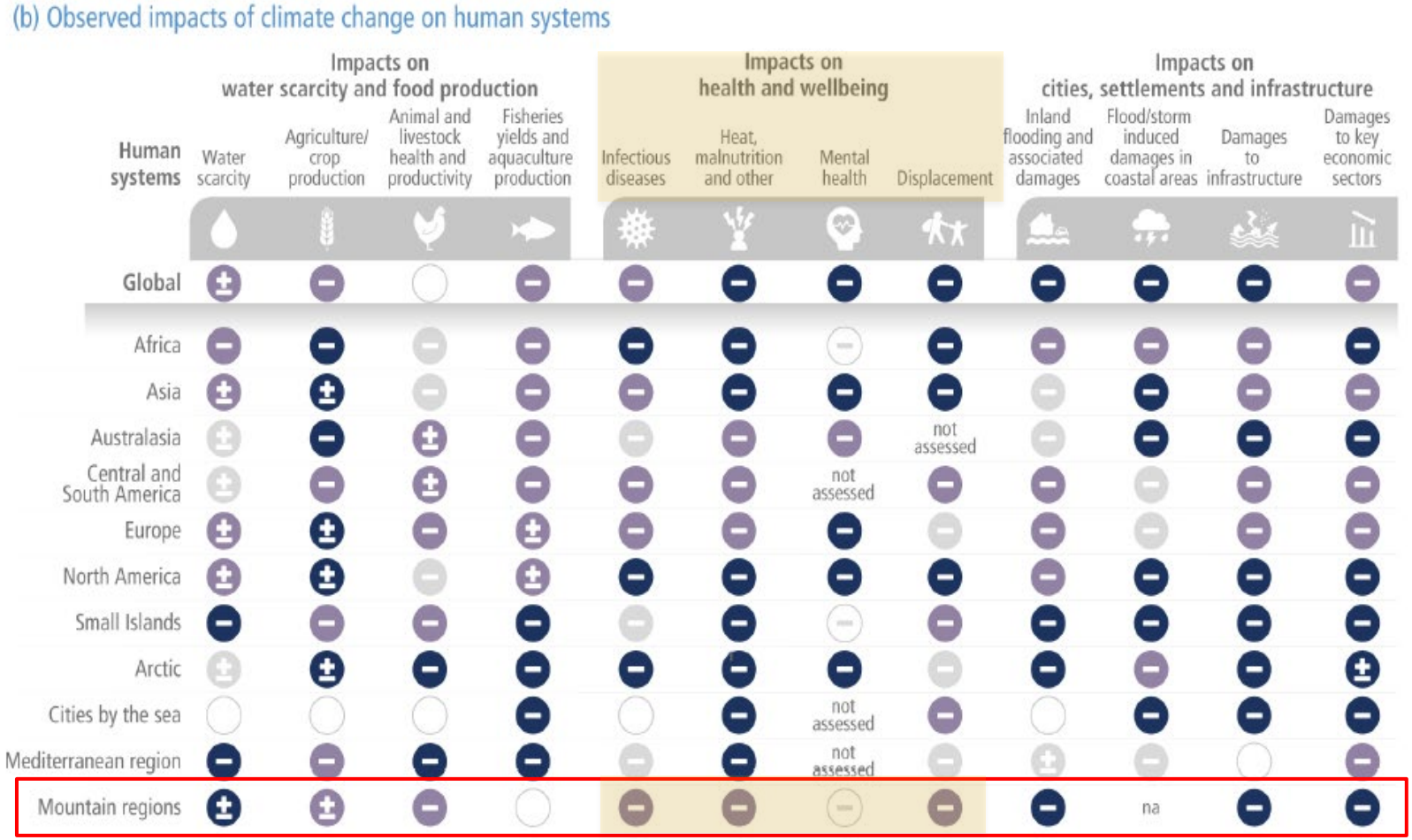

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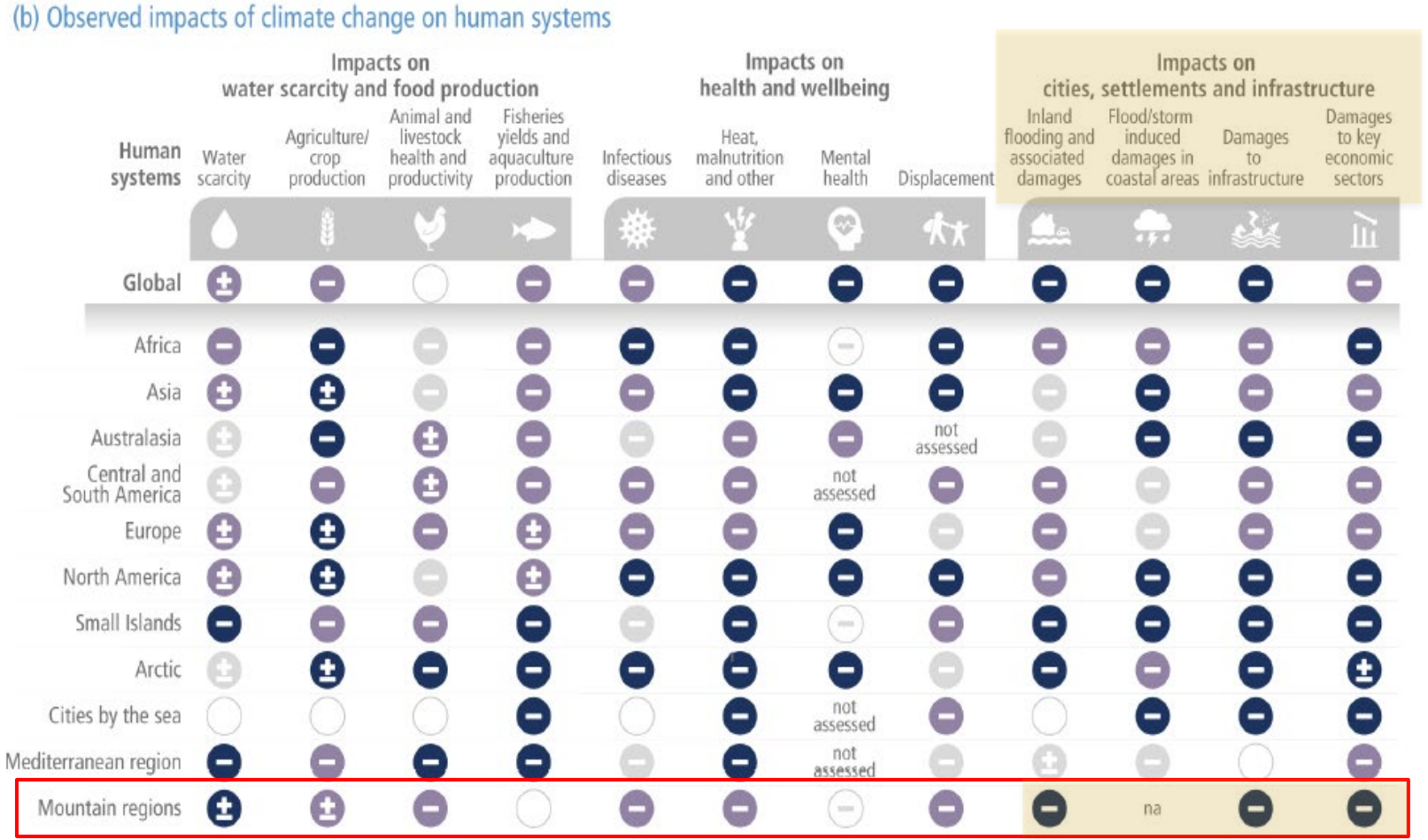


[Damian Markutt – Unsplash]


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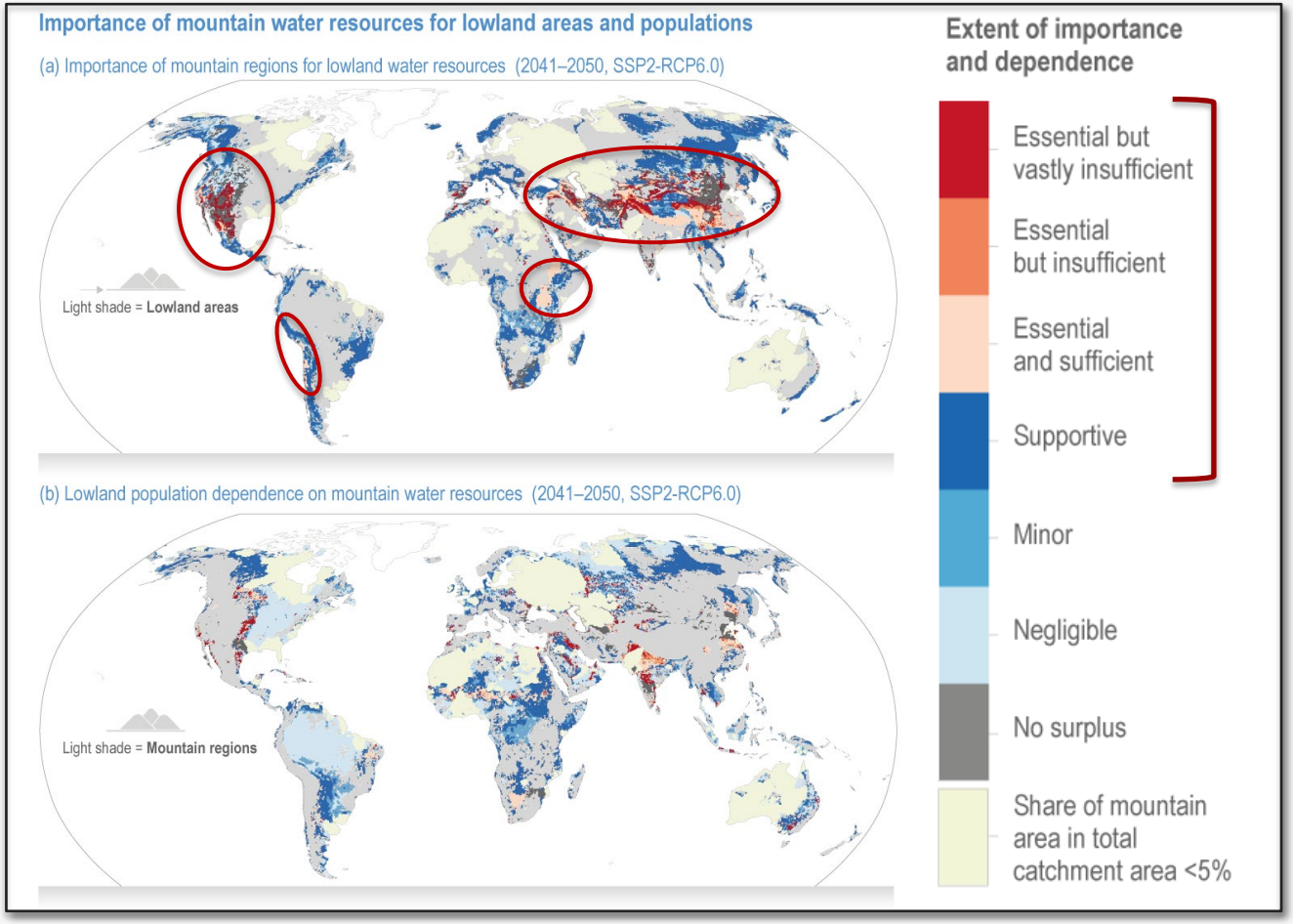
[Xavier von Erlach– Unsplash]

Observed climate change and impacts in mountain regions

- Climate change impacts, and their attribution to human influence, have increased - observable and serious consequences for people and ecosystems in many mountain regions.
- Two-thirds of irrigated agriculture is dependent on water from mountain sources. Variable timing of glacier- and snow-melt increasingly affecting people and economies, and exacerbating conflicts over water resources in seasonally dry regions.
- Observed seasonal changes negatively affecting tourism (e.g. winter); while exposure to climate-related hazards such as flash floods and landslides are contributing to an increase in disasters affecting a growing number of people in mountain regions and further downstream.



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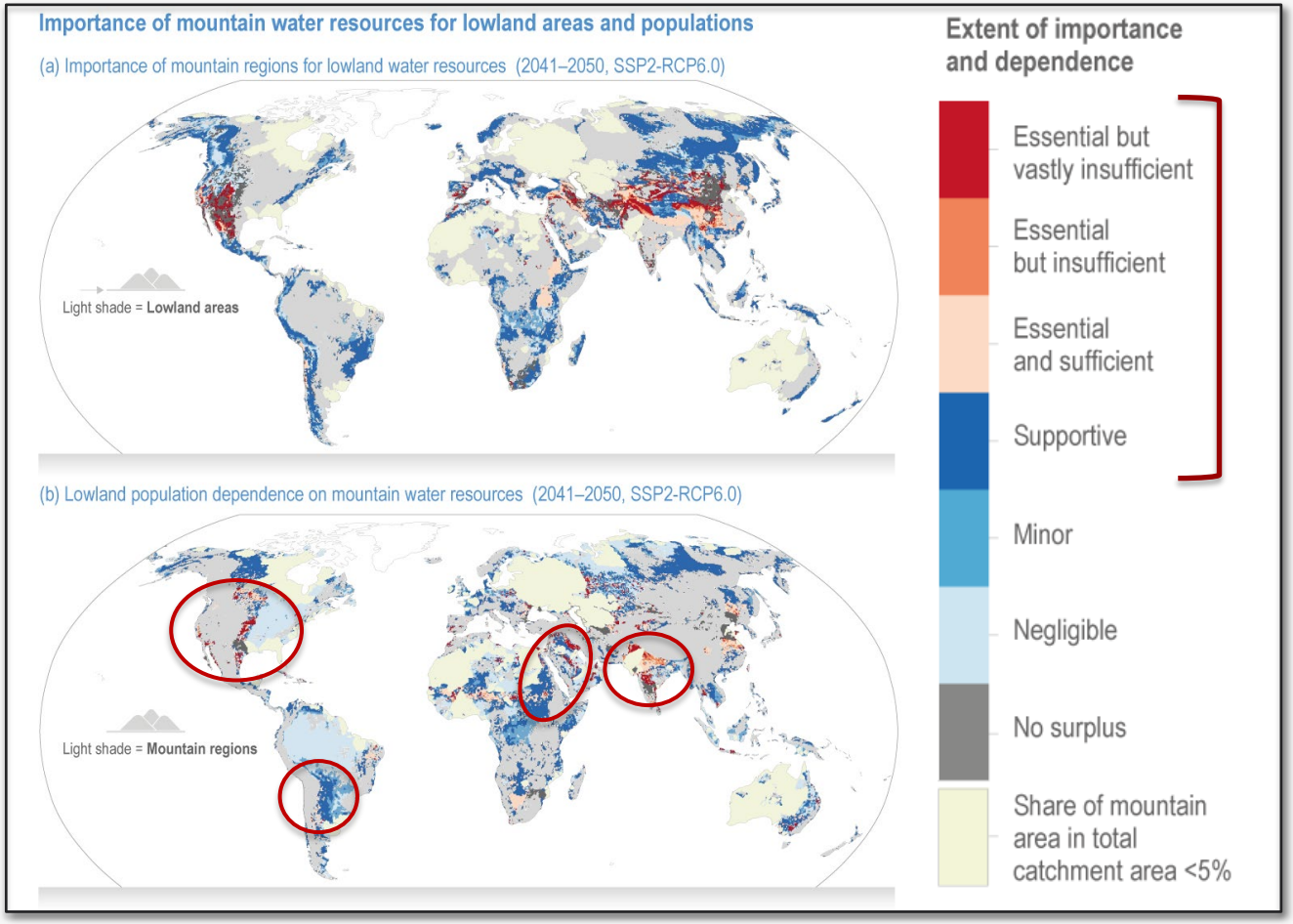

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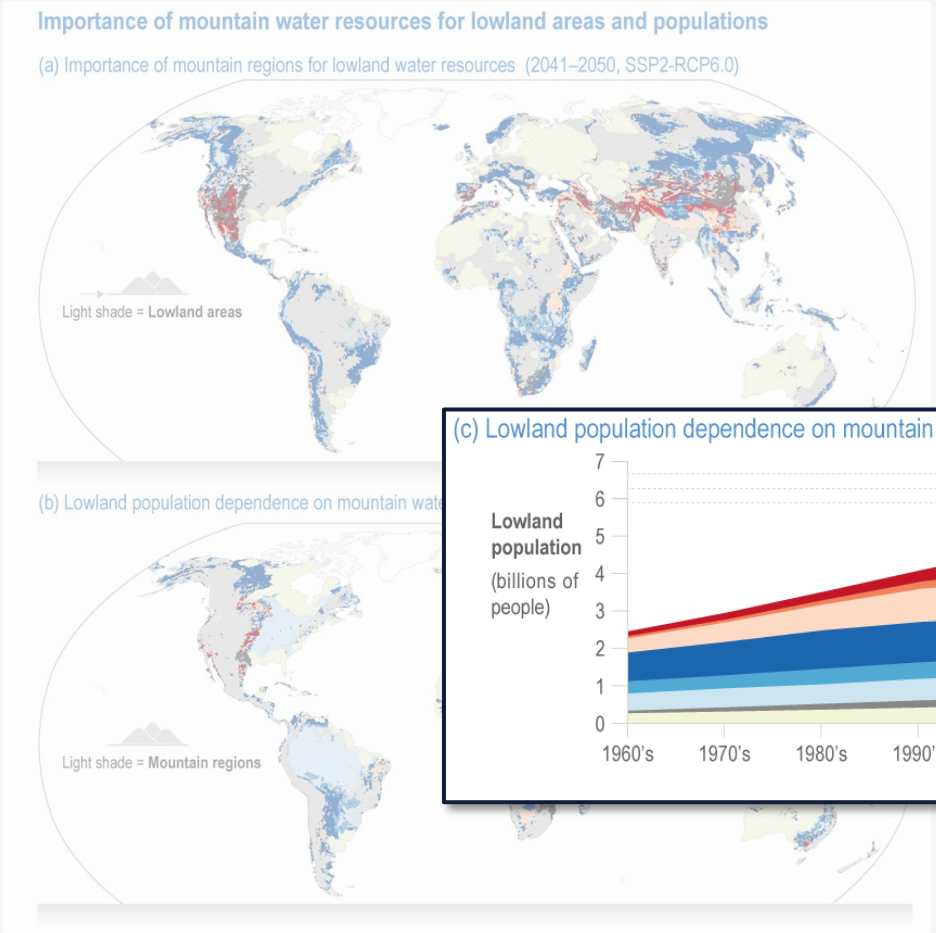
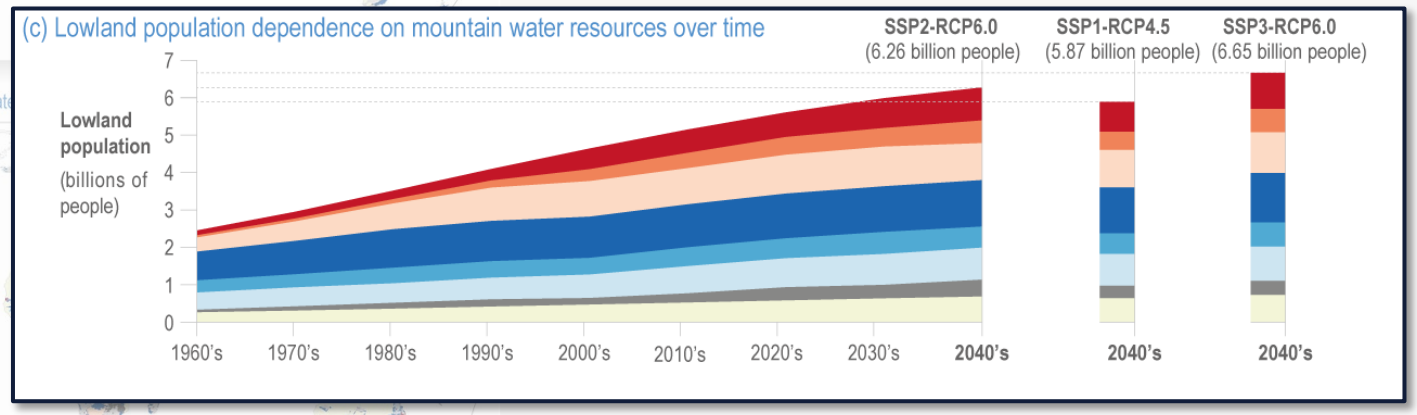


Mountains are an essential source of freshwater for large, and growing populations

The number of people largely or fully dependent on water from mountains has increased worldwide from ~0.6 billion in the 1960s to ~2 billion in the past decade.



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> Increasing temperatures will continue to induce changes in mountain regions throughout the 21st century, with expected negative consequences for mountain cryosphere, biodiversity, ecosystem services and human well being (CCP5.3.1)

Photo Vivek Sharma/unsplash

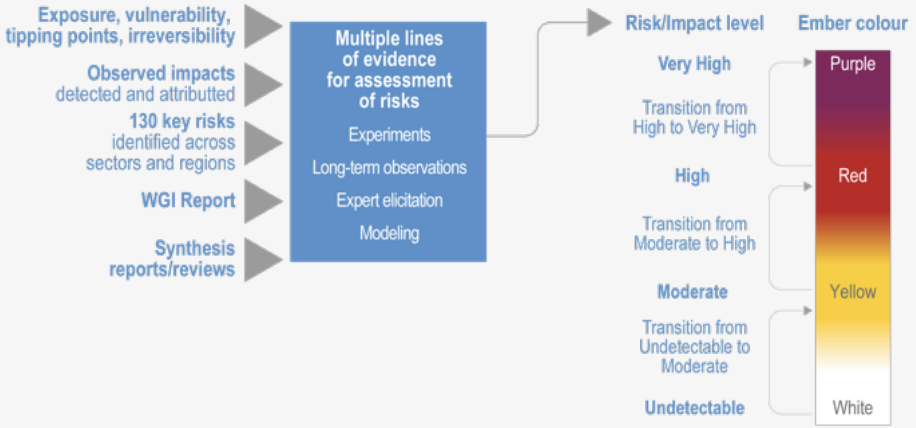
Projected impacts at 1.5°C and beyond

- Many low elevation and small glaciers will lose most of their total mass at 1.5°C.
- Endemic mountain species will be at increasingly risk of extinction by exceeding 1.5°C (even temporarily).
- Regions relaying on glacier- and snow-melt for irrigation will face erratic water supply and increased food insecurity (already irreversible).
- Damages and losses from water related hazards such as floods and landslides are projected to increase between 1.5°C and 3°C. Globally projected increase in direct flood damages are 2.5-3.9 times higher at 3°C compared to 1.5°C.

Ref CCP5.3, SPM.B.4.2, SPM.B.6.1

Photo: Danny Postma, Unsplash

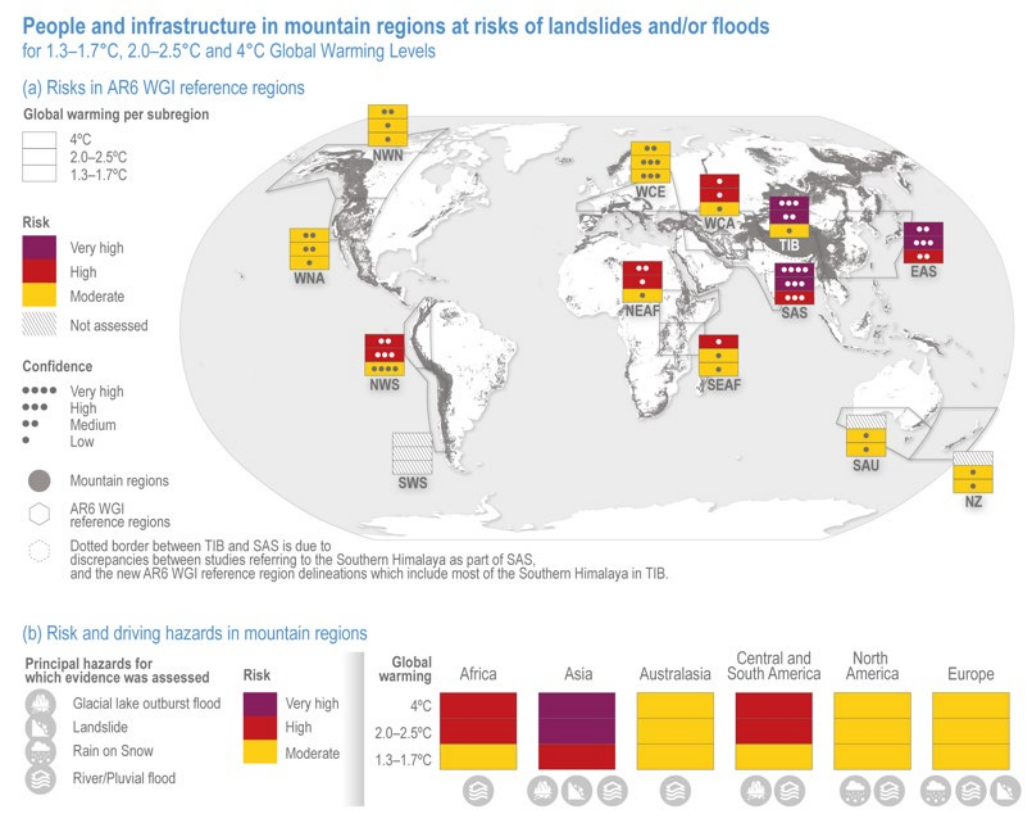
Key risks assessments and key risks in mountains



- Loss of lives, harm to people, and damages to infrastructures from landslides and floods.
- Adverse impacts to livelihoods and risks to economic sectors for mountain communities and in the lowlands from changes in water supply and its managements.
- Changes to mountain ecosystems and risks of mountain top species extinction due to warming and range constraints including shifts in treelines.
- Intangible losses and harm to people and loss of cultural values from decline of ice, snow cover and warming as well as increase in disasters.

Ref CCP5.3.2

Loss of lives, harm to people, and damages to infrastructures from landslides and floods

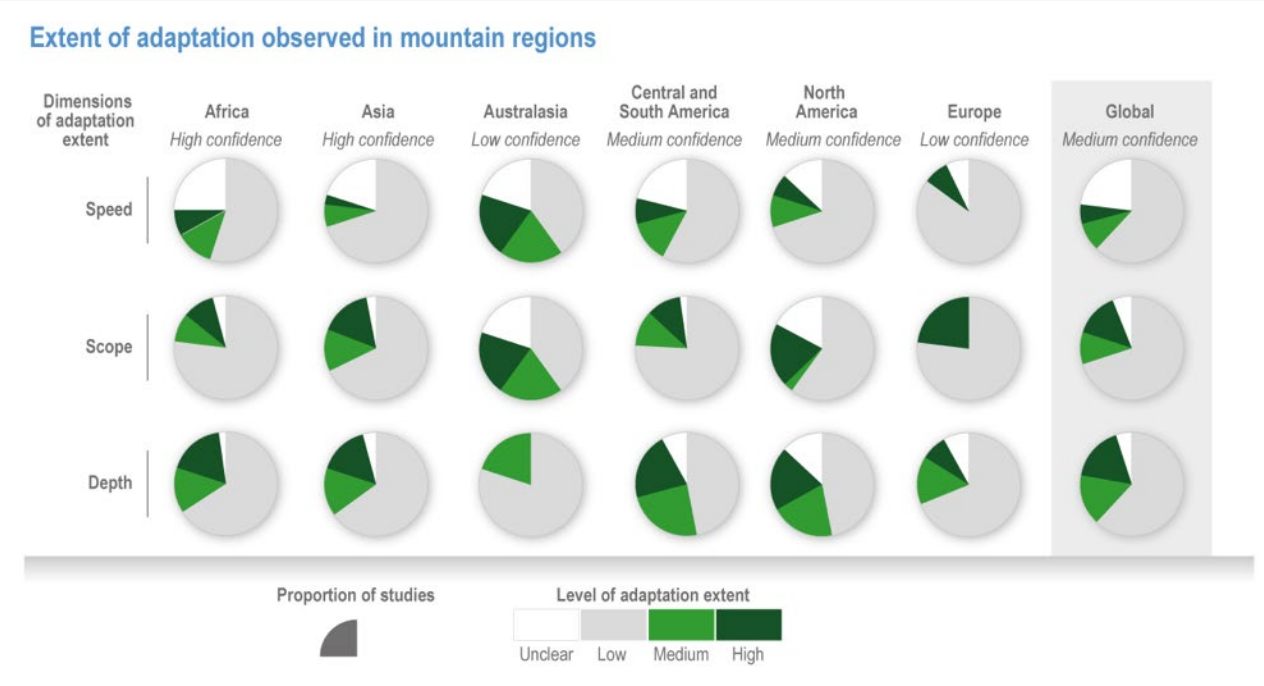


Examples of severe consequences in mountains by mid to end century

- **Twofold average** increase in the number of people exposed to inland flooding between **2°C and 4°C** with highest increases in South Asia, Southeast Asia and North-western South America.
- **By mid century 50 to 100%** of the lowland population is projected to become water stressed in areas dependent on essential but largely insufficient share of freshwater (e.g. Northwestern South America, Central Asia).
- Underlying conditions contributing to the severity of consequences: current level of vulnerabilities continuing into the future (e.g. Northwestern South America and South Asia); people and infrastructure in new hazard prone locations; high dependency on water supplies from snow melt and glaciers (e.g. Northwestern South America, Central Asia, South Asia); limited financial resources and low adaptive capacity.

Ref CCP5.3.2, SM16.7.4

The extent of implemented and planned adaptation in mountains is insufficient to address future (key) risks in mountains and in particular at higher warming (beyond 1.5°C)



Extent of planned and implemented adaptation actions observed in mountain regions shown in terms of three dimensions: i) speed (timeframe within which adaptations are being implemented), ii) scope (the scale of changes observed from the adaptation action), and iii) its depth (i.e., degree to which a change reflects something new)

CCP5.7 Figure shown for illustrative purposes only. Figure subject to final edit. Do not cite or reuse

With warming above 1.5°C the needs for adaptation to address the key risks becomes increasingly urgent. We are not on track to achieve a climate resilient, sustainable world

- Effective measures to reduce risks are those that are robust under uncertain futures (i.e. allow for adaptive planning), incorporate people's concern and values and address multiple risks.
    - Examples: Ecosystem-based adaptation / awareness raising combined with early warning systems; multi-purpose water reservoirs.
- Regional cooperation and transboundary governance enable long-term actions where risks go beyond boundaries and jurisdictions.
- Ability of adaptation to reduce risks declines with increasing warming.
- The scope and options to achieve a climate resilient and sustainable development will become more limited by 2°C and might not by possible in some regions and sub-regions (including mountains) if warming exceed 2°C.

Ref CCP5.4, SPM.D.5.1

THANK YOU

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