

CLIMATE CHANGE 2014

Mitigation of Climate Change

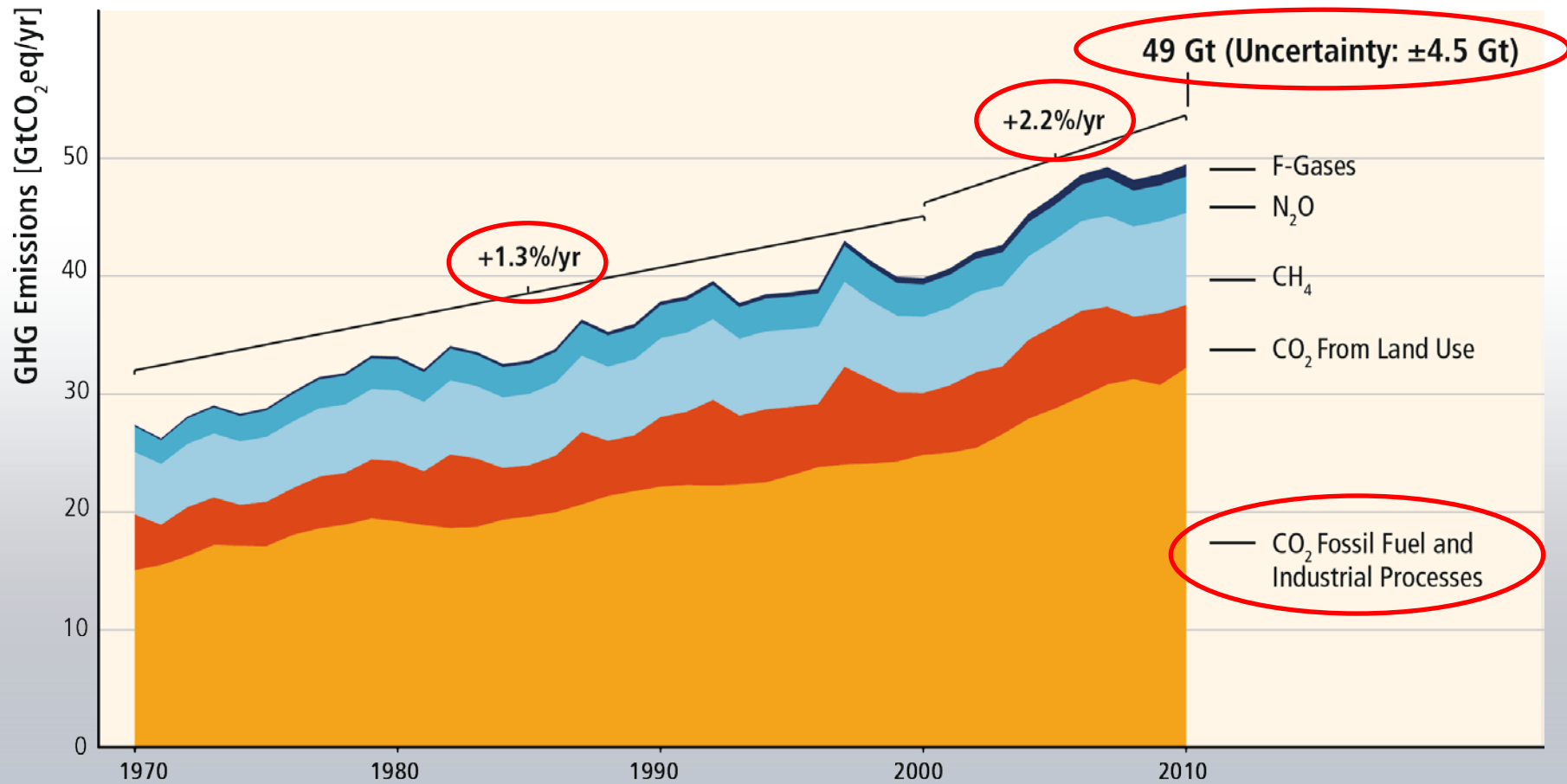
Prof. Dr. Ottmar Edenhofer
Co-Chair, IPCC Working Group III
TEC 9, Bonn, 18 August 2014

Exploring the solution space

A high-angle, blue-tinted photograph of a mining or construction site. In the foreground, a metal conveyor belt structure is visible, partially filled with dark material. In the middle ground, a yellow bulldozer is positioned on a large, uneven pile of earth or coal, facing away from the camera. The background shows more of the site with various tracks and structures, all under a heavy, blue sky.

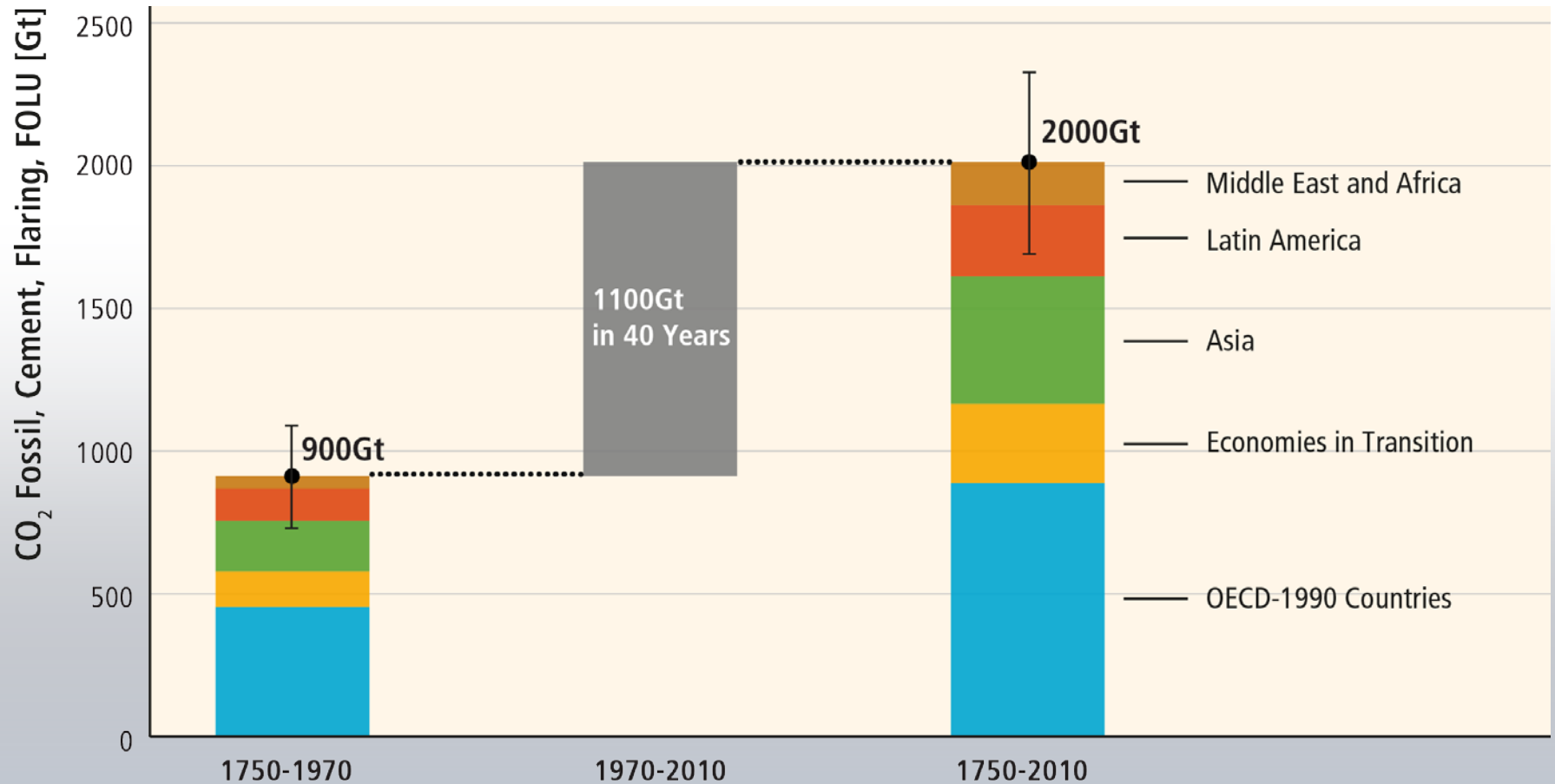
GHG emissions growth has accelerated despite reduction efforts.

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



Based on Figure 1.3

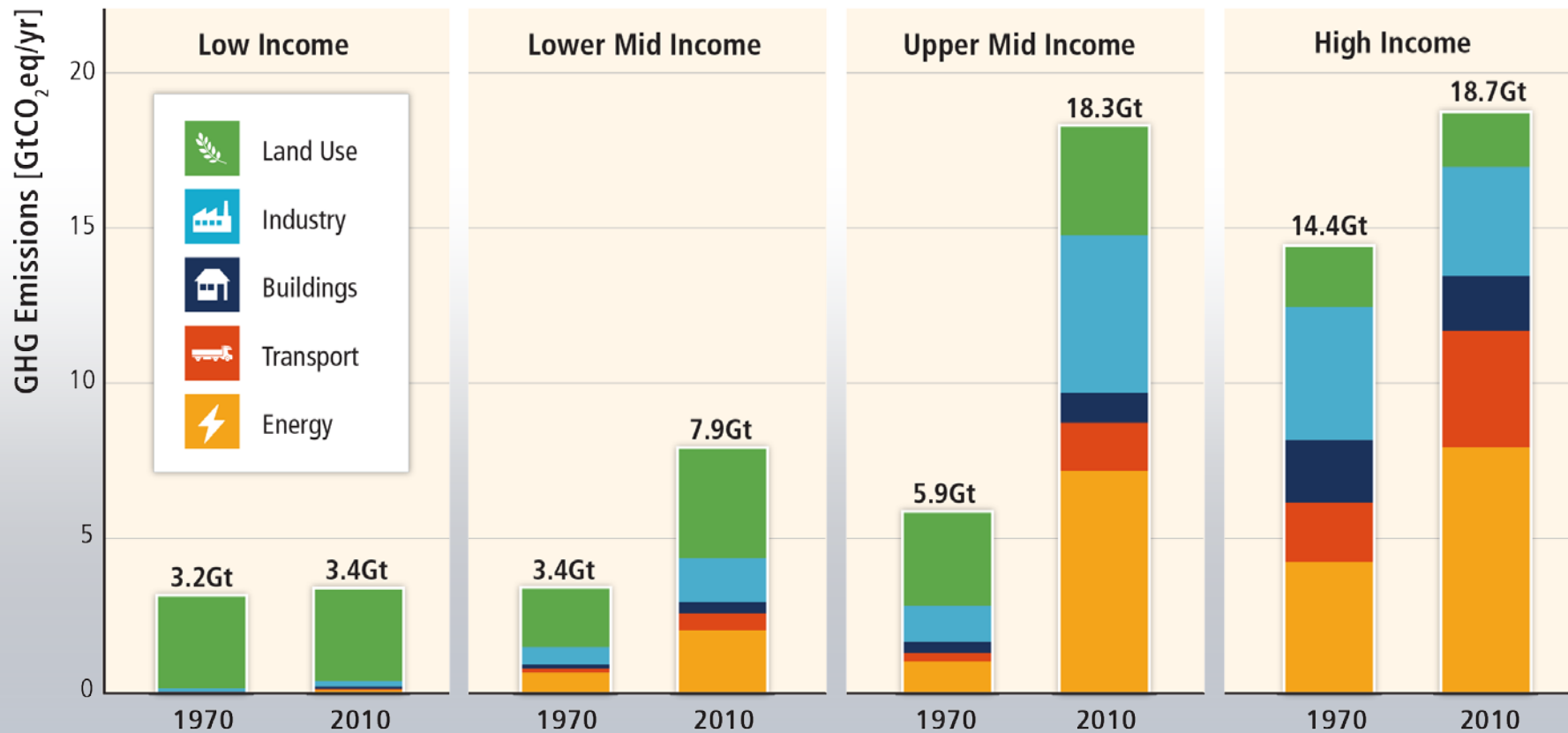
About half of cumulative anthropogenic CO₂ emissions between 1750 and 2010 have occurred in the last 40 years.



Based on Figure 5.3

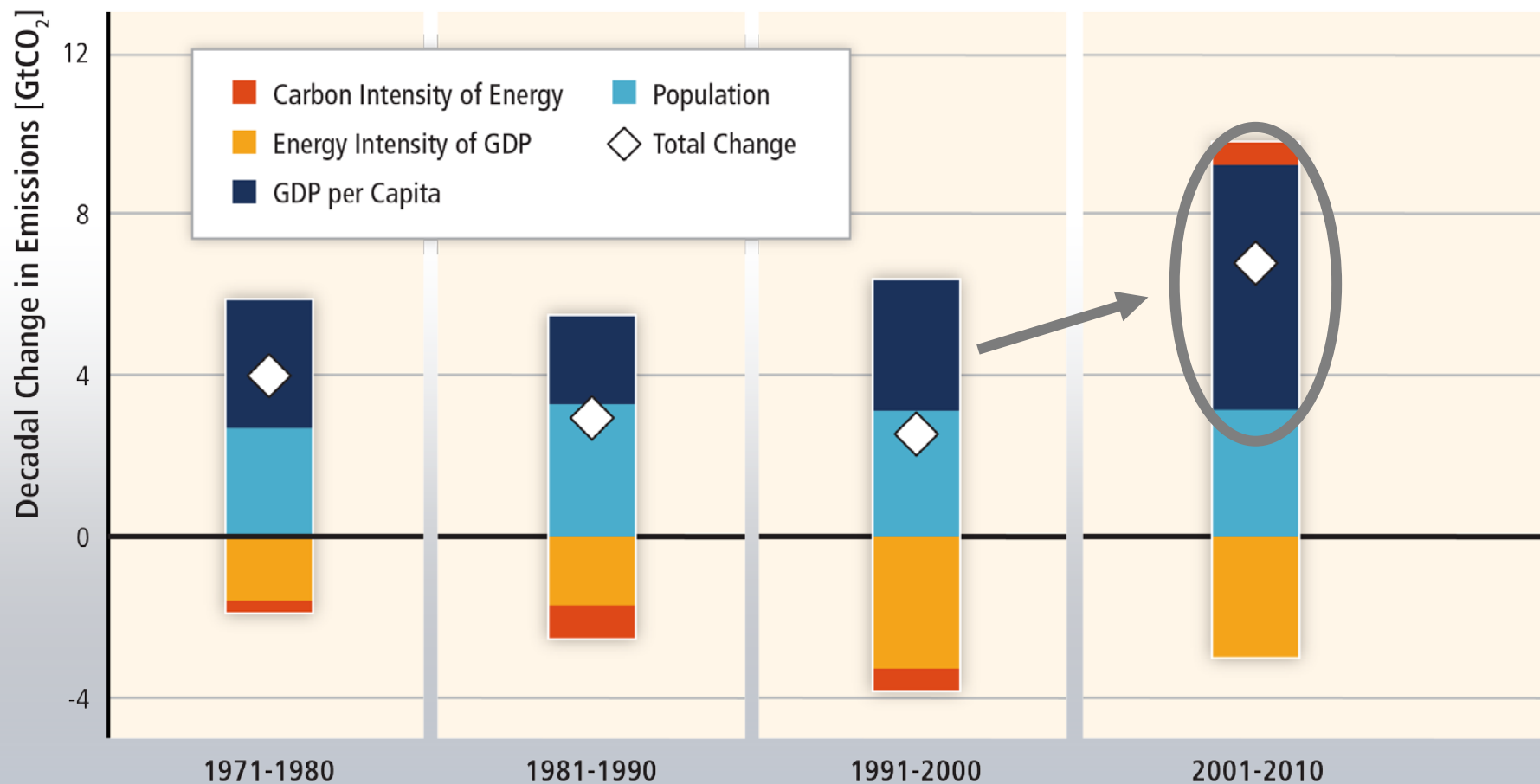
Regional patterns of GHG emissions are shifting along with changes in the world economy.

GHG Emissions by Country Group and Economic Sector



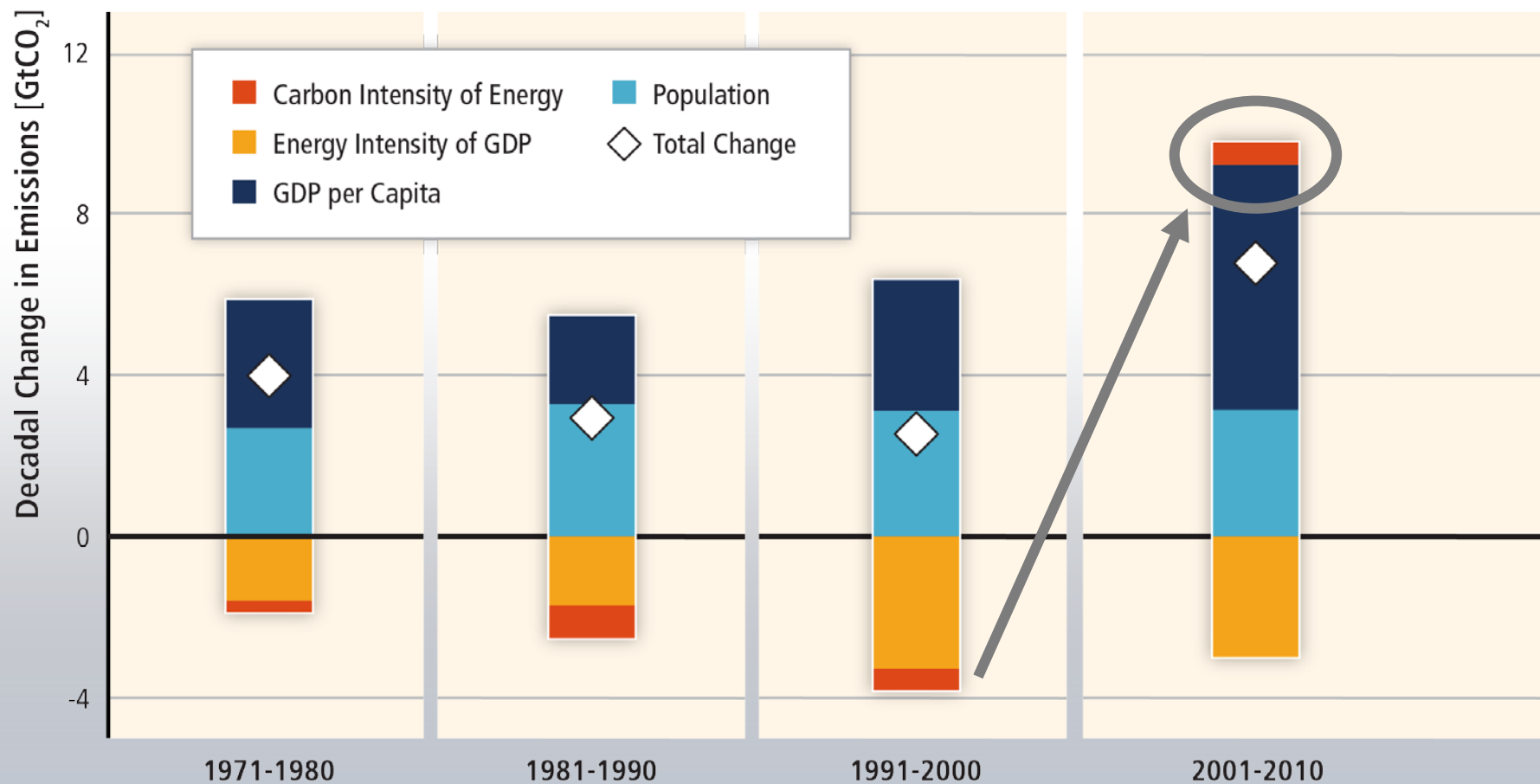
Based on Figure 1.6

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



Based on Figure 1.7

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

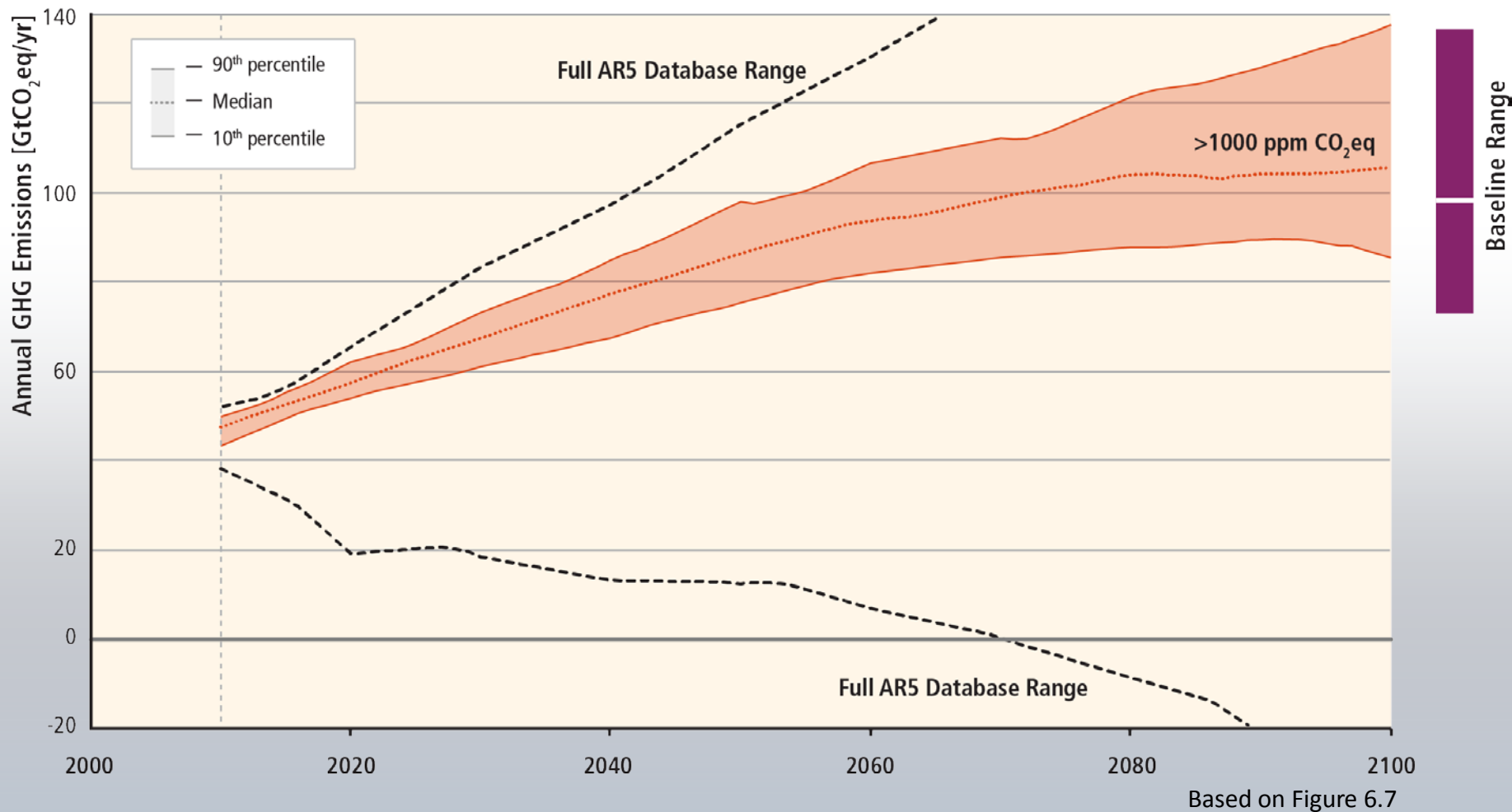


Based on Figure 1.7

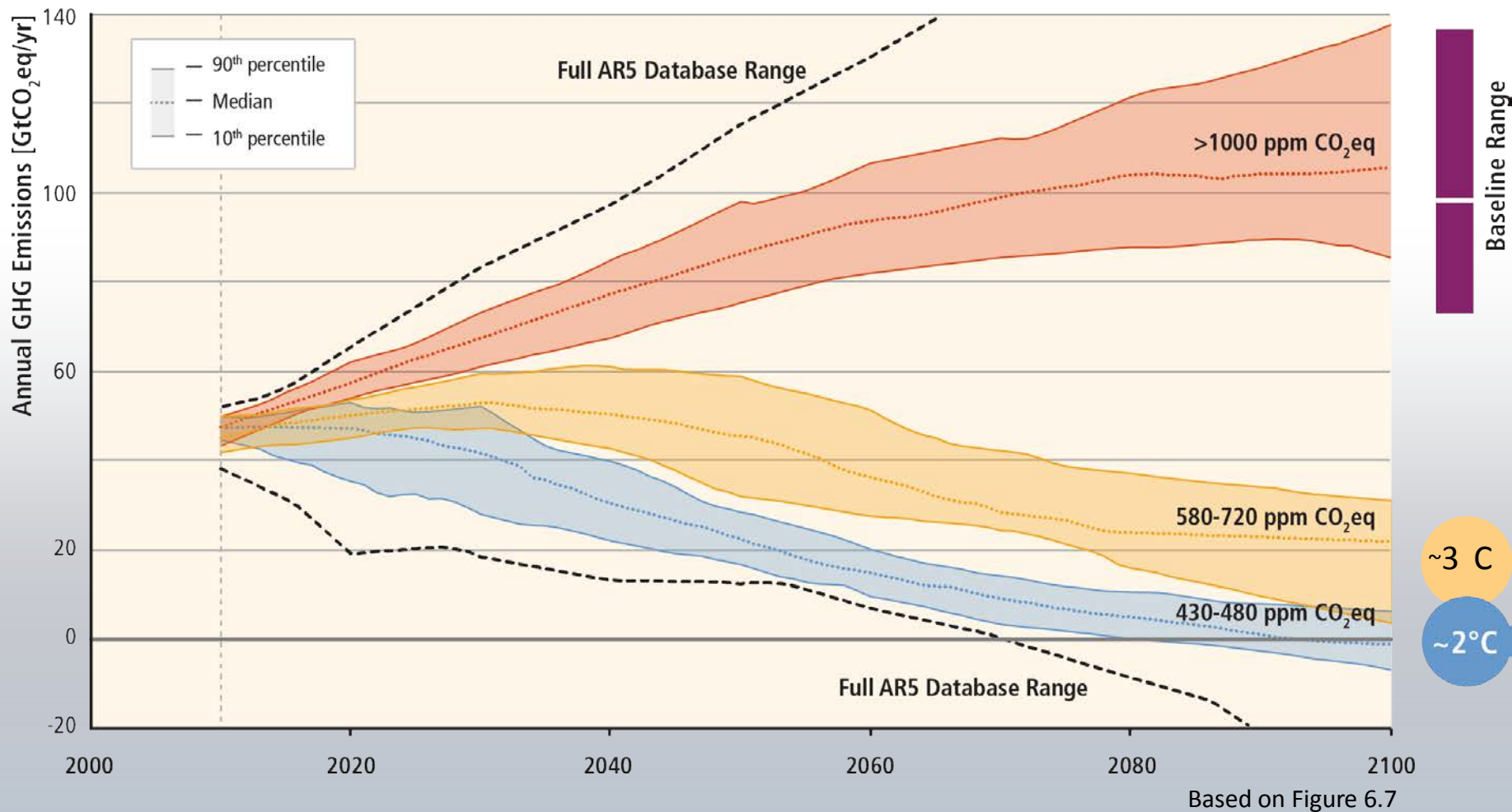
An aerial photograph of a dense urban landscape, likely a major city in Asia, featuring a complex multi-level highway interchange in the foreground and a dense cluster of high-rise buildings in the background under a blue sky with light clouds. The text is overlaid in the center of the image.

Limiting warming to 2 C involves substantial technological, economic and institutional challenges.

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



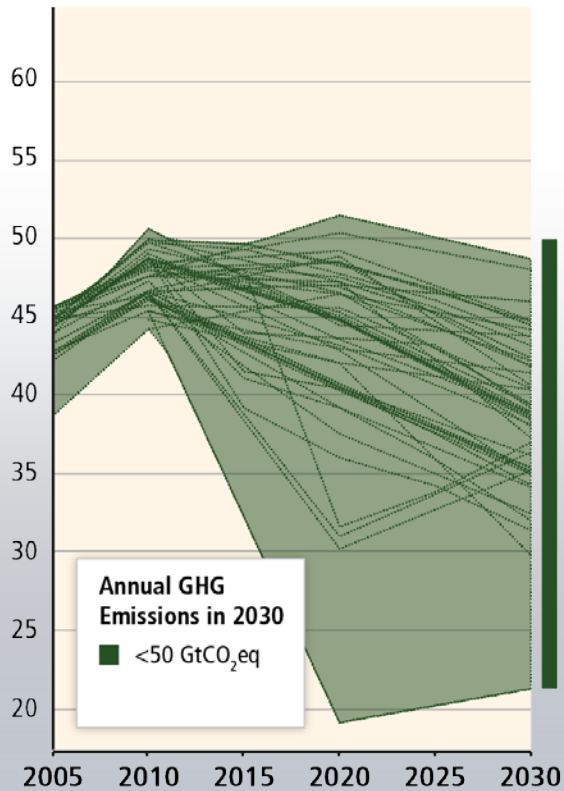
Stabilization of atmospheric concentrations requires moving away from the baseline – regardless of the mitigation goal.



Delaying mitigation increases the difficulty and narrows the options for limiting warming to 2°C.

Before 2030

GHG Emissions Pathways [GtCO₂eq/yr]

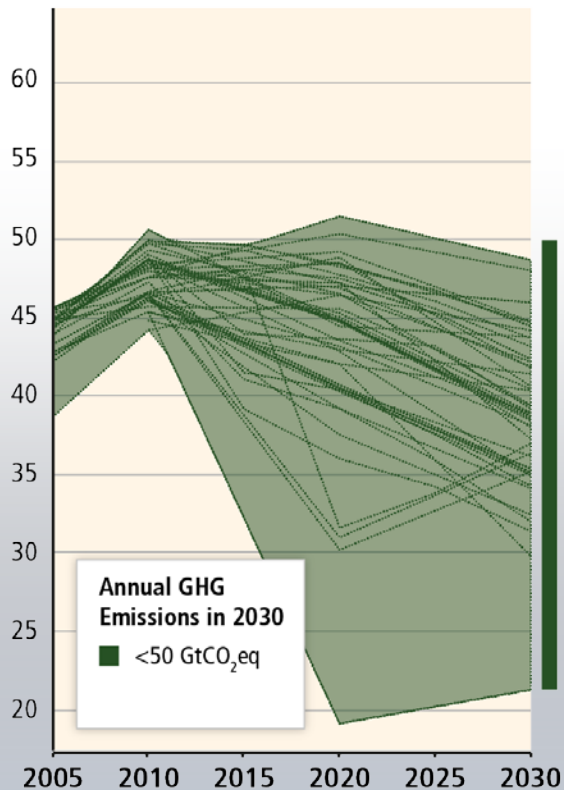


„immediate action“

Delaying mitigation increases the difficulty and narrows the options for limiting warming to 2°C.

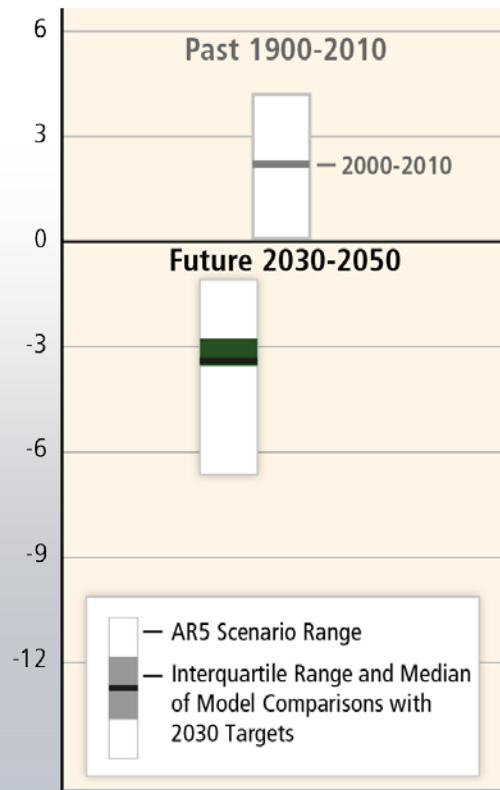
Before 2030

GHG Emissions Pathways [GtCO₂eq/yr]



After 2030

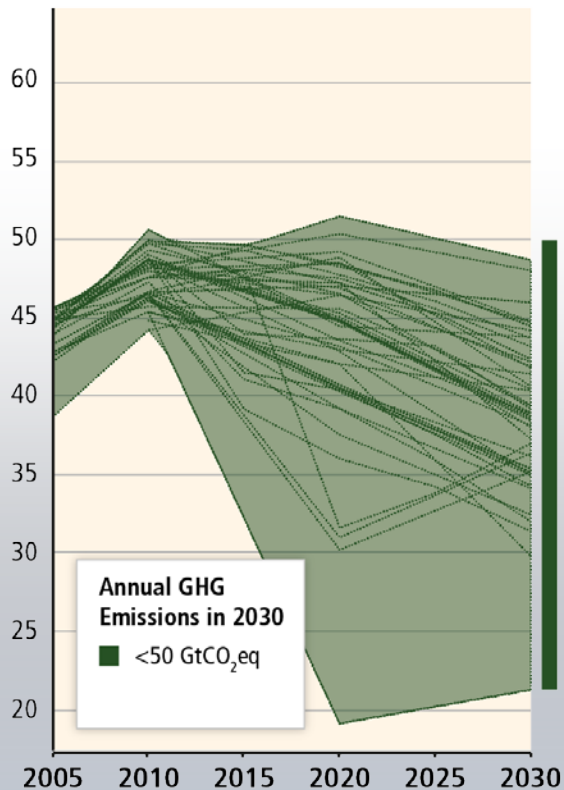
Rate of CO₂ Emission Change [%/yr]



Delaying mitigation increases the difficulty and narrows the options for limiting warming to 2°C.

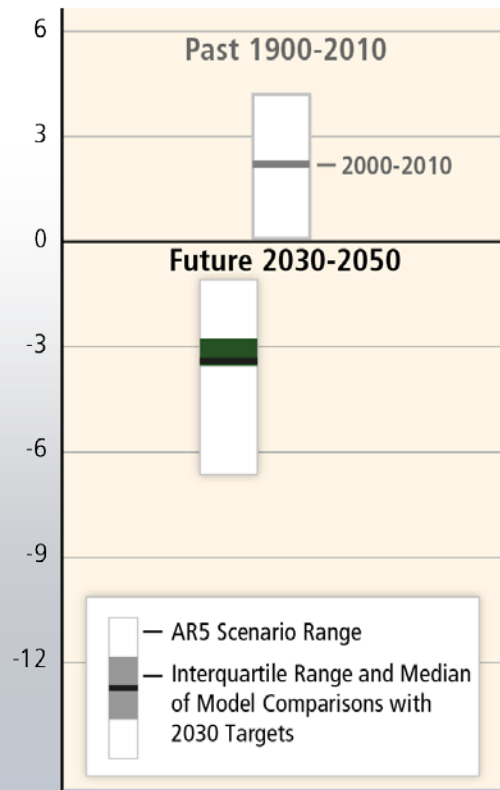
Before 2030

GHG Emissions Pathways [GtCO₂eq/yr]

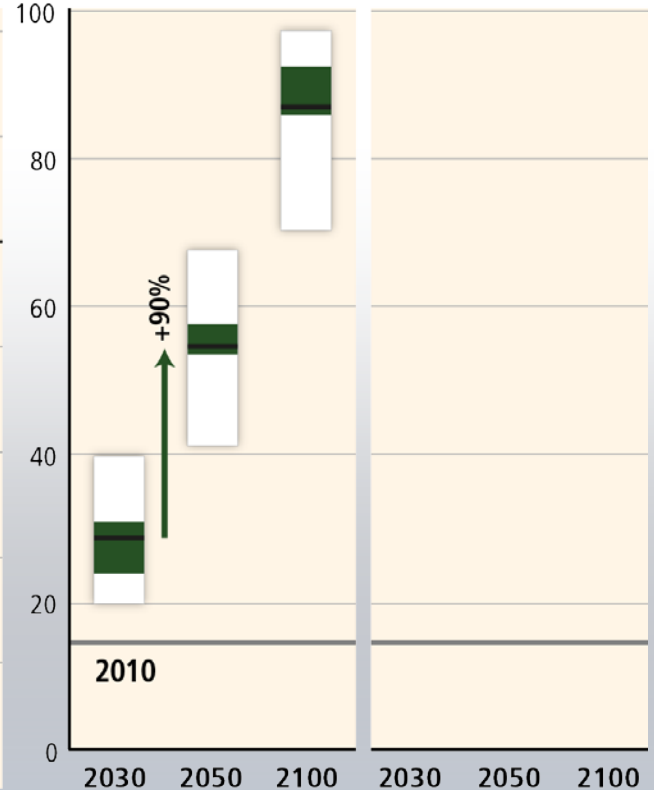


After 2030

Rate of CO₂ Emission Change [%/yr]



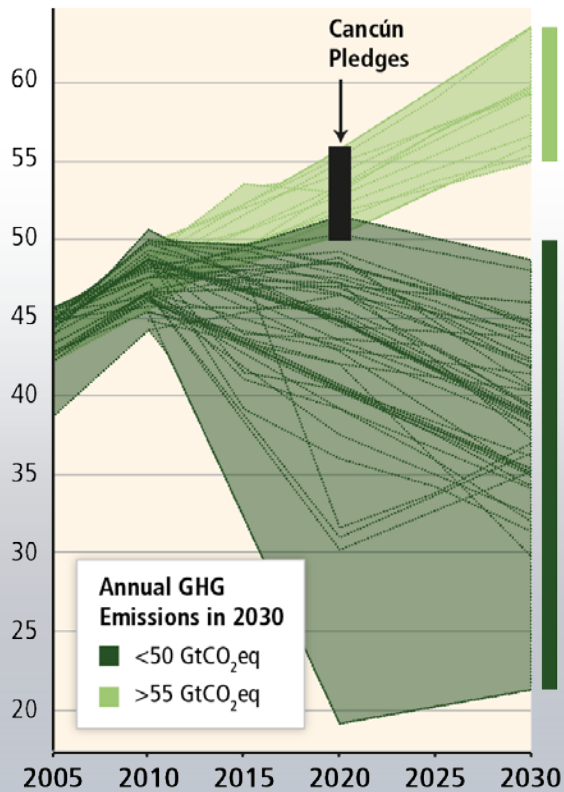
Share of Low Carbon Energy [%]



Delaying mitigation is estimated to increase the difficulty and narrow the options for limiting warming to 2°C.

Before 2030

GHG Emissions Pathways [GtCO₂eq/yr]



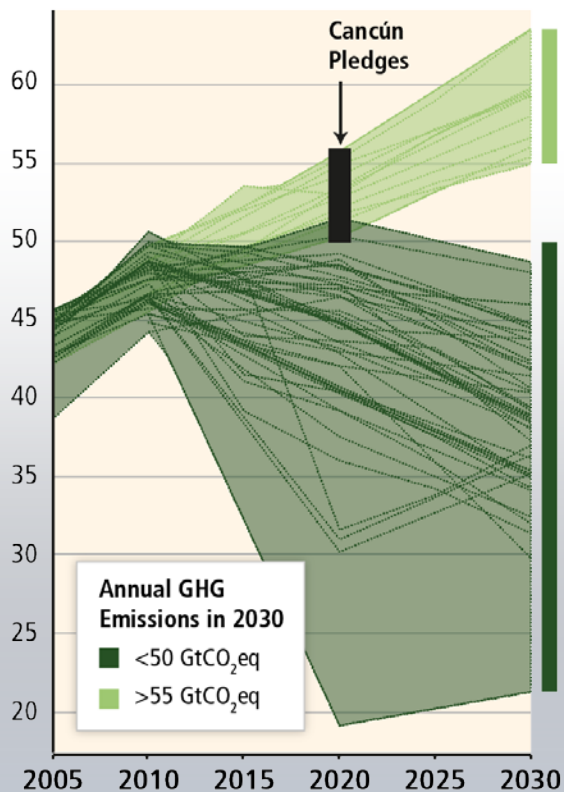
„delayed mitigation“

„immediate action“

Delaying mitigation is estimated to increase the difficulty and narrow the options for limiting warming to 2°C.

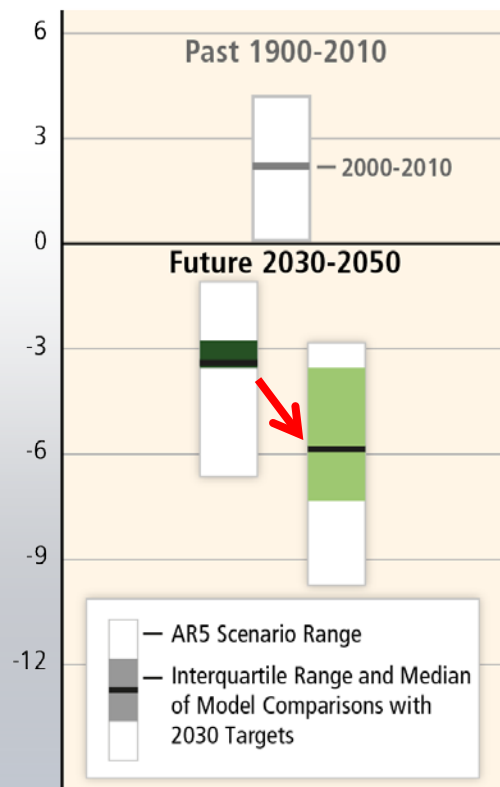
Before 2030

GHG Emissions Pathways [GtCO₂eq/yr]

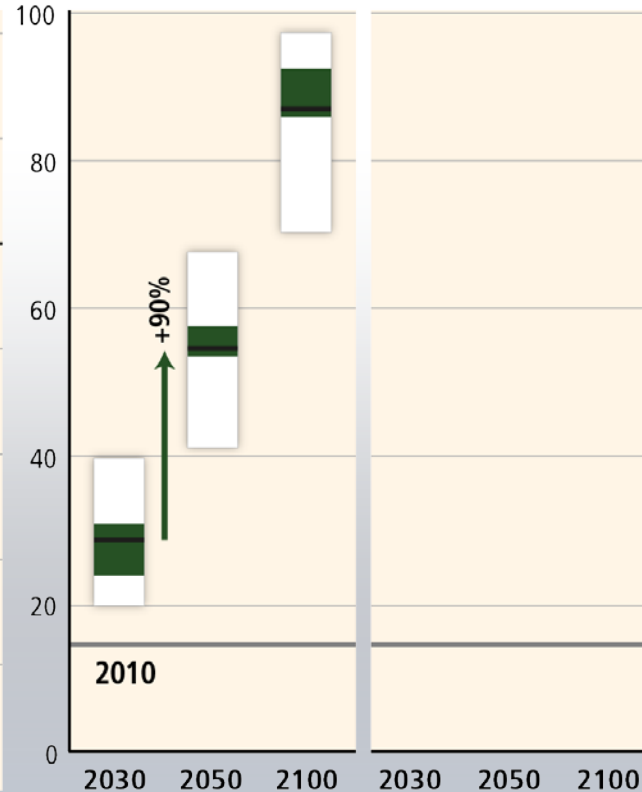


After 2030

Rate of CO₂ Emission Change [%/yr]



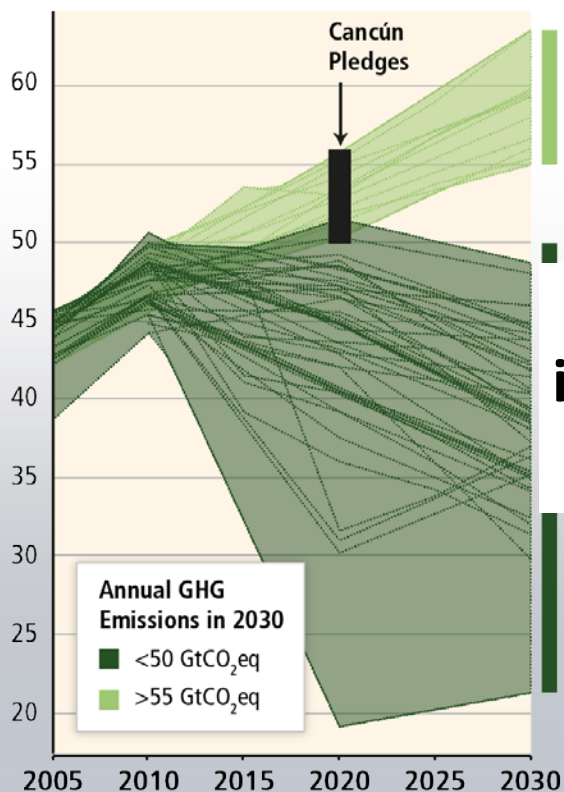
Share of Low Carbon Energy [%]



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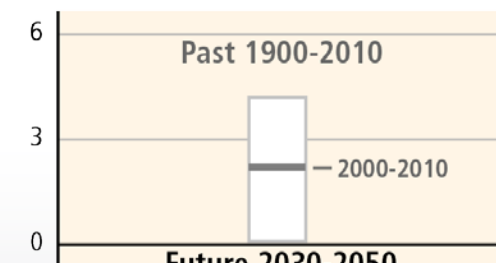
Before 2030

GHG Emissions Pathways [GtCO₂eq/yr]

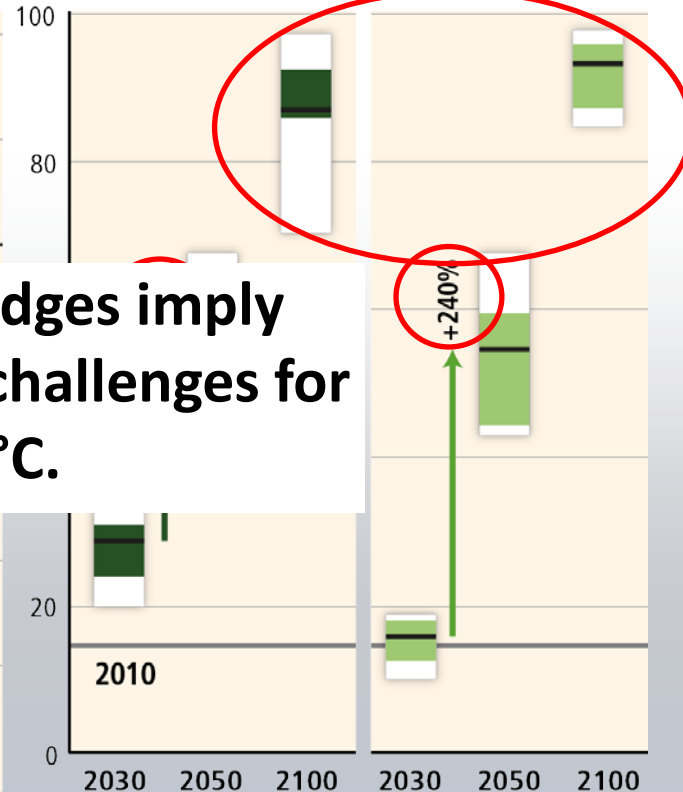


After 2030

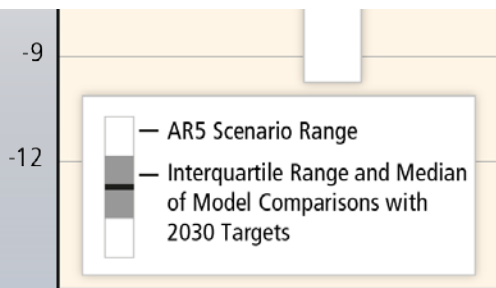
Rate of CO₂ Emission Change [%/yr]



Share of Low Carbon Energy [%]



Current Cancun Pledges imply increased mitigation challenges for reaching 2°C.



Based on Figures 6.32 and 7.16

Scientific evidence on the 1.5°C goal remains limited.

A comprehensive assessment is difficult in the absence of multi-model comparison studies and the limited number of studies focusing on the 1.5°C goal. Existing studies indicate:

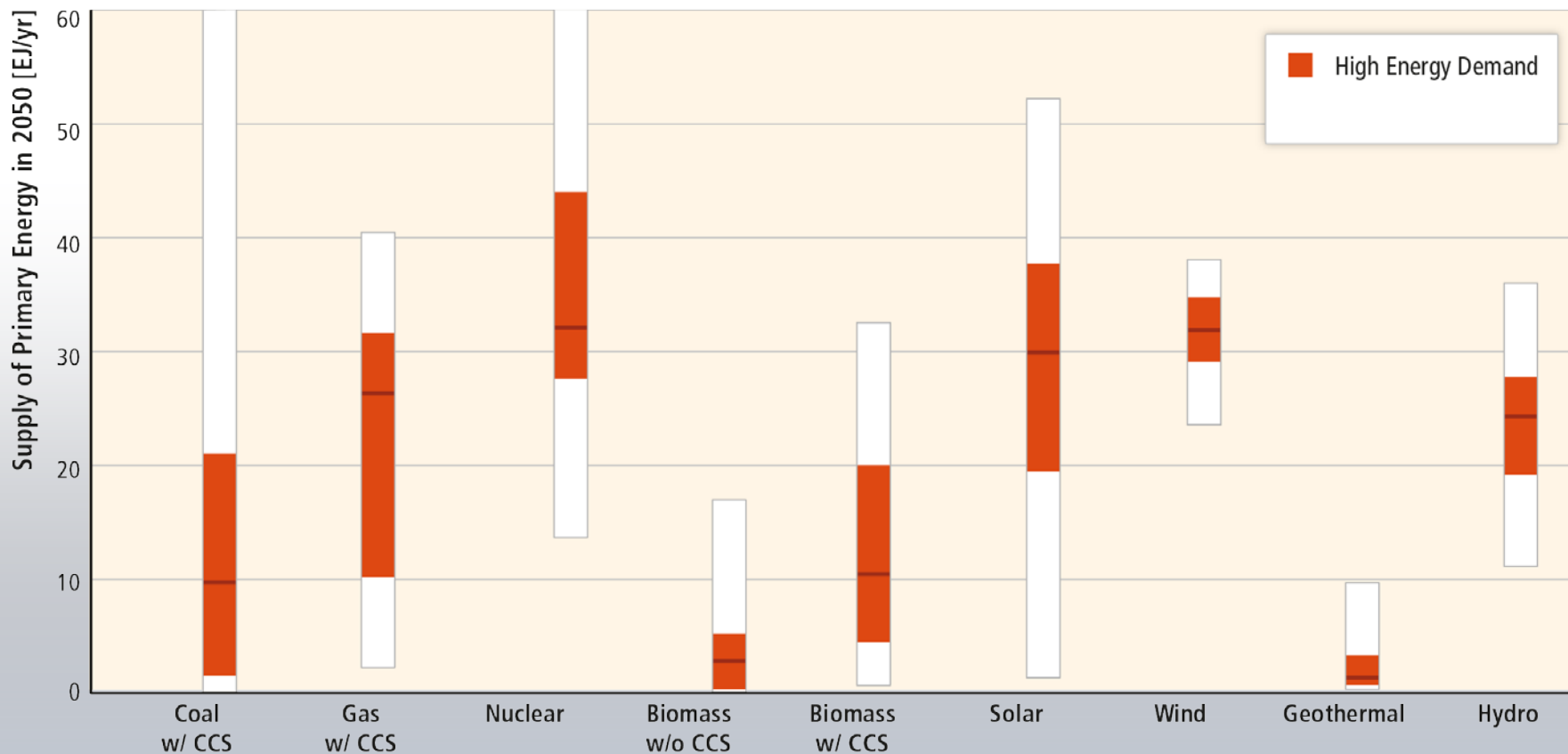
- Temperature overshoot and large scale application of carbon dioxide removal technologies
- Immediate mitigation action
- Rapid upscaling of the *full* set of technologies
- Development along a low energy demand pathway

An aerial, high-angle photograph of a complex industrial facility, likely a refinery or chemical plant. The scene is dominated by a dense network of silver-colored metal pipes, walkways, and structural beams. A single worker in a bright yellow safety vest and white hard hat is visible in the center, providing a sense of scale to the vast machinery. The entire image has a blue color cast. Overlaid on the center is white text.

Low stabilization scenarios are dependent upon a full decarbonization of energy supply in the long term.

Decarbonization of energy supply is a key requirement for limiting warming to 2°C.

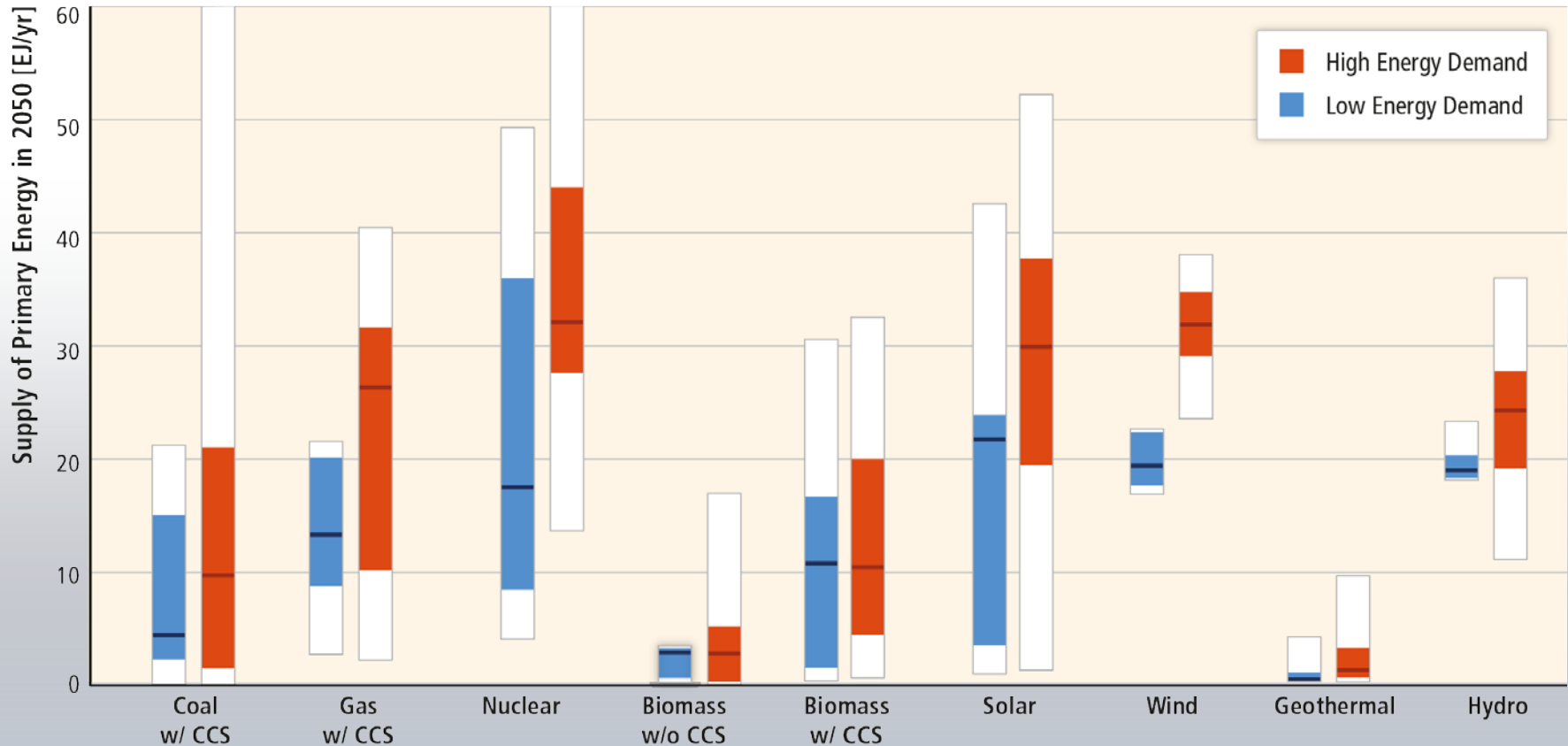
Contribution of Low Carbon Technologies to Energy Supply (430-530 ppm CO₂eq Scenarios)



Based on Figure 7.11

Energy demand reductions can provide flexibility, hedge against risks, avoid lock-in and provide co-benefits.

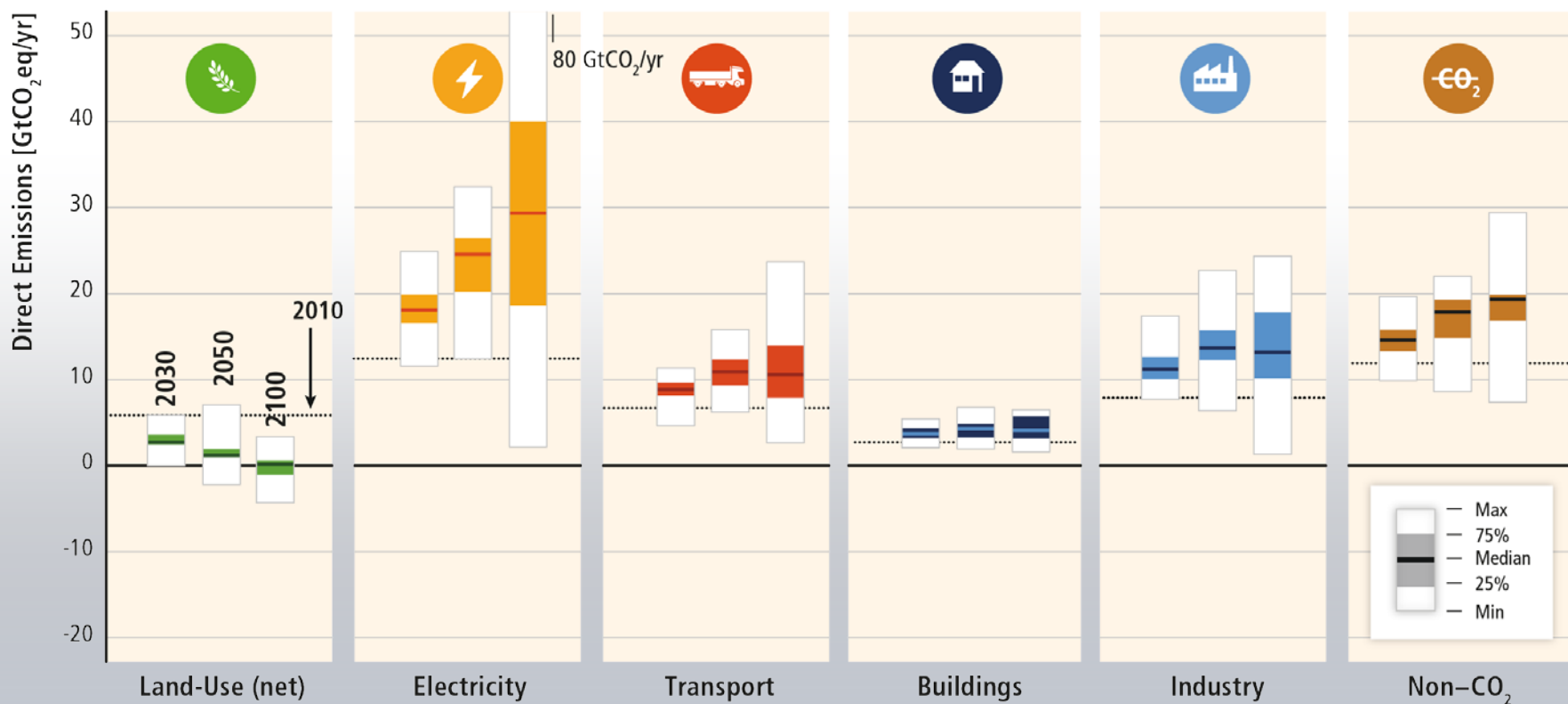
Contribution of Low Carbon Technologies to Energy Supply (430-530 ppm CO₂eq Scenarios)



Based on Figure 7.11

Baseline scenarios suggest rising GHG emissions in all sectors, except for CO₂ emissions in the land-use sector.

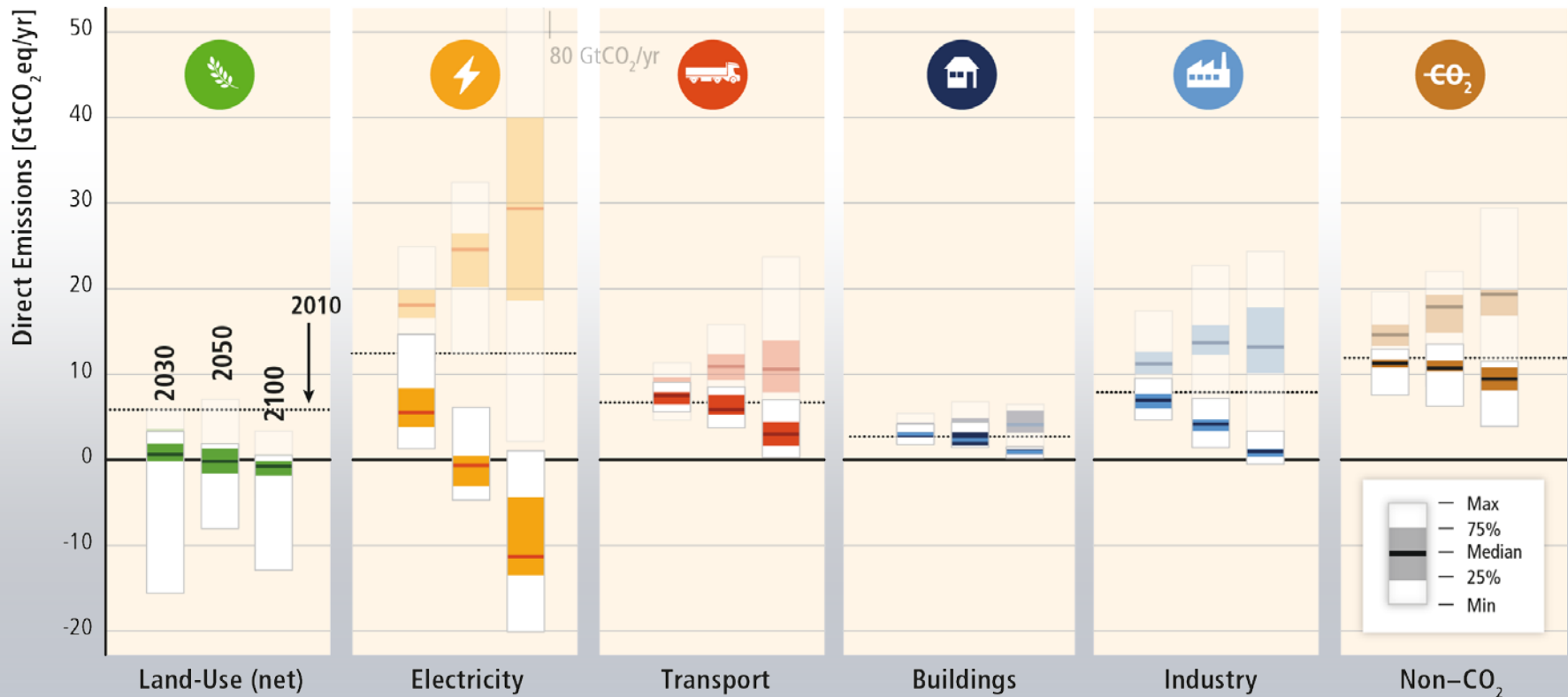
BASELINES



Based on Figure TS.17

Mitigation requires changes throughout the economy. Systemic approaches are expected to be most effective.

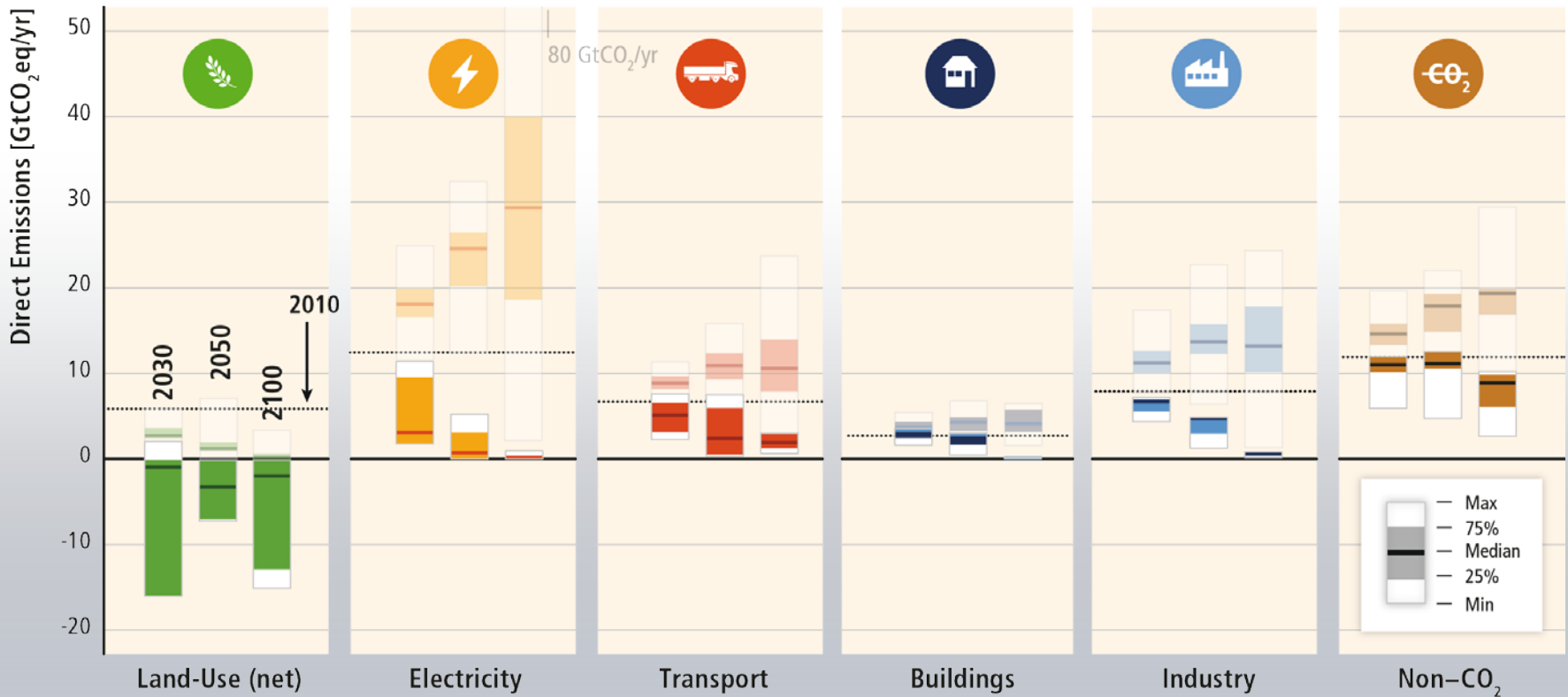
450 ppm CO₂eq with Carbon Dioxide Capture & Storage



Based on Figure TS.17

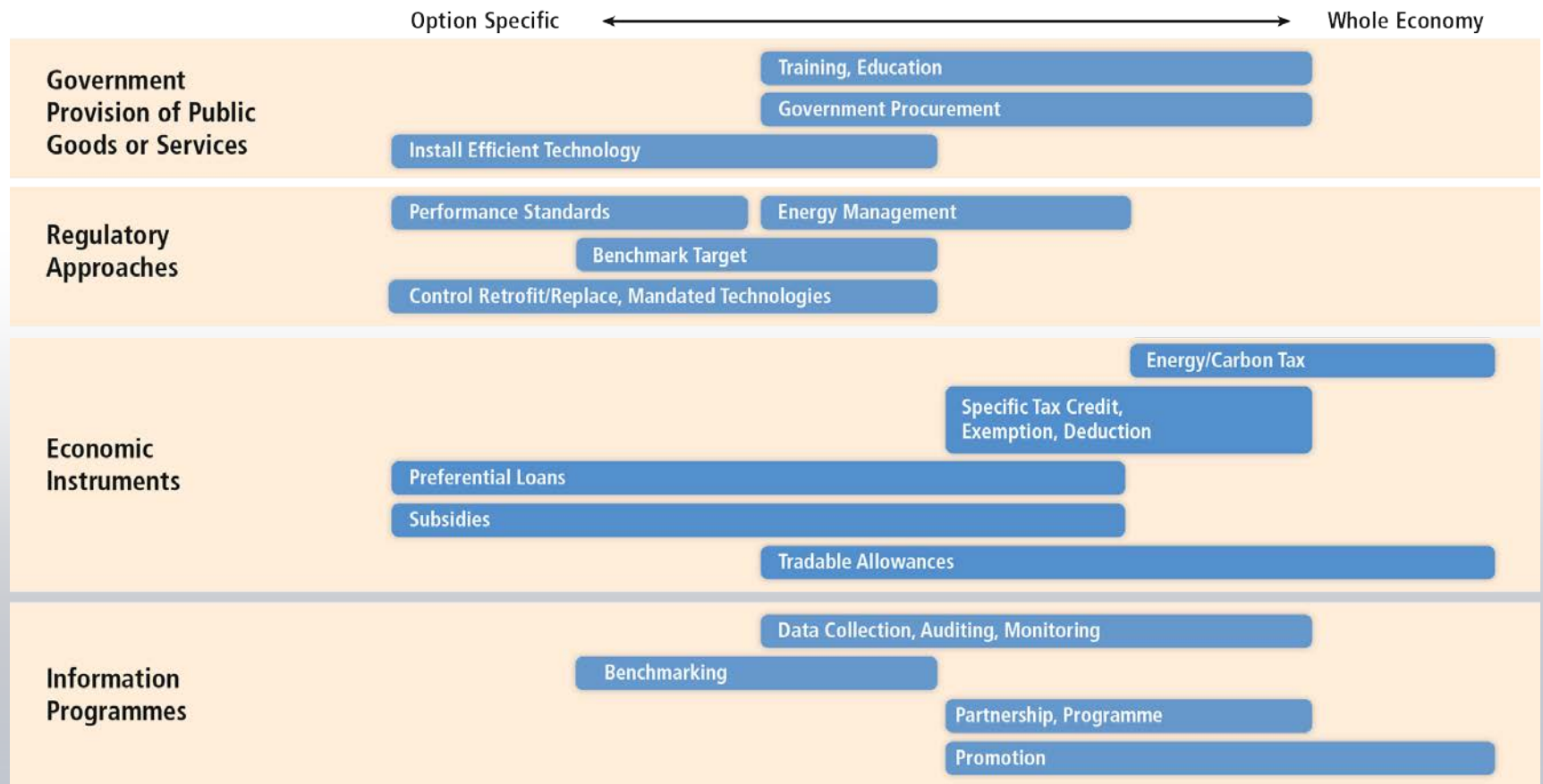
Mitigation efforts in one sector determine efforts in others.

450 ppm CO₂eq without Carbon Dioxide Capture & Storage



Based on Figure TS.17

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

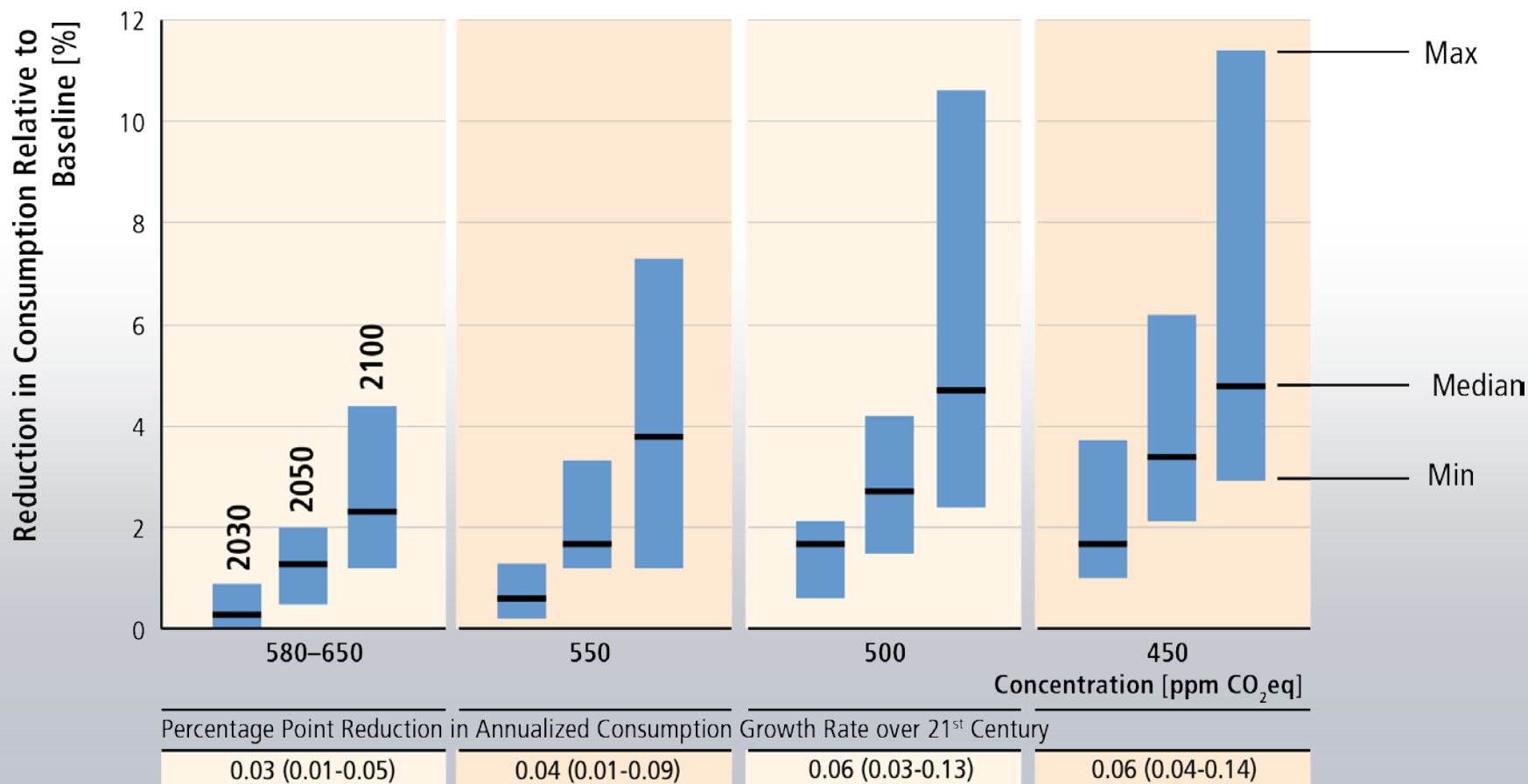


Based on Figure 10.15

A large container ship is shown from an elevated perspective, sailing on a dark blue ocean. The ship is white with a red hull and is heavily loaded with colorful shipping containers. The text is overlaid in the center of the image.

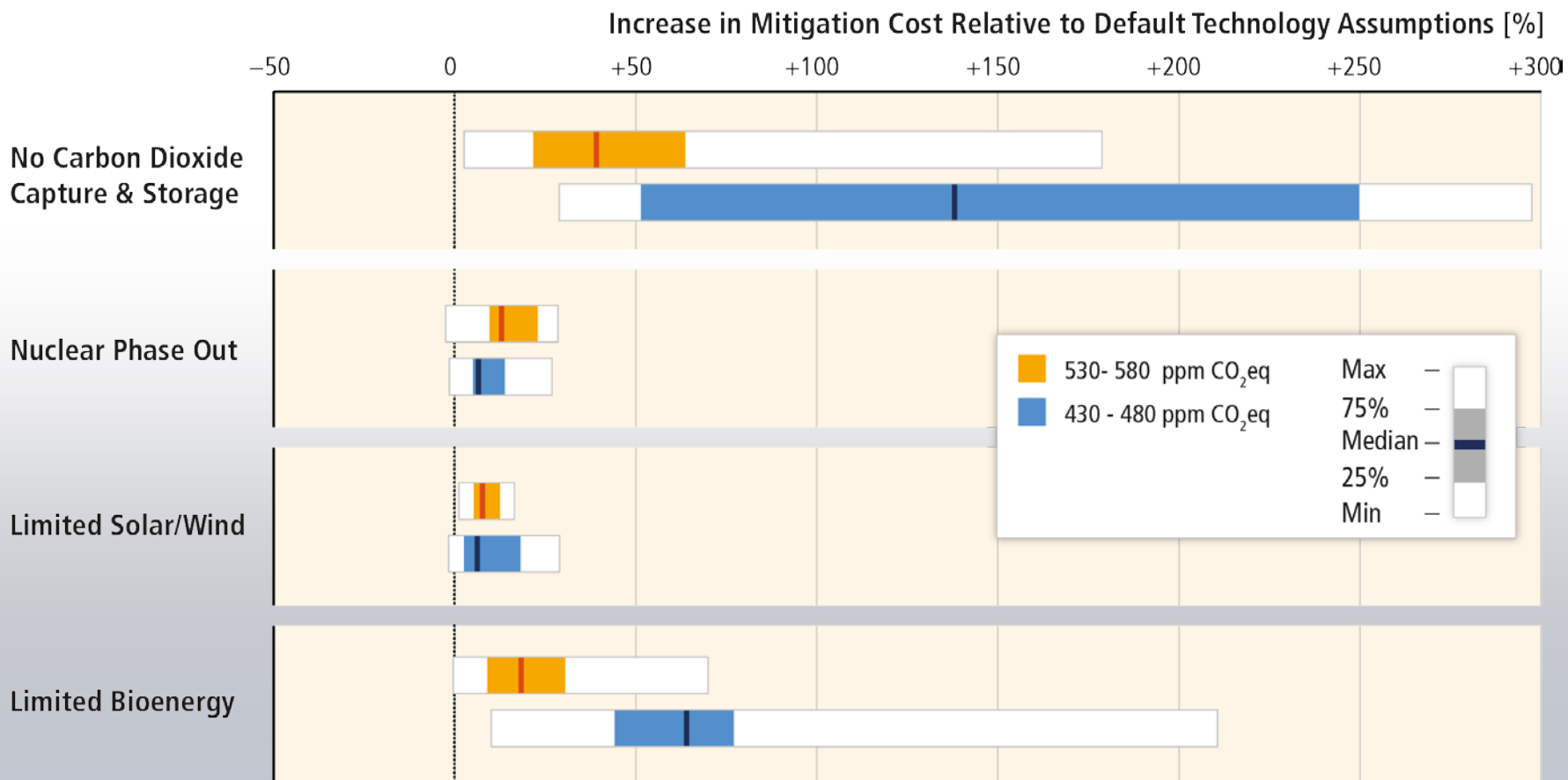
Mitigation cost estimates vary, but do not strongly affect global GDP growth.

Global costs rise with the ambition of the mitigation goal.



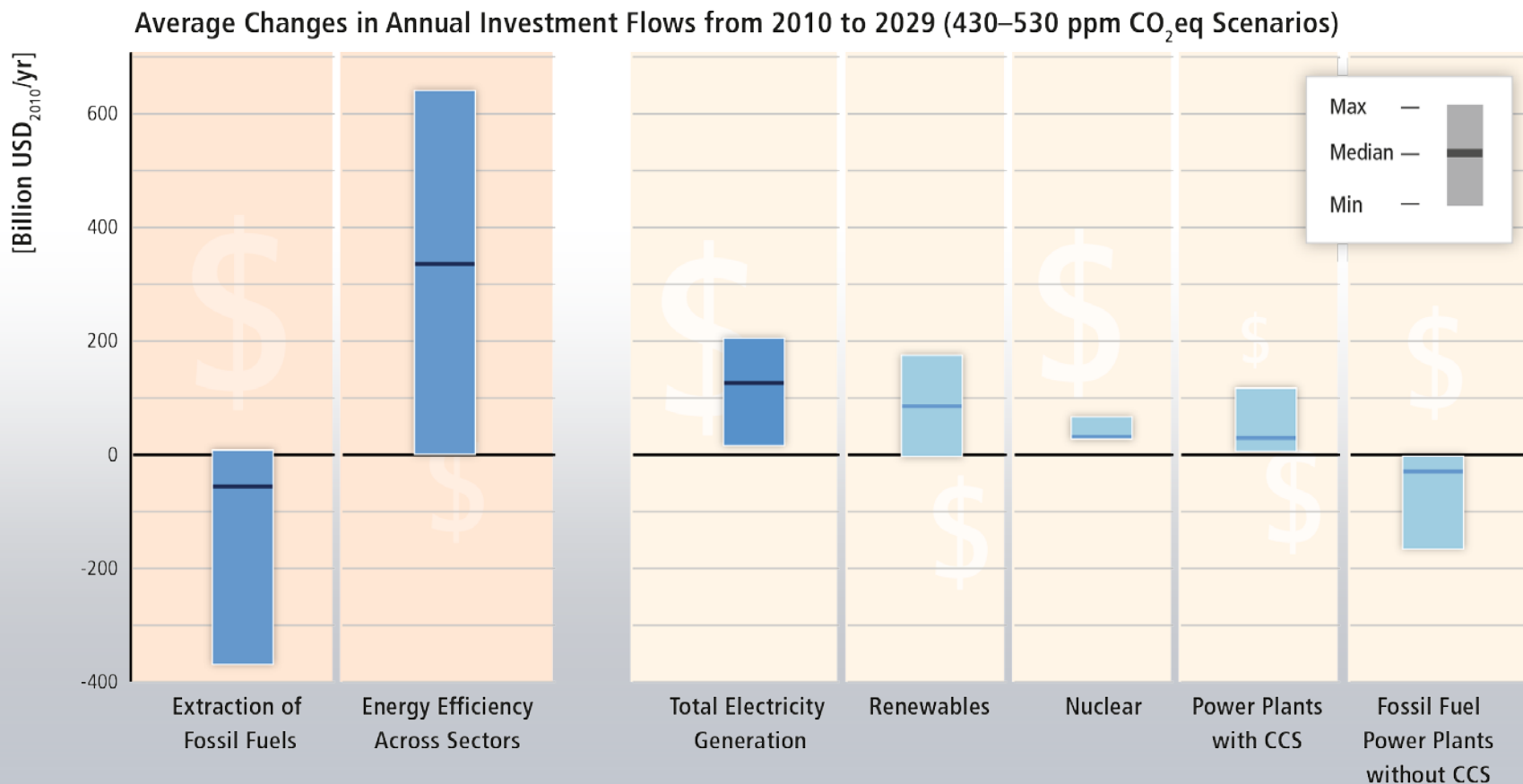
Based on Table SPM.2

Availability of technology can greatly influence mitigation costs.



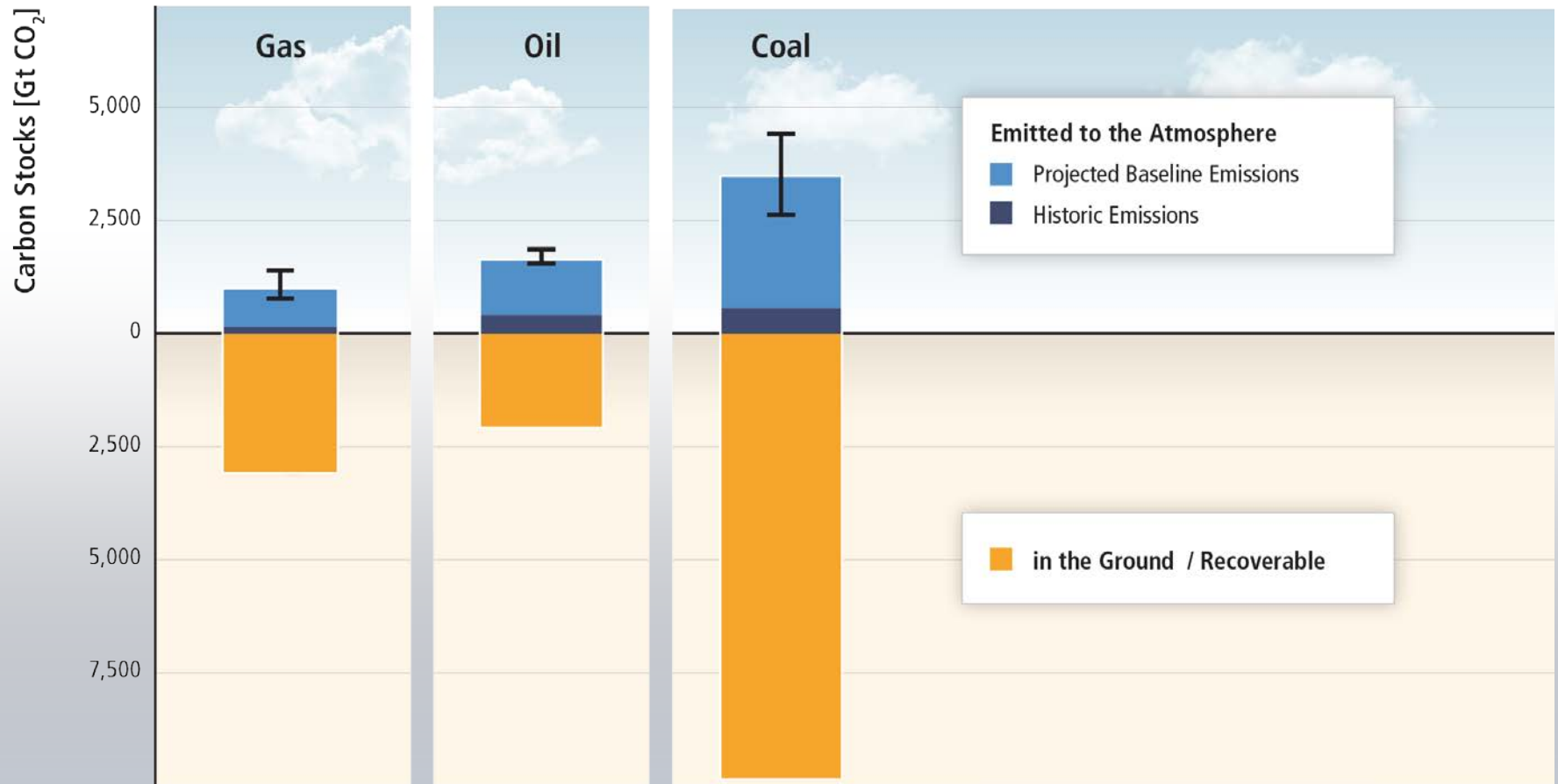
Based on Figure 6.24

Substantial reductions in emissions would require large changes in investment patterns and appropriate policies.



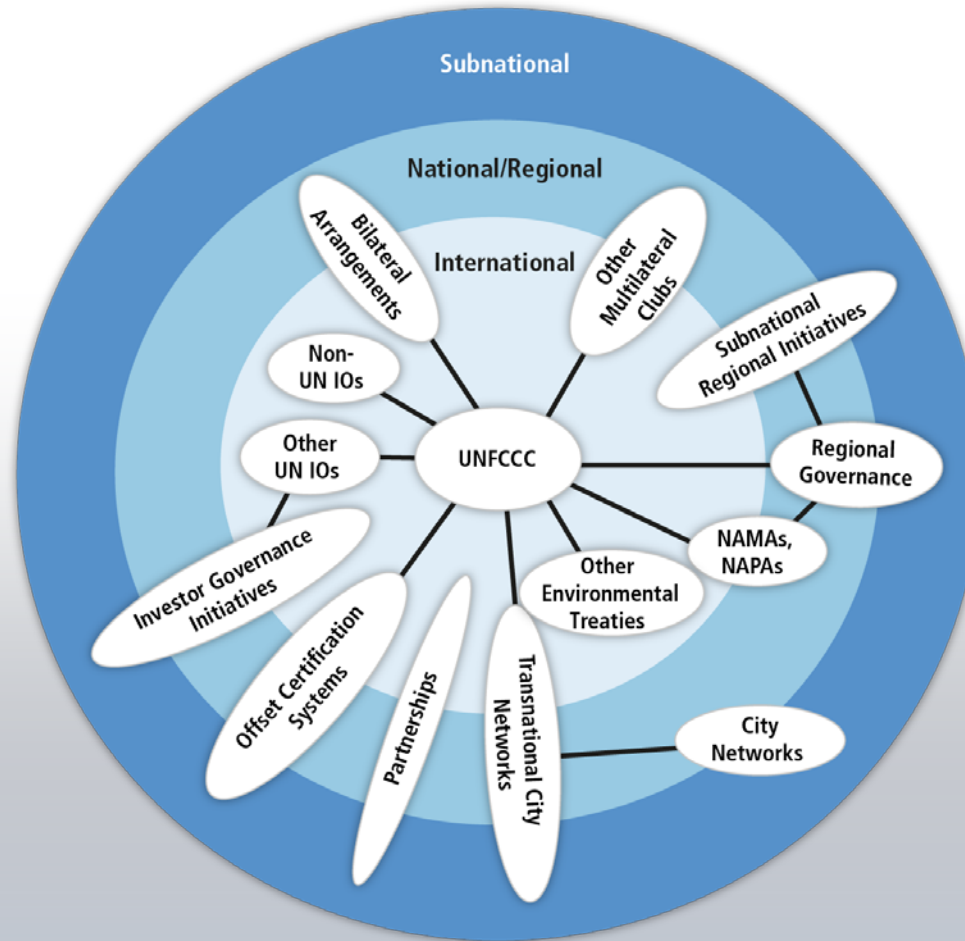
Based on Figure 16.3

There is far more carbon in the ground than emitted in any baseline scenario.



Based on SRREN Figure 1.7

Climate change mitigation is a global commons problem that requires international cooperation across scales.



Based on Figure 13.1

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