



La vulnérabilité des systèmes socio-économiques et naturels au changement climatique

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1. Vulnerability and risk for the IPCC
2. Observed impacts, vulnerability, and adaptation in a complex and changing world
3. Future risks and opportunities for adaptation
4. Managing future risks and building resilience

UNFCCC, Article 2

"... achieve ... stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system."

UNFCCC, Article 2

“Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.”

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1. Vulnerability and risk for the IPCC

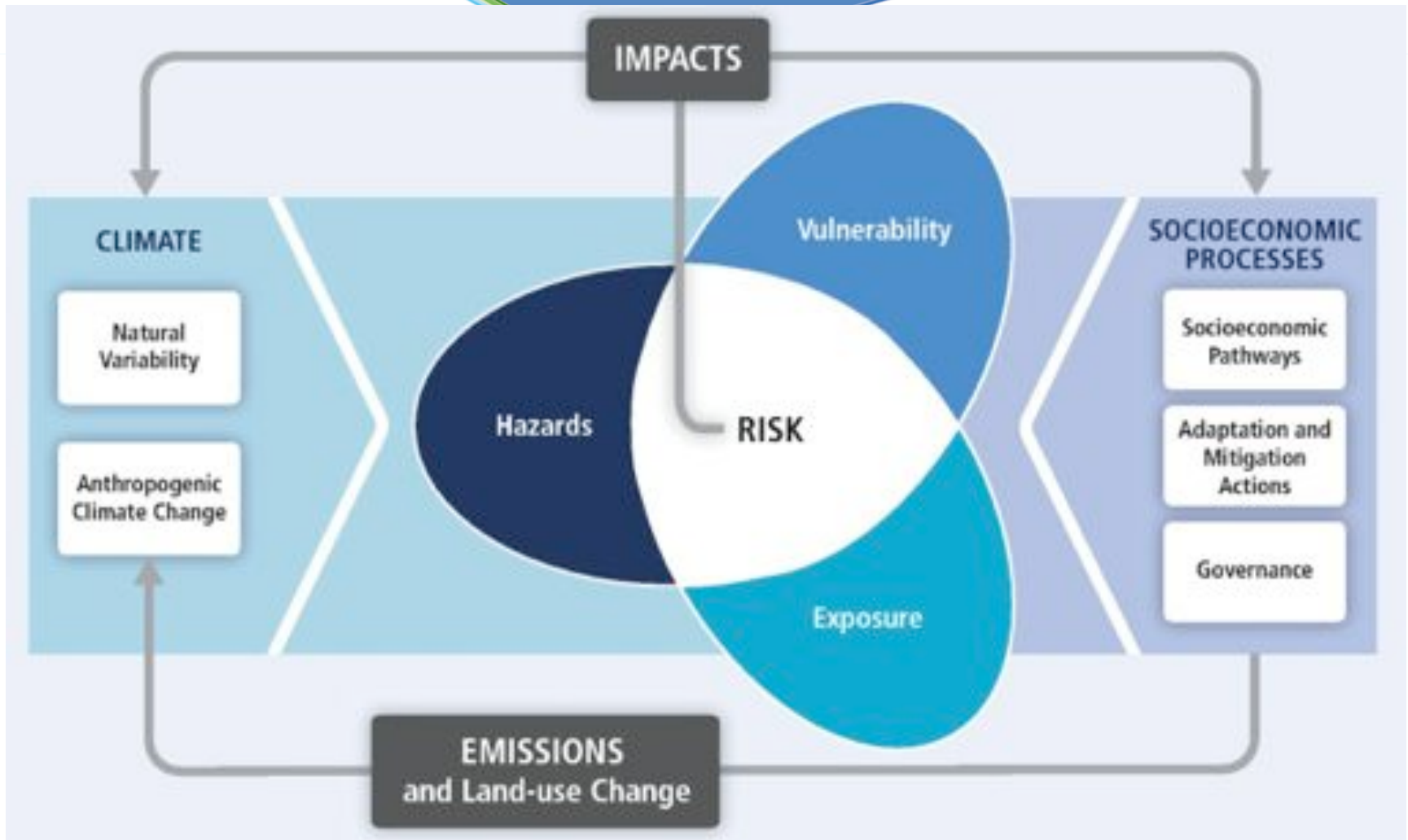
Vulnerability...

...is the degree to which
a system is **sensitive** to global change

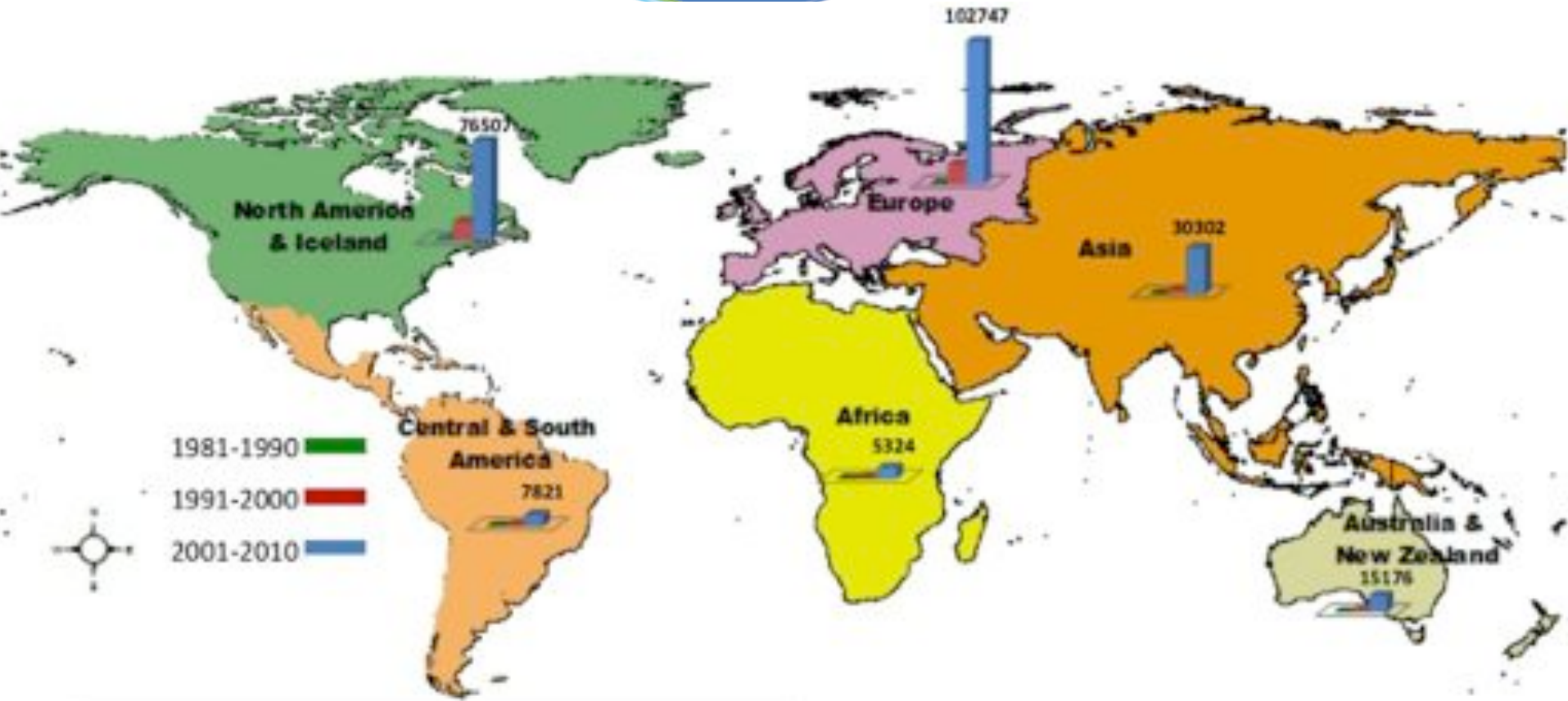
plus

the degree to which the sector that relies
on this system is **unable to cope with**
the changes

1. Vulnerability and risk for the IPCC



Assessing the literature



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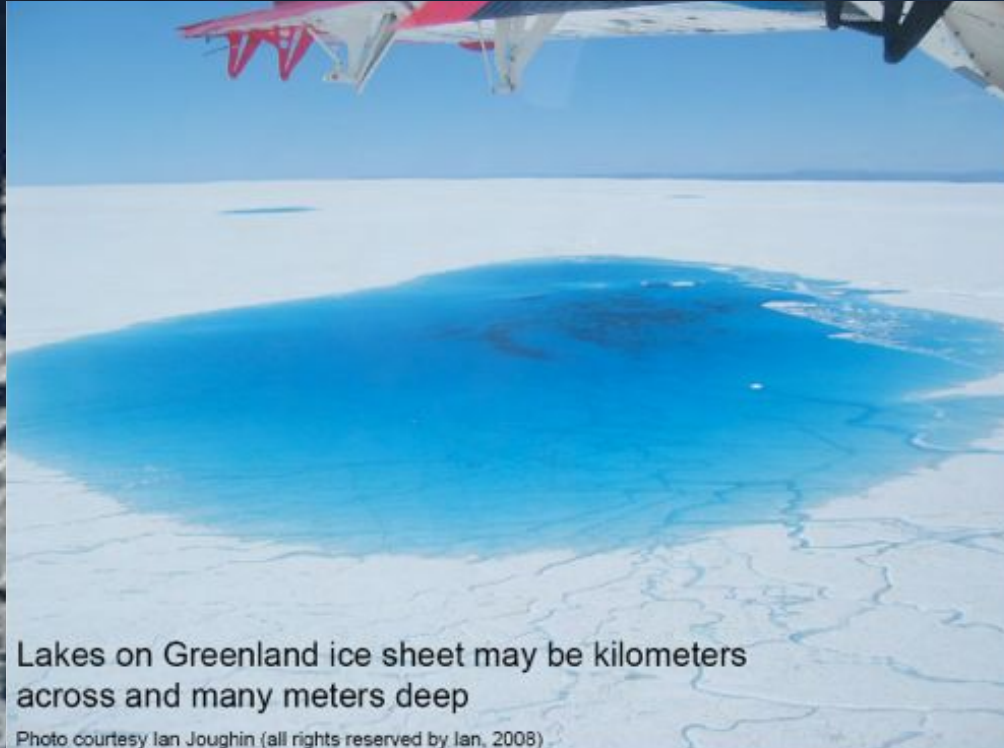
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2. Observed impacts, vulnerability, and adaptation in a complex and changing world

- Observed impacts, vulnerability, and exposure
- Adaptation experience
- The decision-making context



Greenland ice loss



Lakes on Greenland ice sheet may be kilometers across and many meters deep

Photo courtesy Ian Joughin (all rights reserved by Ian, 2008)





Lorraine, France, August 2003

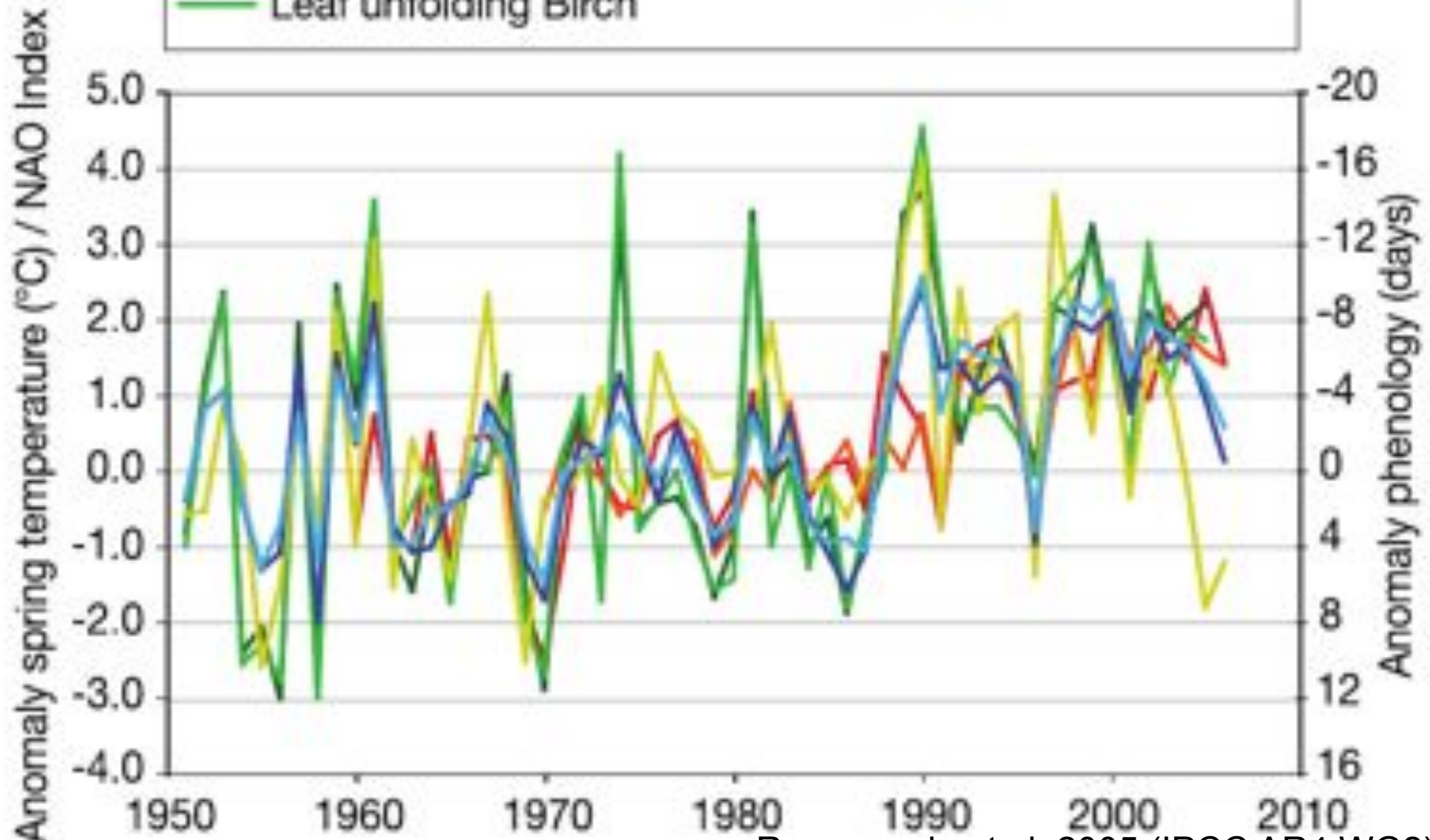


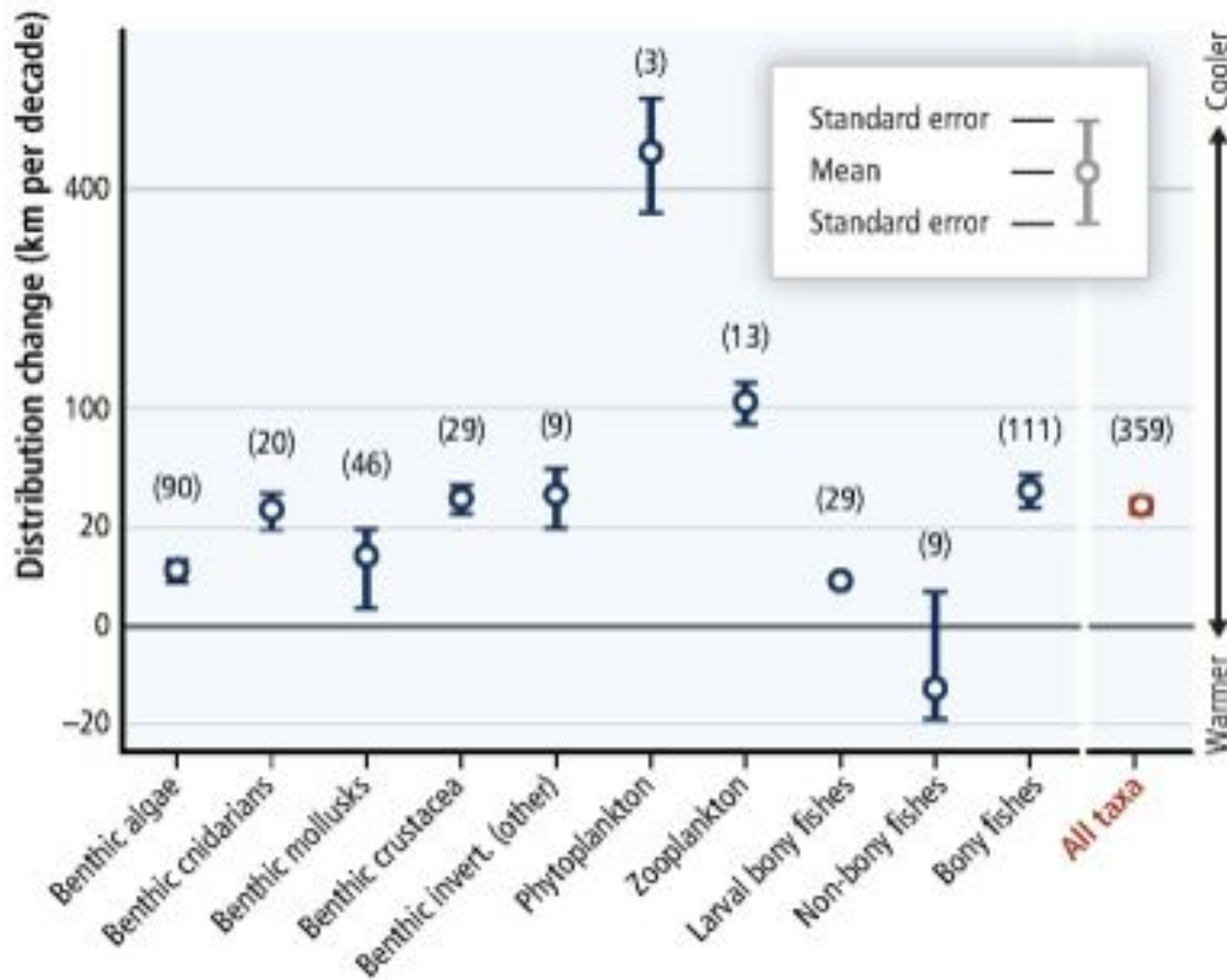
Hurricane Sandy, Oct 2012
http://en.wikipedia.org/wiki/Hurricane_Sandy



Pakistan, August 2010

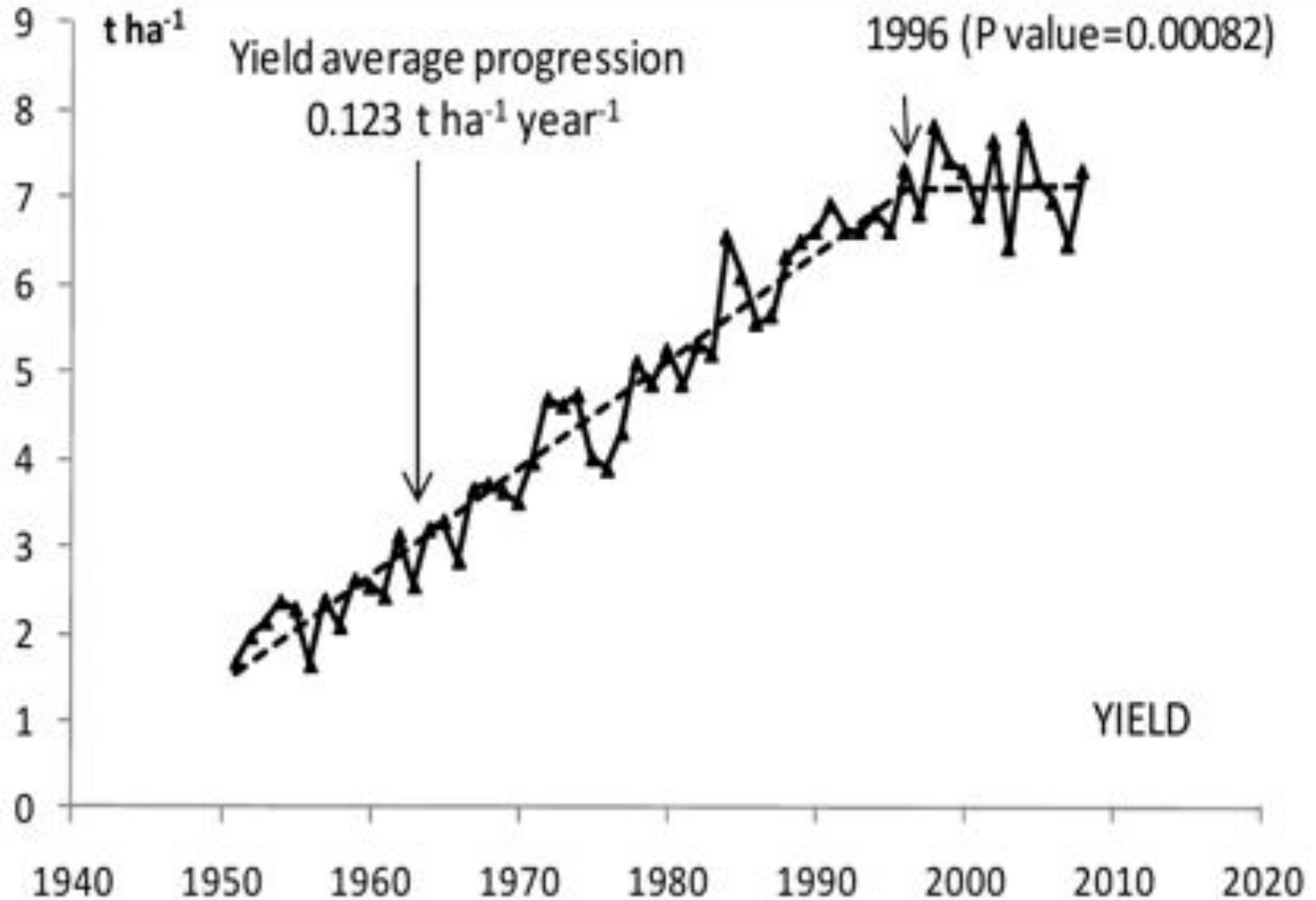
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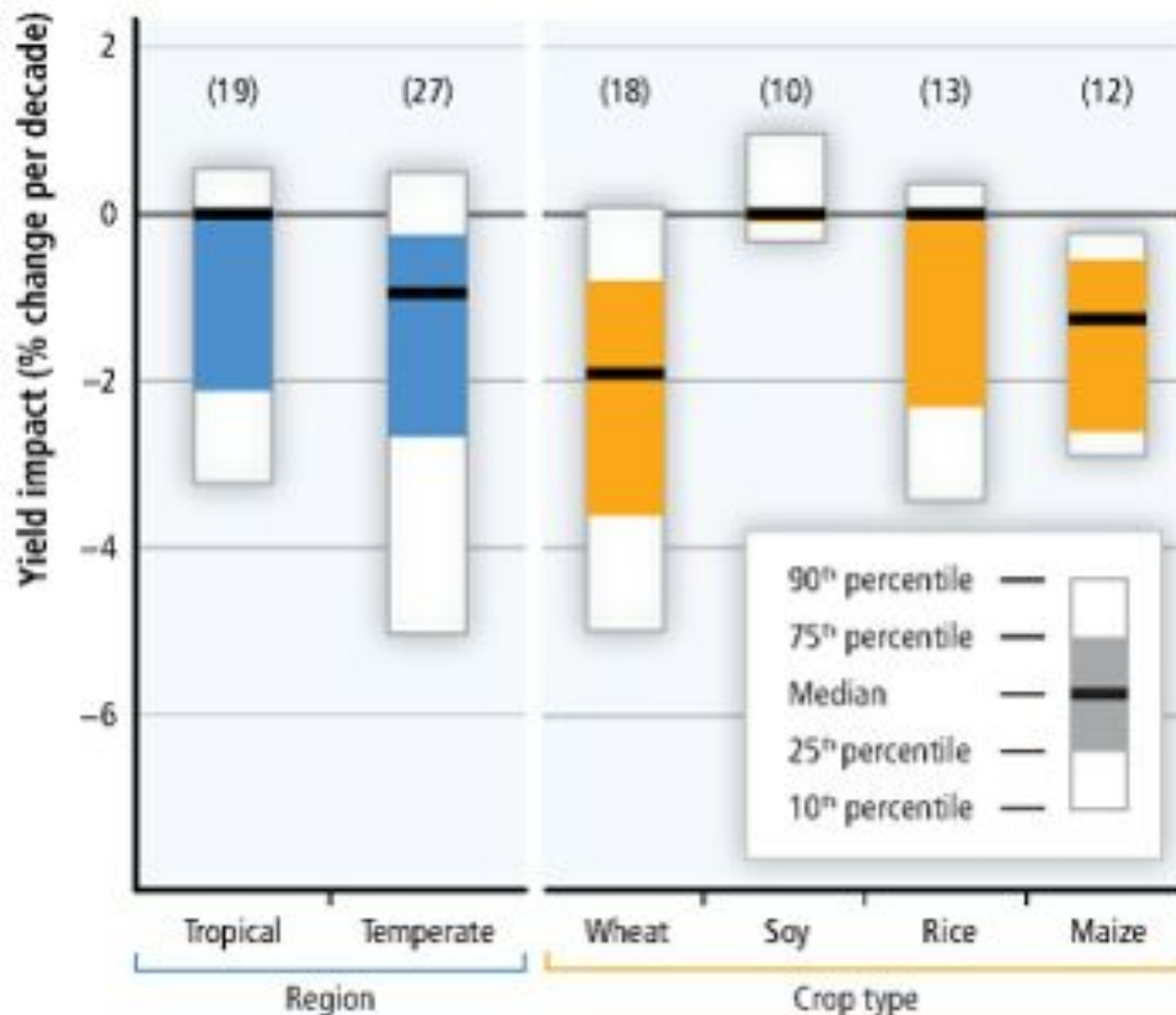




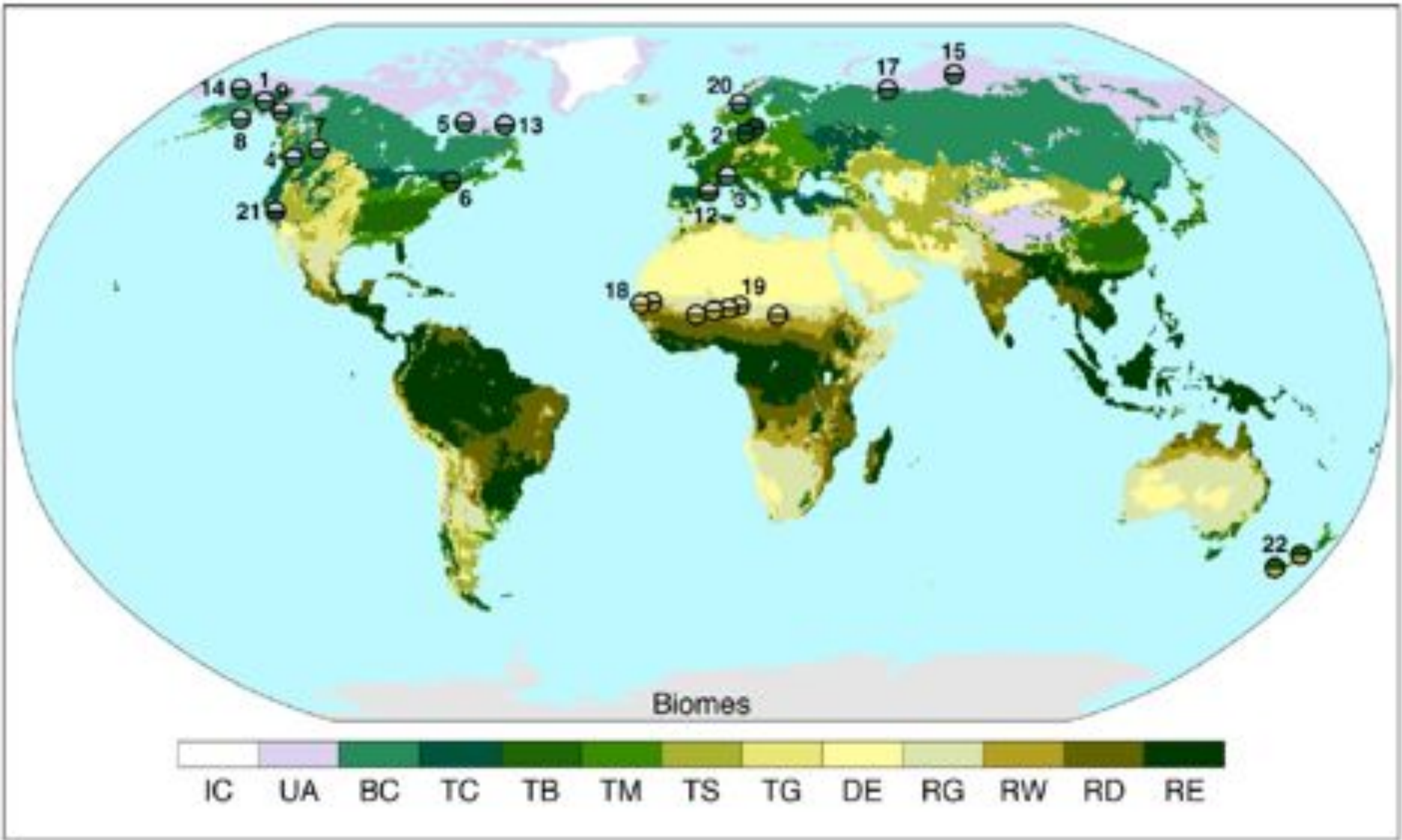
Average rates of change in distribution (km per decade) for marine taxonomic groups based on observations over 1900–2010. Positive distribution changes are consistent with warming (moving into previously cooler waters, generally poleward). The number of responses analyzed is given within parentheses for each category.

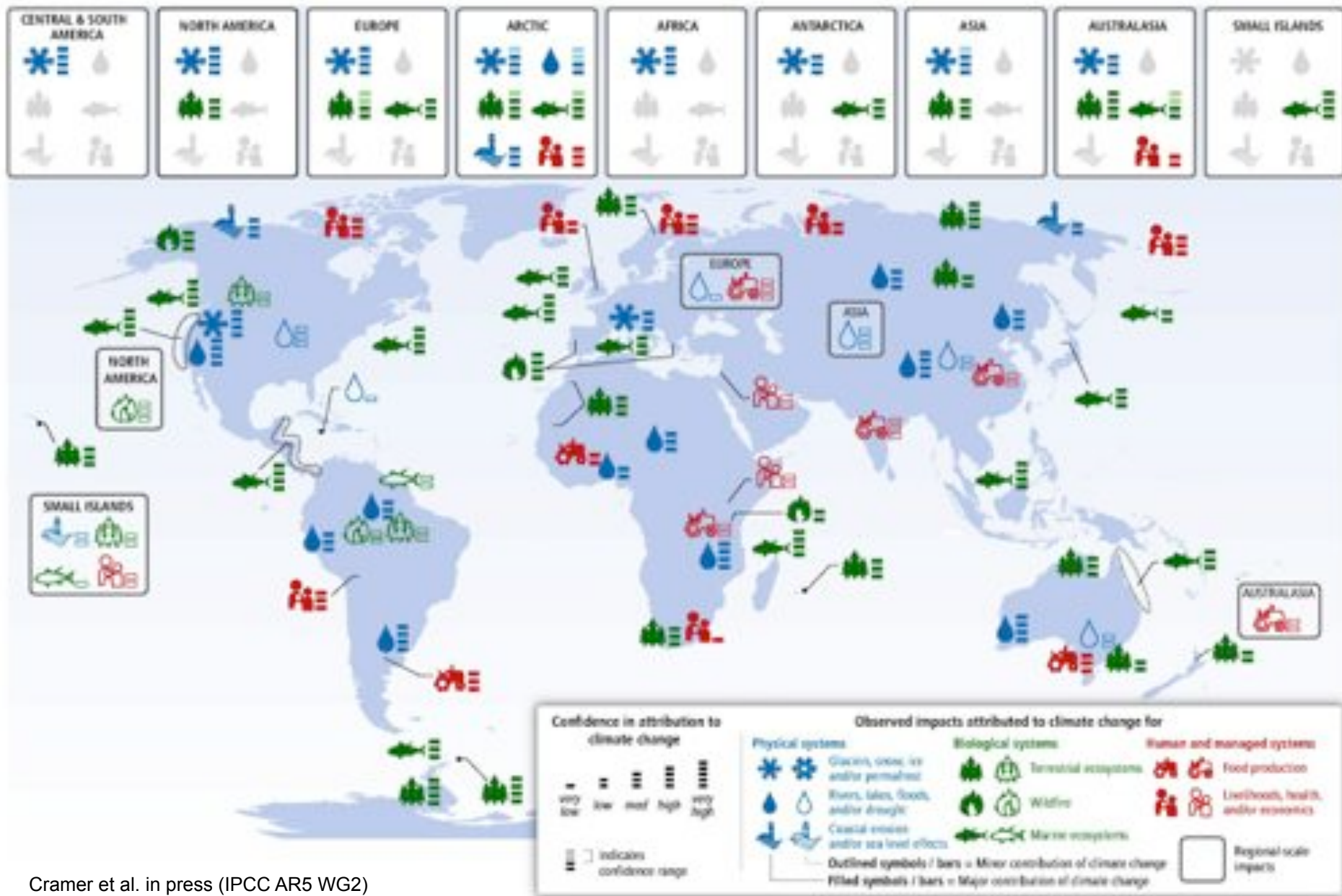
Wheat yields in France





Summary of estimated impacts of observed climate changes on yields over 1960–2013 for four major crops in temperate and tropical regions, with the number of data points analyzed given within parentheses for each category.

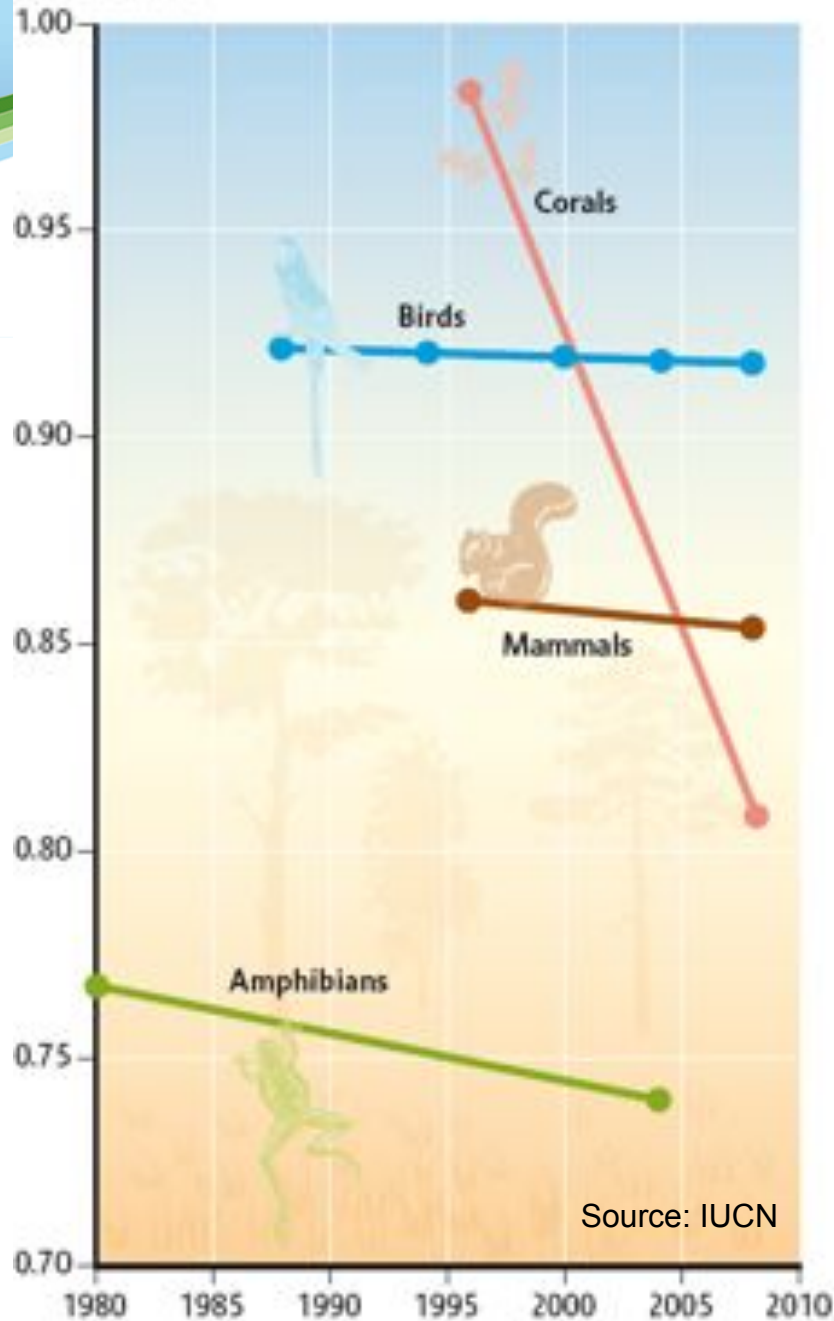




Cramer et al. in press (IPCC AR5 WG2)

Figure 18-3 | Global patterns of observed climate change impacts reported since 1980. Each filled symbol in the top panels indicates a class of systems for which climate change has played a major role in observed changes in at least one system within that class across the respective region, with the range of confidence in attribution for those region-wide impacts indicated by the bars. Regional-scale impacts where climate change has played a minor role are shown by outlined symbols in a box in the respective region. Sub-regional impacts are indicated with symbols on the map, placed in the approximate area of their occurrence. The impacted area can vary from specific locations to broad areas such as a major river basin. Impacts on physical (blue), biological (green), and human (red) systems are differentiated by color. This map represents a graphical synthesis of Tables 18-5, 18-6, 18-7, 18-8, and 18-9. Absence of climate change impacts from this figure does not imply that such impacts have not occurred.

Red List Index



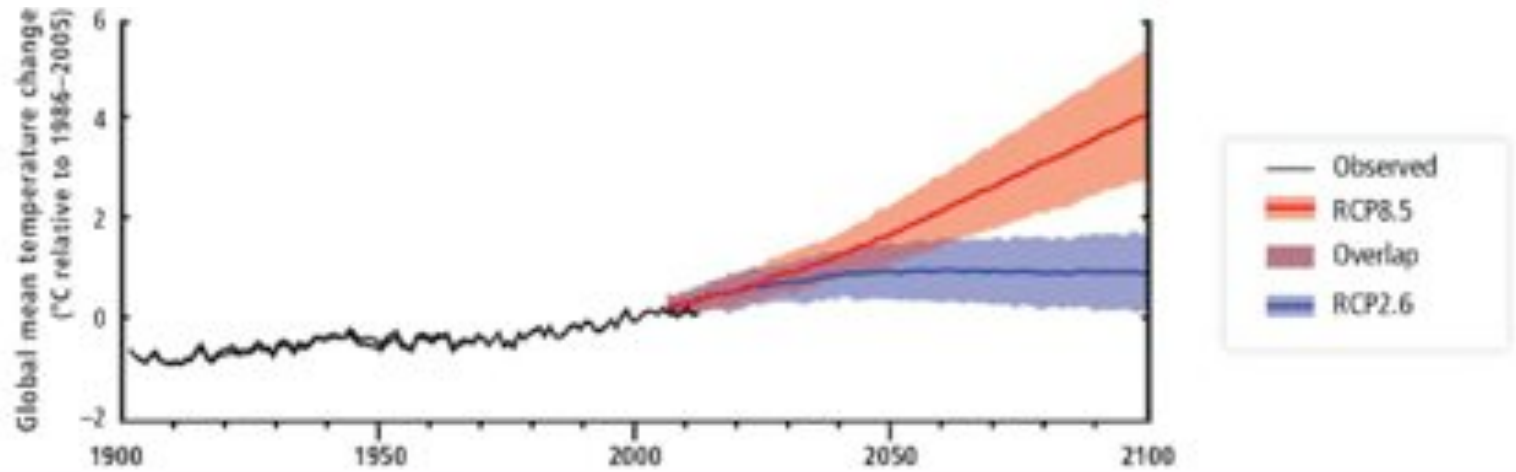
- The Red List Index (RLI) for all these species groups is decreasing
- Coral species are moving most rapidly towards greater extinction risk
- Amphibians are, on average, the group most threatened
- **But:** only a few recent species extinctions have been attributed as yet to climate change

Adaptation experience

Governments are starting to develop adaptation plans and policies and to integrate climate-change considerations into broader development plans.

- In **Africa**, most national governments are initiating governance for adaptation (disaster risk mgmt, ecosystem-based approaches, public health, livelihood diversif.).
- In **Europe**, adaptation policy has been developed across all levels of government (coastal & water mgmt, environm. protection, land planning, disaster risk mgmt).
- In **Asia**, adaptation is being facilitated in some areas (climate adaptation in development planning, early warning systems, integrated water resources management, agroforestry, reforestation of mangroves).
- In **Australasia**, planning for sea level rise, and in southern Australia for reduced water availability, is becoming adopted widely.
- In **North America**, governments are engaging in incremental adaptation assessment and planning, particularly at the municipal level. Some proactive adaptation is occurring to protect longer-term investments in energy and public infrastructure.
- In **Central and South America**, ecosystem-based adaptation including protected areas, conservation agreements, community mgmt of natural areas is occurring.
- In the **Arctic**, some communities deploy adaptive co-management strategies and communications infrastructure, combining traditional and scientific knowledge.
- In **small islands**, community-based adaptation has been shown to generate larger benefits when delivered in conjunction with other development activities.
- In the **ocean**, international cooperation and marine spatial planning are starting to facilitate adaptation to climate change, with constraints from challenges of spatial scale and governance issues.

The decision-making context



Projected Temperature Change



Difference from 1986-2005 mean (°C)

Solid Color

Very strong agreement

White Dots

Strong agreement

Gray

Divergent changes

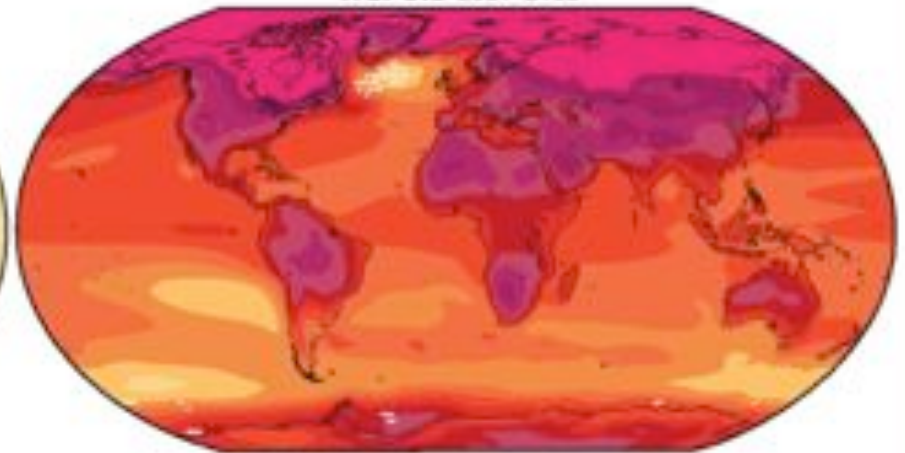
Diagonal Lines

Little or no change

RCP2.6 2081-2100



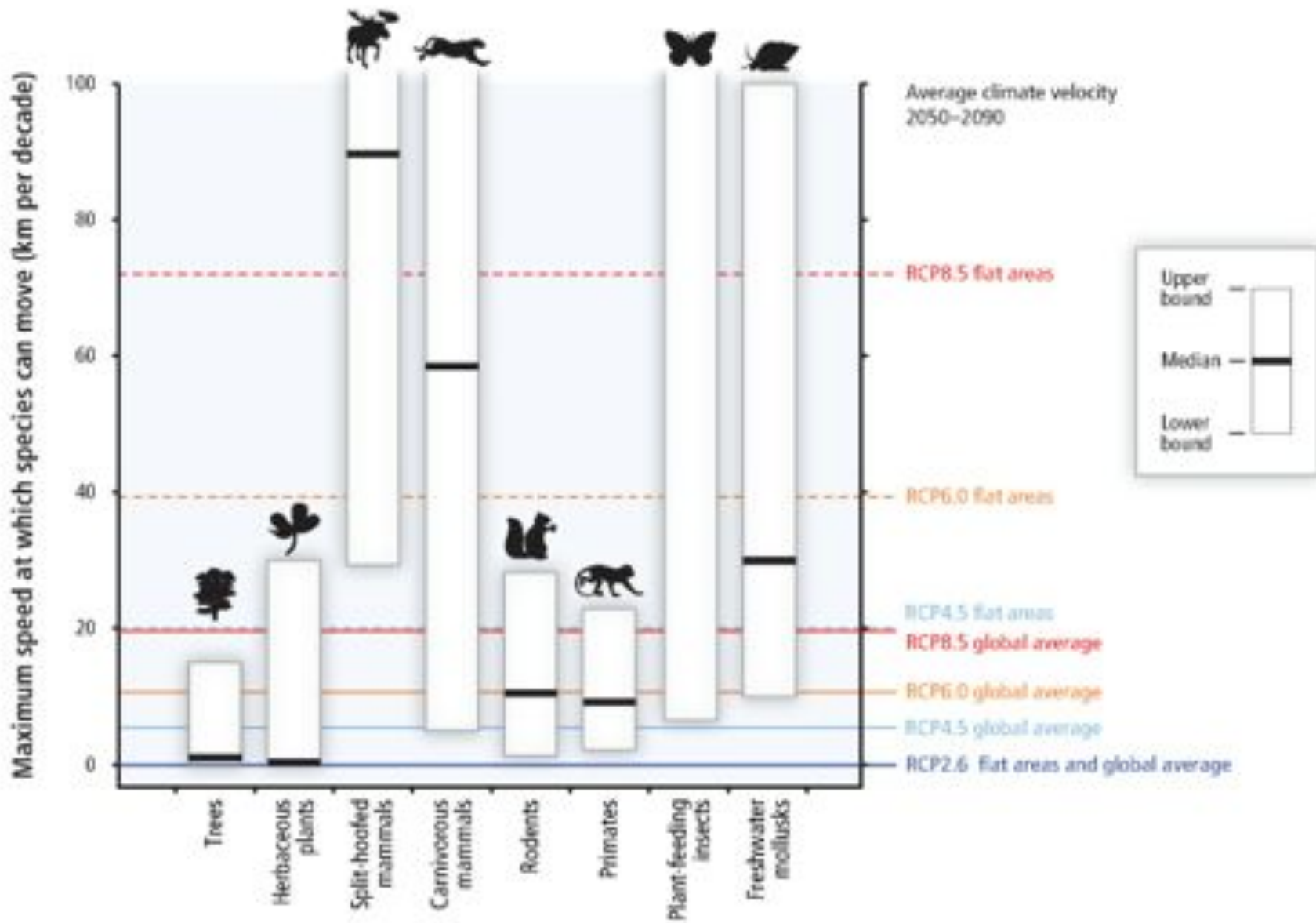
RCP8.5 2081-2100



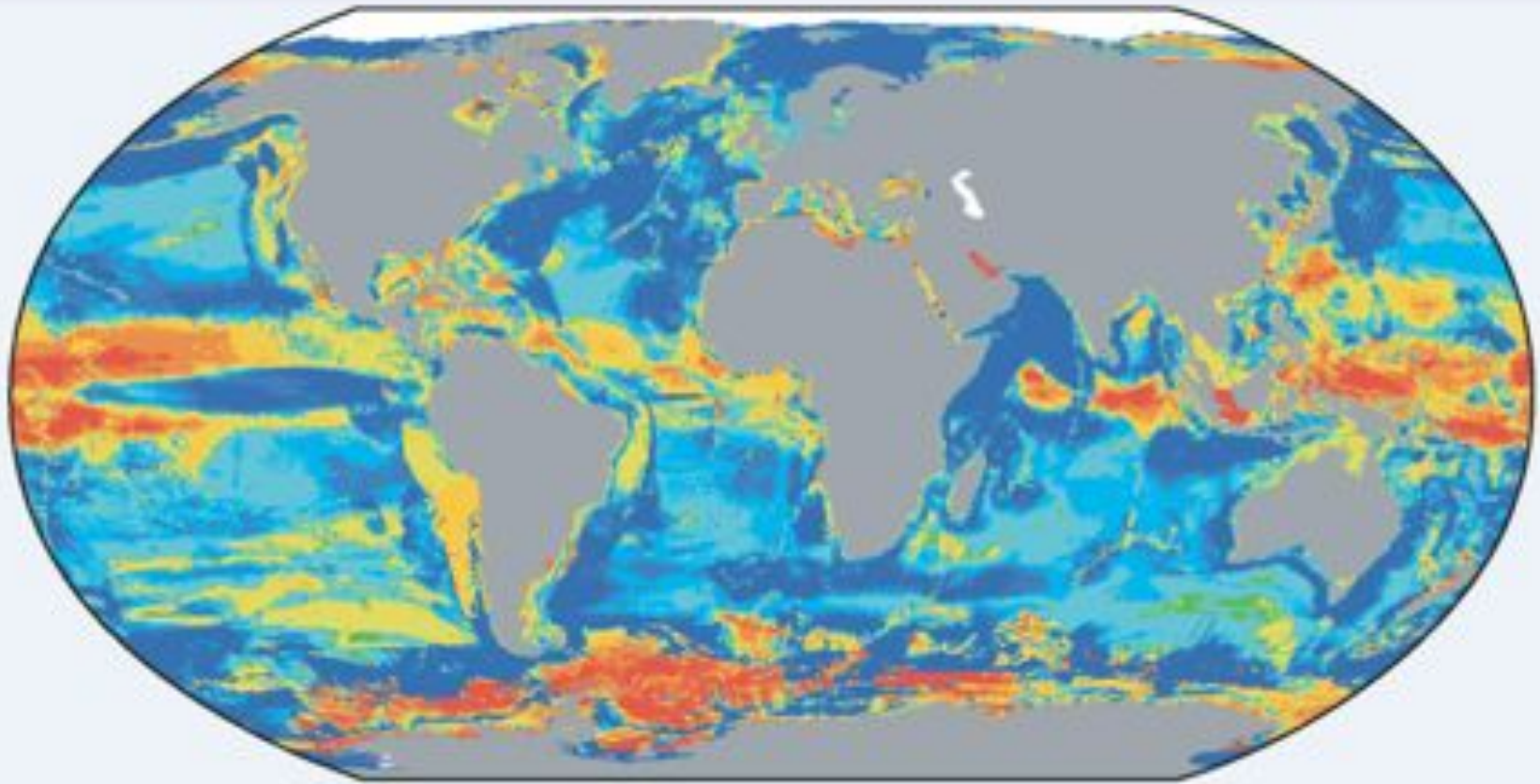
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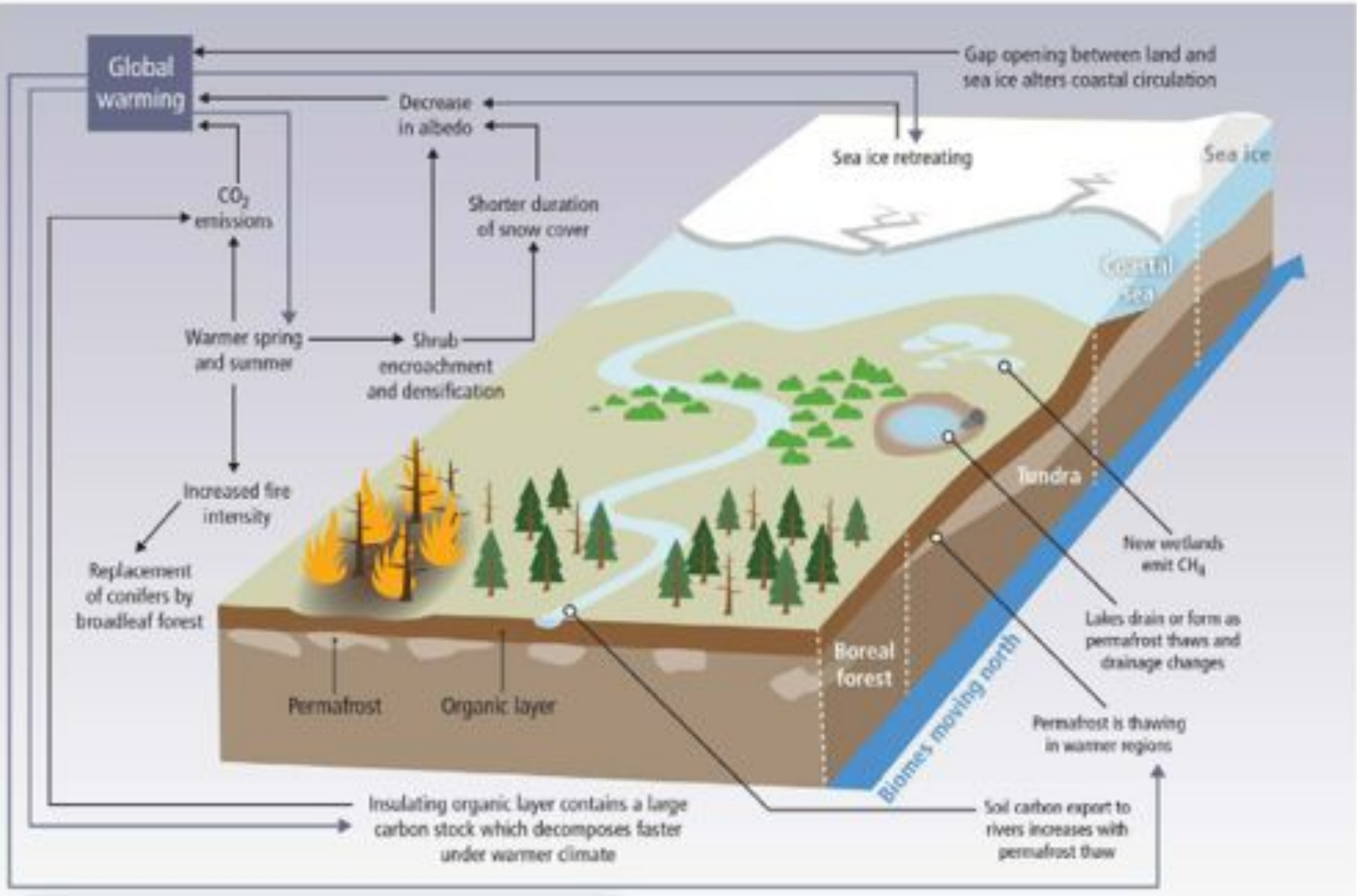
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3. Future risks and opportunities for adaptation



Change in maximum catch potential (2051–2060 compared to 2001–2010, SRES A1B)





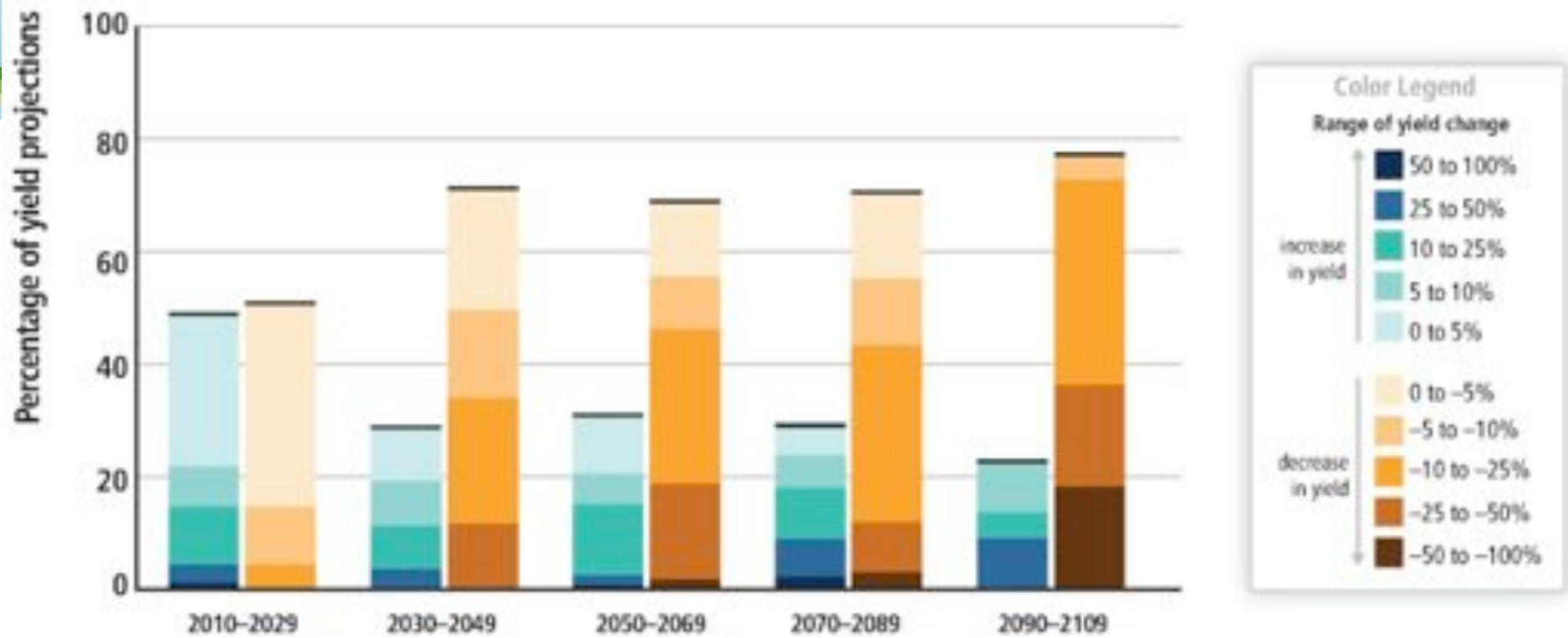
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Shrub
- 

Dead tree
- 




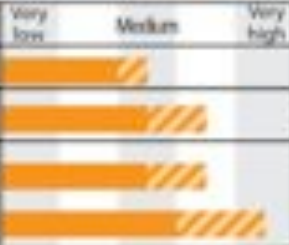


Conifer
- 

Fire



Summary of projected changes in crop yields, due to climate change over the 21st century. The figure includes projections for different emission scenarios, for tropical and temperate regions, and for adaptation and no-adaptation cases combined. Relatively few studies have considered impacts on cropping systems for scenarios where global mean temperatures increase by 4°C or more. For five timeframes in the near term and long term, data (n=1090) are plotted in the 20-year period on the horizontal axis that includes the midpoint of each future projection period. Changes in crop yields are relative to late-20th-century levels. Data for each timeframe sum to 100%.

Europe

Key risk	Adaptation issues & prospects	Climatic drivers	Timeframe	Risk & potential for adaptation
<p>Increased economic losses and people affected by flooding in river basins and coasts, driven by increasing urbanization, increasing sea levels, coastal erosion, and peak river discharges (high confidence)</p> <p>[23.2-3, 23.7]</p>	<p>Adaptation can prevent most of the projected damages (high confidence).</p> <ul style="list-style-type: none"> • Significant experience in hard flood-protection technologies and increasing experience with restoring wetlands • High costs for increasing flood protection • Potential barriers to implementation: demand for land in Europe and environmental and landscape concerns 		<p>Present</p> <p>Near term (2030-2040)</p> <p>Long term (2080-2100)</p> <p>2°C</p> <p>4°C</p>	<p>Very low Medium Very high</p> 
<p>Increased water restrictions. Significant reduction in water availability from river abstraction and from groundwater resources, combined with increased water demand (e.g., for irrigation, energy and industry, domestic use) and with reduced water drainage and runoff as a result of increased evaporative demand, particularly in southern Europe (high confidence)</p> <p>[23.4, 23.7]</p>	<ul style="list-style-type: none"> • Proven adaptation potential from adoption of more water-efficient technologies and of water-saving strategies (e.g., for irrigation, crop species, land cover, industries, domestic use) • Implementation of best practices and governance instruments in river basin management plans and integrated water management 		<p>Present</p> <p>Near term (2030-2040)</p> <p>Long term (2080-2100)</p> <p>2°C</p> <p>4°C</p>	<p>Very low Medium Very high</p> 
<p>Increased economic losses and people affected by extreme heat events: impacts on health and well-being, labor productivity, crop production, air quality, and increasing risk of wildfires in southern Europe and in Russian boreal region (medium confidence)</p> <p>[23.3-7, Table 23-1]</p>	<ul style="list-style-type: none"> • Implementation of warning systems • Adaptation of dwellings and workplaces and of transport and energy infrastructure • Reductions in emissions to improve air quality • Improved wildfire management • Development of insurance products against weather-related yield variations 		<p>Present</p> <p>Near term (2030-2040)</p> <p>Long term (2080-2100)</p> <p>2°C</p> <p>4°C</p>	<p>Very low Medium Very high</p> 

Tipping points in the Earth System

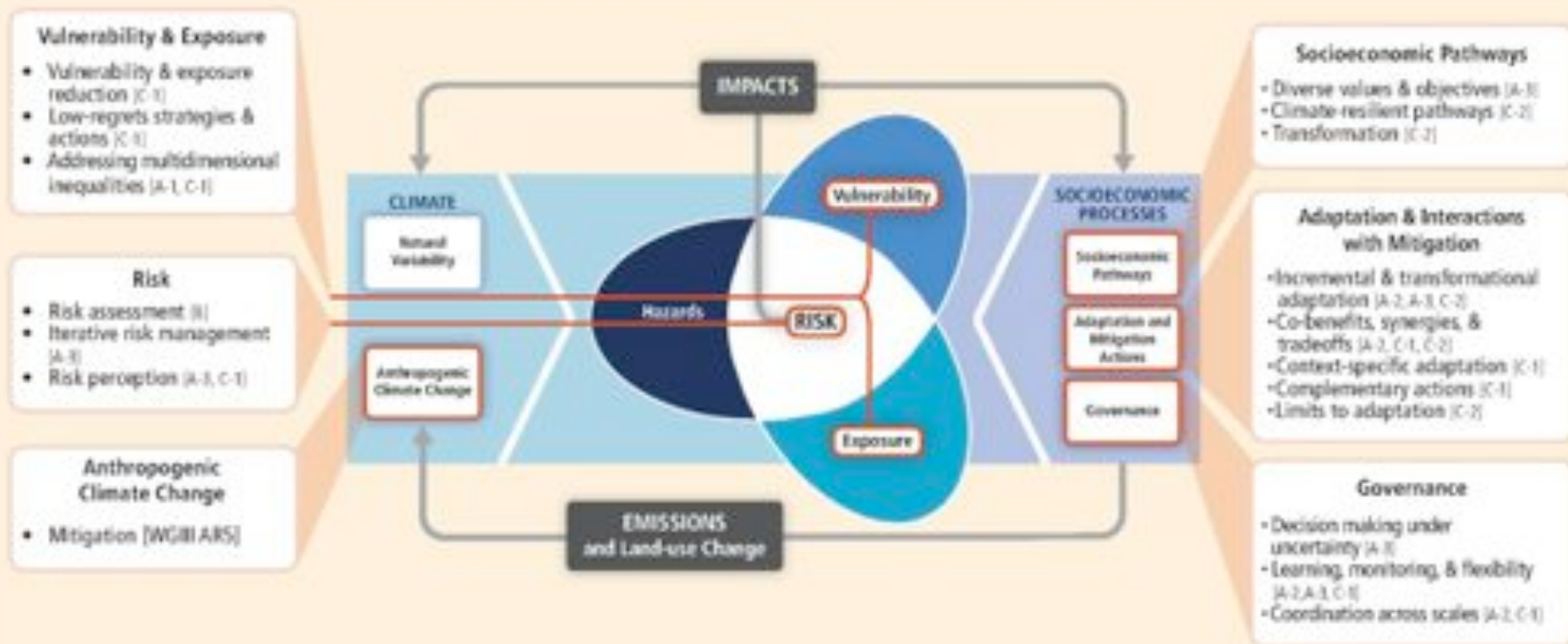


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1. Principles for effective adaptation



4. Managing future risks and building resilience

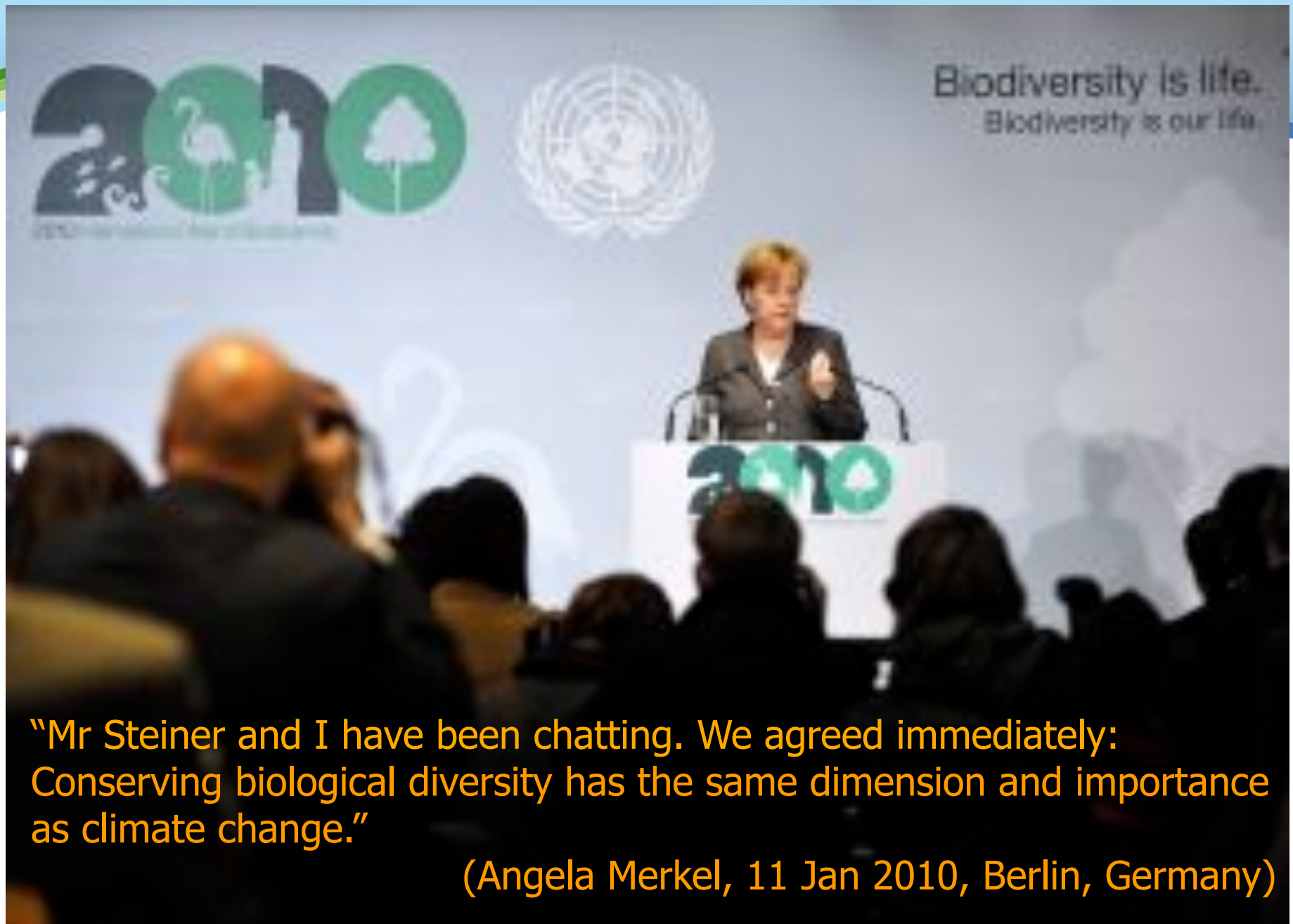
1. Principles for effective adaptation

- vulnerability and exposure reduction
- adaptation
- transformation

4. Managing future risks and building resilience

2. Climate-resilient pathways and transformation

- Prospects for climate-resilient pathways for sustainable development are related fundamentally to what the world accomplishes with climate-change mitigation
- Greater rates and magnitude of climate change increase the likelihood of exceeding adaptation limits
- Transformations in economic, social, technological, and political decisions and actions can enable climate-resilient pathways



“Mr Steiner and I have been chatting. We agreed immediately:
Conserving biological diversity has the same dimension and importance
as climate change.”

(Angela Merkel, 11 Jan 2010, Berlin, Germany)



Thank you very much for your attention!