Working Group II : Impacts, Adaptation, and Vulnerability

Observed impacts and projected key sectoral risk, and potential and opportunities for adaptation

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WMO UNEP

ipcc INTERGOVERNMENTAL PANEL ON climate change

Increasing temperatures

Glacier shrinkage

Changing water resources

Impact on crops/cattle

Impact on livelihoods

Decreasing climate signal

Increasing number of confounders

Terrestrial ecosystems

Have we observed any changes in ecosystem functioning and will ecosystems under future climate change still be able to provide essential service functions?

Manyfold changes in ecosystems observed, but so far non-climatic factors more dominant drivers of ecosystem change
=> exception: highly temperature sensitive systems, i.e. in polar and high-mountain regions (or temperature low tolerant systems: the tropics) .

Example:
‚Peak water' has been passed in several glacier-fed regions (e.g. Andes)
1.5°C and 2°C targets make a difference to cryosphere systems, and low/high emission scenarios make an very significant difference (location/region specific)

Terrestrial ecosystems

The response time in many ecosystems implies late recognition of change and tipping points

Terrestrial ecosystems

Global temperature increase 1911 – 2005:
ca. **0.8°C**

Regional/local temperature increase (Swiss Alps) 1911 – 2005:
ca. **1.6°C**

Glaciers worldwide are not in balance with current climate!

Morteratsch Glacier Switzerland

Gesellschaft für ökologische Forschung, München

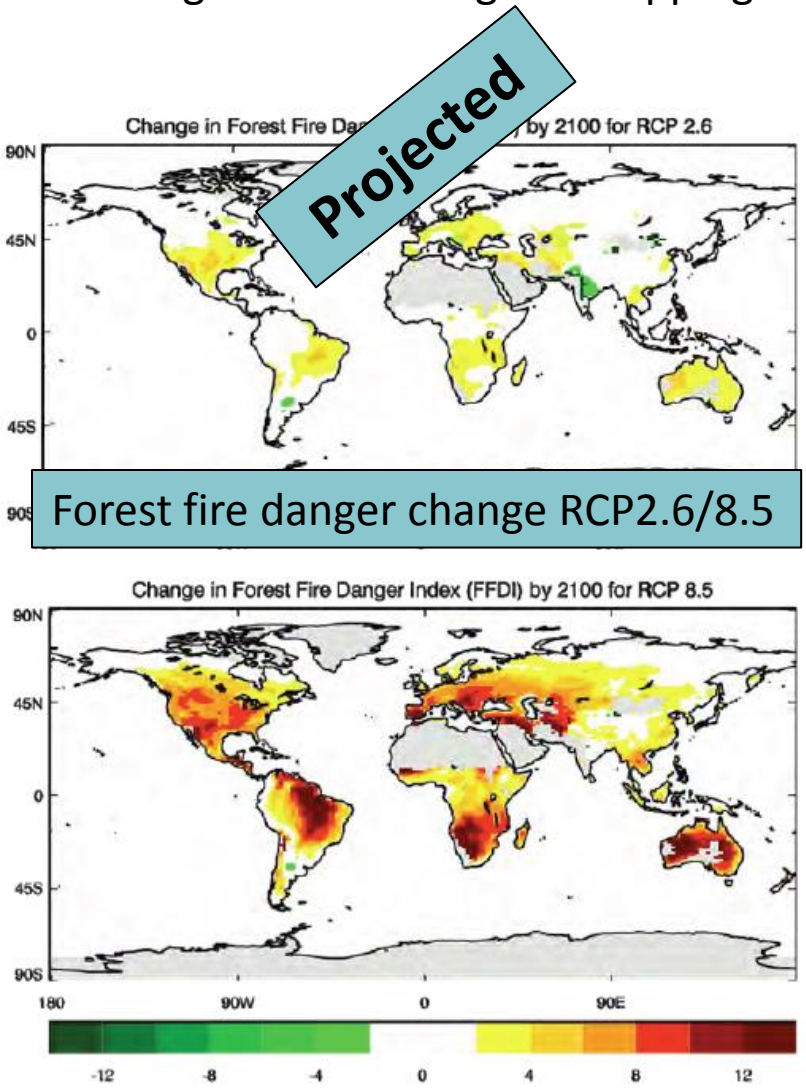
Terrestrial ecosystems

The response time in many ecosystems implies late recognition of change and tipping points

Other drivers (e.g. land-use change) will continue to dominate for low to moderate emission scenarios (exception: highly temperature sensitive and little disturbed ecosystems)

For many ecosystems/species adaptive capacity is insufficient for medium-to-high warming scenarios (=> extinction, loss)
=> Reducing other stressors enhances adaptive capacity

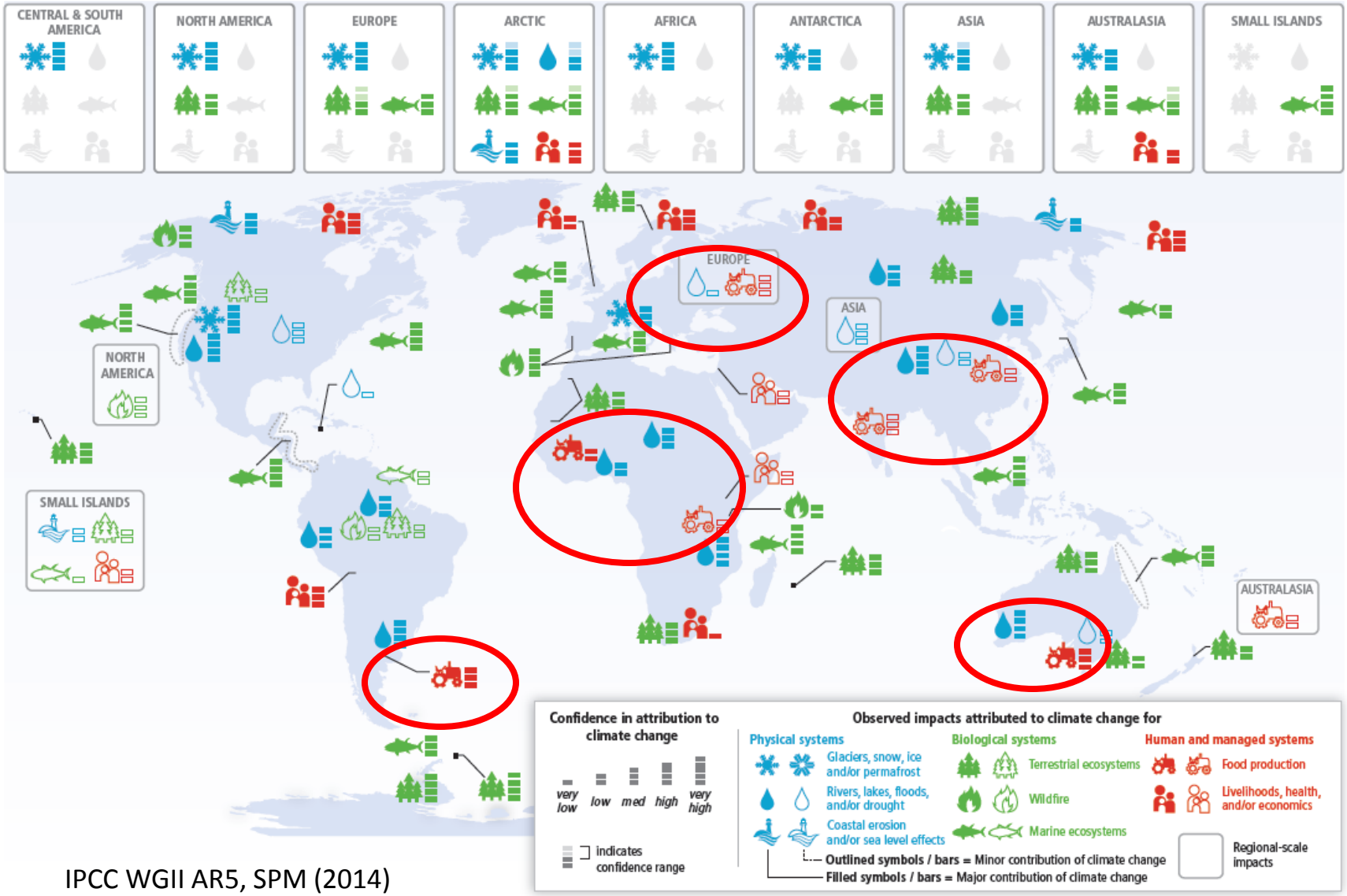
Example:
High confidence that rising water temperatures will lead to shifts in freshwater species and water quality problems



Forest fire danger change RCP2.6/8.5

IPCC WGII, chapter 4

Food production and security



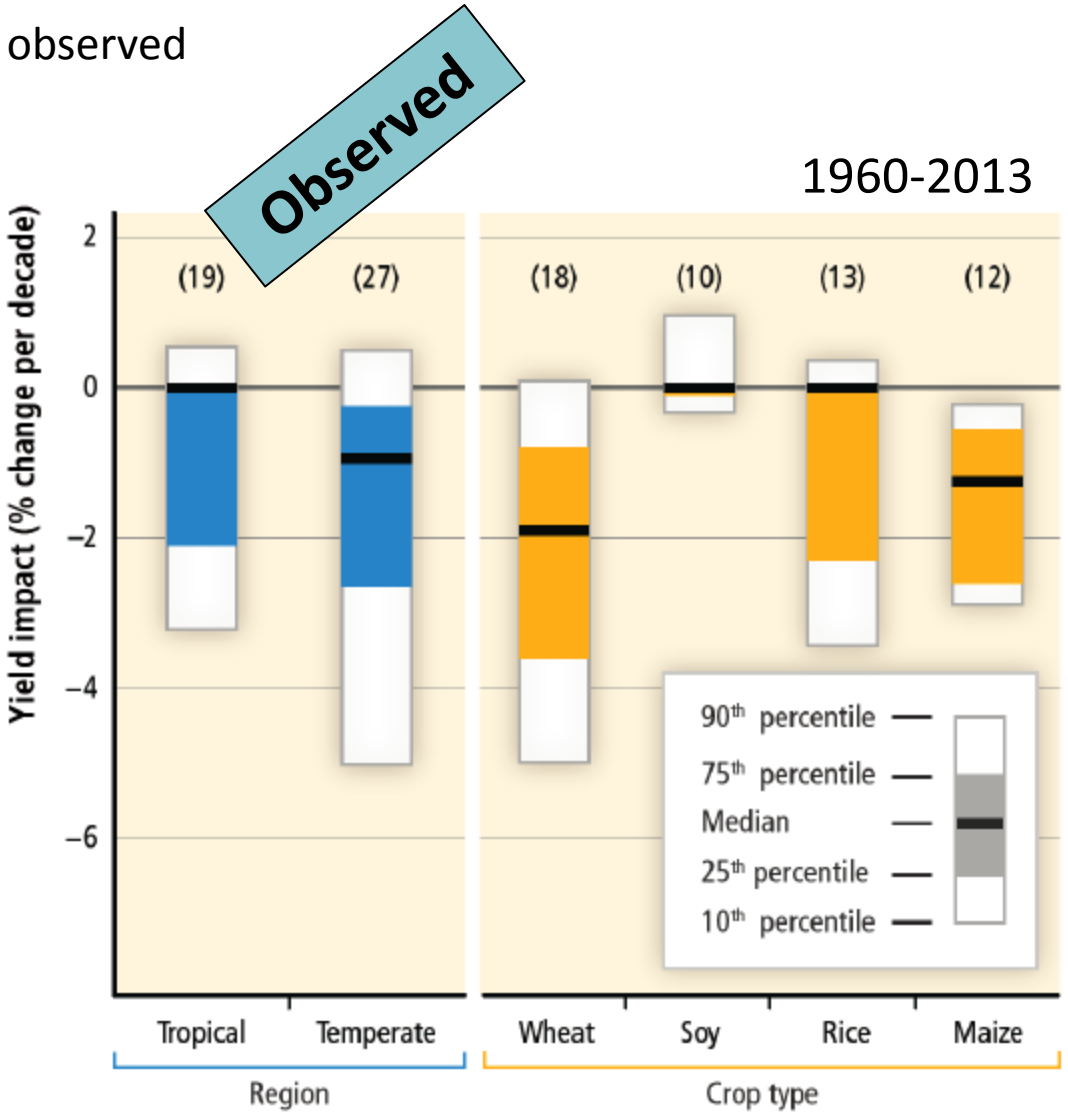
IPCC WGII AR5, SPM (2014)

Food production and security

Impacts on food production mainly observed for agricultural crops and fisheries.

Global trends in climate (summer temp, extremes) have had negative impacts on yield trends of certain crops.

High confidence of major role of climate change on spatial distribution of marine fishes (species composition of harvest)



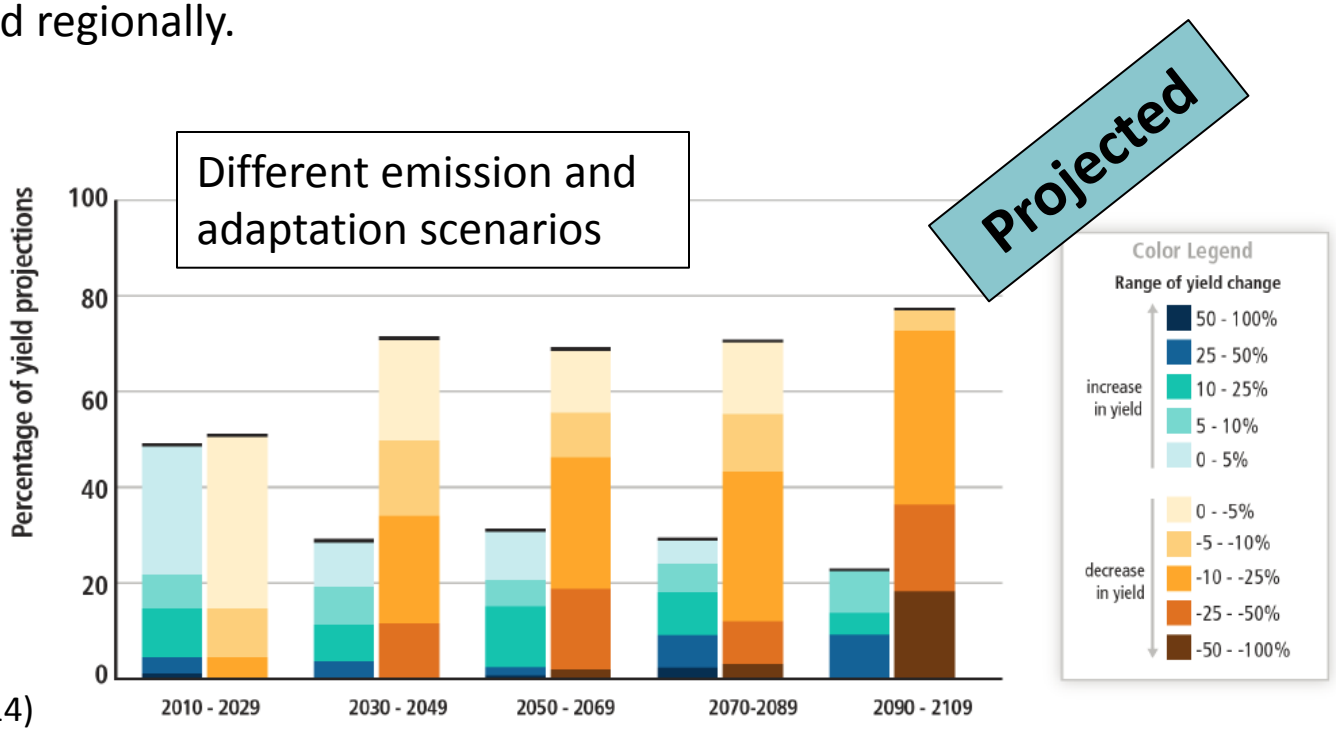
IPCC WGII AR5, TS (2014)

Food production and security

Increasing negative impacts on crop yields and food production with increasing warming.

All aspects of food security potentially affected by climate change (food access, utilization, price stability).

High-emission scenarios, combined with high food demand, pose large risks to food security globally and regionally.



IPCC WGII AR5, SPM (2014)

Forest fire Portugal, EPA

Economic losses from extreme weather events

Confidence in detection and attribution of extreme weather events to human contribution (IPCC WGI):

High confidence	*Medium conf.*	*Low confidence*
Hot days	Heavy precipitation	Tropical cyclones
	Heat wave	Drought

Observed

Increasing economic costs of disasters related to extreme weather mainly due to observed increase in exposure and wealth

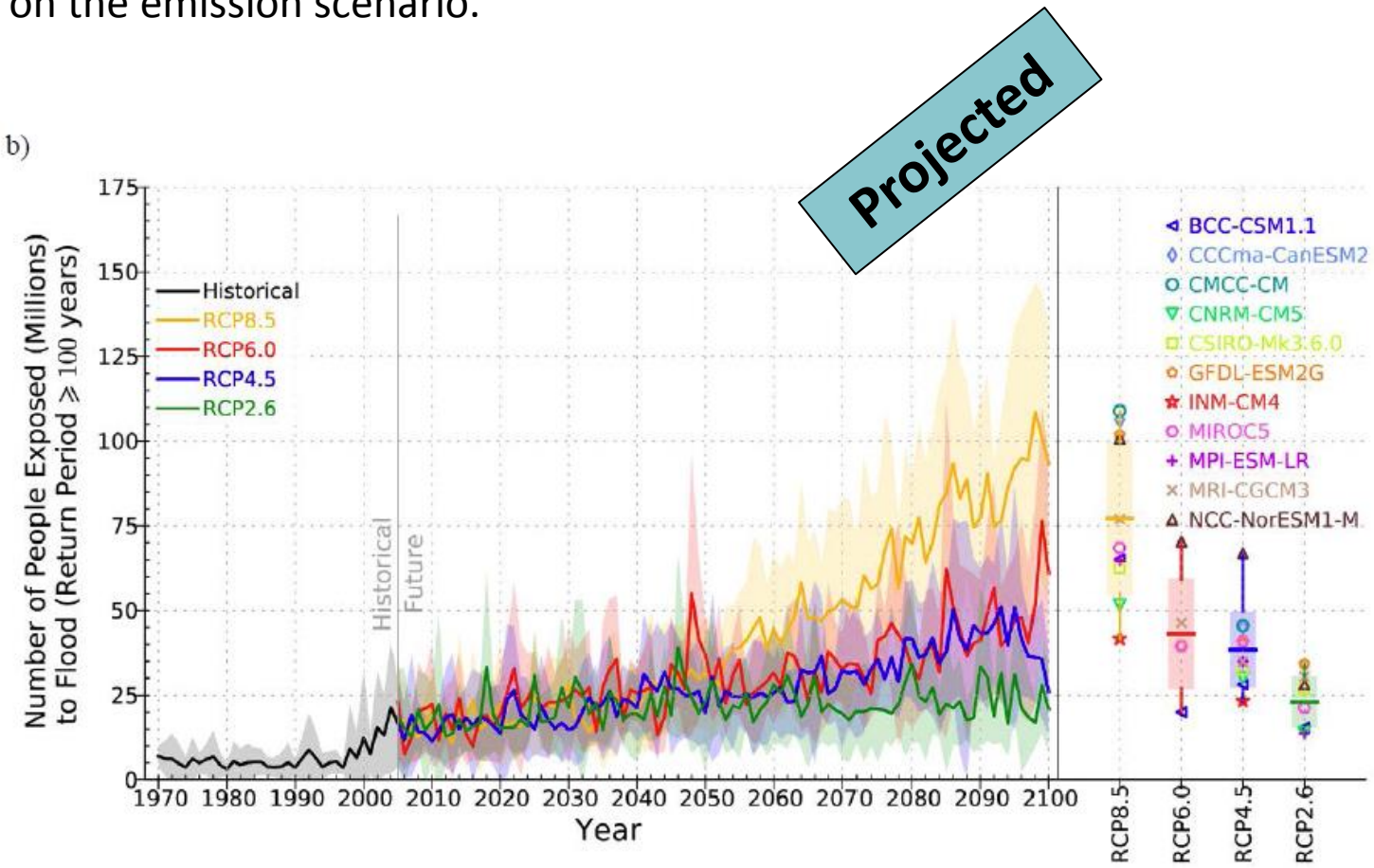
Future losses will be dominated by exposure and vulnerability but climatic drivers of loss will increase over the next decades
=> There is a large potential but differentiated capacity for risk reduction by adaptation (effective on exposure and vulnerability)

Projected

For the context of loss and damage a comprehensive risk framework is supporting the attribution of the different drivers of risks (ongoing post-AR5 studies on questions of attribution and liabilities)

Economic losses from extreme weather events

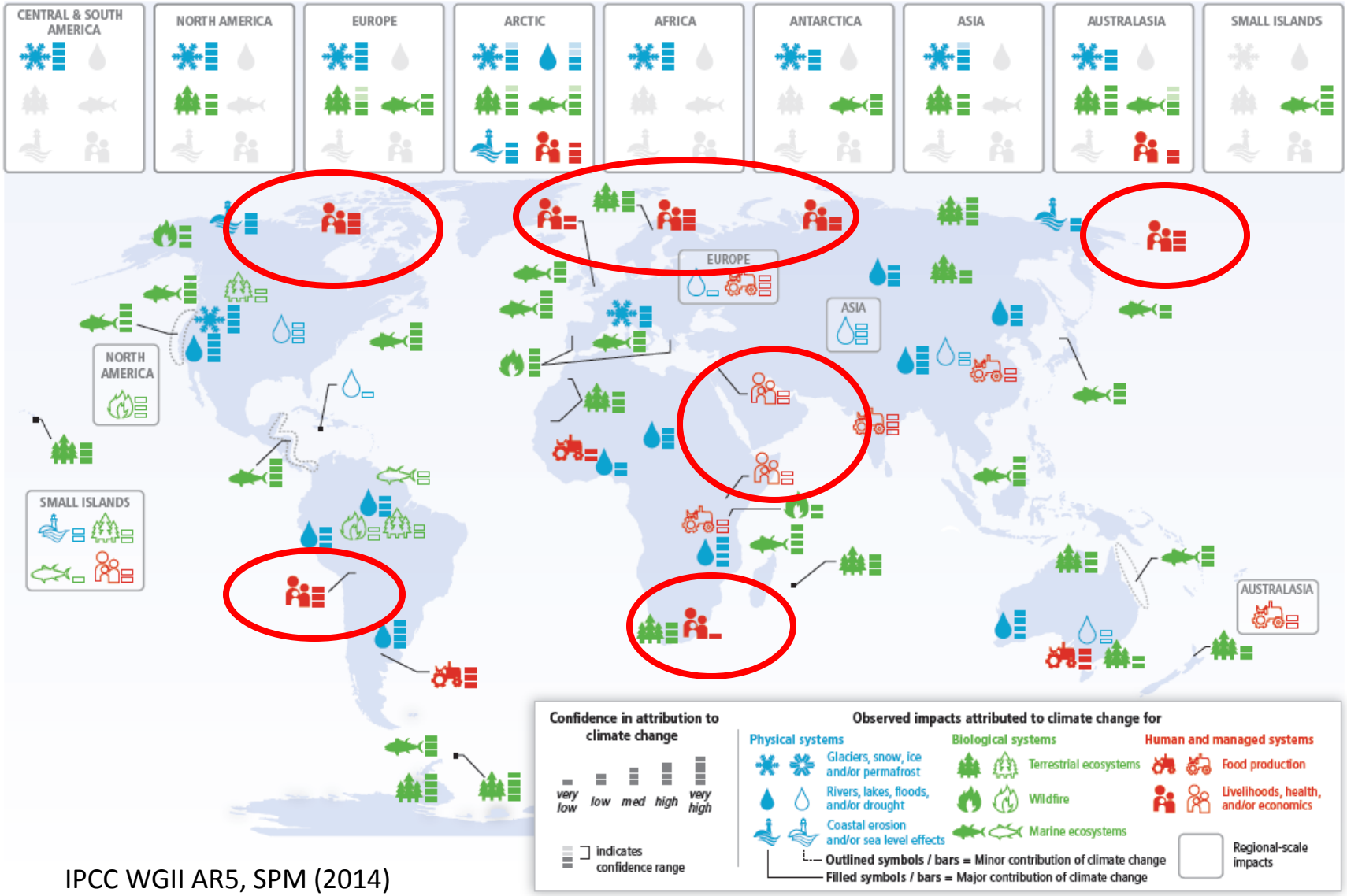
Example: under a scenario of moderate population growth, the global number of people exposed to floods is projected to increase by a factor of 7 – 25, depending on the emission scenario.



IPCC WGII, chapter 3 / Hirabayashi et al., 2013

Gordon Wiltsie (NatGeo)

Livelihoods



IPCC WGII AR5, SPM (2014)

Livelihoods

New, emerging and clearer evidence on climate change impacts on livelihoods! Best evidence of observed impacts of climate change on livelihoods comes from temperature-sensitive regions (Polar region, high-mountains)

Observed

In many regions (Asia, Africa, Latin America) observed impacts on livelihoods so far are related to climate variability and extremes

Climate related hazards exacerbate other stressors => negative impacts on livelihoods

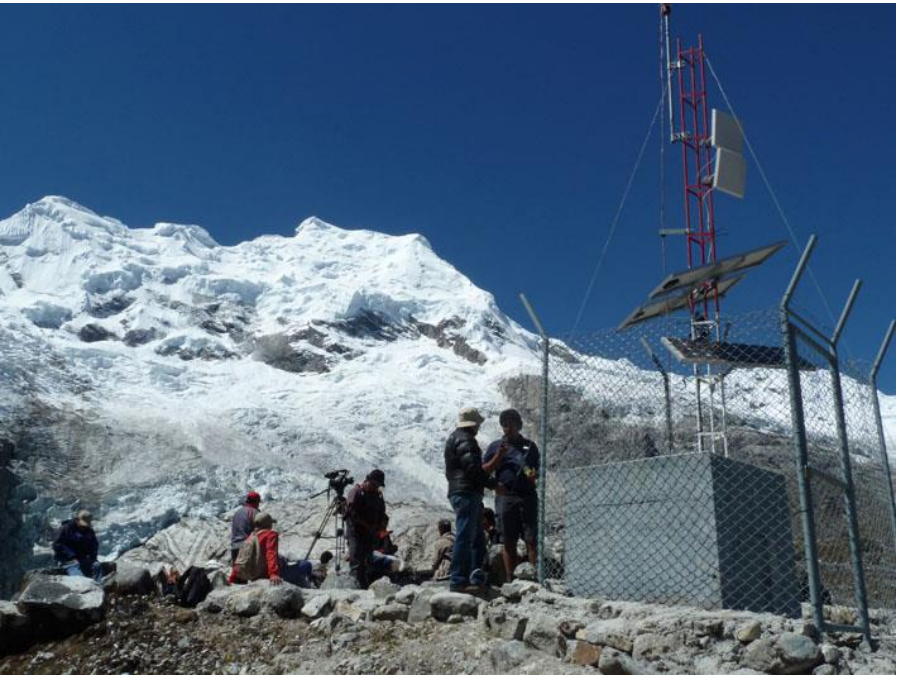
Climate change impacts are expected to slow down economic growth, joepardize poverty reduction and erode food security

Projected

There is a suite of adaptation measures to enhance resilience of vulnerable people; comprehensive/integrative approaches addressing the multi-dimensional aspects of livelihoods (including e.g. inequalities) are likely most effective

Adaptation experiences: co-benefits

Co-benefits between risk reduction and water resource management



Key messages

• More and stronger evidence of climate change impacts on natural and human systems (e.g. glaciers, crop yields, fish stocks, fires, corals, Arctic livelihoods)

• In many sectors/systems non-climatic factors have been more important drivers of risks than climatic factors, which, however, can be substantial additional stressors --- So far non-climatic factors have been more important drivers of risks than climatic factors, yet added substantial additional stress in some sectors such as (many ecosystems, agriculture, livelihoods/human wellbeing).

• For the future, the role of climatic stressors will increase and the magnitude heavily depend on the emission pathways

• Adaptation can effectively reduce risks if implemented with integrative strategies, yet is bound to reach unsurmountable limits (space, high-emission pathways, constraints in adaptive capacity). In systems such as the cryosphere, the Arctic in general, high mountains, or coral reefs those limits have already been reached

Thank you for your attention