The Blue Economy and Climate Change: Challenges and Opportunities

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IPCC Vice-Chair

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Blue Economy

The Blue Economy is a result of a push by coastal nations during the Rio +20 process for a flavour of the Green Economy that better applies to them.

The **Blue Economy** advocates the same desired outcome as the Green Economy namely:

"improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities" (UNEP 2013).

At the core of the Blue Economy is the de-coupling of socioeconomic development from environmental degradation.

http://www.climdev-africa.org/content/blue-economy-are-african-small-islands-ready-embrace-opportunities

Blue Economy: Key Sectors

« … Blue Economy will involve the sustainable development of key economic sectors such as fisheries, coastal tourism, maritime transport, exploitation of seabed resources, and potential sources of renewable energy »

Source: H.E. Minister Didier Dogley (Seychelles) speech today

Why the IPCC ?

Established by WMO and UNEP in 1988

to provide policy-makers with an objective source of information about

- causes of climate change,
- potential environmental and socio-economic impacts,
- possible response options (adaptation & mitigation).

WMO=World Meteorological Organizatior

UNEP= United Nations Environment Programme

What is happening in the climate system?

What are the risks?

What can be done?

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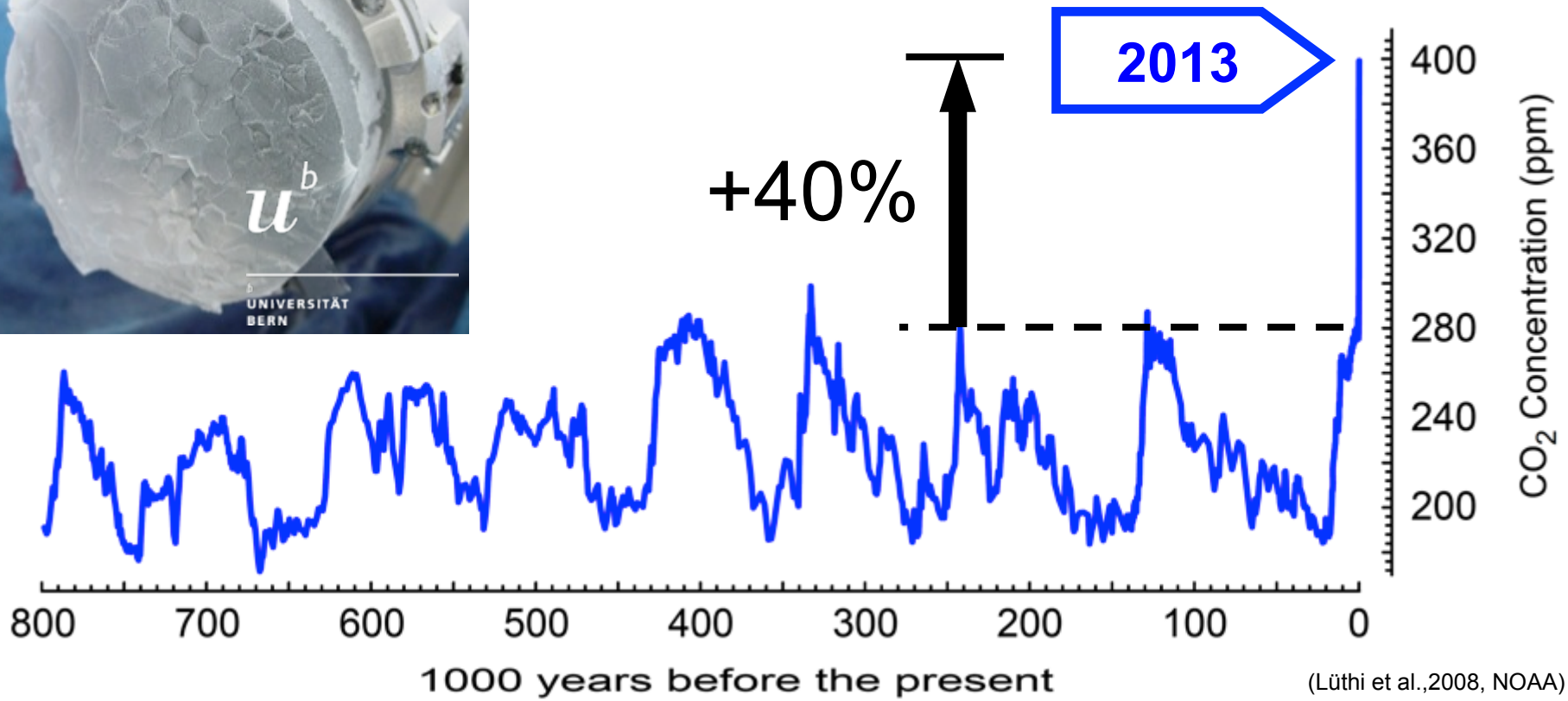
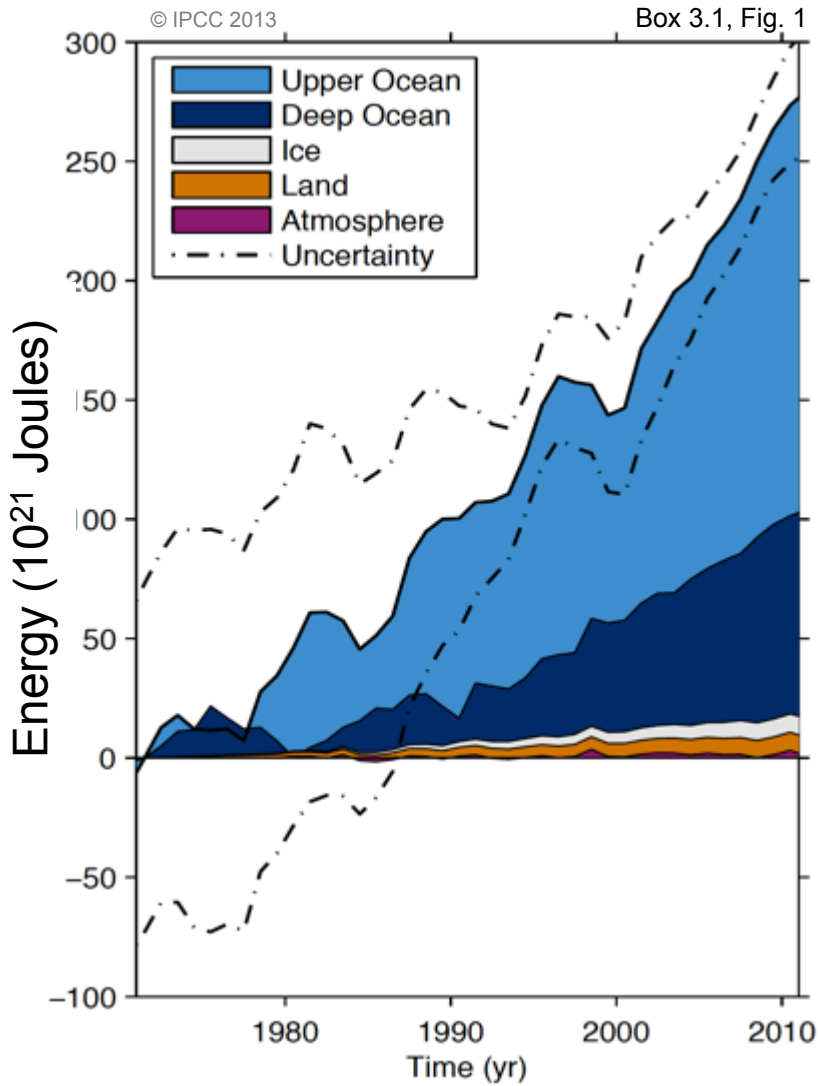
Key messages from IPCC AR5

- Human influence on the climate system is clear
- Continued emissions of greenhouse gases will increase the likelihood of severe, pervasive and irreversible impacts for people and ecosystems
- While climate change is a threat to sustainable development, there are many opportunities to integrate mitigation, adaptation, and the pursuit of other societal objectives
- Humanity has the means to limit climate change and build a more sustainable and resilient future



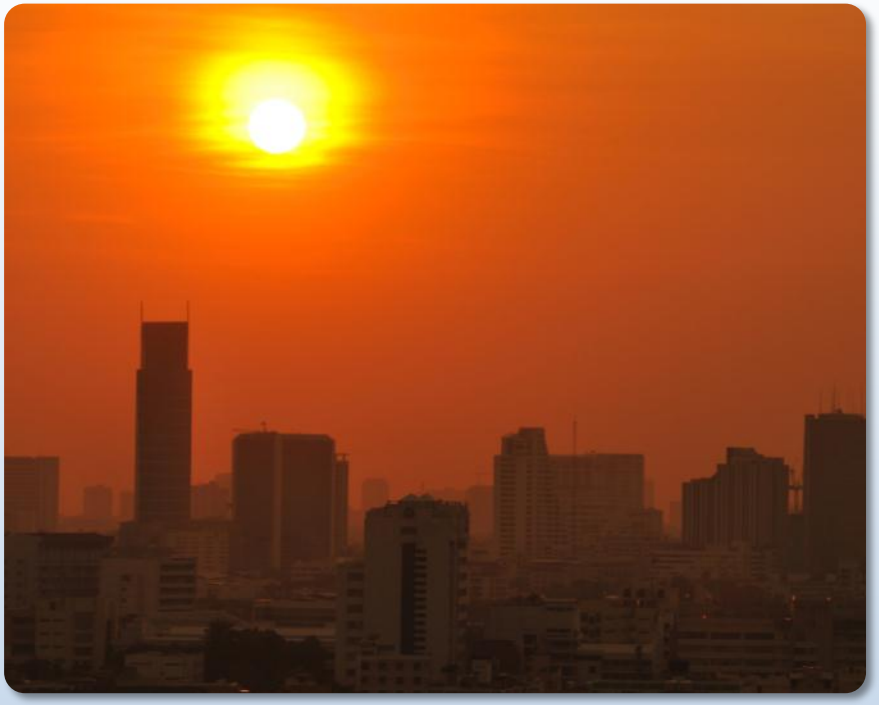
(Lüthi et al.,2008, NOAA)

The atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years.



Ocean warming dominates the increase in energy stored in the climate system, accounting for more than 90% of the energy accumulated between 1971 and 2010 (*high confidence*).

Since 1950, extreme hot days and heavy precipitation have become more common



There is evidence that anthropogenic influences, including increasing atmospheric greenhouse gas concentrations, have changed these extremes

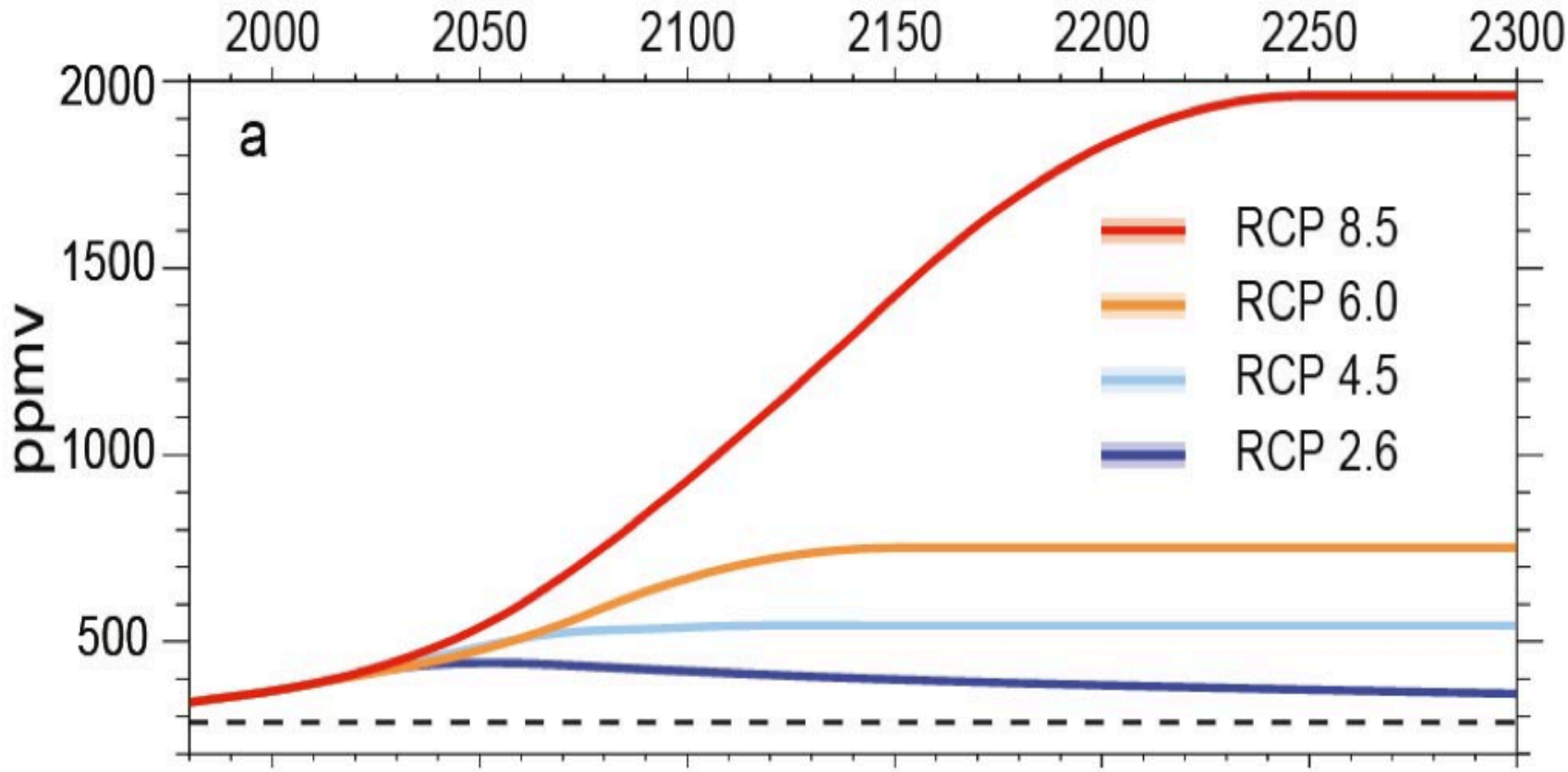
Impacts are already underway

- Tropics to the poles
- On all continents and in the ocean
- Affecting rich and poor countries (but the poor are more vulnerable everywhere)



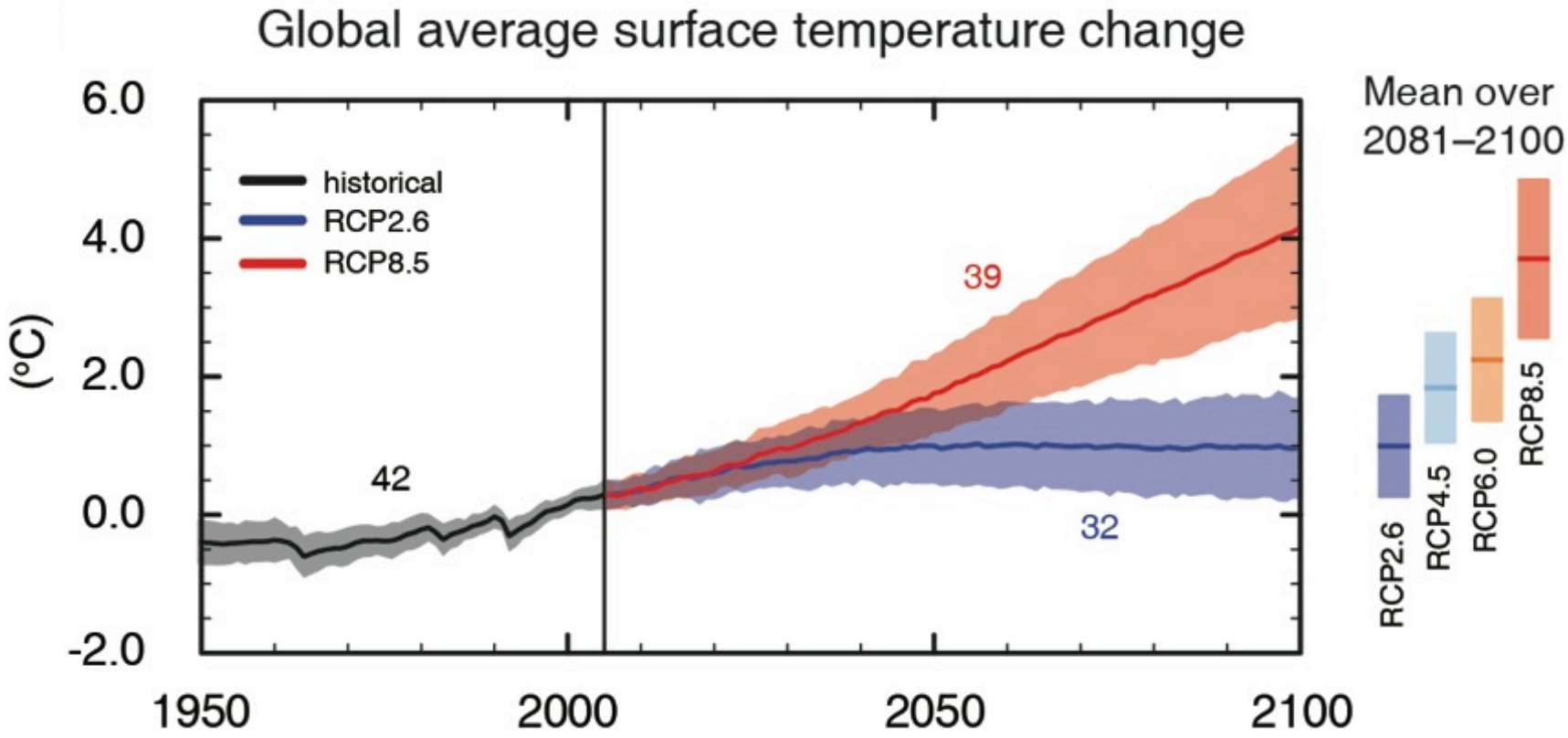

AR5 WGII SPM

RCP Scenarios: Atmospheric CO_2 concentration



Three stabilisation scenarios: RCP 2.6 to 6
One Business-as-usual scenario: RCP 8.5

AR5, chapter 12. WGI



(IPCC 2013, Fig. SPM.7a)

Only the lowest (RCP2.6) scenario maintains the global surface temperature increase above the pre-industrial level to less than 2°C with at least 66% probability

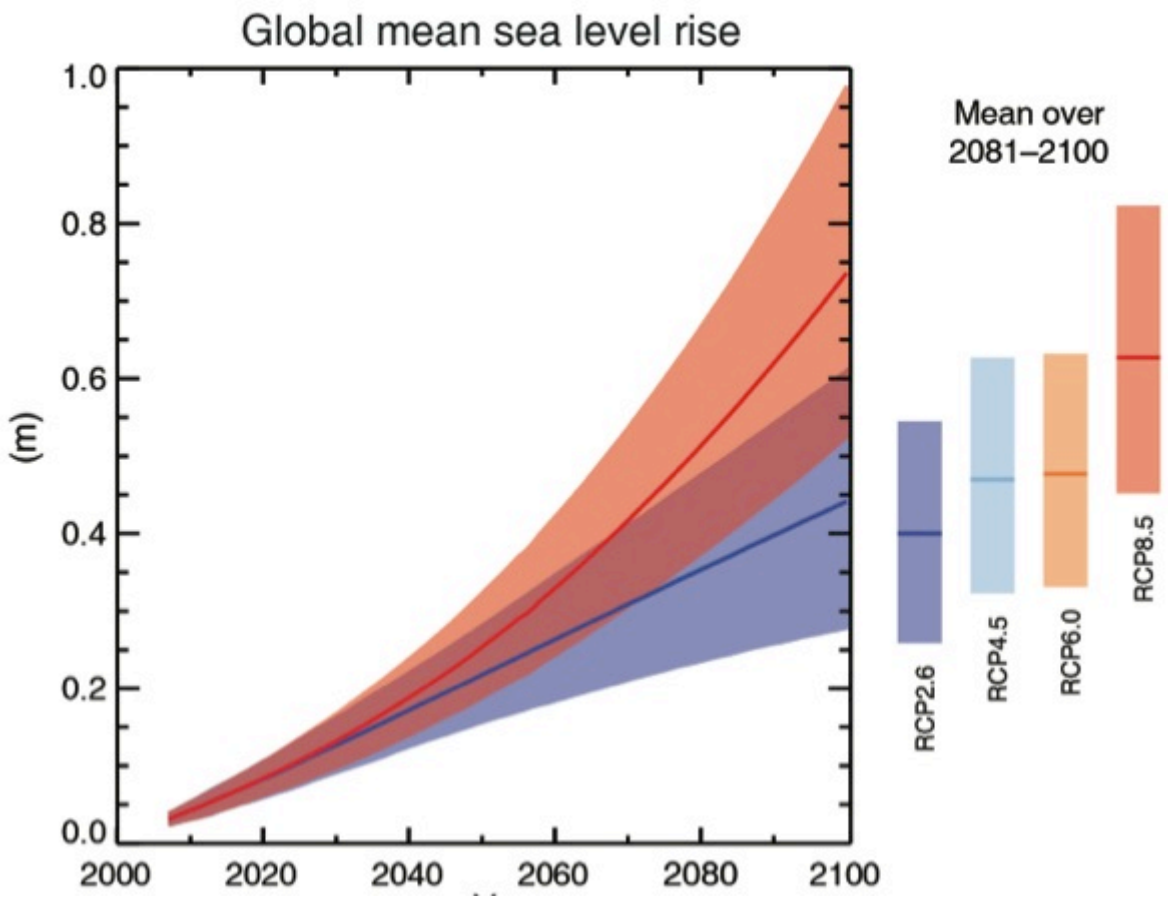


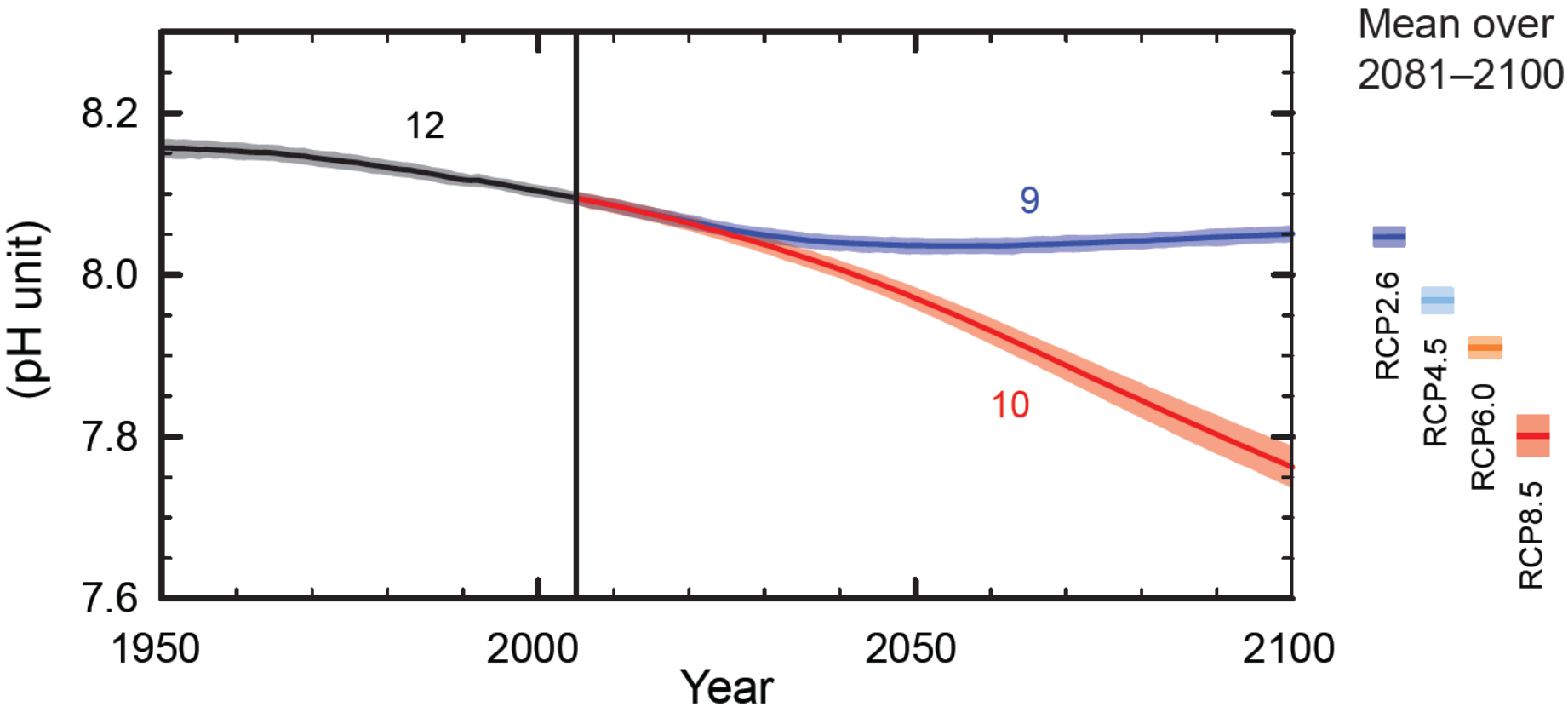
Fig. SPM.9

RCP2.6 (2081-2100), *likely* range: 26 to 55 cm

RCP8.5 (in 2100), *likely* range: 52 to 98 cm

Figure SPM.7c
Global ocean surface pH

Acidification: the lower the pH, the more acid

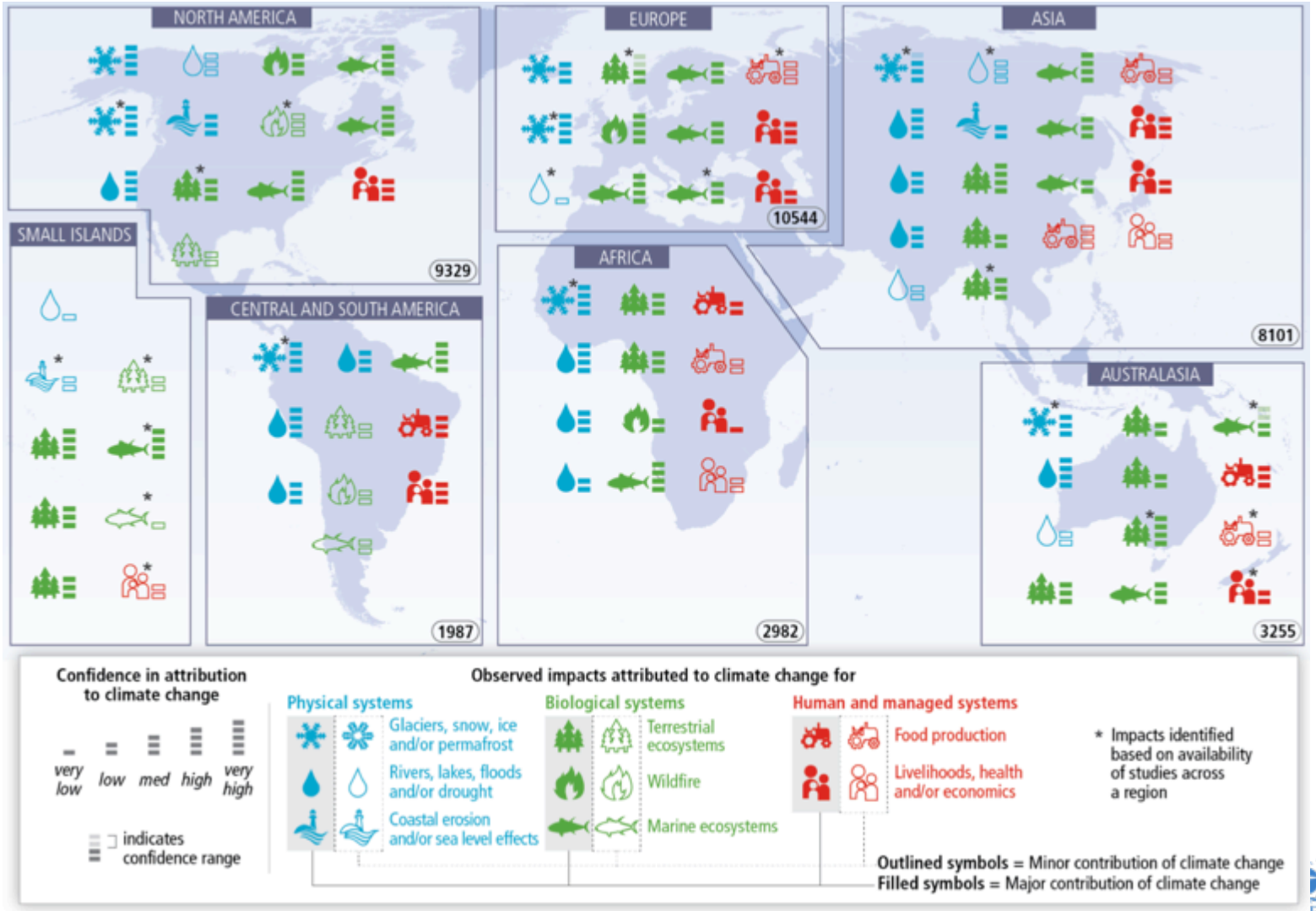


Potential Impacts of Climate Change

- Food and water shortages
- Increased displacement of people
- Increased poverty
- Coastal flooding

AR5 WGII SPM

Widespread impacts attributed to climate change based on the available scientific literature since literature since the AR4



IPCC, AR5, SYR, SPM 4

IPCC AR5 cycle:
Material relevant to coastal areas & small islands

WGI

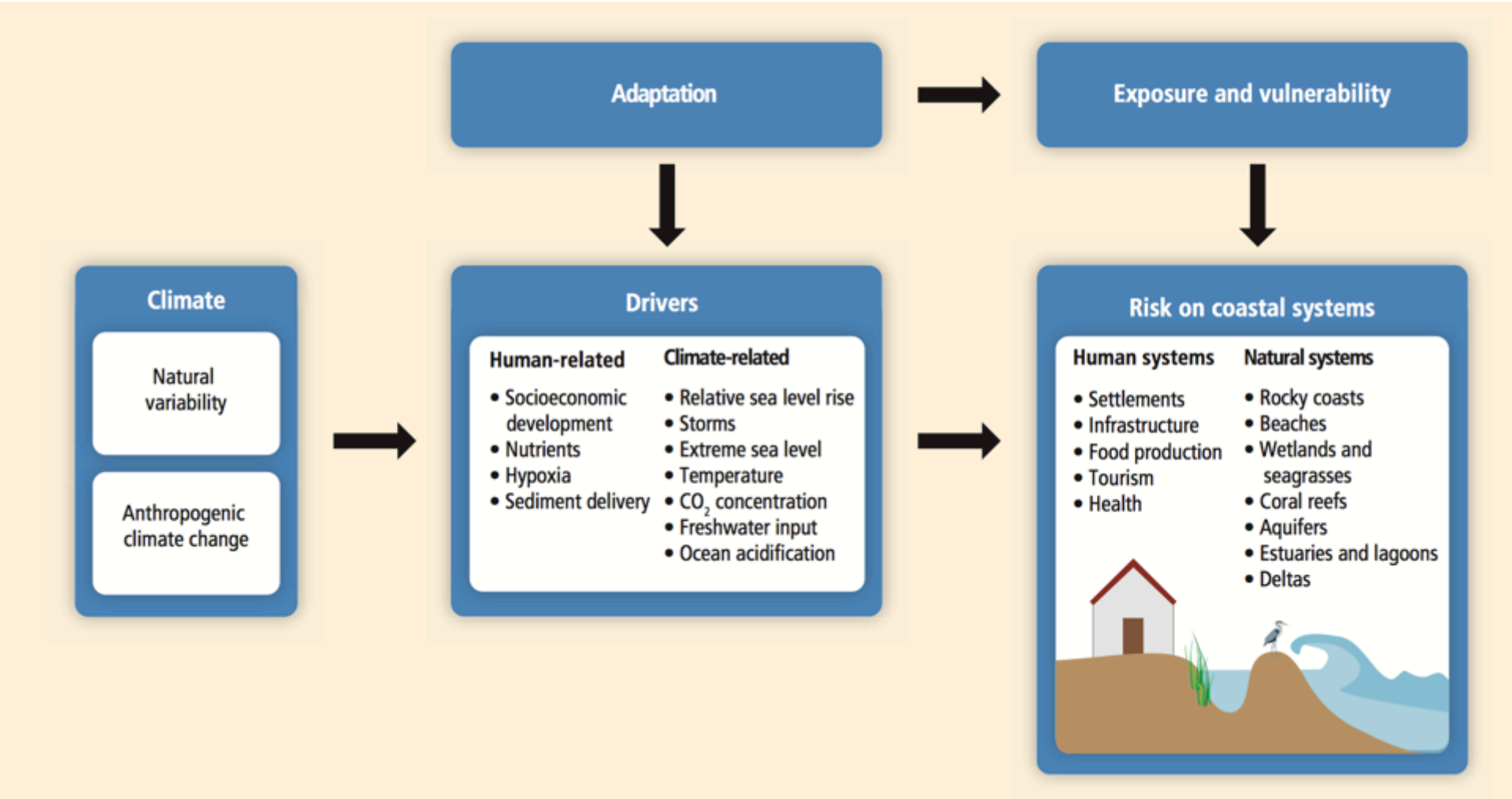
- Ocean Observations (Ch. 3), sea-level change (Ch.13)…
- FAQs (13.1: regional sea-level…)
  and TFEs (2: SLR uncertainties, 5: irreversibility…)

WGII

- Coastal Systems and Low-Lying Areas (Ch.5)
- Regional part: Small Islands (Ch.29), Oceans (Ch.30)
- Cross-chapter boxes : coral reefs, ocean acidification, tropical cyclone resilience, upwelling ecosystems

+ SRREN (Wind energy, ocean energy), SREX

Risks for coastal systems



IPCC, AR5, WG II, Chap. 5, Figure 5-1

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Risks from sea-level rise

Coastal and low-lying areas will experience **more flooding and coastal erosion**

Local sea-level rise can differ substantially from global, due to e.g. subsidence, glacial isostatic adjustment, sediment transport, coastal development

Population exposed and pressure from human activities will increase significantly in the coming decades due to population growth, economic development, and urbanization

Sea-level rise: costs and adaptation

The relative costs of coastal adaptation vary strongly among and within regions and countries for the 21st century

For the 21st century**, the benefits of protecting** against increased coastal flooding and land loss due to submergence and erosion at the global scale **are larger than the social and economic costs of inaction** (limited evidence, high agreement)

Some low-lying developing countries and small island states are **expected to face very high impacts** that, in some cases, could have associated damage and adaptation costs of several percentage points of GDP

Small islands: risks

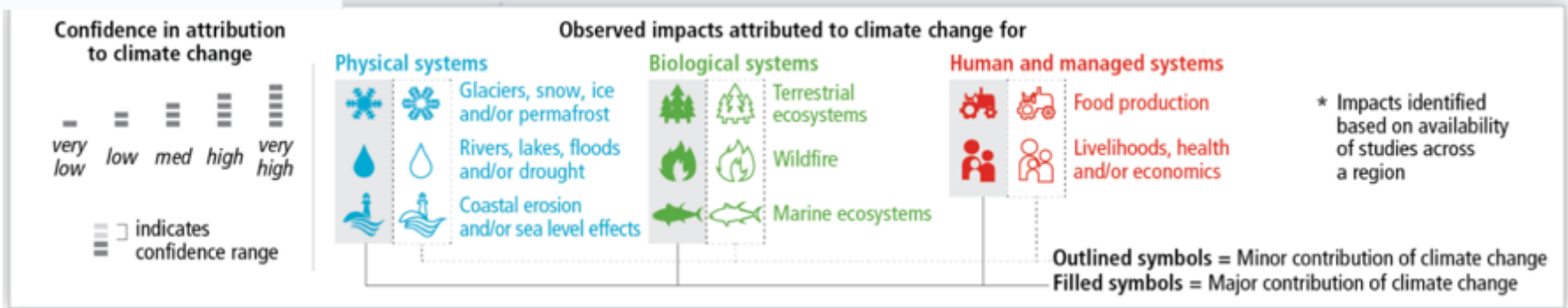
Projected increases < 2100 + extreme sea level events -> **severe sea *flood and erosion risks*** for low-lying coastal areas and atoll islands

seawater will **degrade fresh groundwater** resources

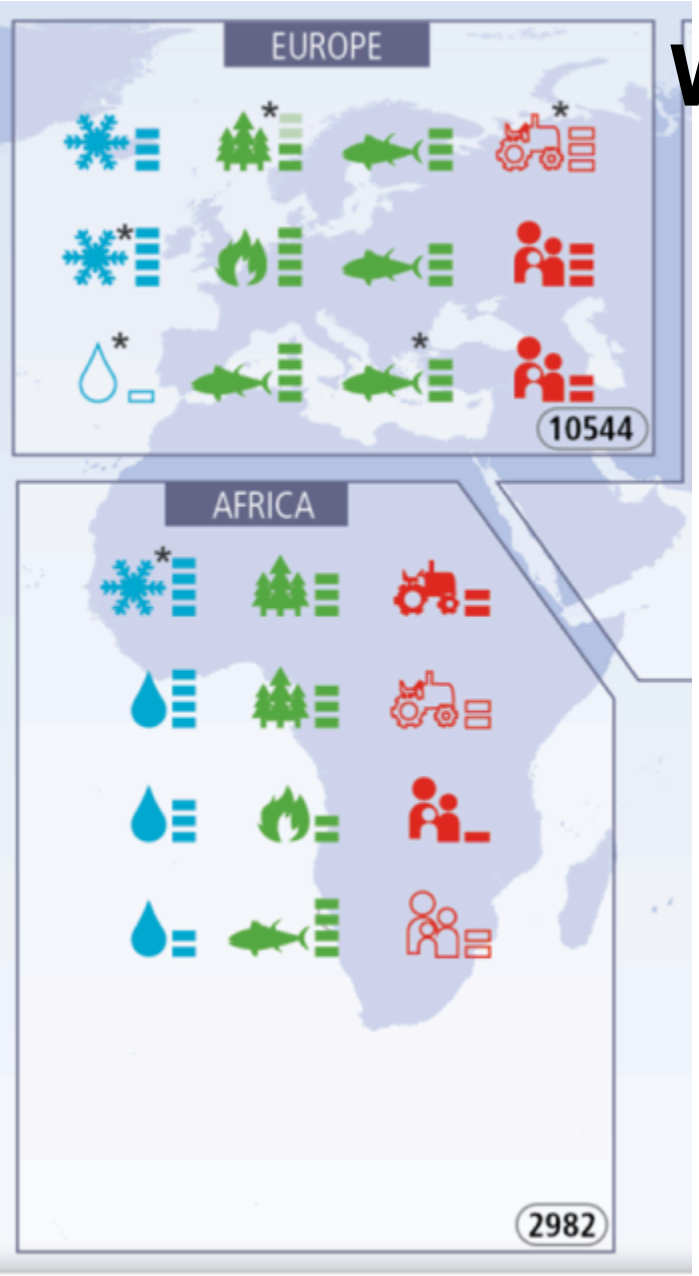
coral reef ecosystem degradation will negatively impact coastal protection, subsistence fisheries, and tourism, thus affecting livelihoods

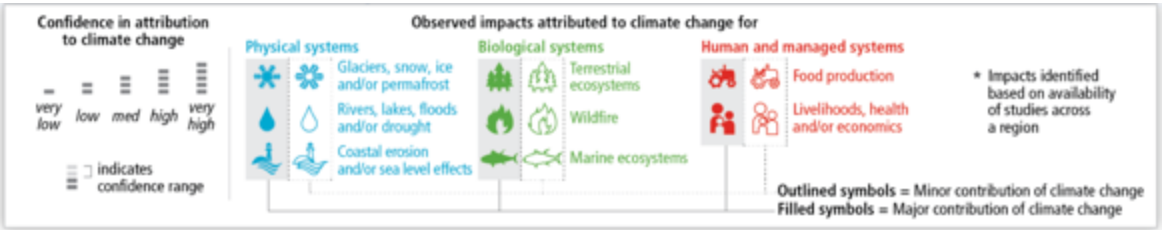
Widespread impacts attributed to climate change based on the available scientific literature since literature since the AR4: SMALL ISLANDS

IPCC, AR5, SYR, SPM 4



Widespread impacts attributed to climate change based on the available scientific literature since the AR4: AFRICA





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IPCC, AR5, SYR, SPM.4

ADAPTATION IS

ALREADY OCCURRING

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Small islands: adaptation

Adaptation generates **larger benefit to small islands when delivered in conjunction with other development activities**,
such as disaster risk reduction and community-based approaches to development

- address current social, economic, environmental issues,
- raise awareness, communicate future risks to local communities

Adaptation and mitigation on small islands are not always trade-offs - they **can be complementary**

- examples include energy supply, tourism infrastructure, coastal wetland services

Appropriate **assistance from the international community may help**

AR5 WGII ch 29

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The approaches available to help coastal communities adapt to the impacts of climate change fall into three general categories:

1. **Protection** of people, property, and infrastructure is a typical first response. This includes **"hard"** measures such as building seawalls and other barriers, along with various measures to protect critical infrastructure. **"Soft" protection measures are increasingly favored.** These include enhancing coastal vegetation and other coastal management programs to reduce erosion and enhance the coast as a barrier to storm surges.

IPCC, AR5, WG II, Chap. 5, p. 387

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The approaches available to help coastal communities adapt to the impacts of climate change fall into three general categories:

2. **Accommodation** is a more adaptive approach involving changes to human activities and infrastructure. These **include retrofitting buildings to make them more resistant** to the consequences of sea level rise, raising low-lying bridges, or increasing physical shelter capacity to handle needs caused by severe weather. Soft accommodation measures include adjustments to land use planning and insurance programs.

IPCC, AR5, WG II, Chap. 5, p. 387

The approaches available to help coastal communities adapt to the impacts of climate change fall into three general categories:

3. **Managed retreat** involves moving away from the coast and may be the only viable option when nothing else is possible.

IPCC, AR5, WG II, Chap. 5, p. 387

Community-based adaptation measures
(examples from WGII ch5 table 5.4)

Impact	Measures
Increased salinity	*Saline-tolerant crop cultivation*
Flooding/ inundation	*Disaster management committees (discuss preparedness and response)* *Early flood warning systems*
Cyclones/ storm surges	*Low-cost retrofitting to strengthen household structures,* *Plantation of specific fruit trees around homestead area*
Sea level rise	*Farmers educated on comprehensive risk insurance*
Multi-coastal impacts	*Integrating climate change into education* *Integrated coastal zone management (ICZM) plan*

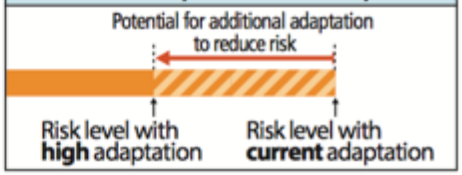
Flood risk adaptation in Bangladesh (example): cyclone shelters, awareness raising, forecasting and warning

photo: Dr Thorsten Klose/German Red Cross (2010), evaluation of the Community Based Disaster Preparedness Programme run by the Red Cross in1996-2002

Selected key risks and potential for adaptation for small islands from the present day to the long term

Climate-related drivers of impacts							
Warming trend	Extreme temperature	Drying trend	Extreme precipitation	Damaging cyclone	Sea level	Ocean acidification	Sea surface temperature

Level of risk & potential for adaptation



Key risk	Adaptation issues & prospects	Climatic drivers	Timeframe	Risk & potential for adaptation
Loss of livelihoods, coastal settlements, infrastructure, ecosystem services, and economic stability (*high confidence*) [29.6, 29.8, Figure 29-4]	• Significant potential exists for adaptation in islands, but additional external resources and technologies will enhance response. • Maintenance and enhancement of ecosystem functions and services and of water and food security • Efficacy of traditional community coping strategies is expected to be substantially reduced in the future.		Present Near term (2030–2040) Long term (2080–2100) 2°C 4°C	Very low / Medium / Very high

IPCC, AR5, WG II, Chap.

Selected key risks and potential for adaptation for small islands from the present day to the long term

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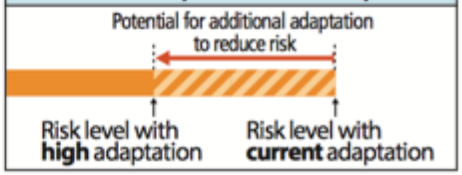

Key risk	Adaptation issues & prospects	Climatic drivers	Timeframe	Risk & potential for adaptation
Decline and possible loss of coral reef ecosystems in small islands through thermal stress (*high confidence*) [29.3.1.2]	Limited coral reef adaptation responses; however, minimizing the negative impact of anthrogopenic stresses (ie: water quality change, destructive fishing practices) may increase resilience.		Present Near term (2030–2040) Long term (2080–2100) 2°C 4°C	Very low / Medium / Very high

IPCC, AR5, WG II, Chap.

Selected key risks and potential for adaptation for small islands from the present day to the long term

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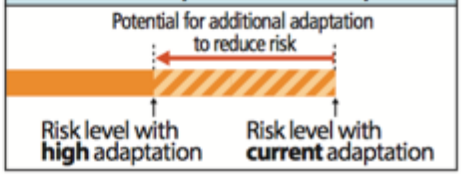
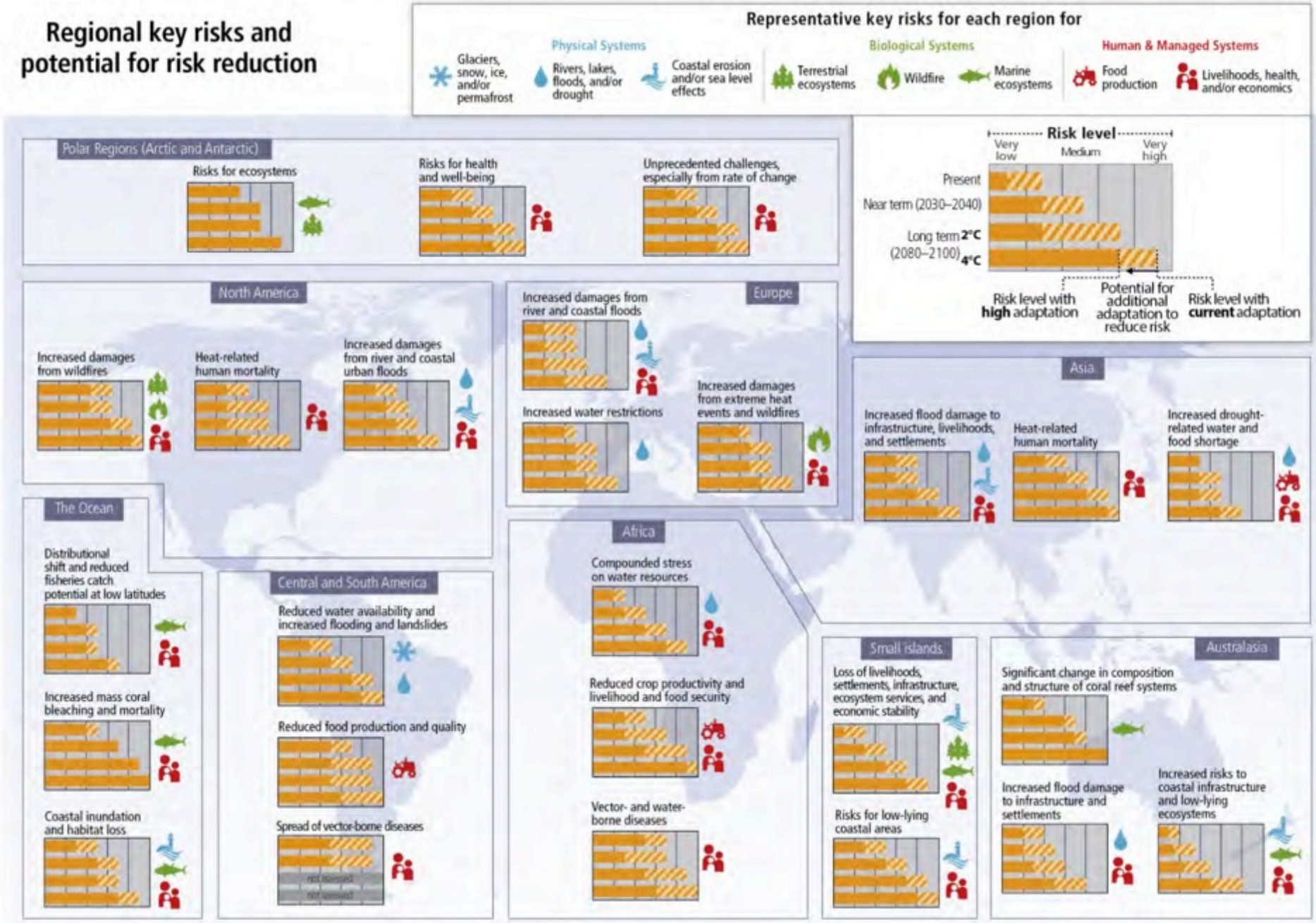


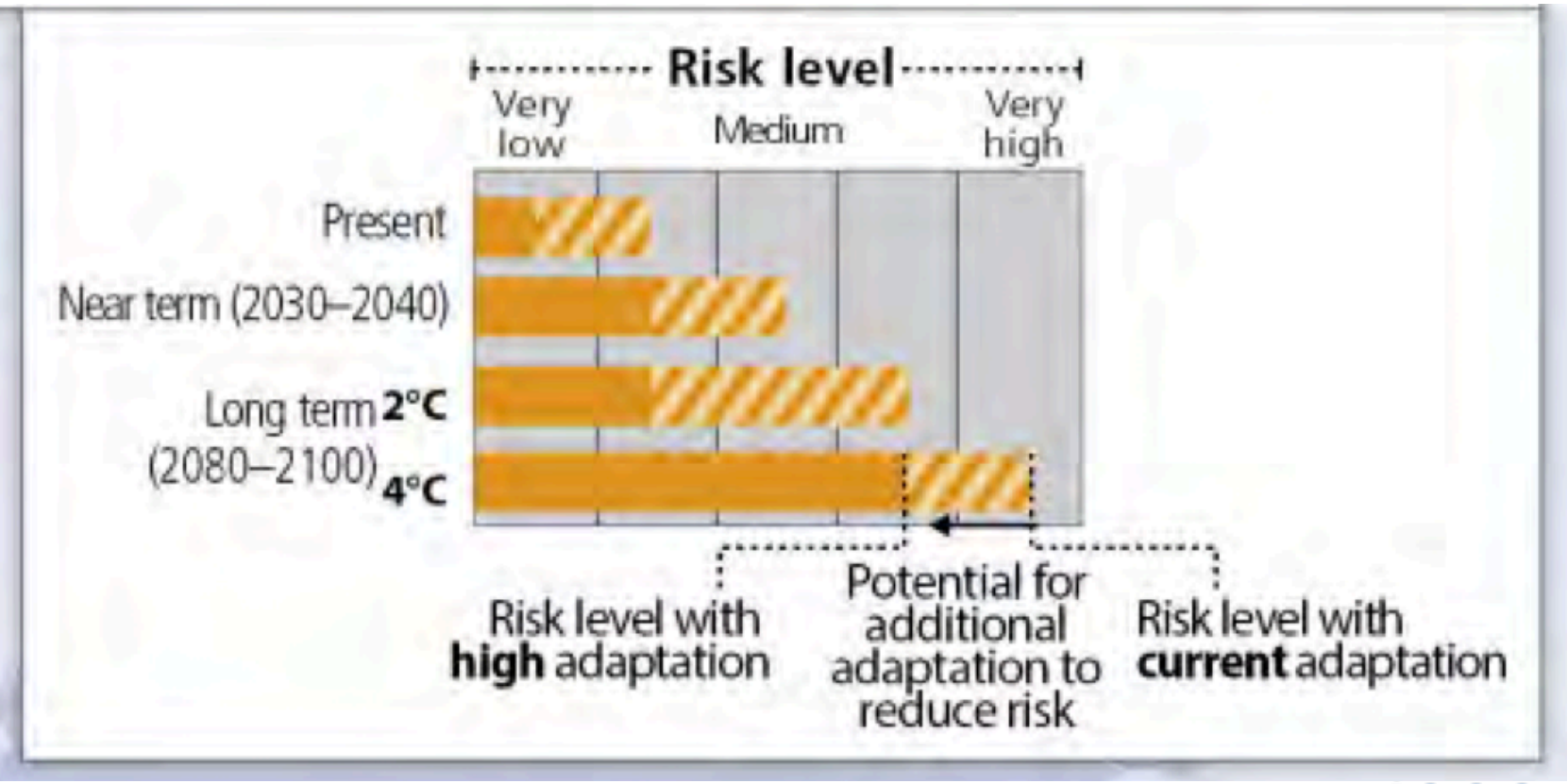
Key risk	Adaptation issues & prospects	Climatic drivers	Timeframe	Risk & potential for adaptation
The interaction of rising global mean sea level in the 21st century with high-water-level events will threaten low-lying coastal areas (*high confidence*) [29.4, Table 29-1; WGI AR5 13.5, Table 13.5]	• High ratio of coastal area to land mass will make adaptation a significant financial and resource challenge for islands. • Adaptation options include maintenance and restoration of coastal landforms and ecosystems, improved management of soils and freshwater resources, and appropriate building codes and settlement patterns.		Present Near term (2030–2040) Long term (2080–2100) 2°C 4°C	Very low / Medium / Very high

IPCC, AR5, WG II, Chap.



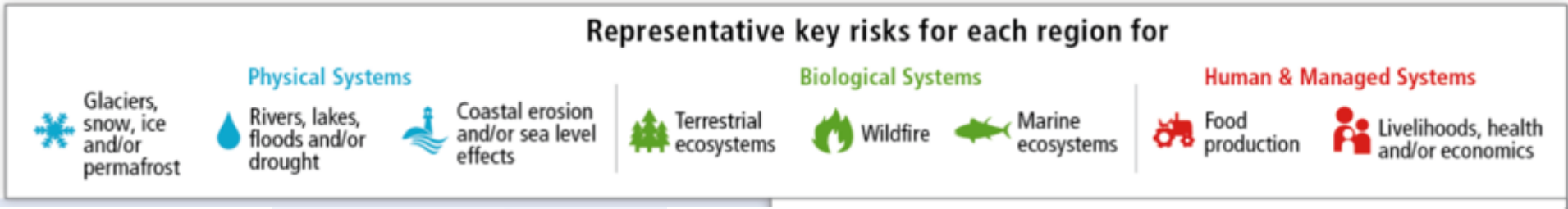
IPCC, AR5, SPM, Figure SPM.8

Regional key risks and potential for risk reduction through adaptation

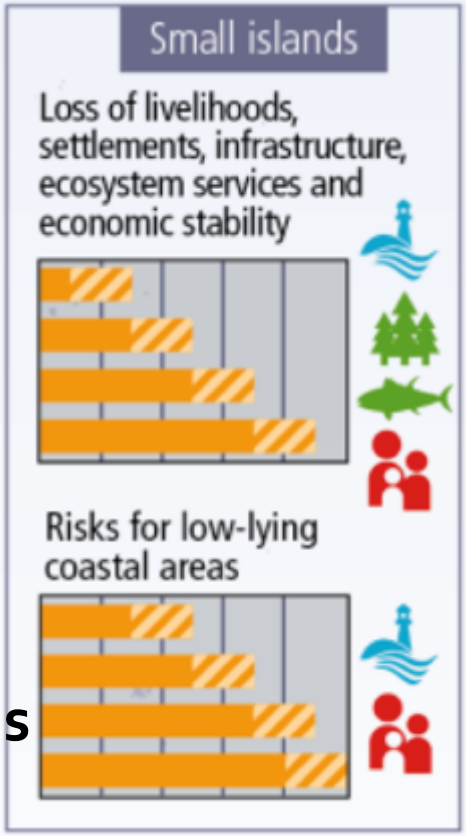


IPCC, AR5, SPM, Figure SPM.8

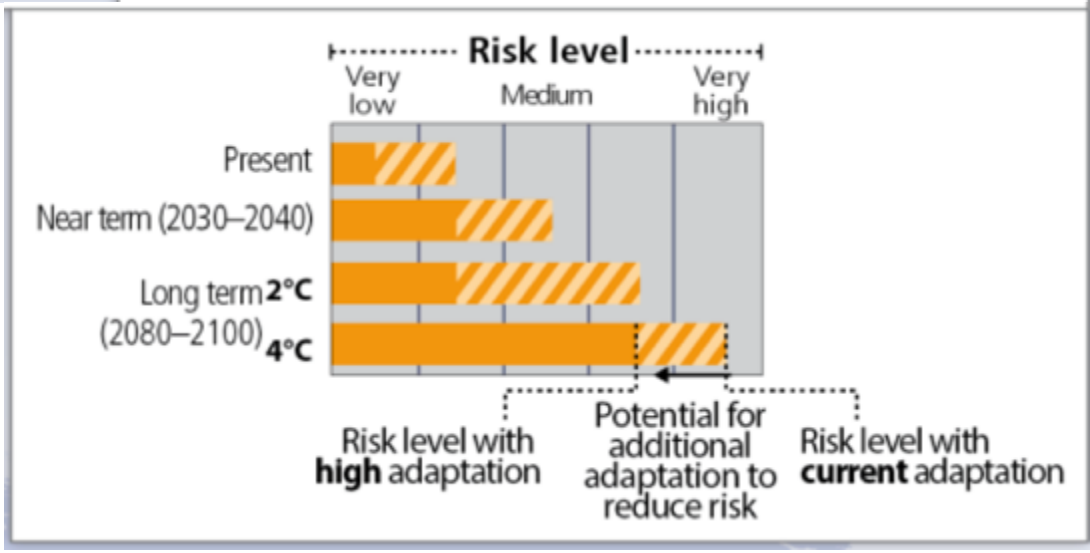
Regional key risks and potential for risk reduction: Small Islands



Losses



Risk to coastal areas



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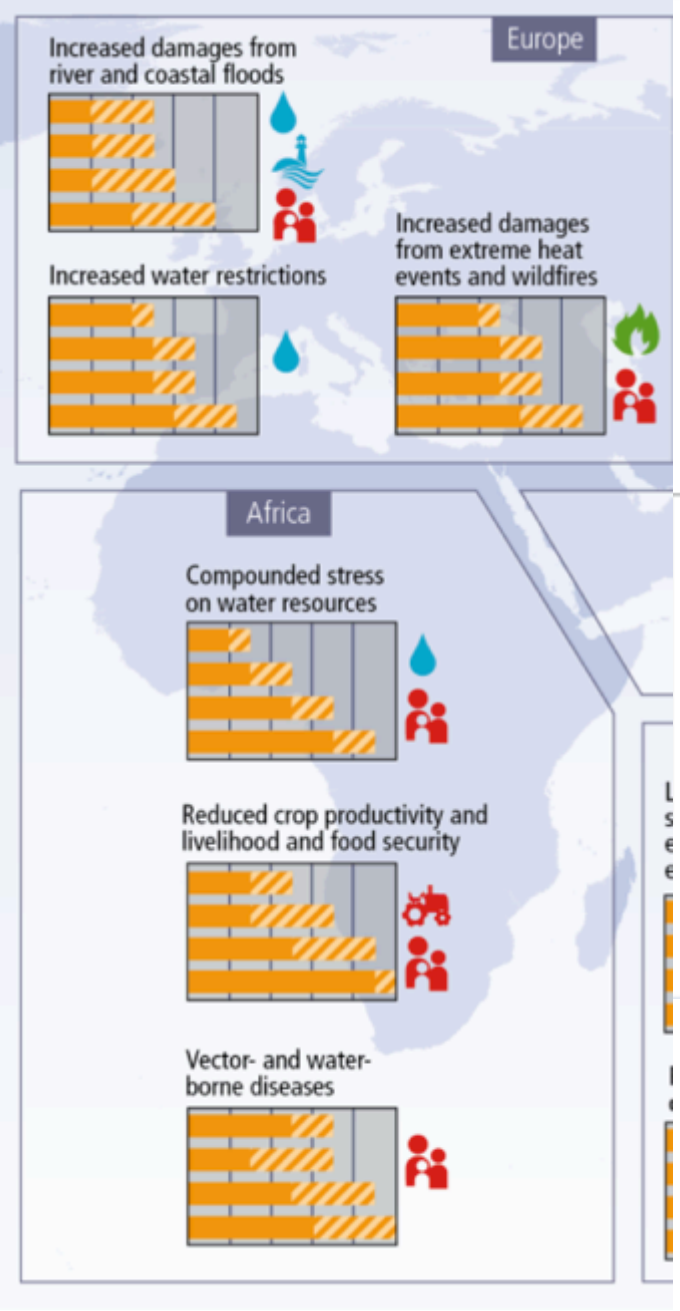
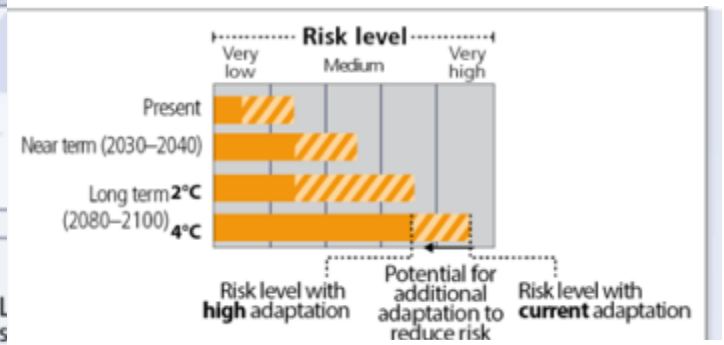
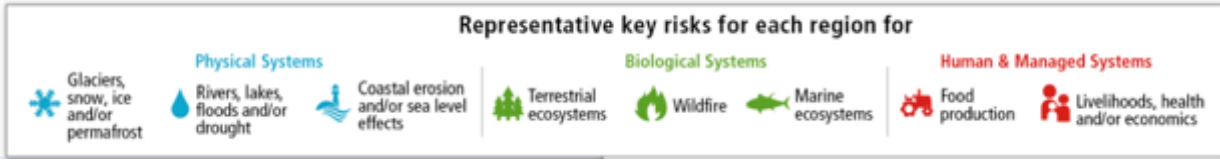
Regional key risks and potential for risk reduction: Africa







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RISKS OF CLIMATE CHANGE **INCREASE** WITH CONTINUED HIGH EMISSIONS

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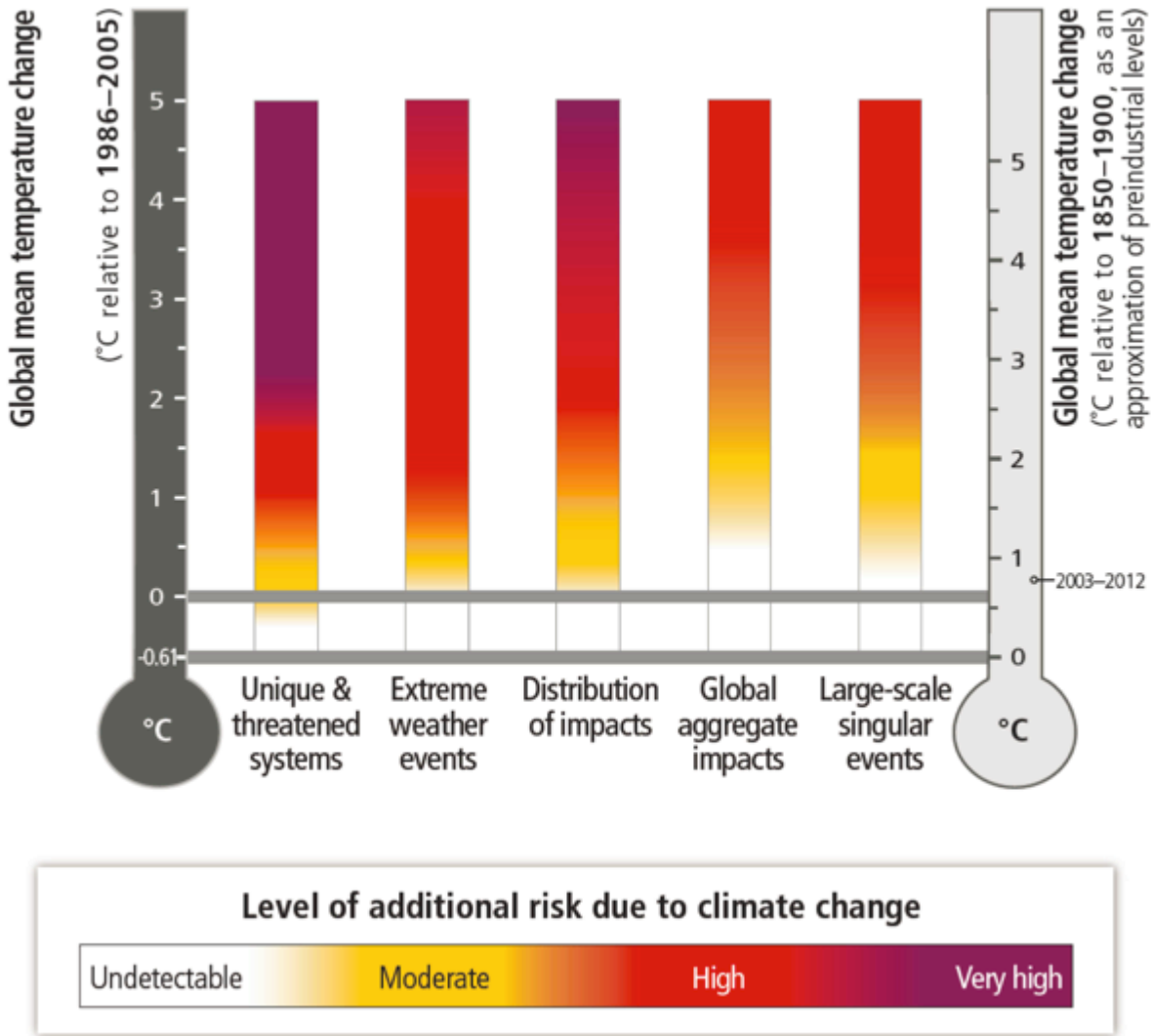
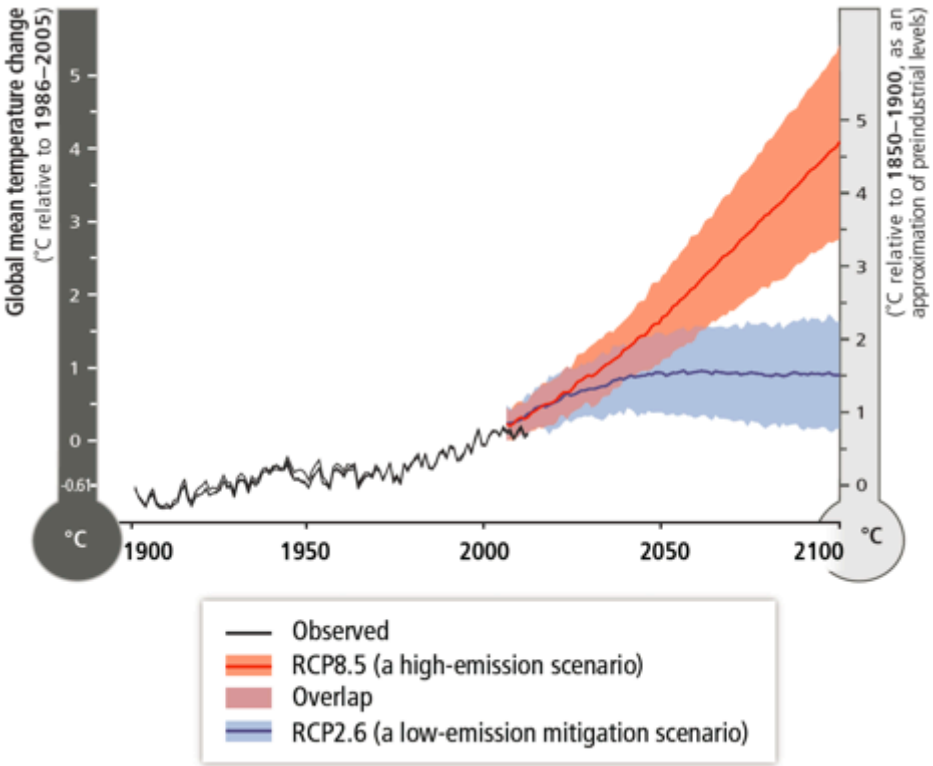
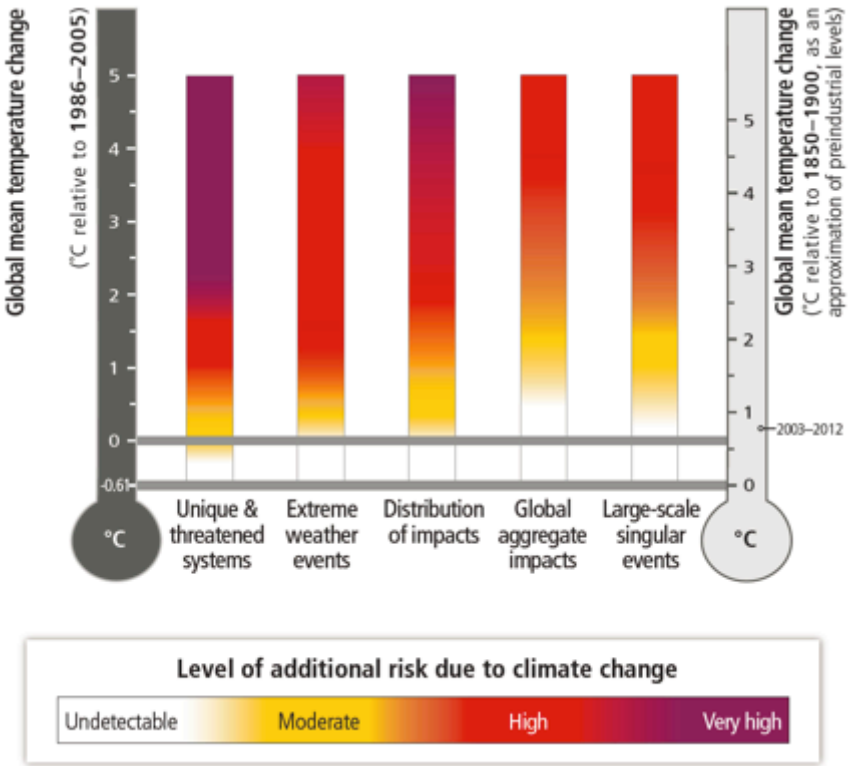


AR5, WGII, Box SPM.1 Figure 1





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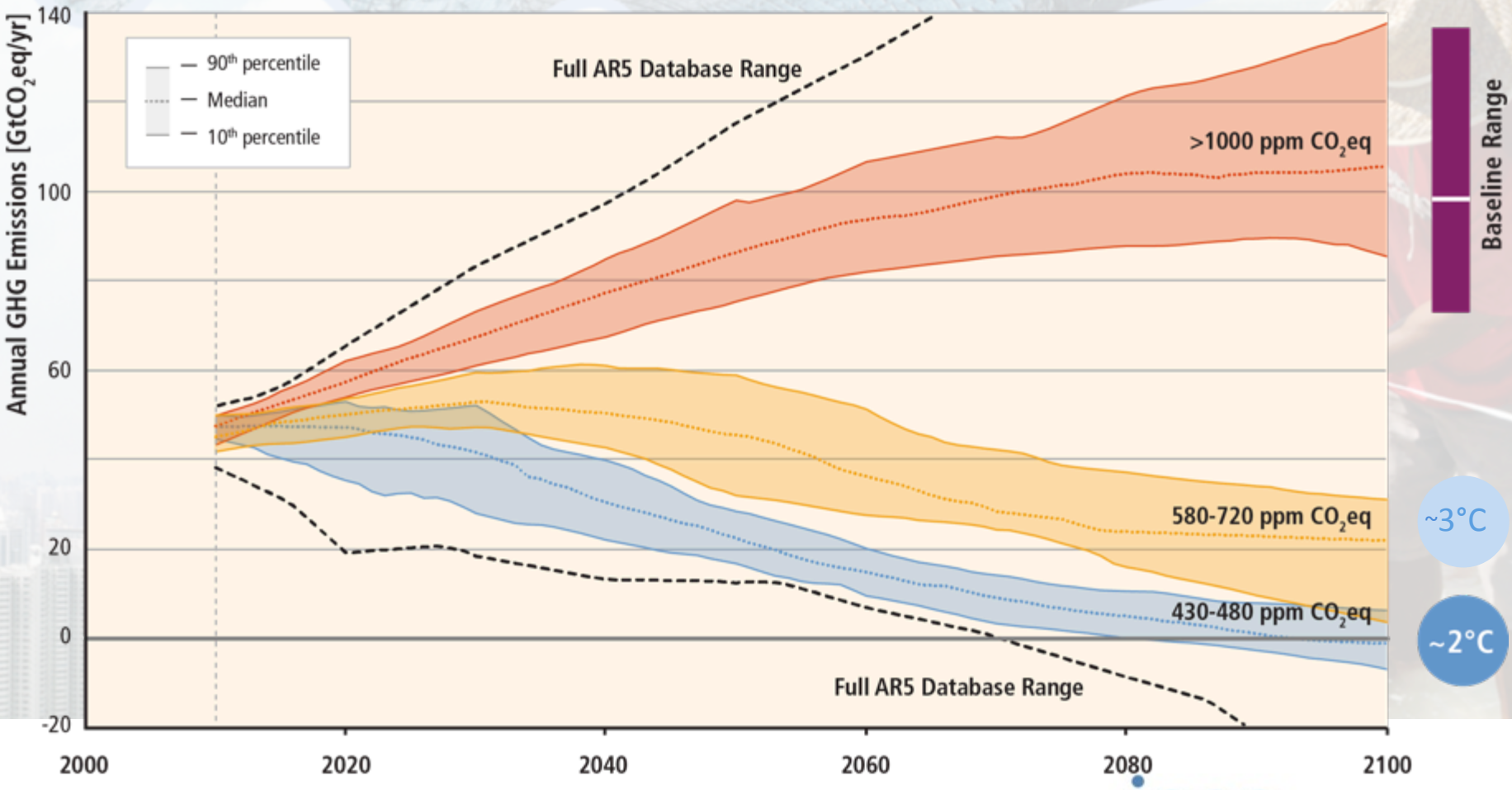
Stabilization of atmospheric concentrations requires moving away from the baseline – regardless of the mitigation goal.



Based on Figure 6.7

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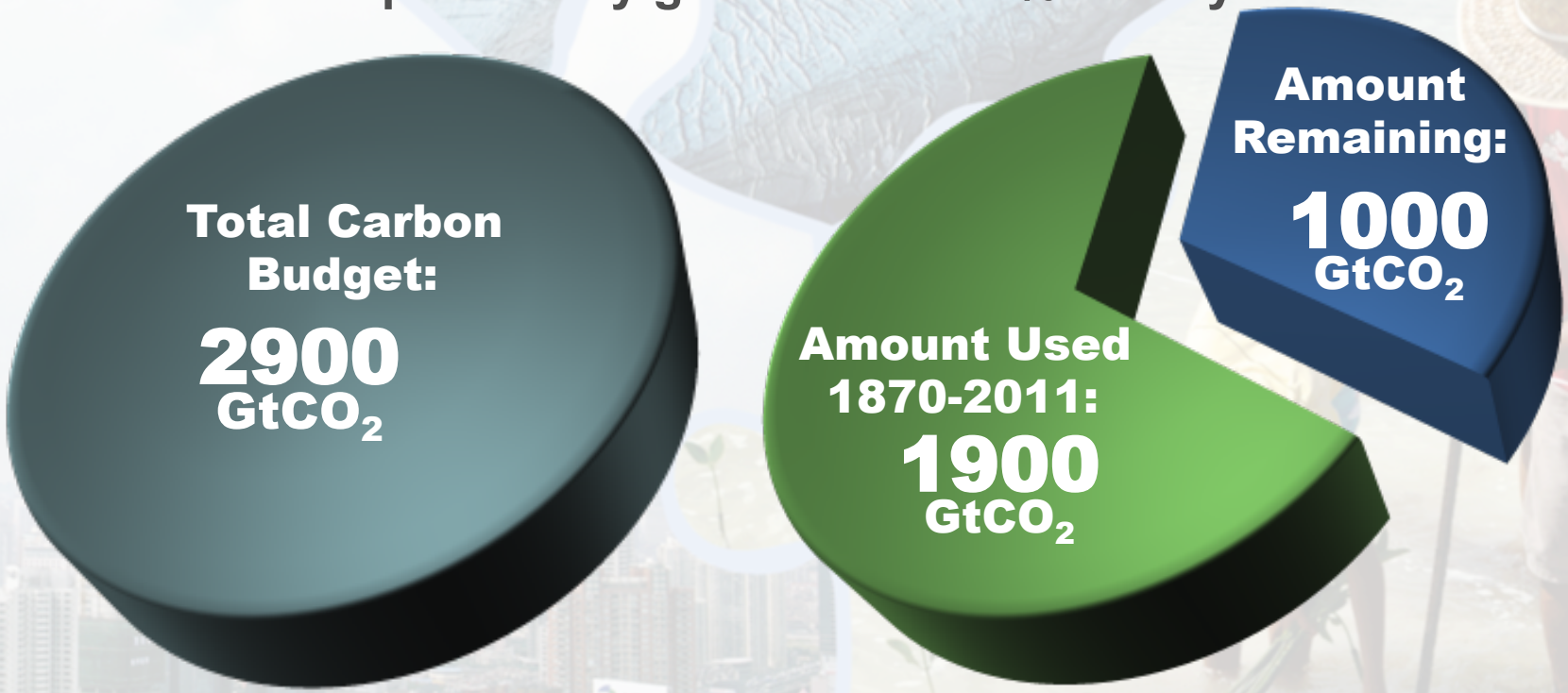
The window for action is rapidly closing

65% of the carbon budget compatible with a 2°C goal is already used
NB: this is with a probability greater than 66% to stay below 2°C



NB: Emissions in 2010: 38 $GtCO_2$/yr (CO_2 only)

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Mitigation Measures

More efficient use of energy

Greater use of low-carbon and no-carbon energy

- Many of these technologies exist today

Improved carbon sinks

- Reduced deforestation and improved forest management and planting of new forests
- Bio-energy with carbon capture and storage

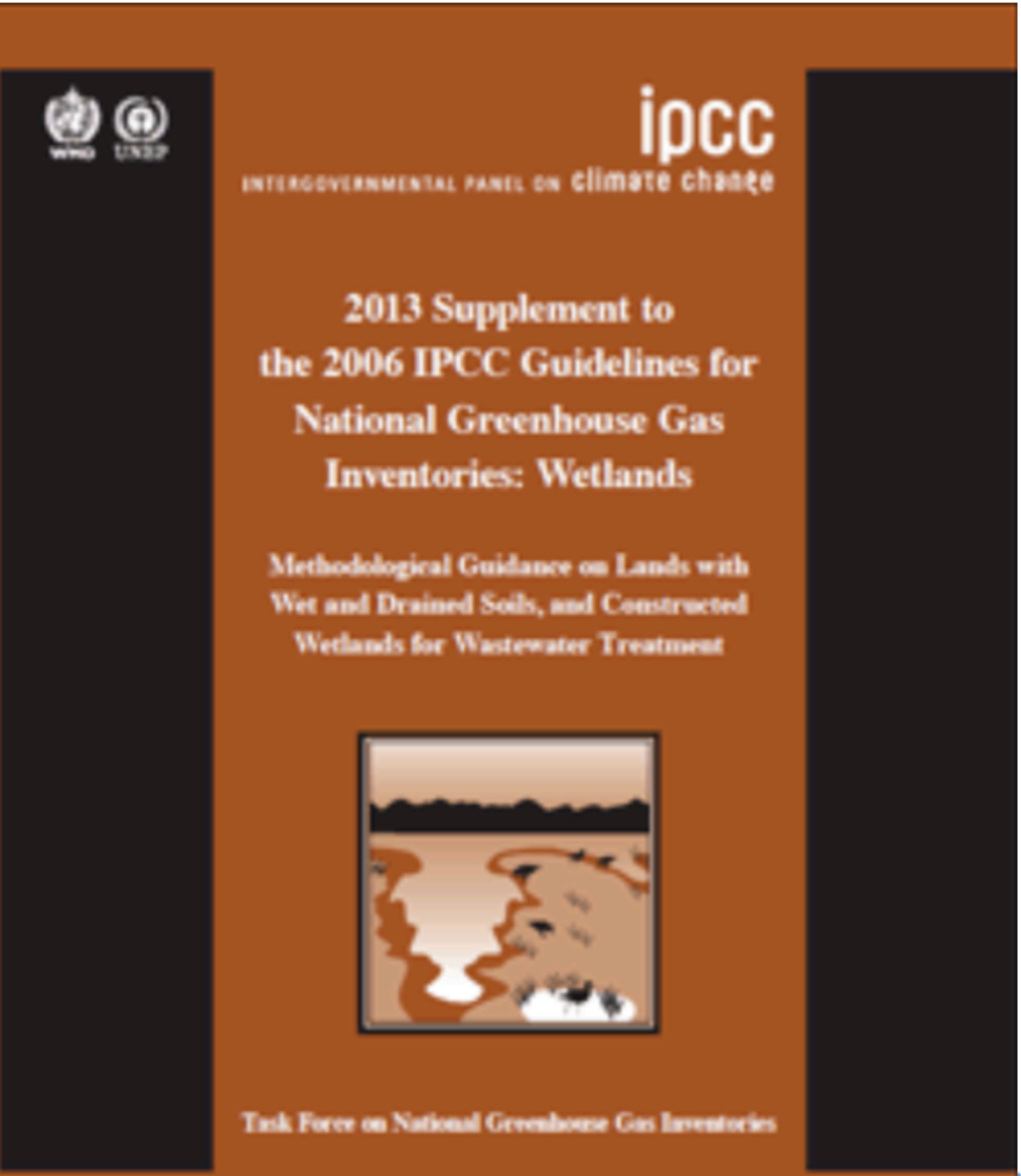
Lifestyle and behavioural changes

AR5 WGIII SPM

Example: OTEC ocean thermal energy conversion:

Larger-scale OTEC developments could have significant markets in tropical maritime nations, including the Pacific Islands, Caribbean Islands, and Central American and African nations if the technology develops to the point of being a cost-effective energy supply option. [6.4.5]

TS SRREN



Chapter 4: Coastal Wetlands

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- **Sustainable development and equity provide a basis for assessing climate policies and highlight the need for addressing the risks of climate change**

- **Issues of equity, justice, and fairness arise with respect to mitigation and adaptation**

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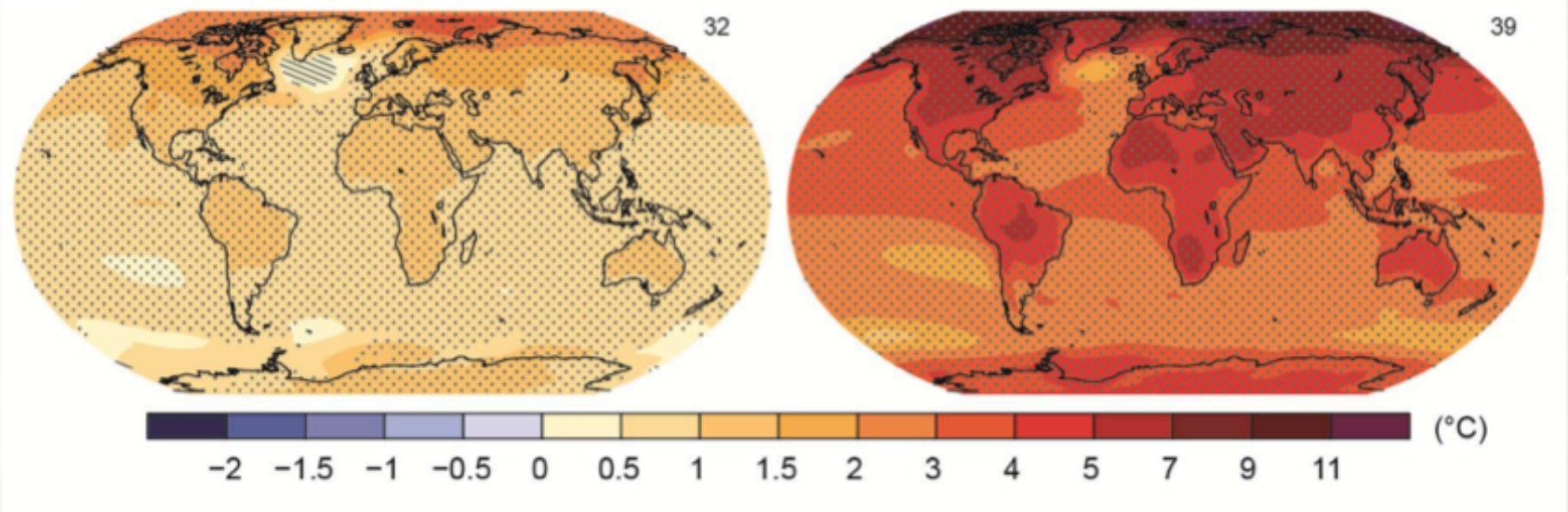
AR5, WGIII, SPM

The Choices Humanity Makes Will Create Different Outcomes (and increase prospects for effective adaptation)

With substantial mitigation

Without additional mitigation



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

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Useful links:

- www.ipcc.ch : IPCC (reports and videos)
- www.climate.be/vanyp : my slides and my platform as candidate IPCC Chair
- **On Twitter: @JPvanYpersele and @IPCC_CH**