

# CLIMATE CHANGE 2014

## *Mitigation of Climate Change*

### Key Insights from the AR5

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Tokyo

08 September 2014

# 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

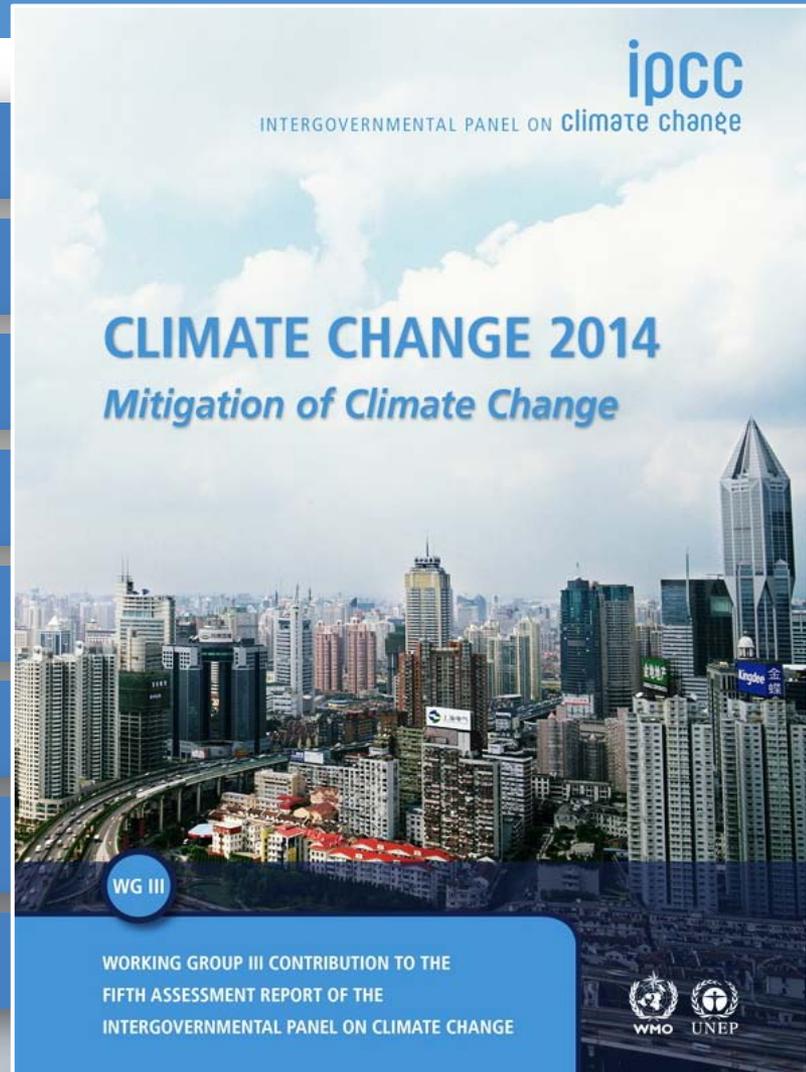
235 Authors

900 Reviewers

More than 2000 pages

Close to 10,000 references

More than 38,000 comments



An aerial photograph of a dense urban landscape, likely Hong Kong, featuring numerous skyscrapers and a complex network of elevated highways. A large, semi-transparent blue circle is centered in the upper half of the image, containing the white text "#1".

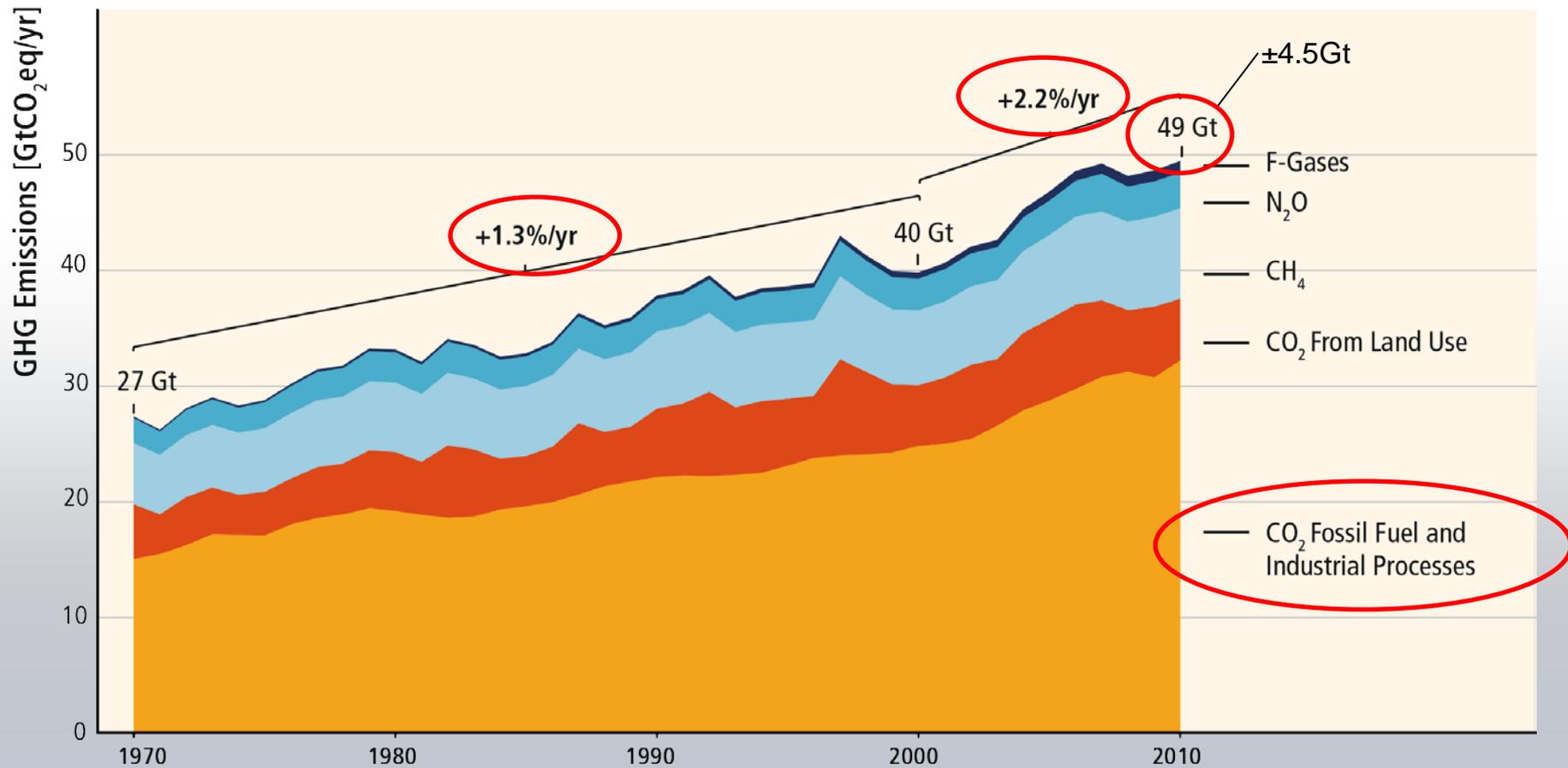
**#1**

**What are the trends in stocks and flows of GHG emissions?**

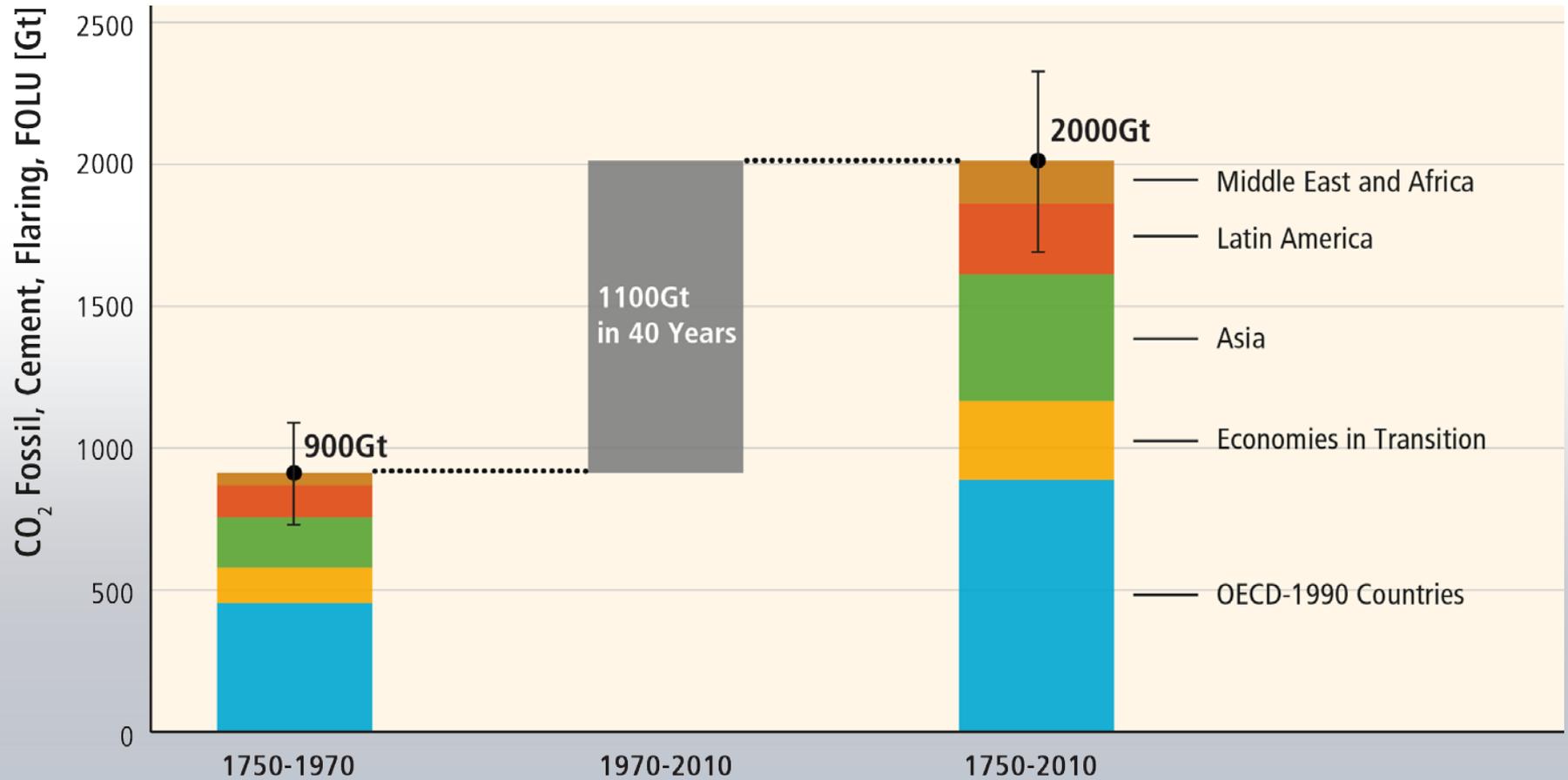
**GHG emissions growth has accelerated  
despite reduction efforts.**



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

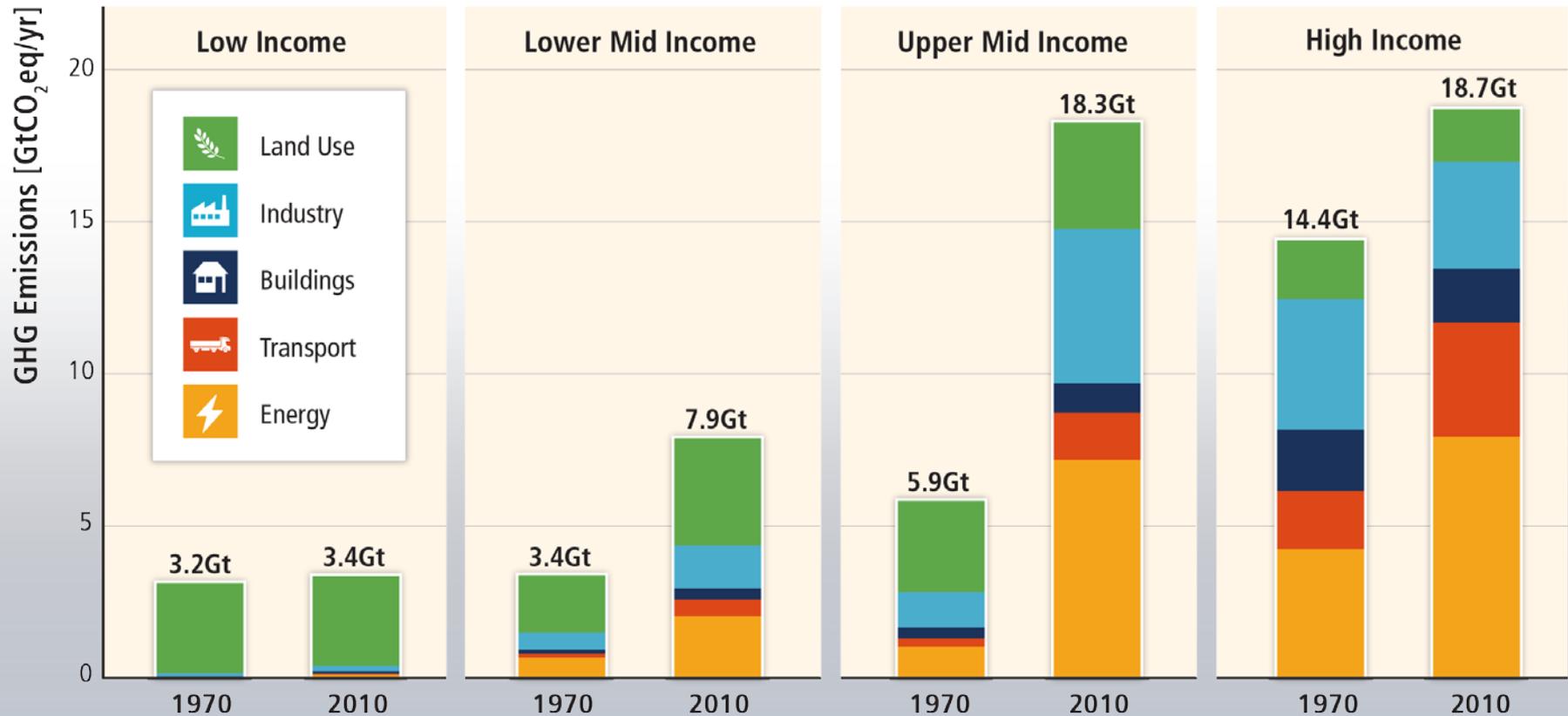


# About half of the cumulative anthropogenic CO<sub>2</sub> emissions between 1750 and 2010 have occurred in the last 40 years.

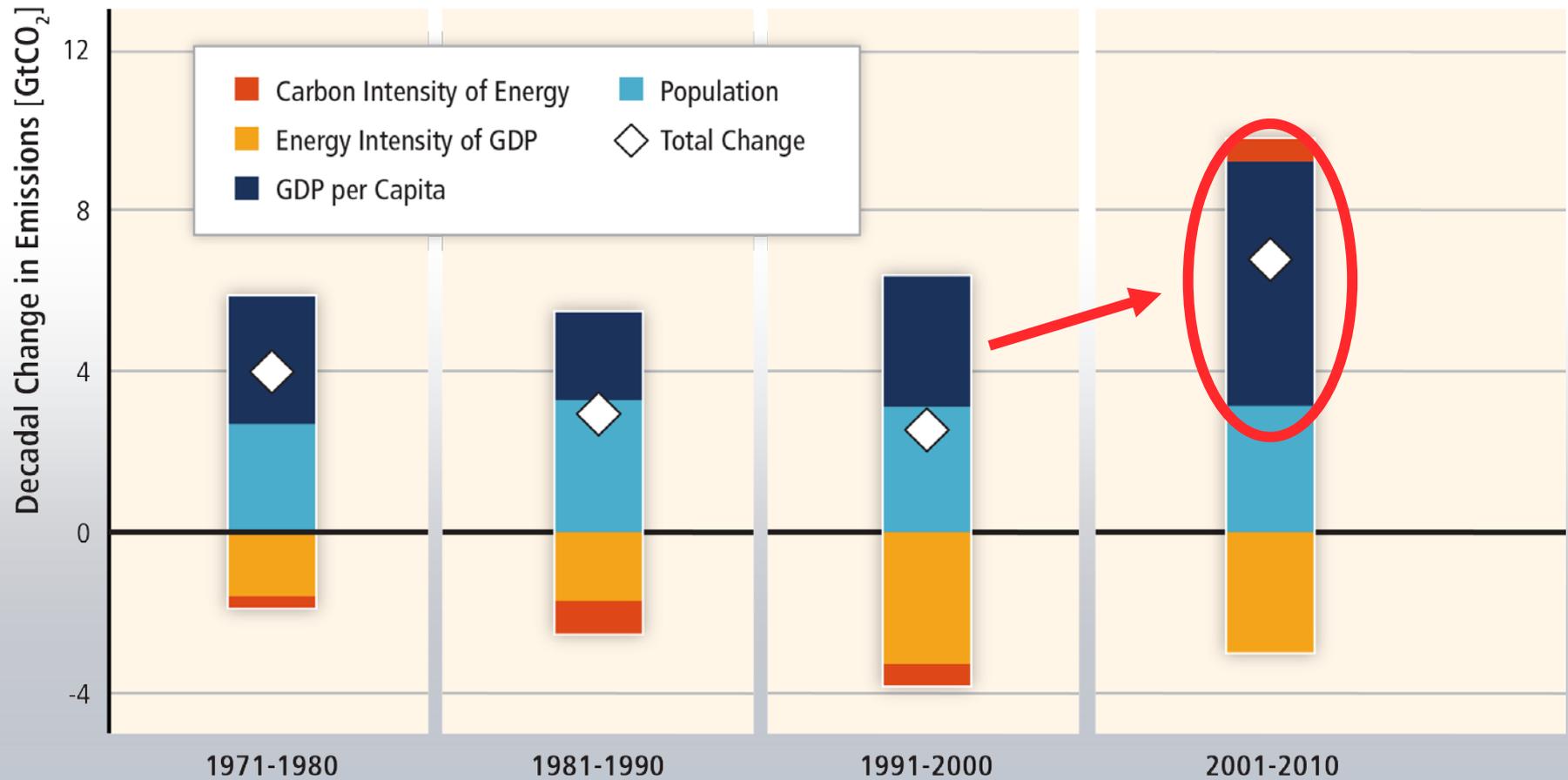


# Regional patterns of GHG emissions are shifting along with changes in the world economy.

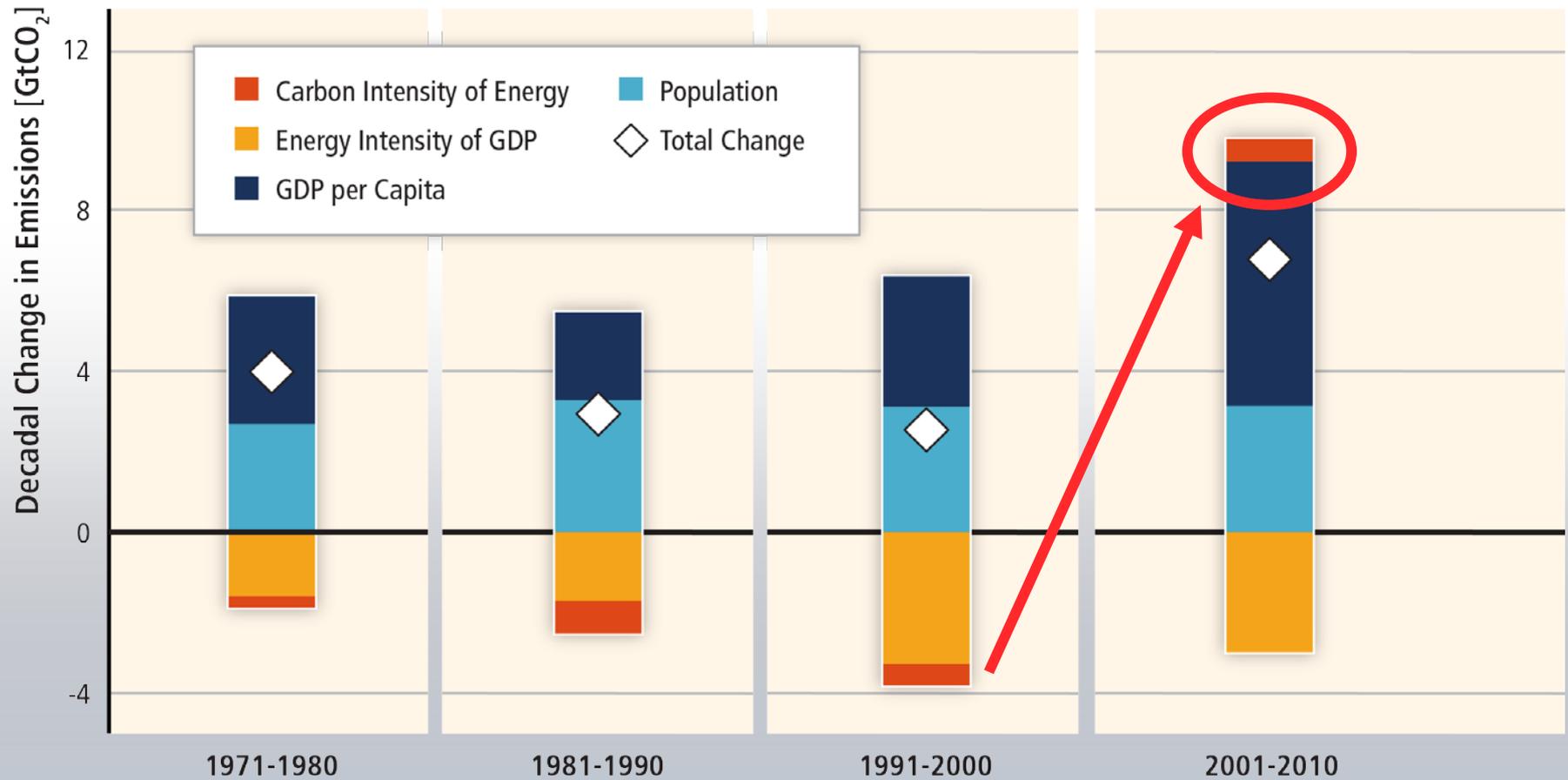
## GHG Emissions by Country Group and Economic Sector

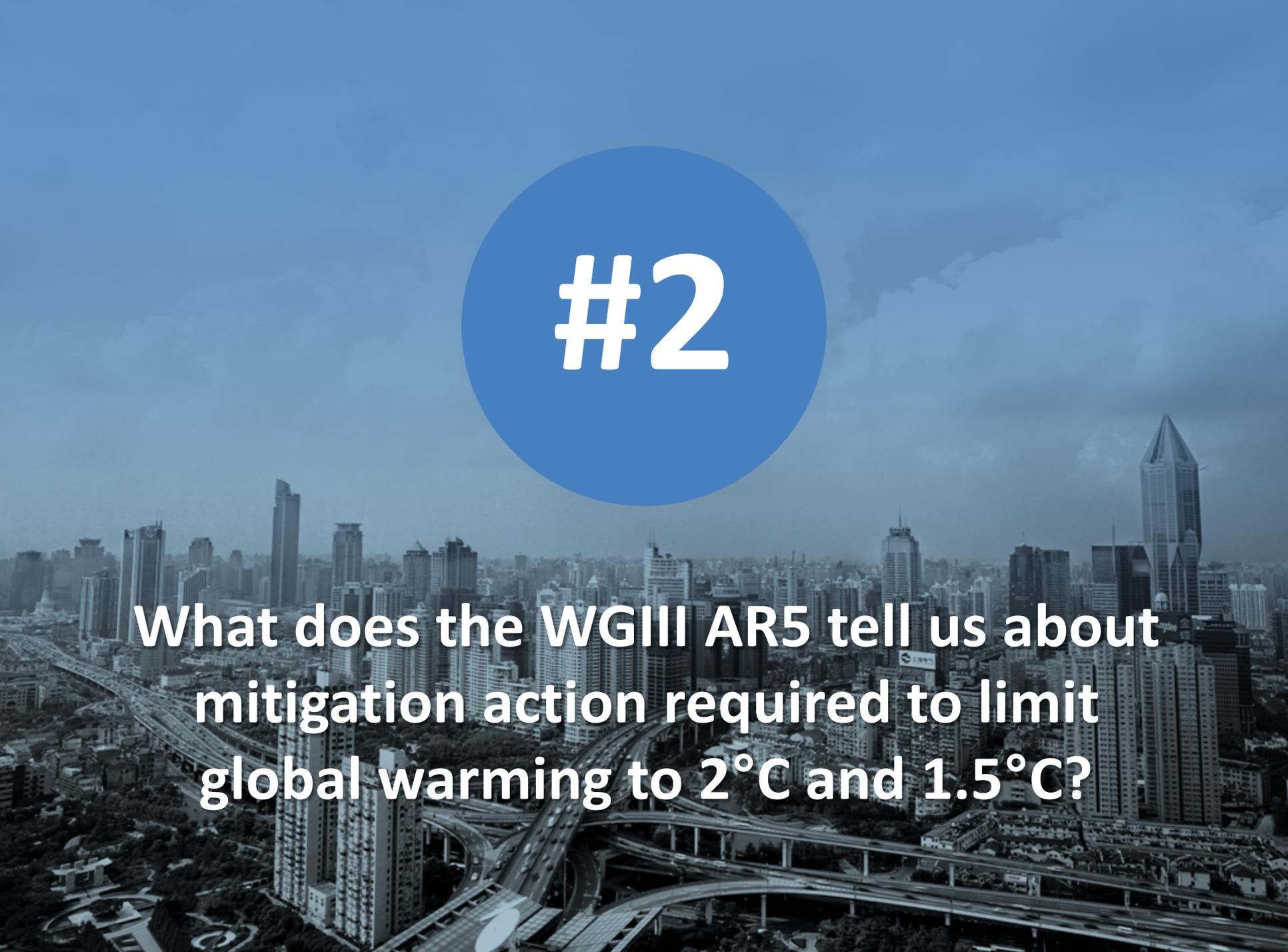


# Most of the recent GHG emissions growth has been driven by growth in economic activity.



# The long-standing trend of gradual decarbonization of energy has reversed recently.



An aerial photograph of a city skyline, likely Hong Kong, featuring numerous skyscrapers and a complex highway interchange. A large blue circle is overlaid in the upper center, containing the white text "#2".

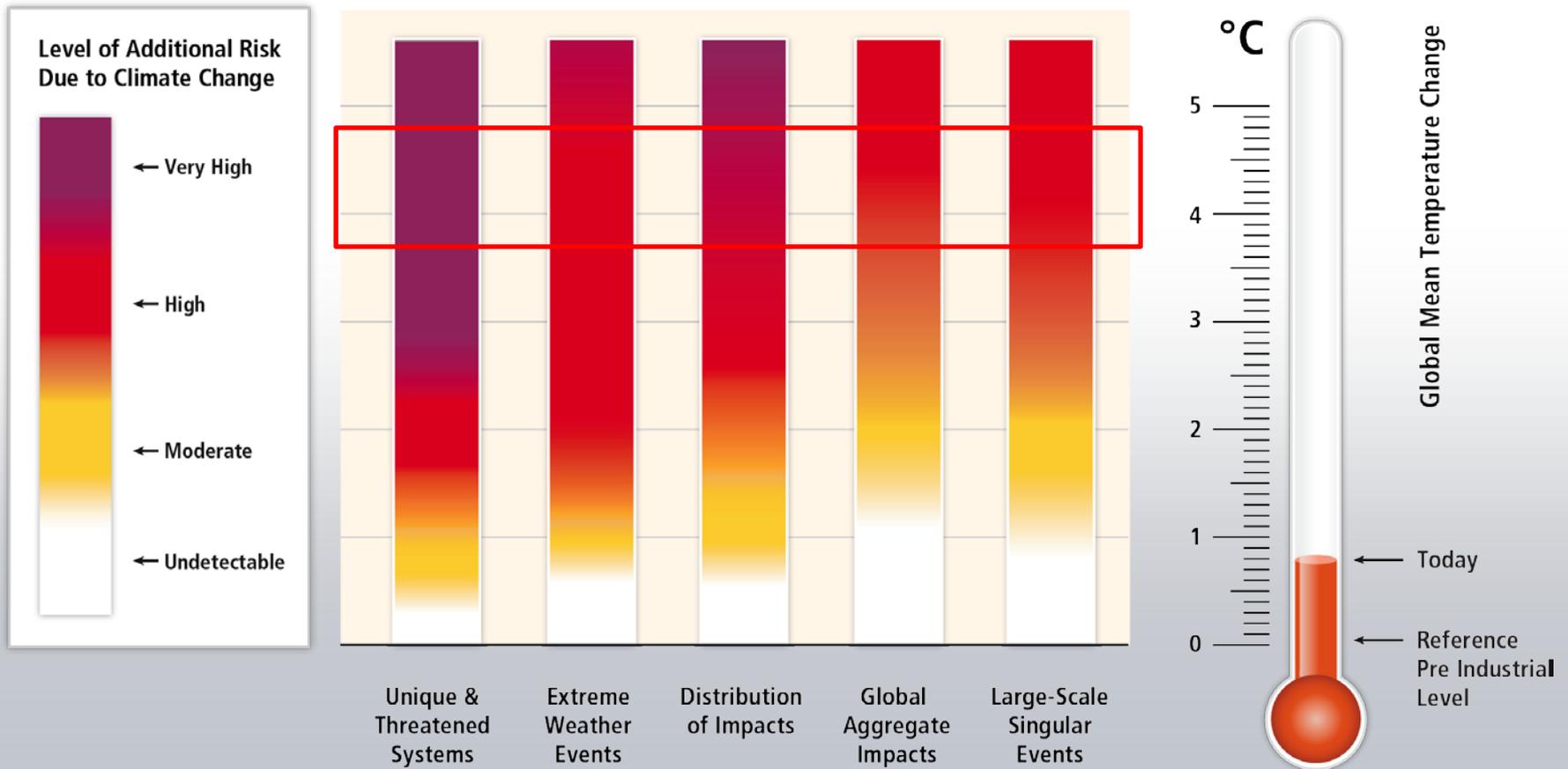
**#2**

**What does the WGIII AR5 tell us about mitigation action required to limit global warming to 2°C and 1.5°C?**

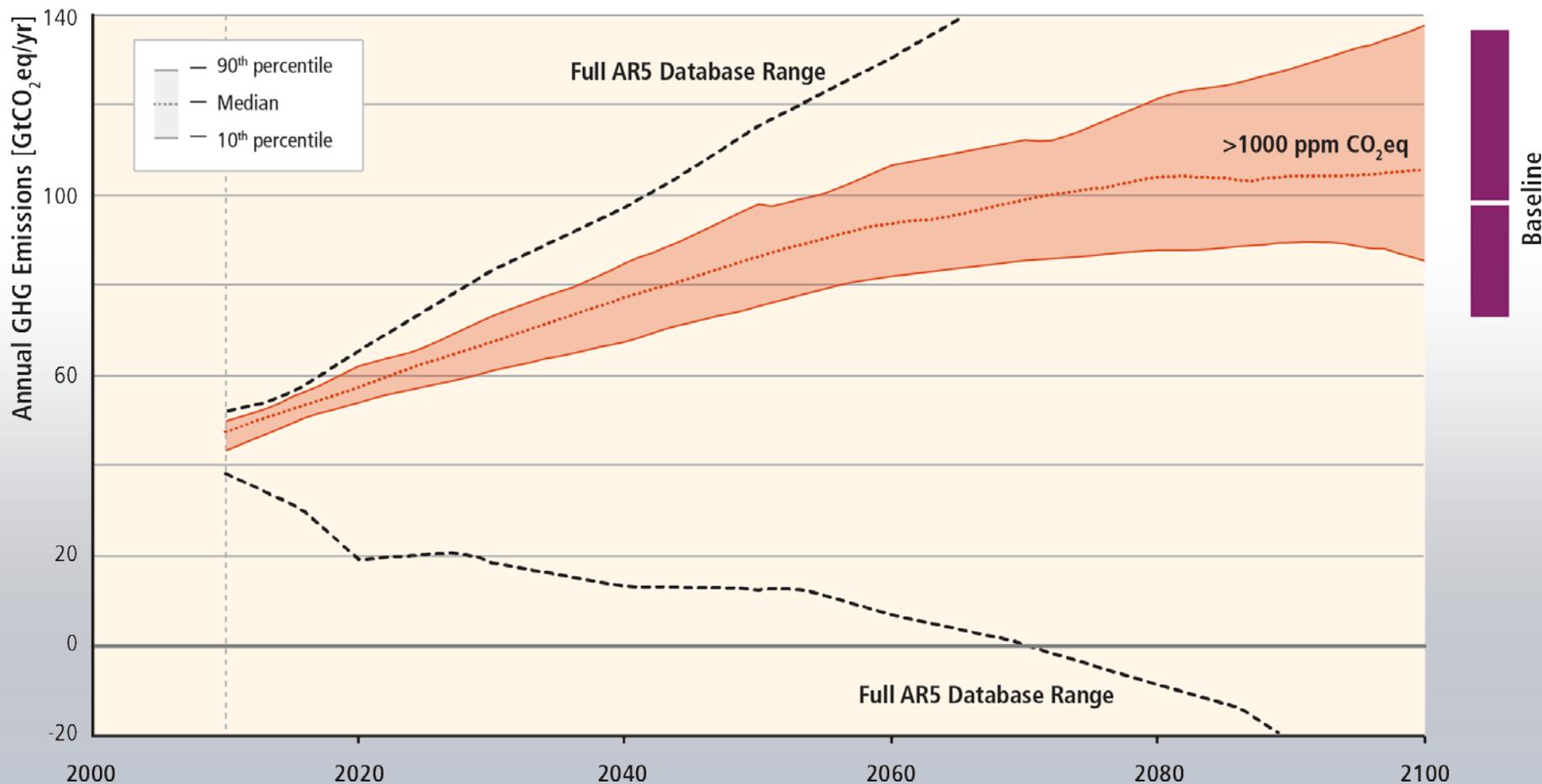
**Limiting warming to 2°C relative to pre-industrial levels involves substantial technological, economic and institutional challenges.**



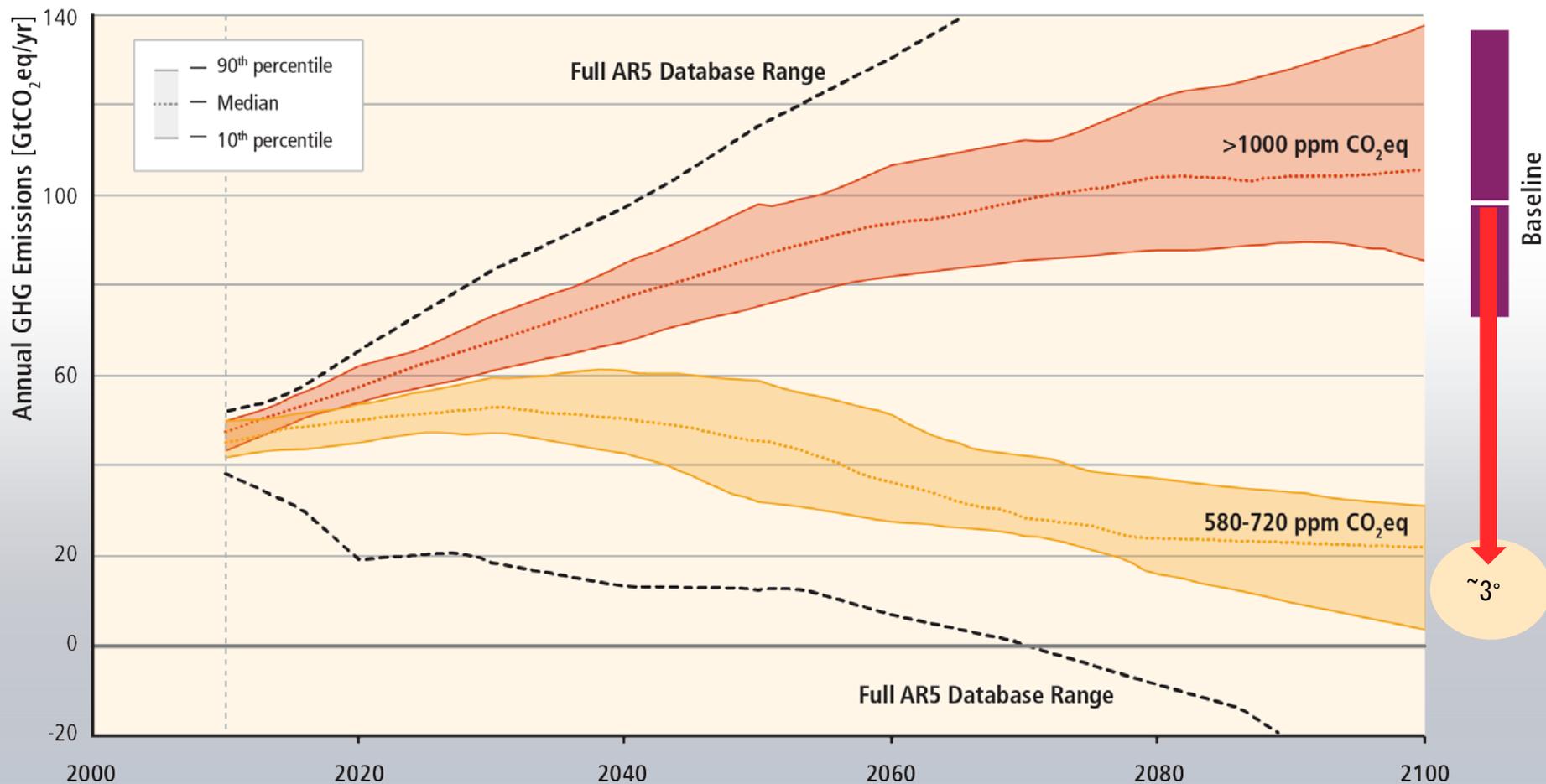
Without additional mitigation, global mean surface temperature is projected to increase by 3.7 to 4.8°C (2.5 - 7.8°C) until 2100.



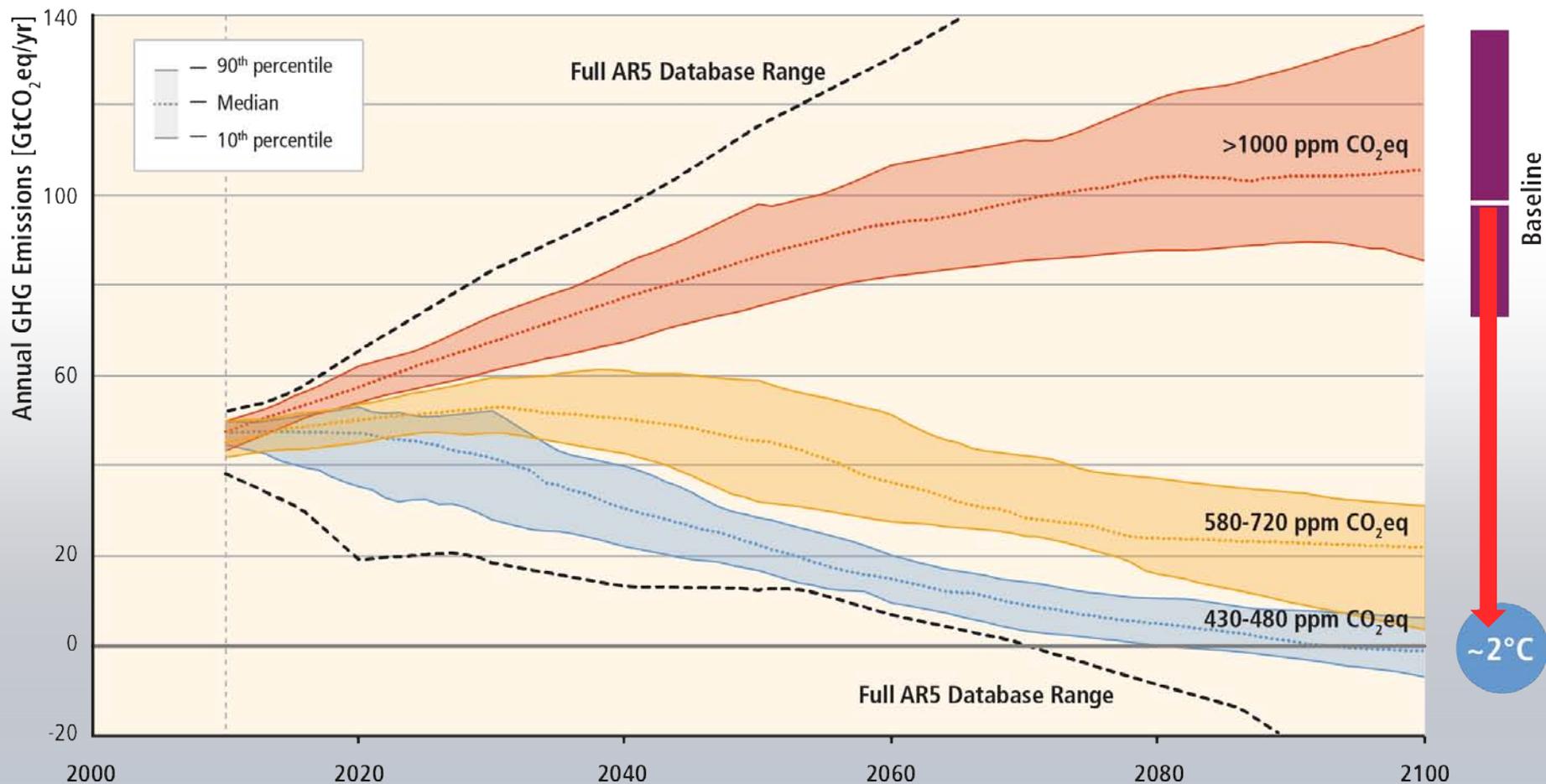
# Stabilization of atmospheric GHG concentrations requires moving away from the baseline, regardless of the mitigation goal.



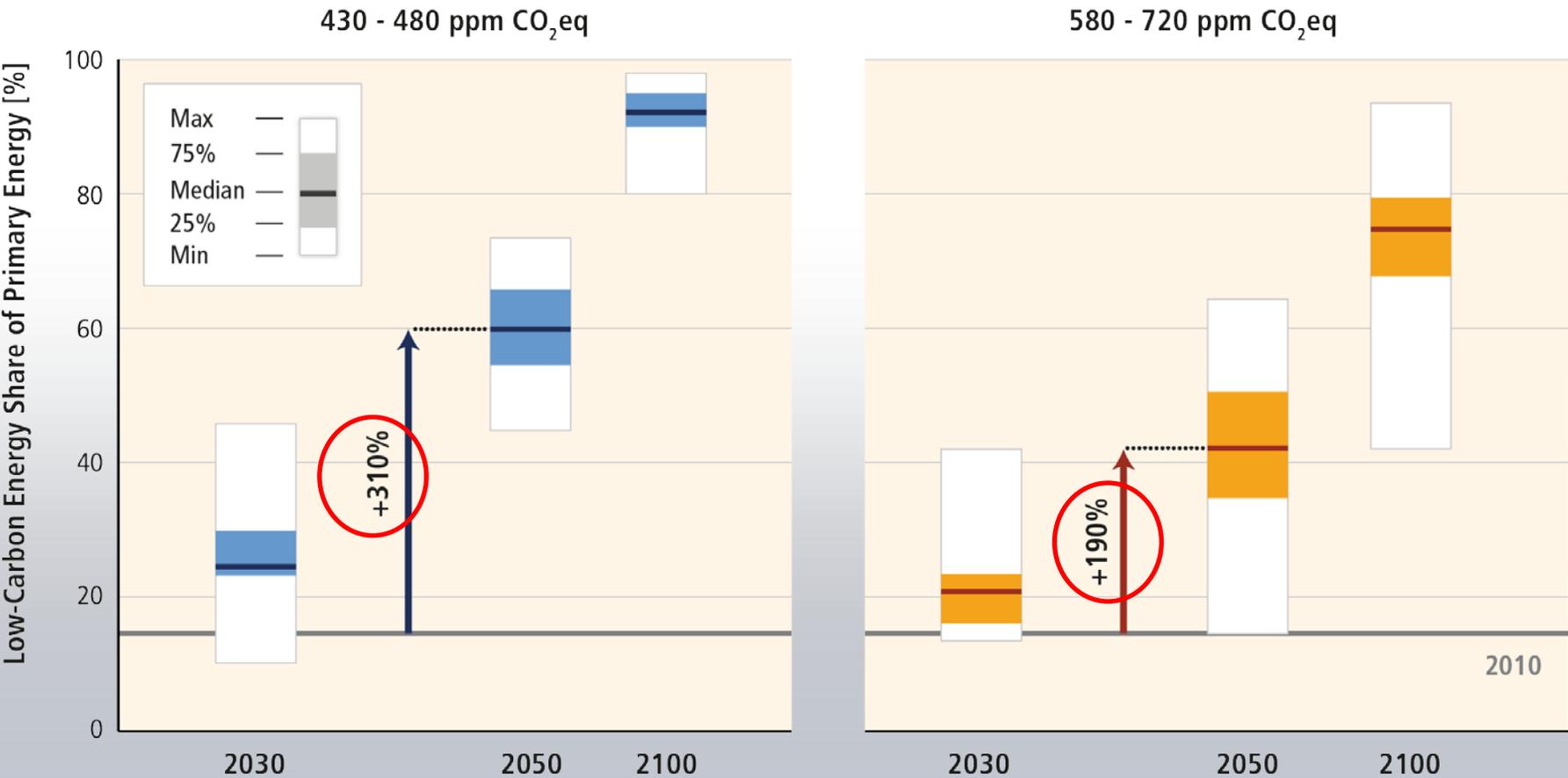
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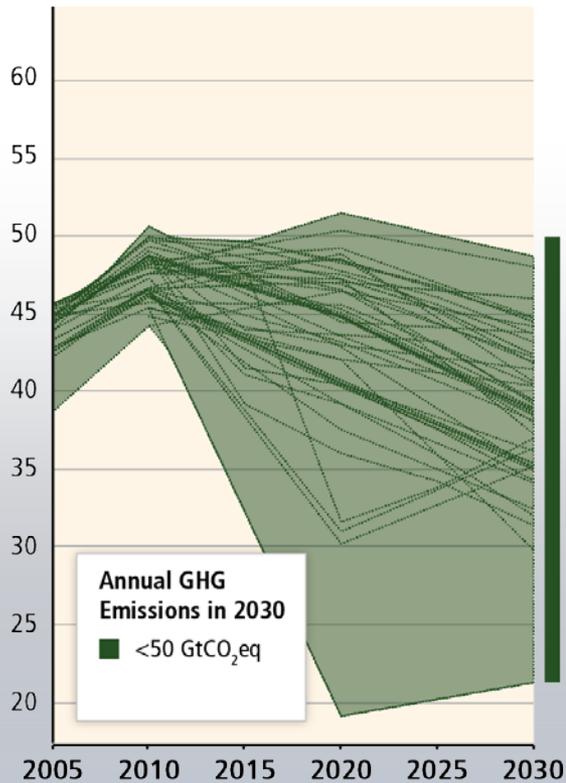
# Mitigation involves substantial upscaling of low carbon energy.



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

Before 2030

GHG Emissions Pathways [GtCO<sub>2</sub>eq/yr]

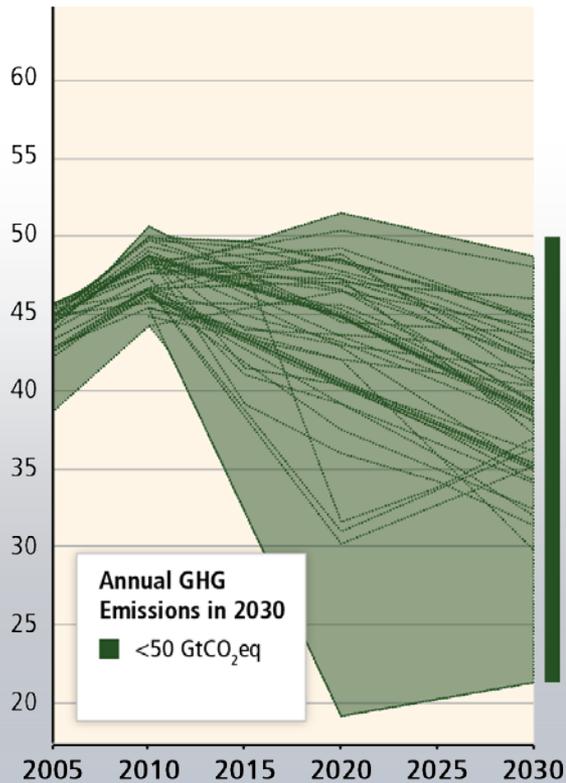


„immediate action“

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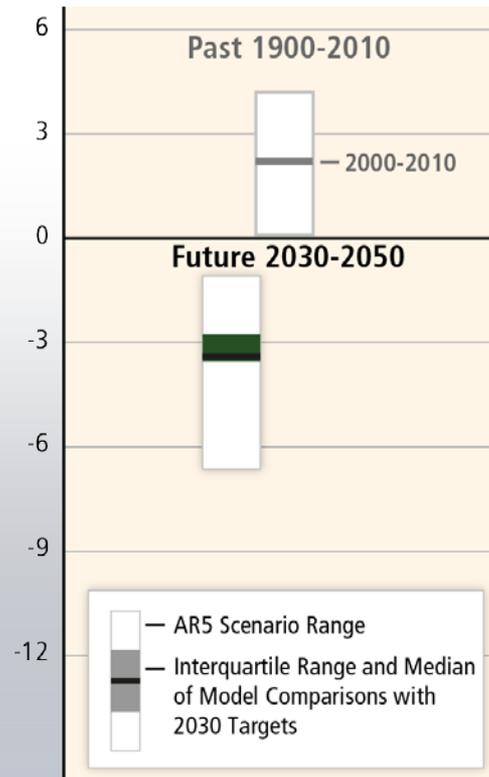
## Before 2030

GHG Emissions Pathways [GtCO<sub>2</sub>eq/yr]



## After 2030

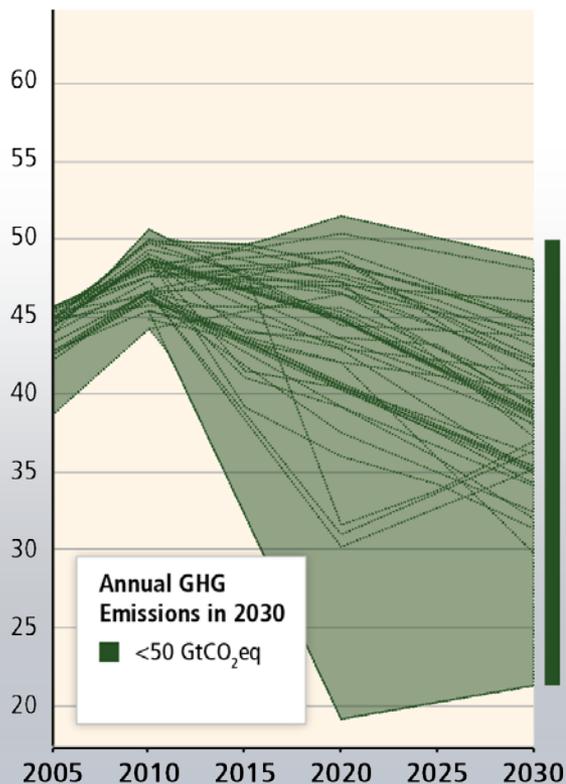
Rate of CO<sub>2</sub> Emission Change [%/yr]



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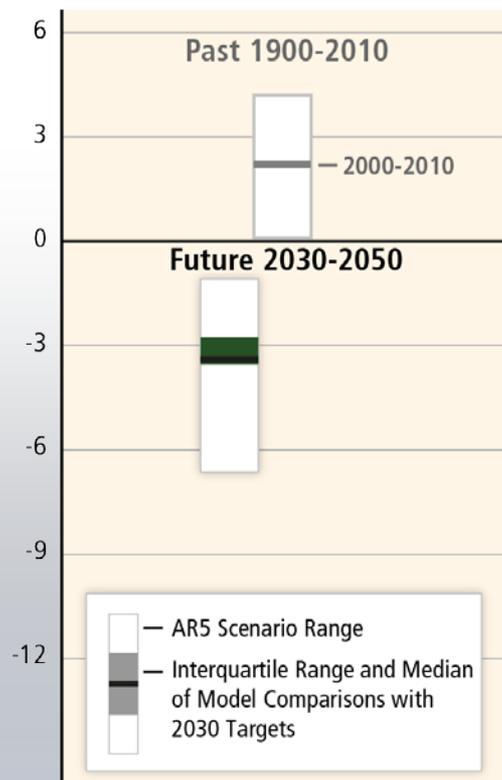
## Before 2030

GHG Emissions Pathways [GtCO<sub>2</sub>eq/yr]

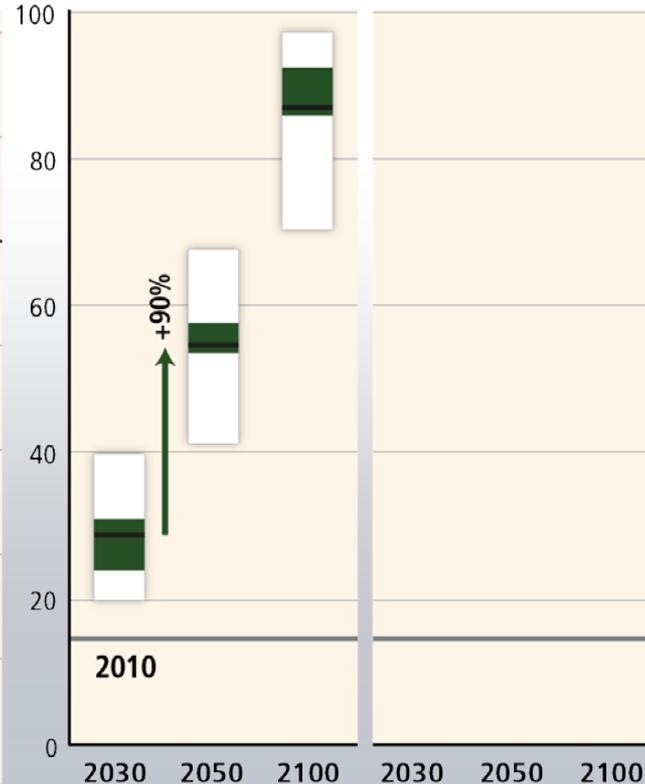


## After 2030

Rate of CO<sub>2</sub> Emission Change [%/yr]



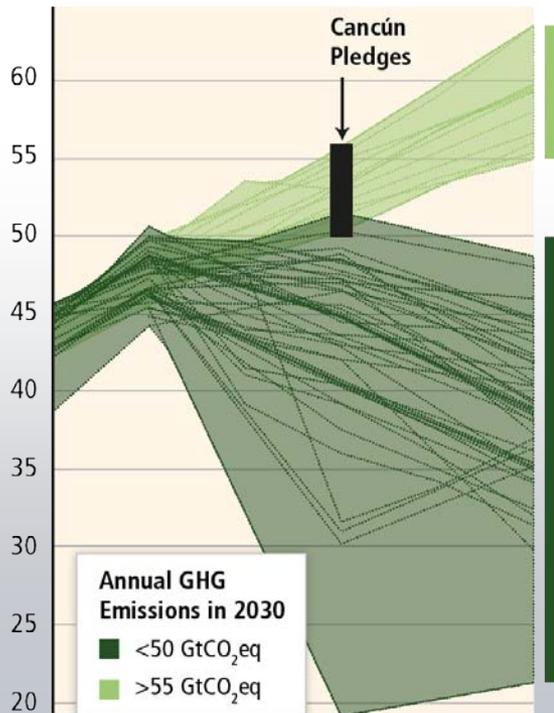
Share of Low Carbon Energy [%]



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Before 2030

GHG Emissions Pathways [GtCO<sub>2</sub>eq/yr]



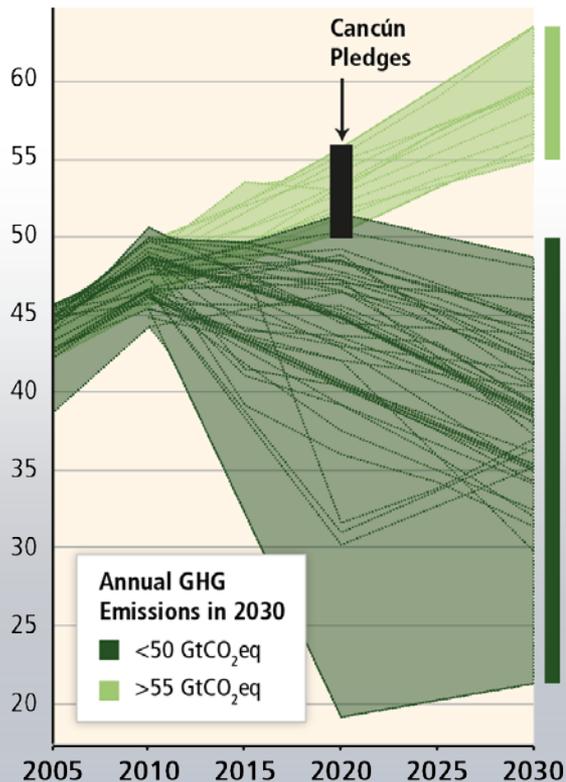
„delayed mitigation“

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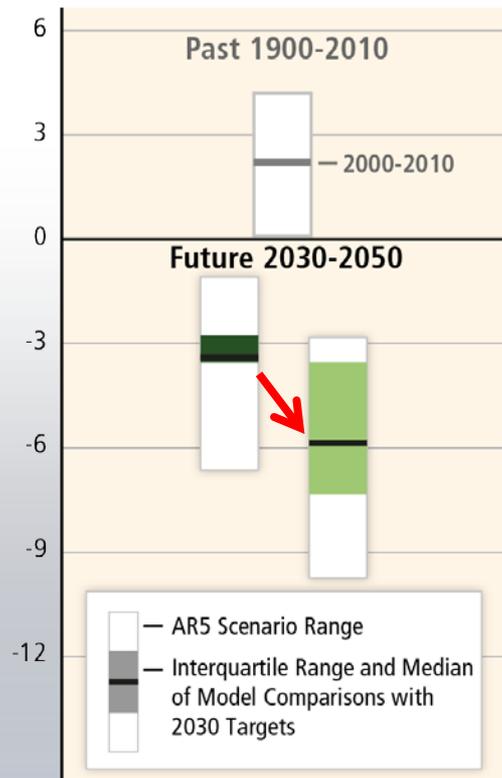
## Before 2030

GHG Emissions Pathways [GtCO<sub>2</sub>eq/yr]

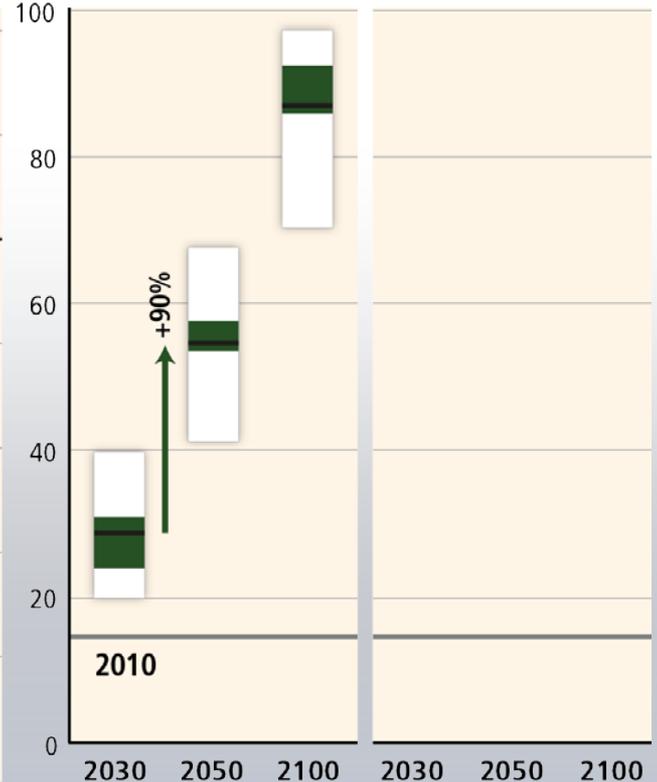


## After 2030

Rate of CO<sub>2</sub> Emission Change [%/yr]



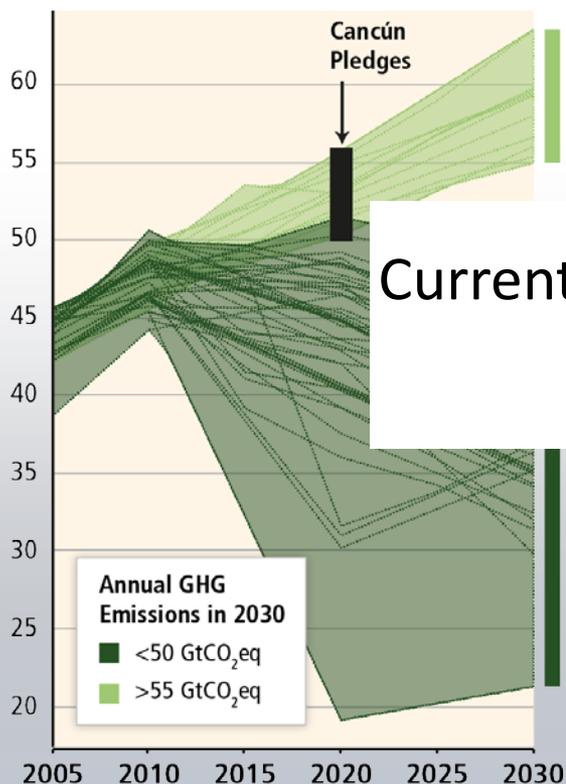
Share of Low Carbon Energy [%]



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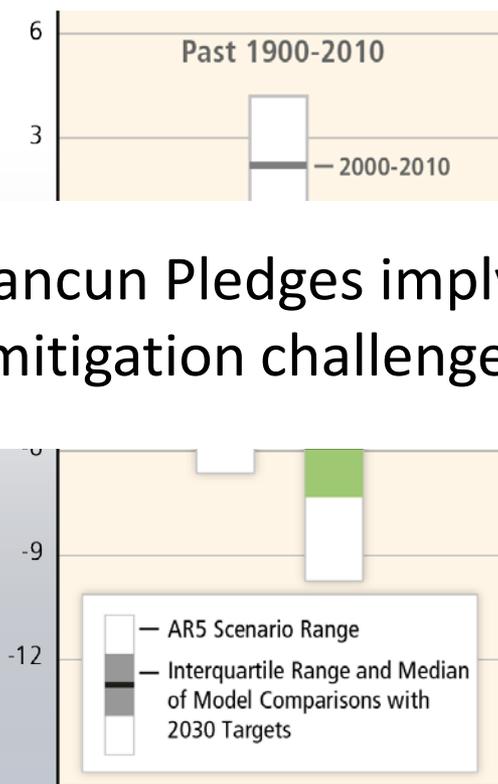
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GHG Emissions Pathways [GtCO<sub>2</sub>eq/yr]

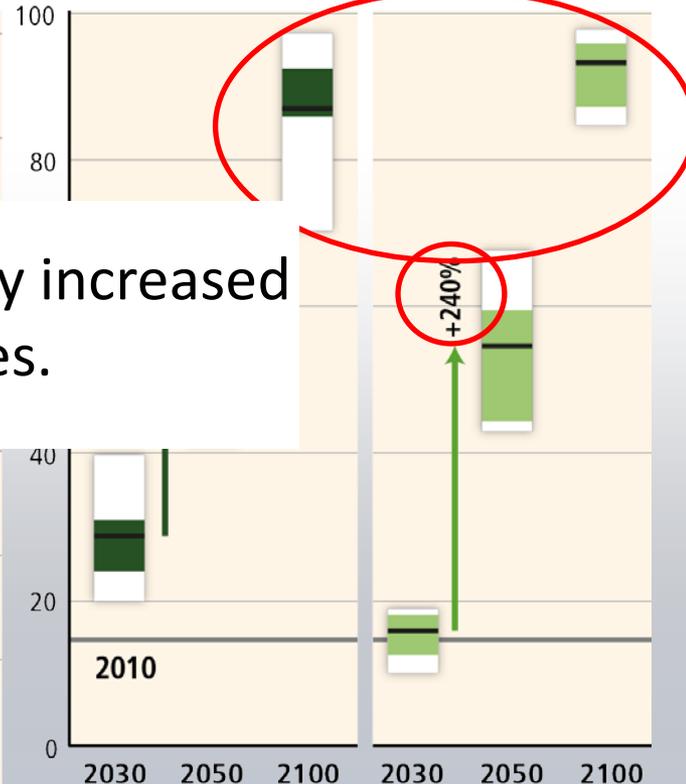


## After 2030

Rate of CO<sub>2</sub> Emission Change [%/yr]



Share of Low Carbon Energy [%]



Current Cancun Pledges imply increased mitigation challenges.

## Scientific evidence on the 1.5°C goal remains limited.

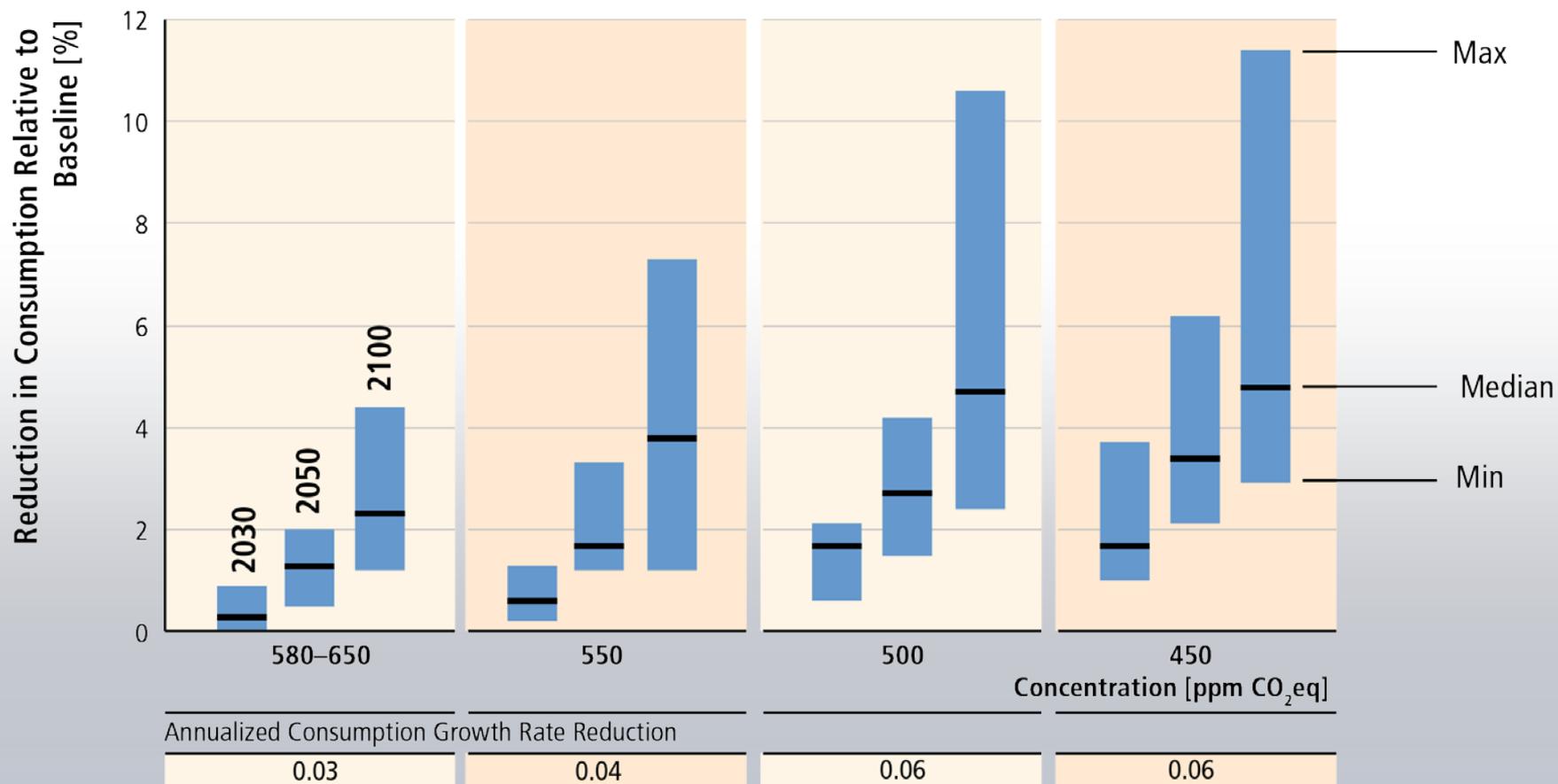
A comprehensive assessment is difficult in the absence of multi-model comparison studies and the limited number of studies focusing on the 1.5°C goal. Existing studies indicate:

- 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

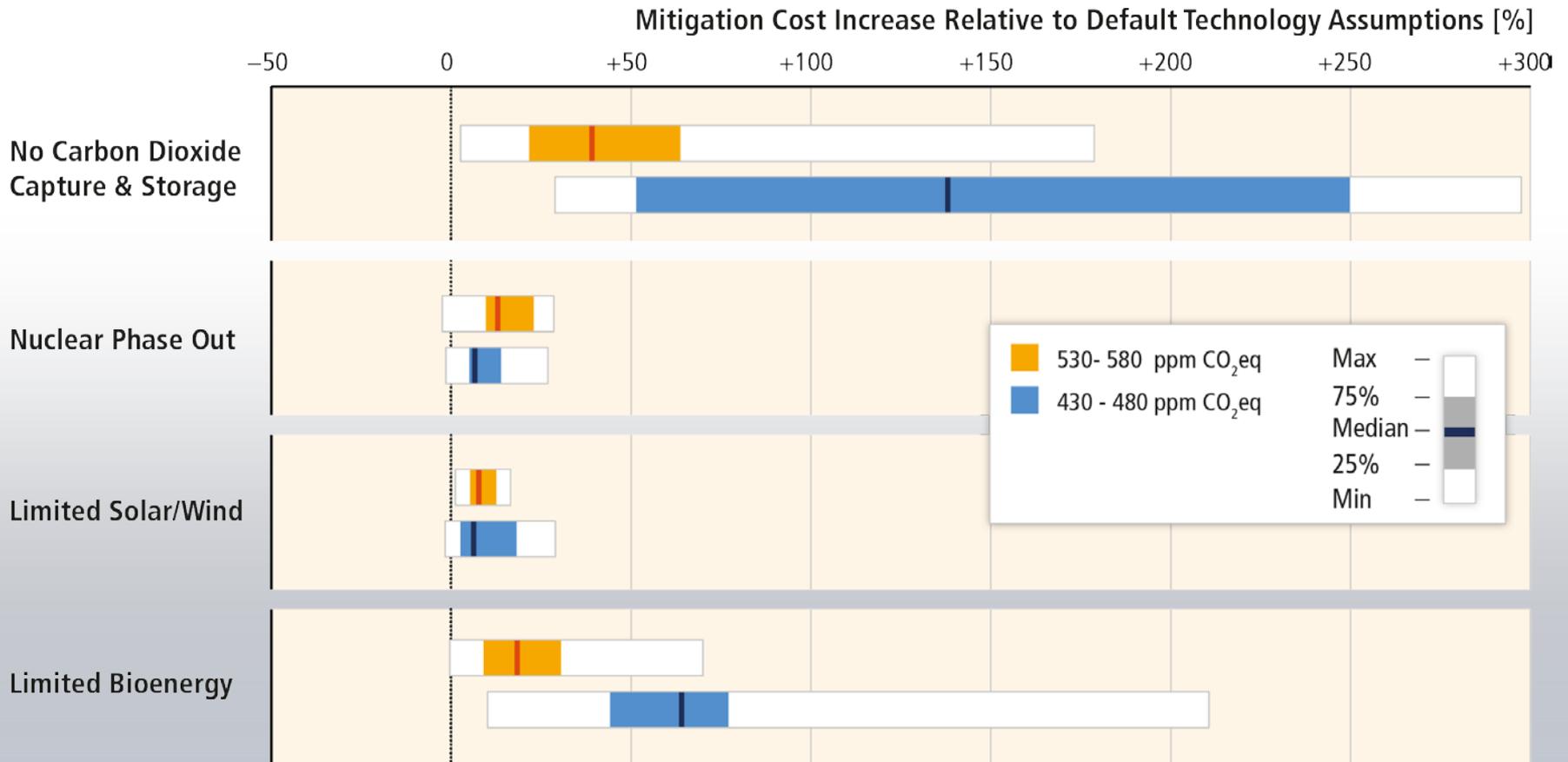
**Mitigation cost estimates vary, but global GDP growth is not strongly affected.**



# Global costs rise with the ambition of the mitigation goal.



# Limited availability of technologies can greatly increase mitigation costs.



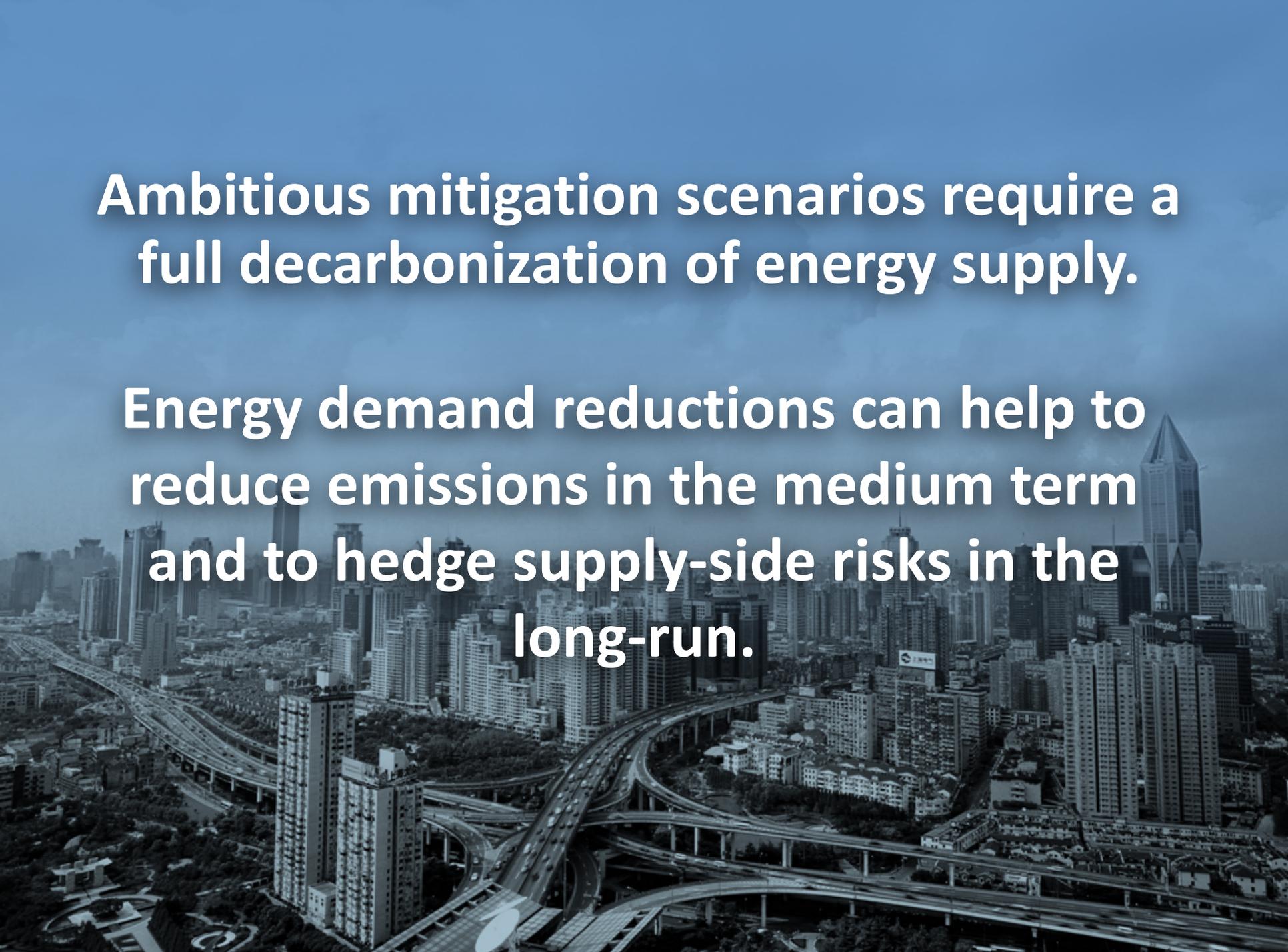


**#3**

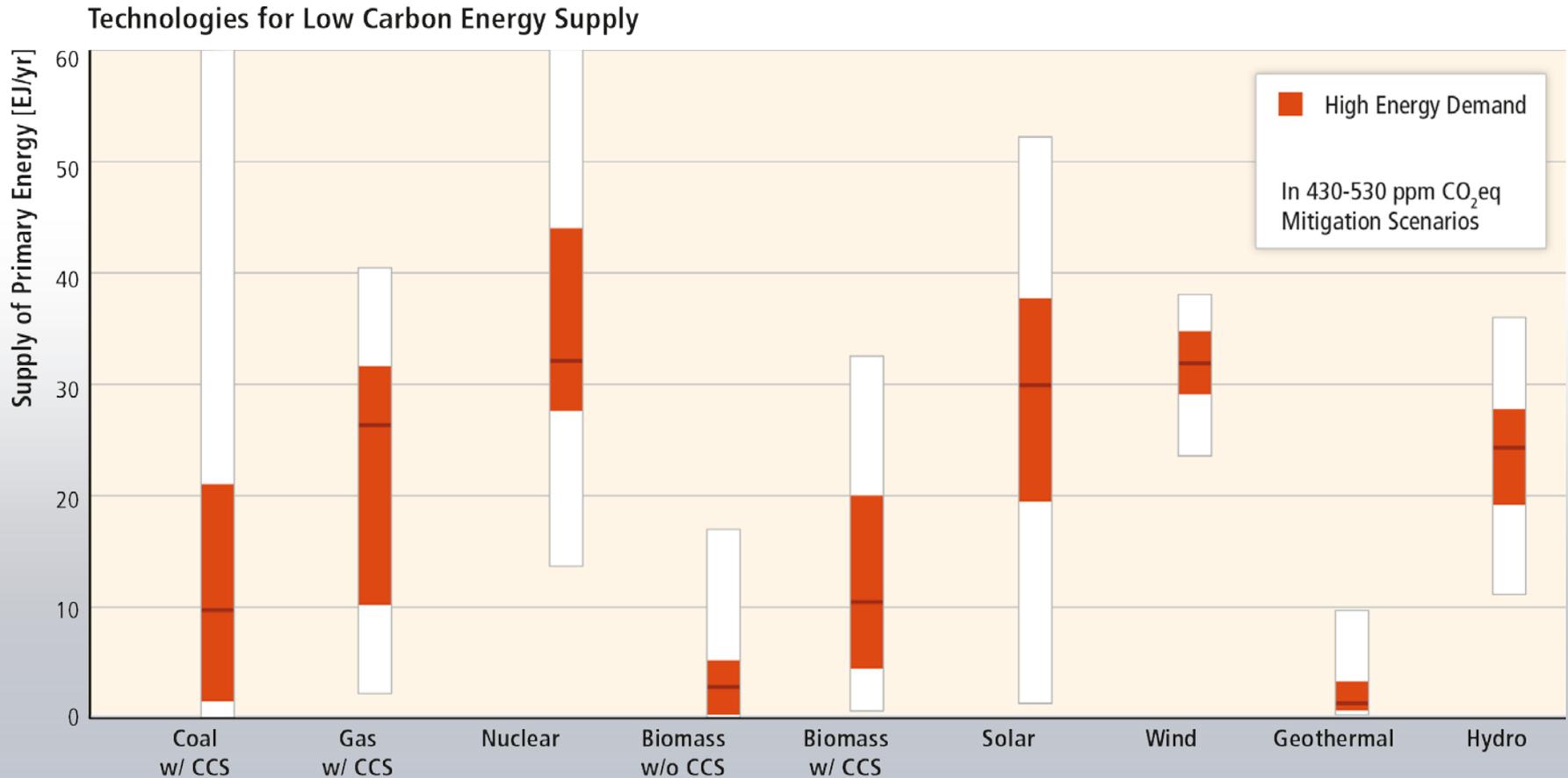
**What are the options for reducing GHG emissions?**

**Ambitious mitigation scenarios require a full decarbonization of energy supply.**

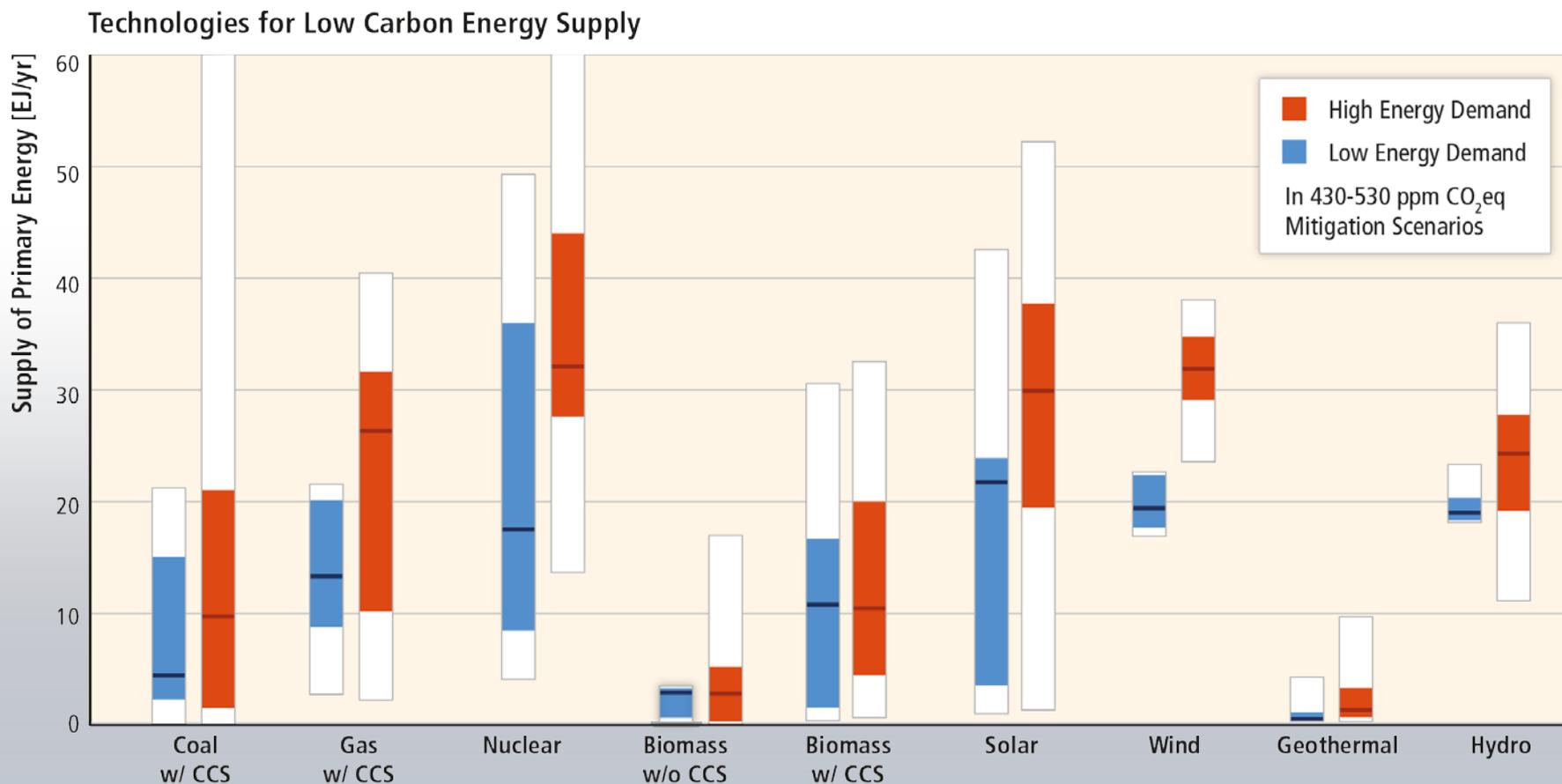
**Energy demand reductions can help to reduce emissions in the medium term and to hedge supply-side risks in the long-run.**



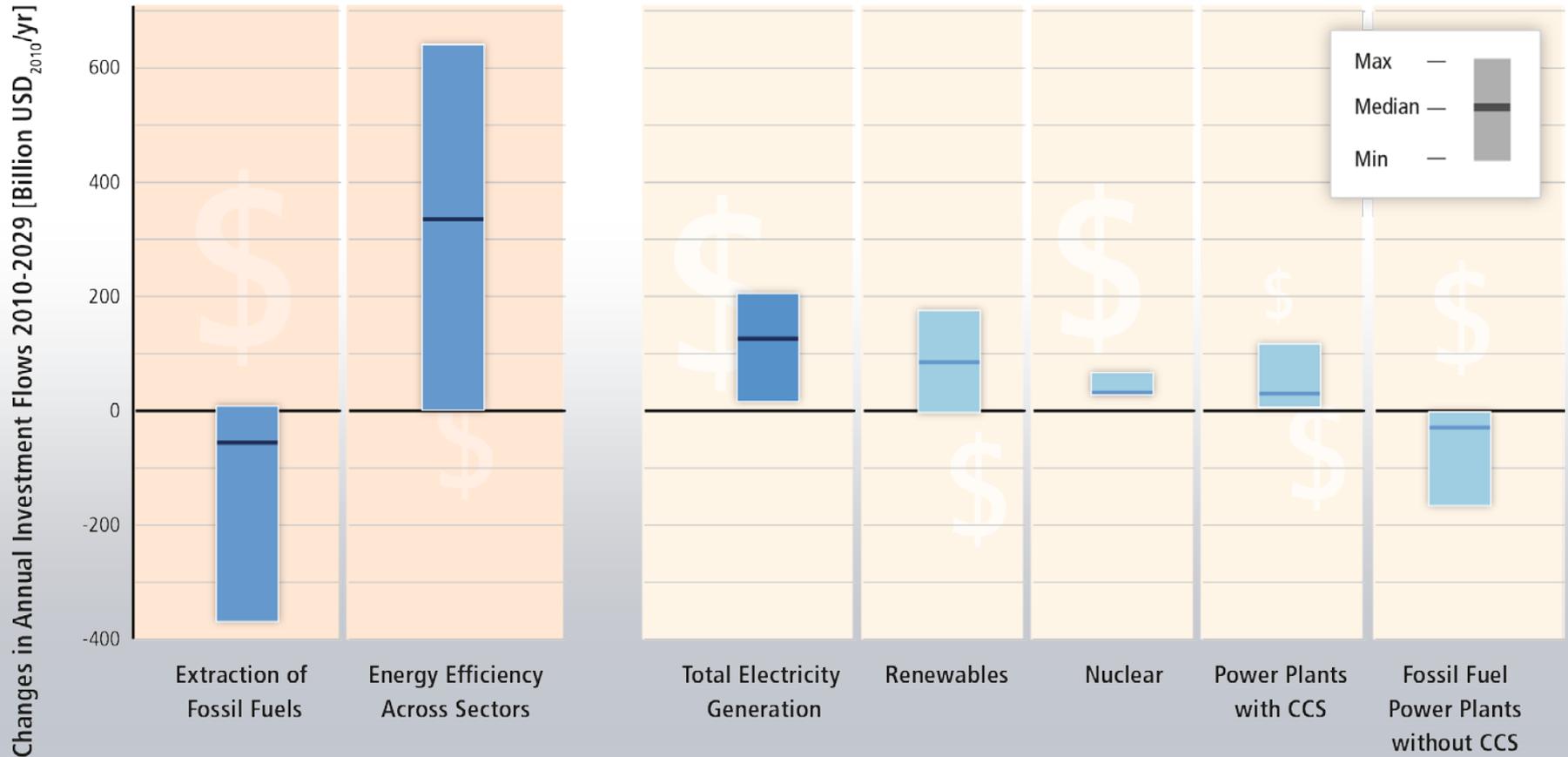
# Mitigation scenarios show there is a lot of flexibility in how to decarbonize energy supply.



# The scale of energy demand reductions determines the flexibility in decarbonization options and the extent of supply-side risks, infrastructure lock-in and co-benefits of mitigation.



# Substantial reductions in emissions would require substantial changes in investment patterns.



An aerial photograph of a city with a complex highway interchange and numerous skyscrapers. A large blue circle is overlaid in the upper center, containing the white text "#4".

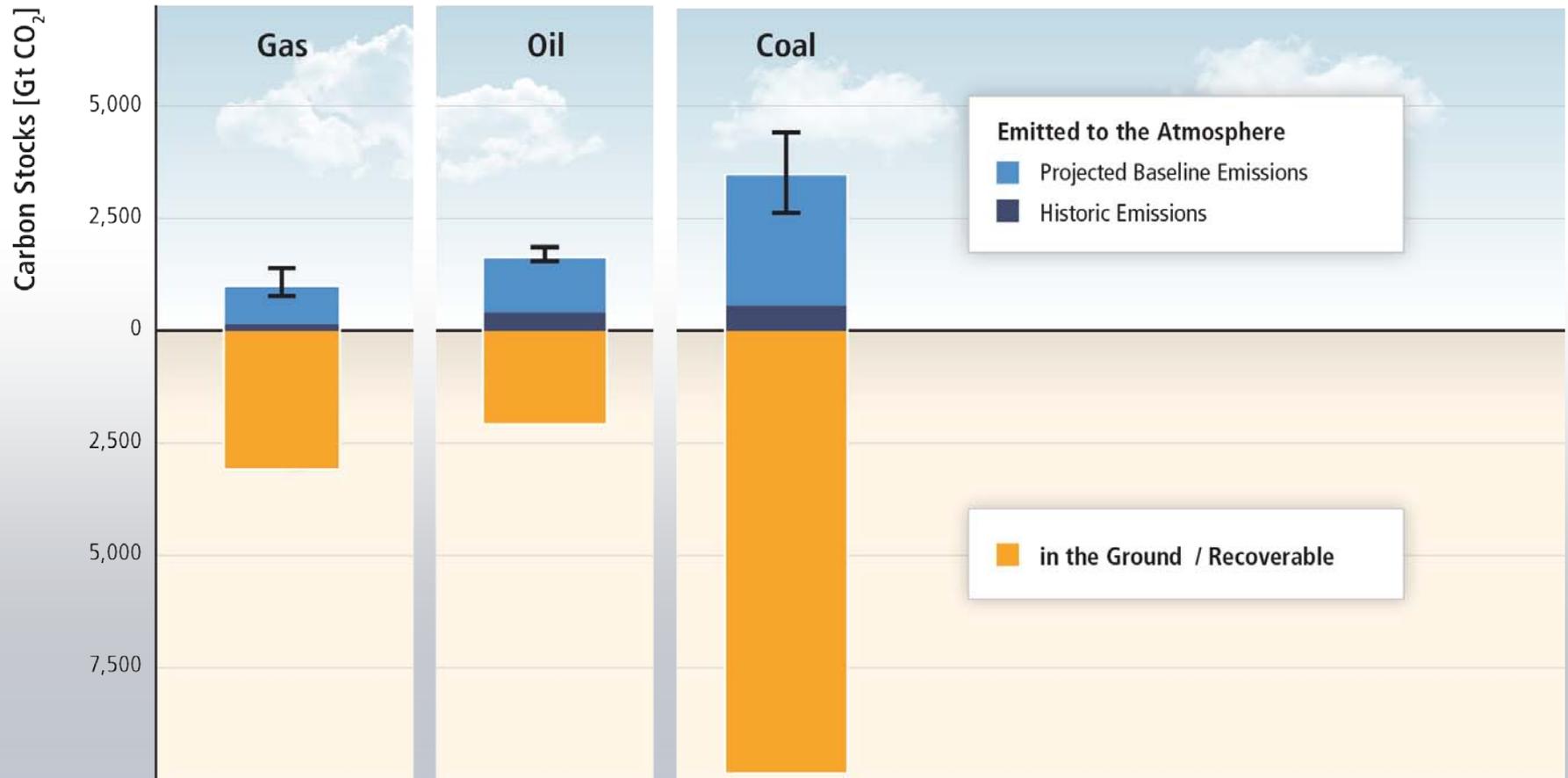
**#4**

**What is the role of international cooperation and national policies in reaching mitigation goals?**

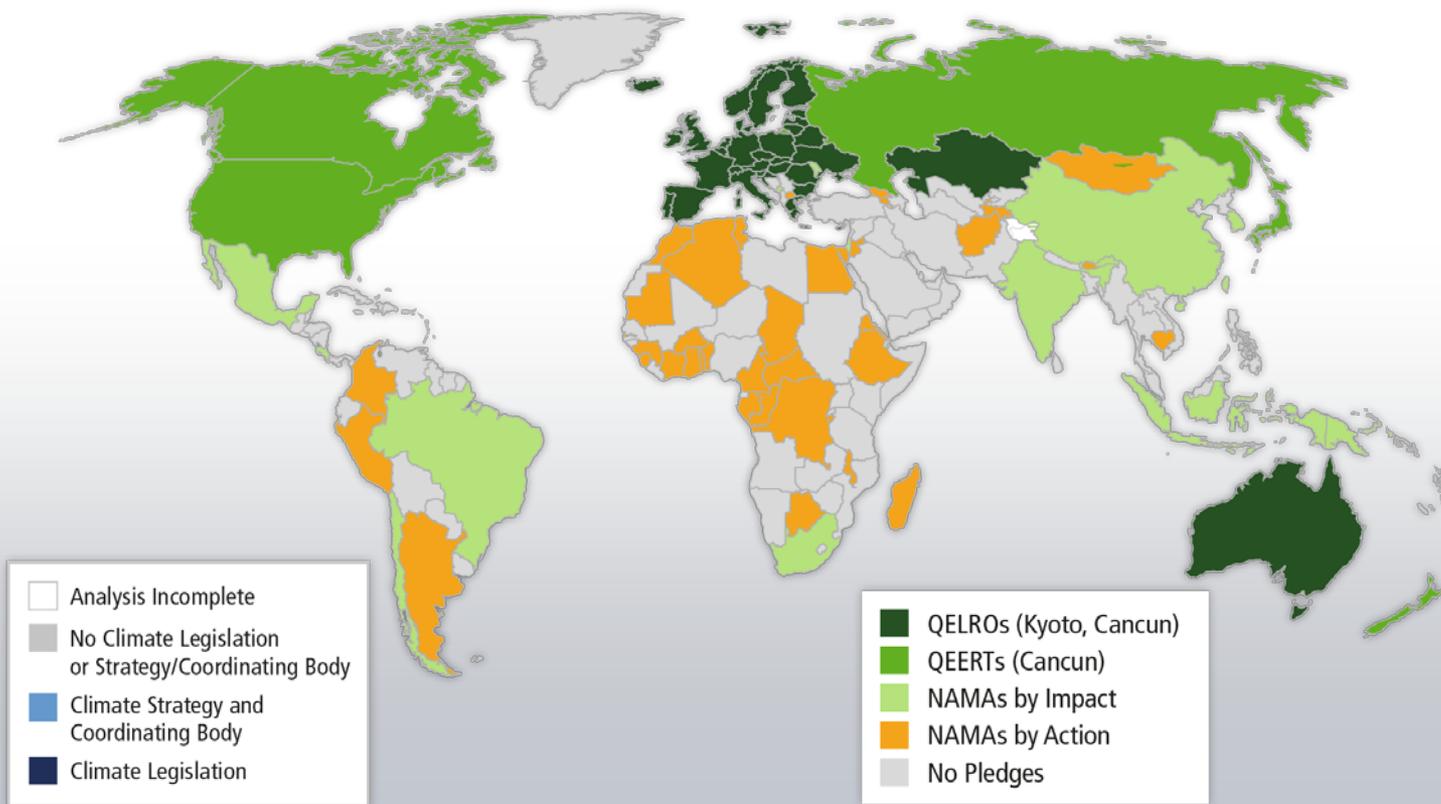
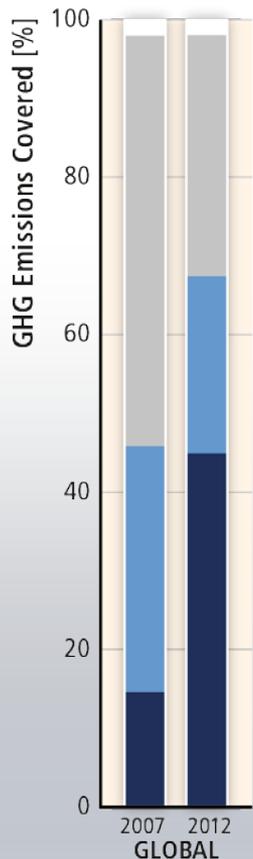
**Climate change mitigation is a global commons problem that requires international cooperation and coordination across scales.**



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



# The number of climate change policies at the national and international level is growing. So far, these policies have not influenced the emission trend significantly.



# Examples of the performance of emission taxes

## UK Climate Change Levy: 10% tax on electricity use

- Electricity use reduction >22% at plants subject to the levy compared to plants with voluntary agreement
- No evidence of detrimental effect on the economy or migration of industry

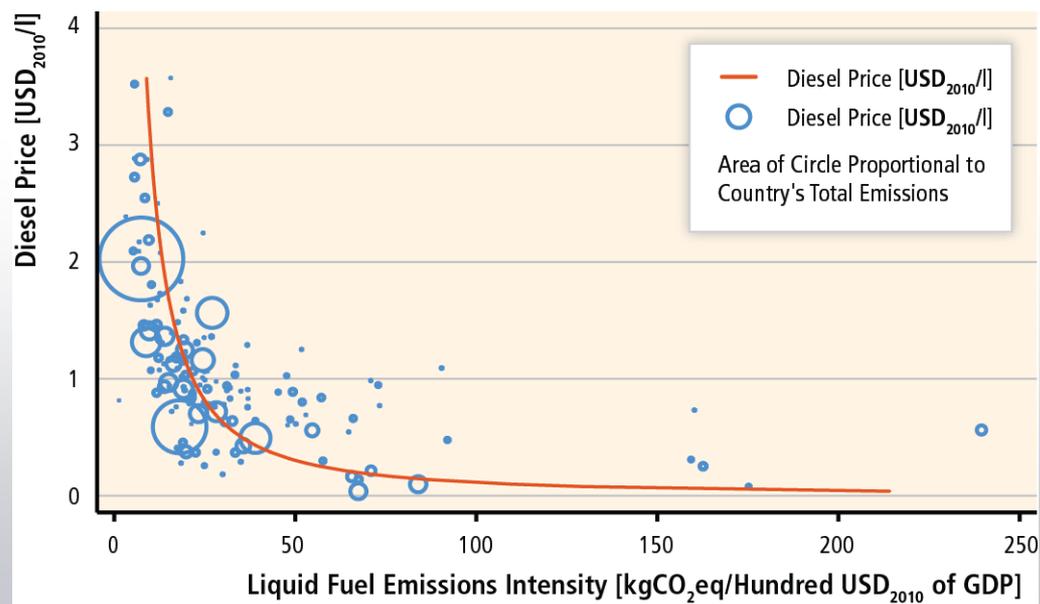
## Swedish carbon tax

- Reductions in carbon intensity of GDP of 40%

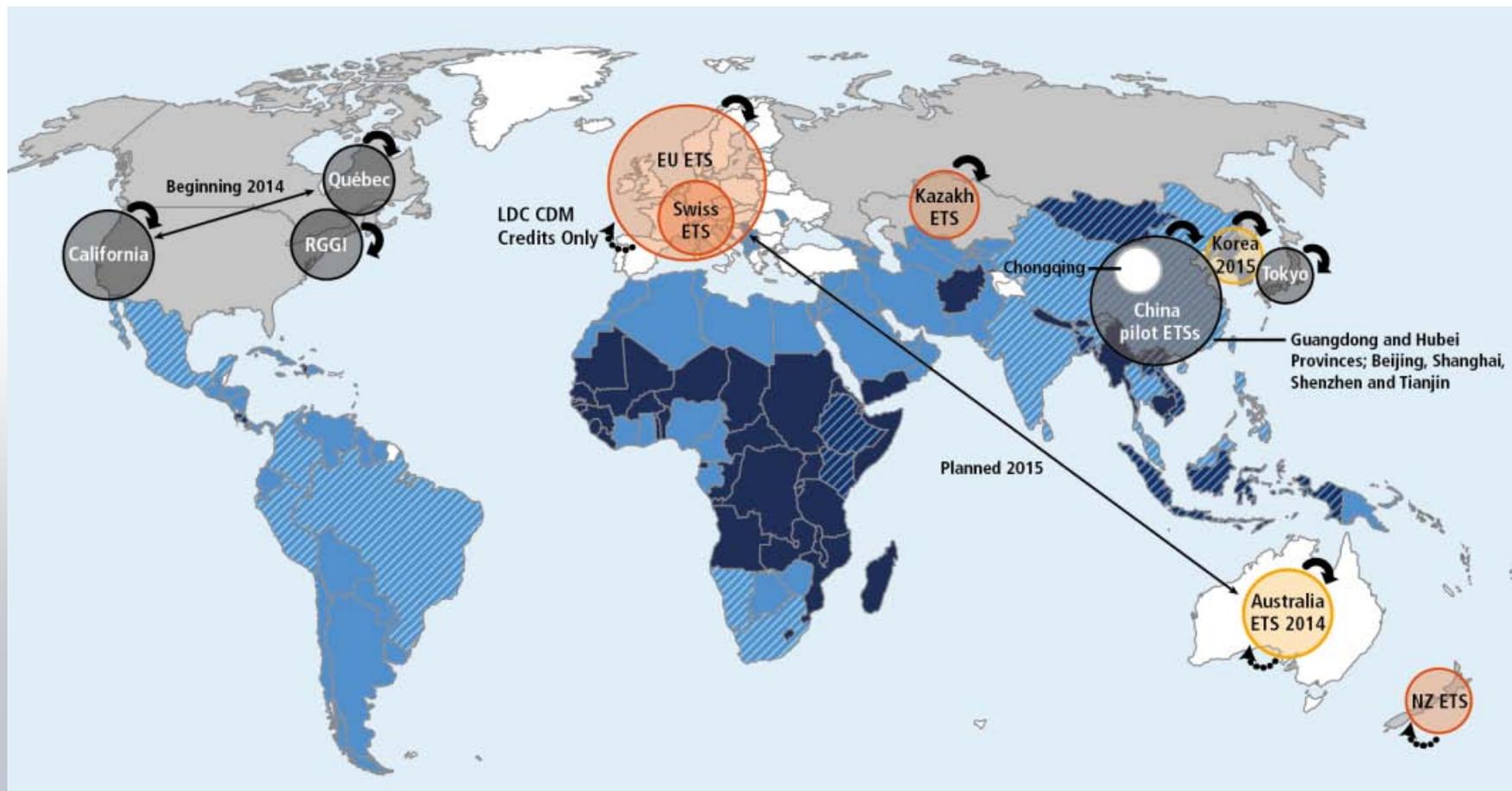
# Examples of the performance of emission taxes

## Fuel taxes

- In the long run 10% higher fuel prices will lead to a roughly 7% reduction in fuel use and emissions
- OECD could have decreased fuel use by more than 35% if all member countries had chosen taxes as high as in the UK



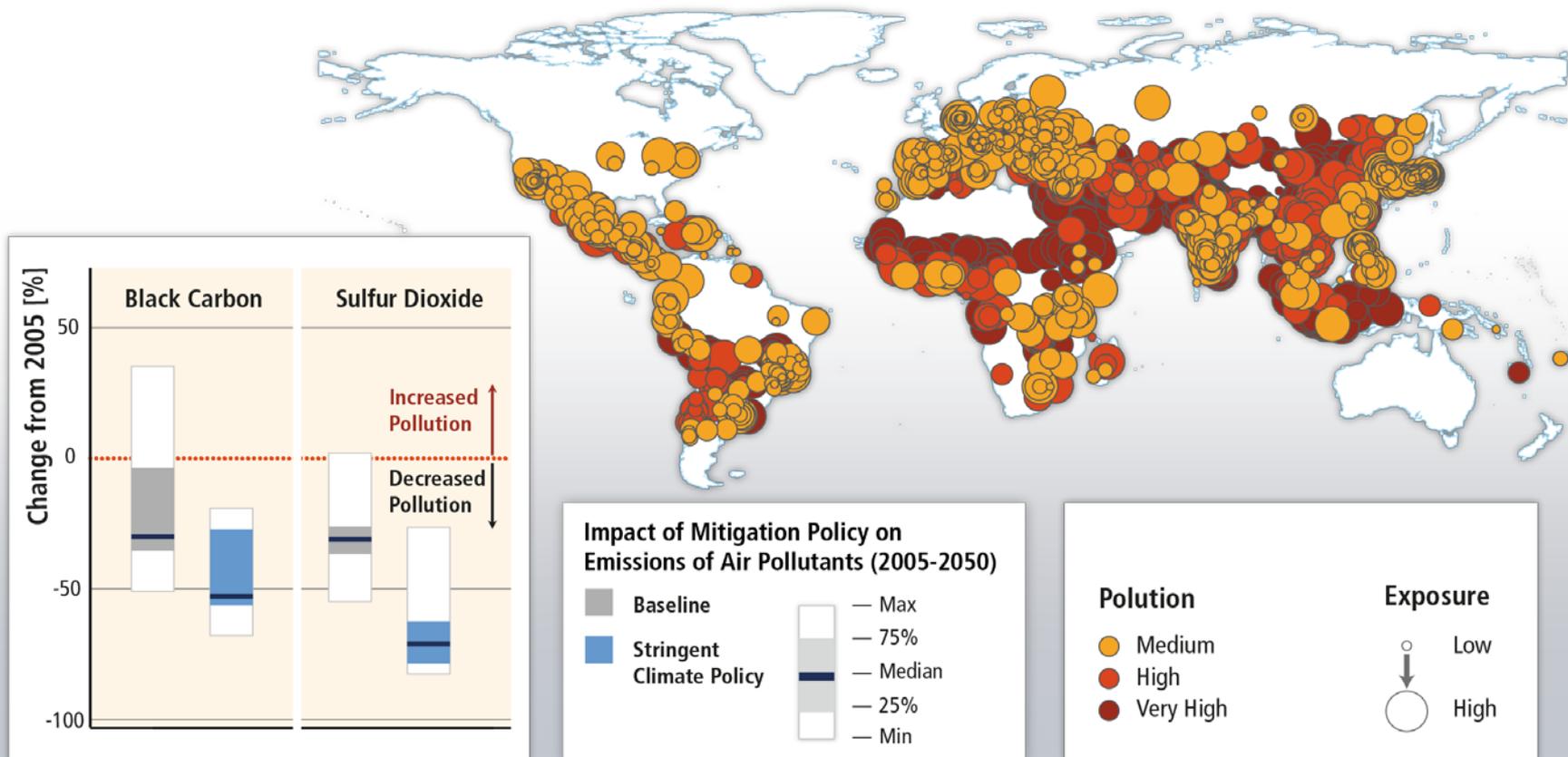
# Regions are starting to cooperate.



## International climate policy is only slowly taking shape.

- The UNFCCC regime is the only platform with broad legitimacy.
- Cooperation outside the UNFCCC has increased but except for the Montreal Protocol did not lead to significant emissions reduction.
- The Kyoto Protocol was less successful than envisaged.
  - The emissions commitments were reached, benefitting from economic changes in countries in transition.
  - The market mechanisms have mobilized low-cost mitigation, whose additionality is however debated.

# Mitigation can result in large co-benefits for human health and other societal goals.



# Some final thoughts beyond IPCC

- After all, carbon pricing is a good a idea: Taxing bads instead of goods.
- Finance ministers might be interested in carbon pricing even if they doubt scientific evidence of climate change.
- Infrastructure investments can create short-term benefits.

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[www.mitigation2014.org](http://www.mitigation2014.org)