

Key Findings of the IPCC AR5

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Outline

- Key findings of IPCC AR5 WG1: Climate science
- Key findings of IPCC AR5 WG2: Impacts, vulnerability and adaptation
- Regional collaboration

ipcc

INTERGOVERNMENTAL PANEL ON climate change

CLIMATE CHANGE 2013

The Physical Science Basis

WG I

WORKING GROUP I CONTRIBUTION TO THE
FIFTH ASSESSMENT REPORT OF THE
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

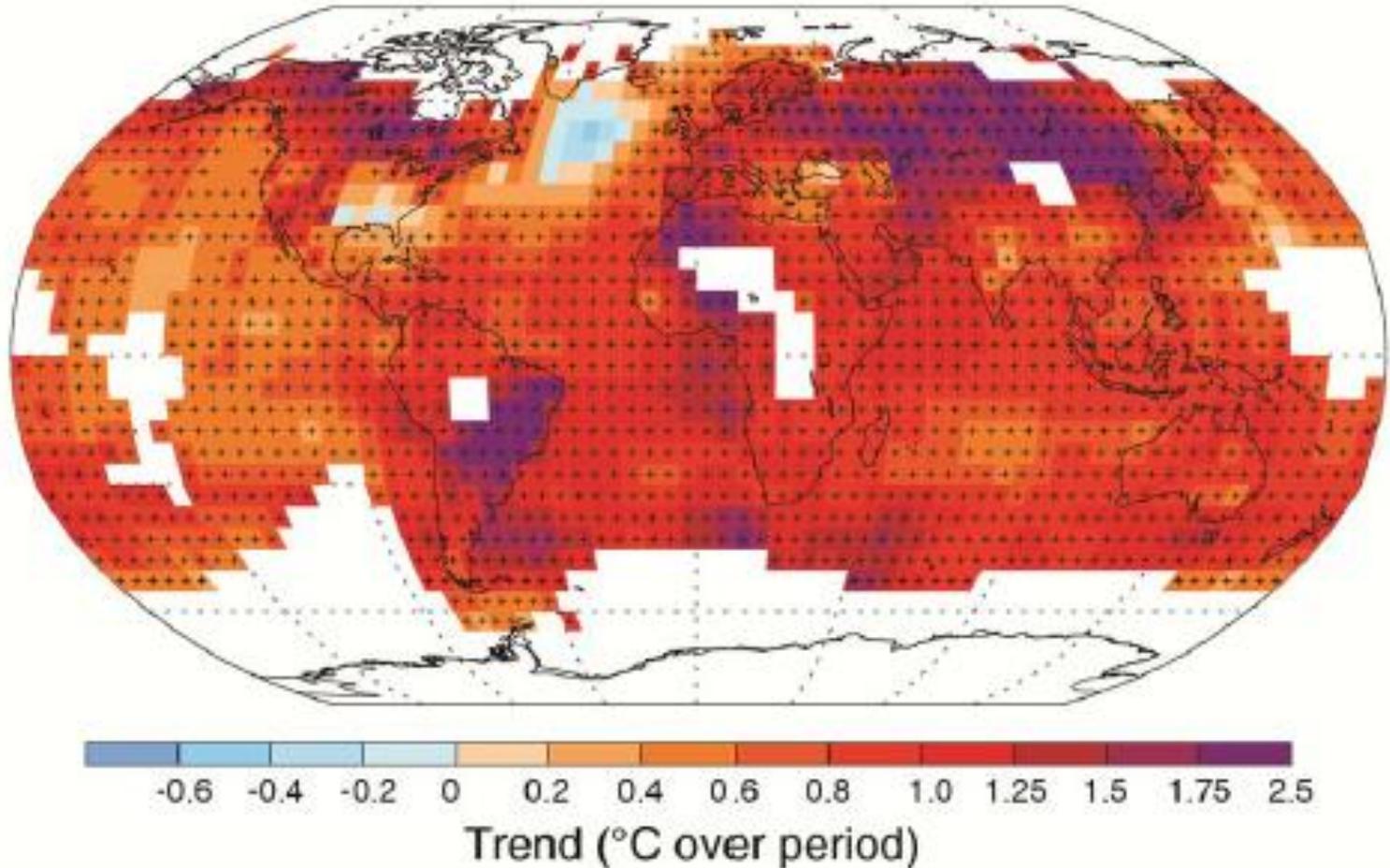


IPCC AR5 (2013)

- Warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia.
- The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased

The planet is warming

(b) Observed change in average surface temperature 1901–2012

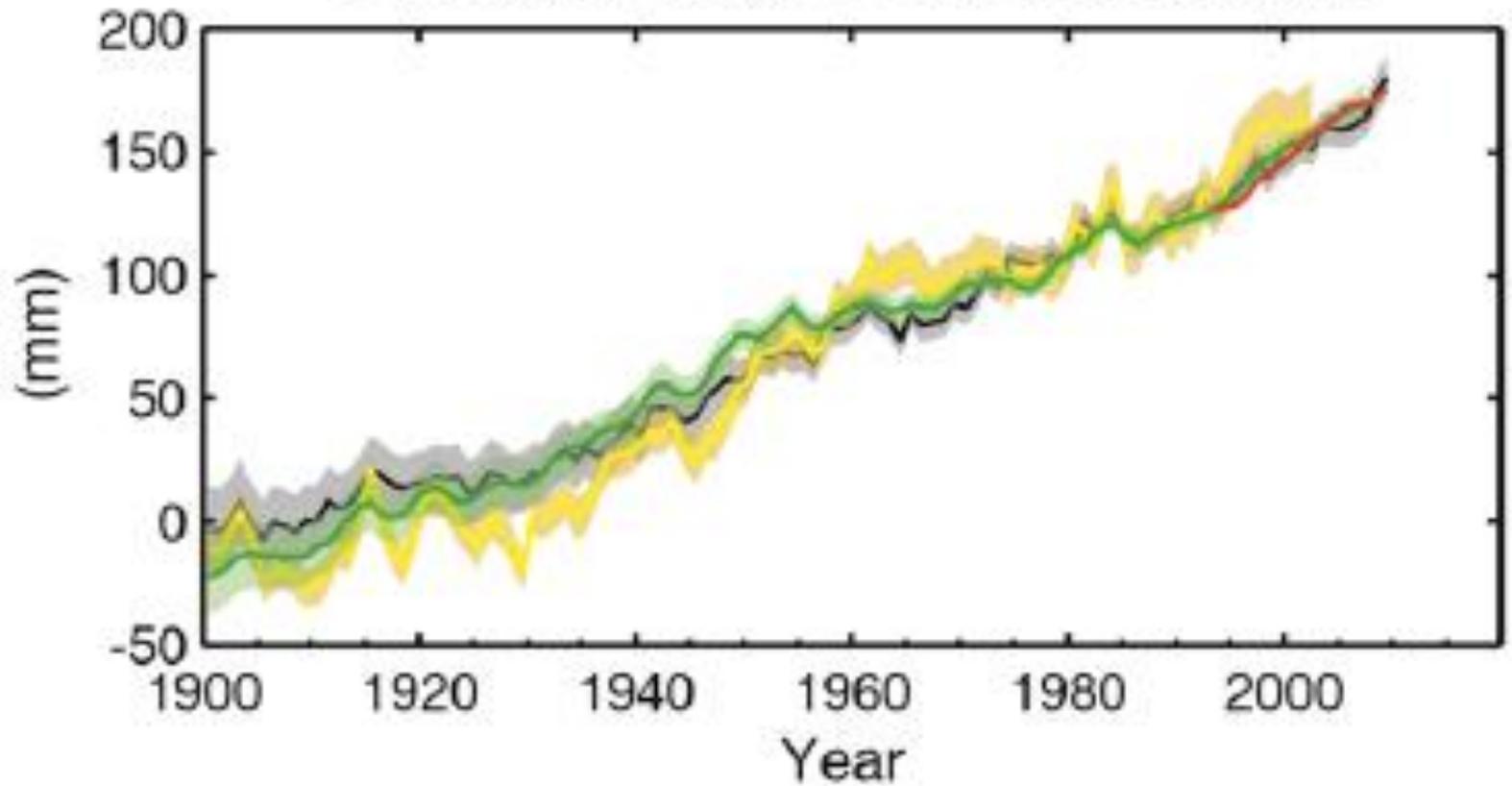


- Each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850
- 1983–2012 was *likely the warmest 30-year period of the last 1400 years*

Sea level rising

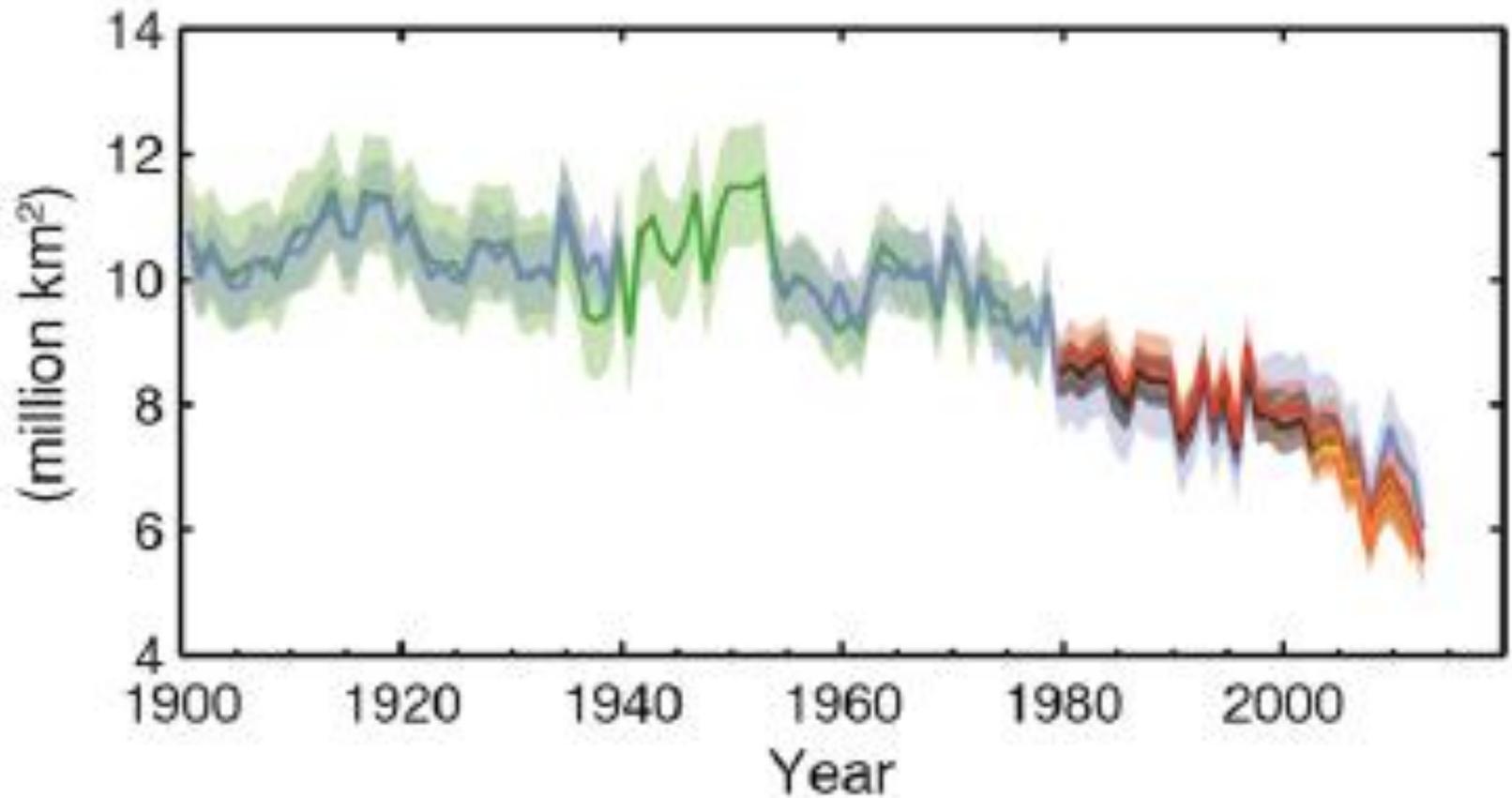
(d)

Global average sea level change

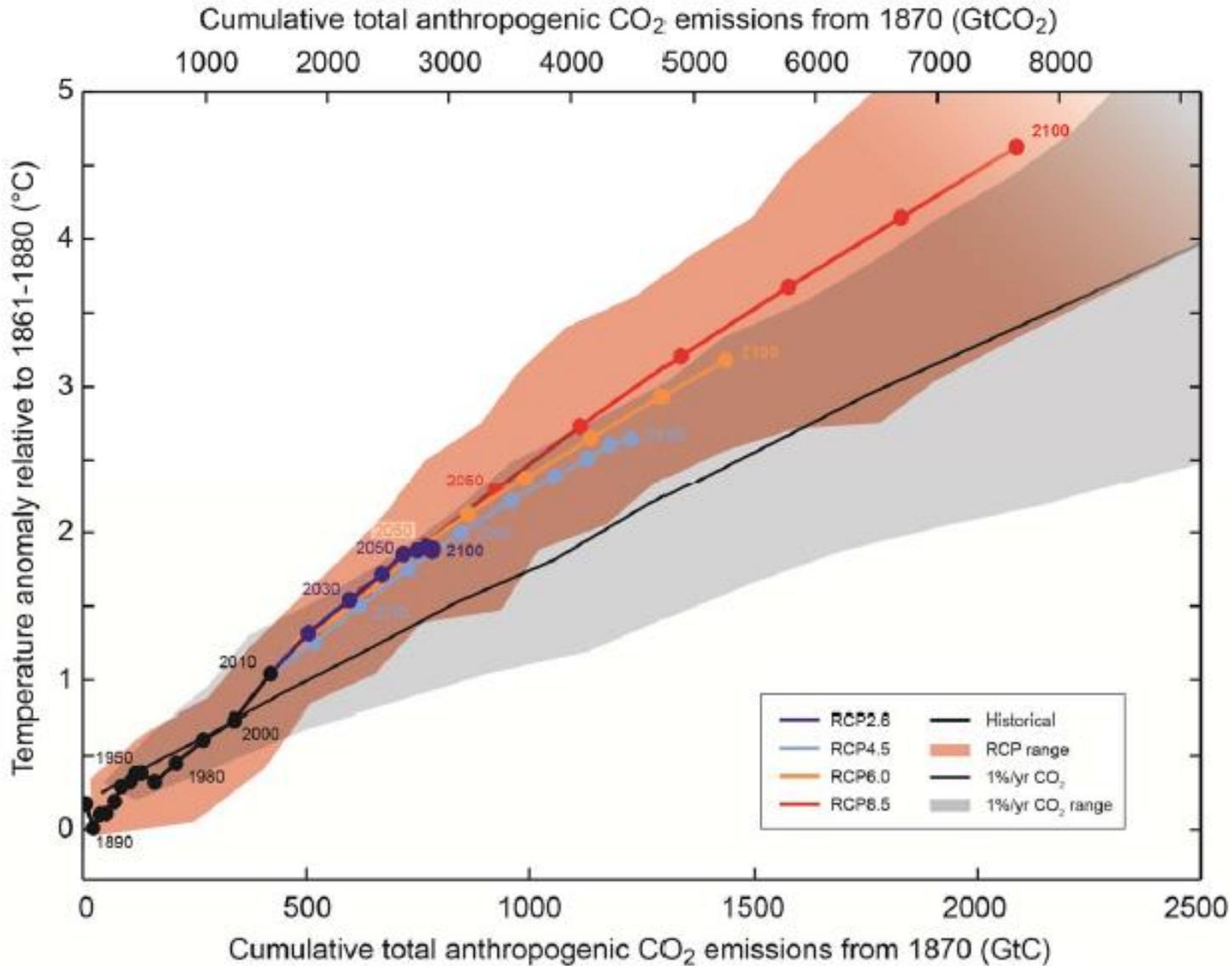


(b)

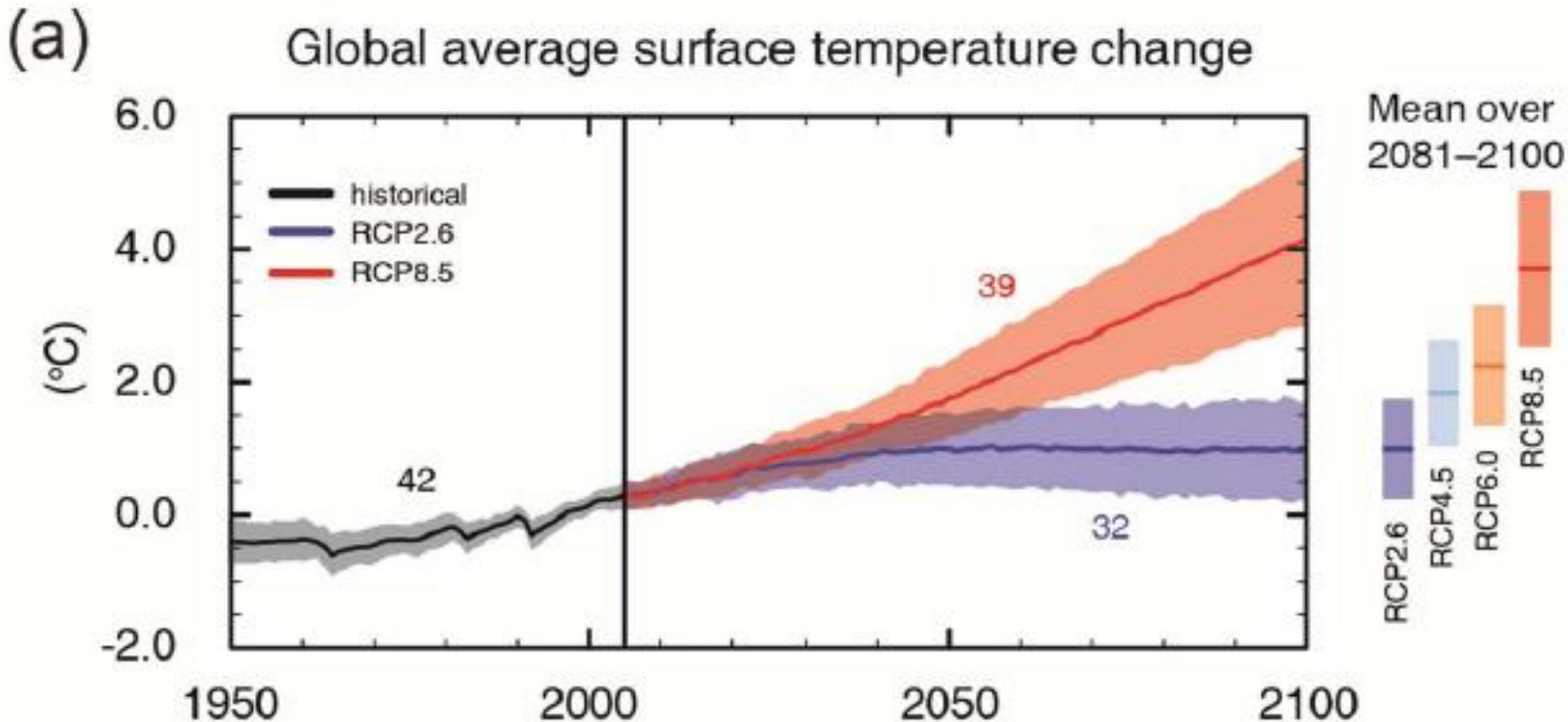
Arctic summer sea ice extent



CO2 emissions rising



Warming world



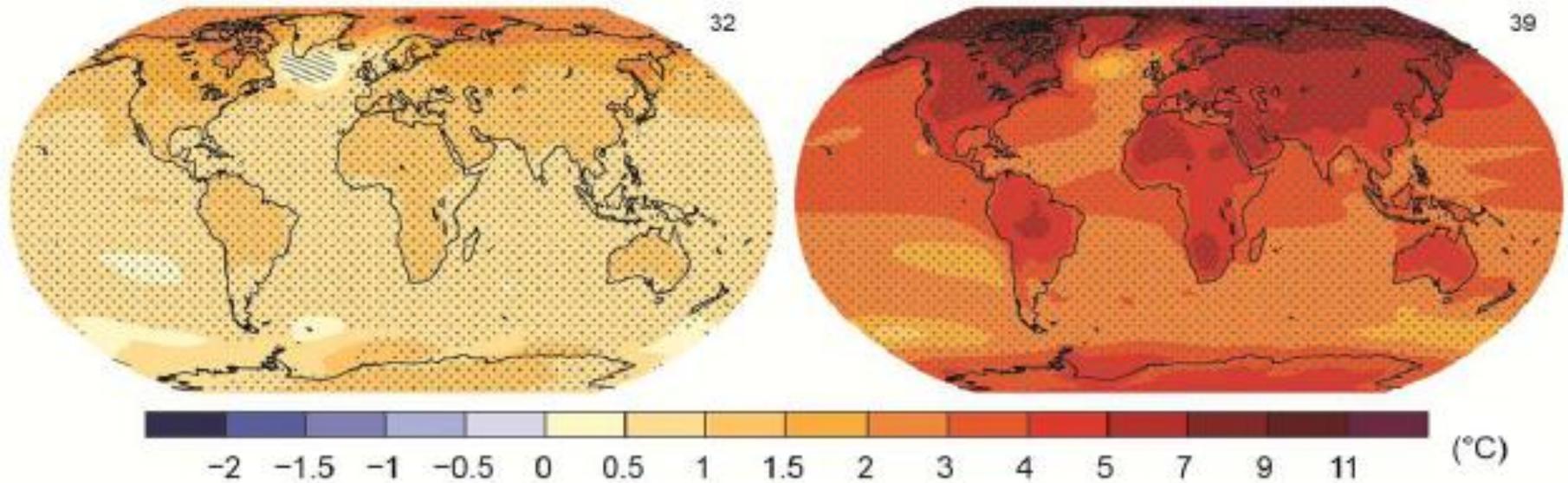
Temperature rising

RCP 2.6

RCP 8.5

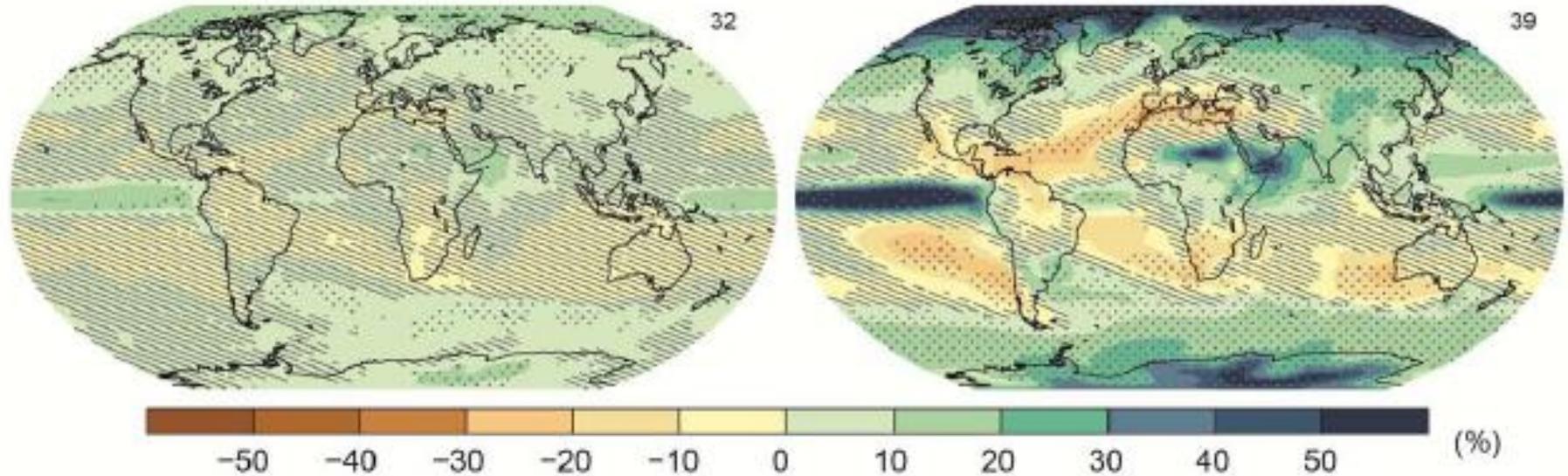
(a)

Change in average surface temperature (1986–2005 to 2081–2100)

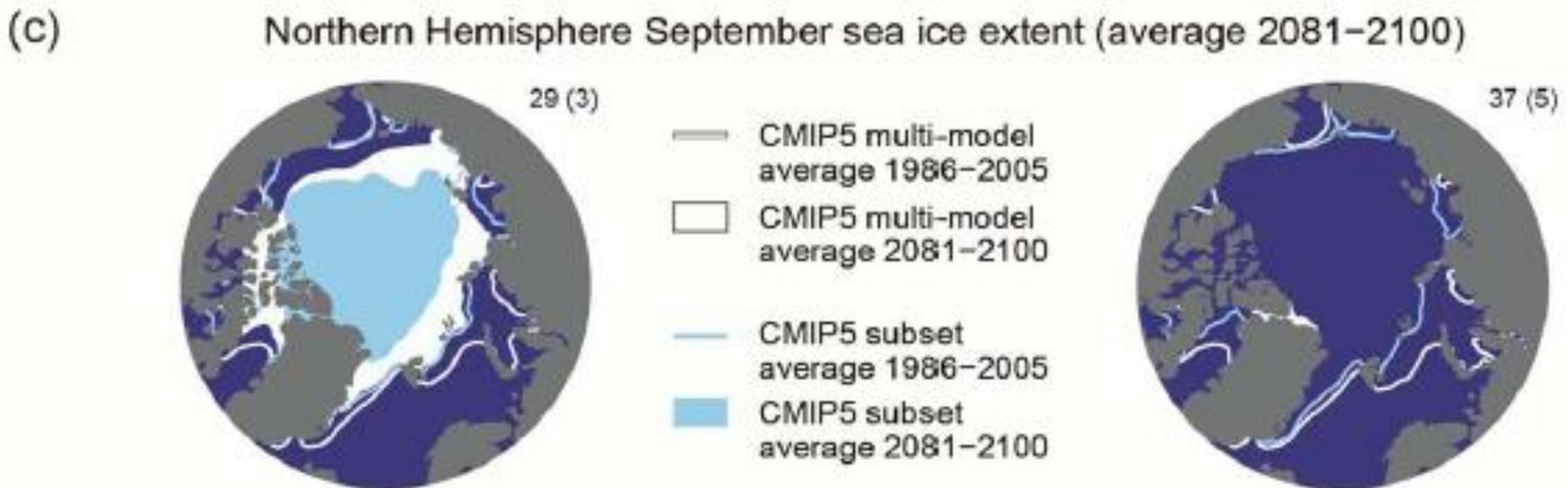


Wet and wetter

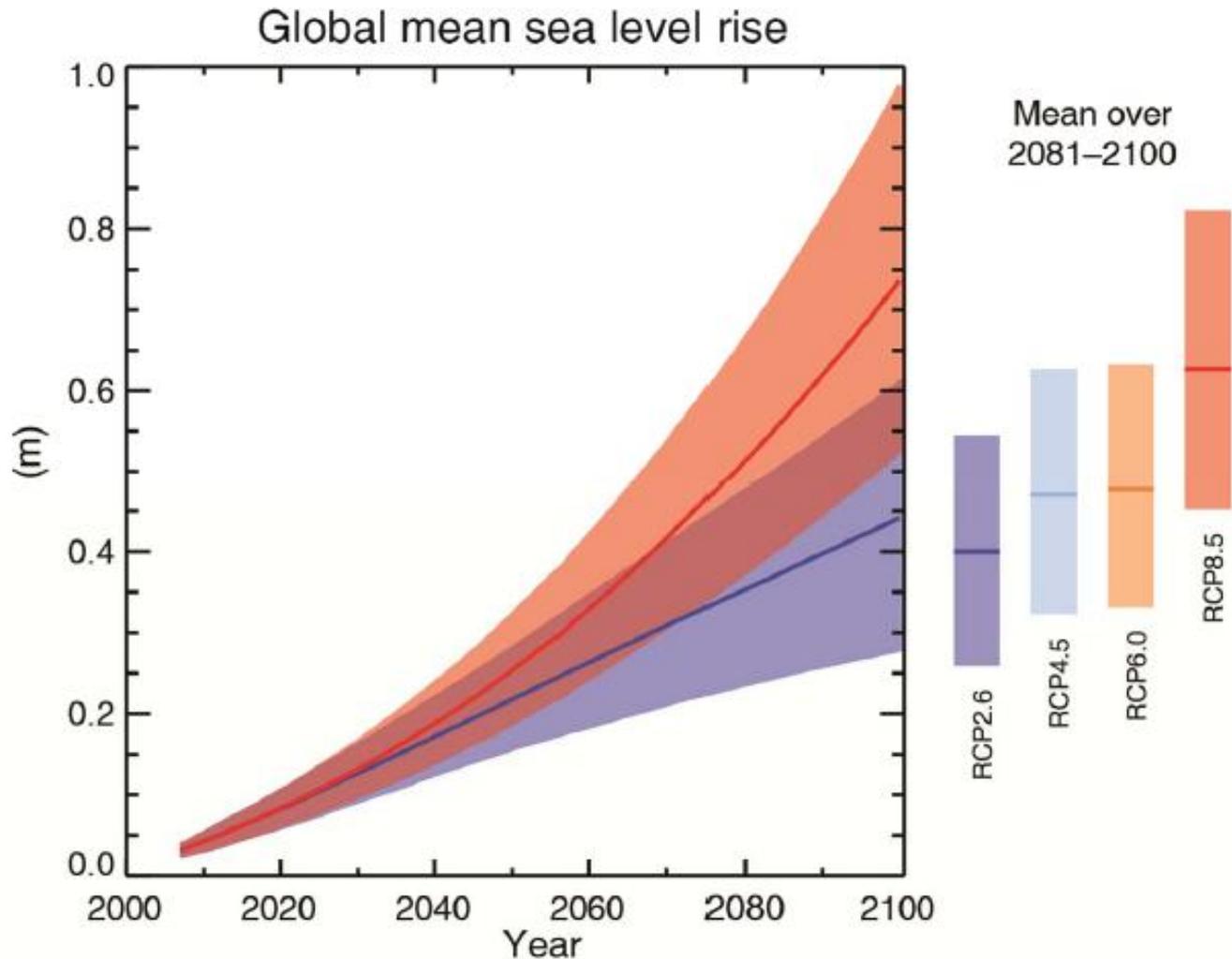
(b) Change in average precipitation (1986–2005 to 2081–2100)



Ice melting



Sea level rising



Greater exposure to tropical cyclones

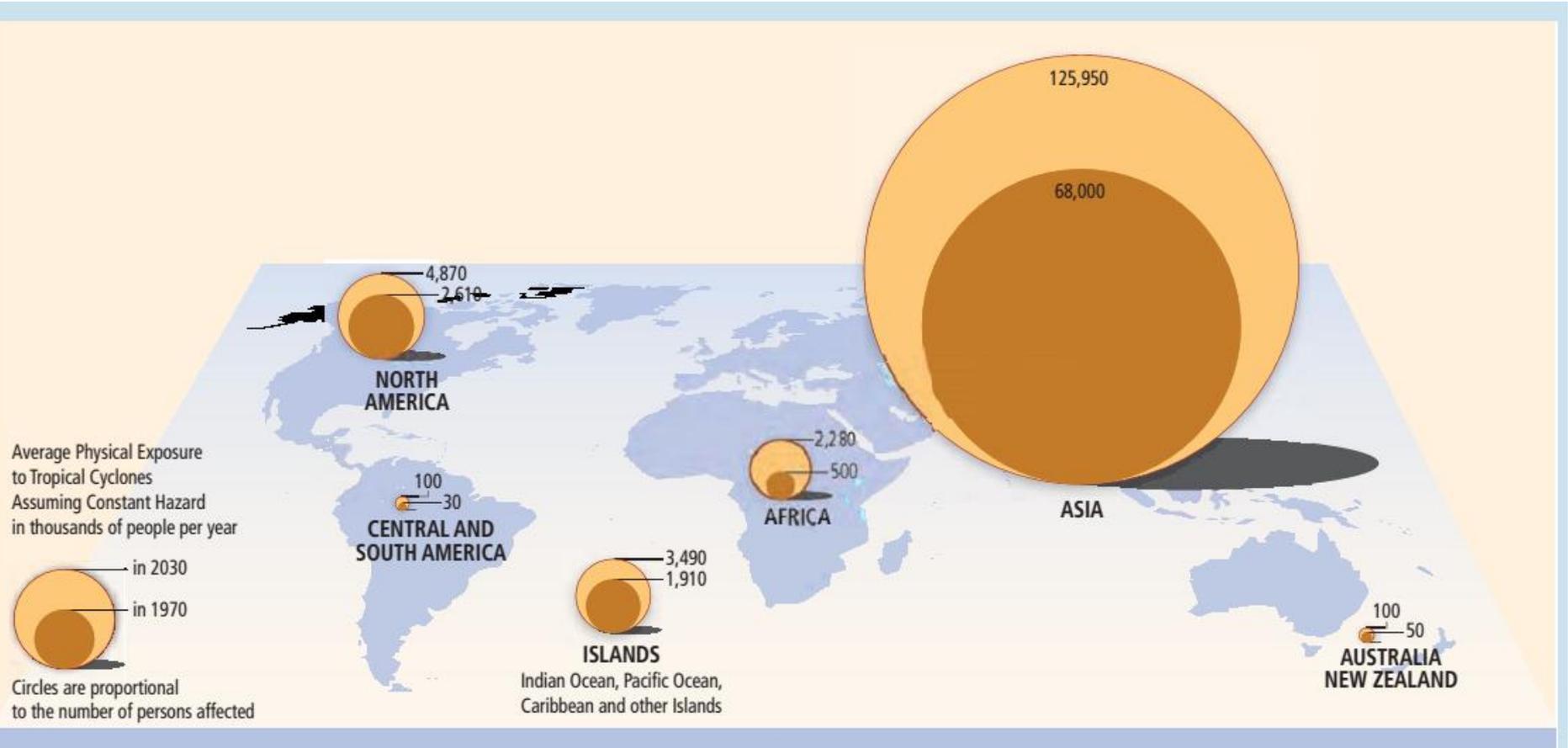


Figure 4-1 | Average physical exposure to tropical cyclones assuming constant hazard (in thousands of people per year). Data from Peduzzi et al., 2011.

Flooding exposure will worsen

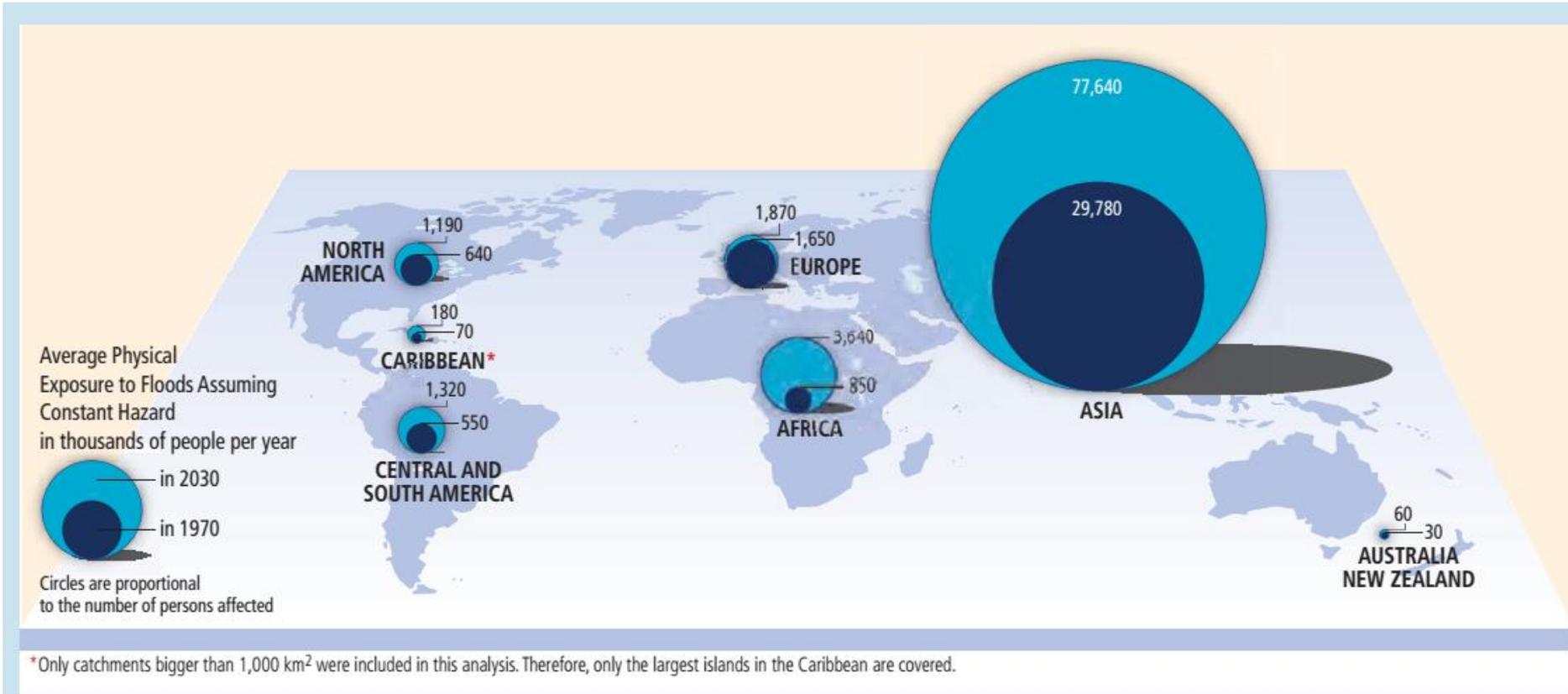
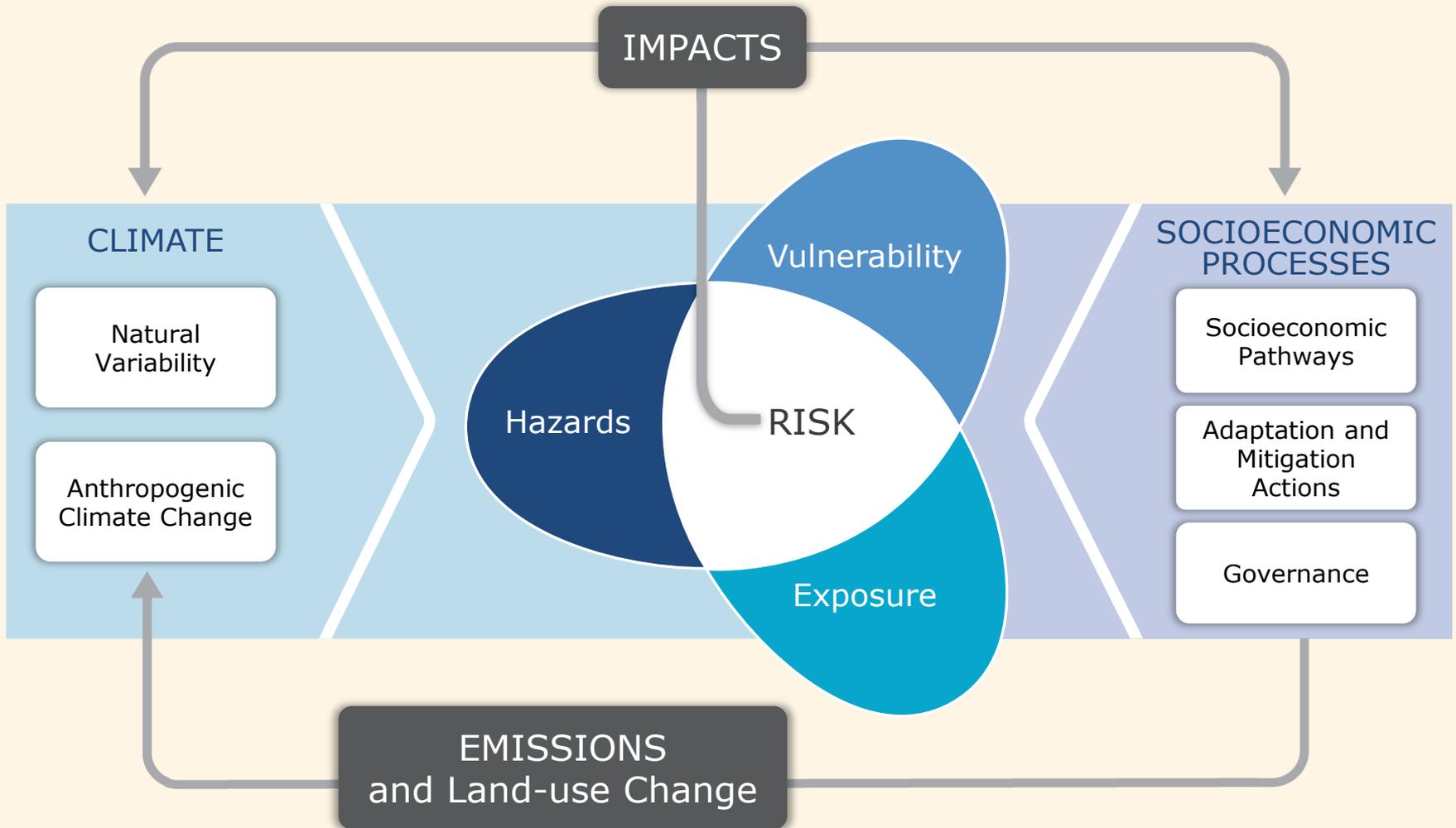


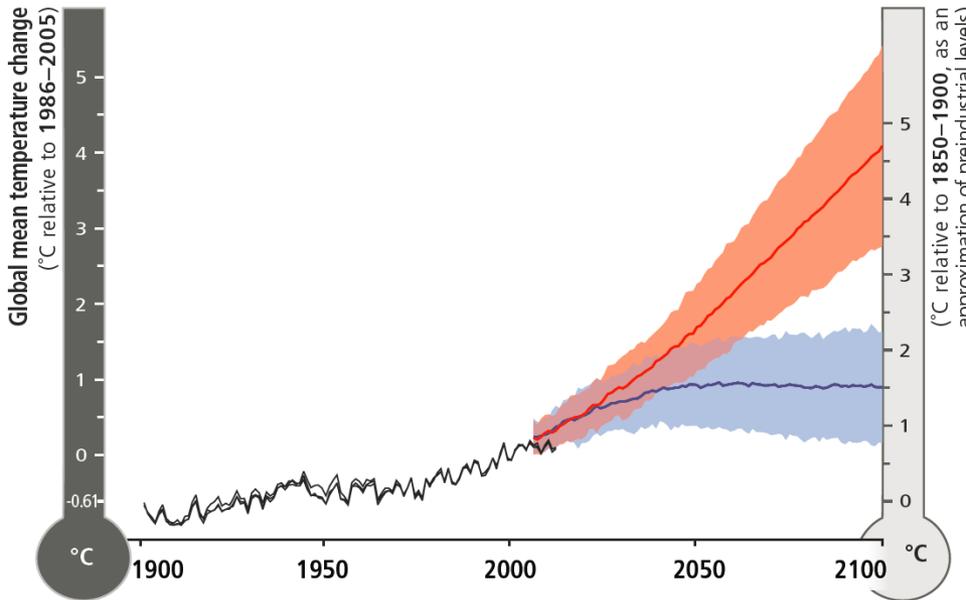
Figure 4-2 | Average physical exposure to floods assuming constant hazard (in thousands of people per year). Data from Peduzzi et al, 2011.

CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY

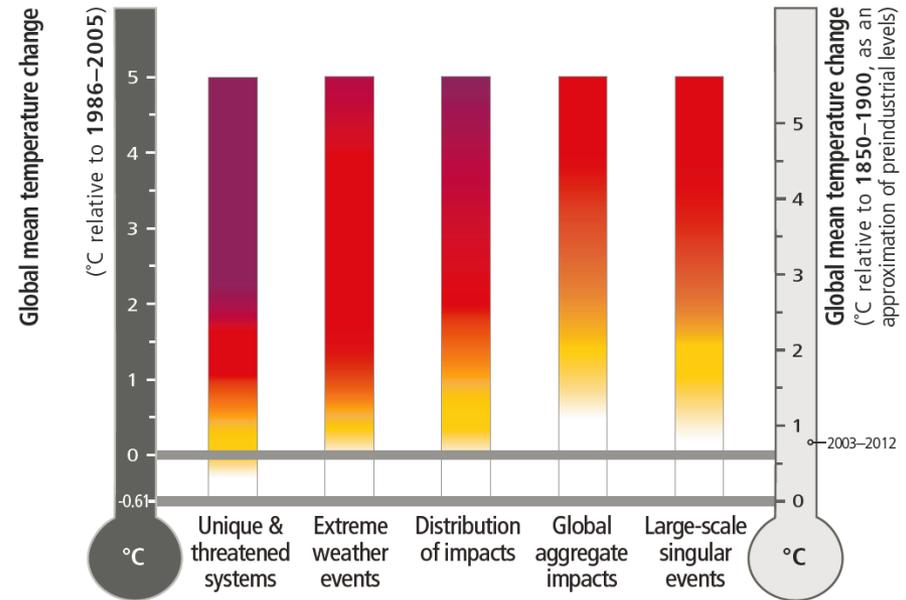




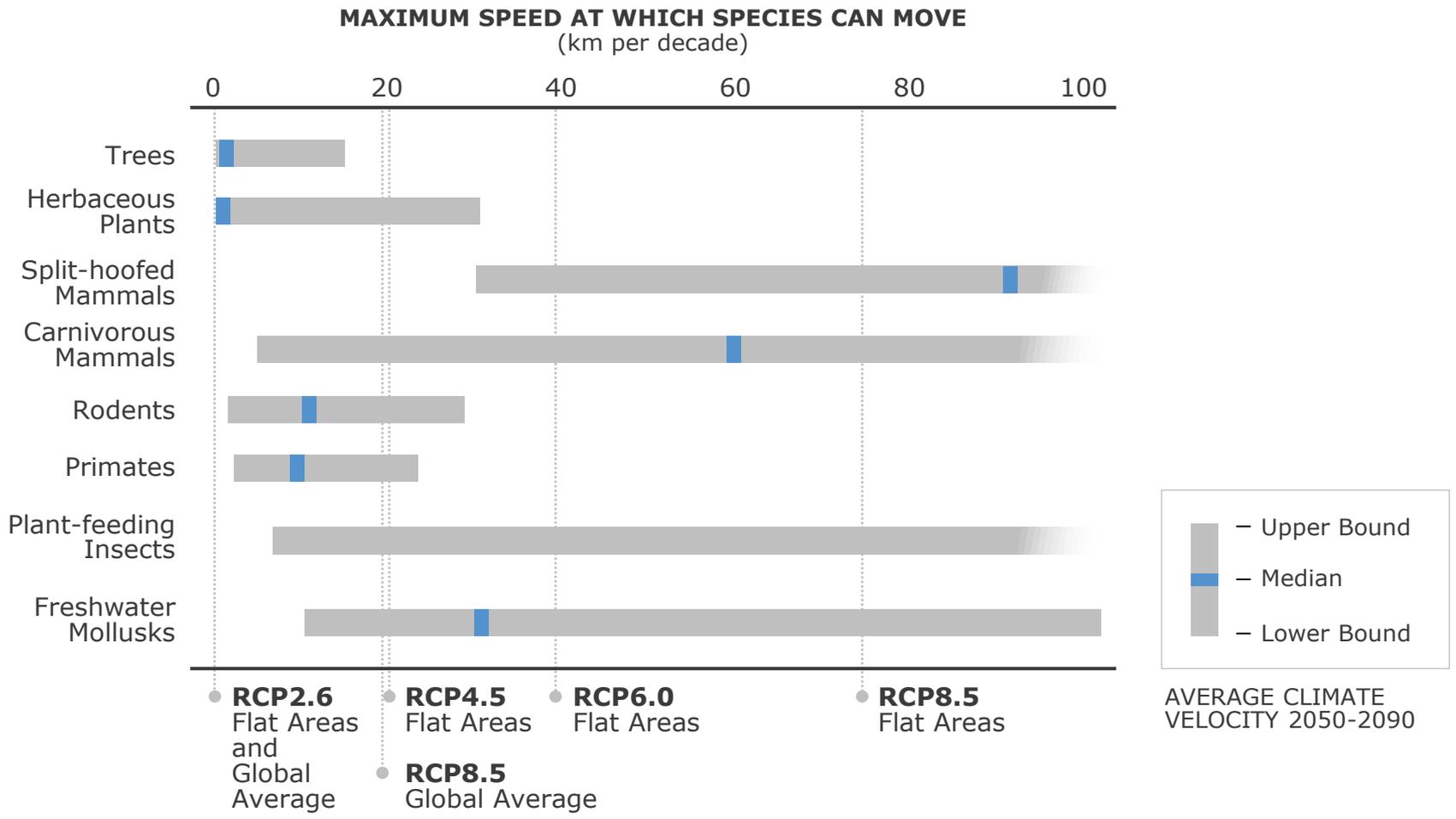
Additional risk due to CC



- Observed
- RCP8.5 (a high-emission scenario)
- Overlap
- RCP2.6 (a low-emission mitigation scenario)

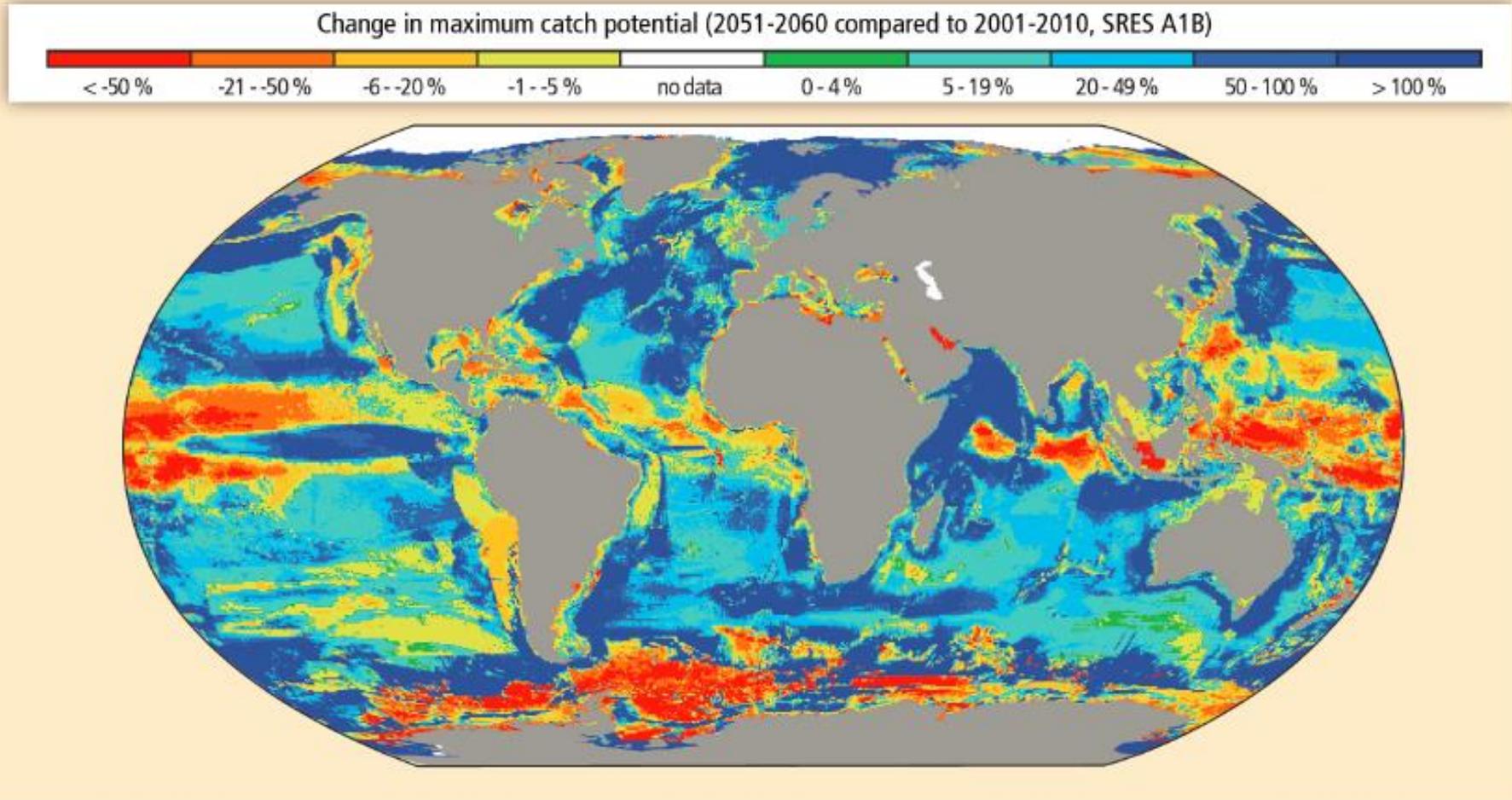


Maximum speed that species can move

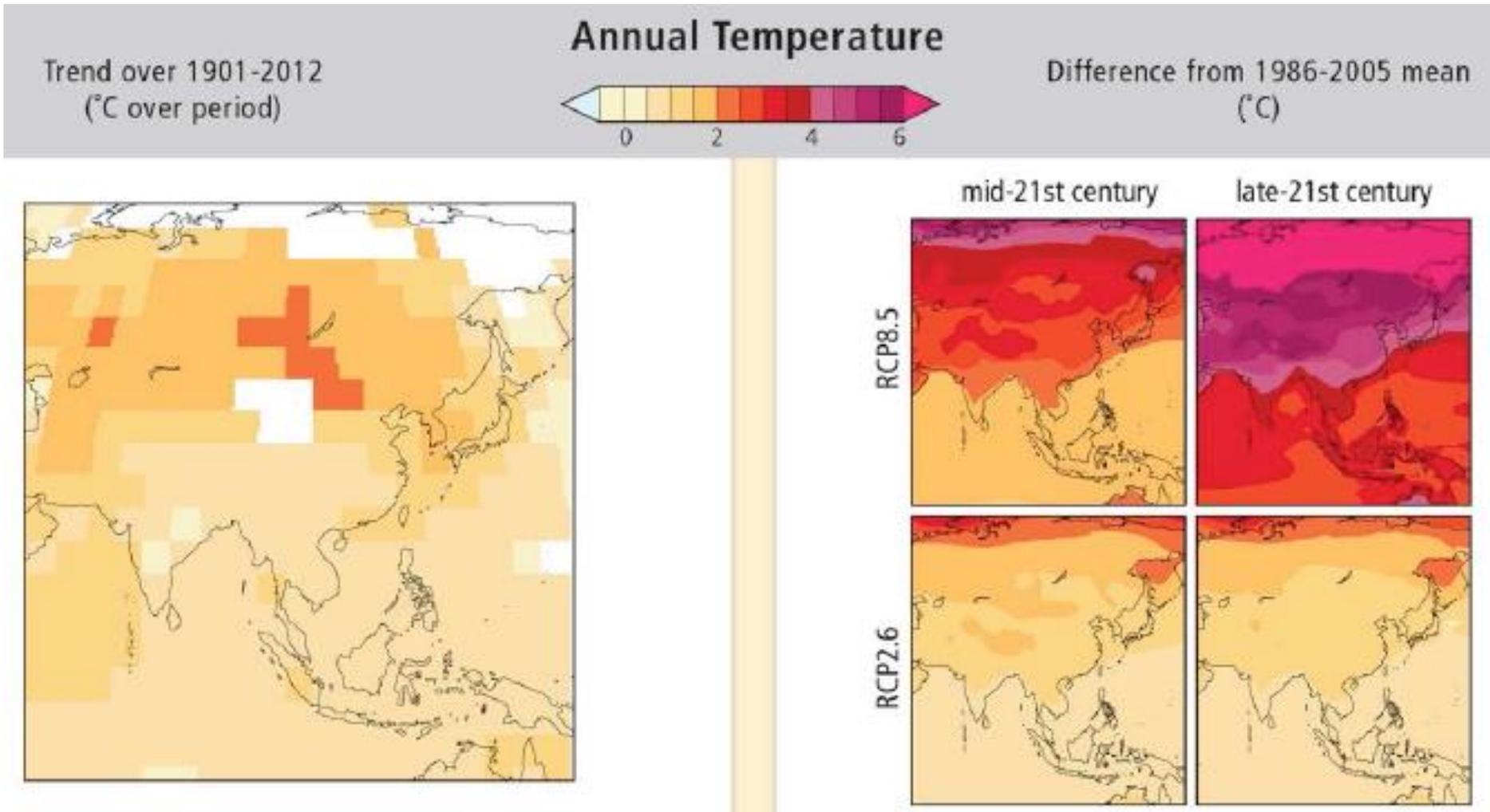


Change in fish catch potential (2051-60)

(A)



A warming Asia



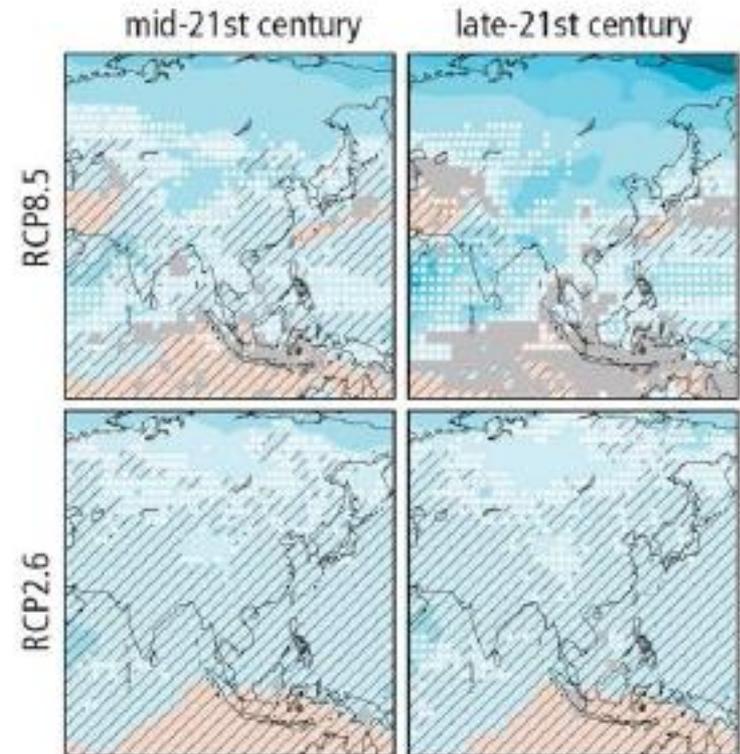
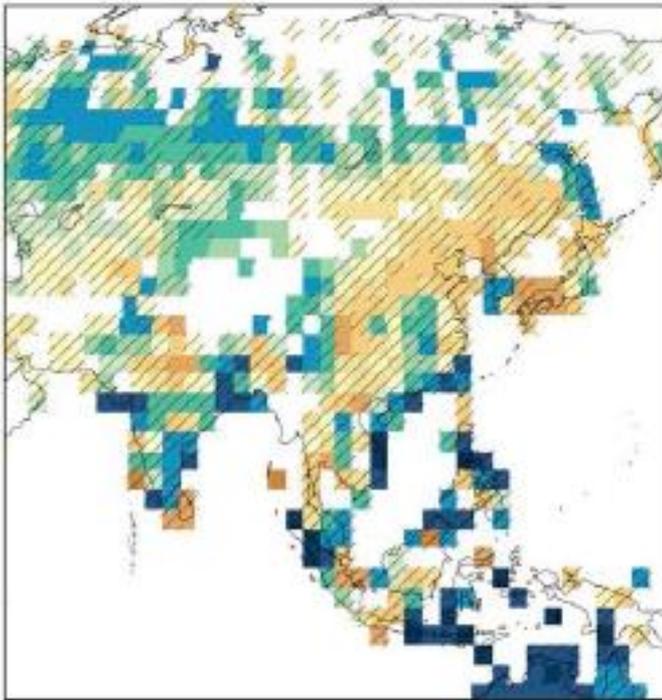
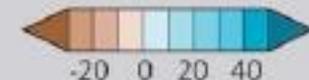
A wetter and drier Asia

Trend over 1951-2012 (mm/year/decade)



Annual Precipitation

Difference from 1986-2005 mean (%)



IPCC WG 2 Asia, 2014

Food Security

- The impacts of climate change will vary by region with many regions to experience a **decline in productivity** (medium confidence)
- This is evident in the case of rice production.
- Most models, using a range of GCMs and SRES scenarios, show that higher temperatures will lead to **lower rice yields** as a result of shorter growing periods.

Food Security

- There are a number of regions that are already near the heat stress limits for rice.
- However, CO₂ fertilization may at least in part offset yield losses in rice and other crops.
- In Central Asia, some areas could be **winners** (cereal production in northern and eastern Kazakhstan could benefit from the longer growing season, warmer winters and slight increase in winter precipitation),

Food Security

- While others could be **losers** (western Turkmenistan and Uzbekistan, where frequent droughts could negatively affect cotton production, increase water demand for irrigation, and exacerbate desertification).
- In the Indo-Gangetic Plains of South Asia there could be a decrease of about 50% in the most favorable and high yielding **wheat** area due to heat stress at 2x CO₂ .

Food Security

- **Sea level rise** will inundate low lying areas and will especially affect rice growing regions.
- There are many potential adaptation strategies being practiced and being proposed but research studies on their effectiveness are still few.

Water

- Water scarcity is expected to be a major challenge for most of the region due to increased water demand and lack of good management (medium confidence)
- Water resources are important in Asia because of the massive population and vary among regions and seasons.

Water

- However, there is low confidence in **future precipitation projections** at a subregional scale and thus in future freshwater availability in most parts of Asia.
- Population growth and increasing demand arising from higher standards of living could worsen water security in many parts in Asia and affect many people in future.

Water

- Integrated water management strategies could help adapt to climate change, including developing water saving technologies, increasing water productivity, and water reuse.

Terrestrial Ecosystems

- Terrestrial systems in many parts of Asia have responded to recent climate change with **shifts in the phenologies, growth rates, and the distributions** of plant species, and permafrost degradation, and the projected changes in climate during the 21st Century will increase these impacts (high confidence)

Terrestrial Ecosystems

- Boreal trees will likely invade treeless arctic vegetation, while evergreen conifers will likely invade deciduous larch forest.
- Large changes may also occur in arid and semiarid areas, but uncertainties in precipitation projections make these more difficult to predict.

Terrestrial Ecosystems

- The rates of vegetation change in the more densely populated parts of Asia may be reduced by the impact of habitat fragmentation on seed dispersal, while the impacts of projected climate changes on the vegetation of the **lowland tropics are currently poorly understood.**

Terrestrial Ecosystems

- Changes in animal distributions have also been projected, in response to both direct impacts of climate change and indirect impacts through changes in the availability of suitable habitats.

Coastal and Marine

- Coastal and marine systems in Asia are under increasing stress from both climatic and non-climatic drivers (high confidence)
- It is likely that mean sea-level rise will contribute to upward trends in extreme coastal high water levels.

Coastal and Marine

- In the Asian Arctic, rising sea-levels are expected to interact with projected changes in permafrost and the length of the ice-free season to cause increased rates of coastal erosion (high agreement, medium evidence).
- **Mangroves, salt marshes and seagrass beds** may decline unless they can move inland, while coastal freshwater swamps and marshes will be vulnerable to saltwater intrusion with rising sea-levels.

Coastal and Marine

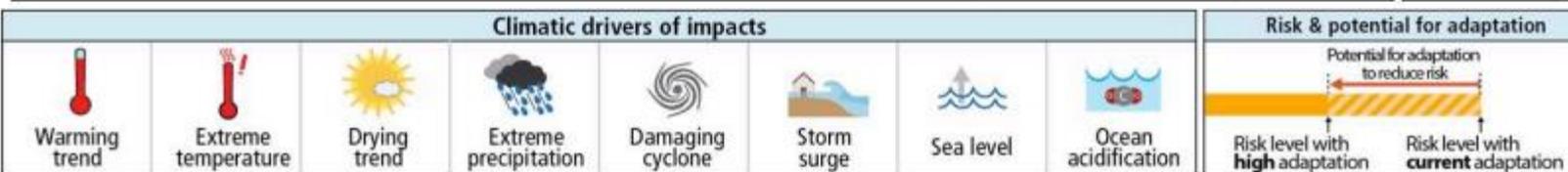
- Widespread damage to **coral reefs** correlated with episodes of high sea-surface temperature has been reported in recent decades and there is high confidence that damage to reefs will increase during the 21st century as a result of both warming and ocean acidification.

Coastal and Marine

- Marine biodiversity is expected to increase at temperate latitudes as warm water species expand their ranges northwards (high confidence), but may **decrease in the tropics** if thermal tolerance limits are exceeded (medium confidence).

Table 24-1: Key risks and the potential for risk reduction through mitigation and adaptation

Key risk	Adaptation issues and prospects	Climatic drivers	Supporting ch. sections	Timeframe	Risk for current and high adaptation
Increased risk of crop failure and lower crop production could lead to food insecurity in Asia (<i>medium confidence</i>)	Autonomous adaptation of farmers on-going in many parts of Asia.		24.4.4	Present Near-term (2030-2040) Long-term (2080-2100) 2°C 4°C	Very low, Medium, Very high
Water shortage in arid areas of Asia (<i>medium confidence</i>)	Limited capacity for water resource adaptation; options include developing water saving technology, changing drought-resilient crops, building more water reservoirs.		24.4.1.3, 24.4.1.4	Present Near-term (2030-2040) Long-term (2080-2100) 2°C 4°C	Very low, Medium, Very high
Increased flooding leading to widespread damage to infrastructure and settlements in Asia (<i>medium confidence</i>)	Adaptation measures include extreme weather exposure reduction via effective land-use planning, selective relocation and structural measures; reduction in the vulnerability of lifeline infrastructure and services (water, energy, waste management, food, biomass, mobility, local ecosystems and telecommunications) and measures to assist vulnerable sectors and households.		24.4.5.1, 24.4.5.2, 24.4.5.3, 24.4.5.5,	Present Near-term (2030-2040) Long-term (2080-2100) 2°C 4°C	Very low, Medium, Very high

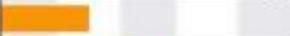
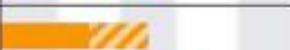
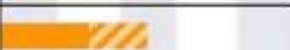


Asia, 2014

Table 24-1: Key risks and the potential for risk reduction through mitigation and adaptation

<p>Increased risk of flood-related deaths, injuries, infectious diseases and mental disorders (<i>medium confidence</i>)</p>	<p>Disaster preparedness including early-warning systems and local coping strategies.</p>		<p>24.4.6.2, 24.4.6.3, 24.4.6.5</p>	<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 risk level]</td> </tr> <tr> <td>Near-term (2030-2040)</td> <td colspan="3">[Bar chart showing risk level]</td> </tr> <tr> <td rowspan="2">Long-term (2080-2100)</td> <td>2°C</td> <td colspan="2">[Bar chart showing risk level]</td> </tr> <tr> <td>4°C</td> <td colspan="2">[Bar chart showing risk level]</td> </tr> </tbody> </table>		Very low	Medium	Very high	Present	[Bar chart showing risk level]			Near-term (2030-2040)	[Bar chart showing risk level]			Long-term (2080-2100)	2°C	[Bar chart showing risk level]		4°C	[Bar chart showing risk level]	
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<p>Increased risk of heat-related mortality (<i>high confidence</i>)</p>	<p>Heat health-warning systems, urban planning to reduce heat islands and improvement of built environment.</p>		<p>24.4.6.2, 24.4.6.3, 24.4.6.5</p>	<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 risk level]</td> </tr> <tr> <td>Near-term (2030-2040)</td> <td colspan="3">[Bar chart showing risk level]</td> </tr> <tr> <td rowspan="2">Long-term (2080-2100)</td> <td>2°C</td> <td colspan="2">[Bar chart showing risk level]</td> </tr> <tr> <td>4°C</td> <td colspan="2">[Bar chart showing risk level]</td> </tr> </tbody> </table>		Very low	Medium	Very high	Present	[Bar chart showing risk level]			Near-term (2030-2040)	[Bar chart showing risk level]			Long-term (2080-2100)	2°C	[Bar chart showing risk level]		4°C	[Bar chart showing risk level]	
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 Warming trend	 Extreme temperature	 Drying trend	 Extreme precipitation	 Damaging cyclone	 Storm surge	 Sea level	 Ocean acidification																

Table 24-1: Key risks and the potential for risk reduction through mitigation and adaptation

Key risk	Adaptation issues and prospects	Climatic drivers	Supporting ch. sections	Timeframe	Risk for current and high adaptation
Increased risk of drought-related water and food shortage causing malnutrition (<i>high confidence</i>)	Disaster preparedness including early-warning systems and local coping strategies.	 	24.4.6.2, 24.4.6.3, 24.4.6.5		Very low Medium Very high
				Present	
				Near-term (2030-2040)	
				Long-term (2080-2100)	2°C  4°C 
Increased risk of water and vector-borne diseases (<i>medium confidence</i>)	Early-warning systems, vector control programs, water management and sanitation programs.	 	24.4.6.2, 24.4.6.3, 24.4.6.5		Very low Medium Very high
				Present	
				Near-term (2030-2040)	
				Long-term (2080-2100)	2°C  4°C 
Exacerbated poverty, inequalities and new vulnerabilities (<i>high confidence</i>)	Insufficient emphasis and limited understanding on urban poverty, interaction between livelihoods, poverty and climate change.	 	24.4.5, 24.4.6		Very low Medium Very high
				Present	
				Near-term (2030-2040)	
				Long-term (2080-2100)	2°C  4°C 

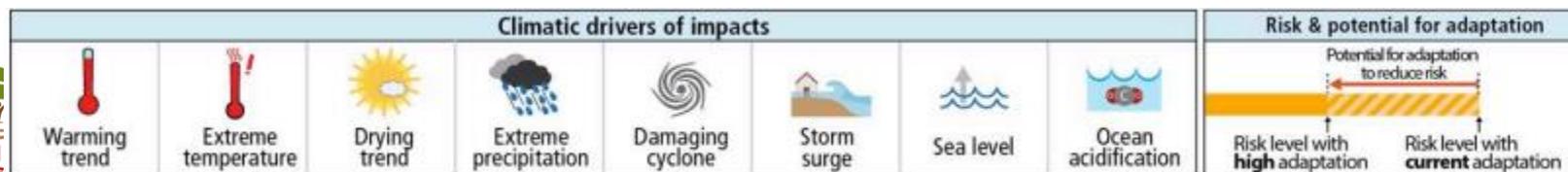


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<p>Coral reef decline in Asia <i>(high confidence)</i></p>	<p>The limited adaptation options include minimizing additional stresses in marine protected areas sited where sea surface temperatures are expected to change least and reef resilience is expected to be highest.</p>		<p>24.4.3.3, 24.4.3.5, CC-CR, CC-OA</p>	<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 risk level]</td> </tr> <tr> <td>Near-term (2030-2040)</td> <td colspan="3">[Bar chart showing risk level]</td> </tr> <tr> <td rowspan="2">Long-term (2080-2100)</td> <td>2°C</td> <td colspan="2">[Bar chart showing risk level]</td> </tr> <tr> <td>4°C</td> <td colspan="2">[Bar chart showing risk level]</td> </tr> </tbody> </table>		Very low	Medium	Very high	Present	[Bar chart showing risk level]			Near-term (2030-2040)	[Bar chart showing risk level]			Long-term (2080-2100)	2°C	[Bar chart showing risk level]		4°C	[Bar chart showing risk level]	
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<p>Mountain-top extinctions in Asia <i>(high confidence)</i></p>	<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.</p>		<p>24.4.2.4, 24.4.2.5</p>	<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 risk level]</td> </tr> <tr> <td>Near-term (2030-2040)</td> <td colspan="3">[Bar chart showing risk level]</td> </tr> <tr> <td rowspan="2">Long-term (2080-2100)</td> <td>2°C</td> <td colspan="2">[Bar chart showing risk level]</td> </tr> <tr> <td>4°C</td> <td colspan="2">[Bar chart showing risk level]</td> </tr> </tbody> </table>		Very low	Medium	Very high	Present	[Bar chart showing risk level]			Near-term (2030-2040)	[Bar chart showing risk level]			Long-term (2080-2100)	2°C	[Bar chart showing risk level]		4°C	[Bar chart showing risk level]	
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ADAPTATION IS

ALREADY OCCURRING



EFFECTIVE CLIMATE CHANGE ADAPTATION

A MORE VIBRANT WORLD

Regional programs/framework on climate change

- ASEAN
- SARC
- ADB
- APEC
- APAN
- APN

ASEAN 2015 can collaborate on:

- Examining and promoting the role of forest ecosystems in adapting to climate-related risks and disasters
 - Mangroves for storm surge protection
 - Forests for flood control
 - Forests for landslide prevention
- Research on climate change impacts on forests

Take home messages...

- Lives and ecosystems may be endangered (food security, sea level rise, flooding)
- We need to adapt now!

Thank You!!!

