

# CLIMATE CHANGE 2014

## *Mitigation of Climate Change*

**Igor Bashmakov**

CLA. Chapter 7. WGIII. IPCC  
Center for Energy Efficiency

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

**1 Summary for Policymakers**

**1 Technical Summary**

**16 Chapters**

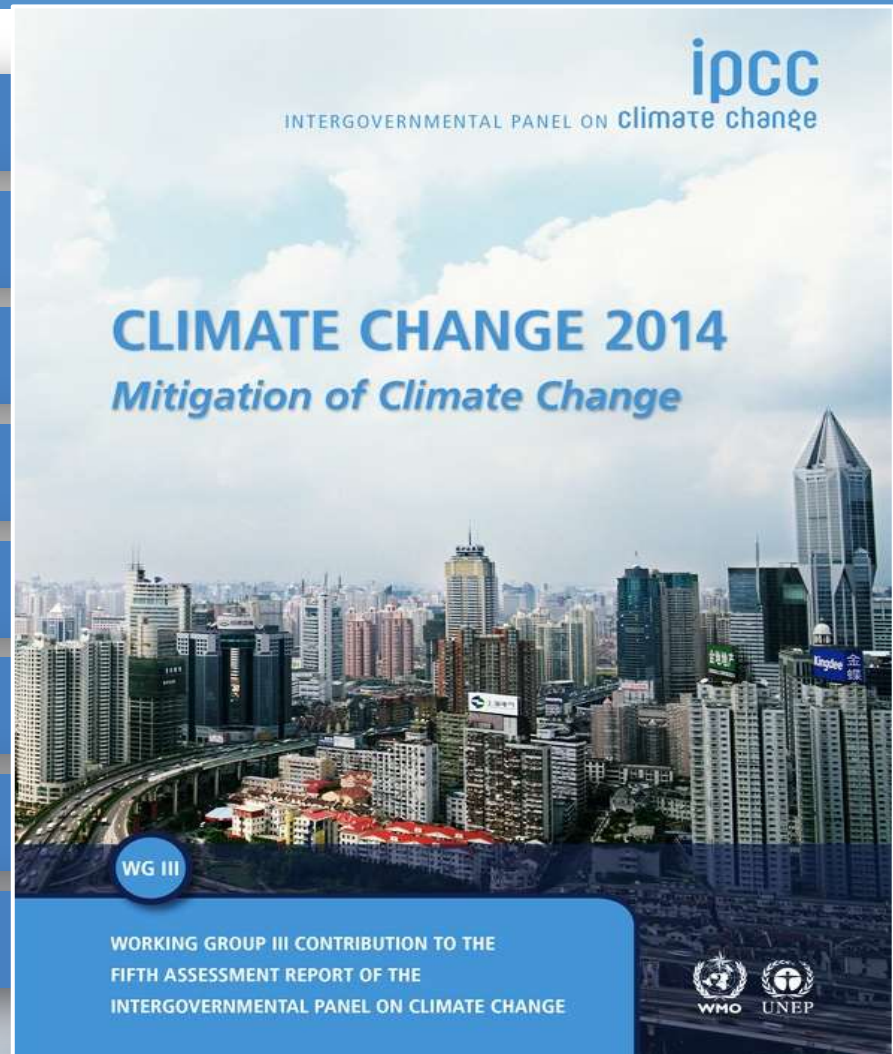
**Only 2 from RF. 235 Authors**

**900 Reviewers**

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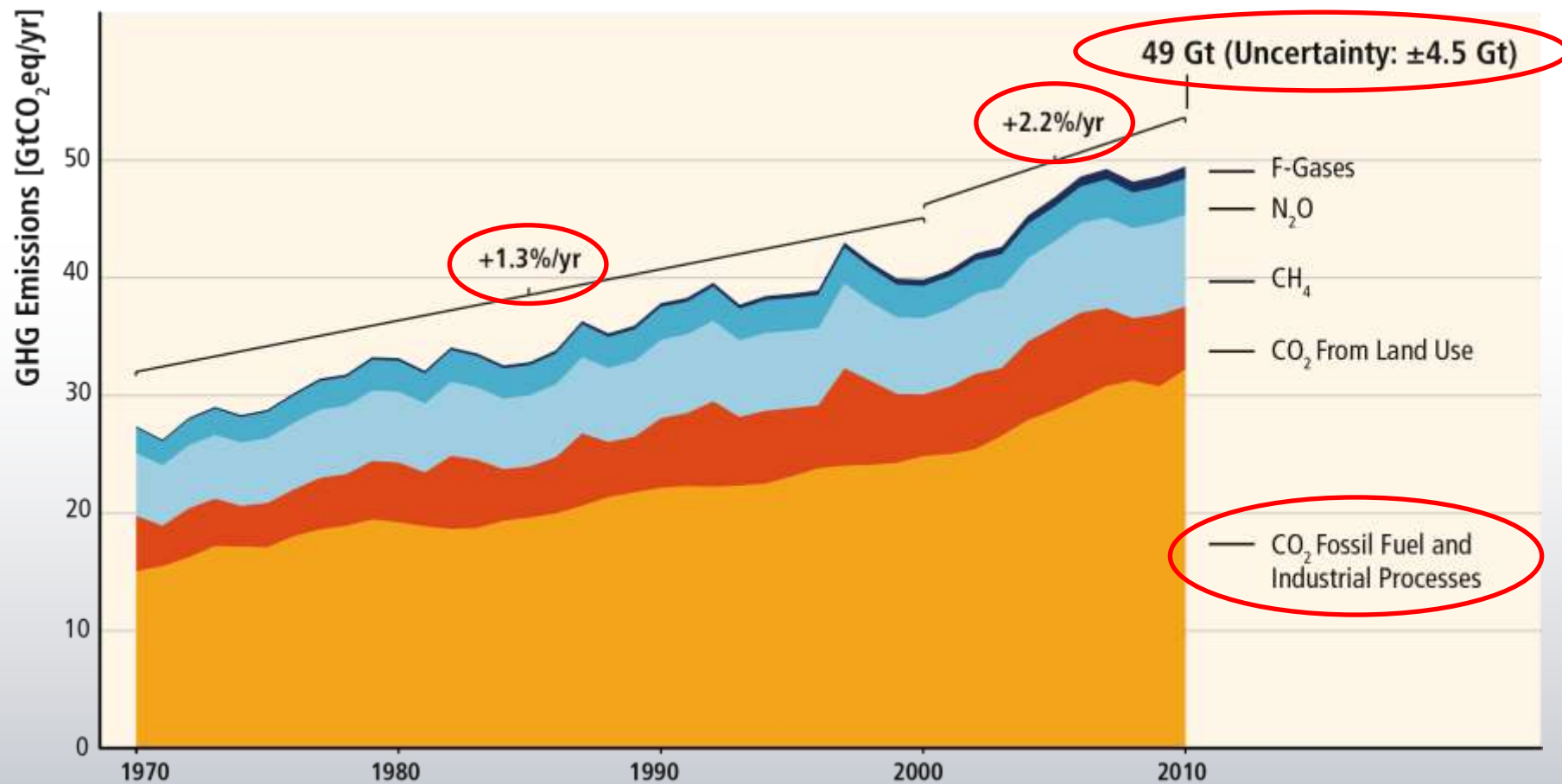




A high-angle, blue-tinted photograph of an industrial mining or processing site. In the upper right, a yellow bulldozer is positioned on a large, dark, textured pile of material, likely coal or ore. The bulldozer's blade is lowered, and it appears to be working on the surface. In the lower left, a conveyor belt system is visible, with a large pile of the same dark material at its end. The entire scene is bathed in a monochromatic blue light, creating a somber and industrial atmosphere. The text "GHG emissions growth has accelerated despite reduction efforts." is overlaid in white, bold, sans-serif font across the center of the image.

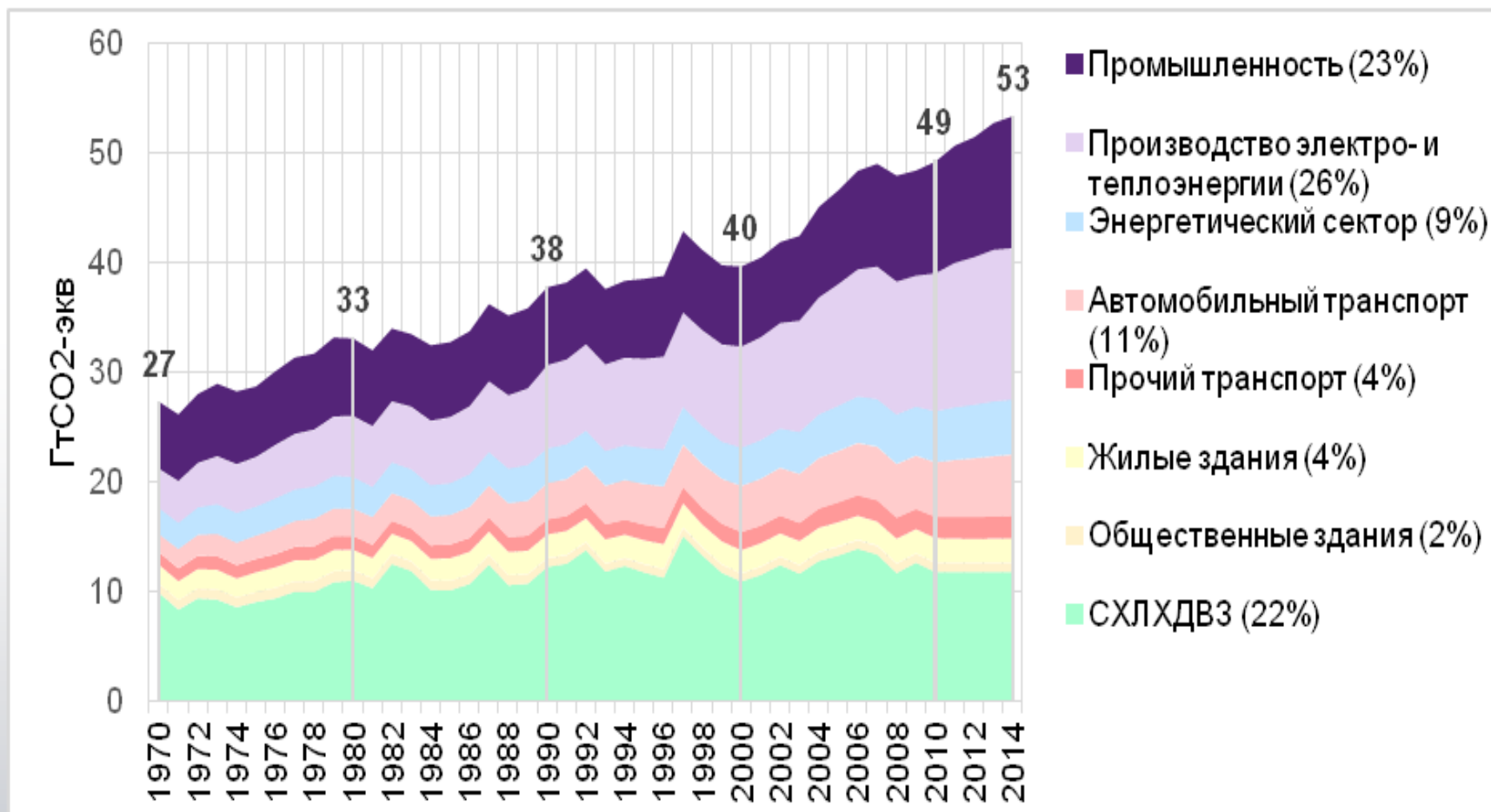
**GHG emissions growth has accelerated  
despite reduction efforts.**

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



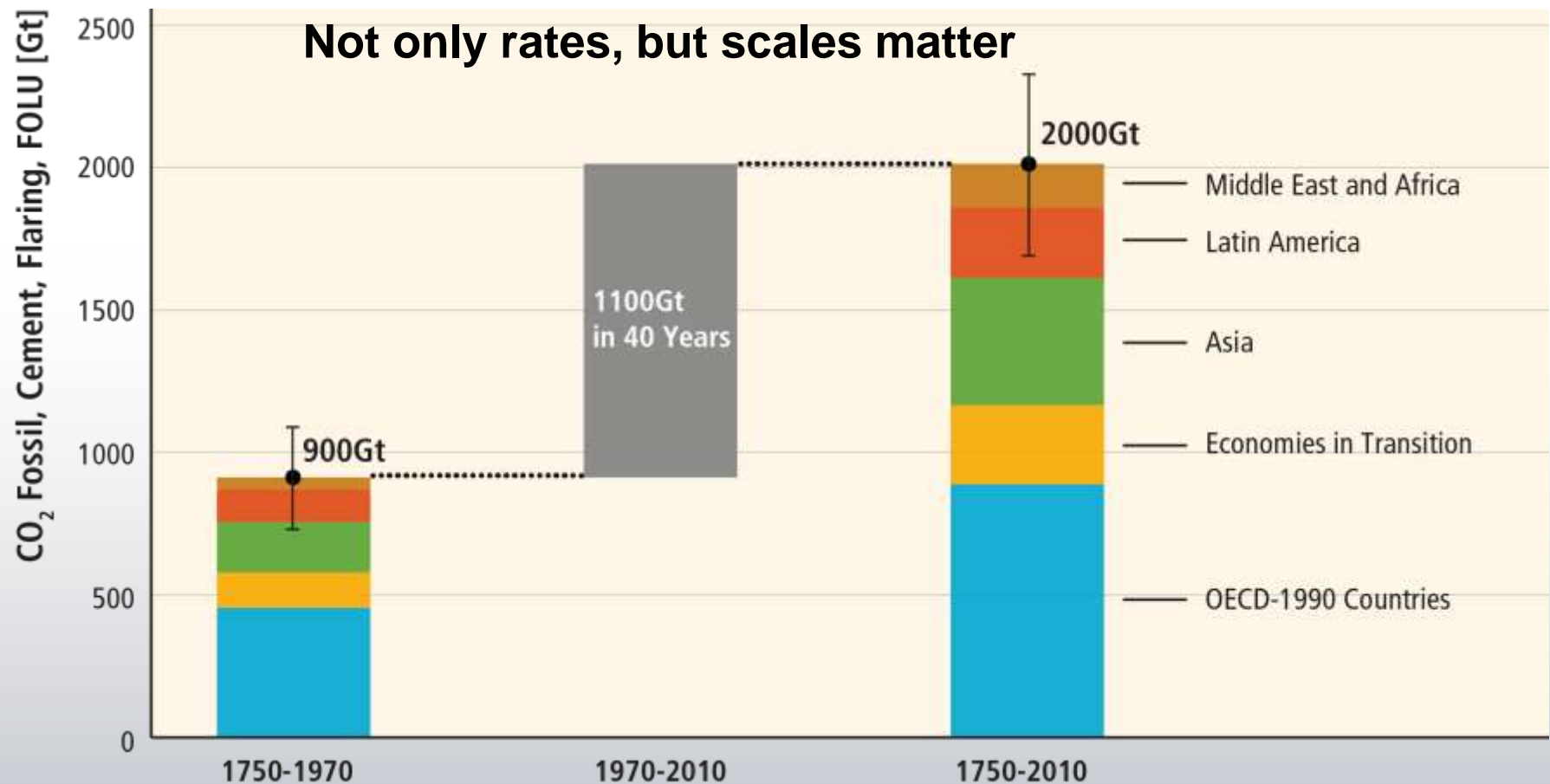
Based on Figure 1.3

**В 2011-2014 гг. антропогенная глобальная эмиссия ПГ росла примерно такими же темпами, как и в 2001-2010 гг., и к 2014 г. превысила 52 млрд т  $\text{CO}_2\text{экв}$**



**В 2014 г. при росте мирового ВВП на 3% выбросы ПГ не выросли**

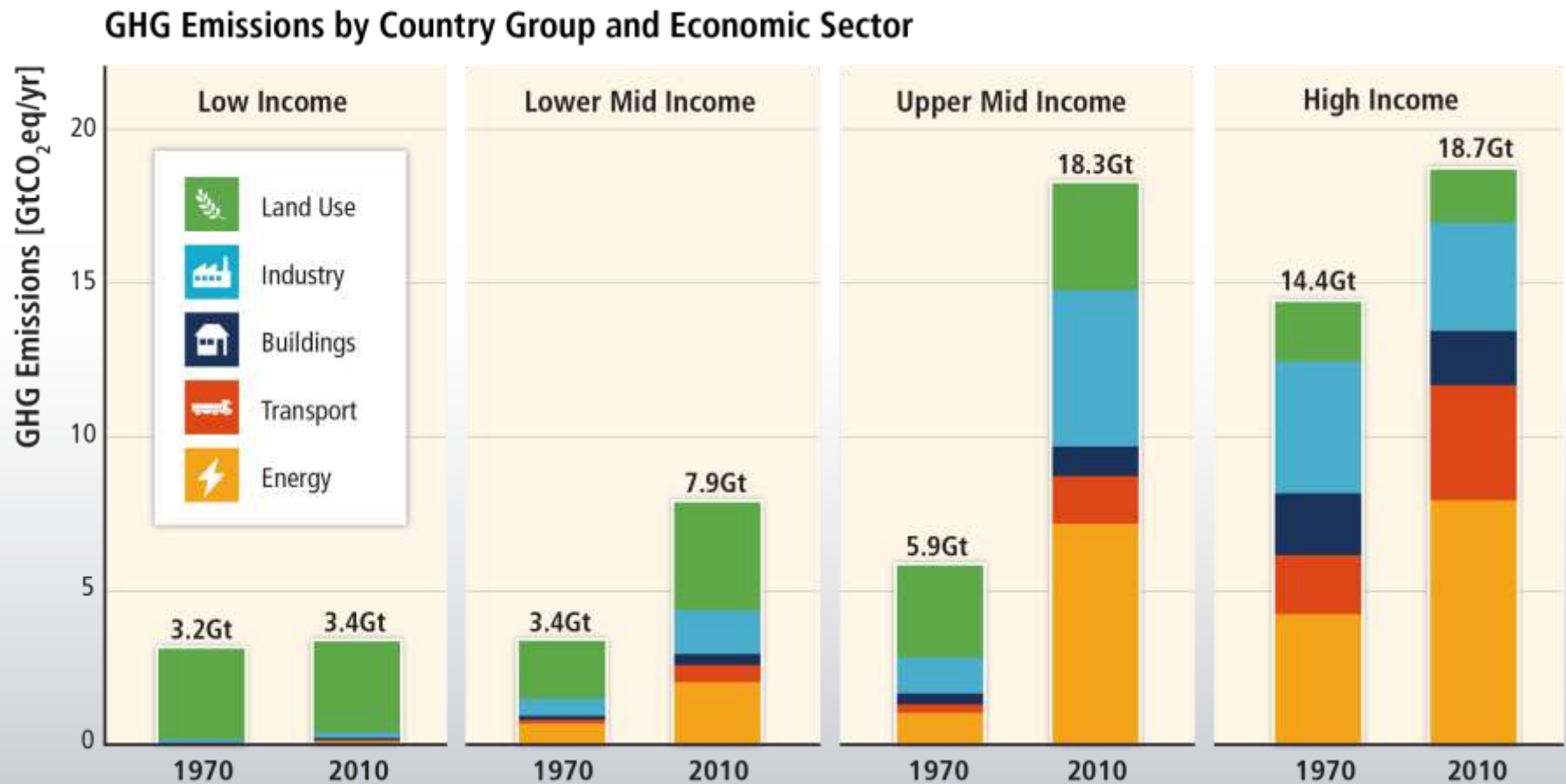
About half of cumulative anthropogenic CO<sub>2</sub> emissions between 1750 and 2010 have occurred in the last 40 years.



Based on Figure 5.3

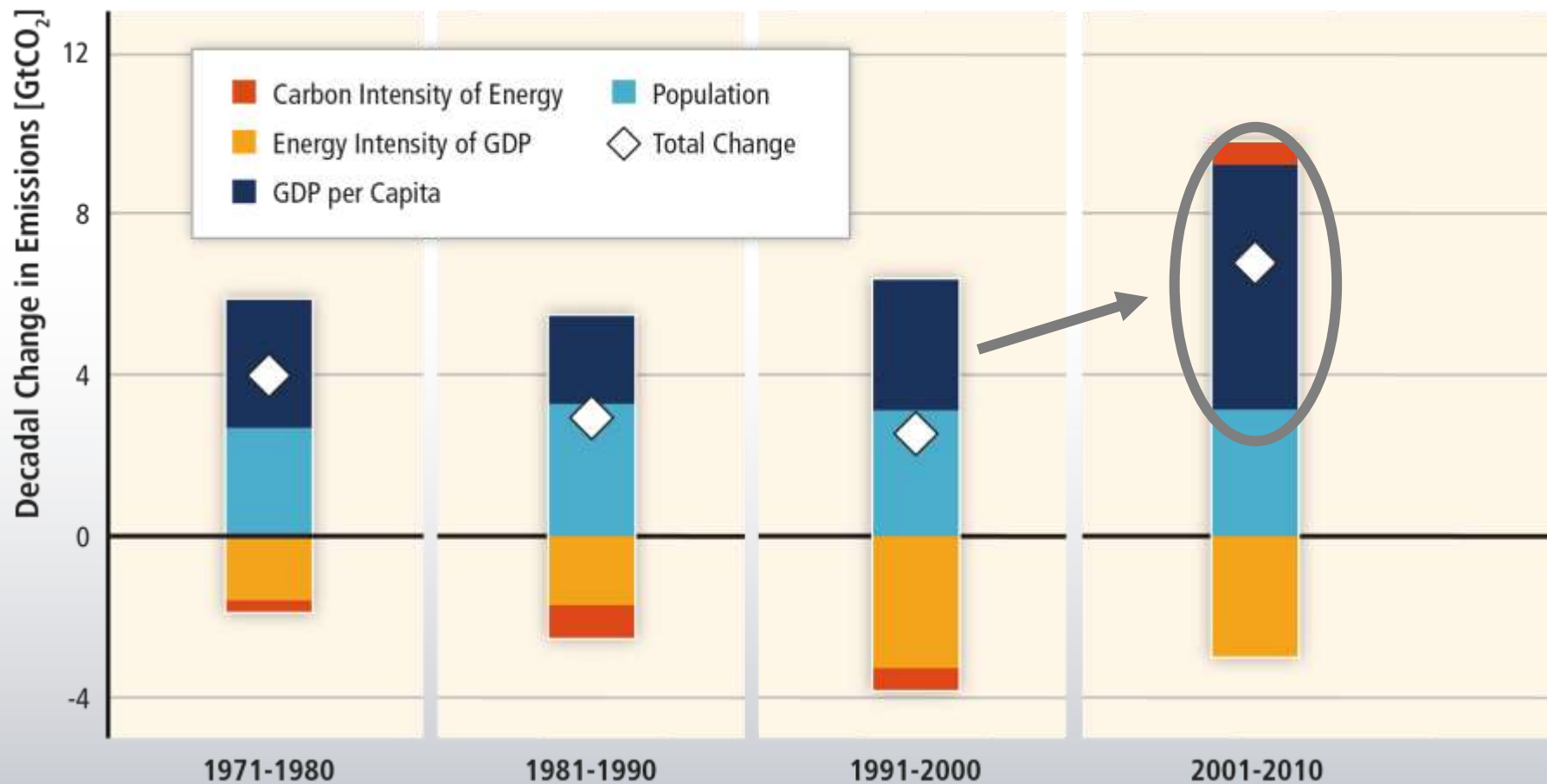


# Regional patterns of GHG emissions are shifting along with changes in the world economy.



Based on Figure 1.6

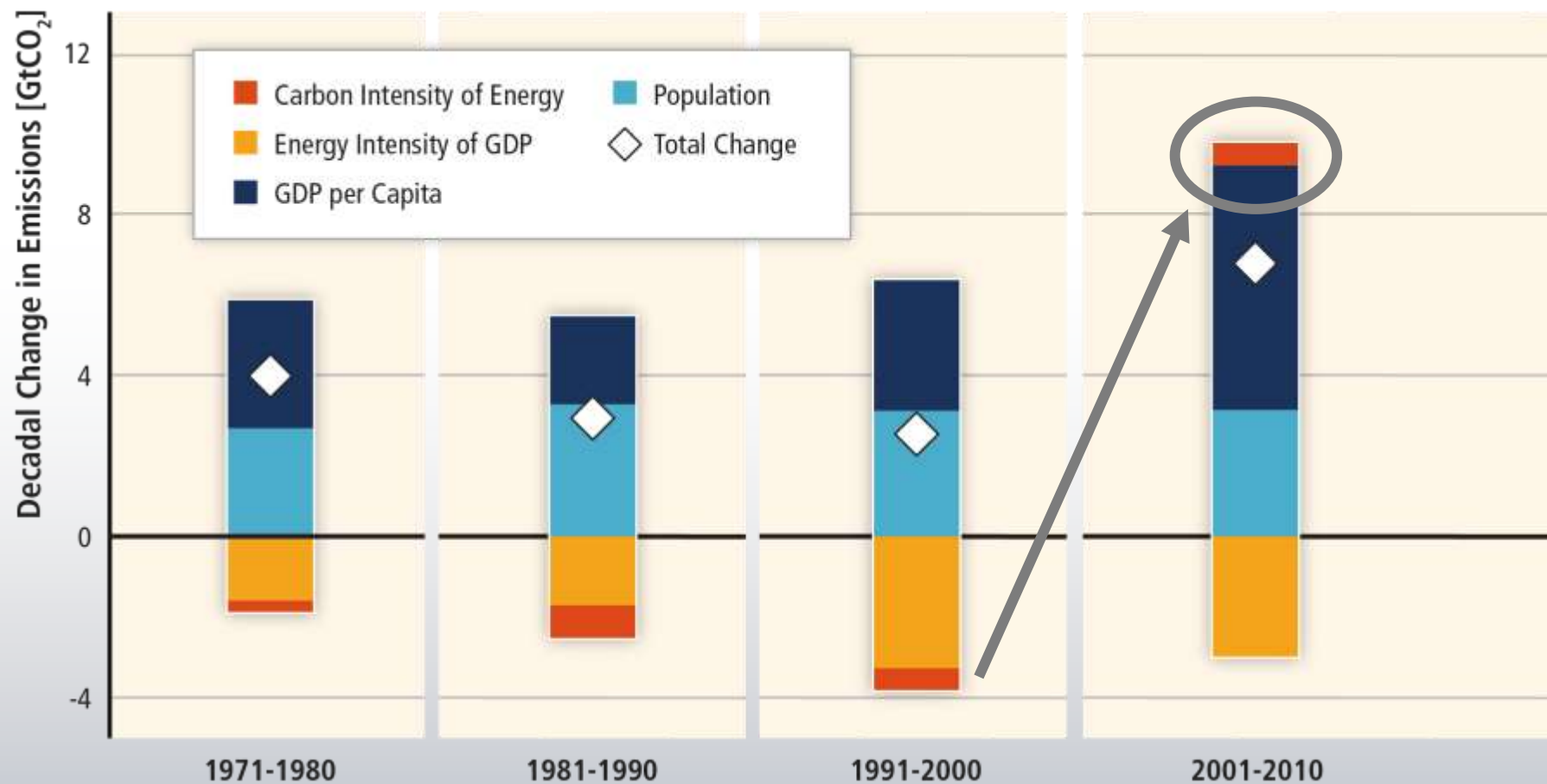
# GHG emissions rise with growth in GDP and population; long-standing trend of decarbonisation of energy reversed.



Based on Figure 1.7



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

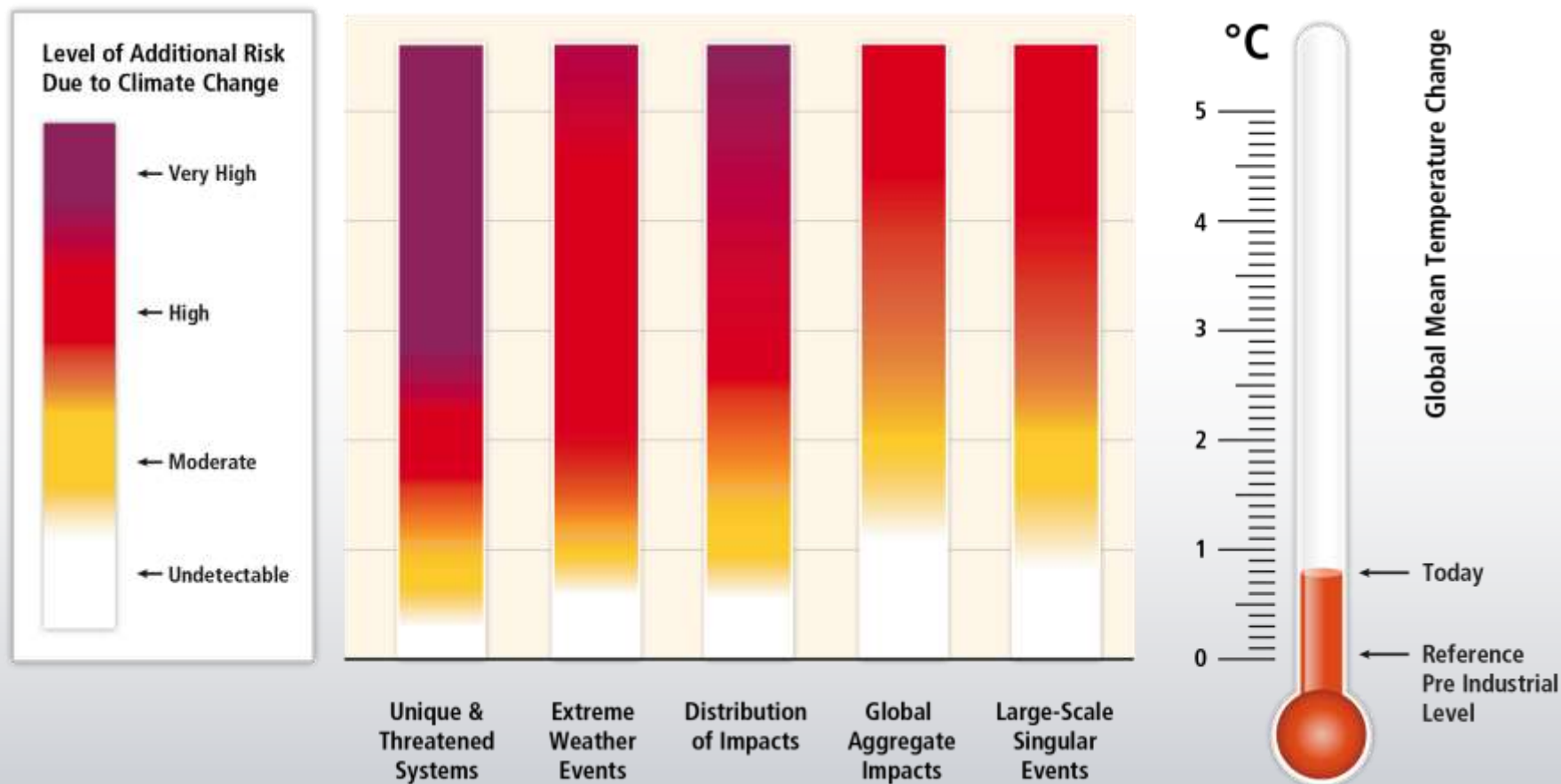


Based on Figure 1.7

An aerial photograph of a sprawling urban landscape, likely Hong Kong, featuring a dense cluster of skyscrapers and a complex multi-level highway interchange in the foreground. The image is overlaid with a semi-transparent blue filter. Centered over the image is white text.

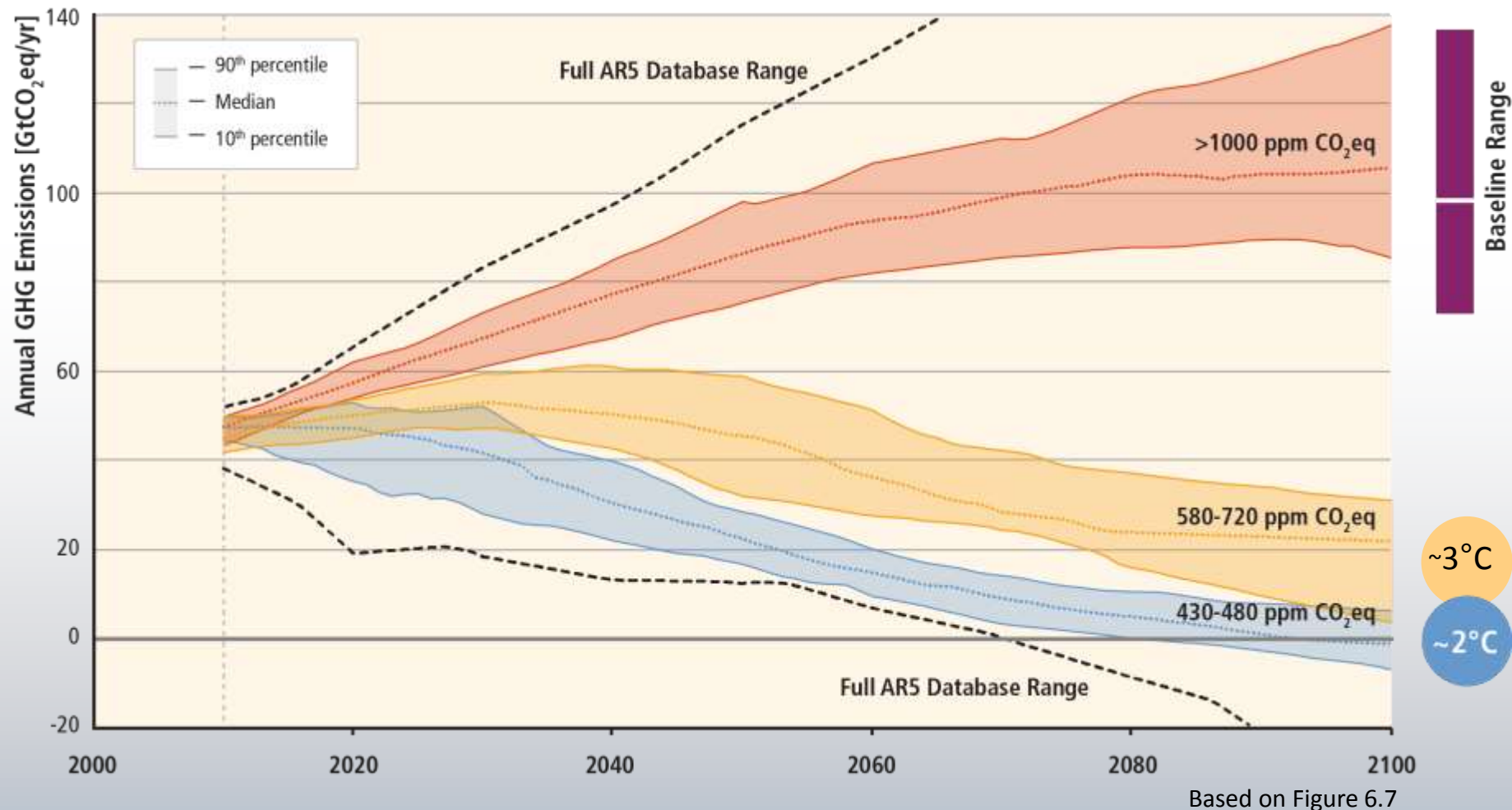
**Limiting warming to 2°C involves substantial technological, economic and institutional challenges.**

Without additional mitigation, global mean surface temperature is projected to increase by 3.7 to 4.8°C over the 21<sup>st</sup> century.



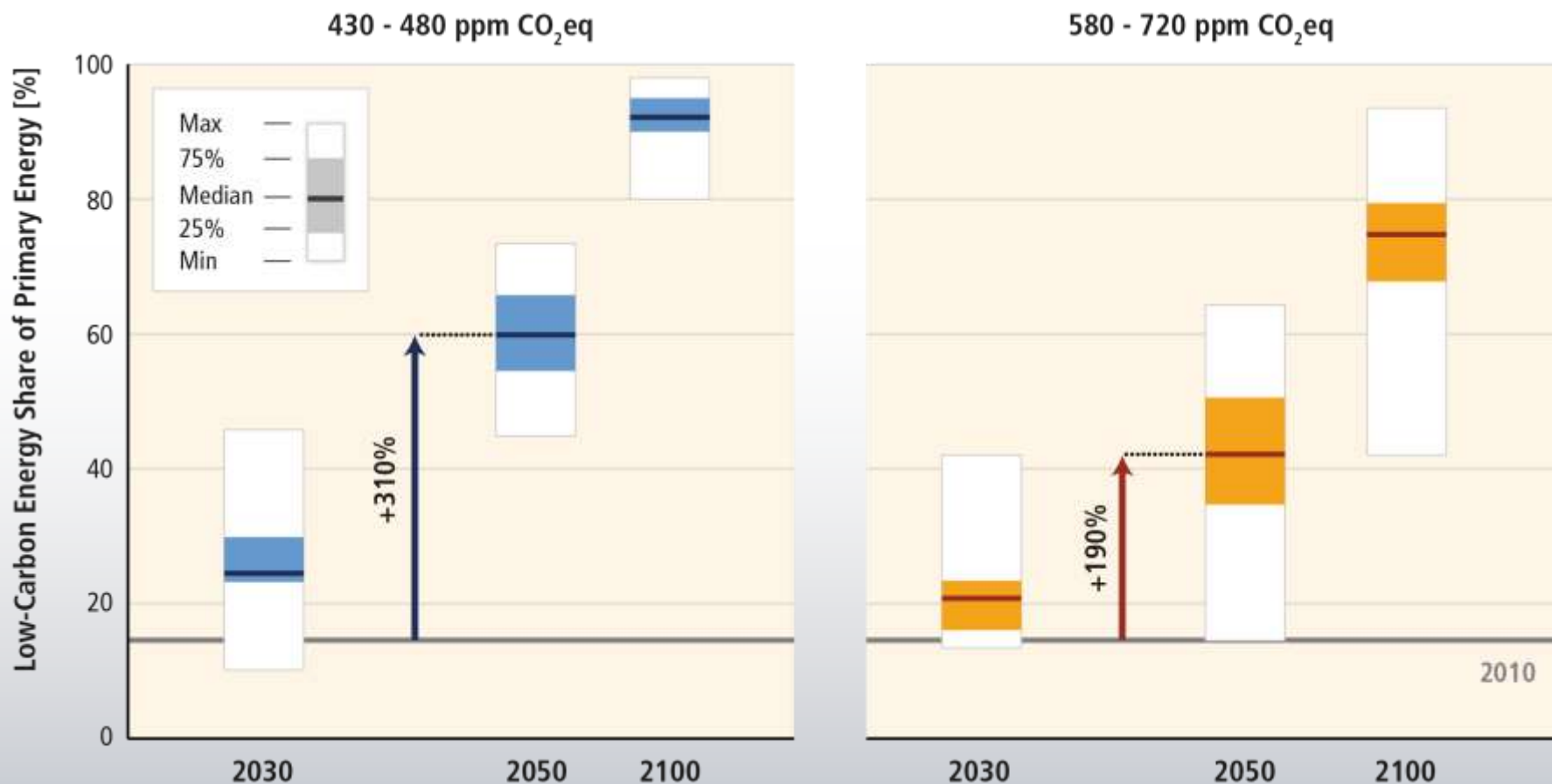
Based on WGII AR5 Figure 19.4

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



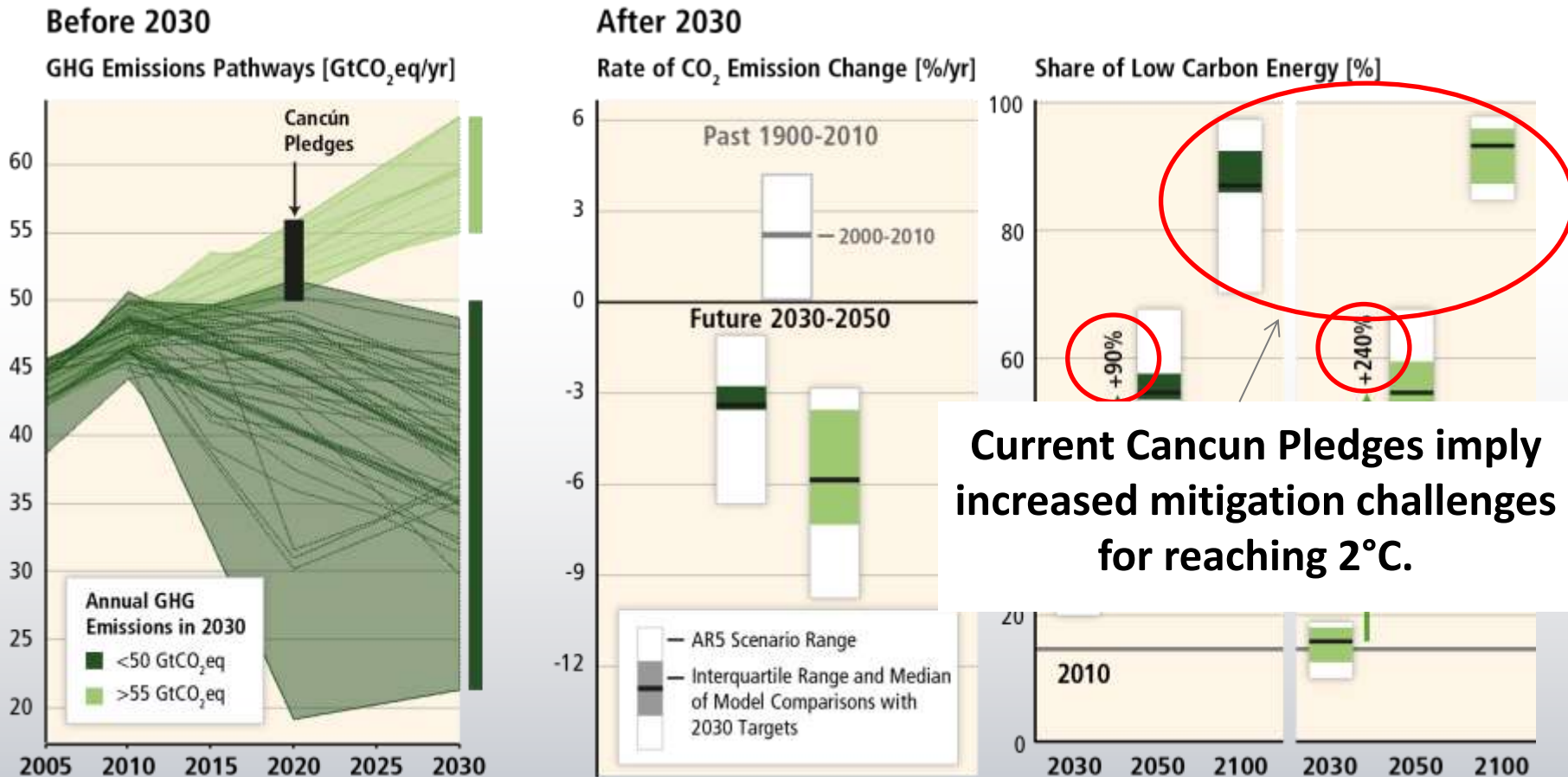


# Mitigation involves substantial upscaling of low-carbon energy.



Based on Figure 7.16

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

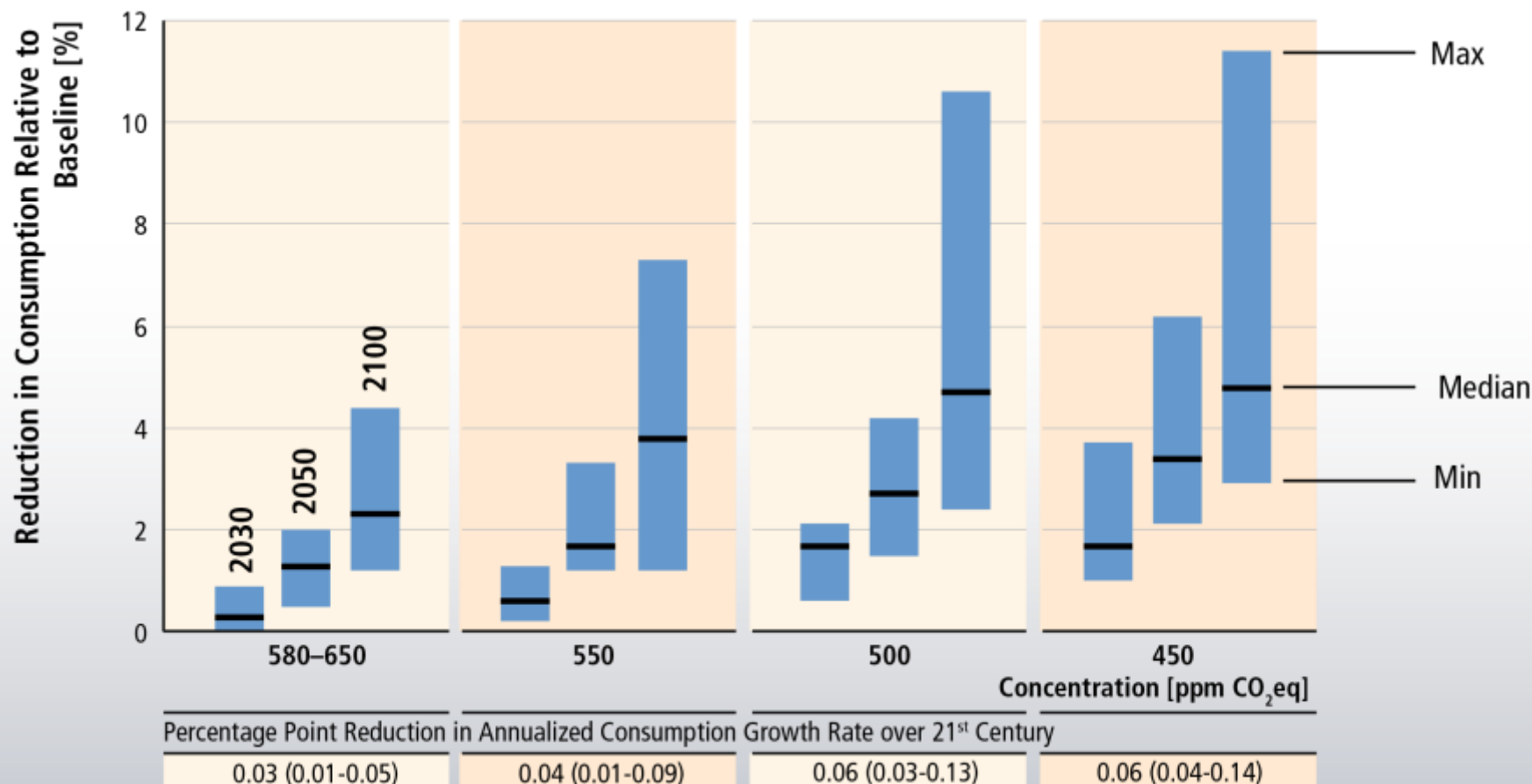


Based on Figures 6.32 and 7.16

An aerial view of a large container ship sailing on the ocean. The ship is white with a red hull and is heavily loaded with colorful shipping containers (blue, red, yellow, and white) stacked high on its deck. The ship is moving towards the bottom left of the frame, leaving a white wake in the dark blue water. The text "Mitigation cost estimates vary, but do not strongly affect global GDP growth." is overlaid in white, bold, sans-serif font across 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.

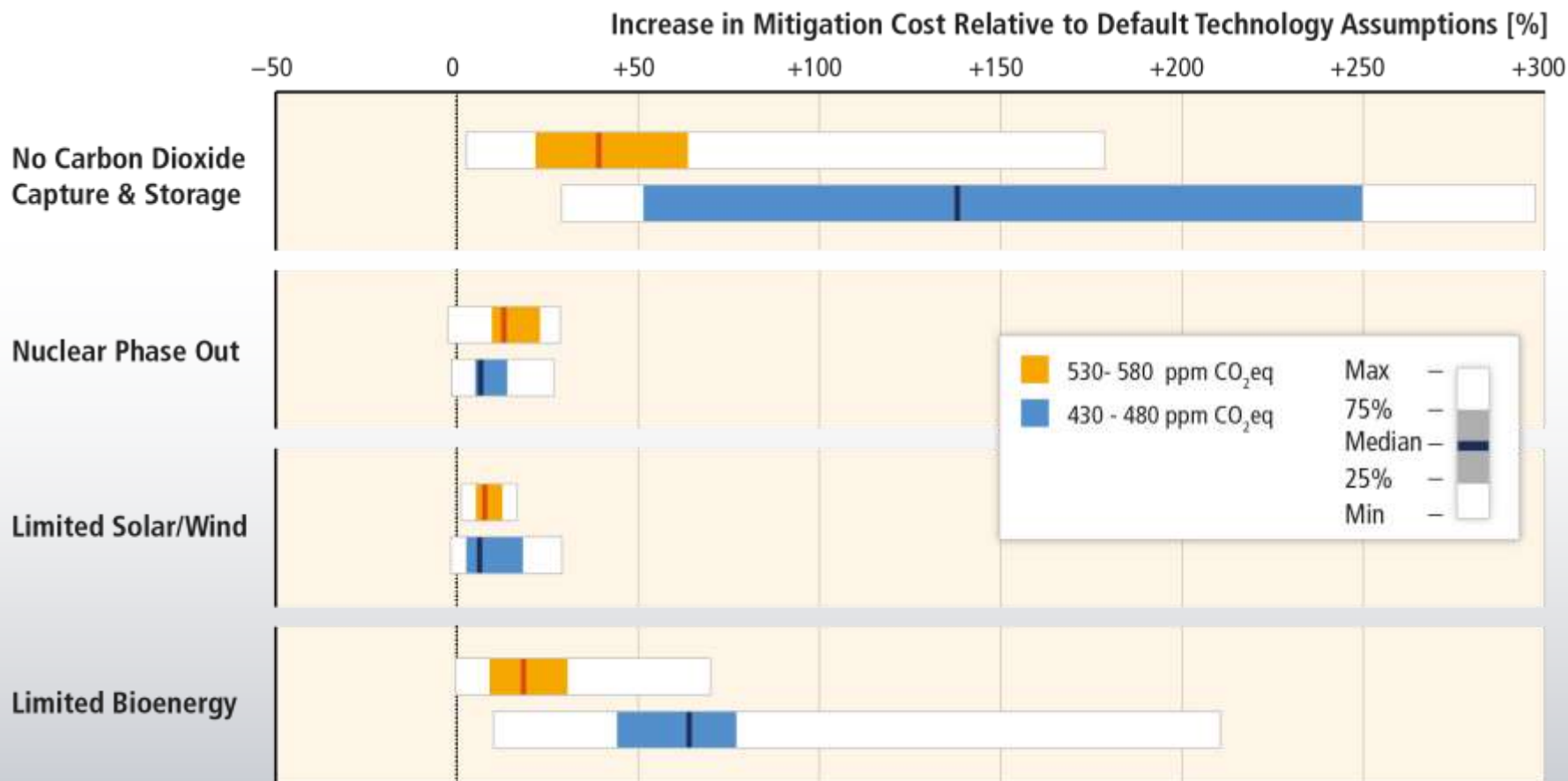


on Table SPM.2

**Global military expenditures – 2.5% GDP**  
**2009 economic crisis – absolut lost of 2.2% GDP, or**  
**lost of 6.1% comparing with 2007 growth (BAU)**

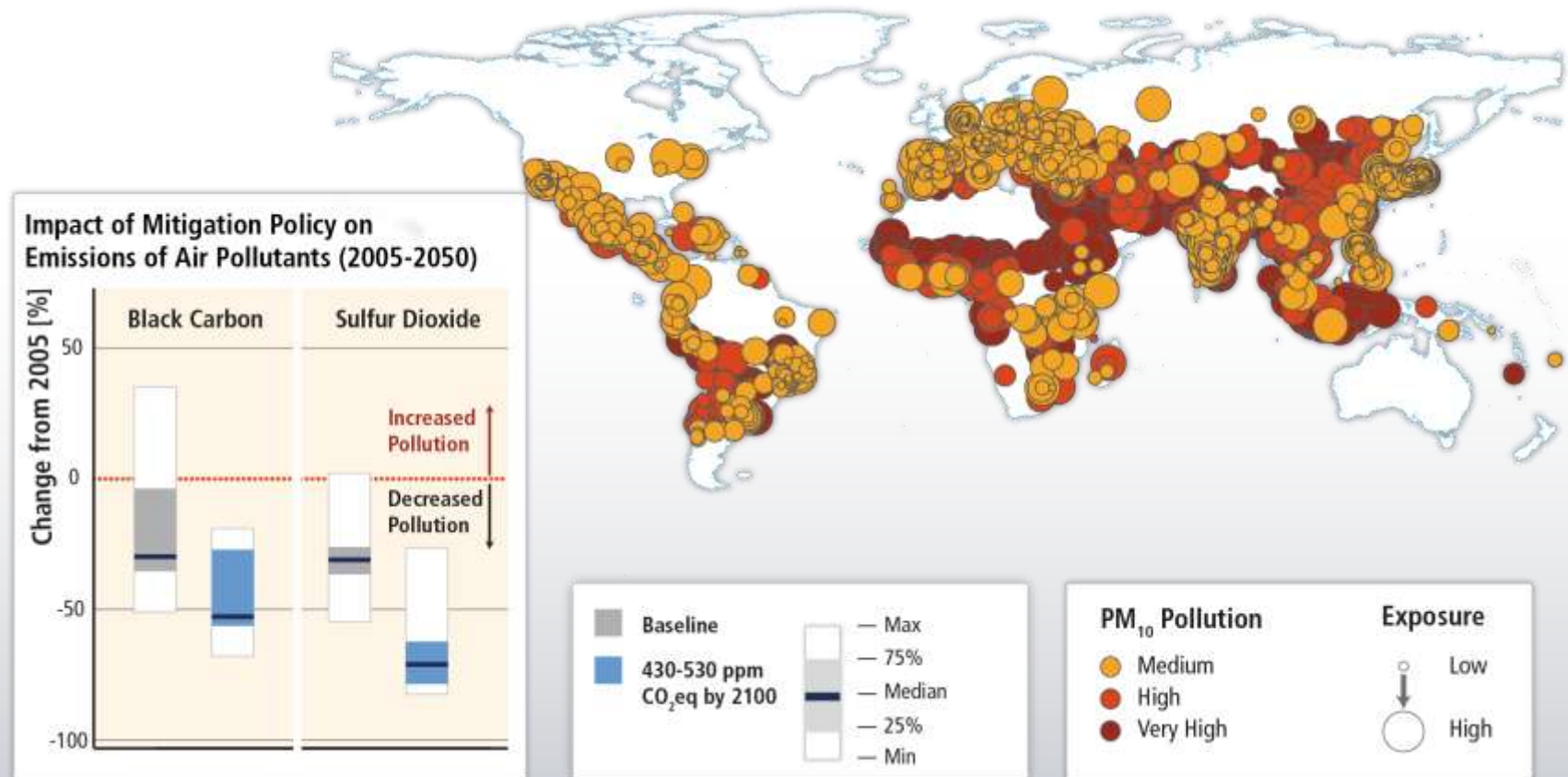


# Availability of technology can greatly influence mitigation costs.



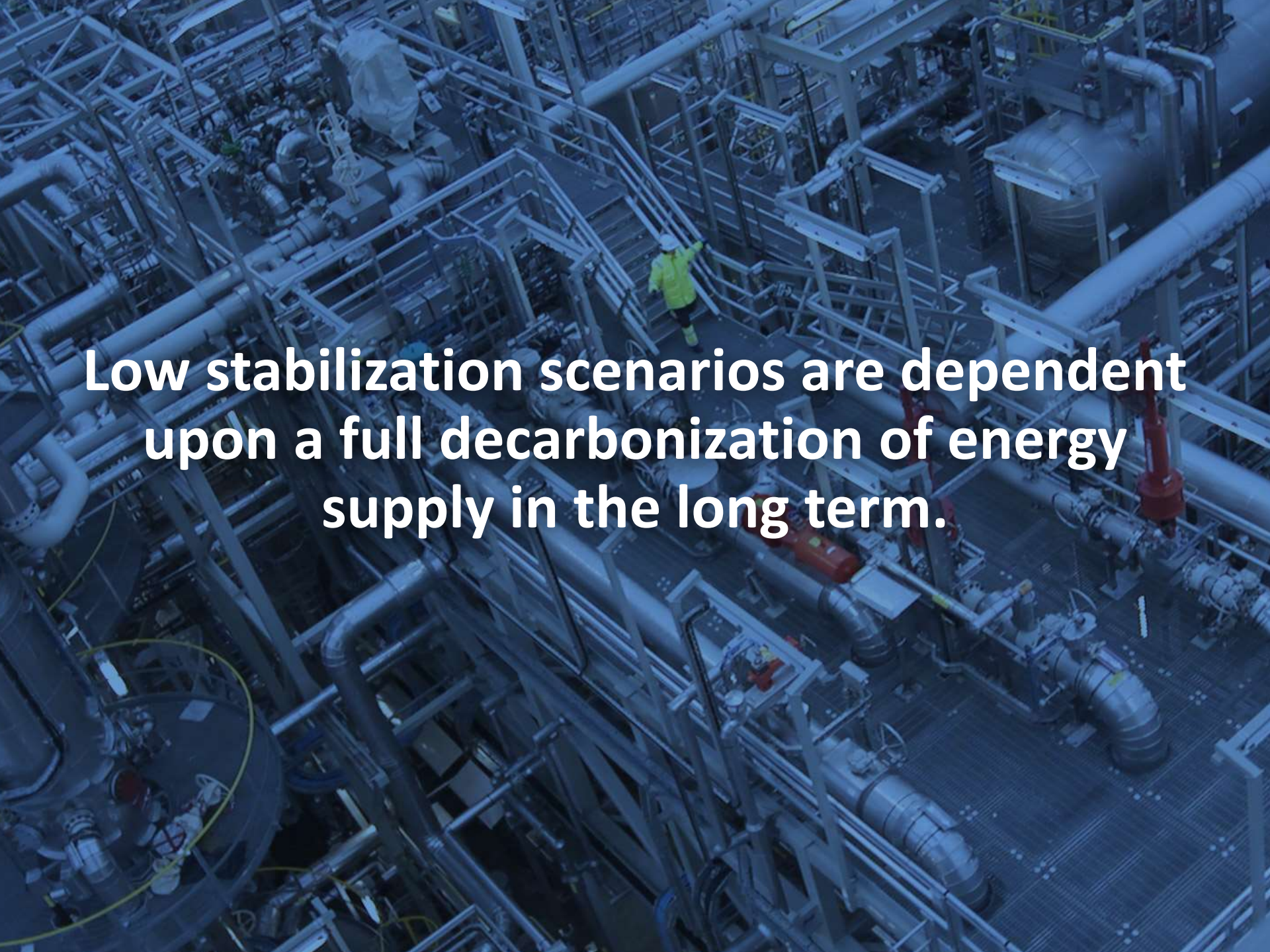
Based on Figure 6.24

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



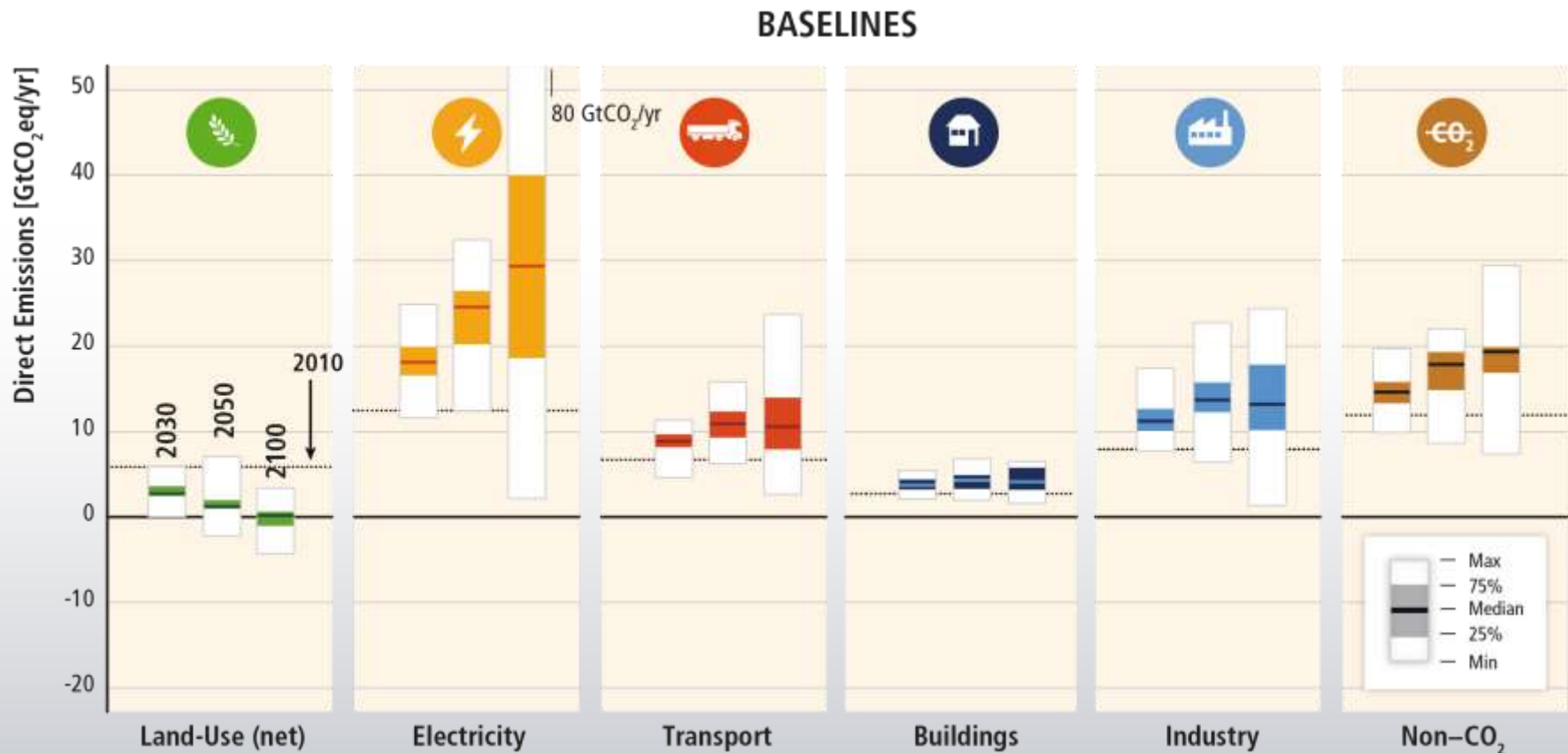
Based on Figures 6.33 and 12.23



An aerial, high-angle photograph of a complex industrial facility, likely a refinery or chemical plant. The image is dominated by a dense network of silver-colored metal pipes, valves, and structural steel frameworks. In the center-left, a worker wearing a bright yellow protective suit and a white hard hat is walking on a metal walkway. To the right, a large, horizontal cylindrical storage tank is visible. The overall scene is industrial and intricate, with various mechanical components and safety railings throughout. The image has a blueish tint, giving it a technical or scientific feel.

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

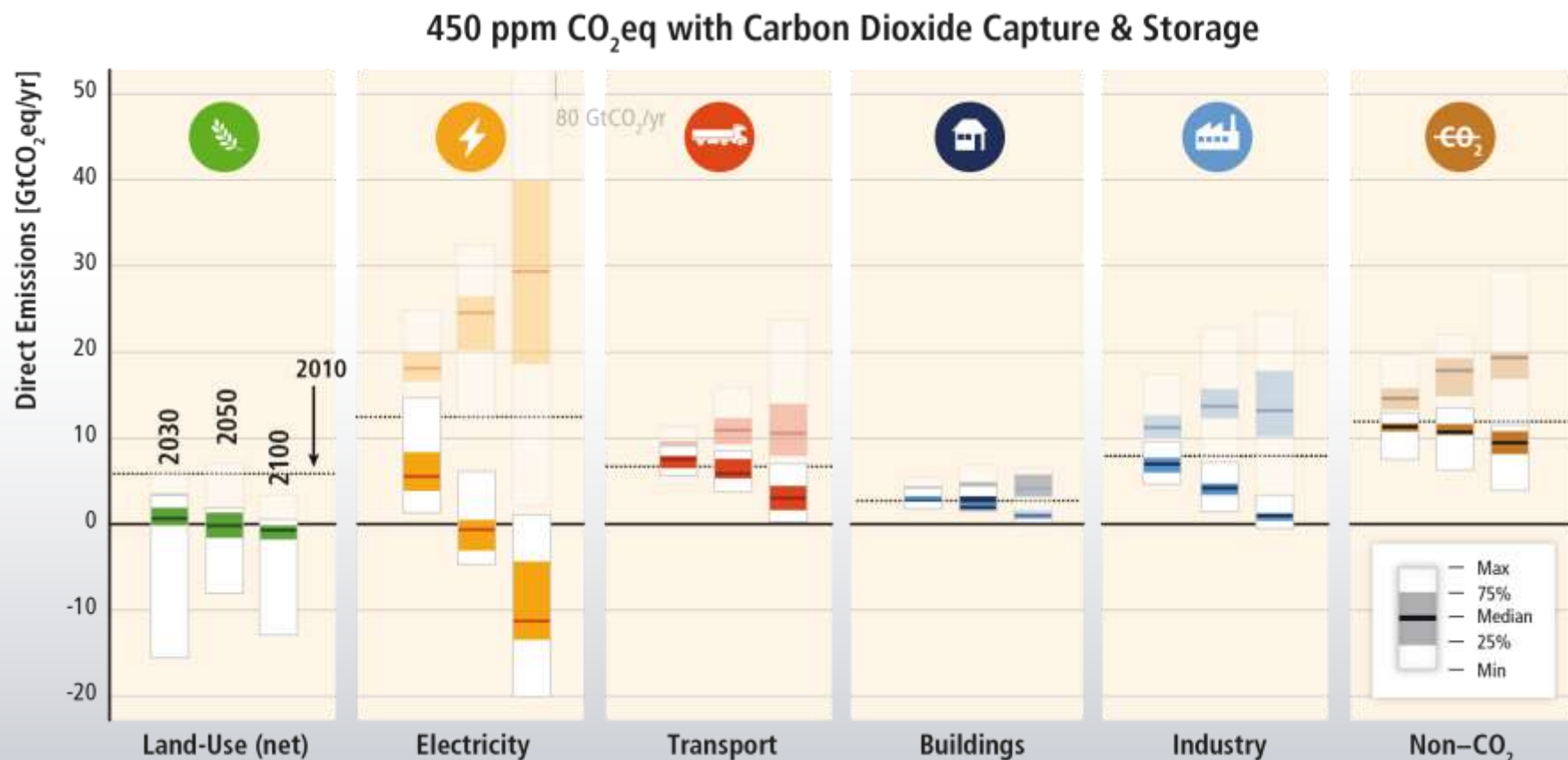
# Baseline scenarios suggest rising GHG emissions in all sectors, except for CO<sub>2</sub> emissions in the land-use sector.



Based on Figure TS.17

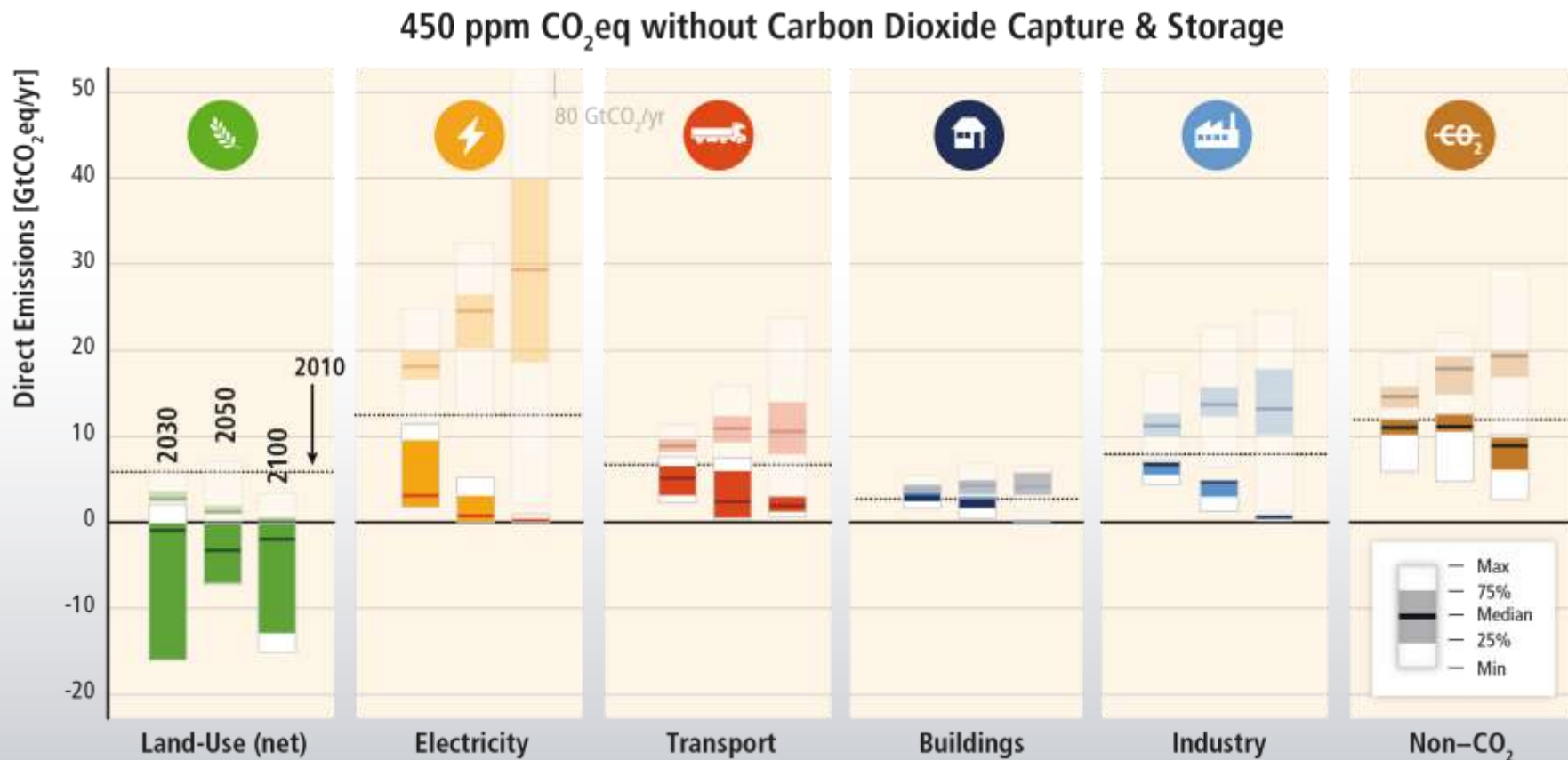


# Mitigation requires changes throughout the economy. Systemic approaches are expected to be most effective.



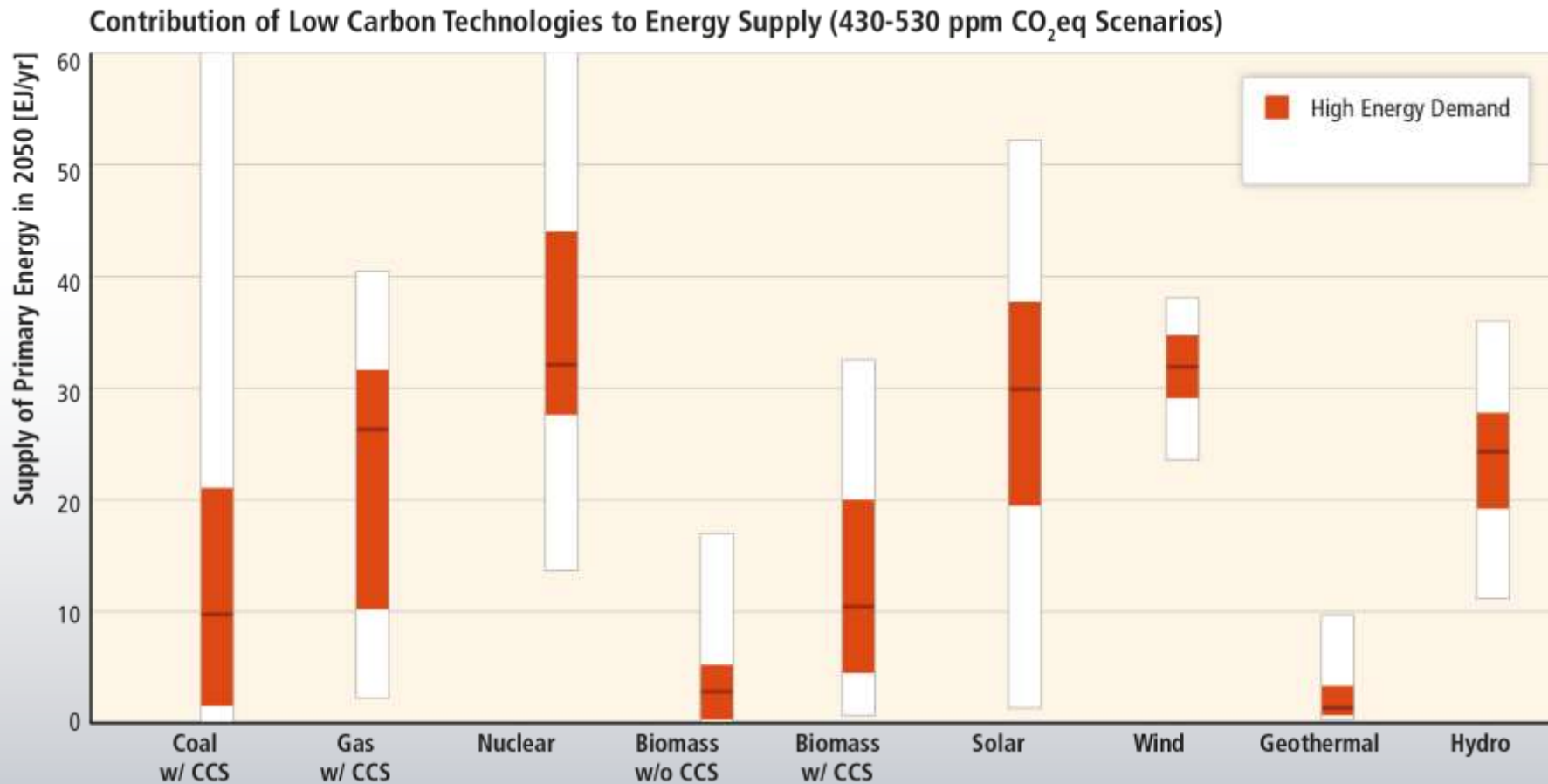
Based on Figure TS.17

# Mitigation efforts in one sector determine efforts in others.



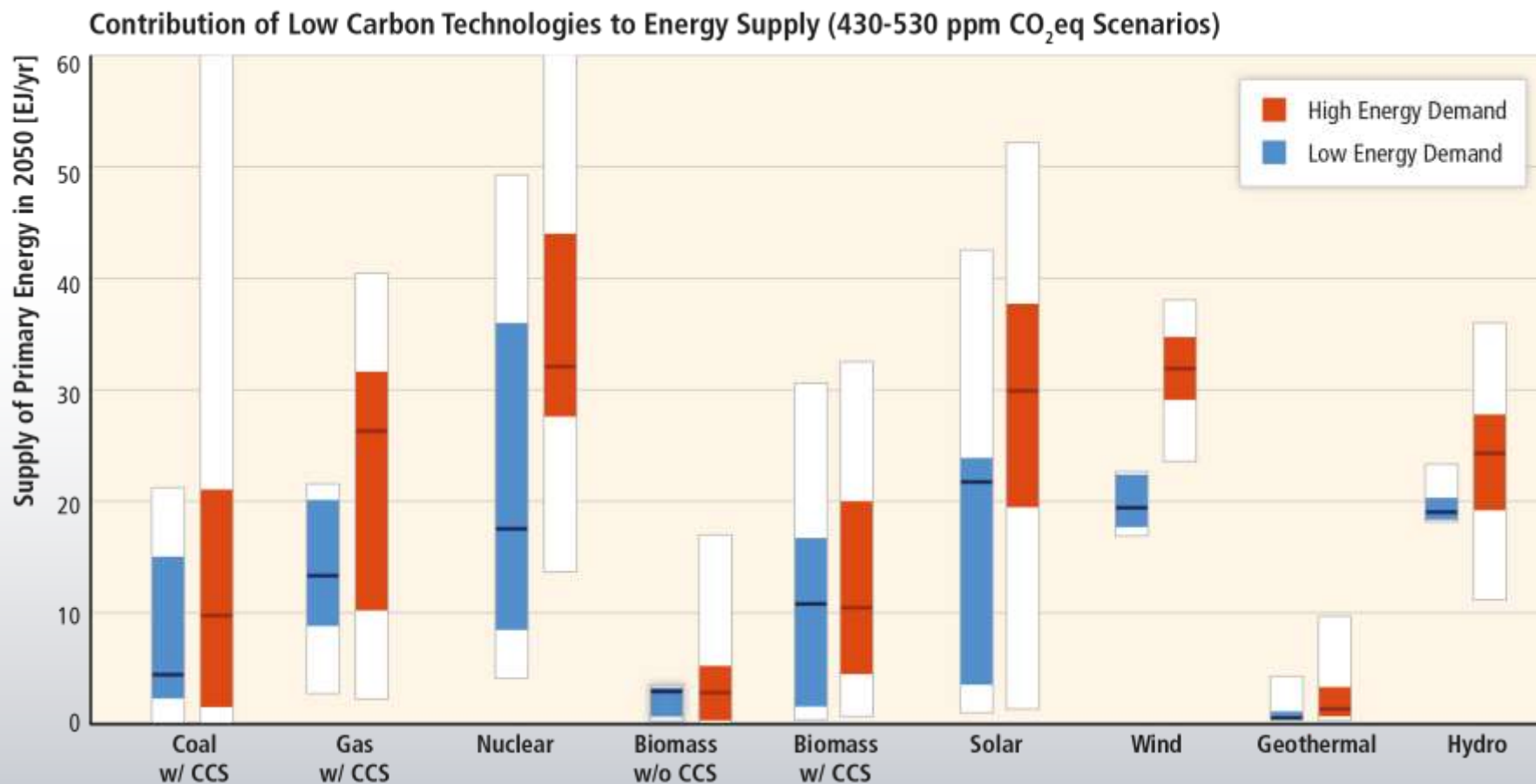
Based on Figure TS.17

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



Based on Figure 7.11

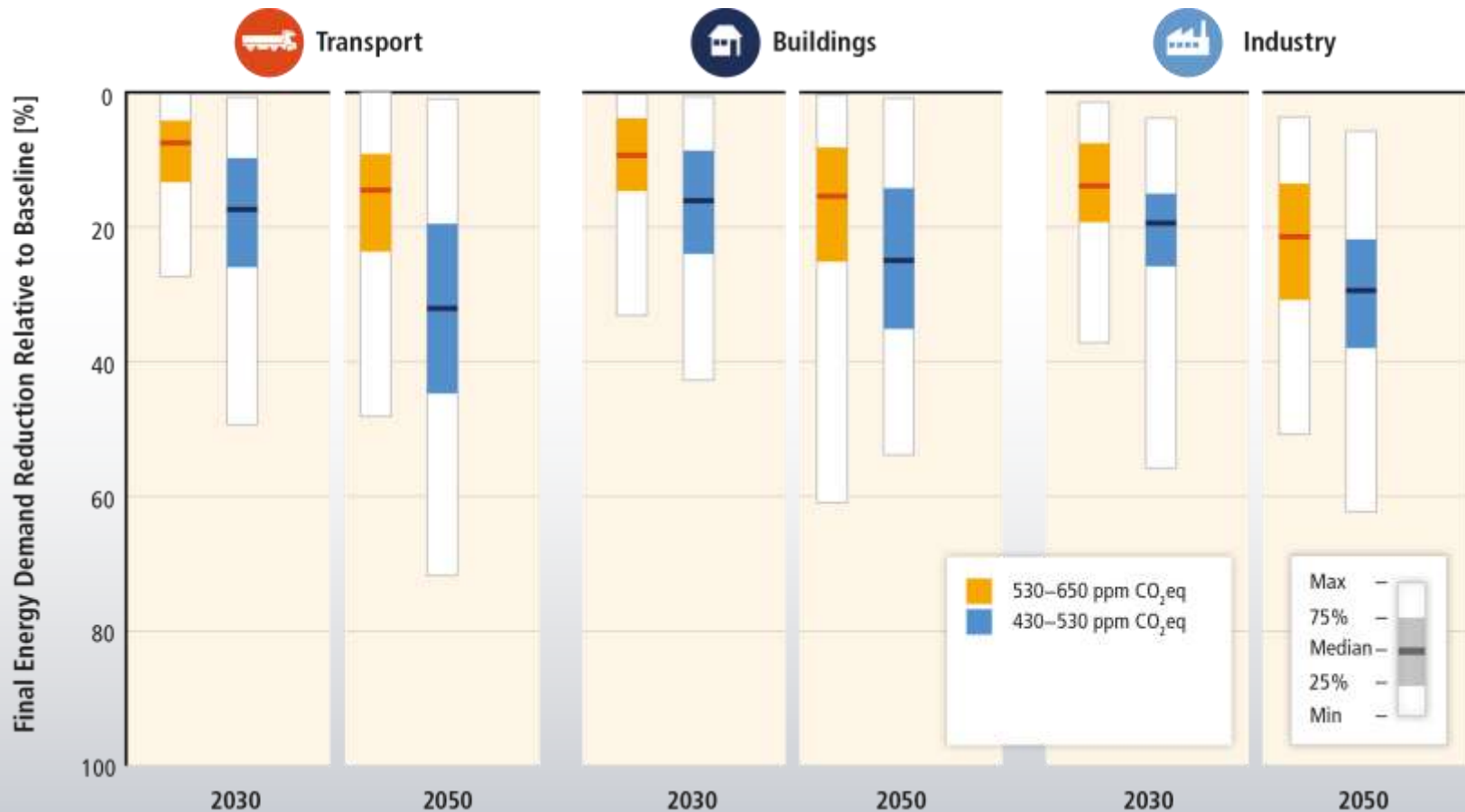
# Energy demand reductions can provide flexibility, hedge against risks, avoid lock-in and provide co-benefits.



Based on Figure 7.11



# Reducing energy demand through efficiency enhancements and behavioural changes are a key mitigation strategy.



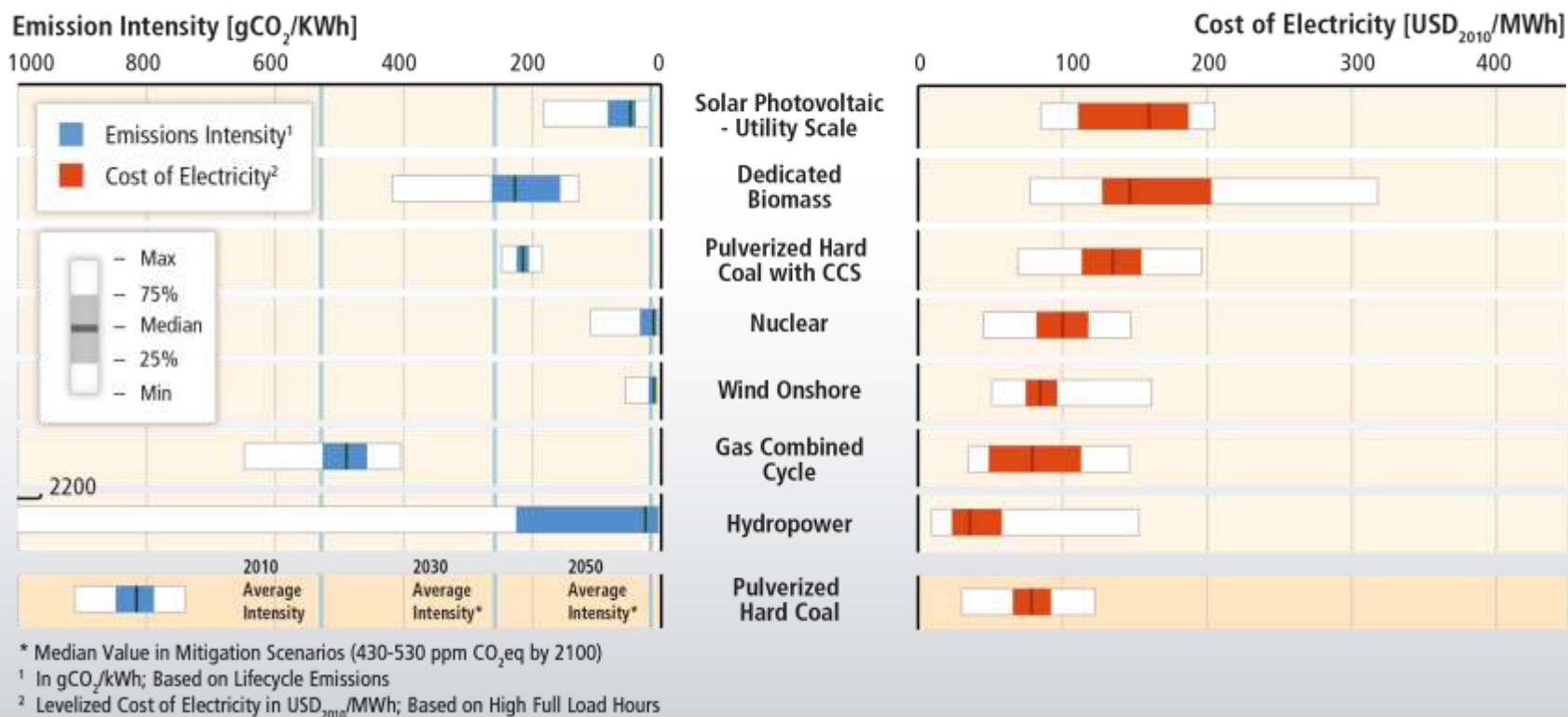
Based on Figure 6.37

An aerial photograph of an offshore wind turbine in the ocean. A large service vessel is positioned directly beneath the turbine's tower, likely for maintenance or construction. The water is dark blue, and the sky is a lighter blue. The text is overlaid in the center of the image.

**The wide-scale application of available best-practice low-GHG technologies could lead to substantial emission reductions**

# Costs of many power supply technologies decreased substantially, some can already compete with conventional technologies.

## Some Mitigation Technologies for Electricity Generation

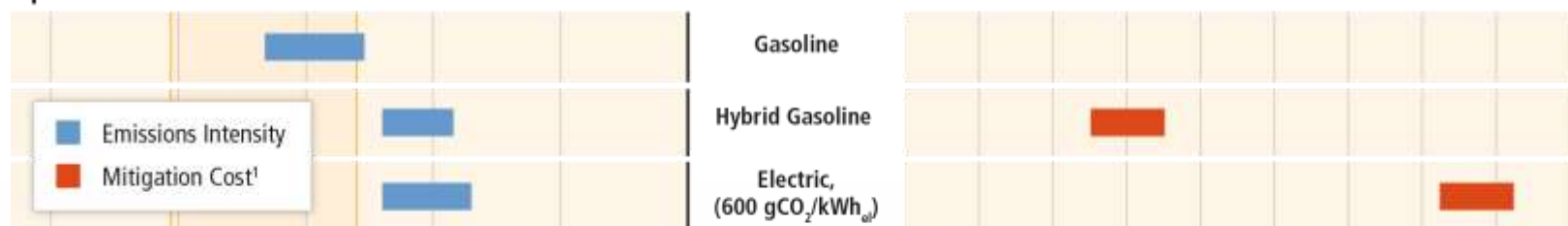


Based on Figure 7.7

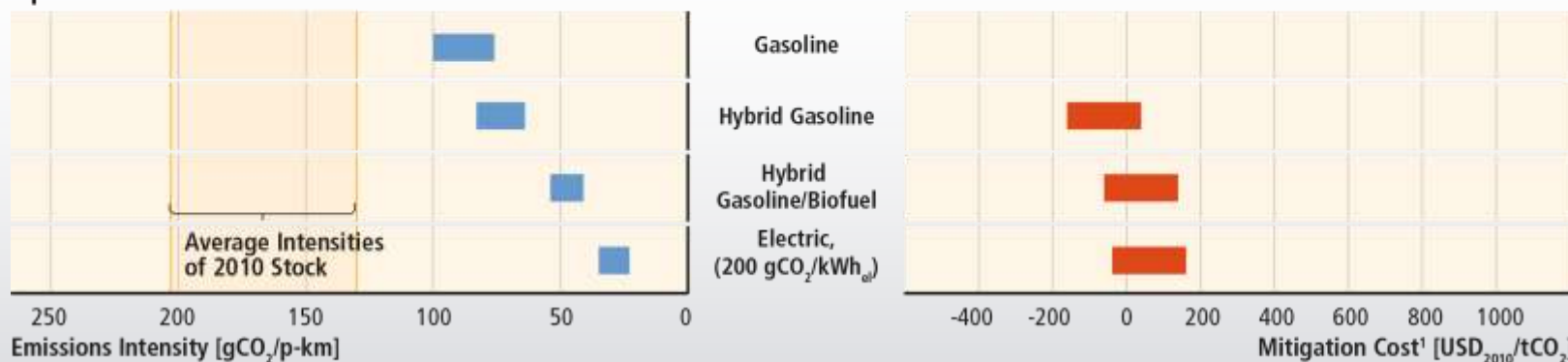
# Private costs of reducing emissions in transport vary widely. Societal costs remain uncertain.

## Some Mitigation Technologies for Light Duty Vehicles

### Options in 2010



### Options in 2030



<sup>1</sup> Levelized cost of conserved carbon; calculated against 2010 new gasoline (2030 optimized gasoline) for 2010 (2030) options. Mitigation cost are based on point estimates  $\pm 100 \text{ USD}_{2010}/\text{tCO}_2$  and are highly sensitive to assumptions.

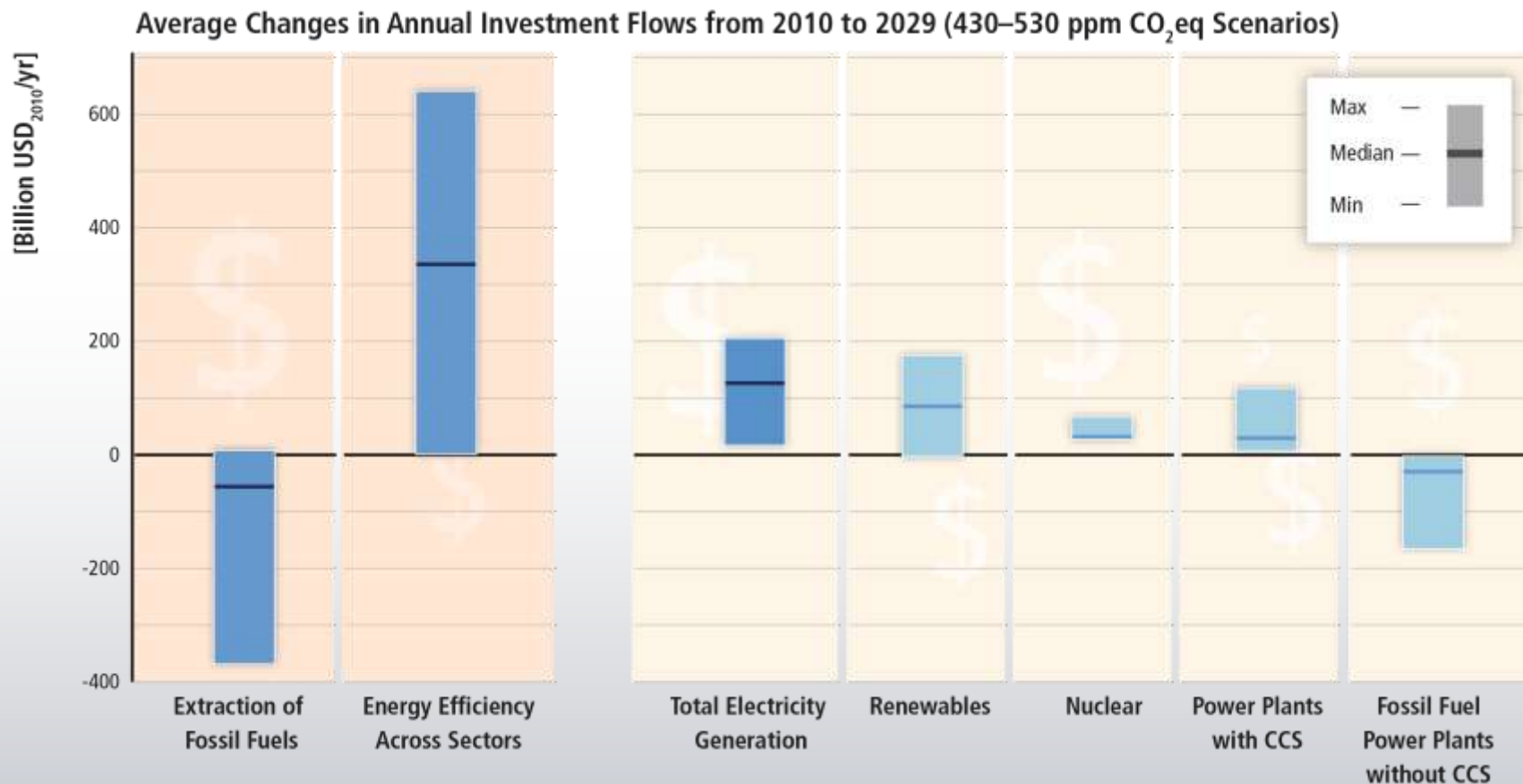
Based on Figure TS.21



A close-up, low-angle shot of a wooden gavel resting on its base. The gavel is made of dark wood and has a textured, fluted design. It is positioned diagonally across the frame. In the background, there is a stack of papers or a book, and a blurred figure of a person in a suit, suggesting a courtroom or legal setting. The lighting is soft and focused on the gavel.

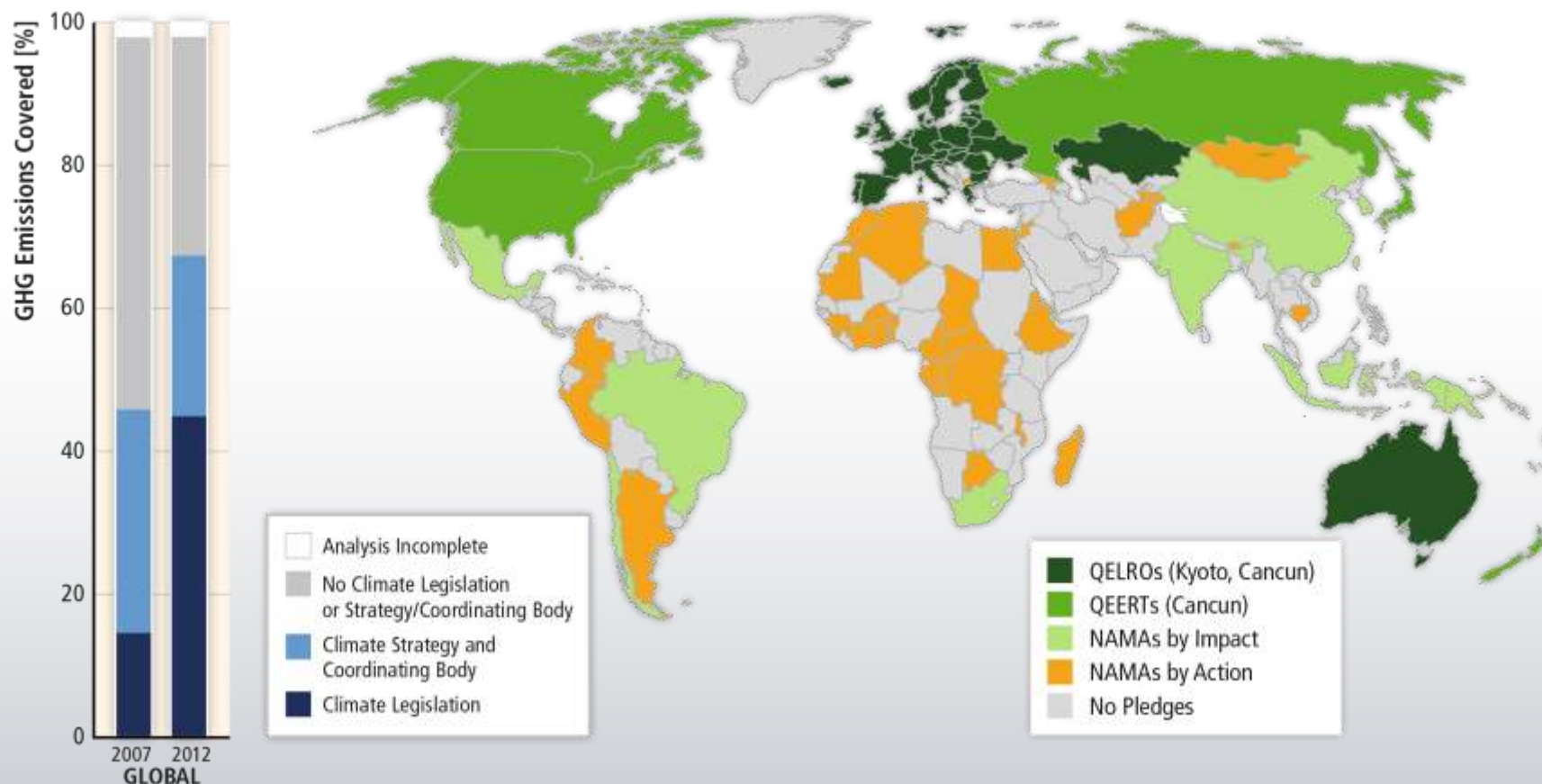
**Effective mitigation will not be achieved if individual agents advance their own interests independently.**

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



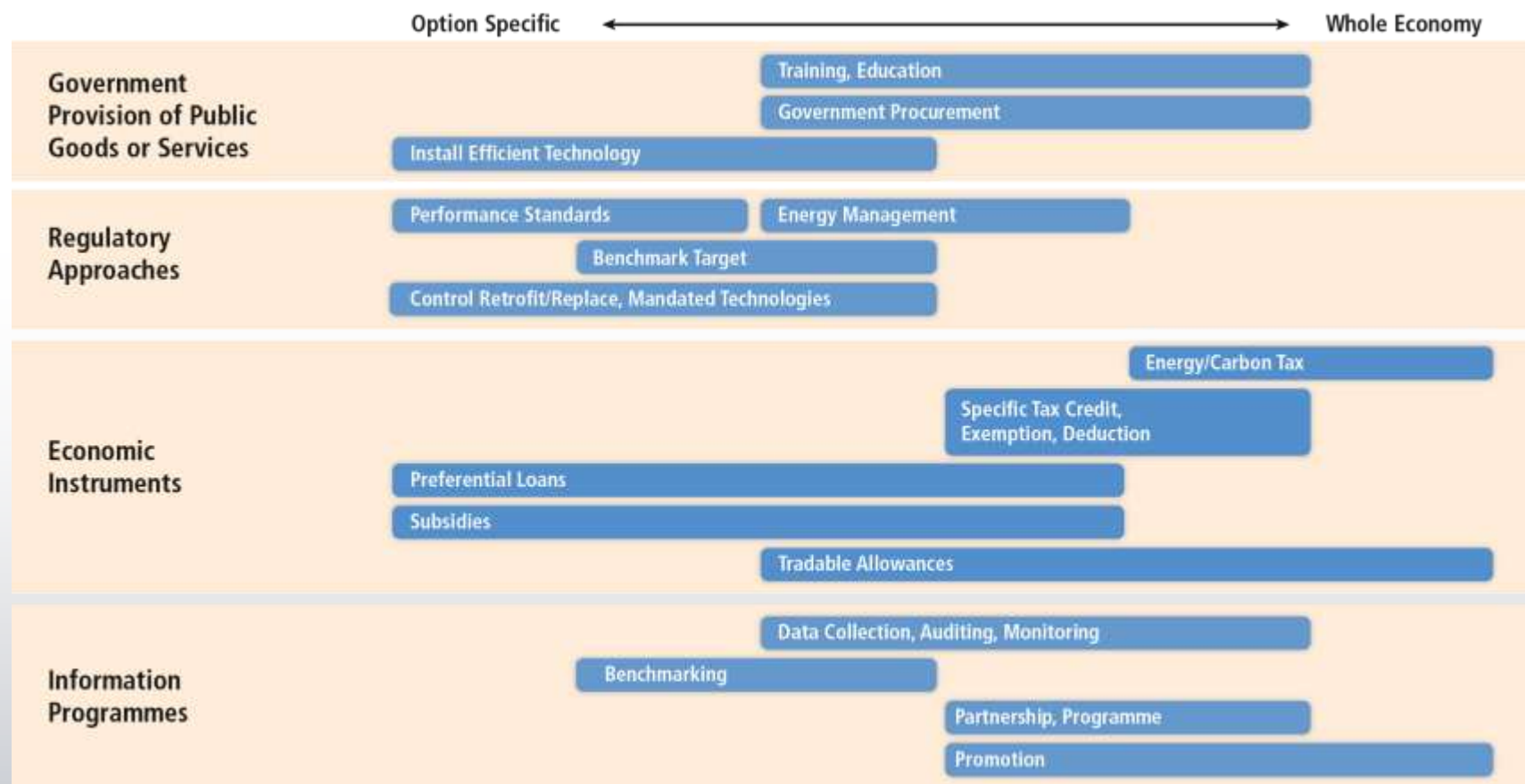
Based on Figure 16.3

# There has been a considerable increase in national and sub-national mitigation policies since AR4.



Based on Figures 15.1 and 13.3

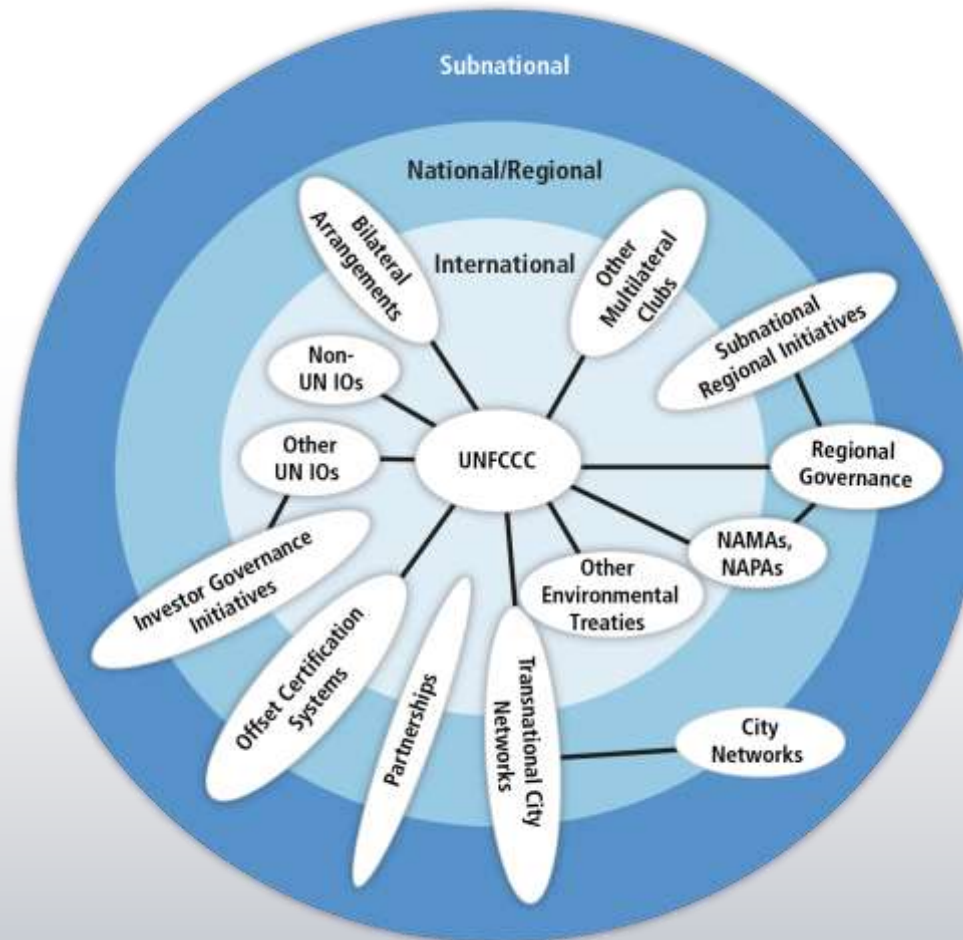
# Sector-specific policies have been more widely used than economy-wide policies.



Based on Figure 10.15

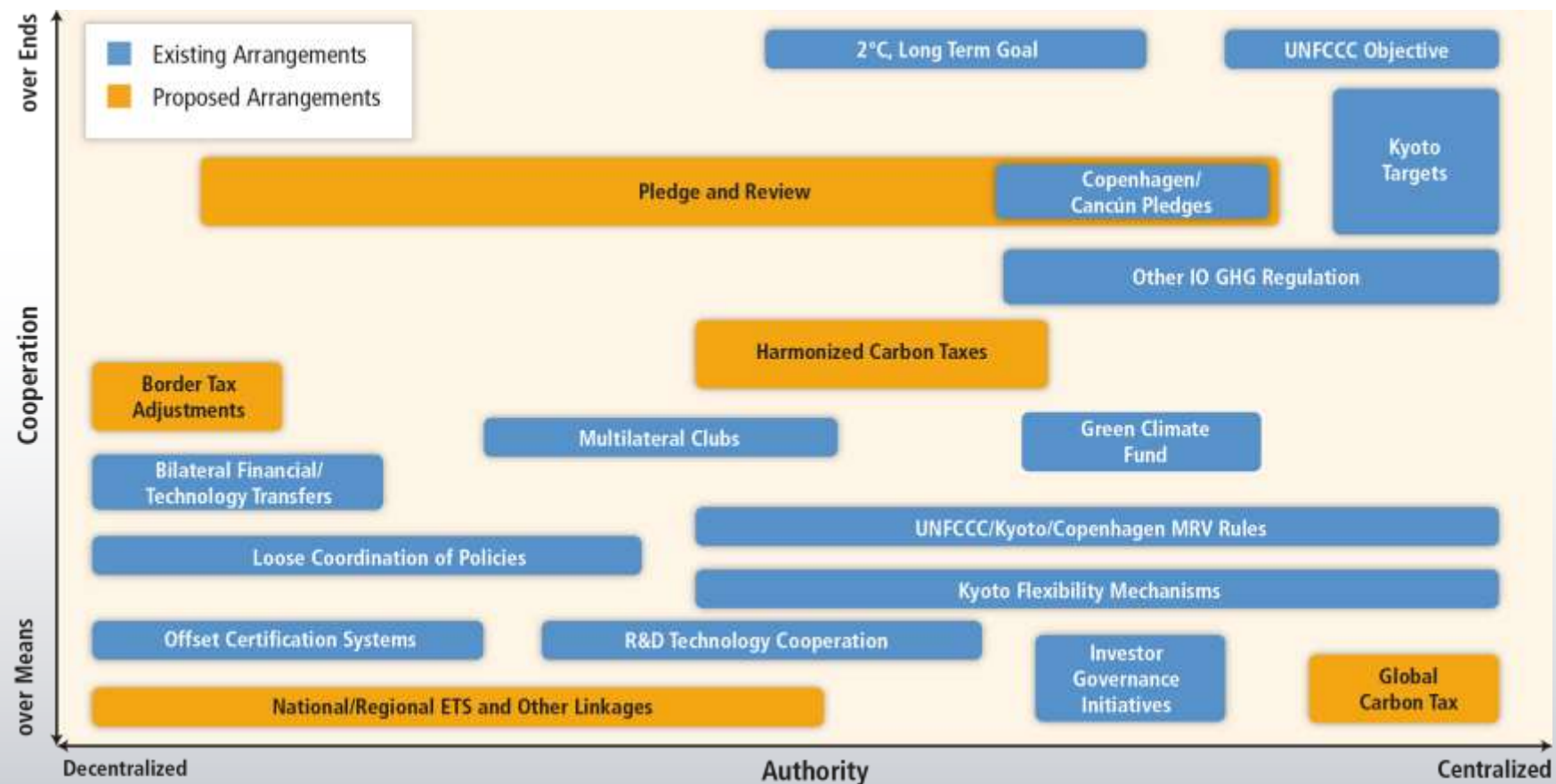


# Climate change mitigation is a global commons problem that requires international cooperation across scales.



Based on Figure 13.1

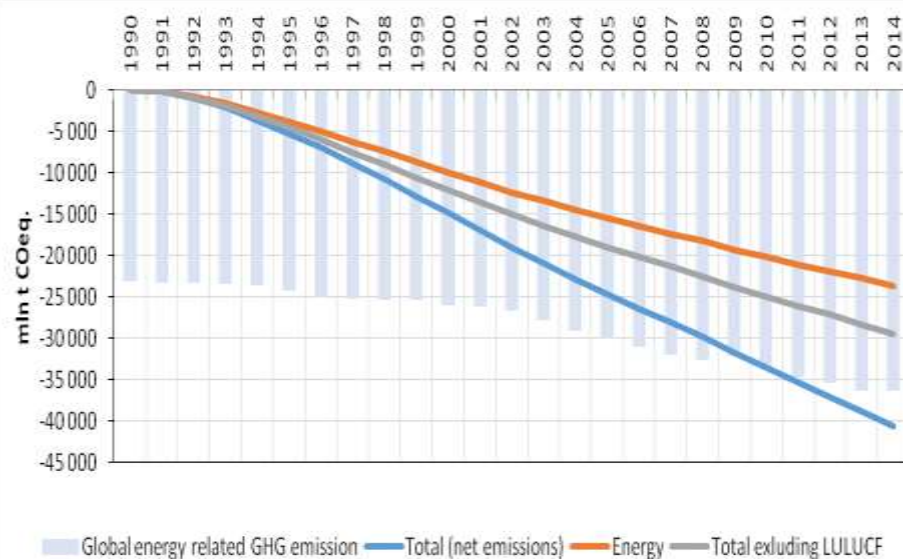
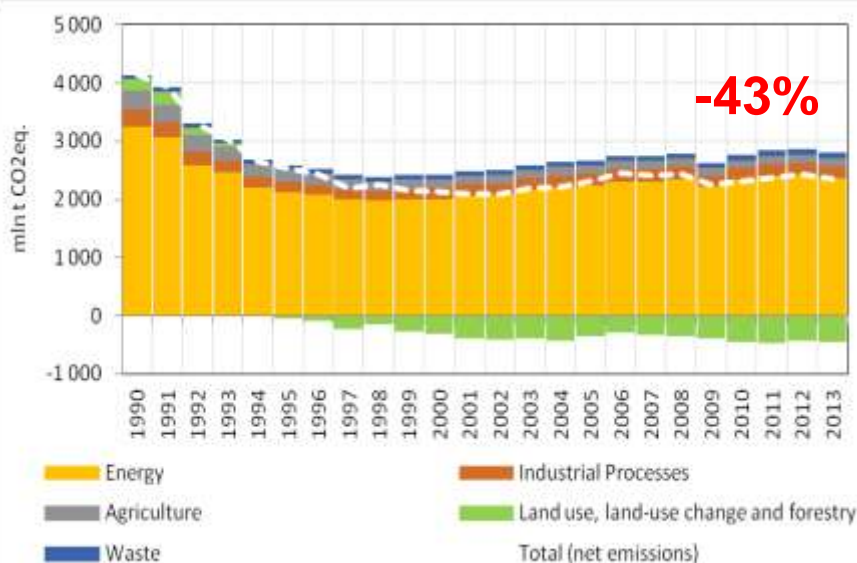
# Effective mitigation will not be achieved if individual agents advance their own interests independently.



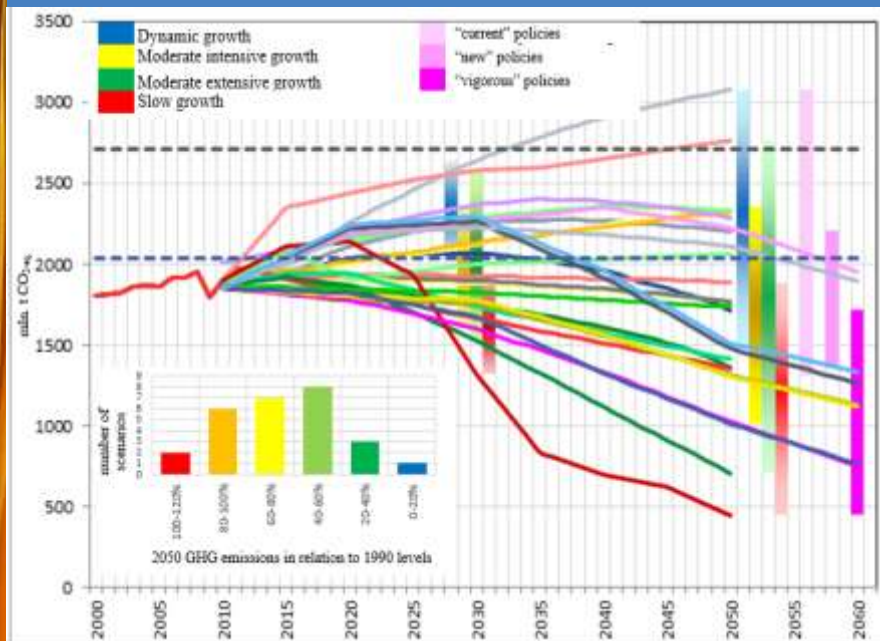
Based on Figure 13.2

During 1991-2014, Russia was the global leader in cumulative reduction of GHG emission. Russia alone managed to impede the negative anthropogenic impact for a whole year!

- ➡ Cumulative reduction of anthropogenic GHG emission in Russia over 1991-2013 exceeds 7 years' EU energy related emission, 5 years' emission of the U.S. and 3 years' emission of China
- ➡ In 1991-2013, cumulative GHG emission reduction in Russia (incl. sinks) equaled 40 bln. t CO<sub>2</sub>-eq. This is more than the current global annual energy-related GHG emissions (about 36 bln. t CO<sub>2</sub>-eq. )



# It is very likely that Russia's energy-related emissions of three greenhouse gases will approach the absolute upper limit (peak) before 2060 at a level at least 11% below the 1990 emissions



It was not GHG emission control that hampered economic growth; vice versa, economic growth slowdown, determined by entirely different reasons, and re-evaluated economic development perspectives became a many-fold contributor to the reduction in the upper range estimates of future GHG emission

The larger package of emission control policies is used, the lower absolute upper limits (peaks) of Russia's energy-related greenhouse gas emissions will be

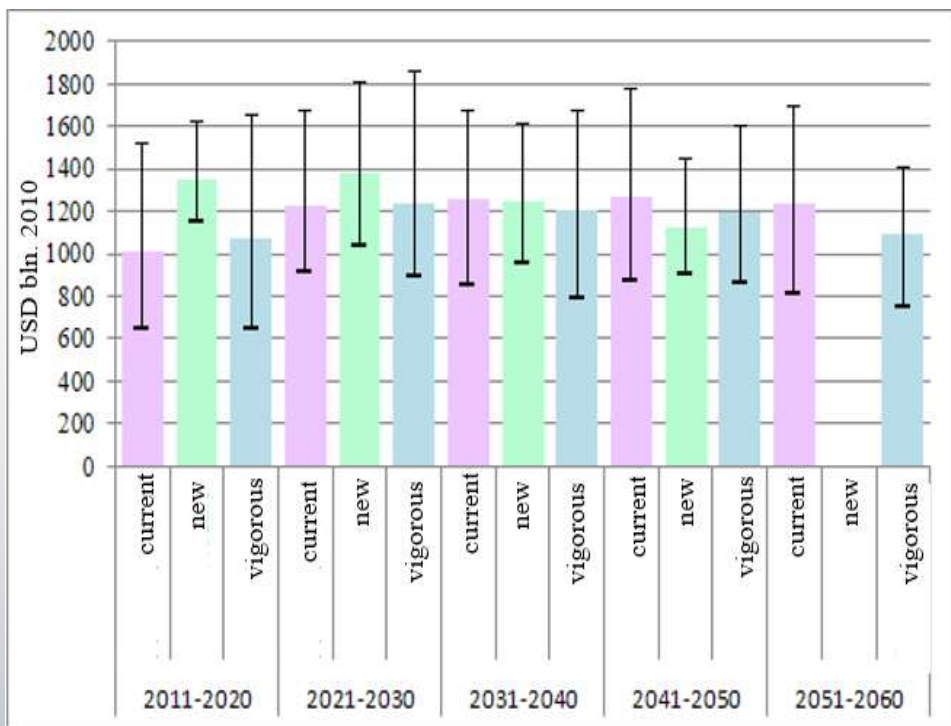
Russian commitments may be formulated in a way different from that of many other countries:

- ➡ not to “*reduce GHG emission by xx%*”, but
- ➡ “*to sustain GHG emissions by xx% below 1990 level*”



# Investments in low-carbon technologies and energy efficiency improvements do not provide any significant investment load on the economy

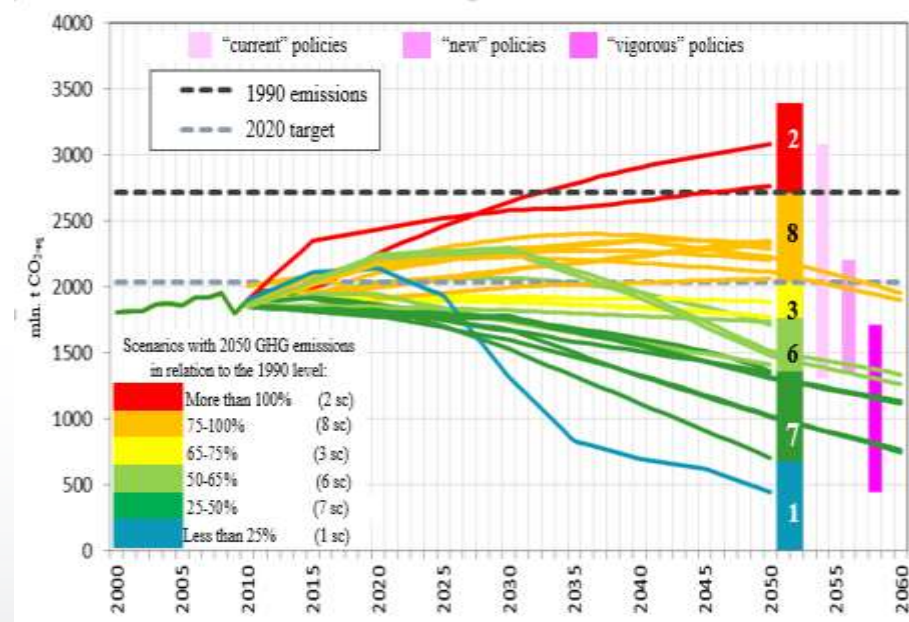
The available estimates do not provide any grounds to claim that investments in low-carbon and energy efficiency technologies will be distracting resources from, and hamper, the economic growth



- ➔ Investments in low-carbon technologies and energy efficiency improvements allow for savings on investments in very capital-intense oil&gas sector and fossil fuel energy generation.
- ➔ Additional total discounted investments in low-carbon technologies and energy efficiency improvements do not exceed 0.8% of discounted GDP in 2014-2050.
- ➔ This figure is similar to the estimated share of capital investments required to control emission in 2030-2050 in industrial countries (not more than 1% of GDP)

# What GHG emission control commitments can Russia make to 2030 and to 2050?

- ➔ Most likely are moderate growth scenarios with “new” and “vigorous” policy packages or slow growth scenarios with “current” and “new” policies
- ➔ More studies are needed to provide more robust results
- ➔ In the 2050 perspective, Russia can make either “soft” or “tough” emission control commitments:



- ➔ “Soft” long-term commitments can be formulated as follows:
  - ➔ cap emission at maximum 75% of the 1990 level; or
  - ➔ cap average annual emission in 2021-2050 at maximum 75% of the 1990 level.
- ➔ “Tough” long-term commitments can be formulated as follows:
  - ➔ cap the 2050 emission at maximum 50% of the 1990 level; or
  - ➔ cap average annual emission in 2021-2050 at no more than 67% of the 1990 level.

# CLIMATE CHANGE 2014

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