

CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY



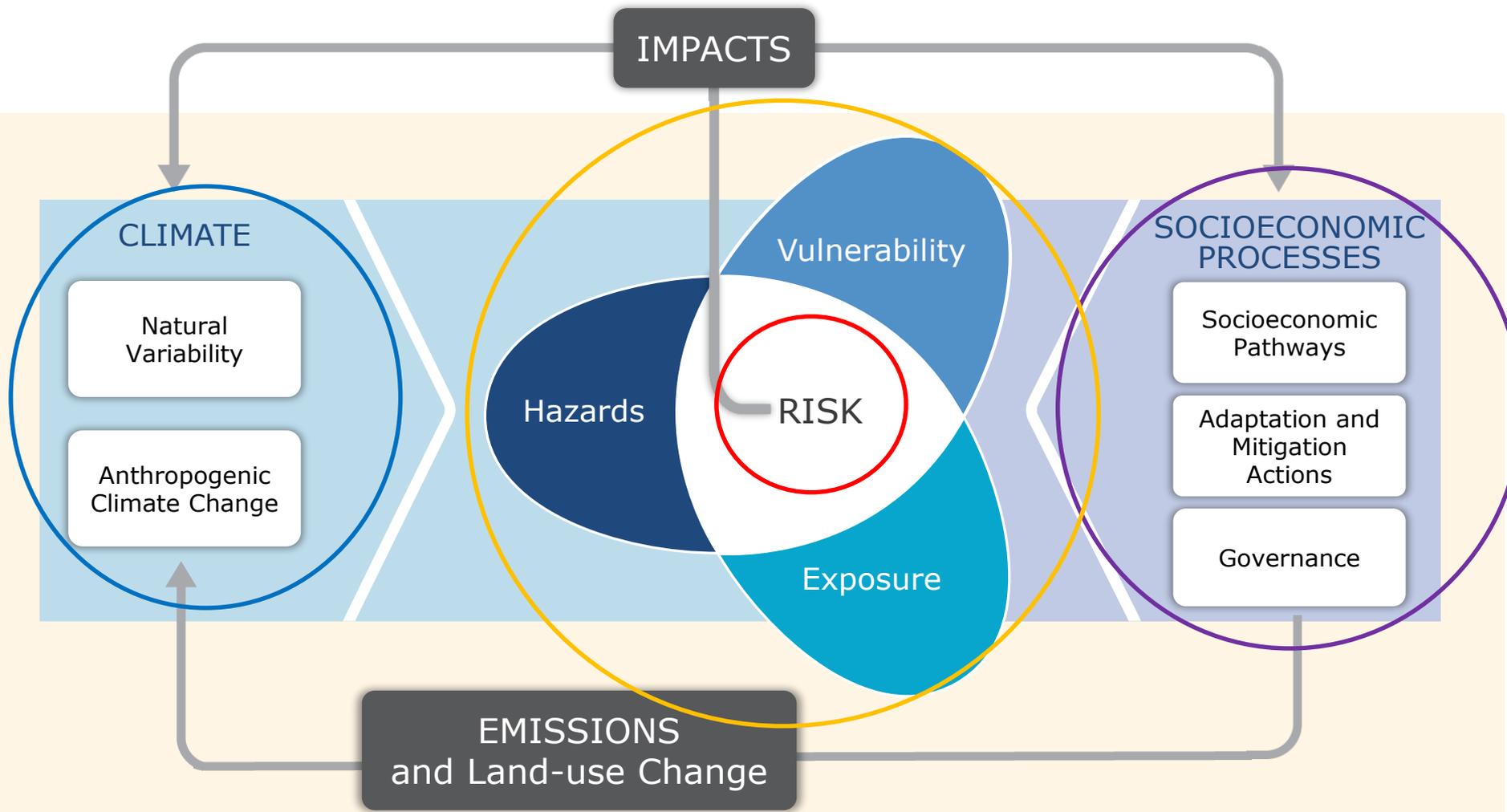
KEY FINDINGS

*A Focus on the Mediterranean and its Natural
and Built Environments*

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The starting point

Human interference with the climate system is occurring, and climate change poses risks for human and natural systems



An underwater photograph of a coral reef. The water is a deep, murky green. In the center, there is a prominent, white, fan-shaped coral structure. The surrounding reef is composed of various types of coral, some appearing brown and bleached, and others in shades of green and brown. The overall scene suggests a degraded or recovering coral reef ecosystem.

WIDESPREAD OBSERVED IMPACTS

A CHANGING WORLD

(A)



Confidence in attribution to climate change



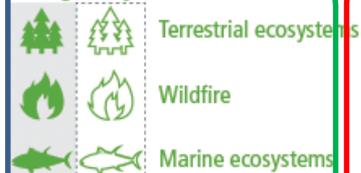
□ indicates confidence range

Observed impacts attributed to climate change for

Physical systems



Biological systems



Human and managed systems

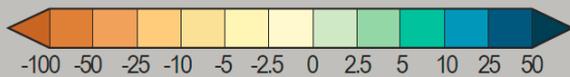


□ Regional-scale impacts

Outlined symbols = Minor contribution of climate change
Filled symbols = Major contribution of climate change

Quantity and quality of water resources is being altered

Observed Precipitation



Trend over 1951-2010
(mm/year/decade)

Solid Color

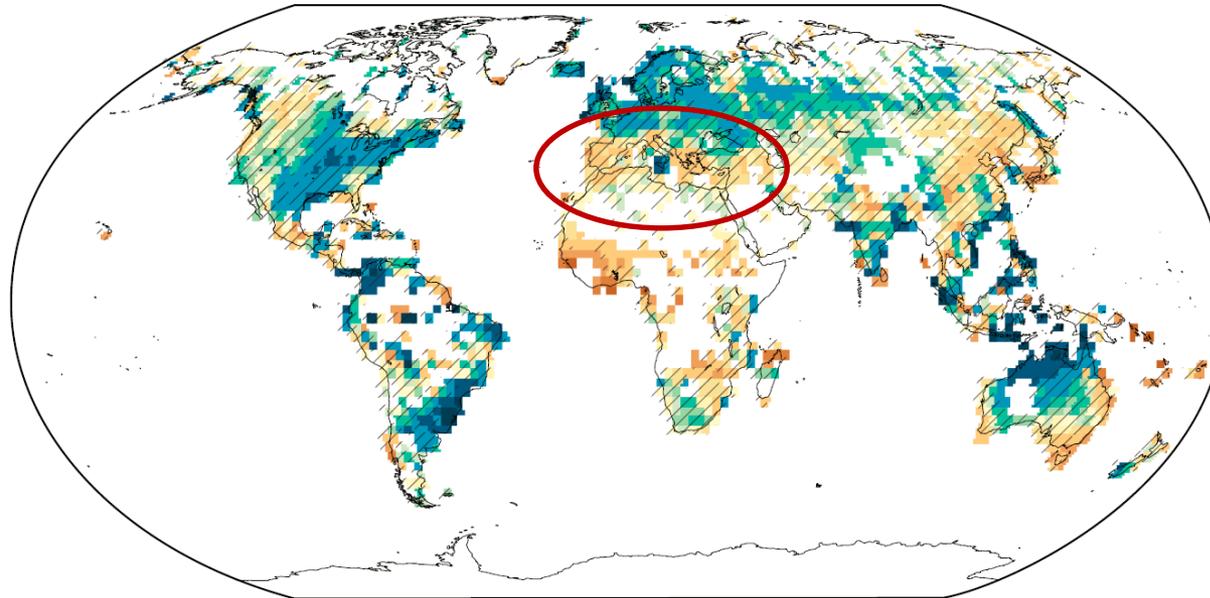
Significant trend

Diagonal Lines

Trend not statistically significant

White

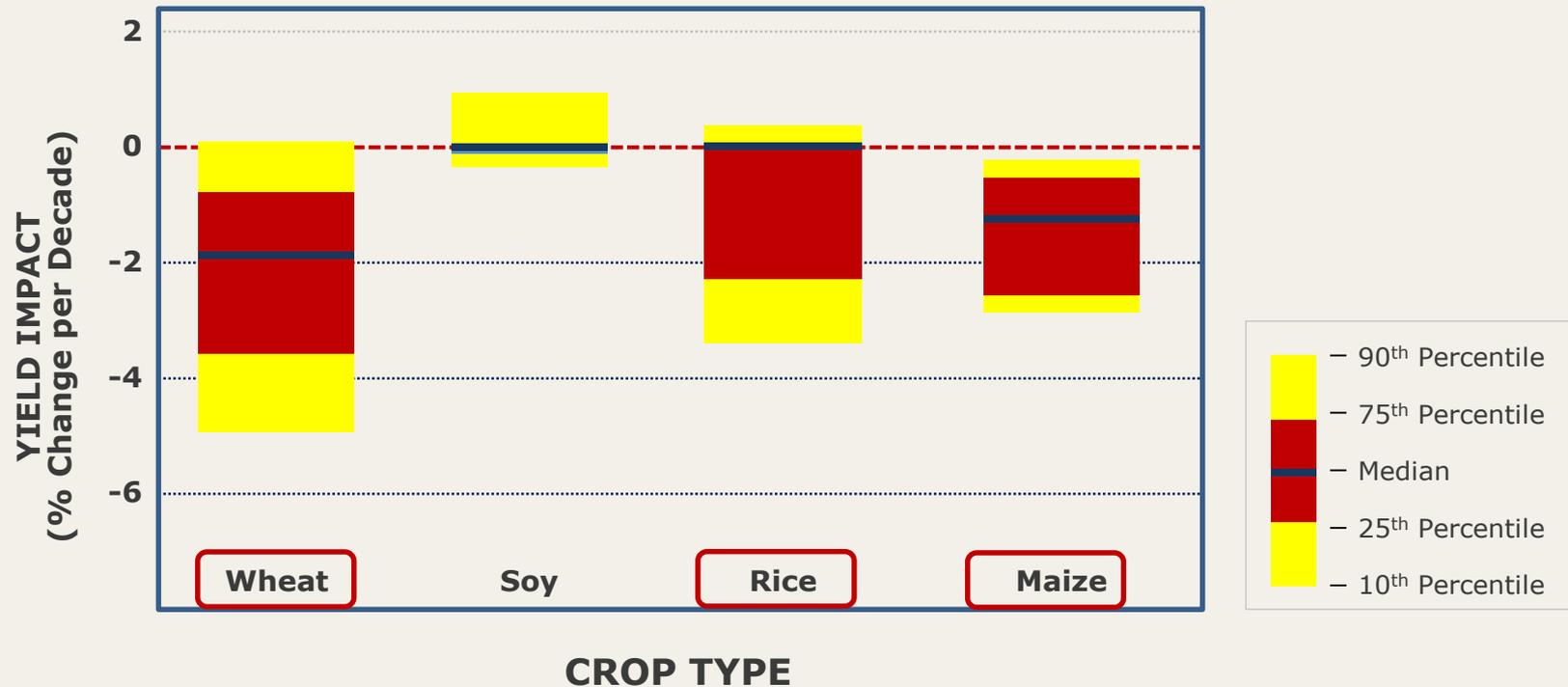
Insufficient data



TS.5

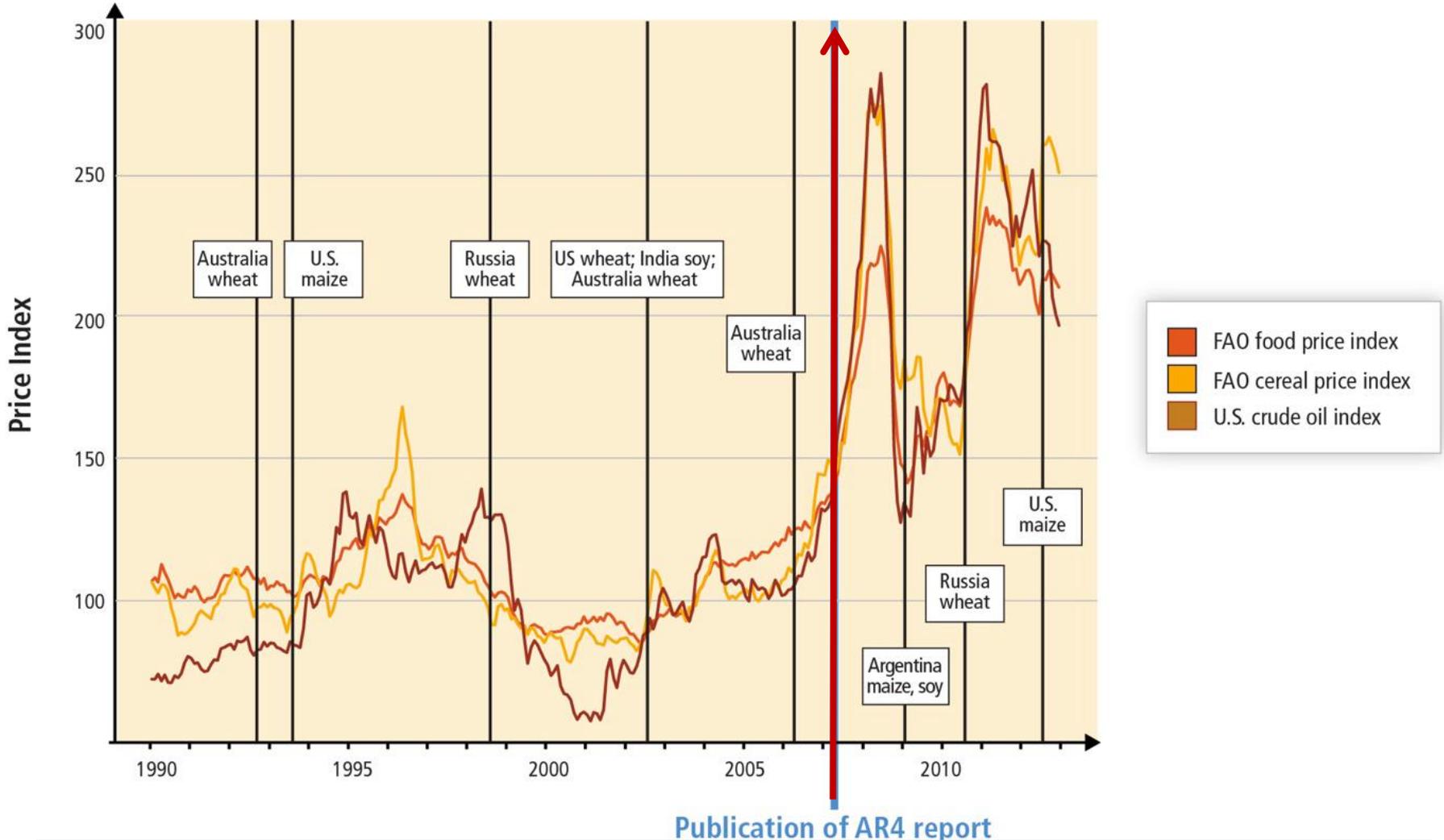
Since 1950, annual precipitation has decreased in parts of Southern Europe; Southern Europe shows trends towards more intense and longer meteorological droughts, but they are still inconsistent (Chapter 23). Over the last few decades the northern regions of North Africa have experienced a strong decrease in the amount of precipitation received in winter and early spring (Chapter 22)

Impacts on food production are more negative than positive



Wheat yield increases have levelled off in several countries over 1961- 2009 [incl. Med countries](Chapter 23)

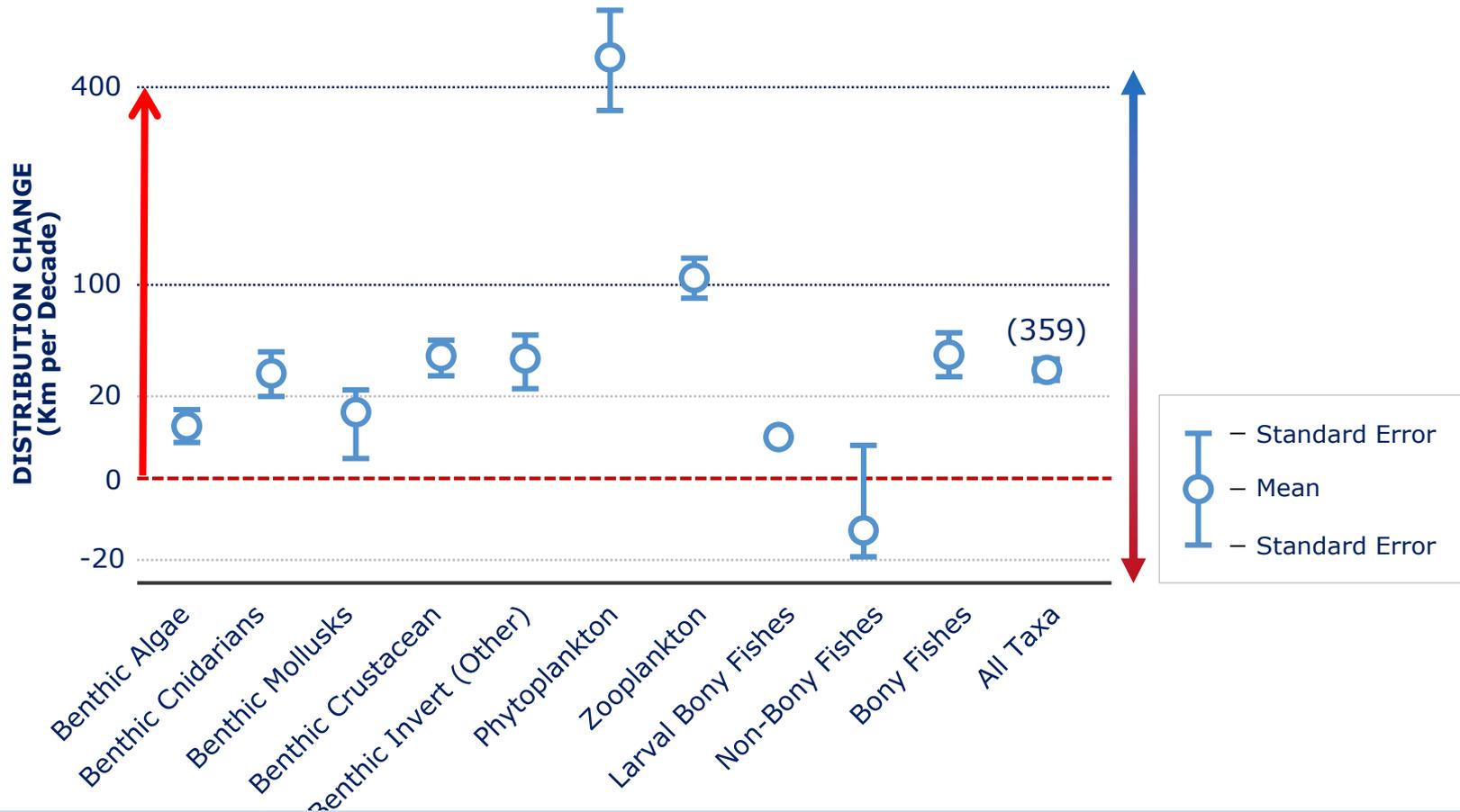
Food prices sensitive to climate extremes



It was estimated that the global rise in food prices has contributed to the deaths of an additional 30,000 to 50,000 children suffering from malnutrition in 2009 in sub-Saharan Africa (Chapter 22)

Widespread changes in the biota

Shifts in the distribution of some marine species



In the Mediterranean [sea], invasive species have arrived in recent years at the rate of one introduction every 4 to 5 weeks (Ch. 23)

Health effects

- **Impacts smaller than other stressors**
 - *At present the world-wide burden of human ill-health from climate change is relatively small compared with effects of other stressors and is not well quantified*
- **The distribution of some diseases has changed**
 - *Local changes in temperature and rainfall have altered the distribution of some water-borne illnesses and disease vectors*
- **Cold/heat changes in mortality**
 - *However, there has been increased heat-related mortality and decreased cold-related mortality in some regions as a result of warming*



Ageing of the population is a significant trend in Europe.... [it has been] confirmed the effects of heat on mortality and morbidity in European populations and particularly in older people and those with chronic disease...(Chapter 23)

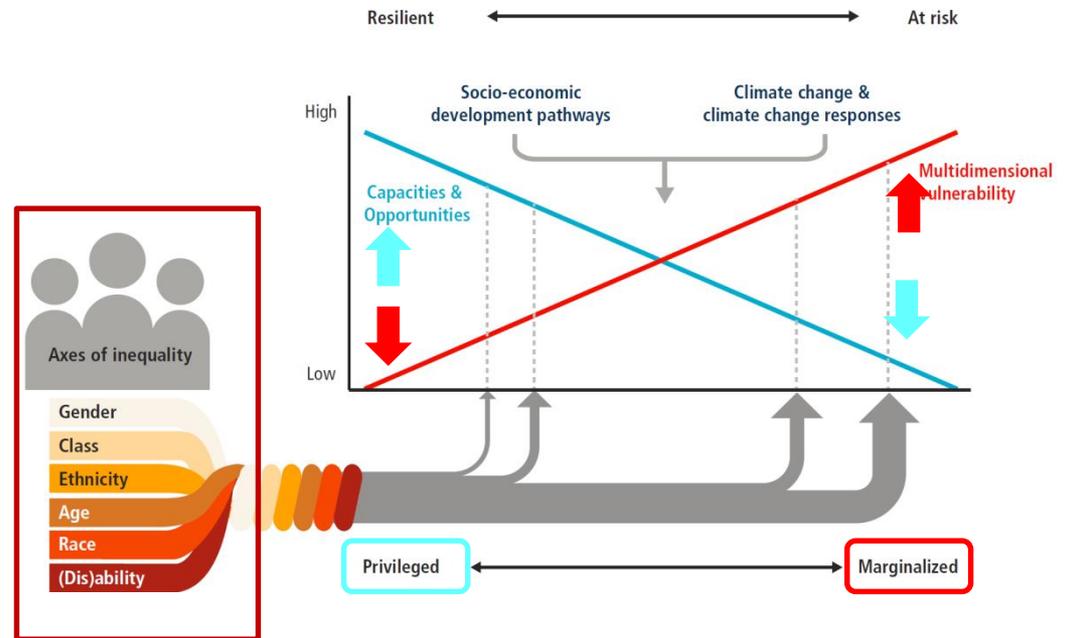


VULNERABILITY AND EXPOSURE

AROUND THE WORLD

Differences in exposure and vulnerability

- *High vulnerability has no single cause*
- *Inequality in impacts and responses vary due to*
 - Age
 - Gender
 - Ethnicity and race
- *Marginalized people are most vulnerable*





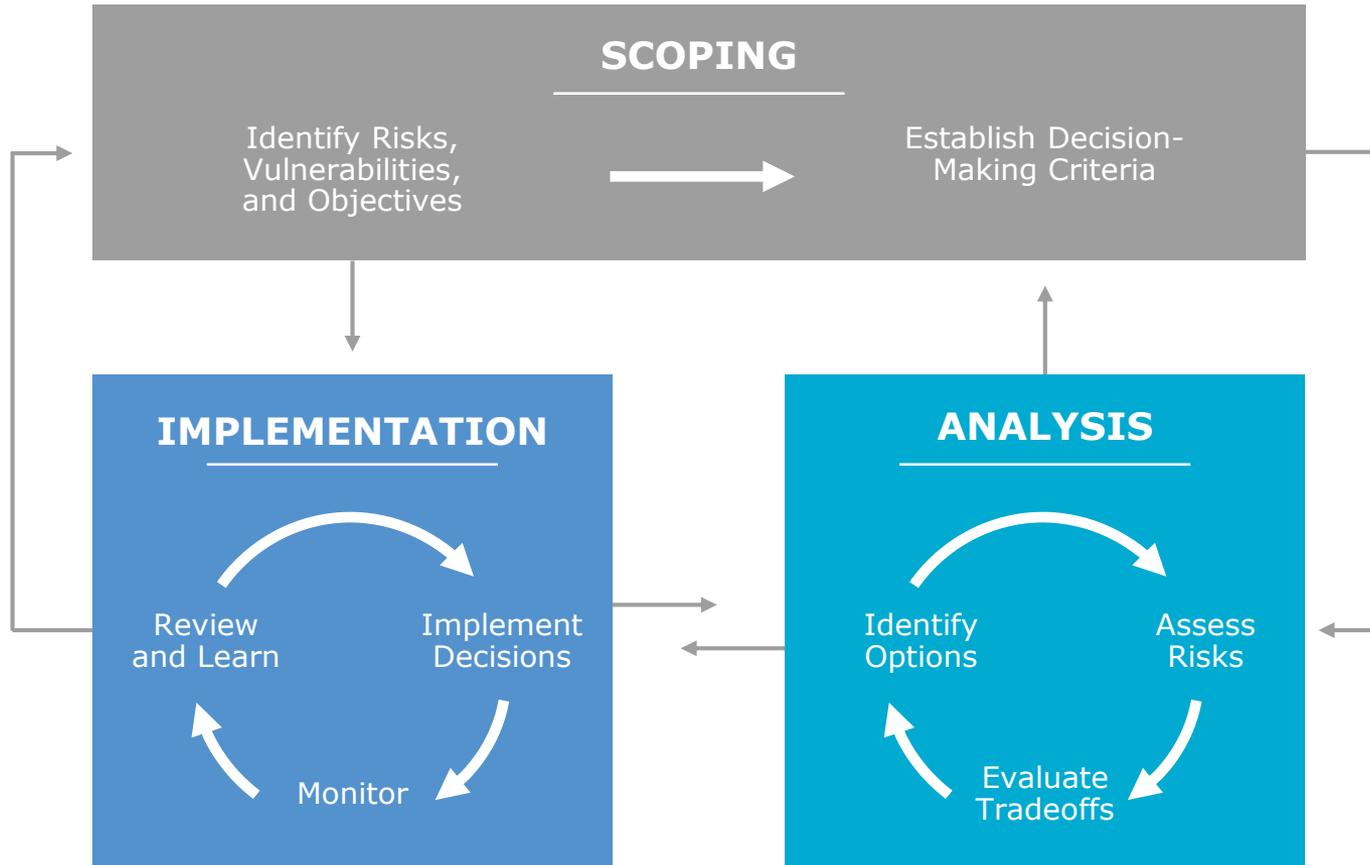
CLIMATE CHANGE

REDUCING AND MANAGING RISKS

ipcc

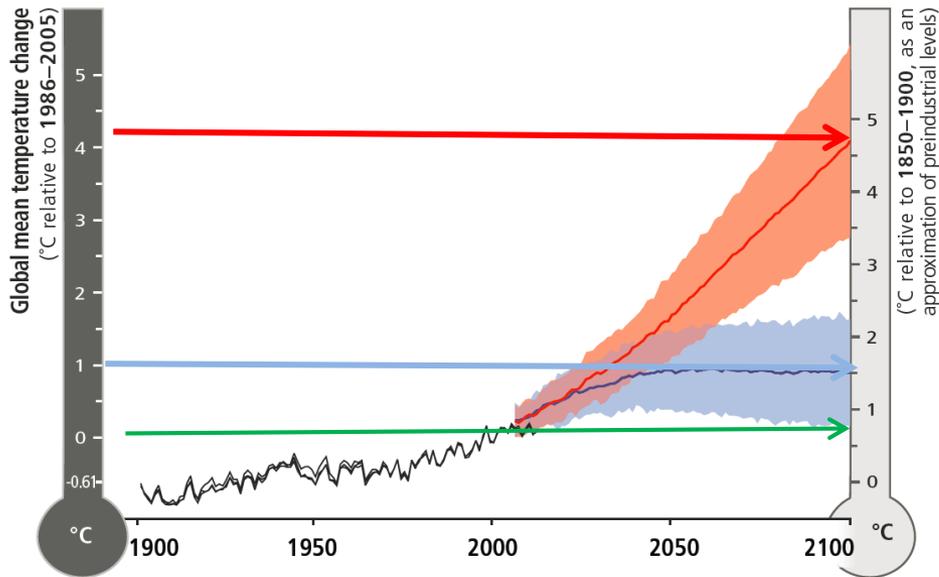
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

Learning, doing, learning,..

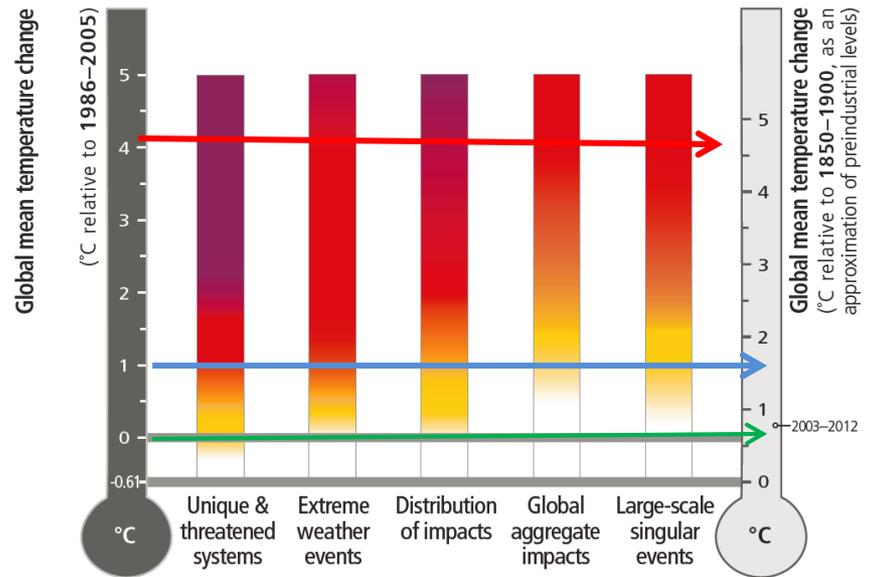




RISKS OF
CLIMATE CHANGE
INCREASE
WITH CONTINUED
HIGH EMISSIONS



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

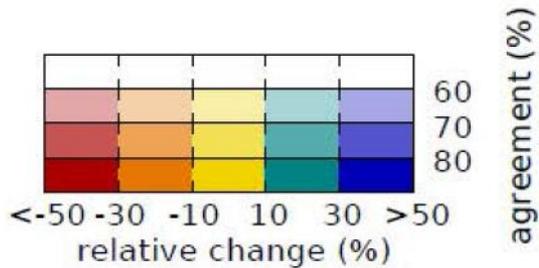
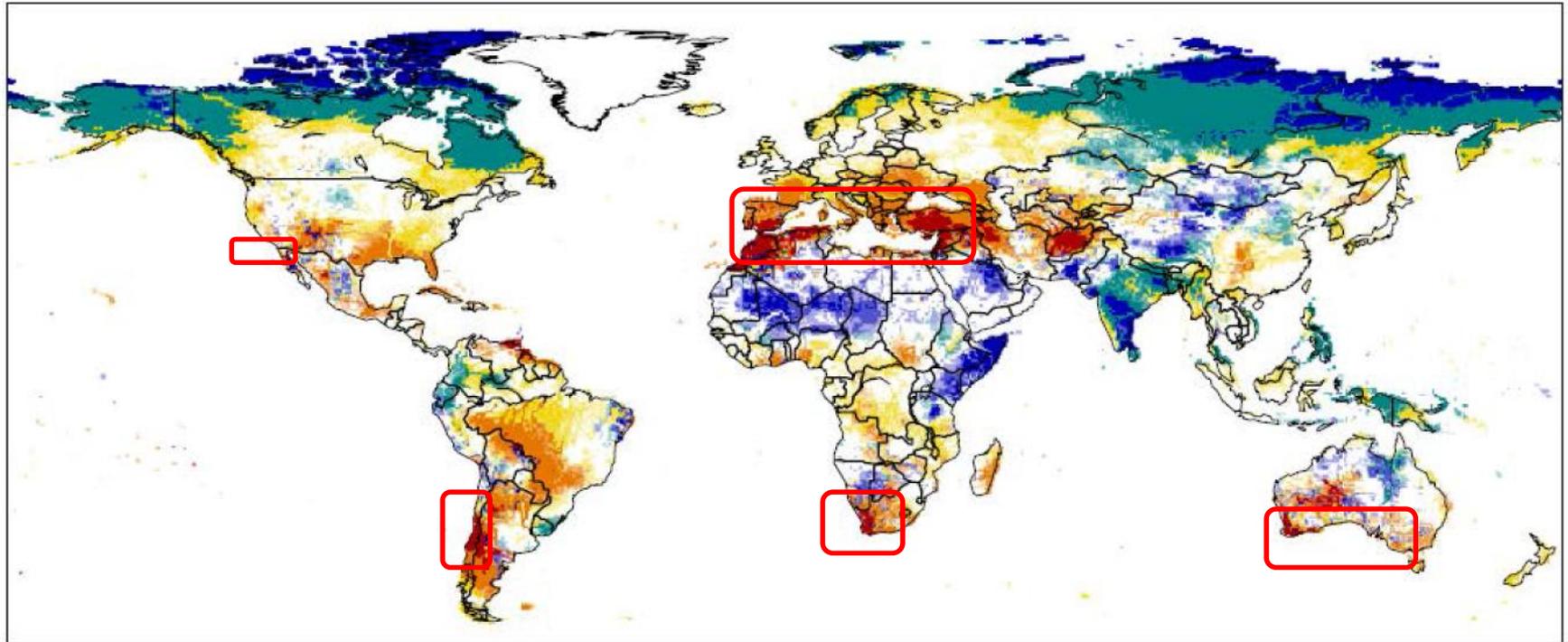




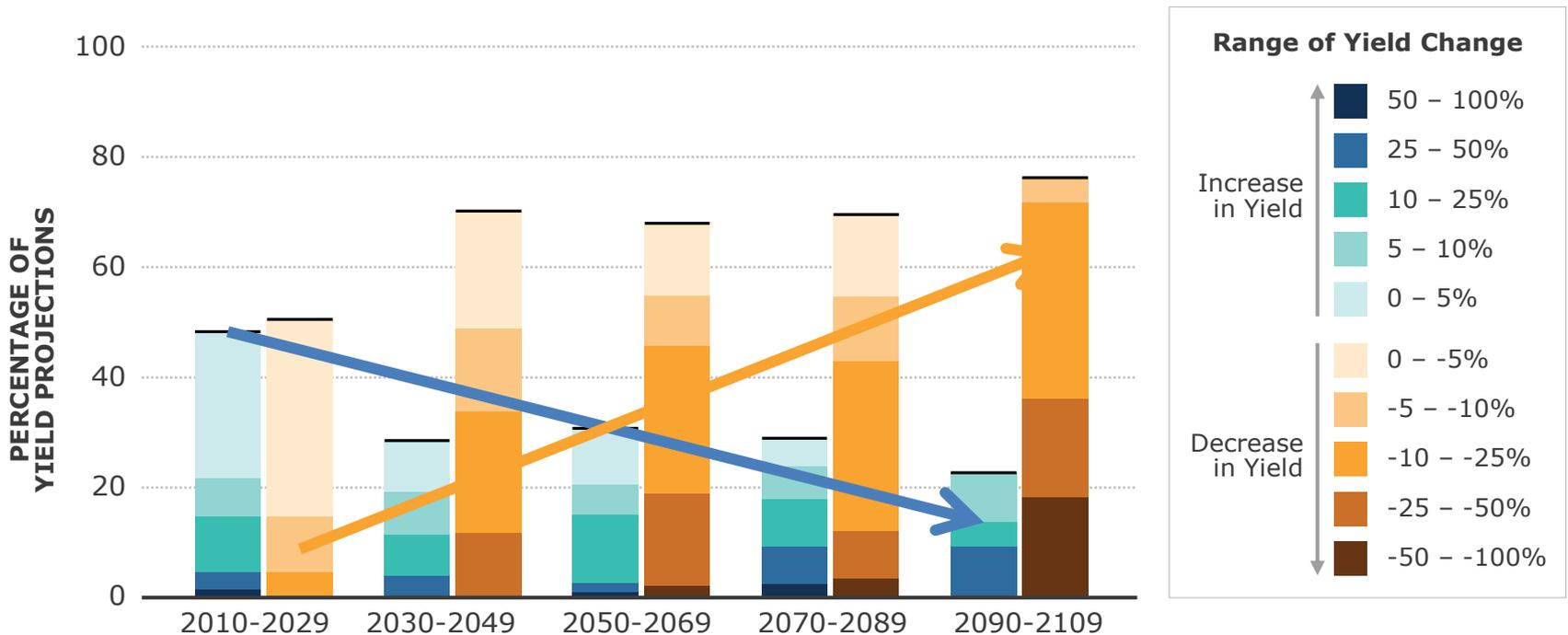
INCREASING MAGNITUDES
OF WARMING INCREASE
THE LIKELIHOOD OF

**SEVERE AND
PERVASIVE IMPACTS**

Projected runoff (% change) for 2.7°C



Percentage of yield projections



Climate change is likely to decrease yields in Southern Europe,...may adversely affect dairy production because of heat stress in lactating cows,...will change the geographic distribution of wine grape varieties and this will reduce the value of wine products and the livelihoods of local wine communities (Chapter 23)

Species and ecosystems

- **A large fraction of species faces increased extinction risk**



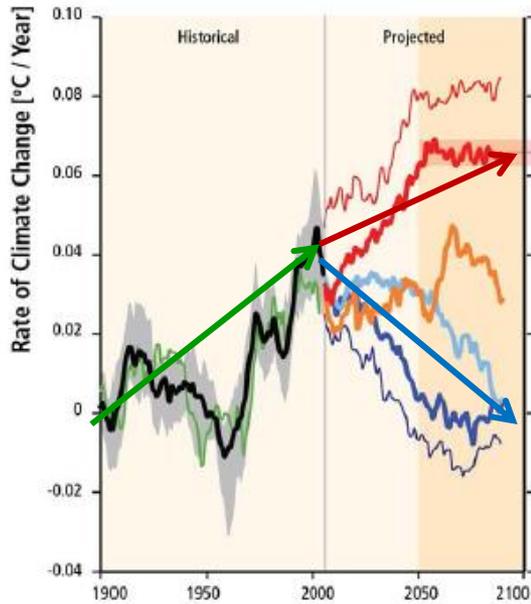
- *A large fraction of both terrestrial and freshwater species faces increased extinction risk under projected climate change during and beyond the 21st century, especially as climate change interacts with other stressors, such as habitat modification, over-exploitation, pollution, and invasive species*

- **Abrupt and irreversible regional-scale changes at medium to high climate change**

- *Within this century, magnitudes and rates of climate change associated with medium- to high-emission scenarios (RCP4.5, 6.0, and 8.5) pose high risk of abrupt and irreversible regional-scale change in the composition, structure, and function of terrestrial and freshwater ecosystems, including wetlands*

Climate change is very likely to cause changes in habitats and species, with local extinctions and continental scale shifts in species distributions, ...constrain both terrestrial and marine ecosystem functioning..., with a reduction in some ecosystem services;...[to increase] the introduction and expansion of invasive; threatens the effectiveness of European conservation areas (Chapter 23)

A. Climate Change Scenarios



A. Rate of Climate Change

- Observed (green line)
- Historical (black line)
- RCP 2.6-low (blue line)
- RCP 2.6 (+ 1.0 °C)
- RCP 4.5 (+ 1.8 °C)
- RCP 6.0 (+ 2.2 °C)
- RCP 8.5-high (orange line)
- RCP 8.5 (+ 3.7 °C)

(Mean projected increase in global temperature for the period 2081-2100 (WGI, Chapter 12))

rate of temperature change under RCP 8.5 scenario between 2050 and 2100

Projected mean

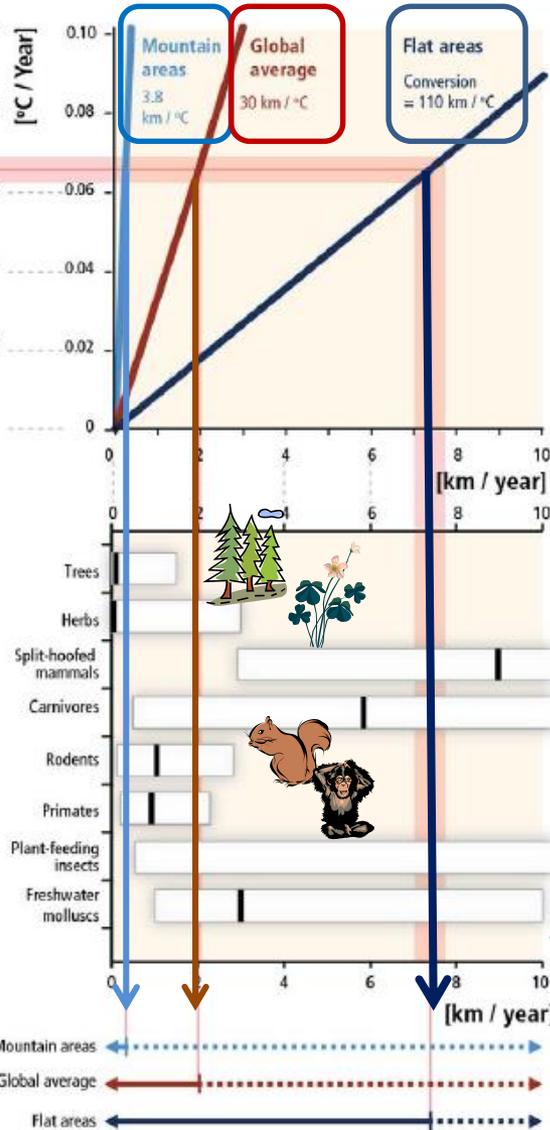
C. Species Displacement Rates

Estimated speed at which species group can move

unable to keep up | able to keep up

Lower bound | Median | Upper bound

B. Estimate of Climate Velocity to Determine Rate of Displacement



C. Species Displacement Rates (required to track climate velocity)

Human health

- **Near term effects mainly by exacerbating current problems**
 - *Until mid-century, projected climate change will impact human health mainly by exacerbating health problems that already exist*
- **Main impacts in low income countries**
 - *Throughout the 21st century, climate change is expected to lead to increases in ill-health in many regions and especially in developing countries with low income, as compared to a baseline without climate change*



Heat-related deaths and injuries are likely to increase, particularly in Southern Europe (Ch. 23)

Climate change and poverty

- **Climate change will exacerbate or create poverty, in developed and developing countries**

- *Throughout the 21st century, climate-change impacts are projected to slow down economic growth, make poverty reduction more difficult, further erode food security, and prolong existing and create new poverty traps, the latter particularly in urban areas and emerging hotspots of hunger*
- *Climate change will exacerbate poverty in most developing countries and create new poverty pockets in countries with increasing inequality, in both developed and developing countries*



Relative poverty is rising in High Income Countries. Many European countries face rapid increases in poverty,... For example, 20% of Spanish citizens were ranked poor in 2009 (Chapter 13)

Climate change and human security

- **Climate change increases**
 - displacements
 - risks of violent conflict
 - amplifies poverty and economic shocks
- **Affects national security**
 - *Influence national security policies due to impacts on critical infrastructure and territorial integrity*



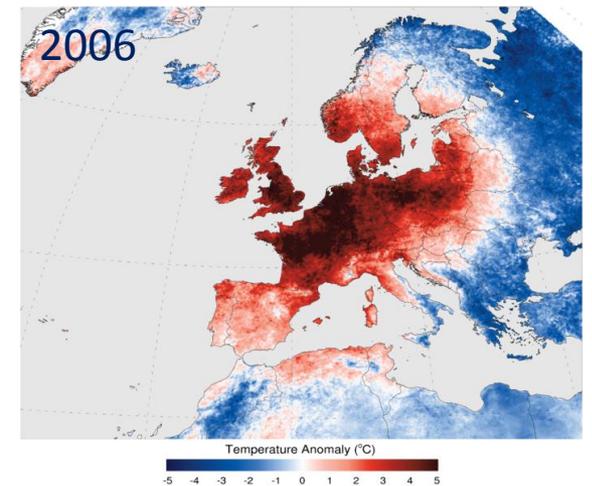
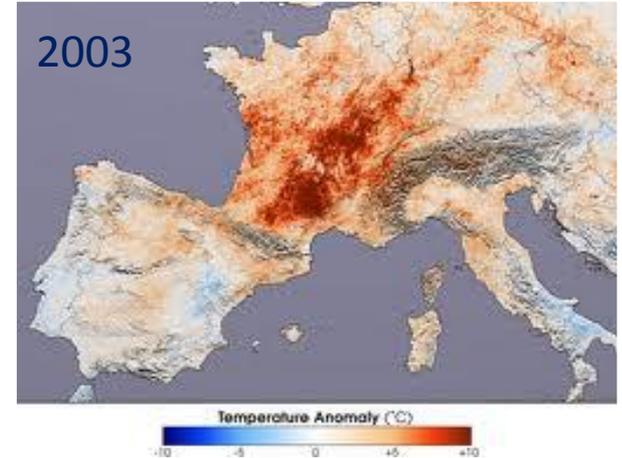


ADAPTATION IS ALREADY OCCURRING

... and it is paying back

[heat waves in France]

- 2003: 15000 excess deaths
- 2006: 2000 excess deaths, 4000 fewer than calculated based on 2003
- A national assessment concluded that this was due to early warning and other measures



Adaptation

- **One does not fit all**
 - *Adaptation is place and context specific, with no single approach for reducing risks*

- **First reduce exposure and vulnerability**
 - *A first step towards adaptation to future climate change is reducing vulnerability and exposure to present climate variability*



Adaptation

- **Beware of constraints**
 - Constraints can interact to impede adaptation planning and implementation
- **... and of the social context**
 - *Underestimating the complexity of adaptation as a social process can create unrealistic expectations about achieving intended adaptation outcomes*
- **Benefit from other actions (cobenefits)**
 - *Adaptation planning and implementation can be enhanced through complementary actions*



Modification of the built environment, via enhanced urban greening, for example, can reduce temperatures in urban areas, with co-benefits for health and wellbeing (Ch. 11)

Regional risks

POLAR REGIONS

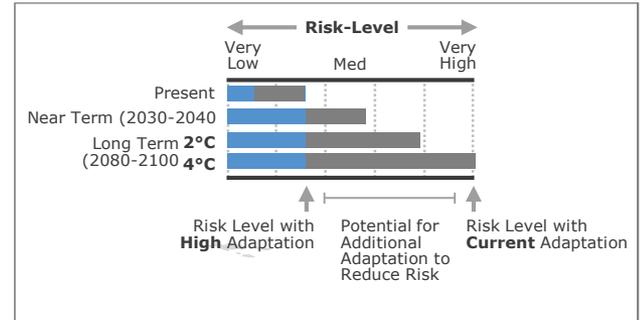
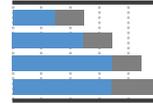
Risks for Ecosystems



Risks for Health and Well-Being



Unprecedented Challenges, Especially from Rate of Change



NORTH AMERICA

Increased Risks from Wildfires



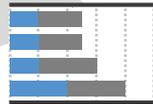
Heat-Related Human Mortality



Damages from River and Coastal Urban Floods

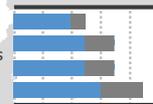


Increased Flood Losses and Impacts



EUROPE

Increased Losses and Impacts from Extreme Heat Events



Increased Water Restrictions



Increased Flood Damage to Infrastructure, Livelihoods, and Settlements



Heat-Related Human Mortality



Increased Drought-Related Water and Food Shortage



ASIA

THE OCEAN

Reduced Fisheries Catch Potential at Low Latitudes



Increased Mass Coral Bleaching and Mortality

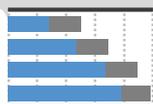


Coastal Inundation and Habitat Loss

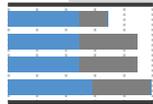


CENTRAL AND SOUTH AMERICA

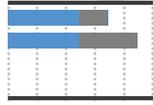
Reduced Water Availability and Increased Flooding and Landslides



Reduced Food Production and Quality

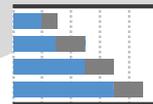


Vector-Borne Diseases



AFRICA

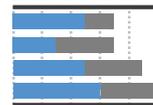
Compounded Stress on Water Resources



Reduced Crop Productivity and Livelihood and Food Security

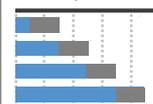


Vector- and Water-Borne Diseases

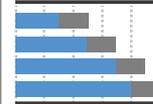


SMALL ISLANDS

Loss of Livelihoods, Settlements, Infrastructure, Ecosystem Services, and Economic Stability

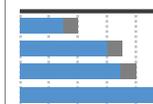


Risks for Low-Lying Coastal Areas



AUSTRALASIA

Significant Change in Composition and Structure of Coral Reef Systems

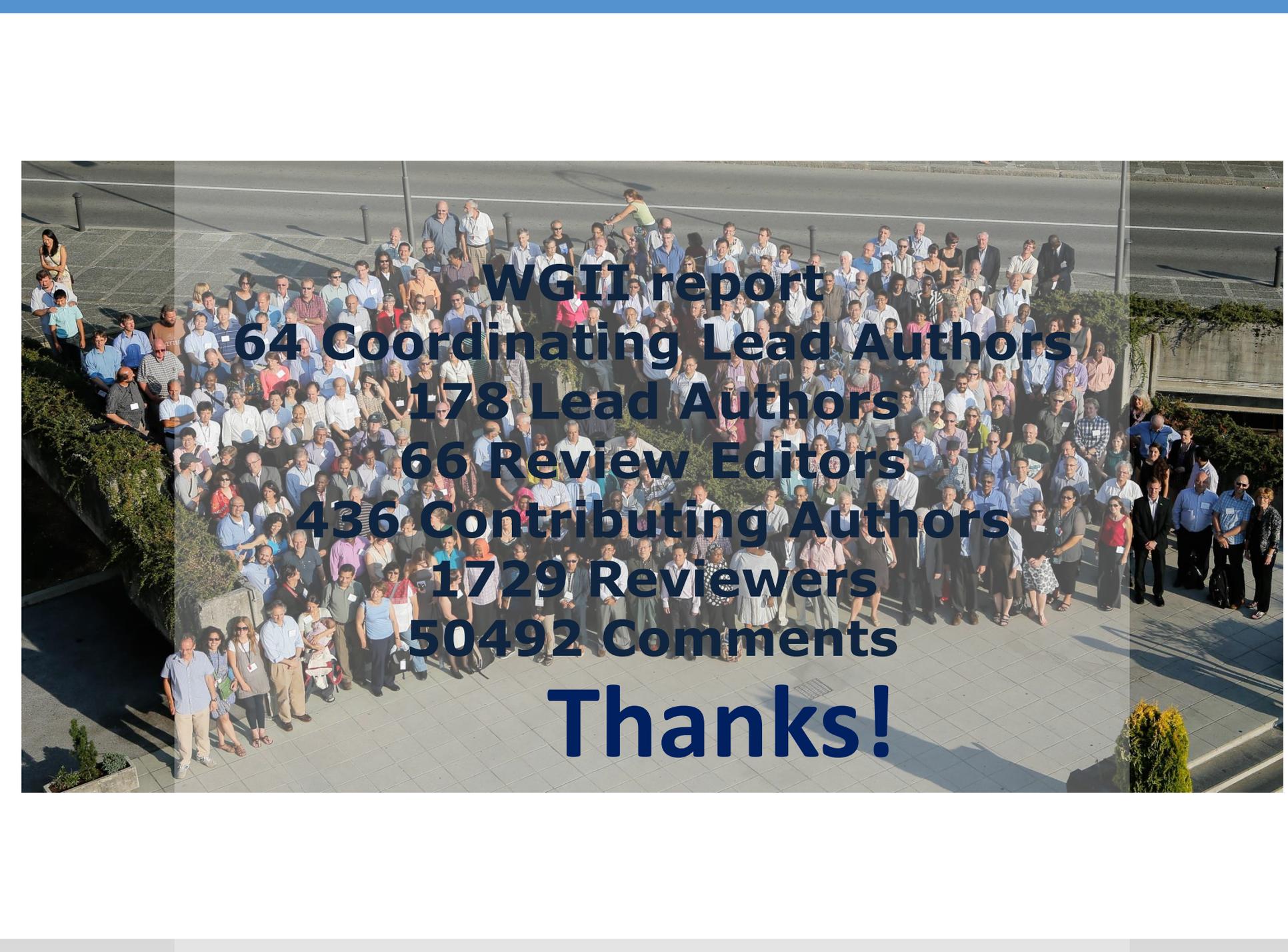


Increased Flood Damage to Infrastructure and Settlements



Increased Risks to Coastal Infrastructure and Low-Lying Ecosystems





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Thanks!