# IPCC Fifth Assessment Report
# Synthesis Report



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INTERGOVERNMENTAL PANEL ON climate change
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# The IPCC Synthesis Report

→ **Integration of three Working Group Reports of the 5th Assessment, 2013-2014**

- **WG I : The Physical Science Basis**
- **WGII: Impacts, Adaptation and Vulnerability**
- **WG III: Mitigation of Climate Change**

# The IPCC Synthesis Report

- → **Written by 60 authors from Working Group reports**
- → **Chaired by the IPCC Chair R.K. Pachauri**
- → **Member governments approved the SPM on 1st November 2014 (total membership of IPCC is 195 governments)**

# Key Messages

→ **Human influence on the climate system is clear**

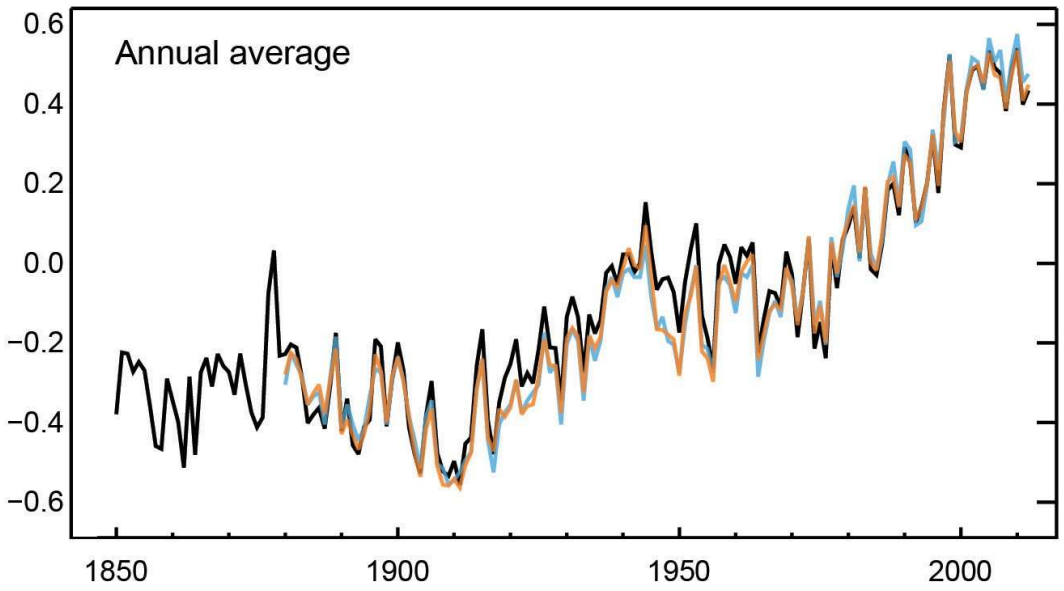
→ **The more we disrupt our climate, the more we risk severe, pervasive and irreversible impacts**

→ **We have the means to limit climate change and build a more prosperous, sustainable future**

AR5 WGI SPM, AR5 WGII SPM, AR5 WGIII SPM

# Humans are changing the climate

**It is extremely likely that we are the dominant cause of warming since the mid-20th century**

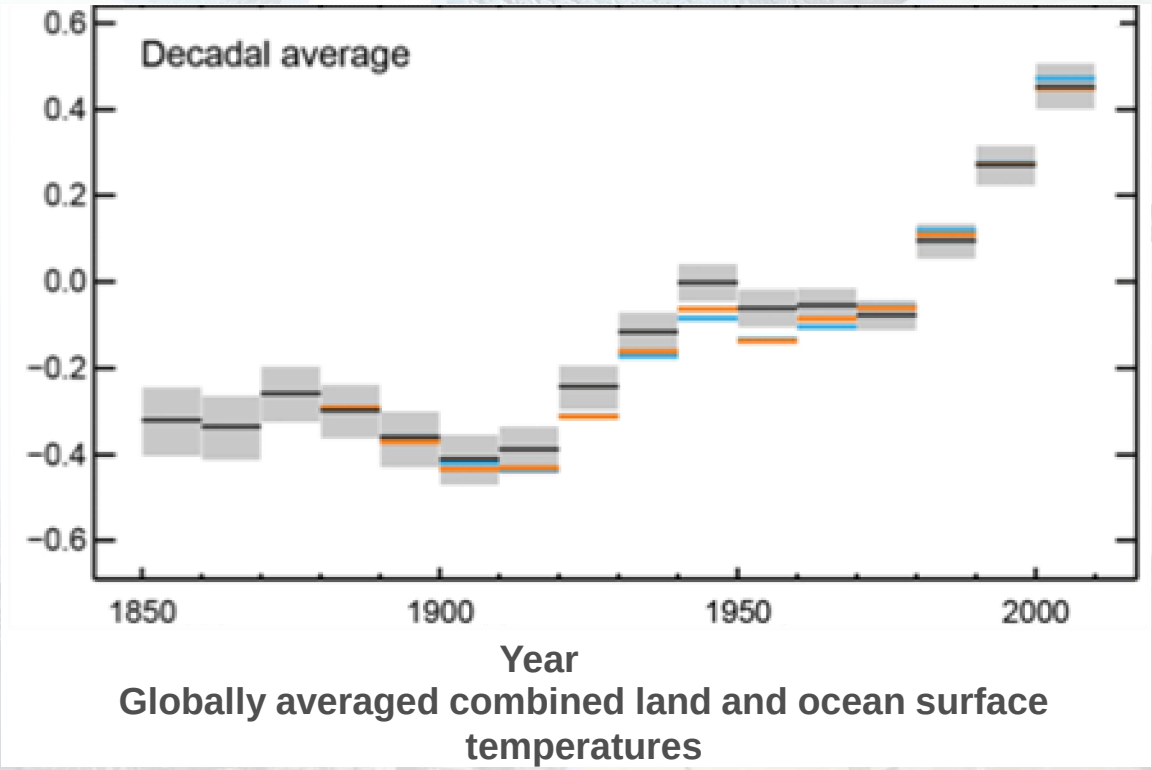



**Globally averaged combined land and ocean surface temperatures**

AR5 WGI SPM

# Temperatures continue to rise

**Each of the past 3 decades has been successively warmer than the preceding decades since 1850**




**Globally averaged combined land and ocean surface temperatures**

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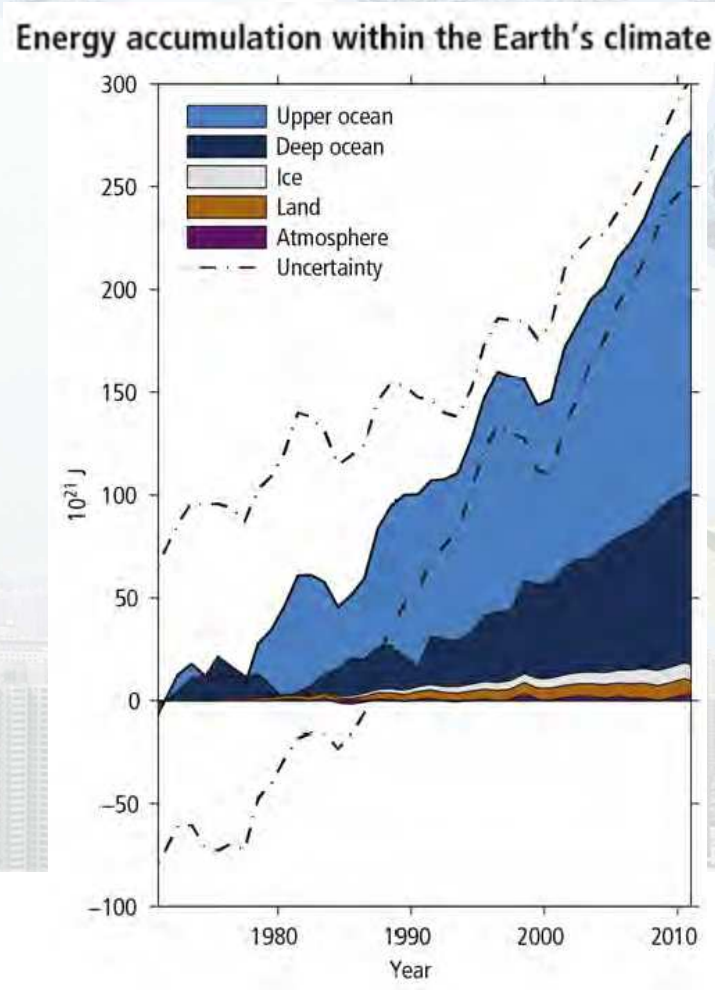
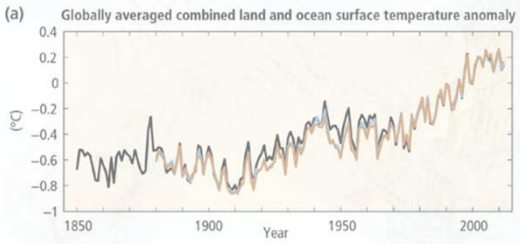
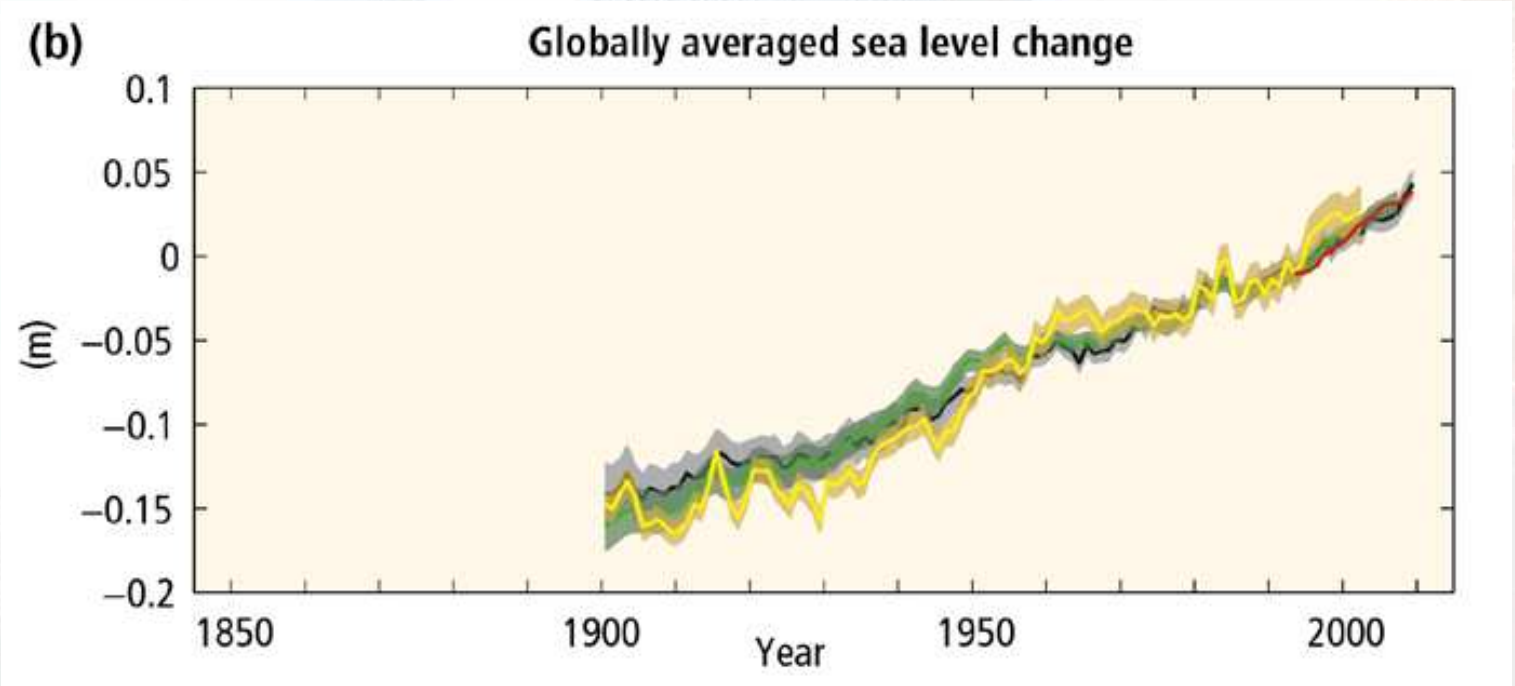
# Oceans absorb most of the heat



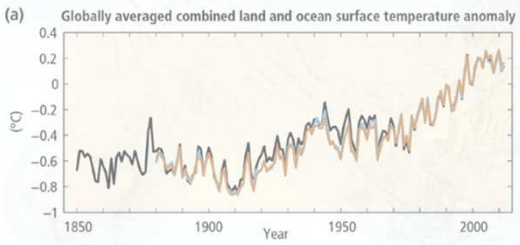

- More than 90% of the energy accumulating in the climate system between 1971 and 2010 has accumulated in the ocean
- Land temperatures remain at historic highs while ocean temperatures continue to climb

AR5 SYR


(a)
Globally averaged combined land and ocean surface temperature anomaly
0.4
0.2
0
−0.2
−0.4
−0.6
−0.8
−1
(°C)
1850
1900
1950
2000
Year


(b)
Globally averaged sea level change
0.1
0.05
0
−0.05
−0.1
−0.15
−0.2
(m)
1850
1900
1950
2000
Year

AR5 SYR SPM


(a)
Globally averaged combined land and ocean surface temperature anomaly
0.4
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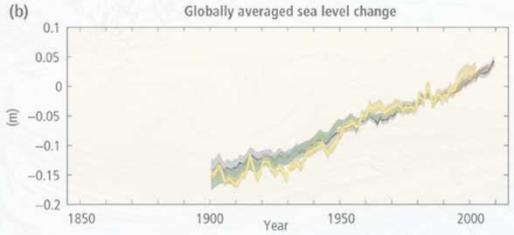
−0.2
−0.4
−0.6
−0.8
−1
(°C)
1850
1900
1950
2000
Year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0.05
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−0.05
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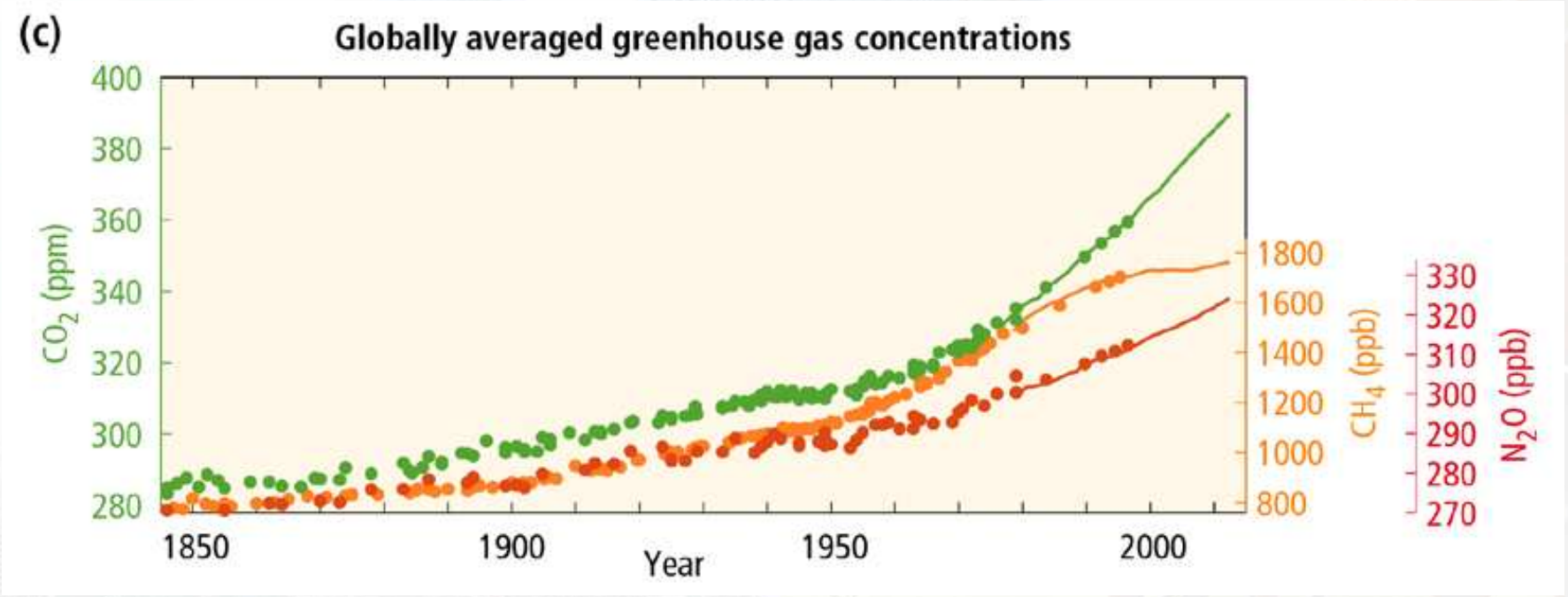
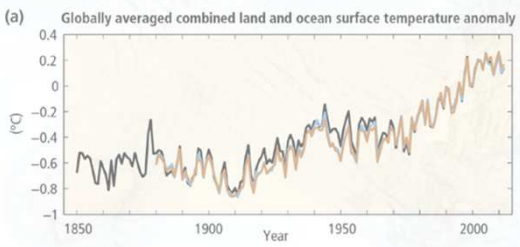
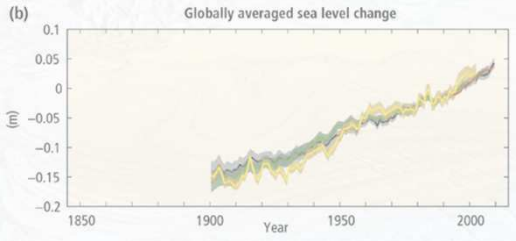
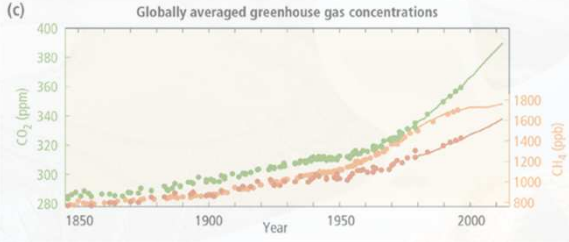
−0.15
−0.2
(m)
1850
1900
1950
2000
Year

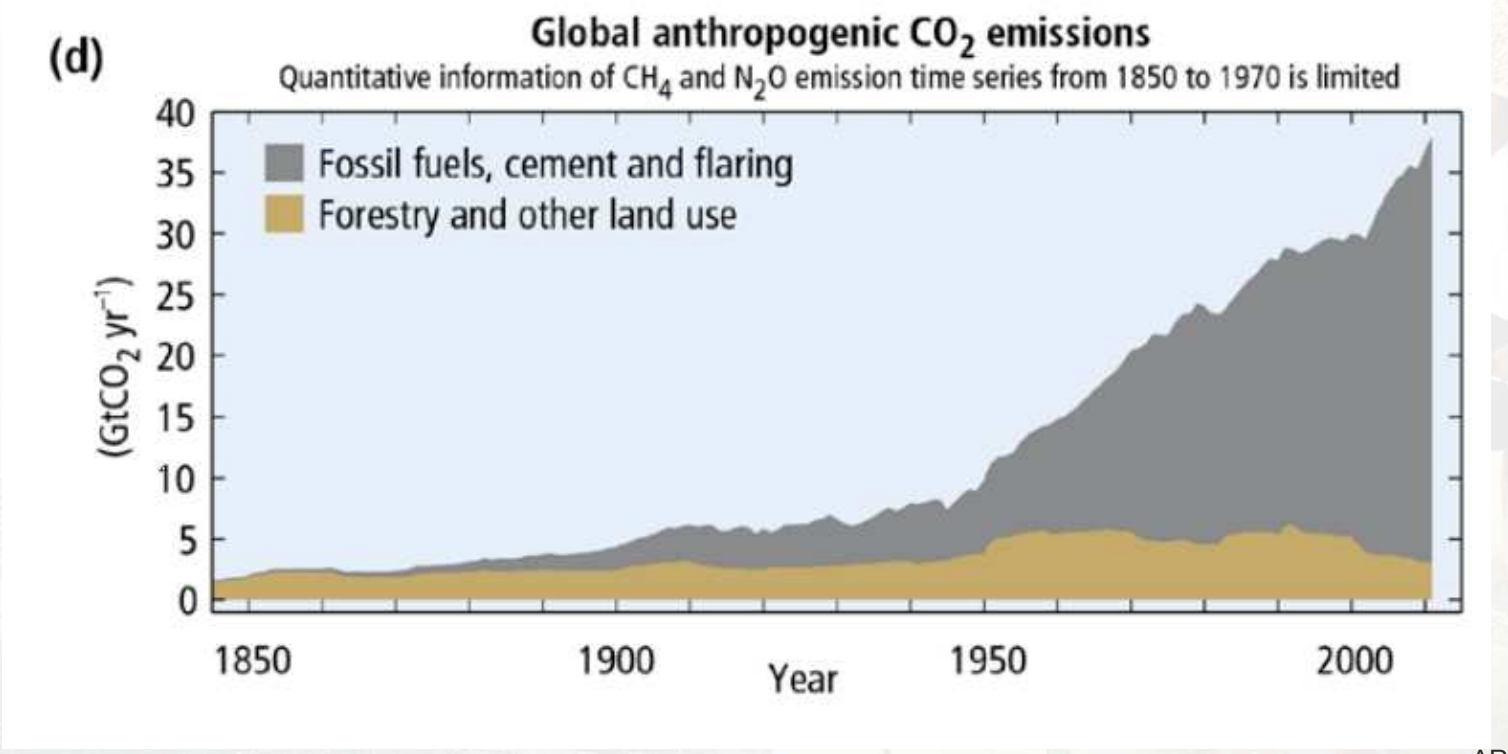

(c)
Globally averaged greenhouse gas concentrations
400
380
360
340
320
300
280
CO2 (ppm)
1850
1900
1950
2000
Year
1800
1600
1400
1200
1000
800
CH4 (ppb)
330
320
310
300
290
280
270
N2O (ppb)

AR5 SYR SPM


(a)
Globally averaged combined land and ocean surface temperature anomaly
(°C)
Year

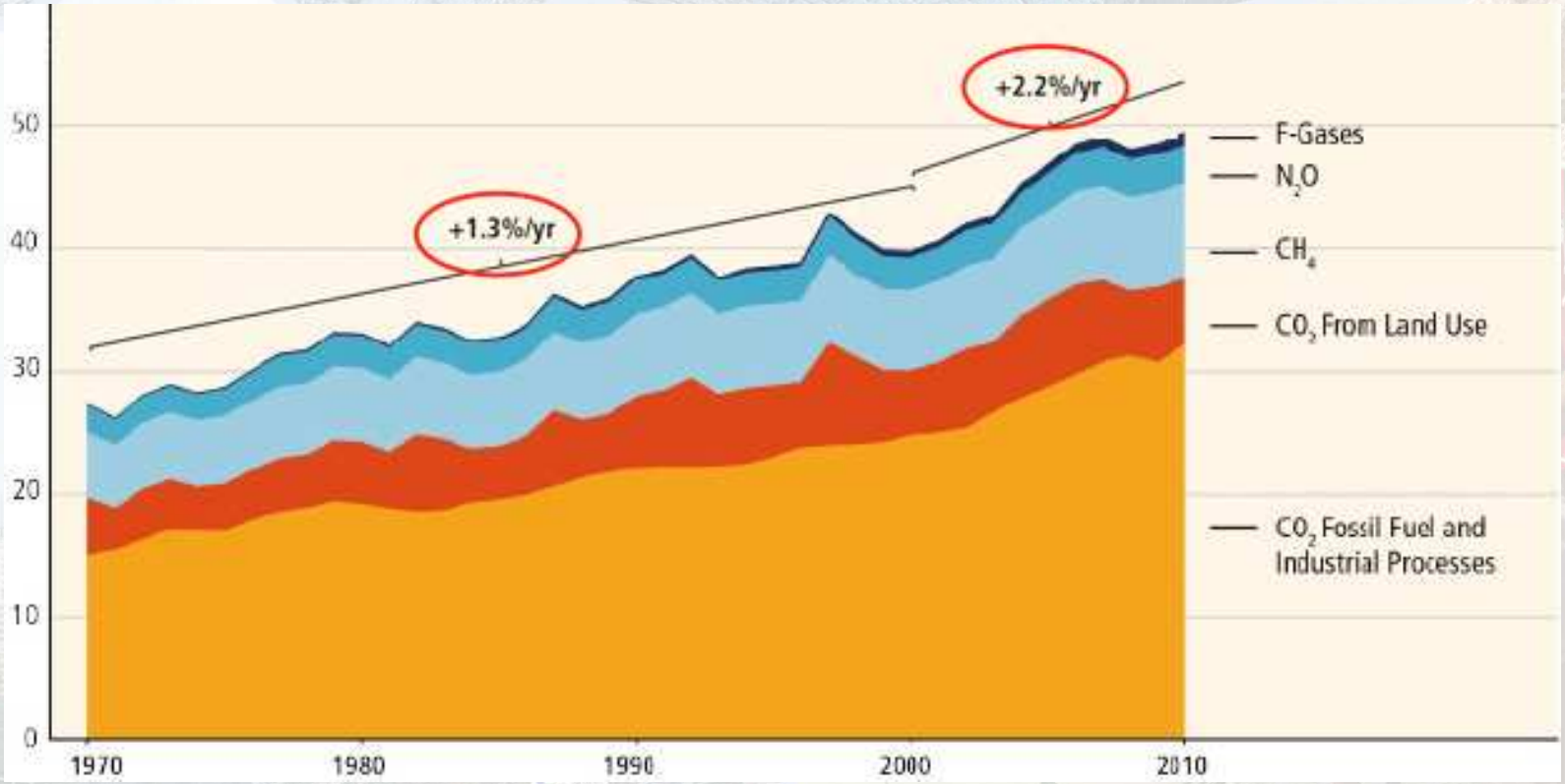

(b)
Globally averaged sea level change
(m)
Year


(c)
Globally averaged greenhouse gas concentrations
Year


(d)
Global anthropogenic $CO_2$ emissions
Quantitative information of $CH_4$ and $N_2O$ emission time series from 1850 to 1970 is limited
Fossil fuels, cement and flaring
Forestry and other land use
$(GtCO_2\ yr^{-1})$
Year

AR5 SYR SPM

# GHG emissions growth between 2000 and 2010 has been larger than in the previous three decades




AR5 WGIII SPM

# Sources of emissions

## Energy production remains the primary driver of GHG emissions


**2010 GHG emissions**

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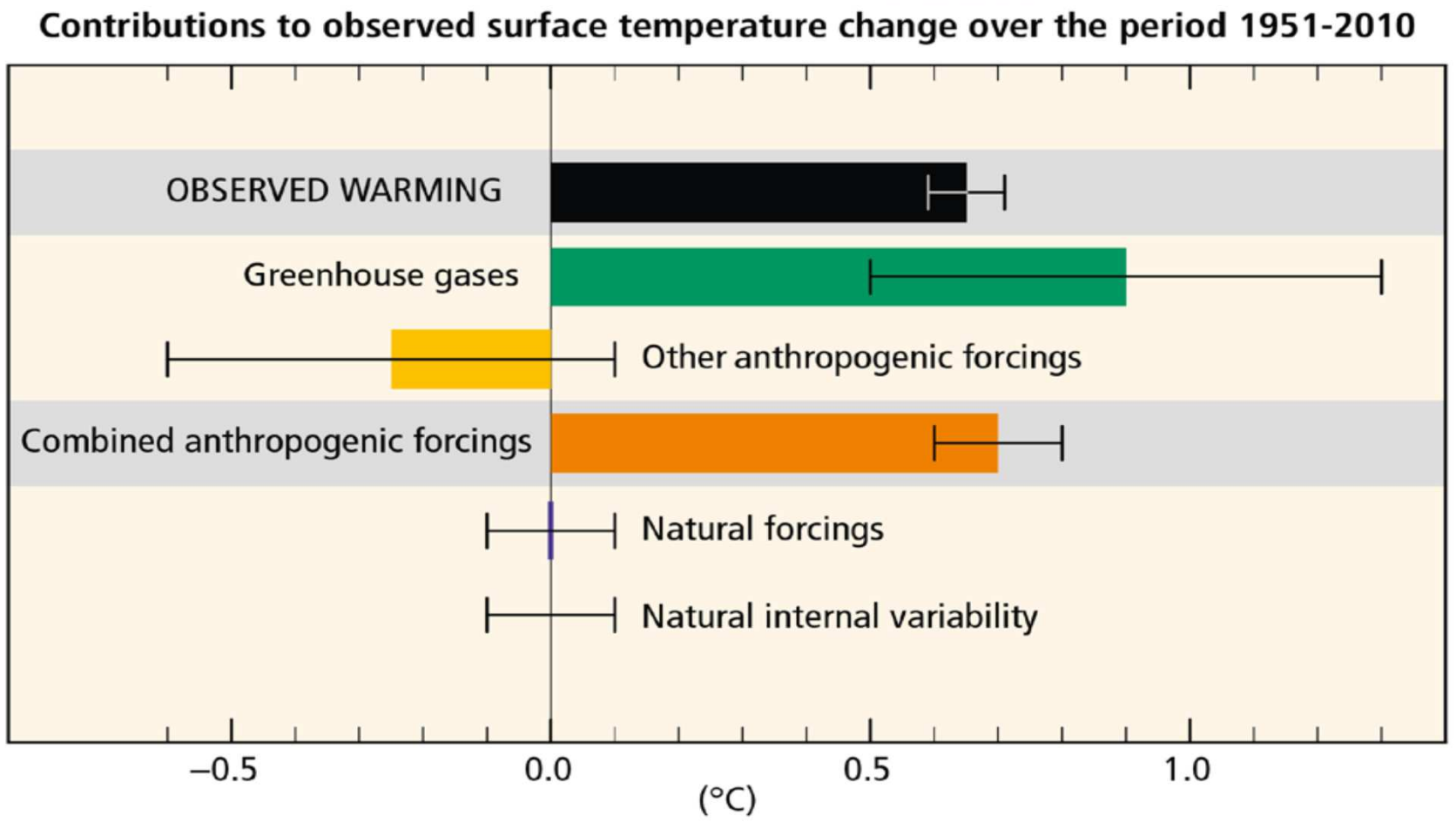
# Antropogenic forcings are *extremely likely* the cause of warming



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# Some of the changes in extreme weather and climate events observed since about 1950 have been linked to human influence

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# Impacts are already underway

- Tropics to the poles
- On all continents and in the ocean
- Affecting rich and poor countries

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# Projected climate changes

## Continued emissions of greenhouse gases will cause further warming and changes in the climate system

Oceans will continue to warm during the 21st century

Global mean sea level will continue to rise during the 21st century

It is very likely that the Arctic sea ice cover will continue to shrink and thin as global mean surface temperature rises

Global glacier volume will further decrease

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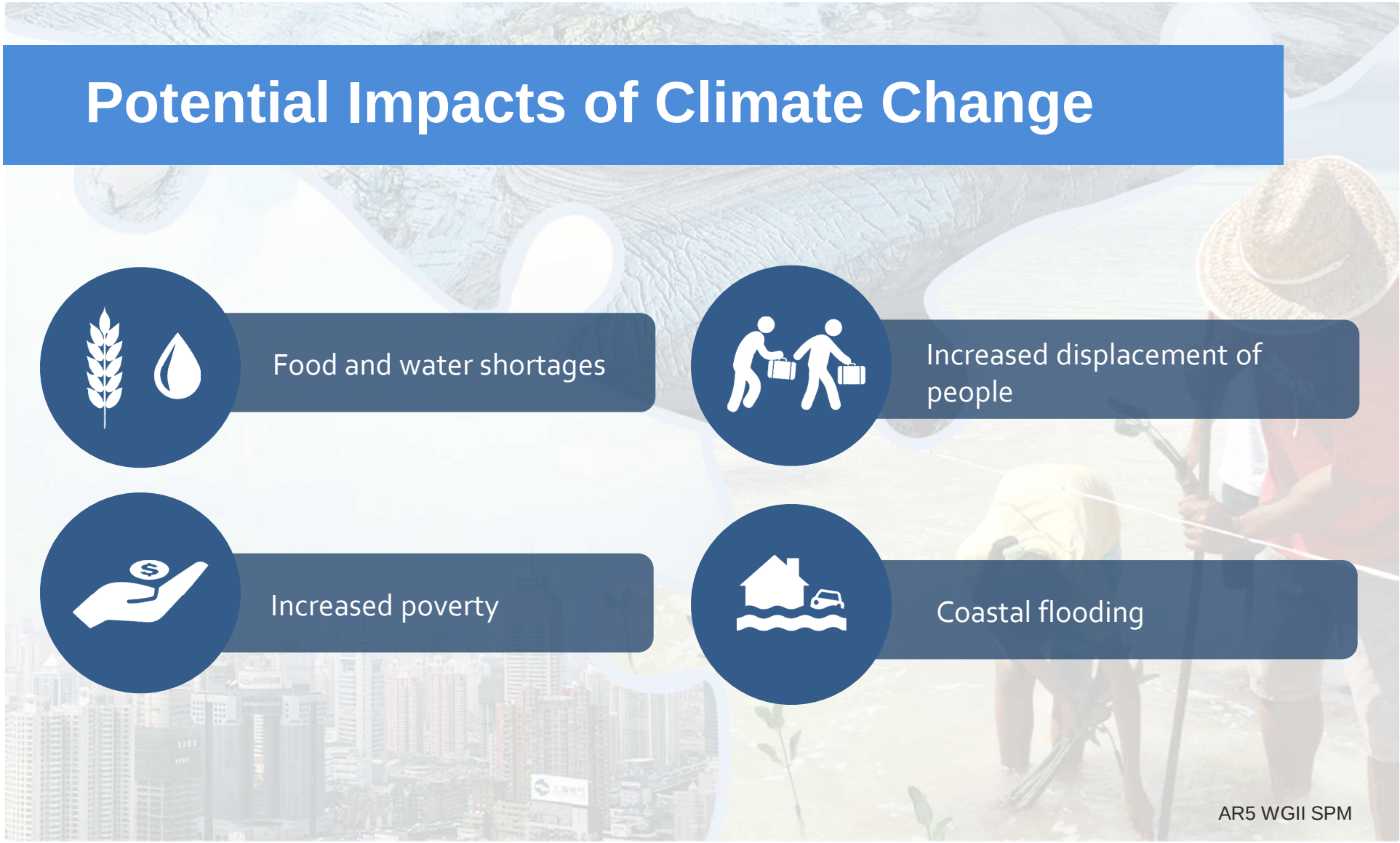
# Potential Impacts of Climate Change

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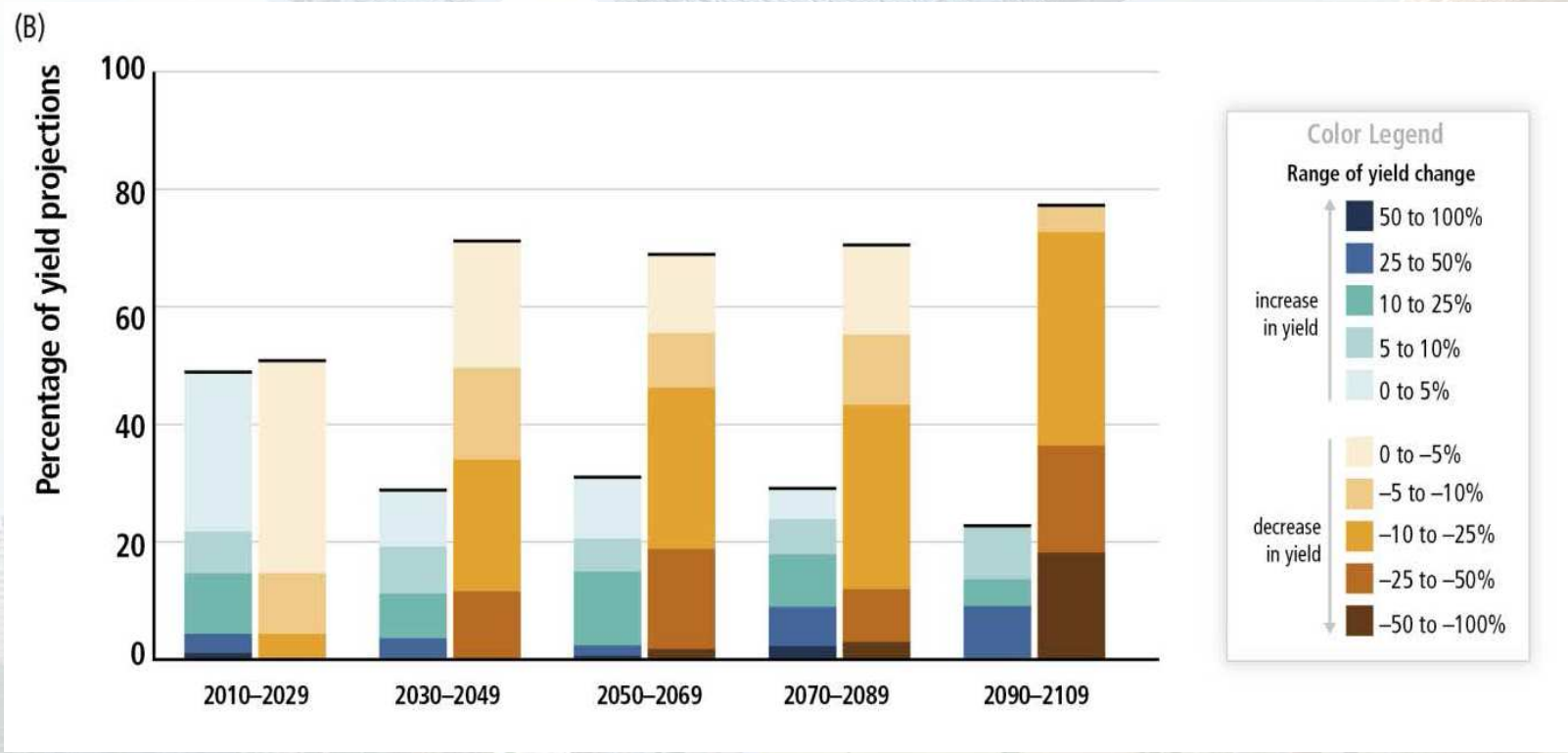
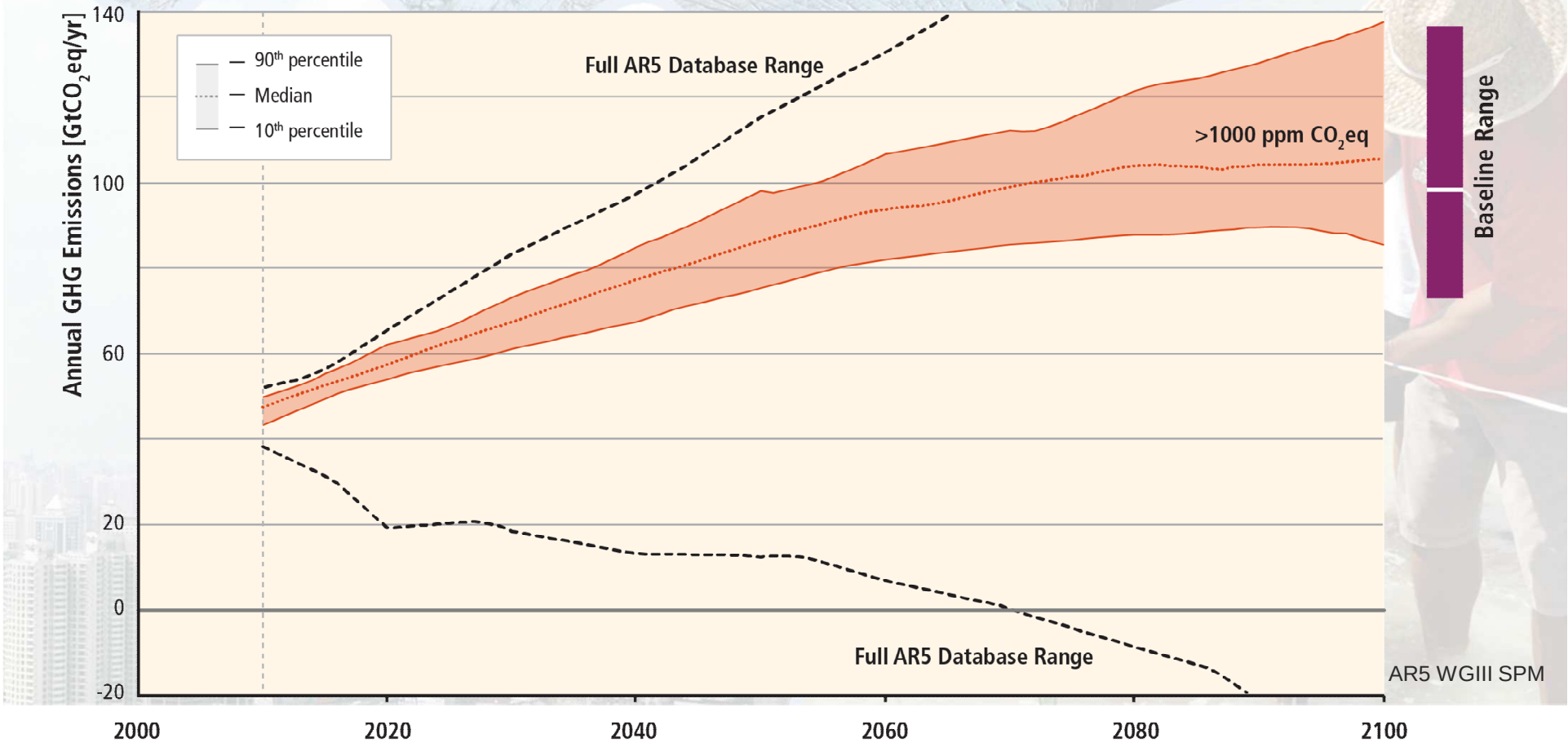
# Climate Change Poses Risk for Food Production

Percentage of yield projections




AR5 SYR SPM

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




Based on Figure 6.7



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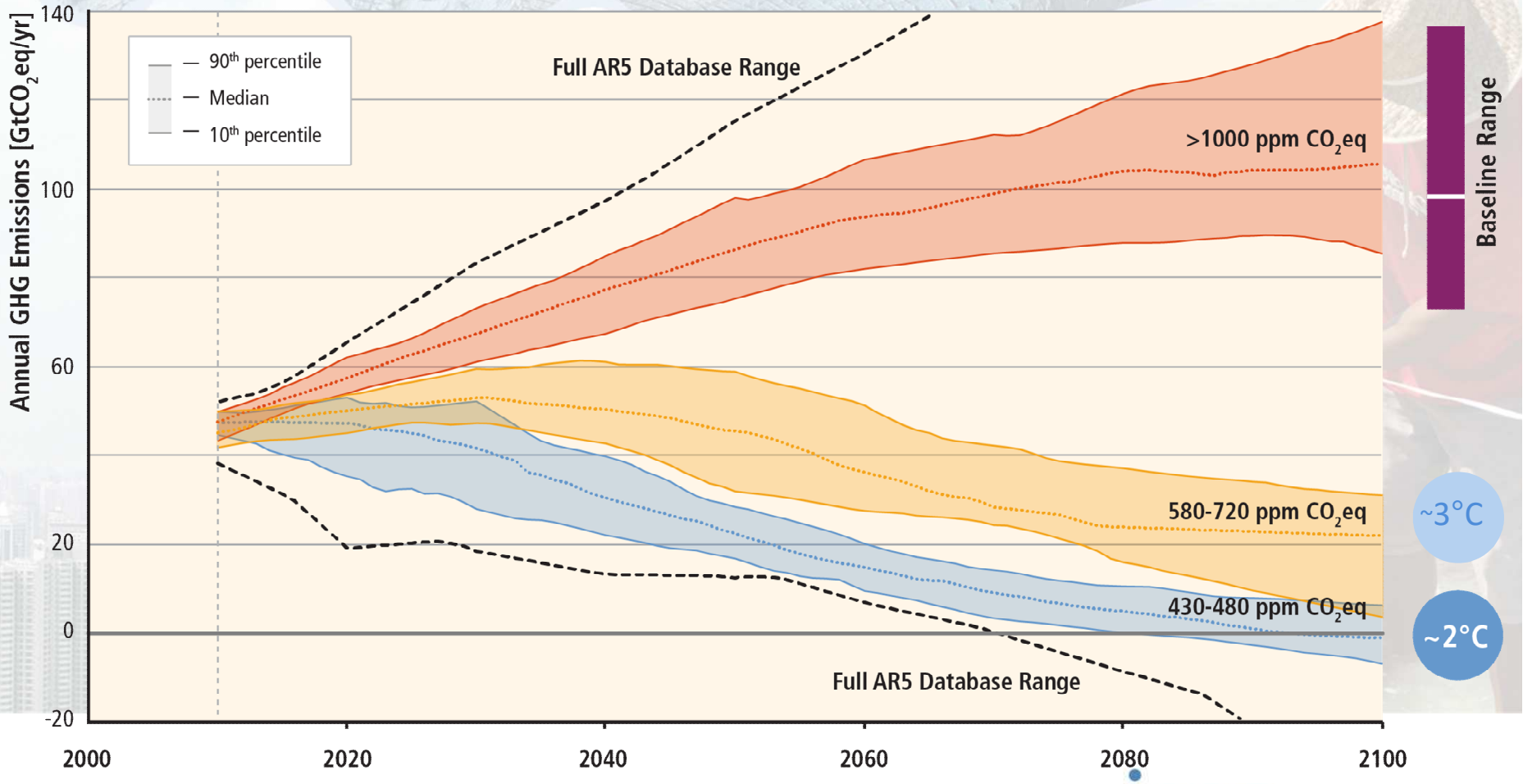
# Stabilization of atmospheric concentrations requires moving away from the baseline – regardless of the mitigation goal.




Based on Figure 6.7

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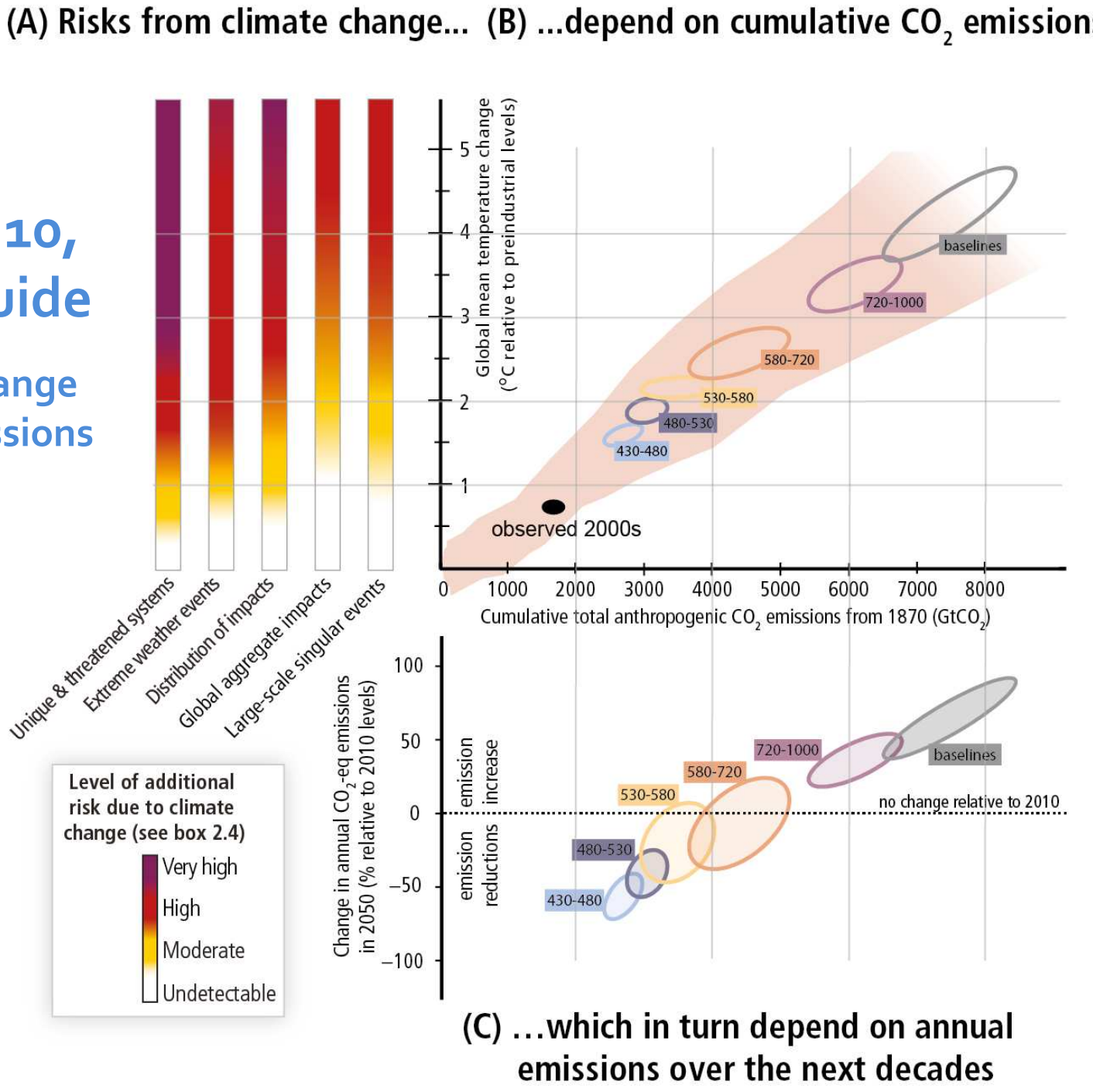
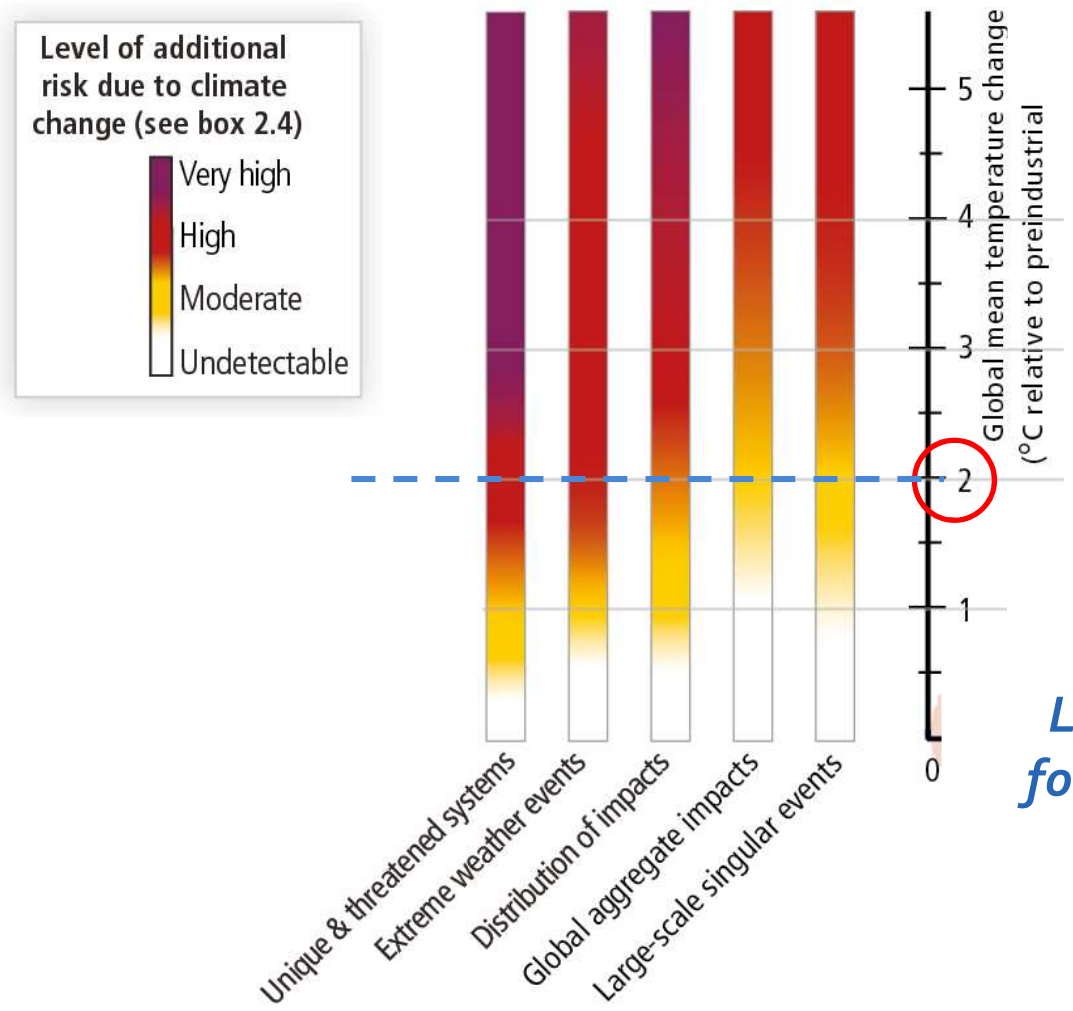
# Figure SPM.10, A reader's guide

## From climate change risks to GHG emissions

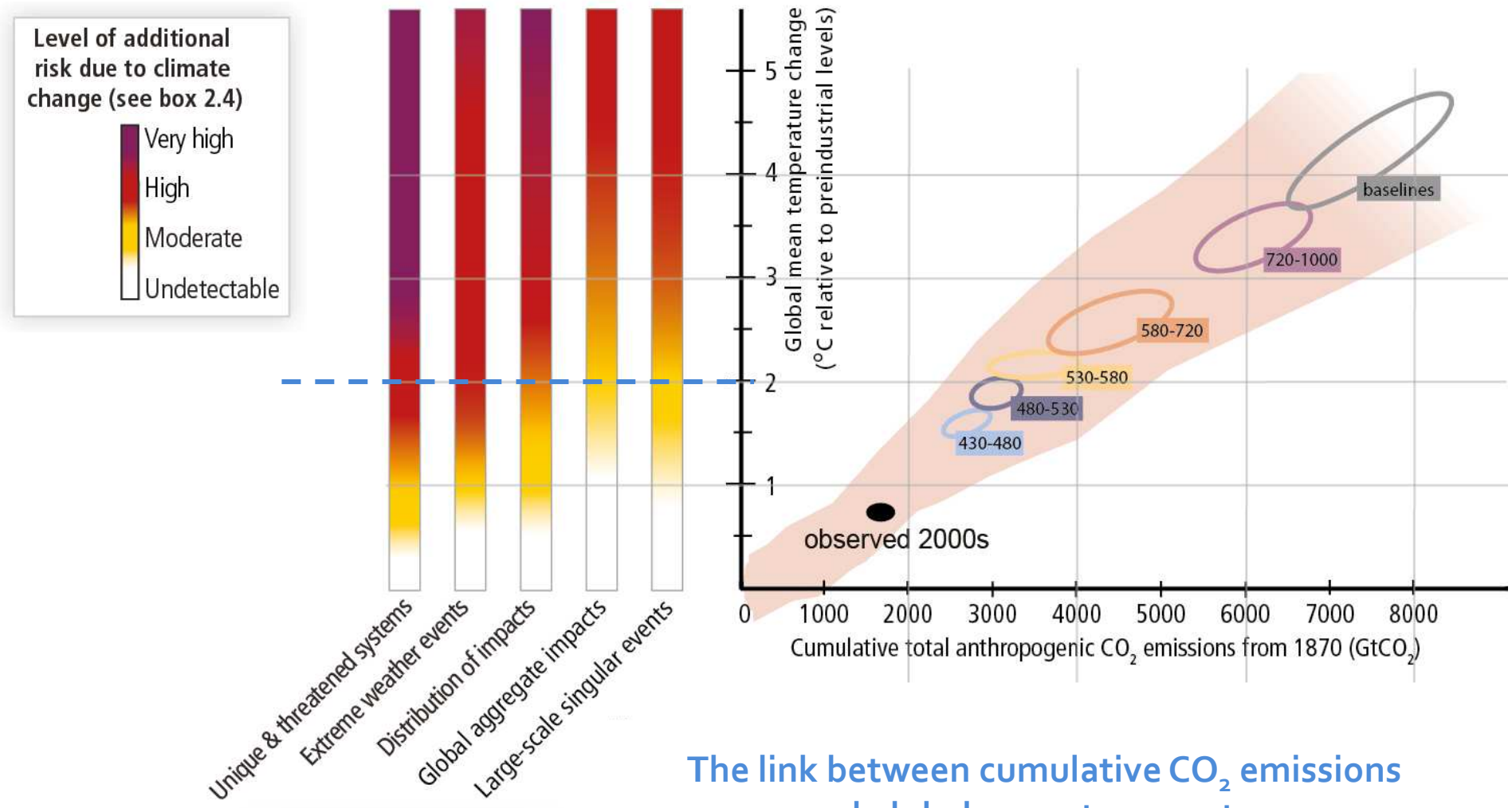





**The risks from climate change, assessed by the WGII of the IPCC AR5, and aggregated in five "Reasons for Concerns"**

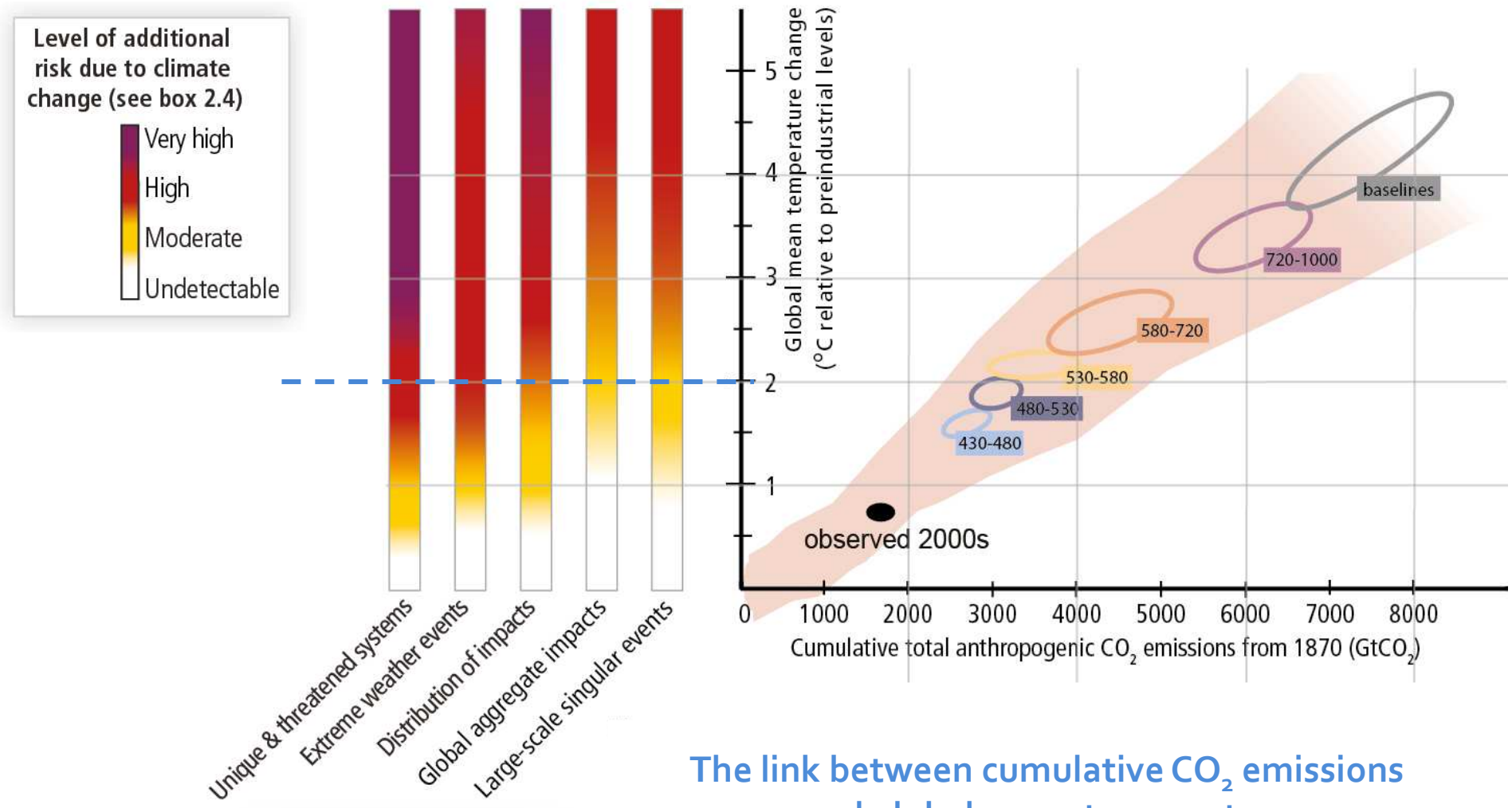
***Levels of risk across the Reasons for Concern can be associated with a level of global temperature change.***

***Here shown for a warming by 2°C***



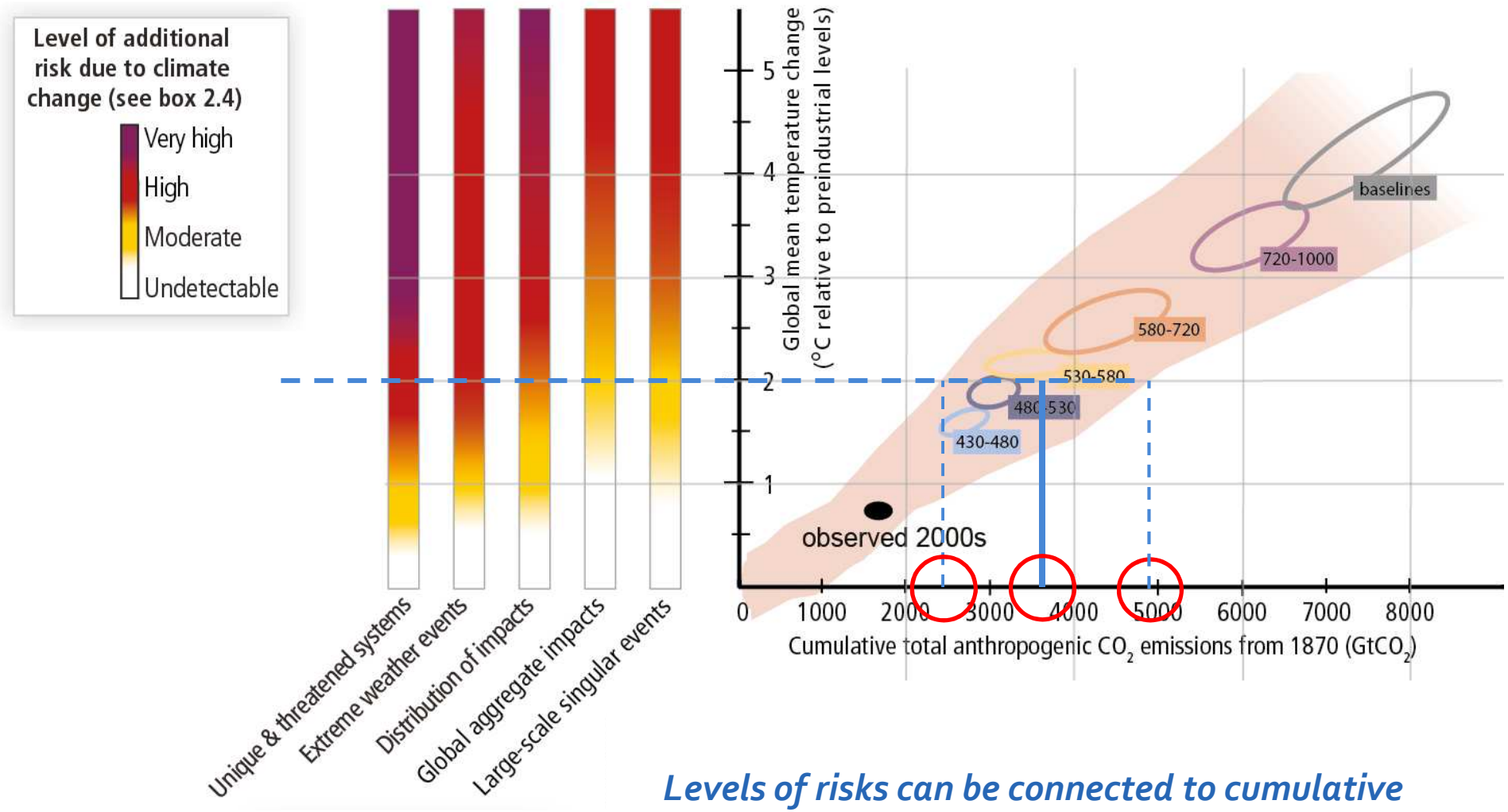

**The link between cumulative $CO_2$ emissions and global mean temperature**

**The pink plume is from WGI complex models. It includes the uncertainty from non-$CO_2$ gases and climate and carbon cycle uncertainty, using the likely range**

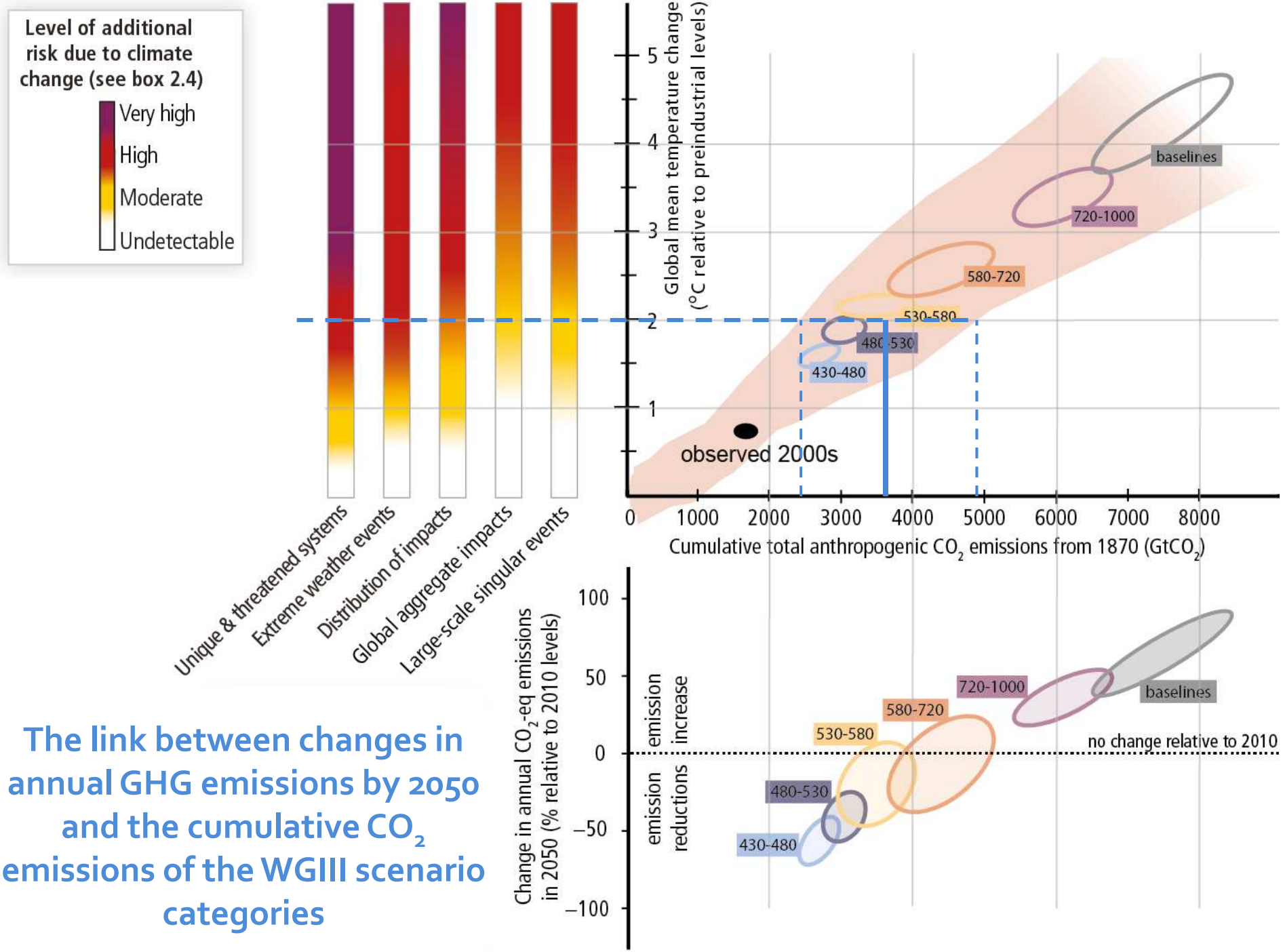



**The link between cumulative $CO_2$ emissions and global mean temperature**

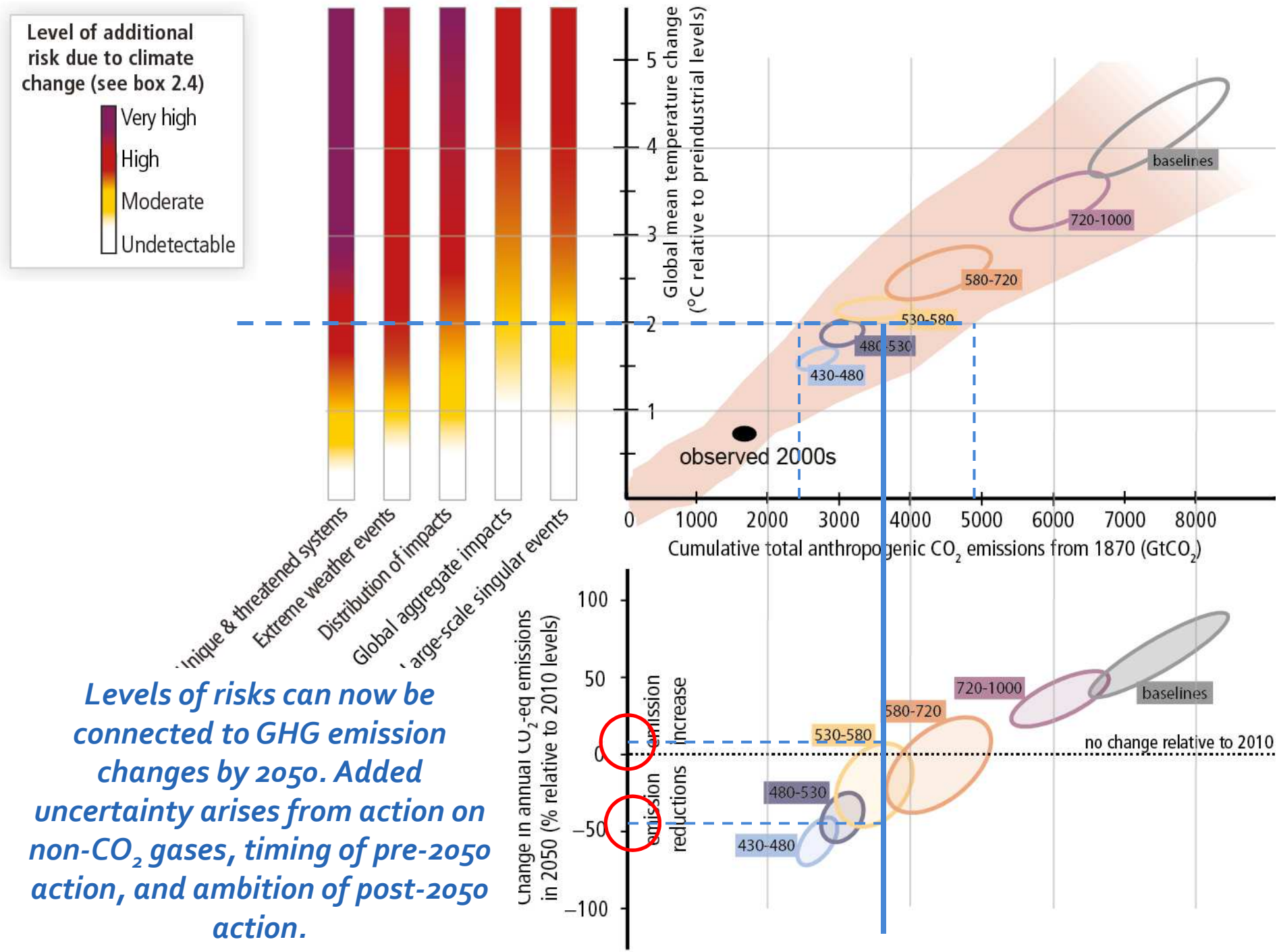
**The ellipses show results from the WGIII models, using a simple climate model. It does not include climate and carbon cycle uncertainty, but explores more comprehensively the scenario uncertainty from a range of CO2 and non-$CO_2$ pathways**



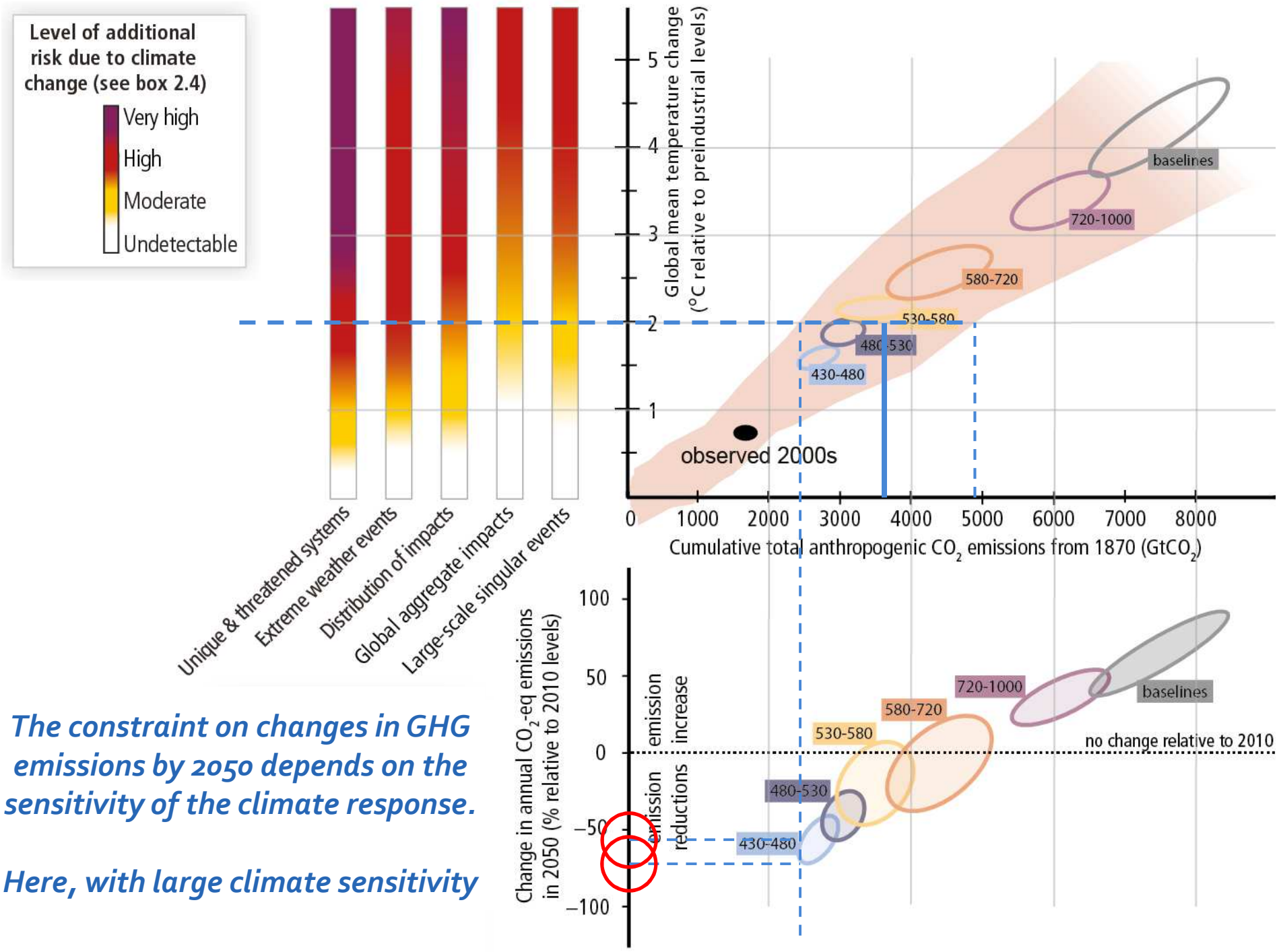

*Levels of risks can be connected to cumulative $CO_2$ emission levels, for the average climate response,*




**The link between changes in annual GHG emissions by 2050 and the cumulative $CO_2$ emissions of the WGIII scenario categories**

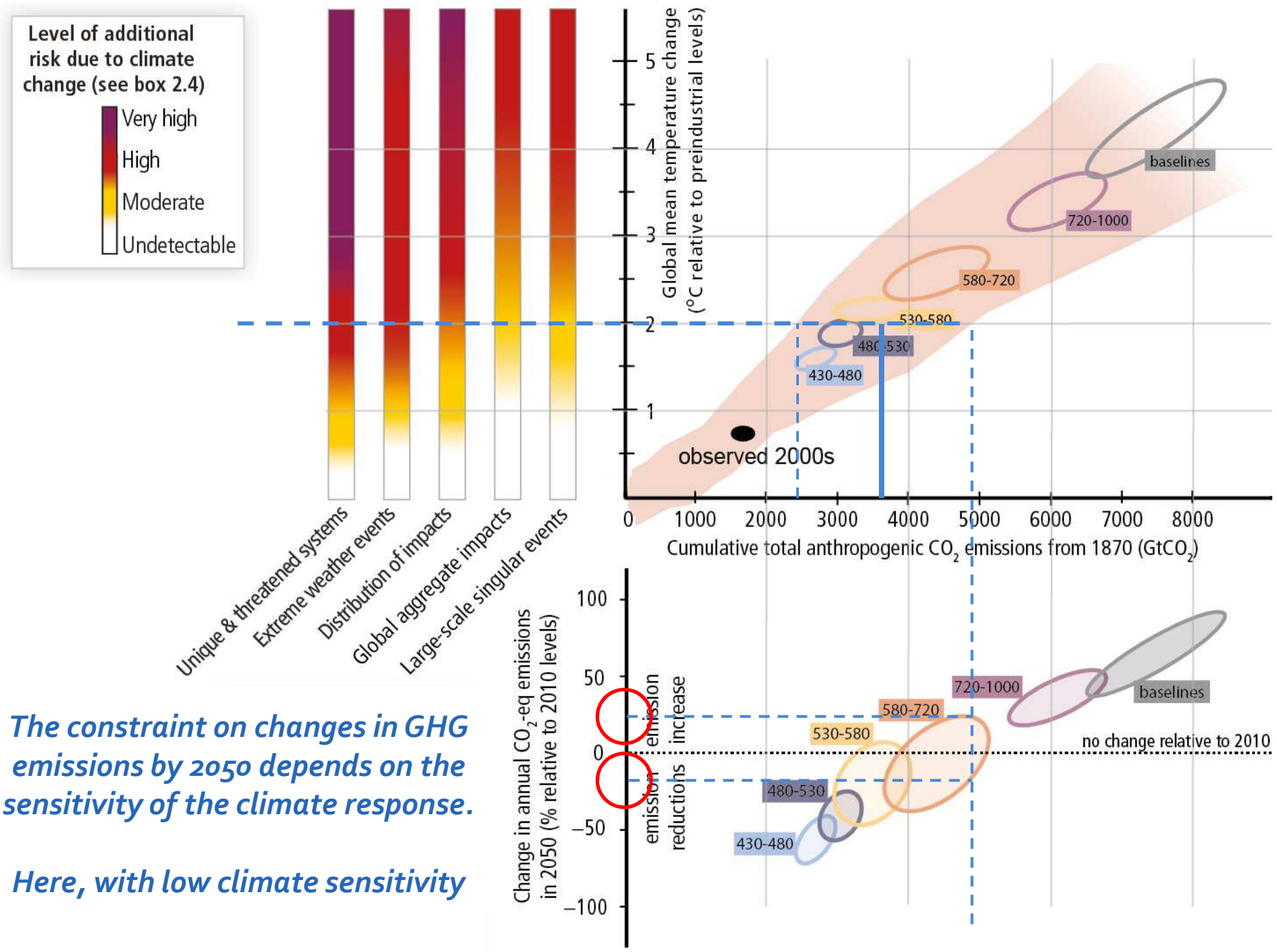



***Levels of risks can now be connected to GHG emission changes by 2050. Added uncertainty arises from action on non-$CO_2$ gases, timing of pre-2050 action, and ambition of post-2050 action.***




***The constraint on changes in GHG emissions by 2050 depends on the sensitivity of the climate response.***

***Here, with large climate sensitivity***




***The constraint on changes in GHG emissions by 2050 depends on the sensitivity of the climate response.***

***Here, with low climate sensitivity***

# Limiting Temperature Increase to 2˚C

Measures exist to achieve the substantial emissions reductions required to limit likely warming to 2°C (40-70% reduction in GHGs globally by 2050 and near zero GHGs in 2100)

A combination of adaptation and substantial, sustained reductions in greenhouse gas emissions can limit climate change risks

Implementing reductions in greenhouse gas emissions poses substantial technological, economic, social, and institutional challenges

But delaying mitigation will substantially increase the challenges associated with limiting warming to 2°C

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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

# Ambitious Mitigation Is Affordable

- ➜ Economic growth reduced by ~ 0.06%
  (BAU growth 1.6 - 3%)
- ➜ This translates into delayed and not forgone growth
- ➜ Estimated cost does not account for the benefits of reduced climate change
- ➜ Unmitigated climate change would create increasing risks to economic growth

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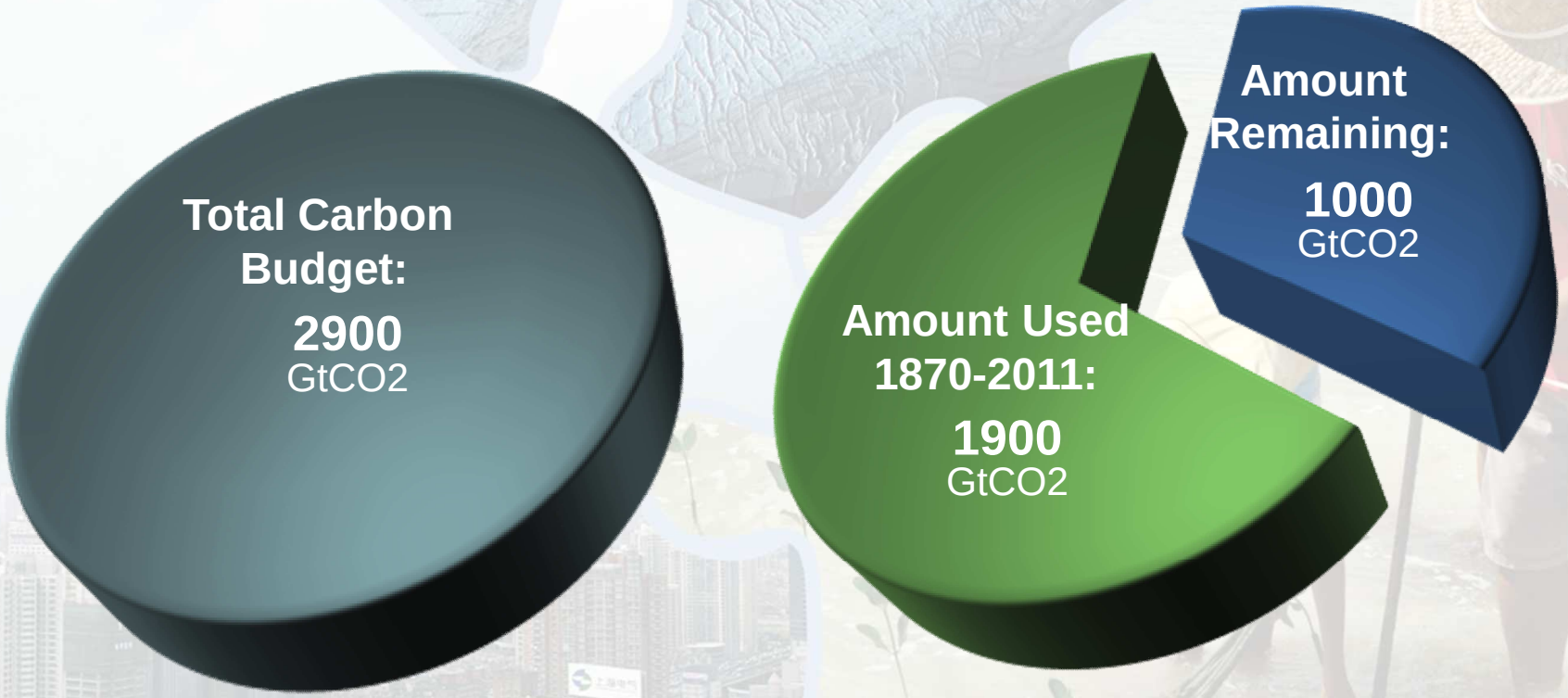
# The window for action is rapidly closing

**65% of our carbon budget compatible with a 2°C goal already used**

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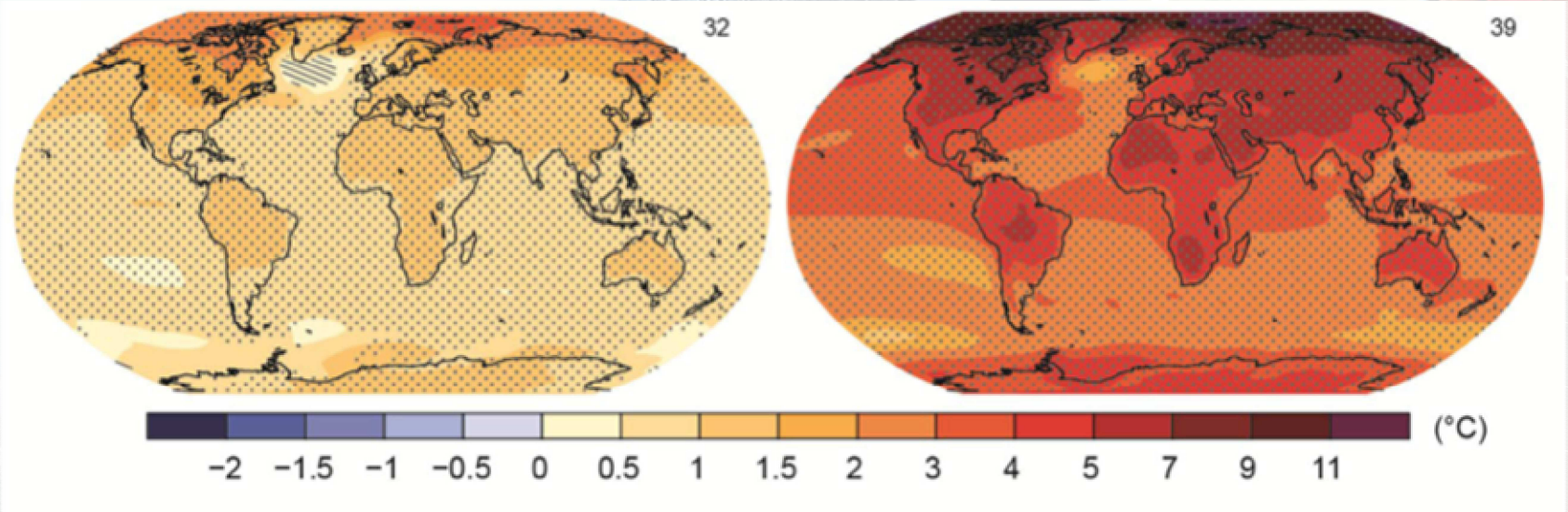
# The Choices We Make Will Create Different Outcomes

**With substantial mitigation**

**Without additional mitigation**




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

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