Transformational Climate Science

The future of climate change research following the IPCC Fifth Assessment Report

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Working Group III

The challenge of mitigation

#climate2014

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CLIMATE CHANGE 2014
Mitigation of Climate Change

Climate Change Adaptation and Mitigation: Key messages from IPCC's AR5
16 May 2014, University of Exeter, Great Britain

Working Group III contribution to the
IPCC Fifth Assessment Report

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WMO   UNEP

Exploring the solution space

IPCC reports are the result of extensive work of many scientists from around the world.

1 Summary for Policymakers
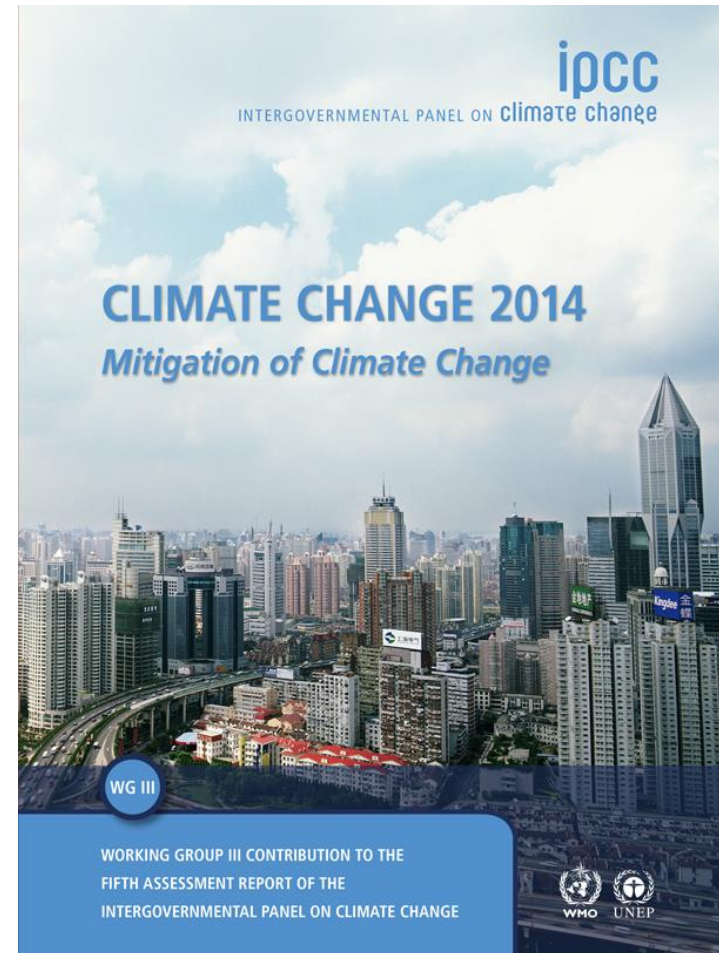**1** Technical Summary

16 Chapters
235 Authors
900 Reviewers
More than **2000** pages
Close to **10,000** references
More than **38,000** comments

GHG emissions accelerate despite reduction efforts. Most emission growth is CO_2 from fossil fuel combustion.

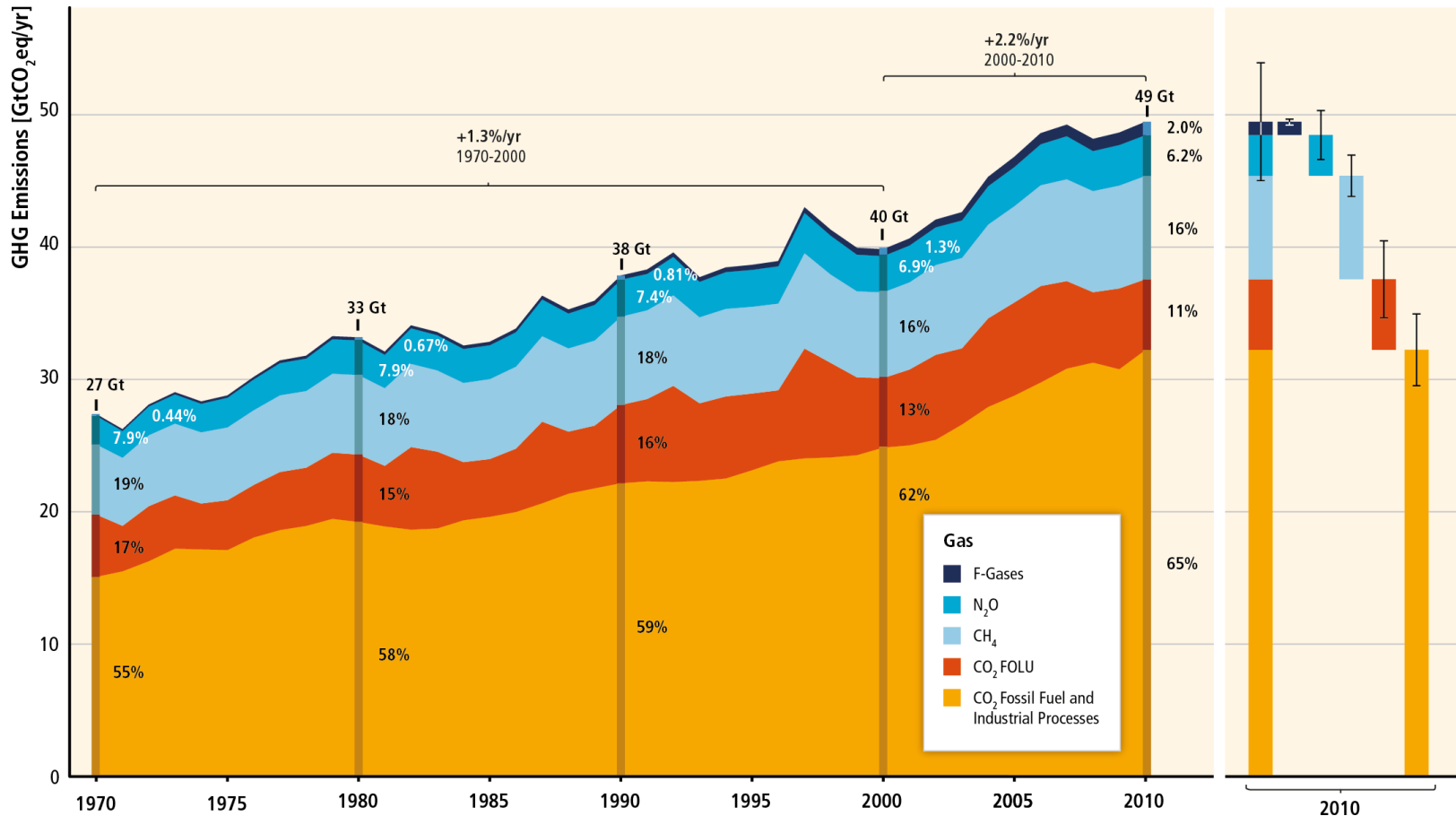Total Annual Anthropogenic GHG Emissions by Groups of Gases 1970-2010

Figure SPM.1

Cumulative CO₂ emissions have more than doubled since 1970.
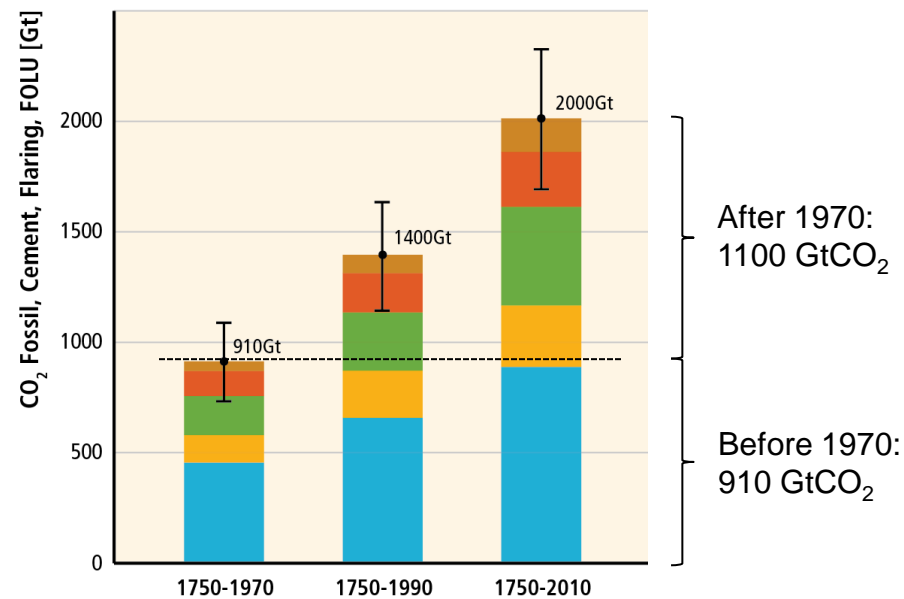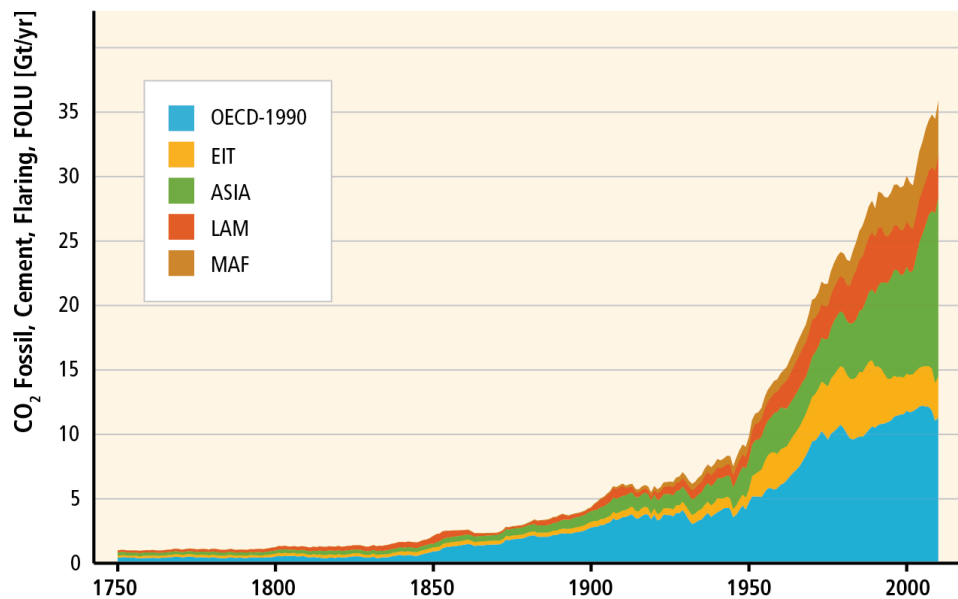
Figure TS.2

Regional patterns of GHG emissions are shifting along with changes in the world economy.
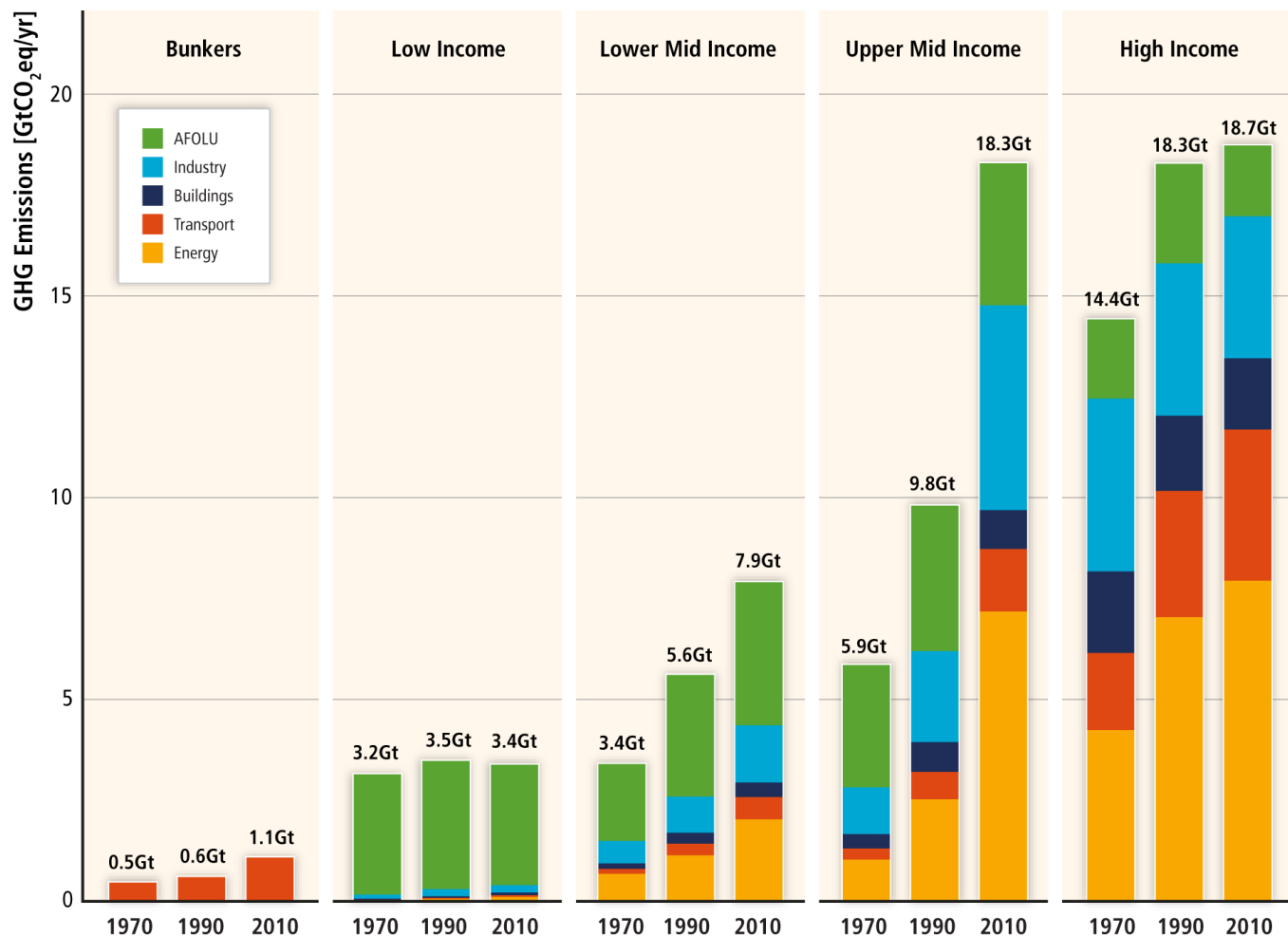
Figure TS.3

National per-capita GHG emissions are highly variable within and between income groups.
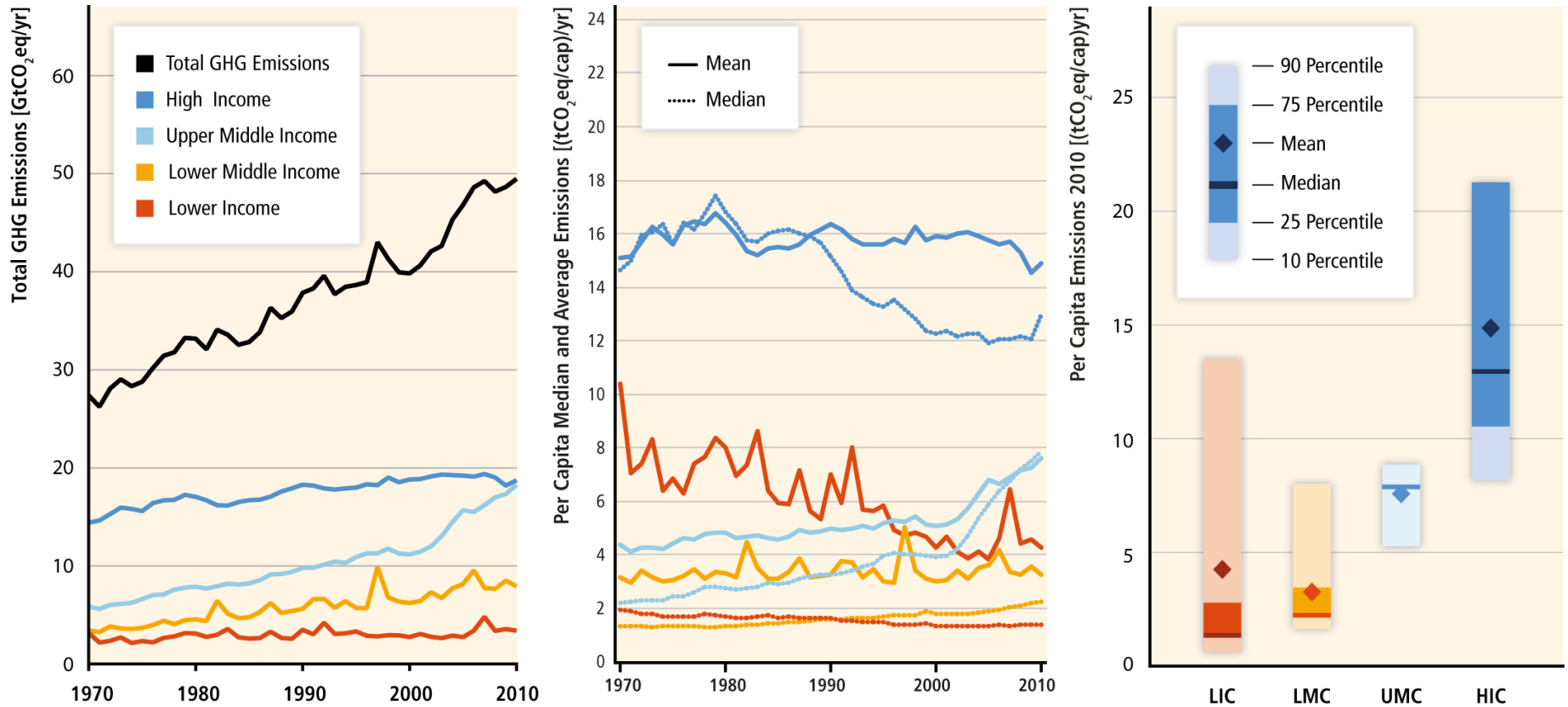
Figure TS.4
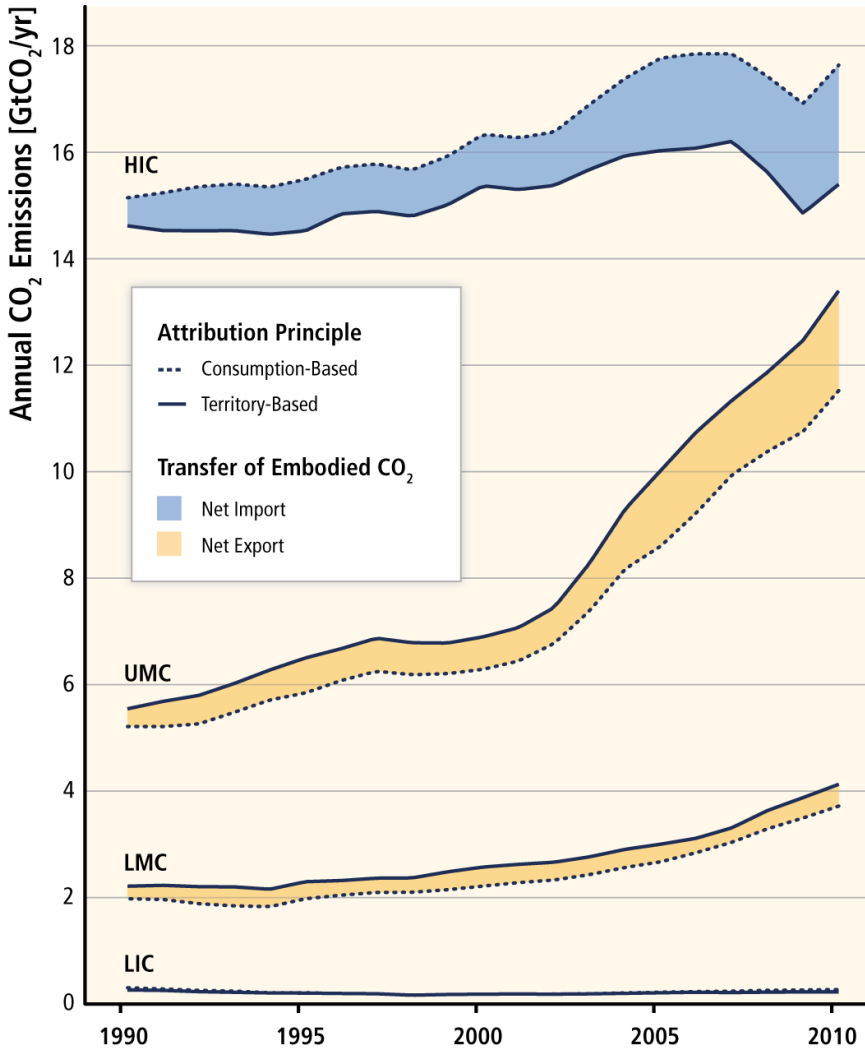
A growing share of CO$_2$ emissions from fossil fuel combustion and industrial processes in low and middle income countries has been released in the production of goods and services exported, notably from upper-middle income countries to high income countries.

Figure TS.5

GHG emissions rise with growth in GDP and population; long-standing trend of decarbonisation of energy reversed.

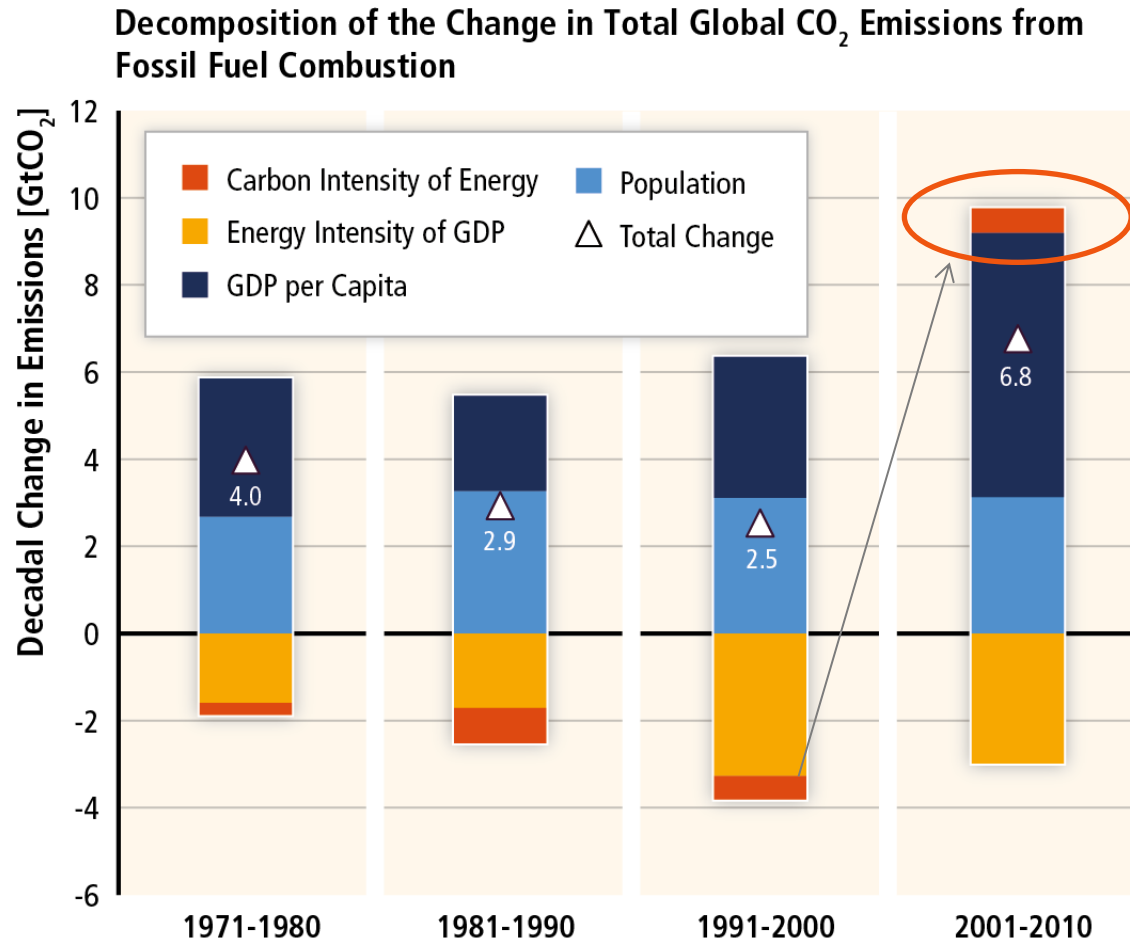Decomposition of the Change in Total Global CO_2 Emissions from Fossil Fuel Combustion

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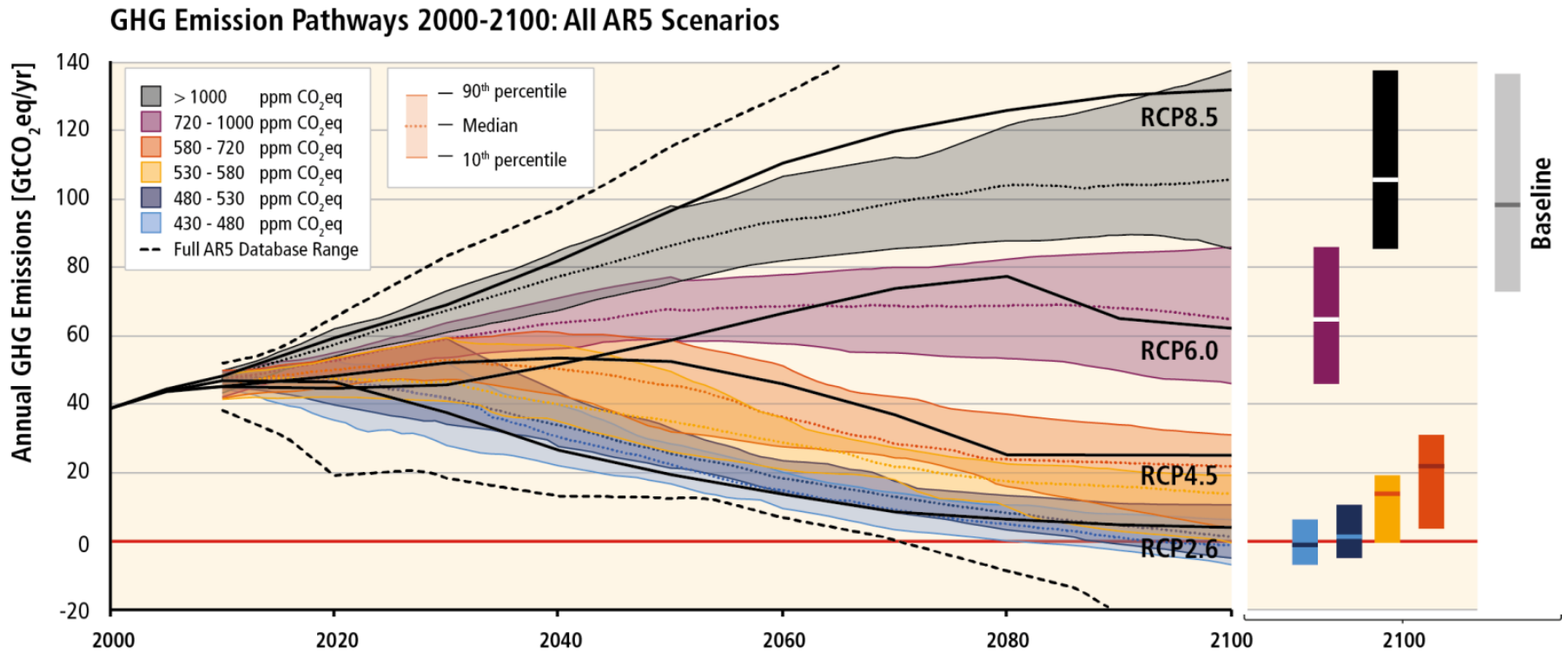# Without more mitigation, global mean surface temperature might increase by 3.7° to 4.8°C over the 21st century.

Figure SPM.4

Mitigation requires major technological and institutional changes including the upscaling of low- and zero carbon energy.

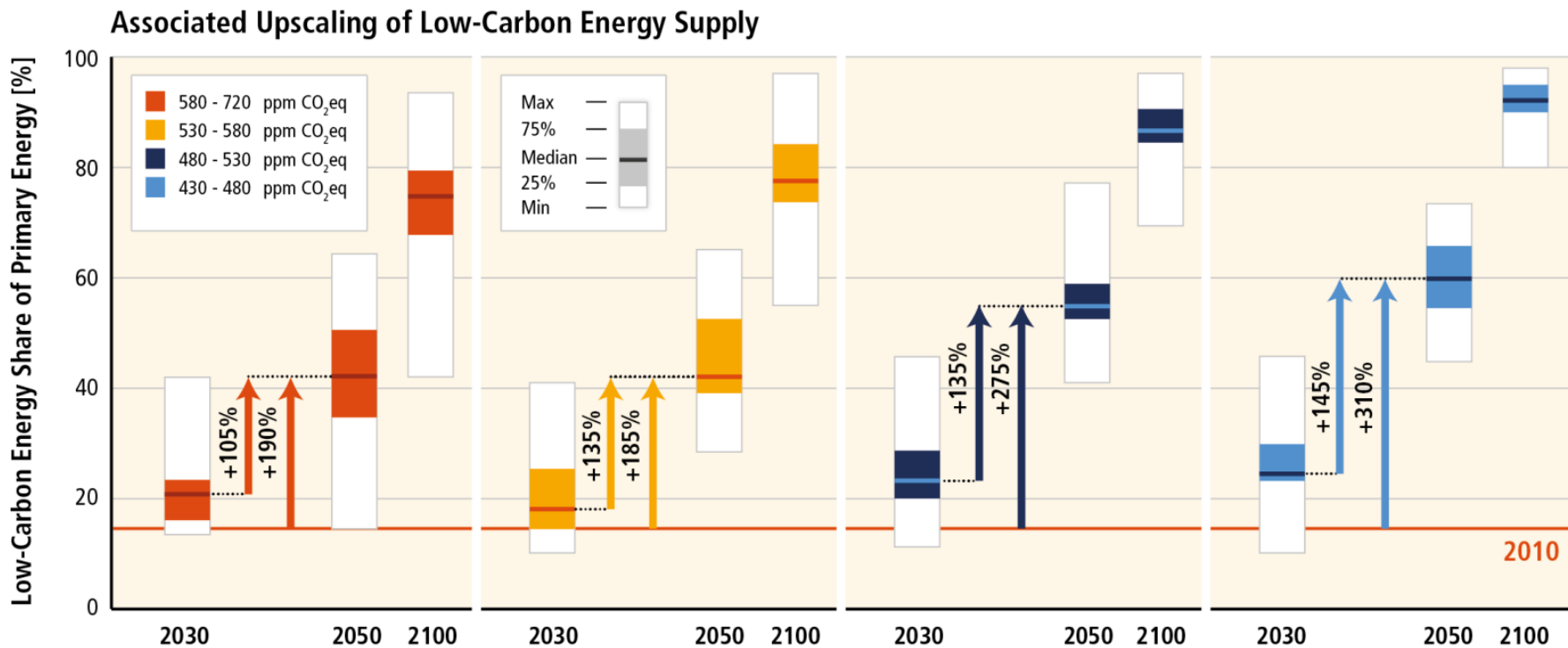Associated Upscaling of Low-Carbon Energy Supply

In cost-effective 2°C mitigation strategies, emissions have peaked and emission levels in 2030 tend to be lower than today

GHG Emissions Pathways to 2030
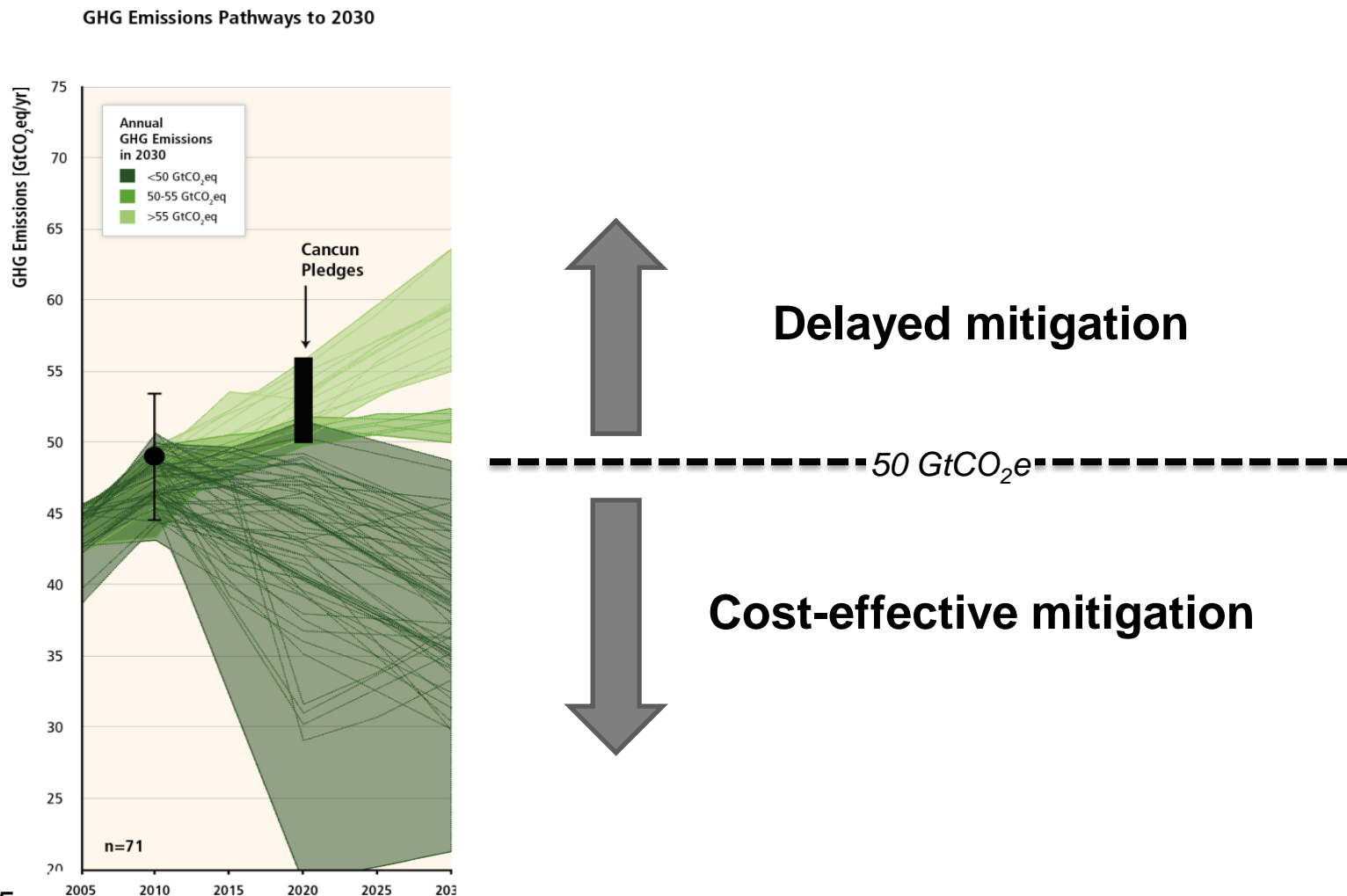
Annual GHG Emissions in 2030
- <50 GtCO₂eq
- 50-55 GtCO₂eq
- >55 GtCO₂eq

Cancun Pledges

n=71

Delayed mitigation

50 GtCO₂e

Cost-effective mitigation

Figure SPM.5

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Delayed mitigation significantly increases the challenge to reach low concentration targets

Figure SPM.5

Delayed mitigation significantly increases the challenge to reach low concentration targets

GHG Emissions Pathways to 2030

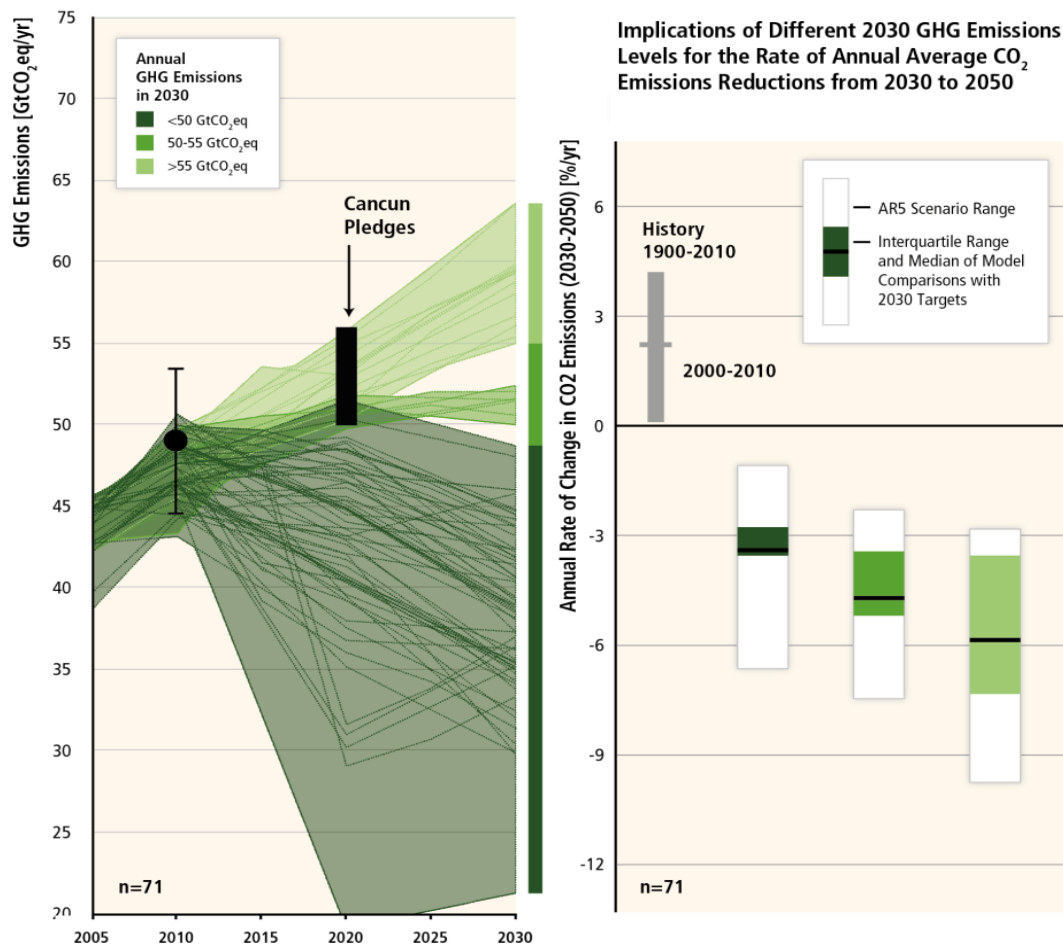**Current Cancun Pledges imply increased mitigation challenges for reaching 2°C**
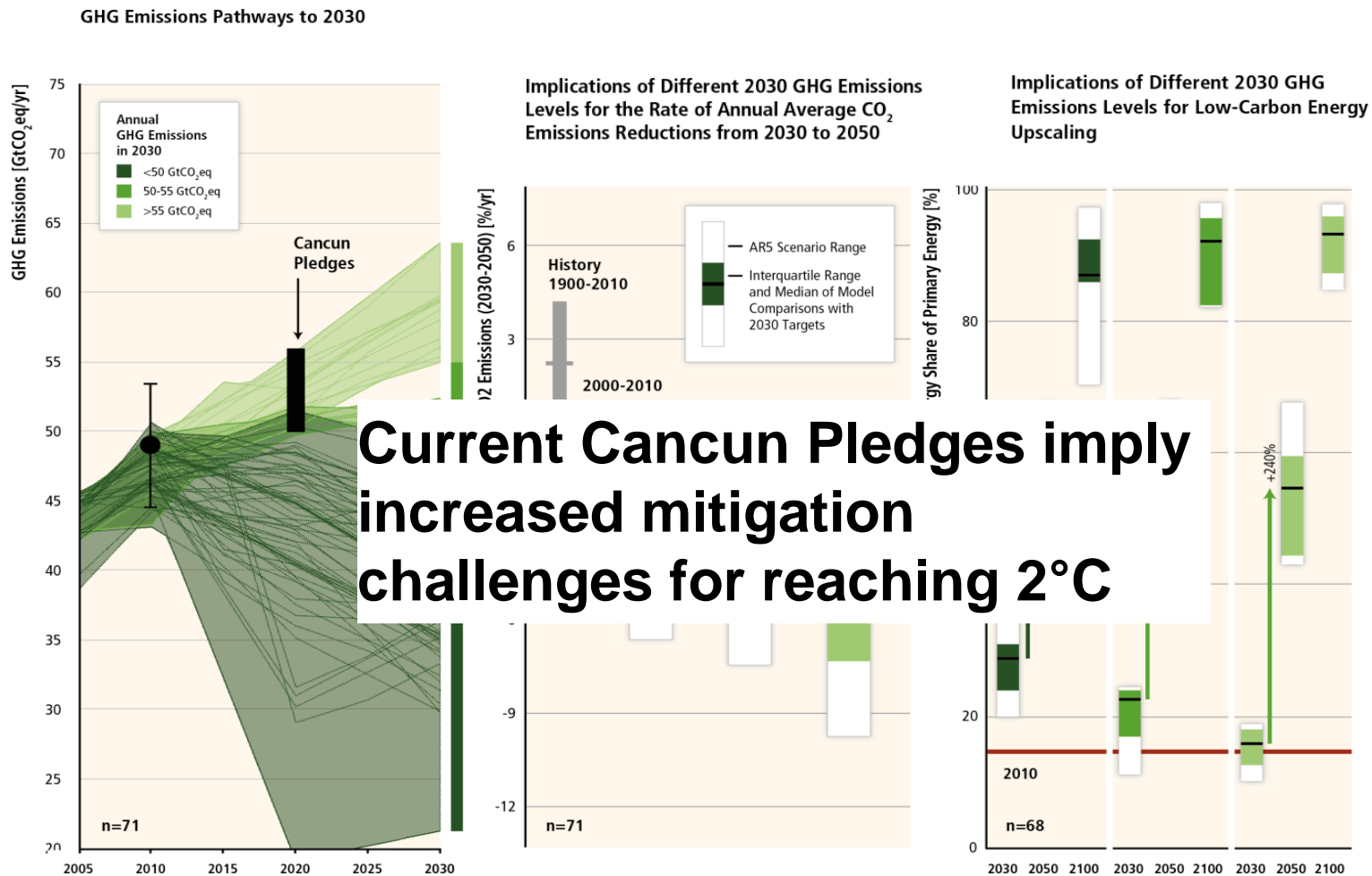
Figure SPM.5

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Estimates for mitigation costs vary widely.

- Reaching 450ppm CO_2eq entails consumption losses of 1.7% (1%-4%) by 2030, 3.4% (2% to 6%) by 2050 and 4.8% (3%-11%) by 2100 relative to baseline (which grows between 300% to 900% over the course of the century).

- This is equivalent to a reduction in consumption growth over the 21st century by about 0.06 (0.04-0.14) percentage points a year (relative to annualized consumption growth that is between 1.6% and 3% per year).

- Cost estimates exlude benefits of mitigation (reduced impacts from climate change). They also exclude other benefits (e.g. improvements for local air quality).

- Cost estimates are based on a series of assumptions.

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Limited availability of technologies increases costs.
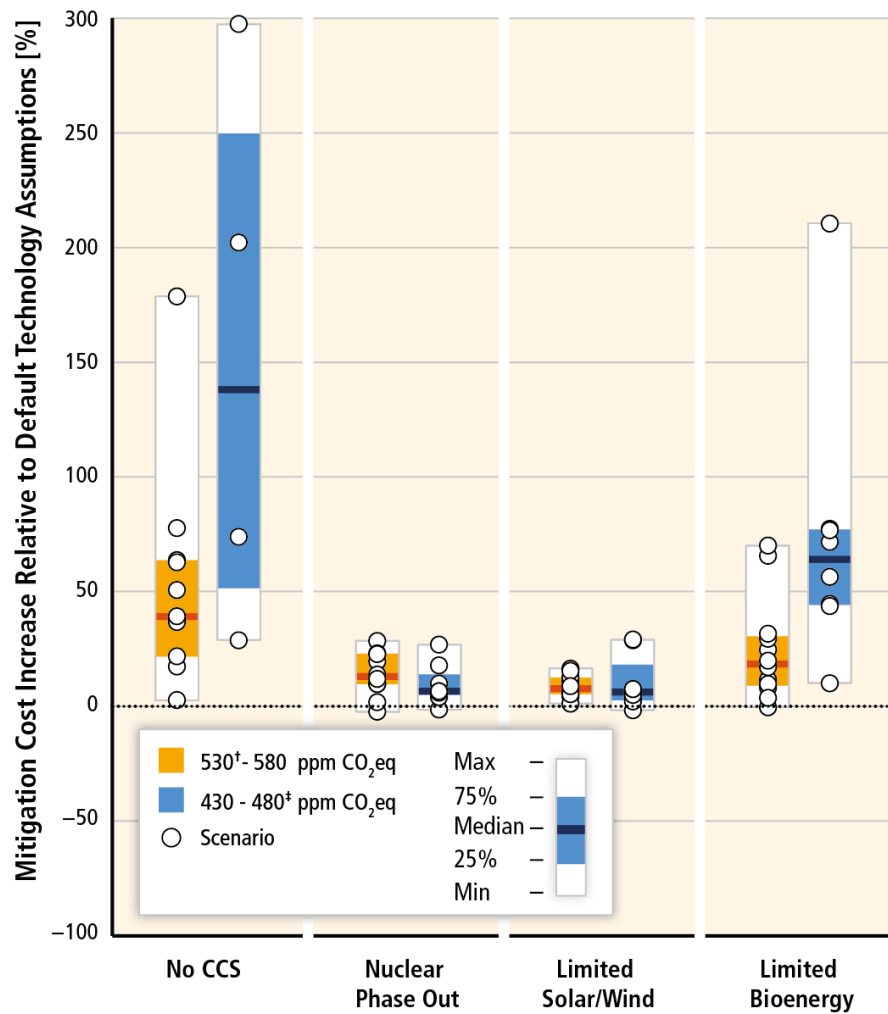
Figure TS.13
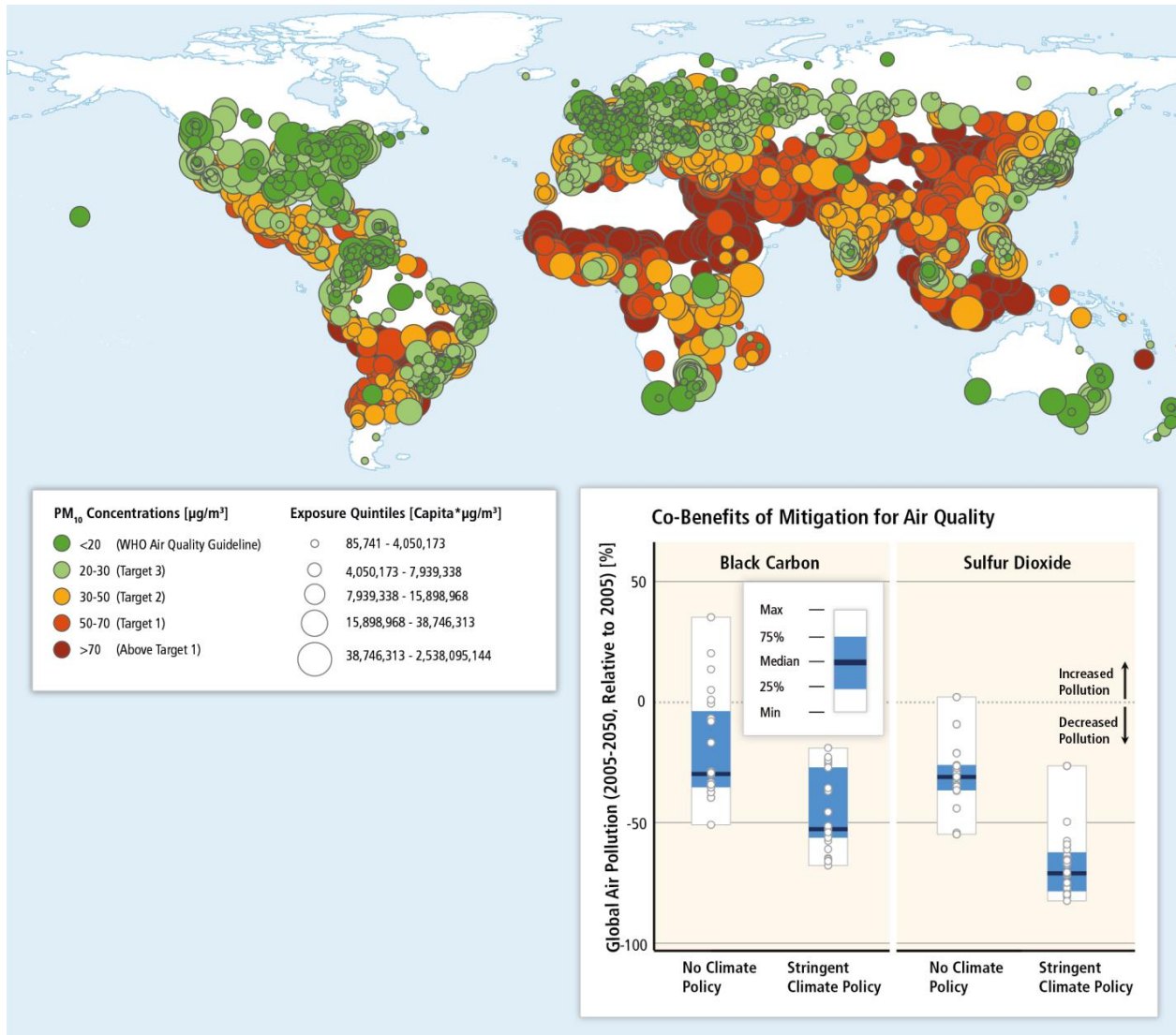
Mitigation can result in large co-benefits for human health and other societal goals.

Figure TS.14
Figure 12.23

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Mitigation requires changes throughout the economy. Efforts in one sector determine mitigation efforts in others.

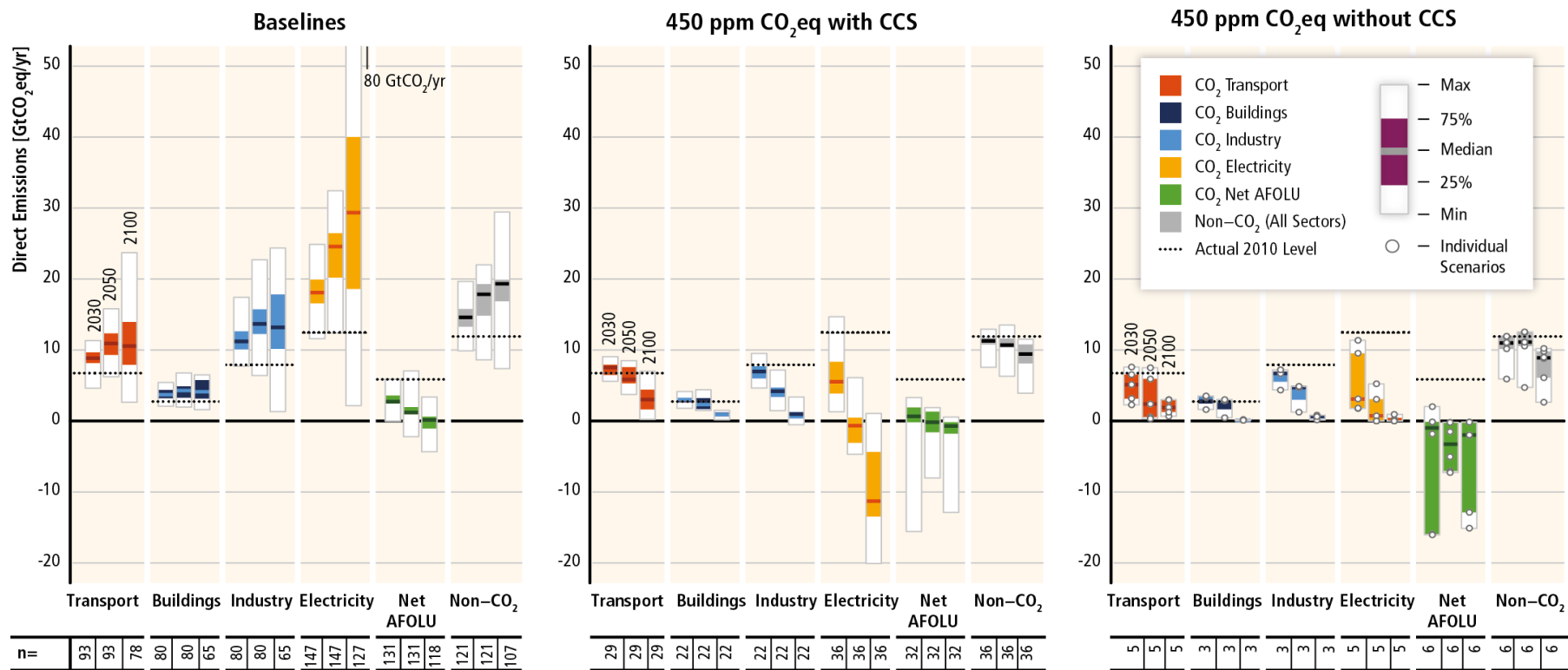Direct Sectoral CO₂ and Non-CO₂ GHG Emissions in Baseline and Mitigation Scenarios with and without CCS

Figure SPM.7

Substantial reductions in emissions would require large changes in investment patterns.
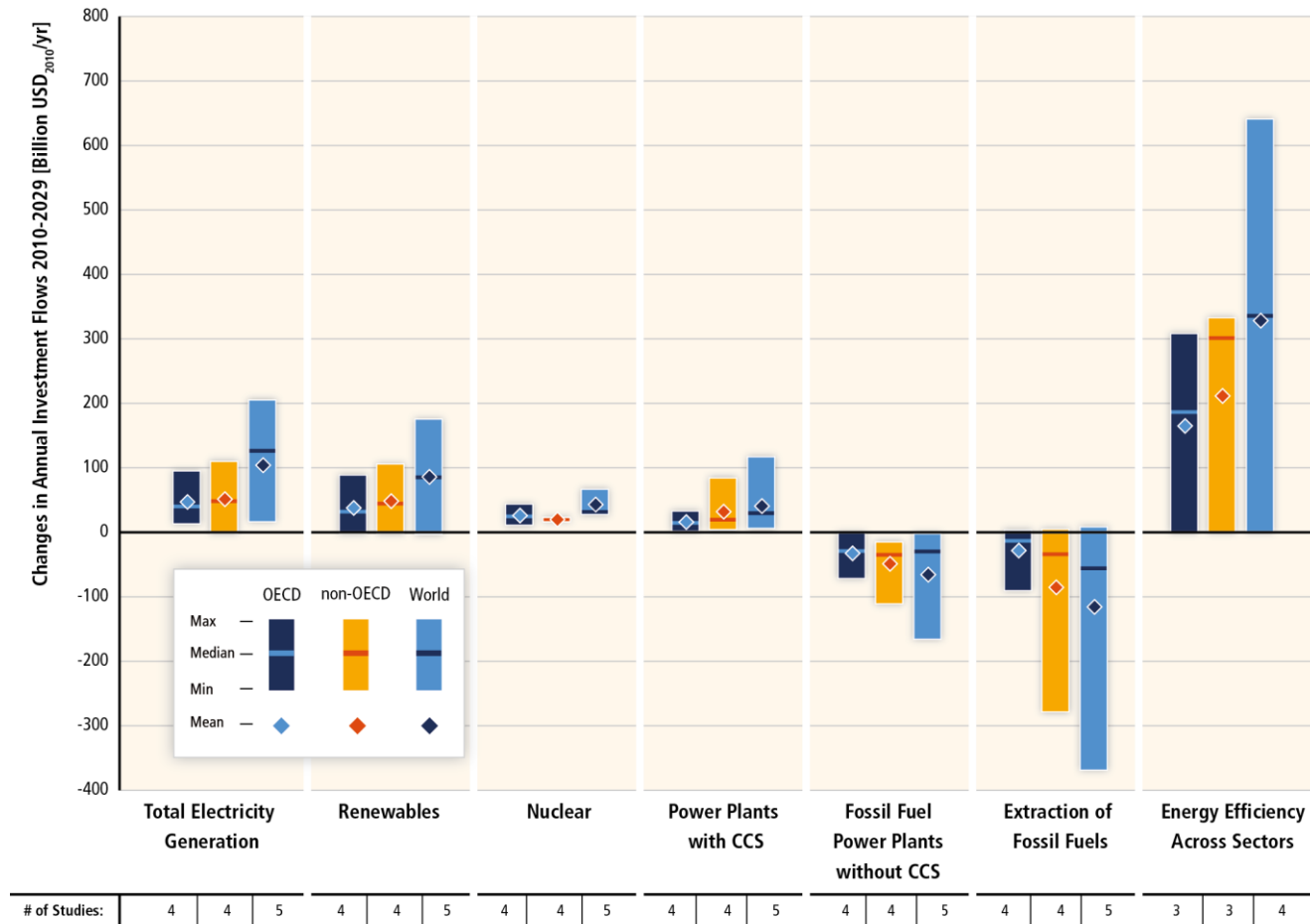
Figure SPM.9

Since AR4, there has been an increased focus on policies designed to integrate multiple objectives, increase co-benefits and reduce adverse side-effects.

- Sector-specific policies have been more widely used than economy-wide policies.

- Regulatory approaches and information measures are widely used, and are often environmentally effective.

- Since AR4, cap and trade systems for GHGs have been established in a number of countries and regions.

- In some countries, tax-based policies specifically aimed at reducing GHG emissions–alongside technology and other policies–have helped to weaken the link between GHG emissions and GDP.

- The reduction of subsidies for GHG-related activities in various sectors can achieve emission reductions, depending on the social and economic context.

Climate change is a global commons problem that implies the need for international cooperation.
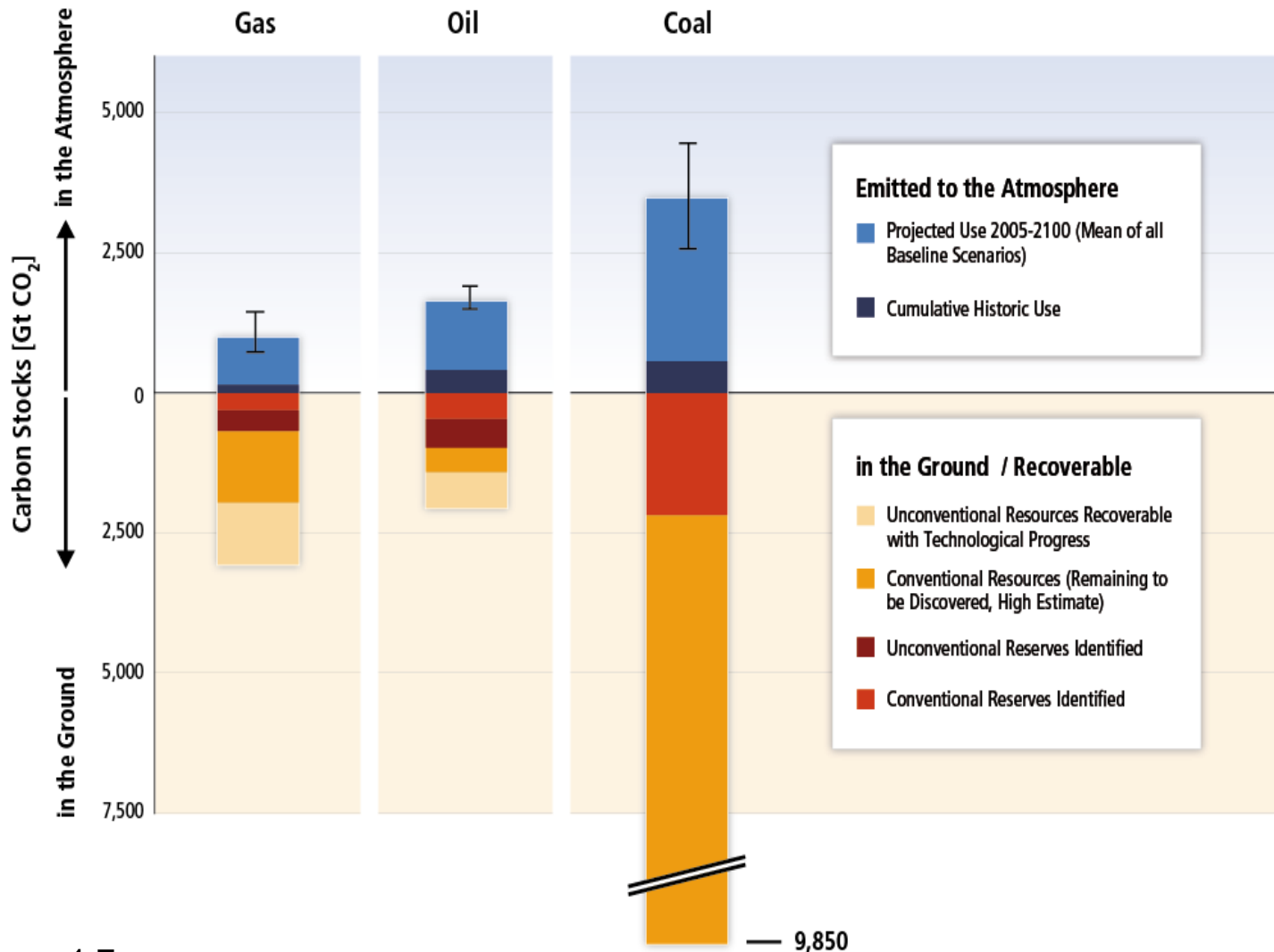
SRREN, Figure 1.7

Effective mitigation will not be achieved if individual agents advance their own interests independently.

- Existing and proposed international climate change cooperation arrangements vary in their focus and degree of centralization and coordination.

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

- Climate policy may be informed by a consideration of a diverse array of risks and uncertainties, some of which are difficult to measure, notably events that are of low probability but which would have a significant impact if they occur.

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