Observed impacts, attribution to climate change and associated key risks

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IPCC WGII AR5, Lead Author Chapter 18:
‚Detection and attribution of climate change impacts‘

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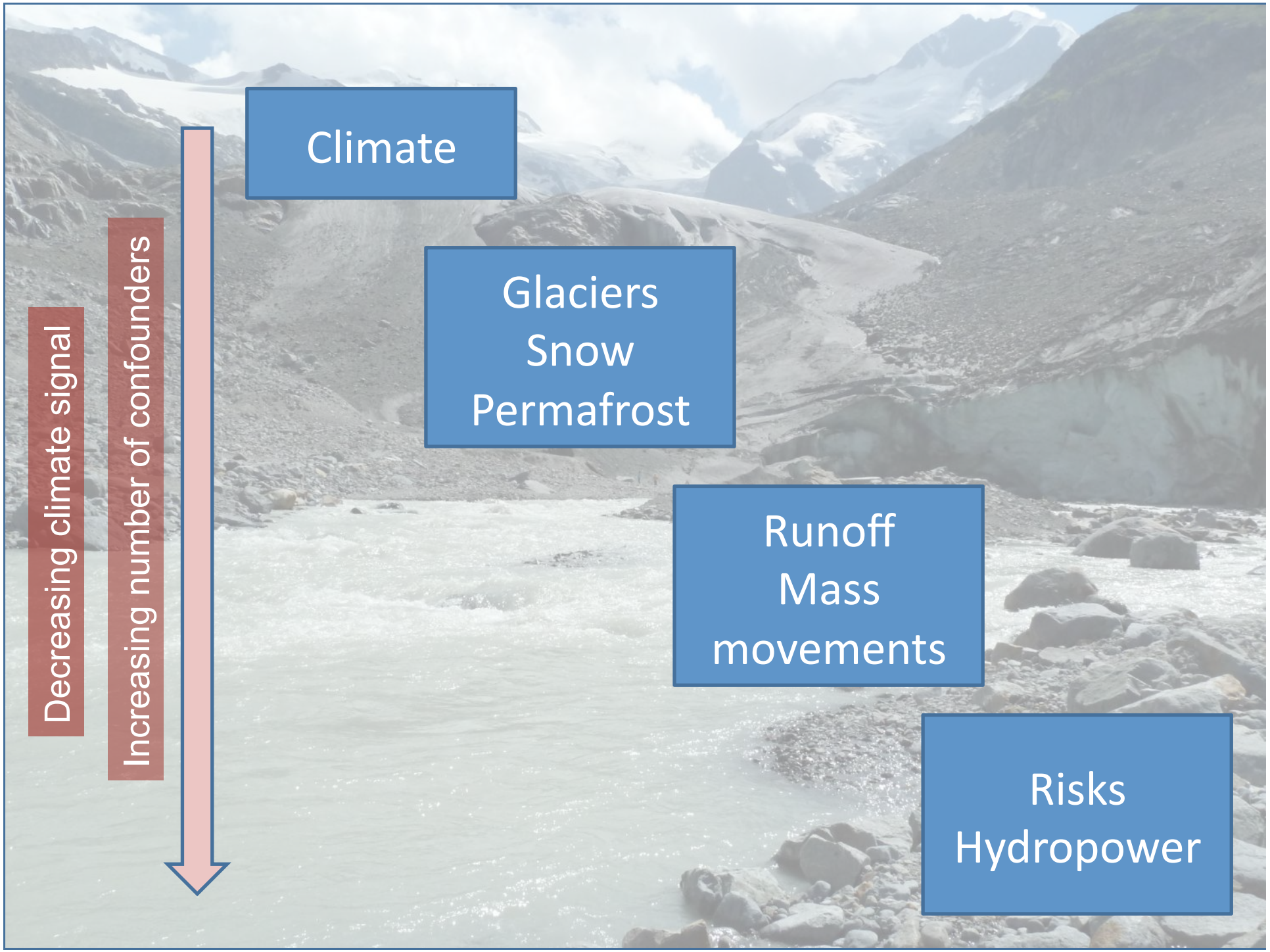
Detection and attribution

'**Human influence on the climate system is clear**.'
(IPCC WGI AR5, SPM)

'**In recent decades, changes in climate have caused impacts on natural and human systems on all continents and across the oceans.'**
(IPCC WGII AR5, SPM)

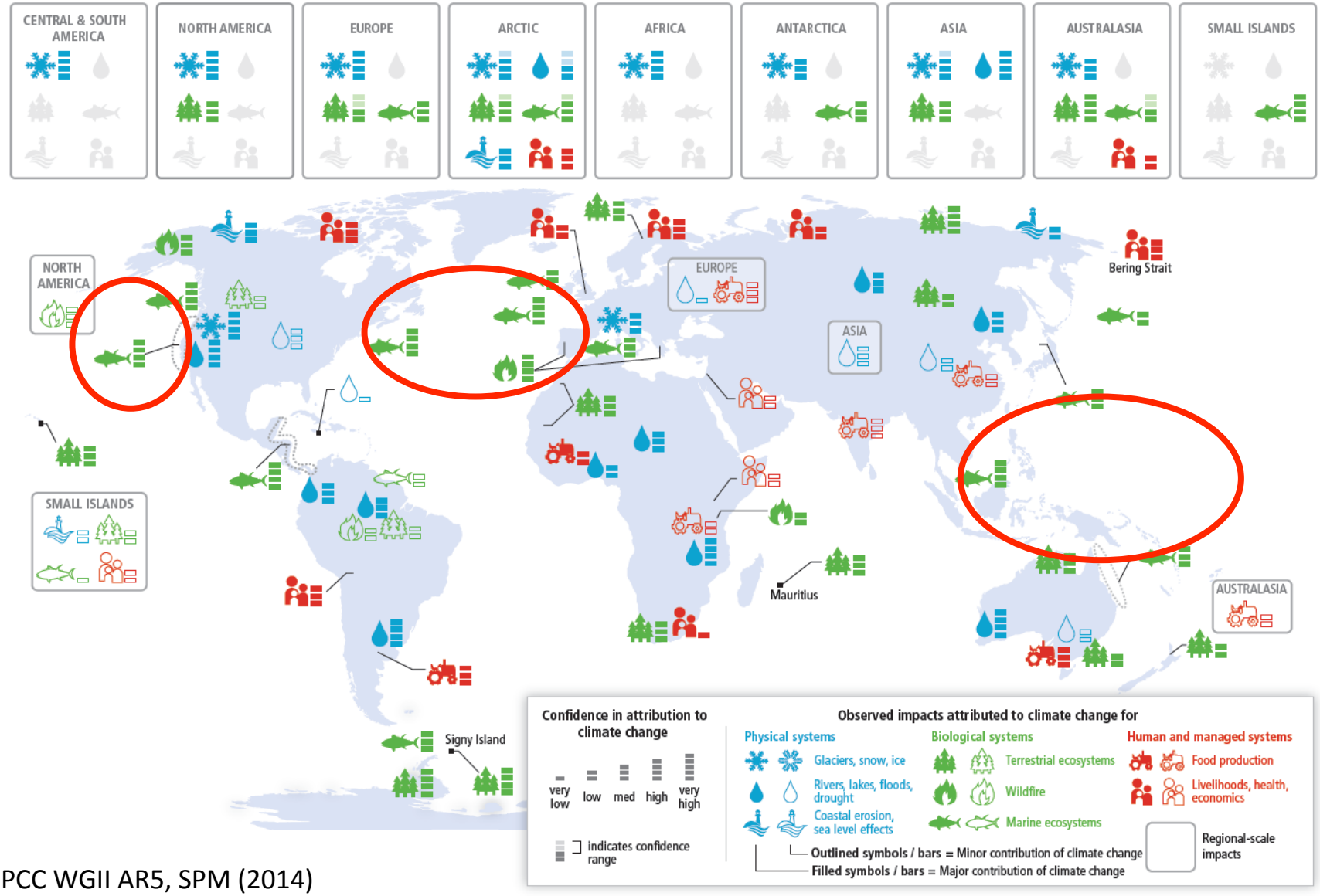

Climate
Glaciers
Snow
Permafrost
Runoff
Mass
movements
Risks
Hydropower
Decreasing climate signal
Increasing number of confounders

Detection and attribution

‘Detection of impacts addresses the questions whether a natural or human system changes beyond a specific baseline that characterizes its behavior in the absence of climate change.’
(IPCC WGII AR5, Chapter 18)

‘Attribution addresses the question of the magnitude of contribution of climate change to a change in a system.’
(IPCC WGII AR5, Chapter 18)

Attribution of observed impacts across systems



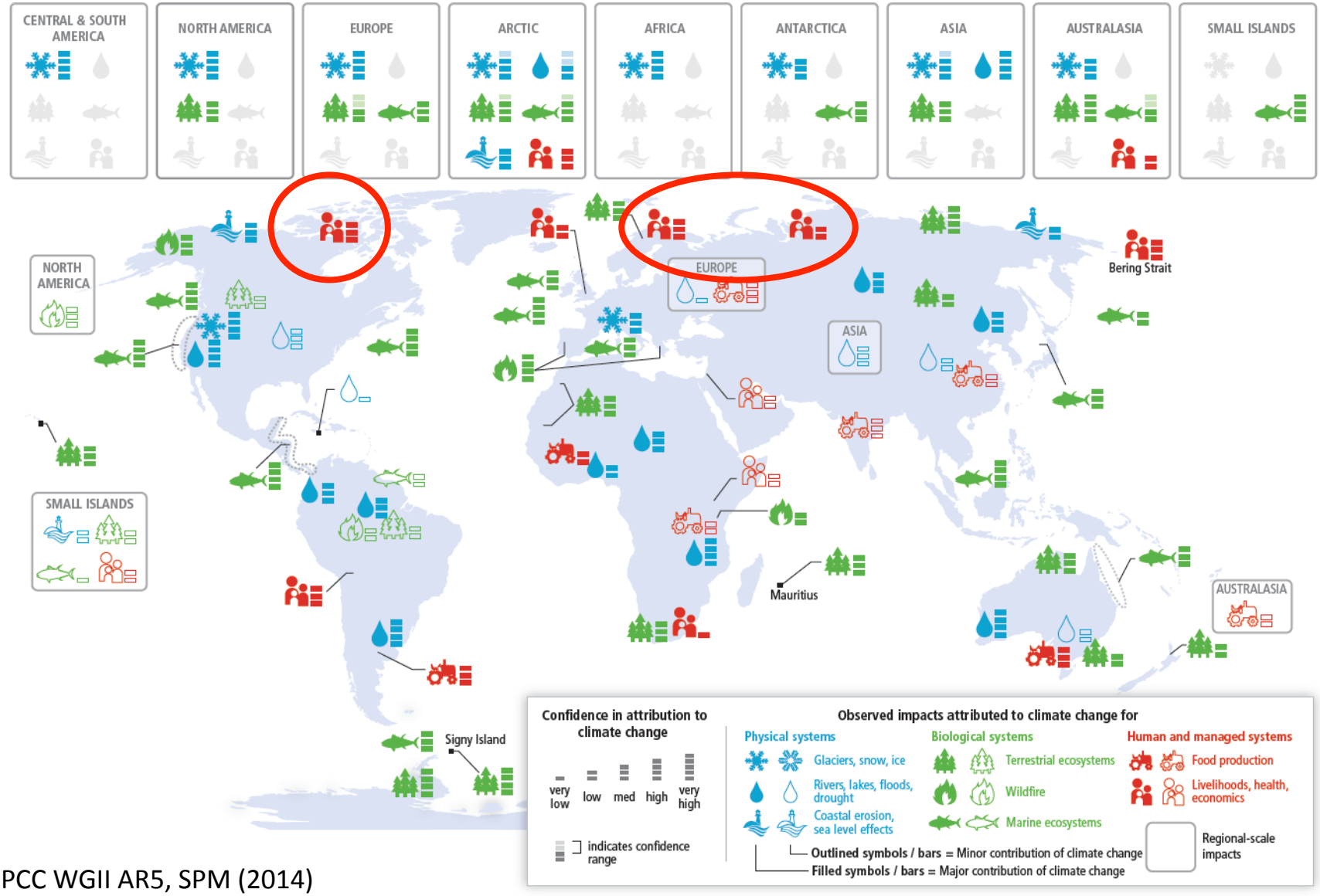
IPCC WGII AR5, SPM (2014)

Oceanworld.tamu.edu

Oceans

Process/ Observation	Confidence in detection	Confidence in attribution	Role of climate
Impacts on reef-building corals (bleaching)	Very high	High	Major
Changes in marine species community composition	High	High	Major
Impacts on large non-fish species (e.g. walruses, penguins, other sea-birds)	High	High	Major

Attribution of observed impacts across systems



IPCC WGII AR5, SPM (2014)

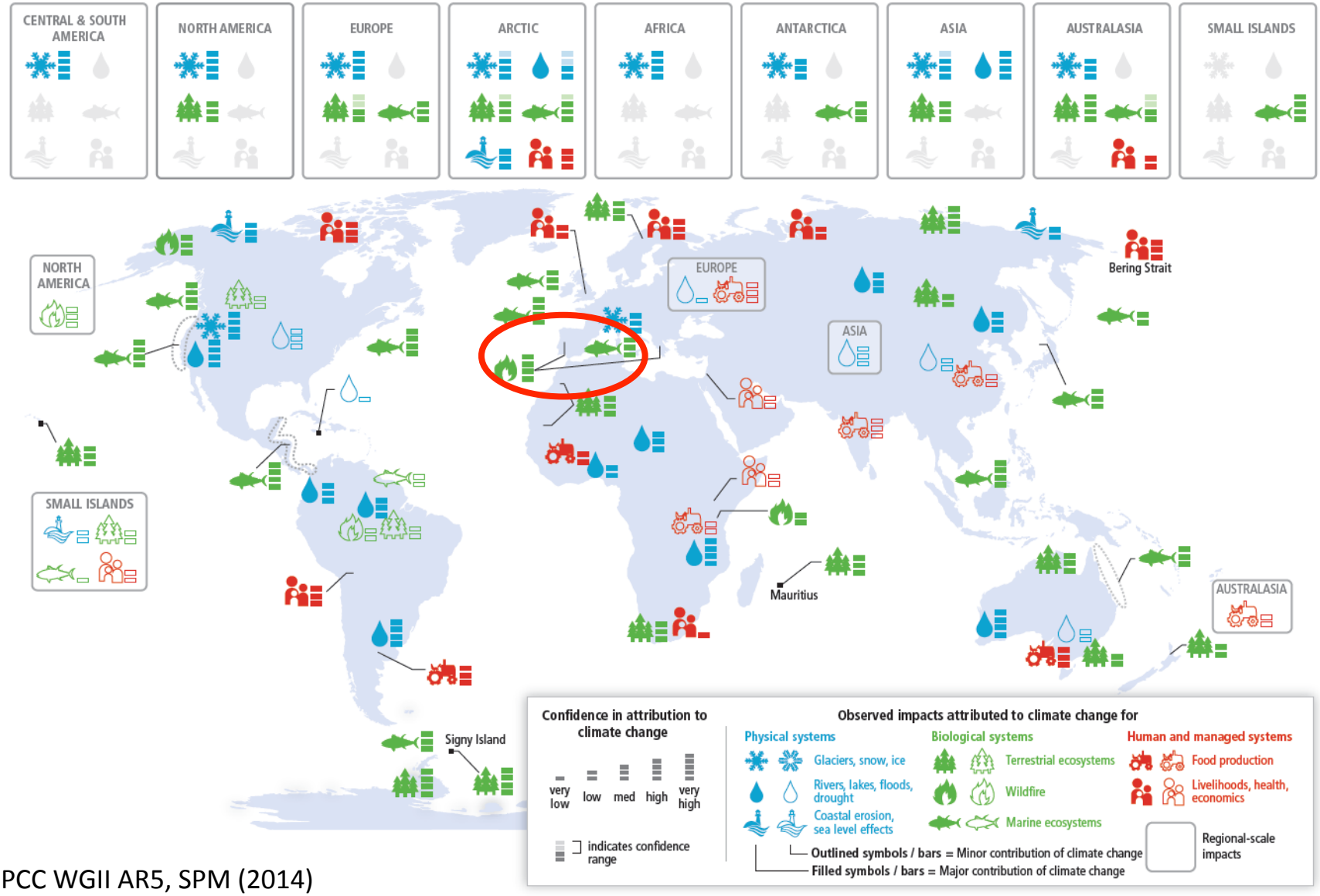
Gordon Wiltsie (NatGeo)

Polar regions and livelihoods

Shismaref, Alaska (alaskaconservation.org)

Process/ Observation	Confidence in detection	Confidence in attribution	Role of climate
Impacts on livelihoods of Arctic indigenous people	Medium	Medium	Major
Increased coastal erosion across the Arctic	Medium	Medium	Major
Increase of shipping traffic across the Bering Strait	Medium	Medium	Major

Attribution of observed impacts across systems



IPCC WGII AR5, SPM (2014)

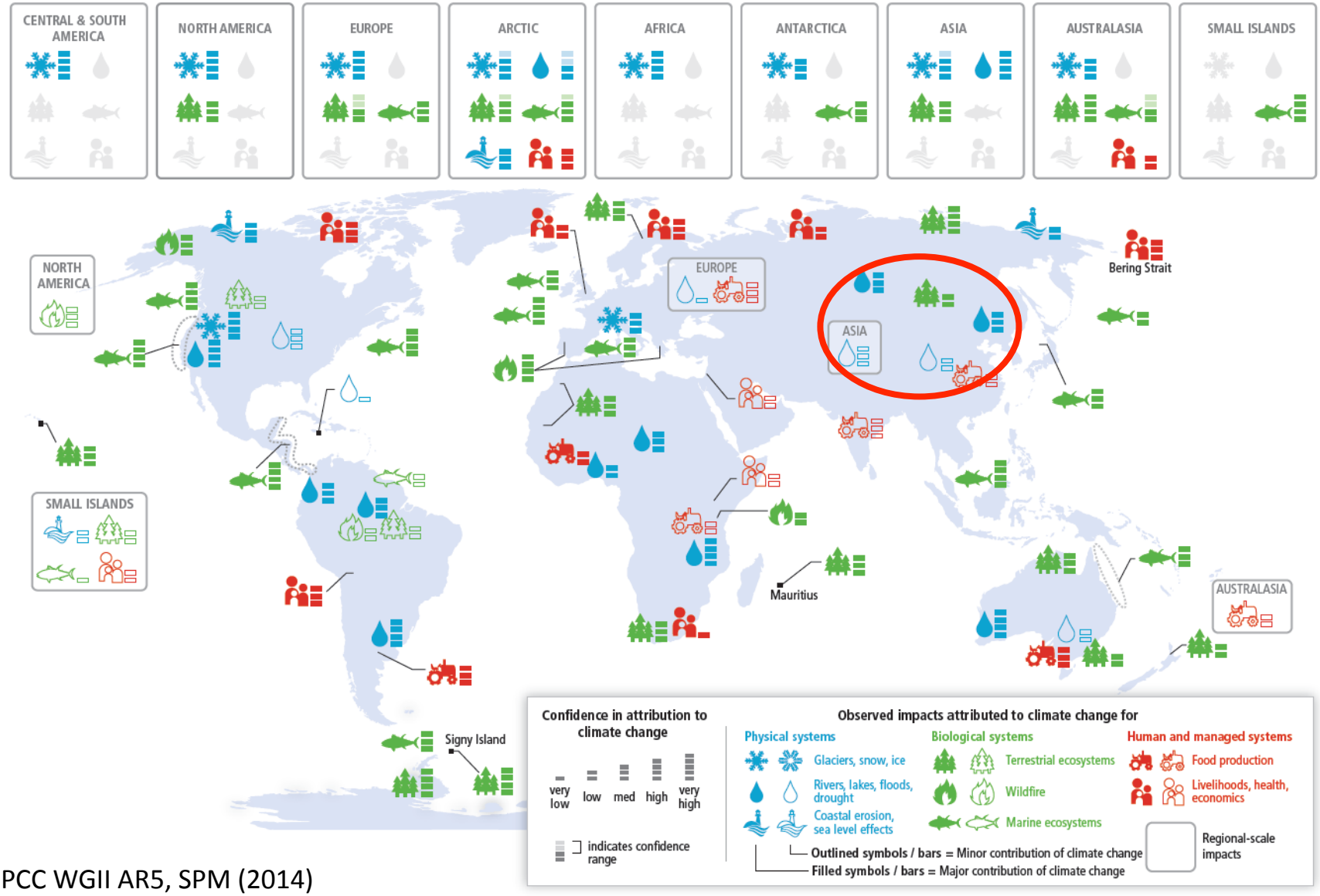
Forest fire Portugal, EPA

Europe: forest fire and floods

Germany, 2013 (Süddeutsche)

Process/ Observation	Confidence in detection	Confidence in attribution	Role of climate
Increasing burnt forest areas during recent decades (Greece, Portugal)	High	High	Major
Changes in the occurrence of extreme river discharges and floods	Low	Very low	Minor

Attribution of observed impacts across systems



IPCC WGII AR5, SPM (2014)

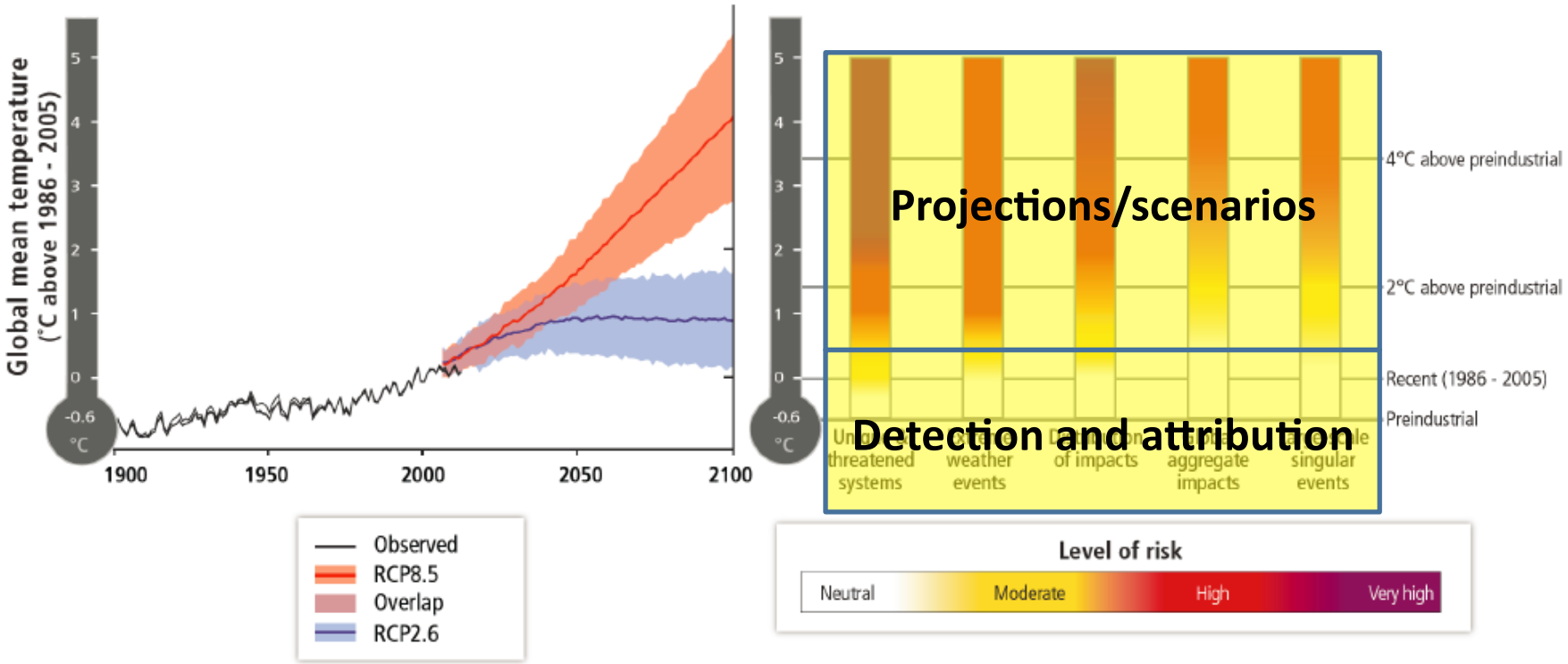
Xiaolangdi Dam, Yelllow river (m.ammoth.us)

Asian river flow

Process/ Observation	Confidence in detection	Confidence in attribution	Role of climate
Changes in water availability in many Chinese rivers	High	Low	Minor
Increased flow in some rivers due to shrinking glaciers in the Himalayas and Central Asia	High	High	Major

Generally low attribution for changes in groundwater storage, water quality, river sediment load

Risks and Reasons for Concern



IPCC WGII AR5, SPM (2014)

Risks and adaptation

IPCC WGII AR5

Conclusions & Perspectives

- Climate impacts are increasingly observed in natural and human systems

- Quantification of an anthropogenic ‚finger print, (in relation to emissions) is still difficult for many climate impacts

- In many socio-environmental/human systems non-climatic factors are more important drivers of risks than climatic factors, which, however, can be substantial additional stressors

- Risks in different systems increase with warming

- Depending on the system adaptation can substantially reduce the risks, but for some systems adaptation is virtually impossible (= loss!).

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Thank you for your attention

Thanks to all IPCC WGII AR5 Chapter 18 colleagues

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Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Federal Office for the Environment

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Akademie der Naturwissenschaften
Accademia di scienze naturali
Académie des sciences naturelles

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