Climate Change Mitigation: Will we make it?

Natasa Markovska

IPCC Focal Point - Macedonia

Research Centre for Energy and Sustainable Development

Macedonian Academy of Sciences and Arts

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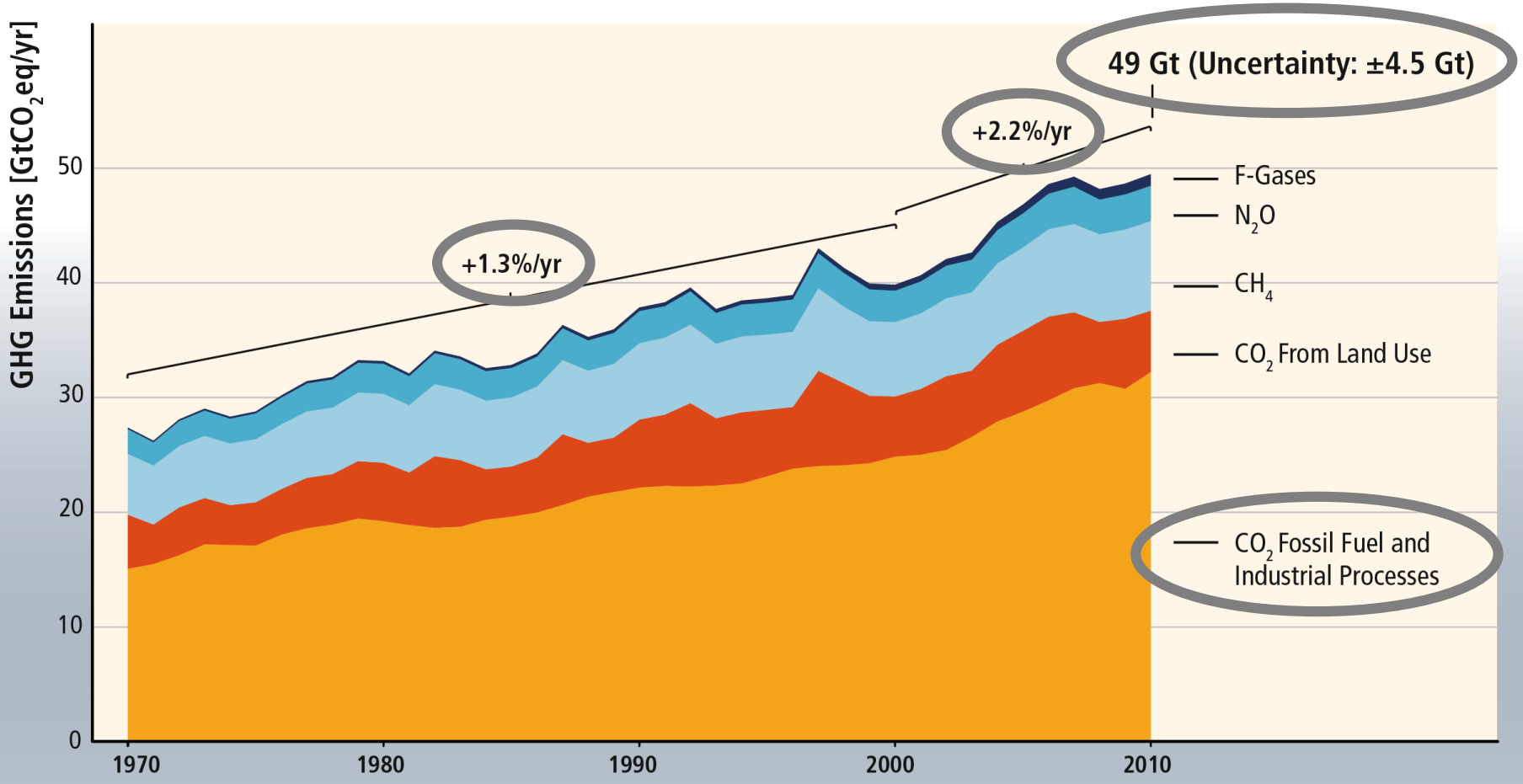
Overview

- The past trends and driving factors of the emissions
- Limiting the global warming
- Mitigation measures and polices
- Prerequisites for effective mitigation
- Paris 2015: Latest developments
- Will we make it?

The past trends and driving factors of the emissions

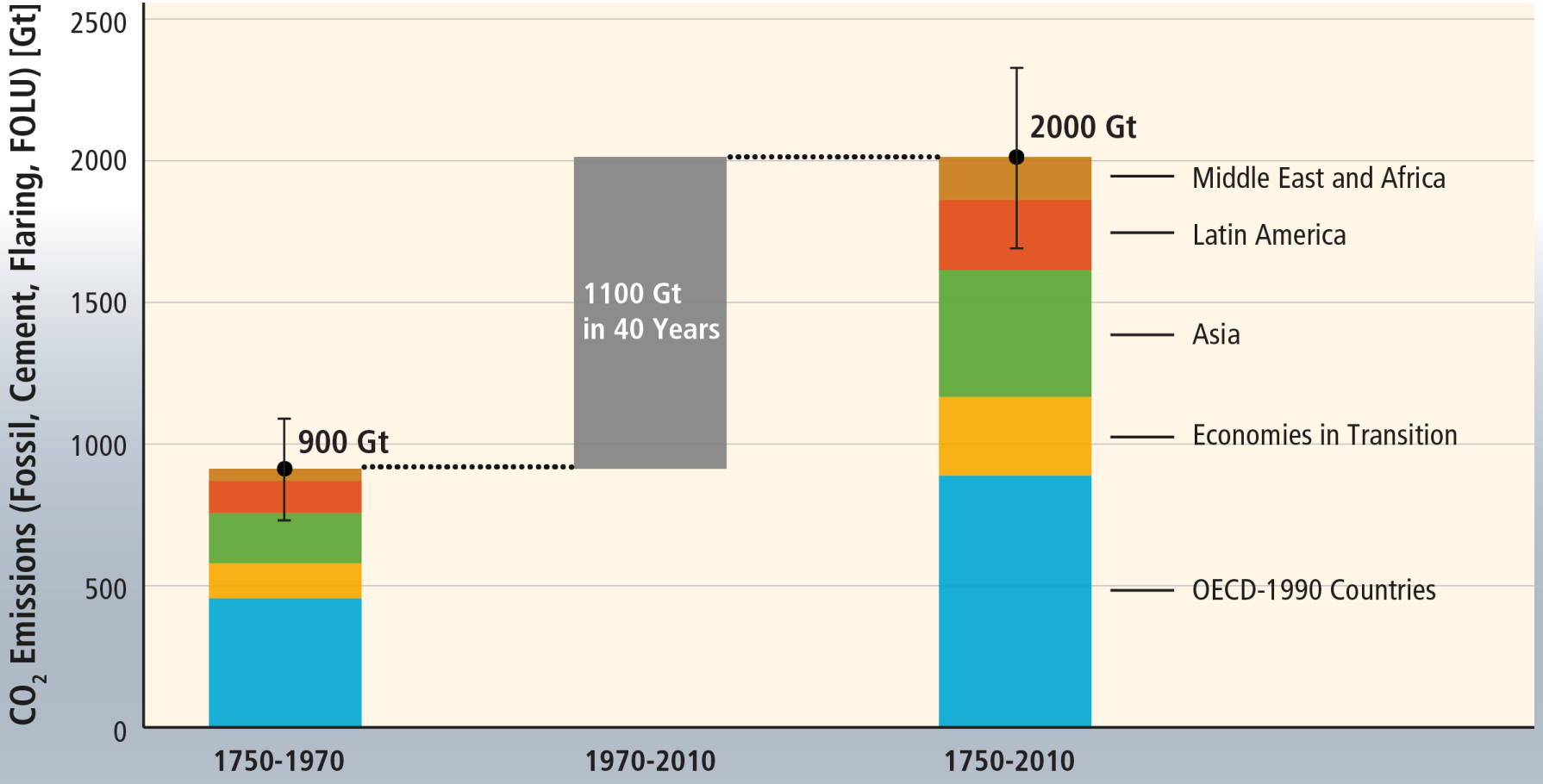

GHG emissions growth has accelerated
despite reduction efforts.

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



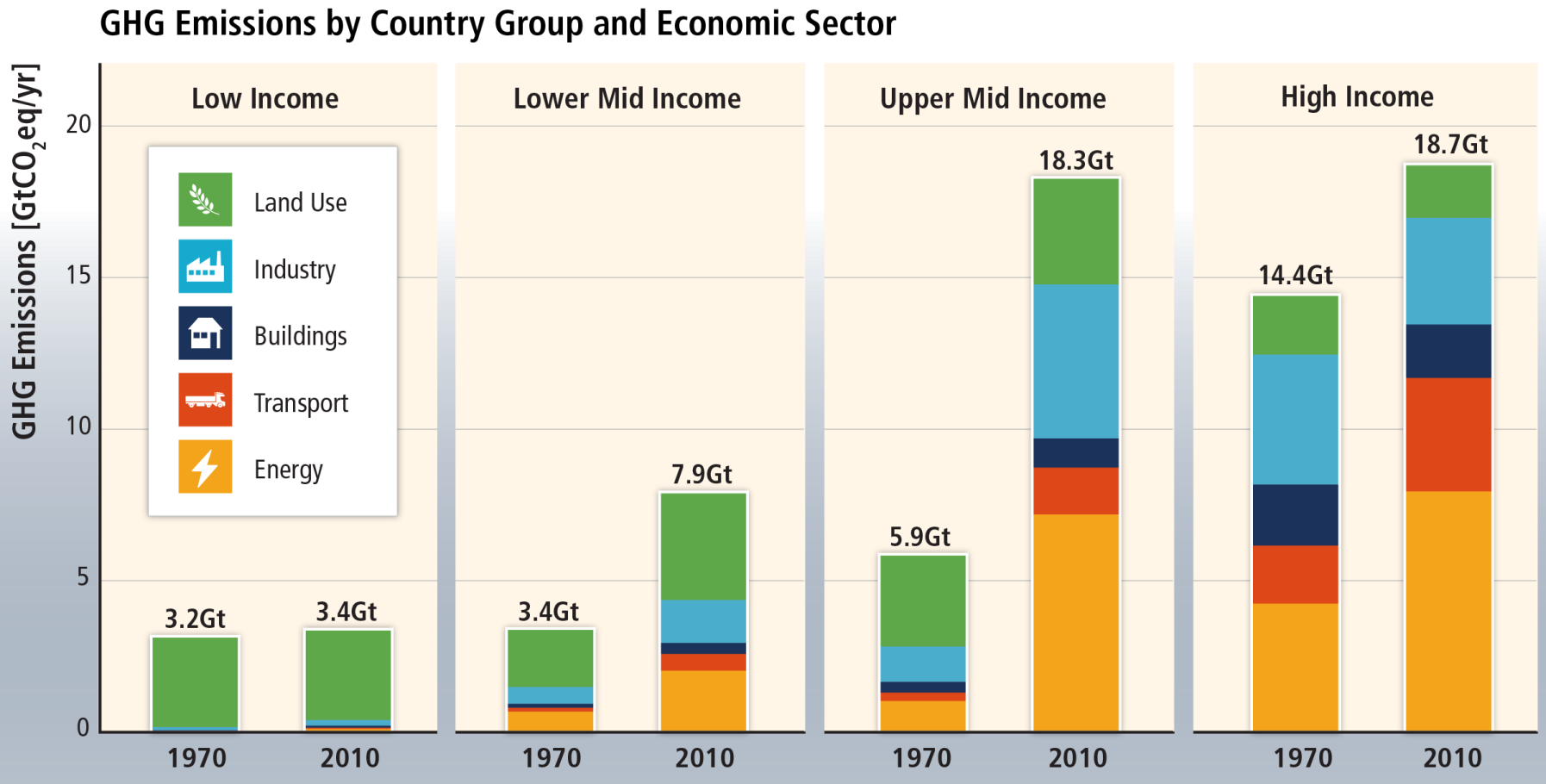
Based on Figure SPM.1

About half of the cumulative anthropogenic CO_2 emissions between 1750 and 2010 have occurred in the last 40 years.



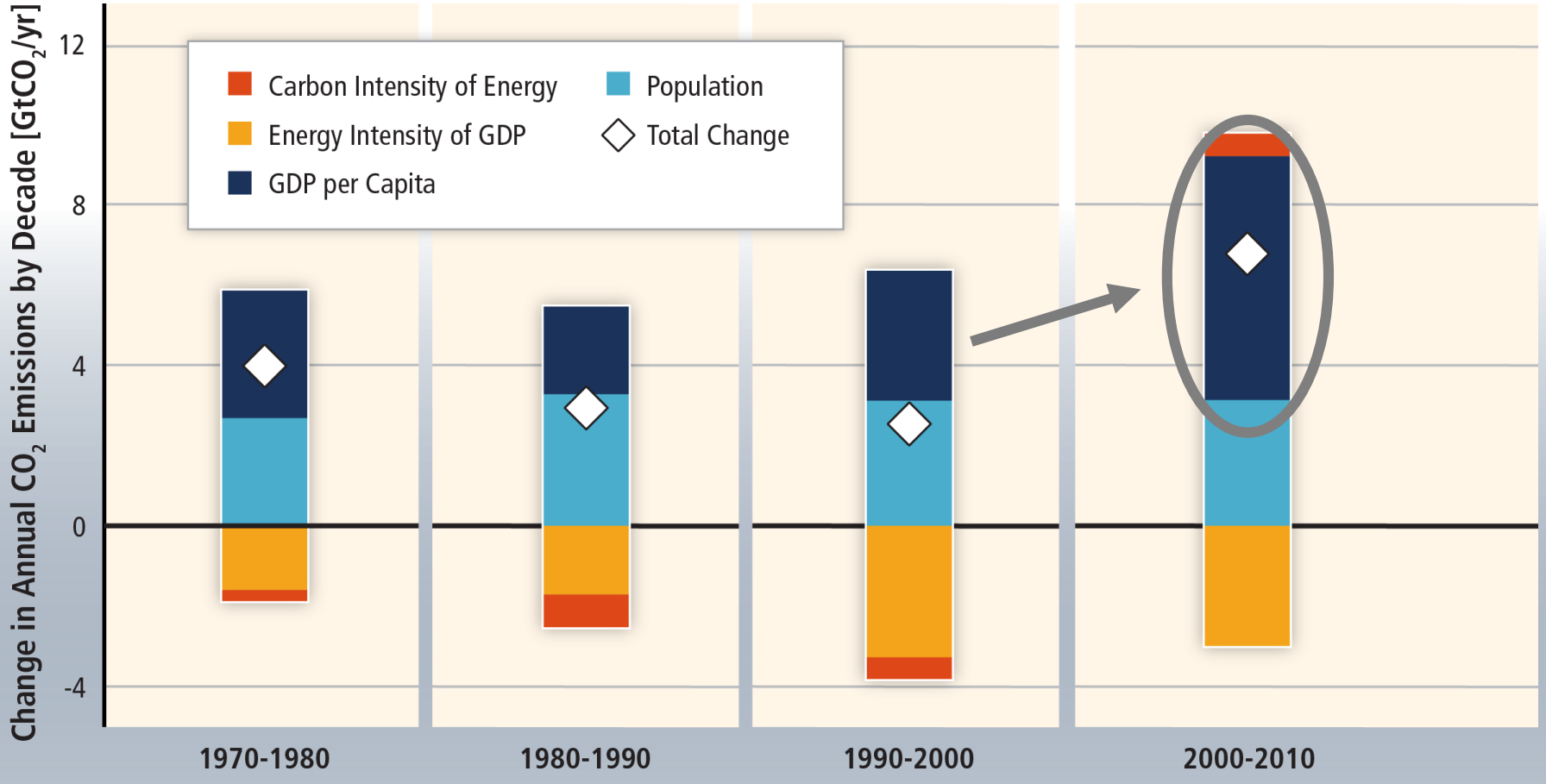
Based on Figure 5.3

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



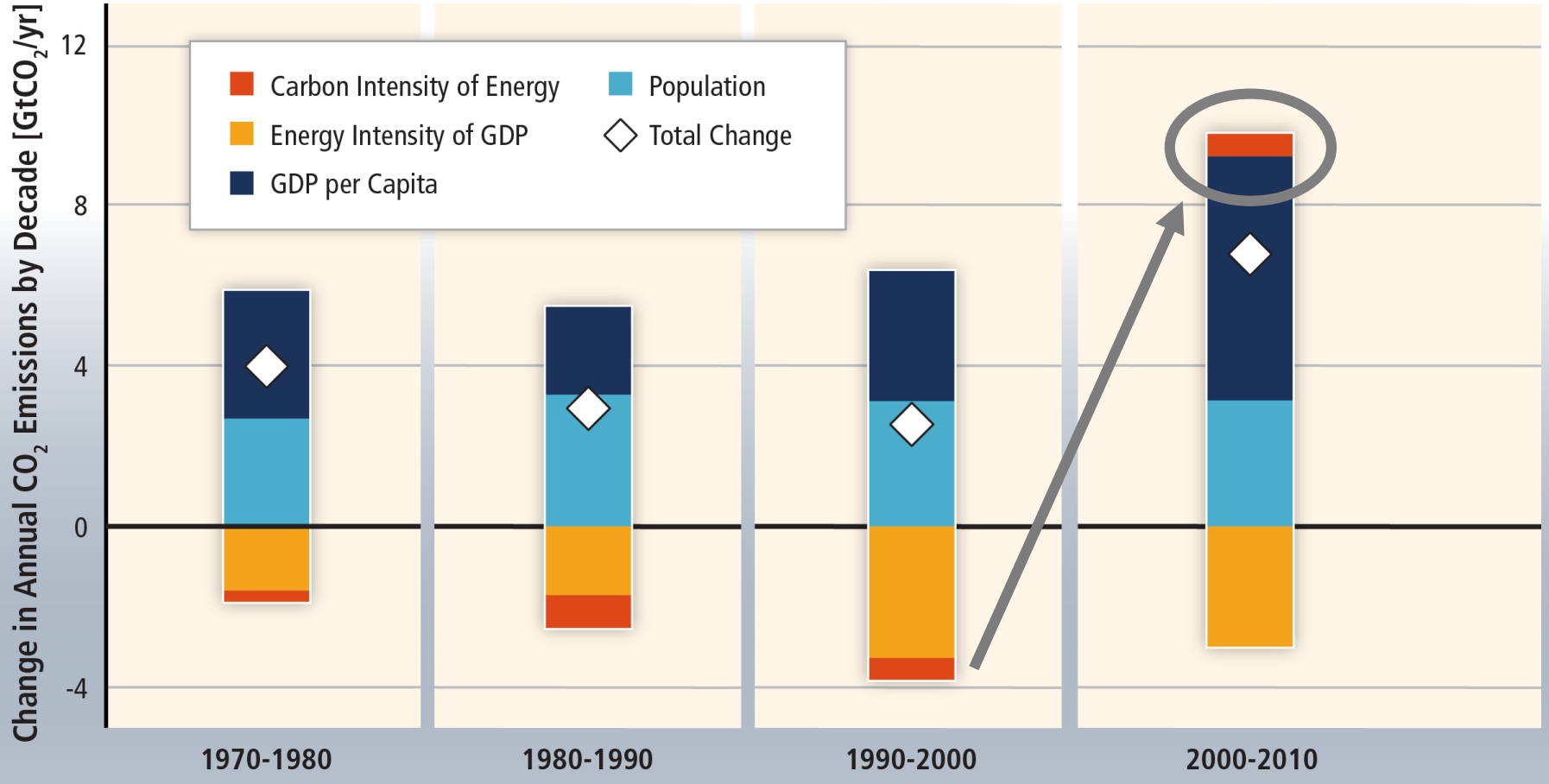
Based on Figure 1.6

GHG emissions rise with growth in GDP and population.



Based on Figure SPM.3

The long-standing trend of decarbonization has reversed.

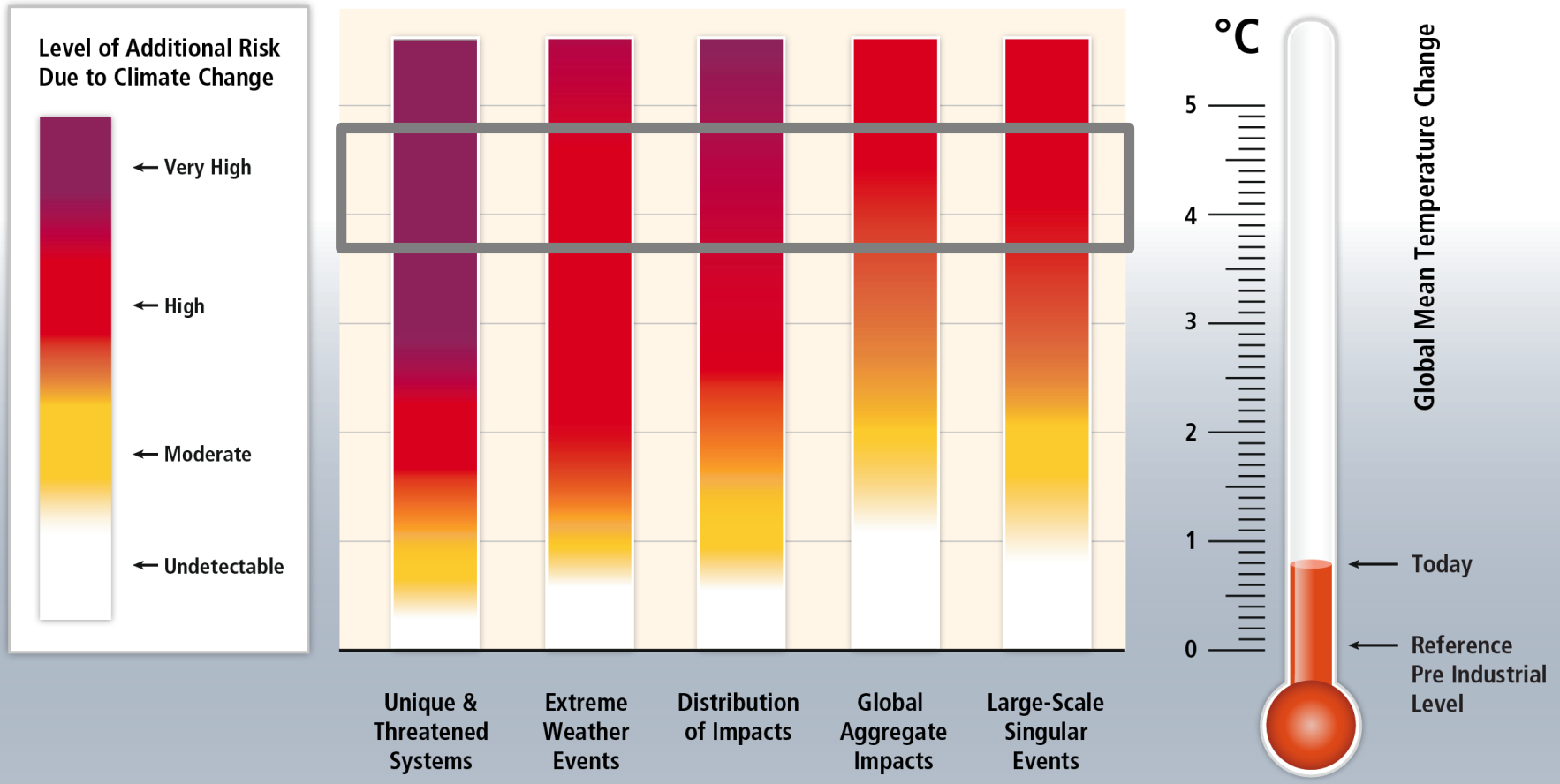


Based on Figure SPM.3

Limiting the global warming

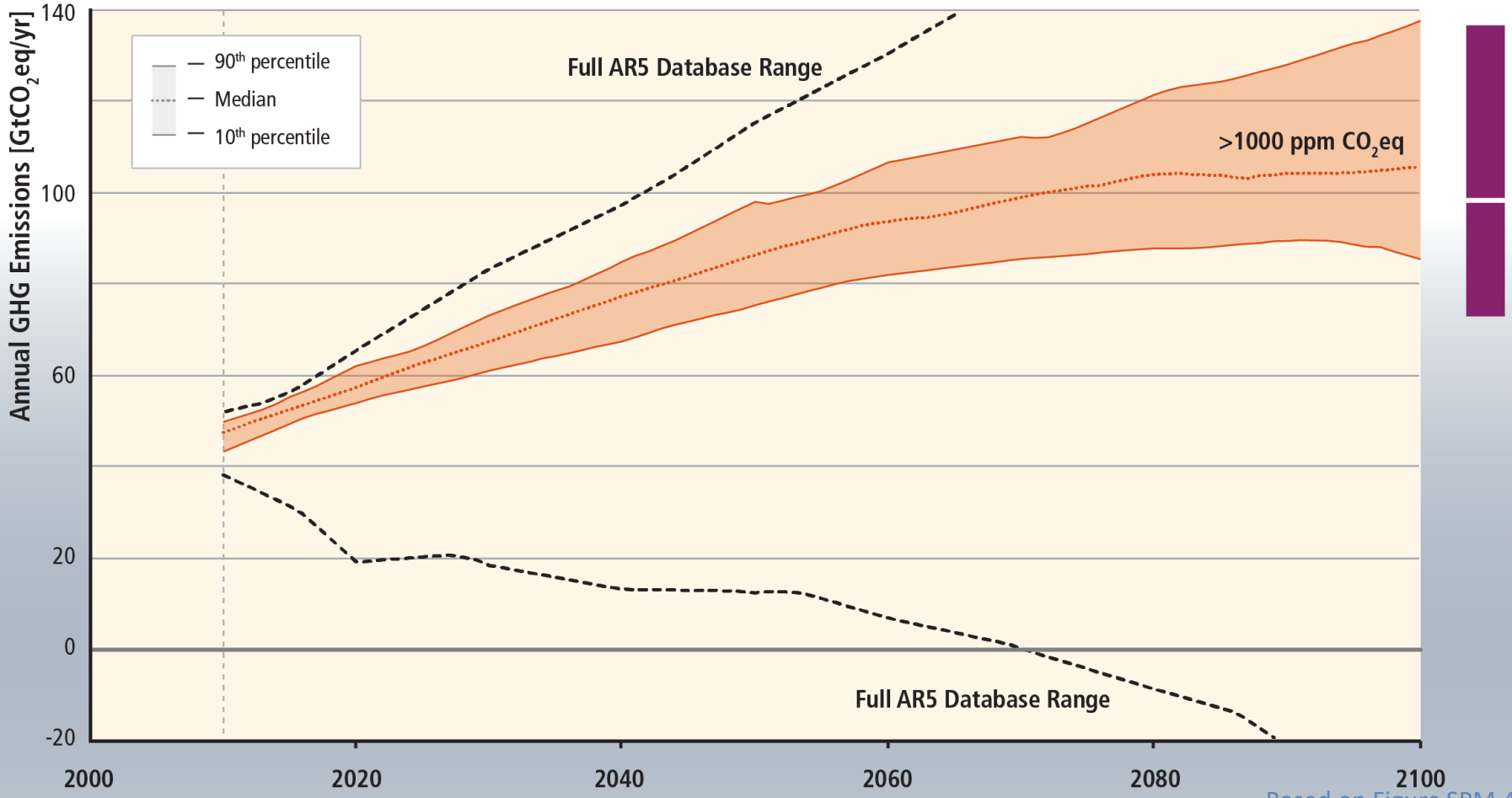

Limiting warming involves substantial technological, economic and institutional challenges.

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



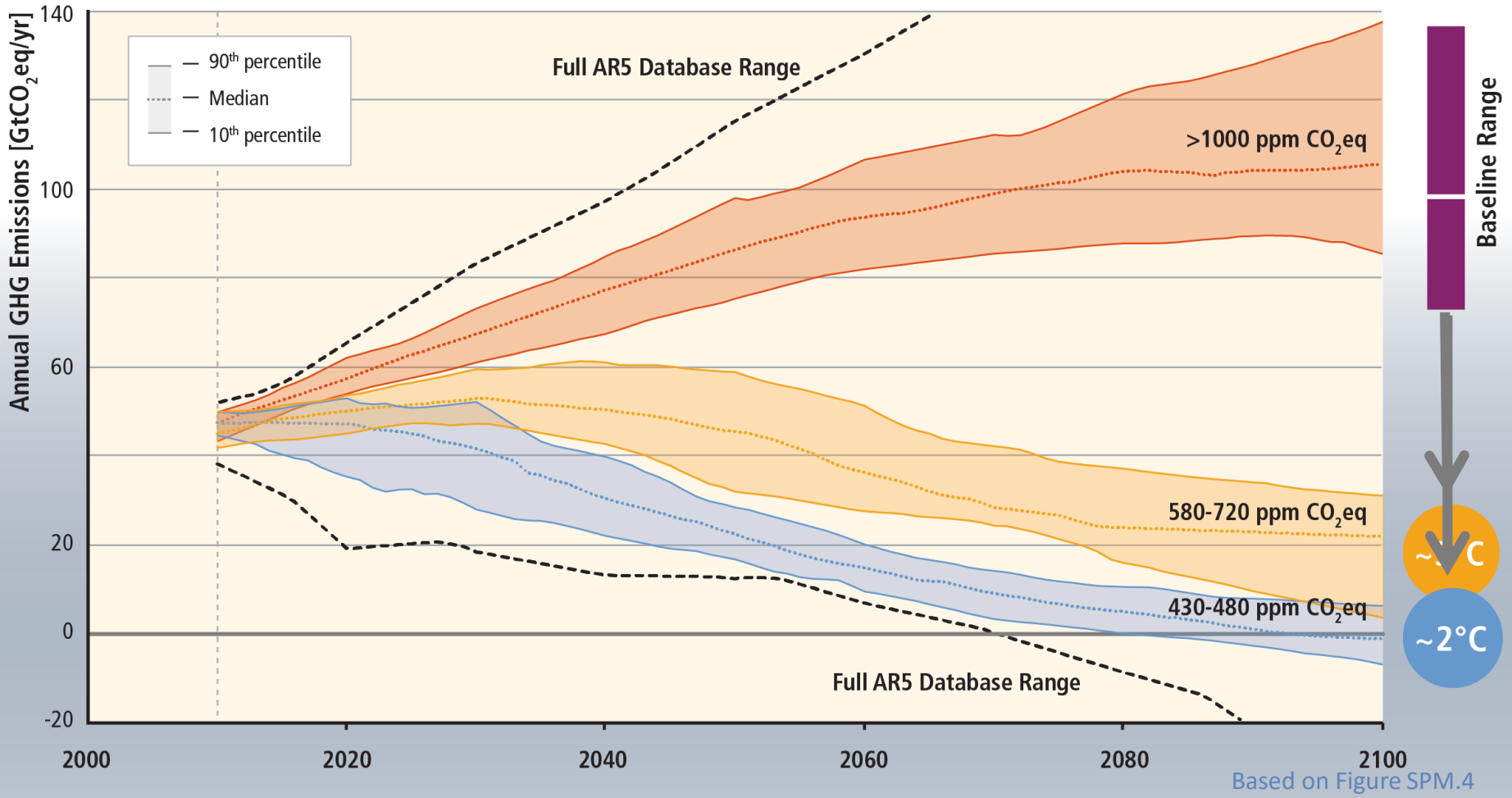
Based on WGII AR5 Figure 19.4

Stabilization of atmospheric GHG concentrations requires moving away from business as usual.



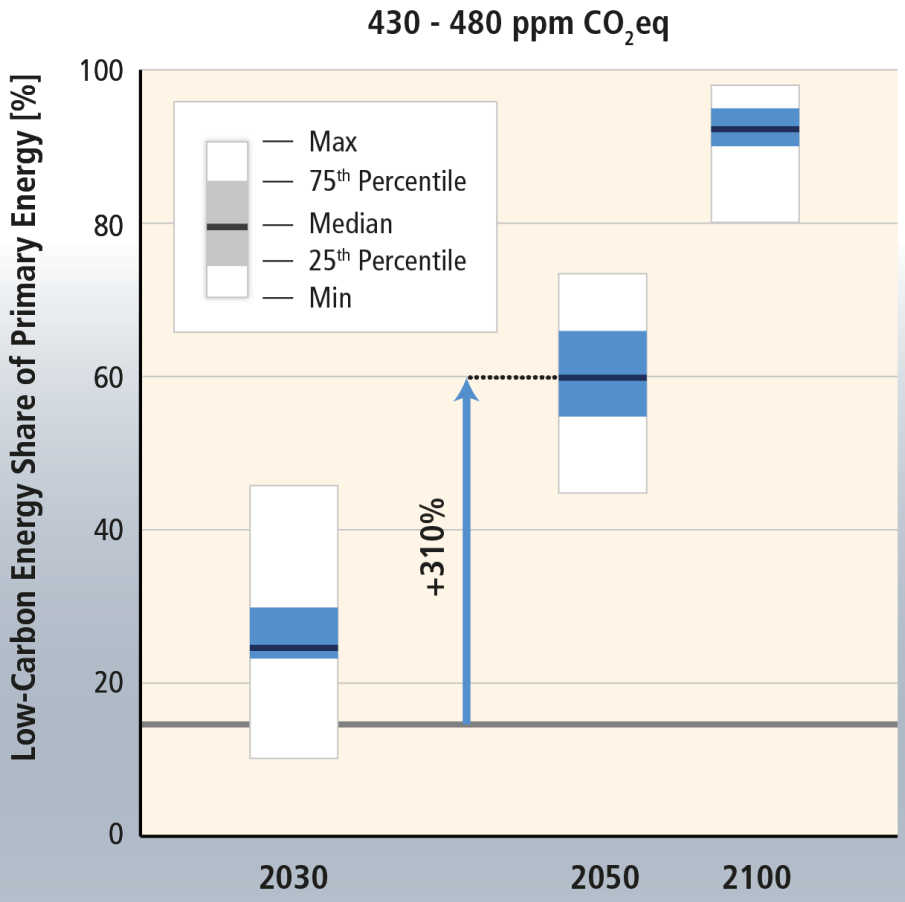
Based on Figure SPM.4

Lower ambition mitigation goals require similar reductions of GHG emissions.



Based on Figure SPM.4

Mitigation involves substantial upscaling of low-carbon energy.



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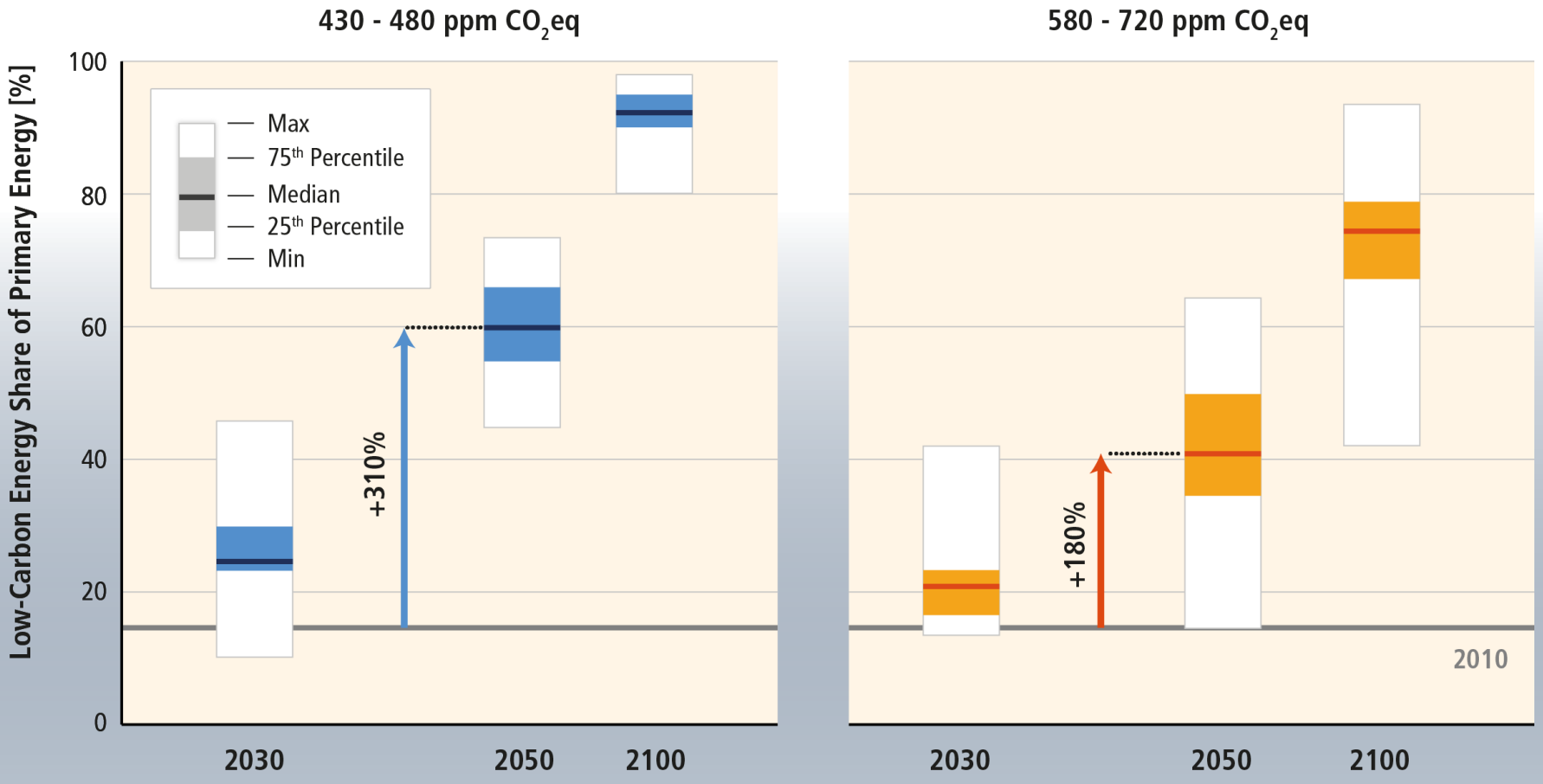
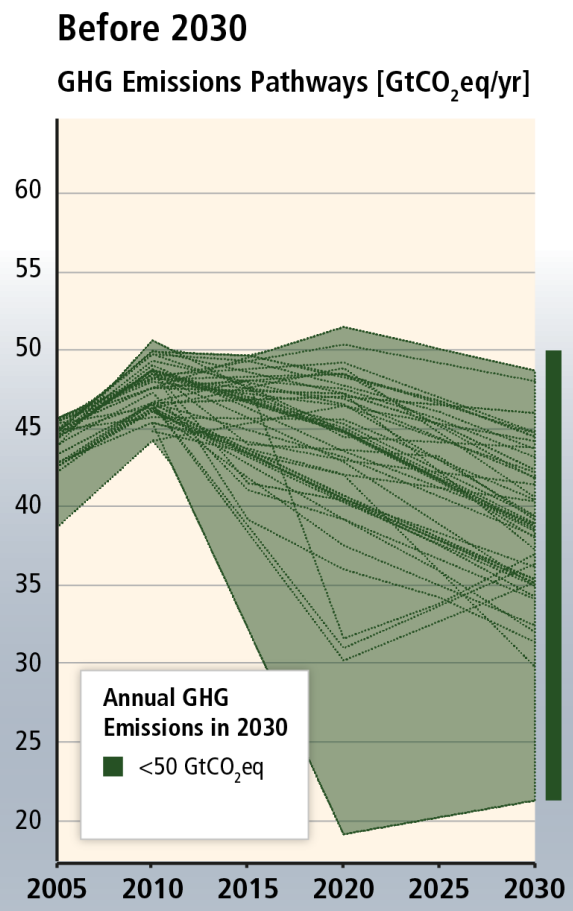


Based on Figure SPM.4

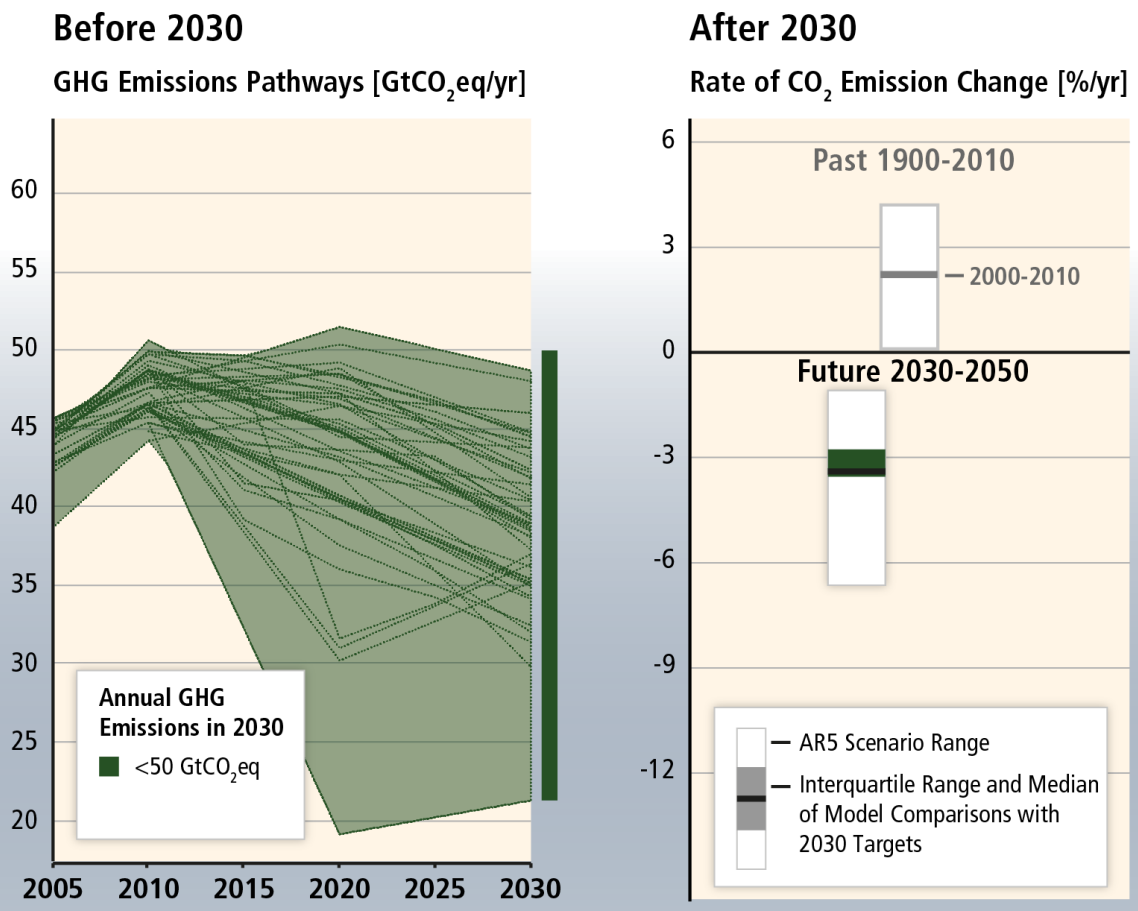
Many scenarios make it at least *about as likely as not* that warming will remain below 2°C relative to pre-industrial levels.



"Immediate Action"

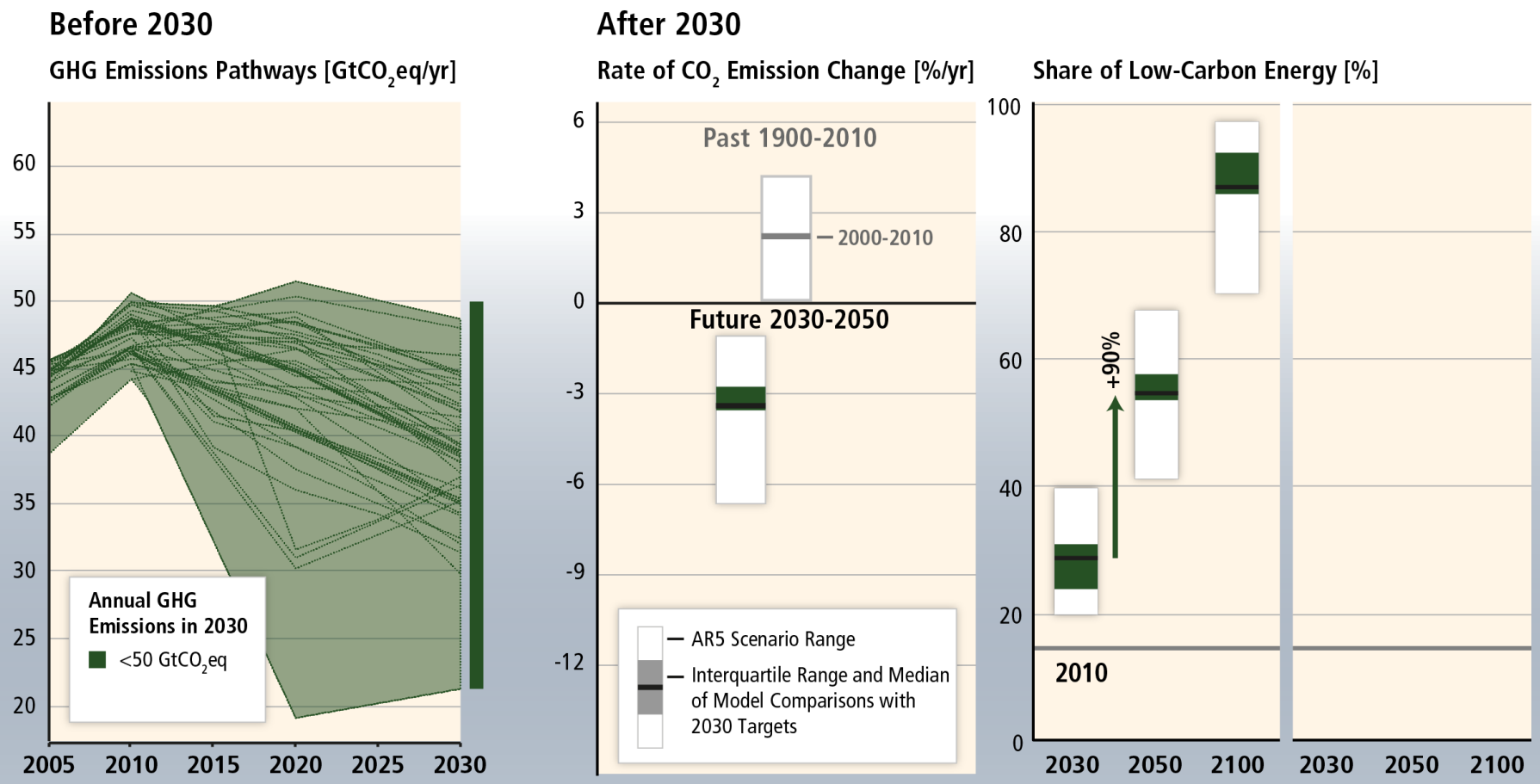
Based on Figure SPM.5

Still, between 2030 and 2050, emissions would have to be reduced at an unprecedented rate...



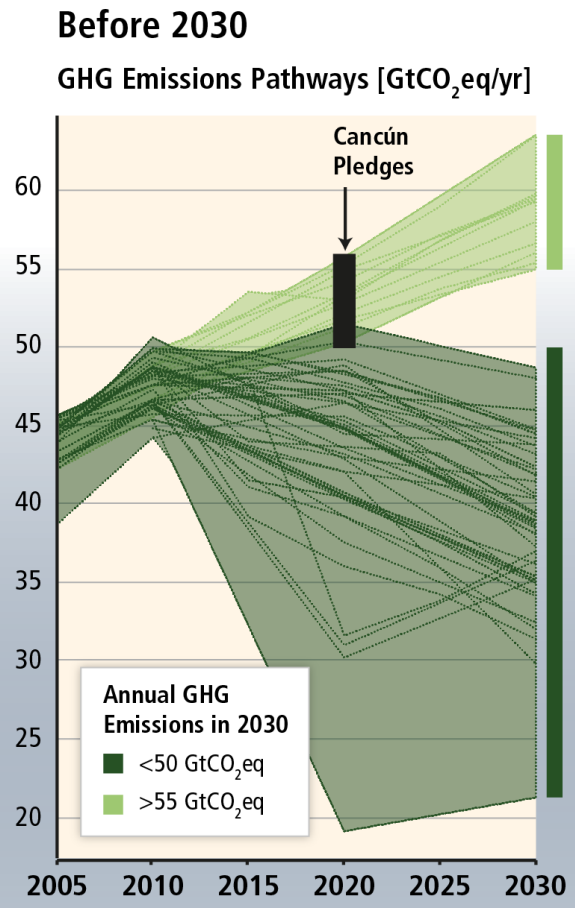
Based on Figure SPM.5

...implying a rapid scale-up of low-carbon energy.



Based on Figure SPM.5

Delaying emissions reductions increases the difficulty and narrows the options for mitigation.



"Delayed Mitigation"

"Immediate Action"

Based on Figure SPM.5

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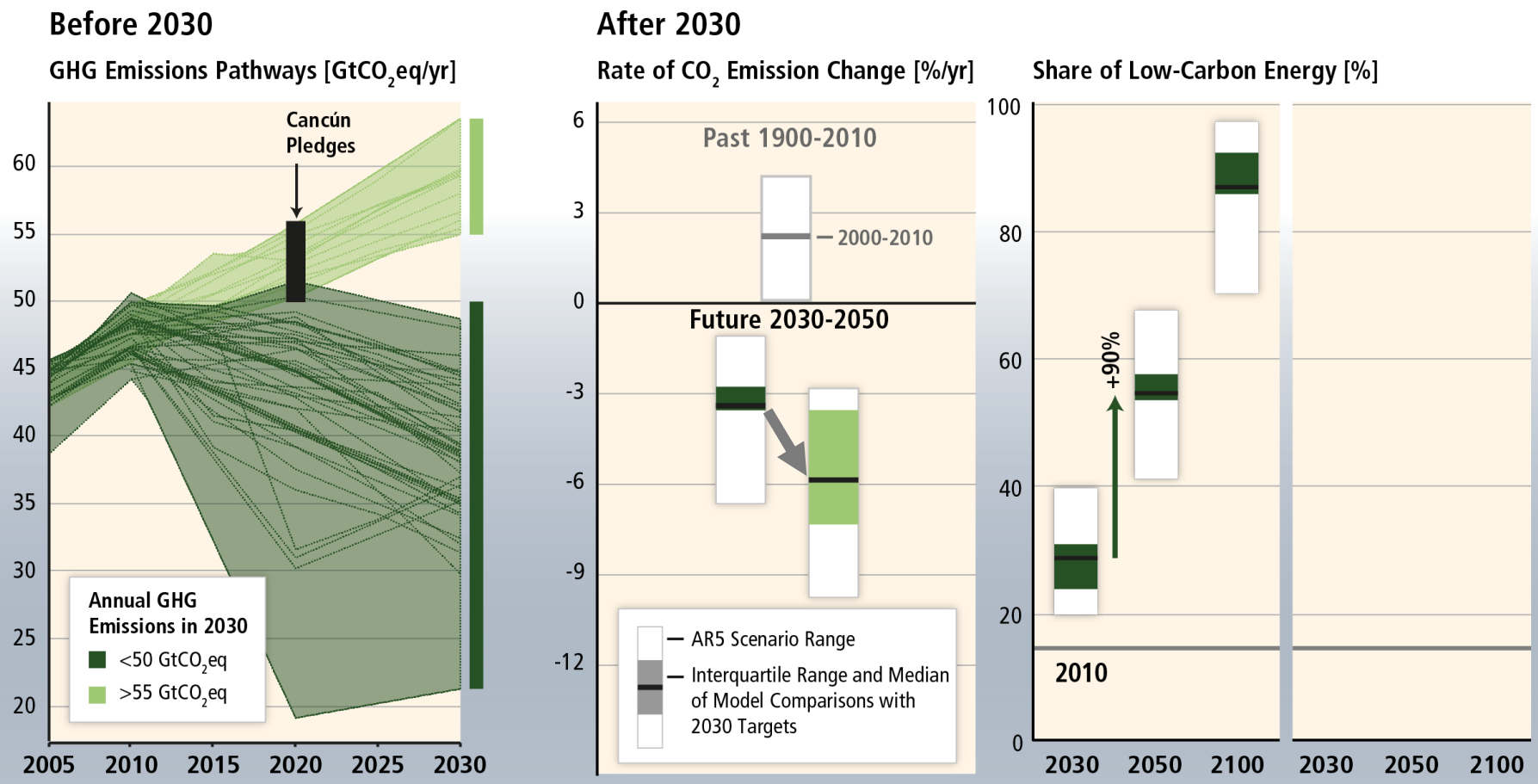

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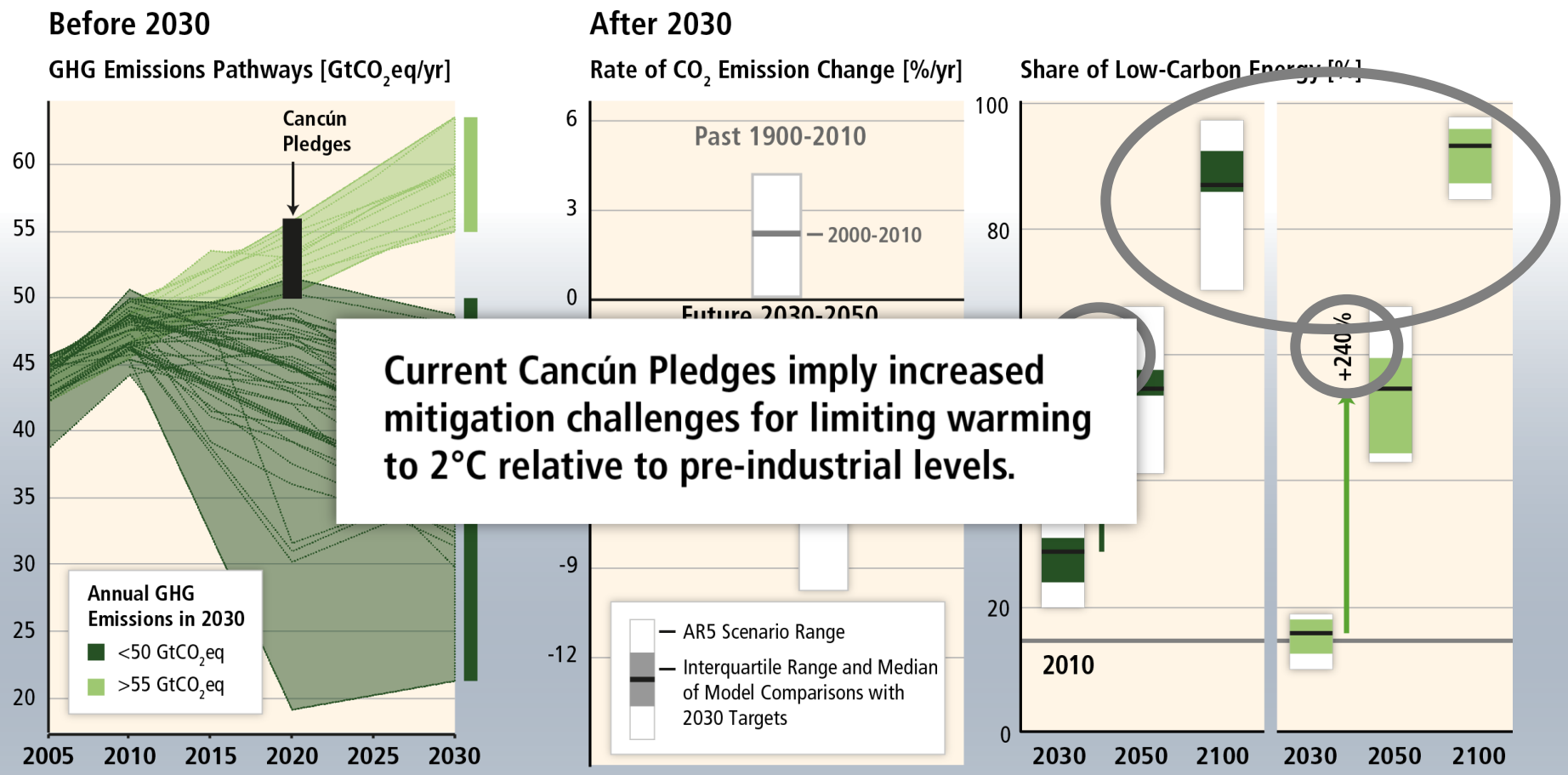
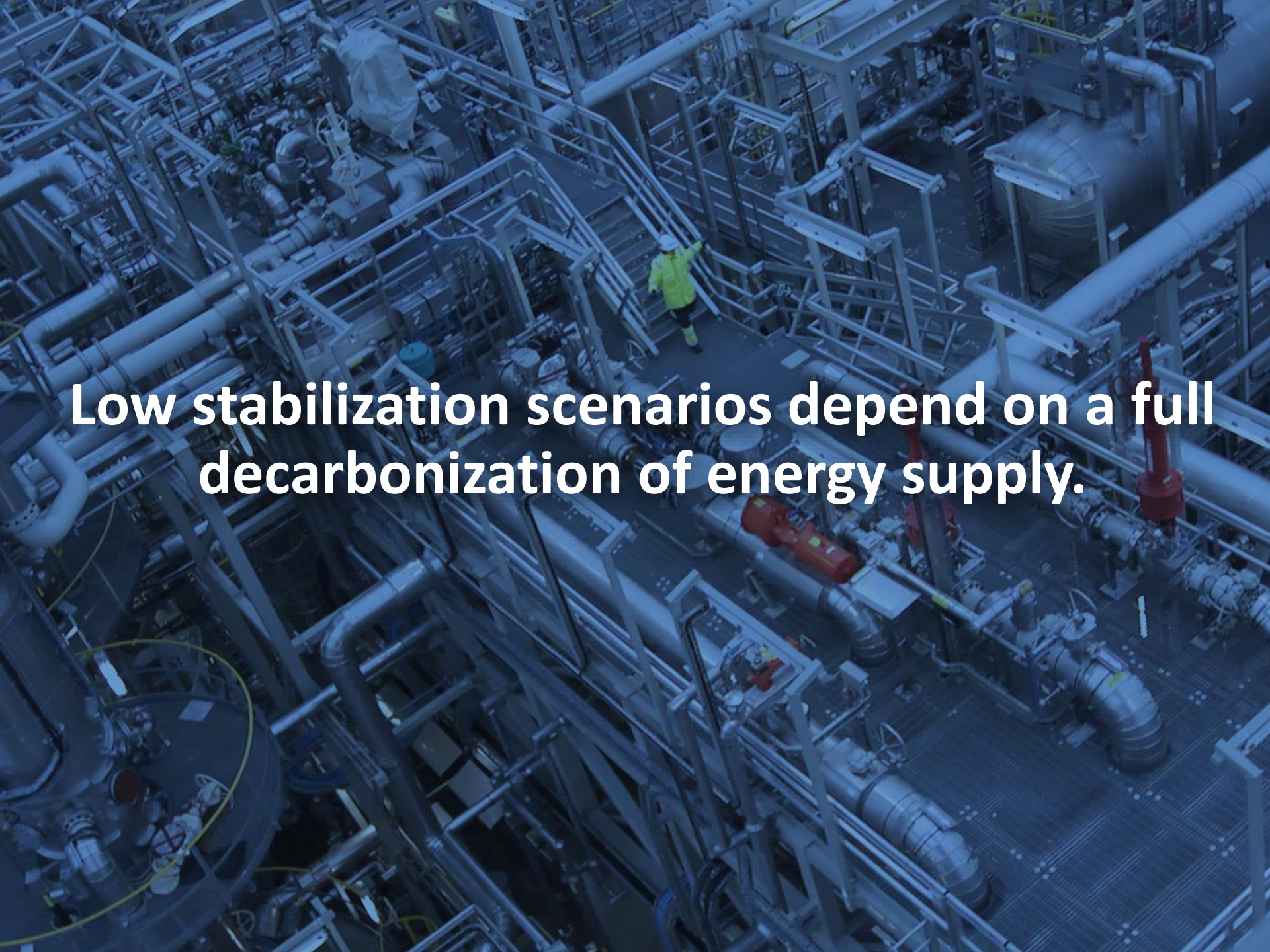
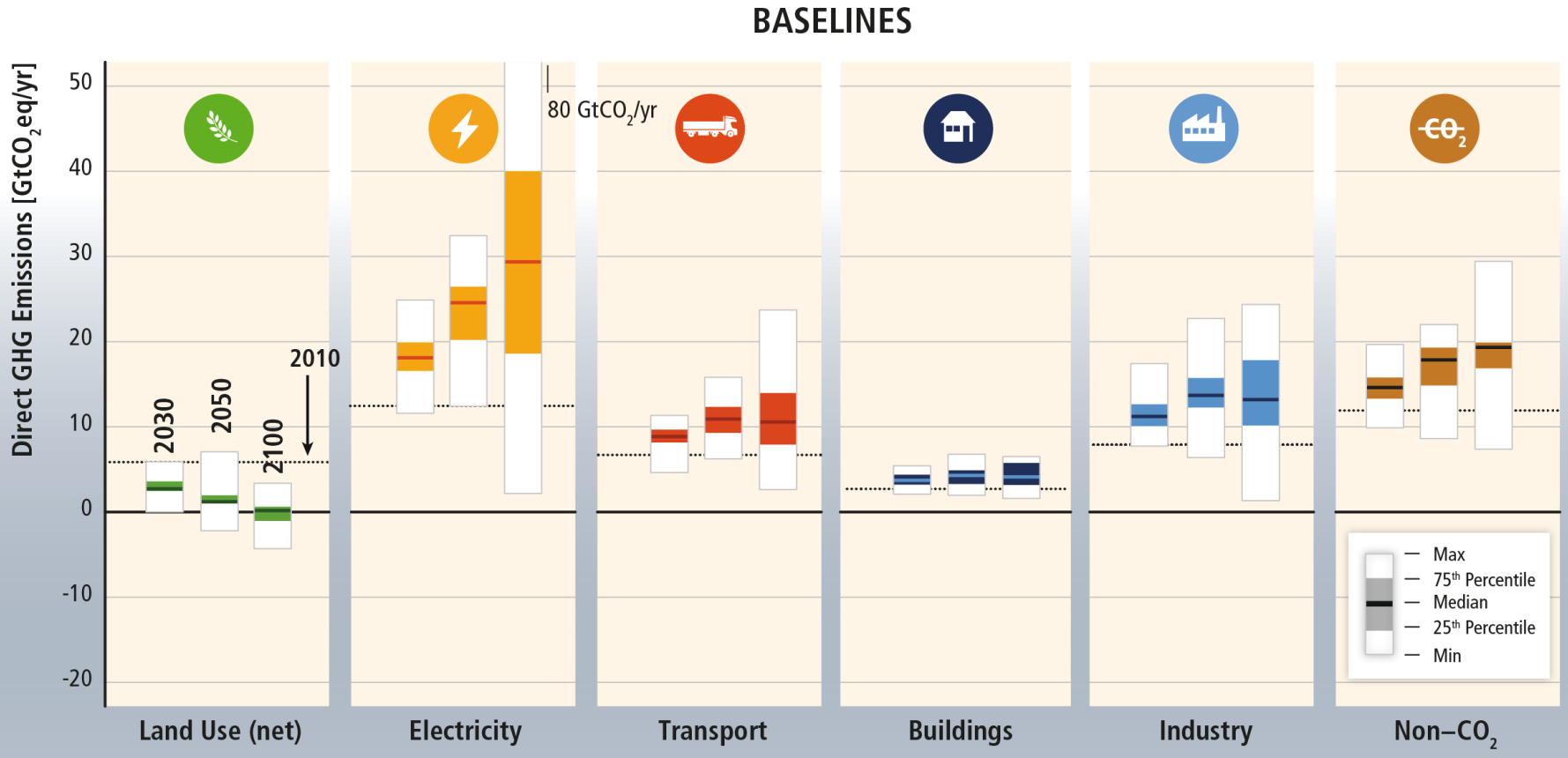


Based on Figure SPM.5

Mitigation measures and policies

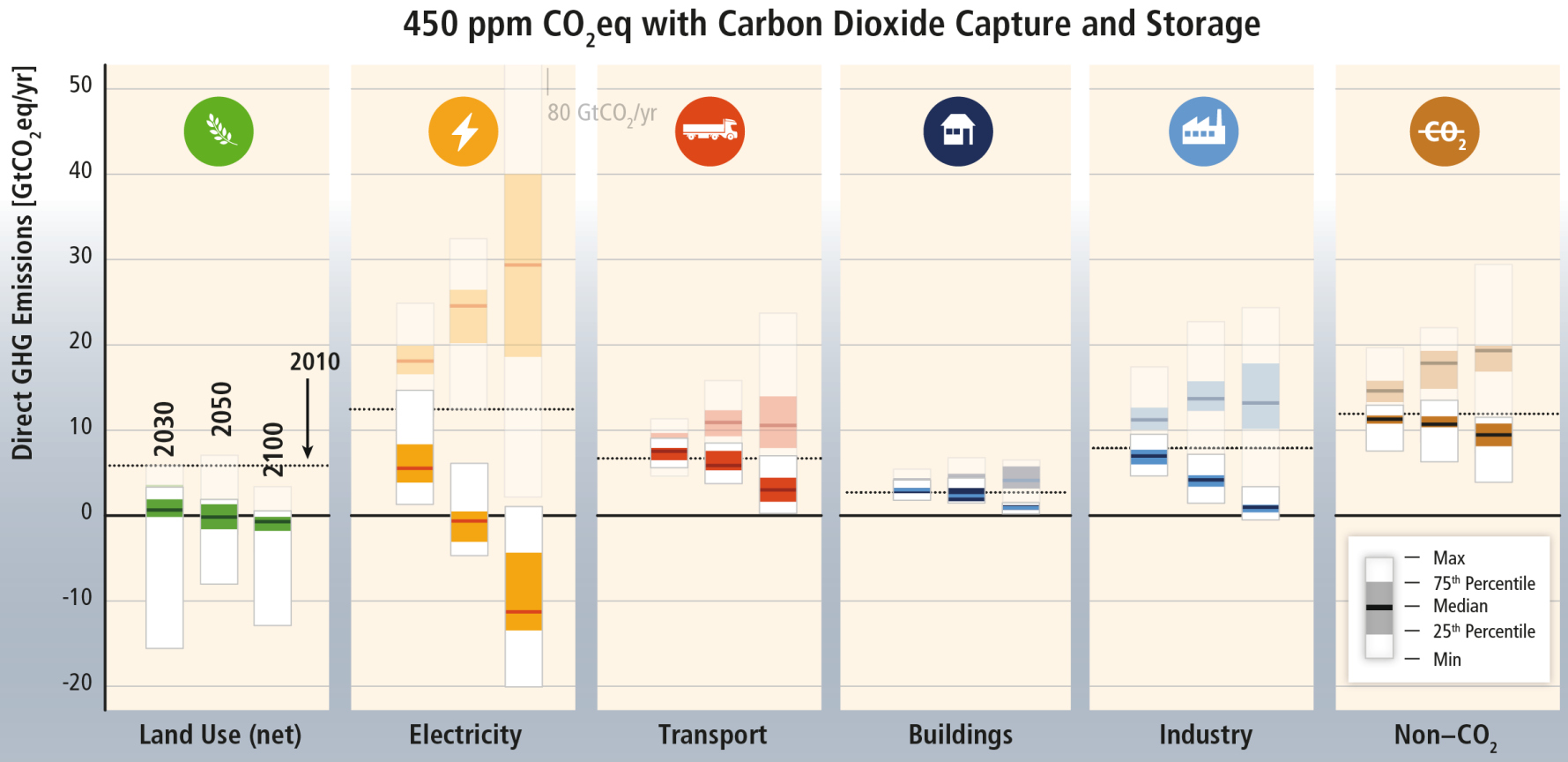

Low stabilization scenarios depend on a full decarbonization of energy supply.

Baseline scenarios suggest rising GHG emissions in all sectors, except for CO_2 emissions from the land-use sector.



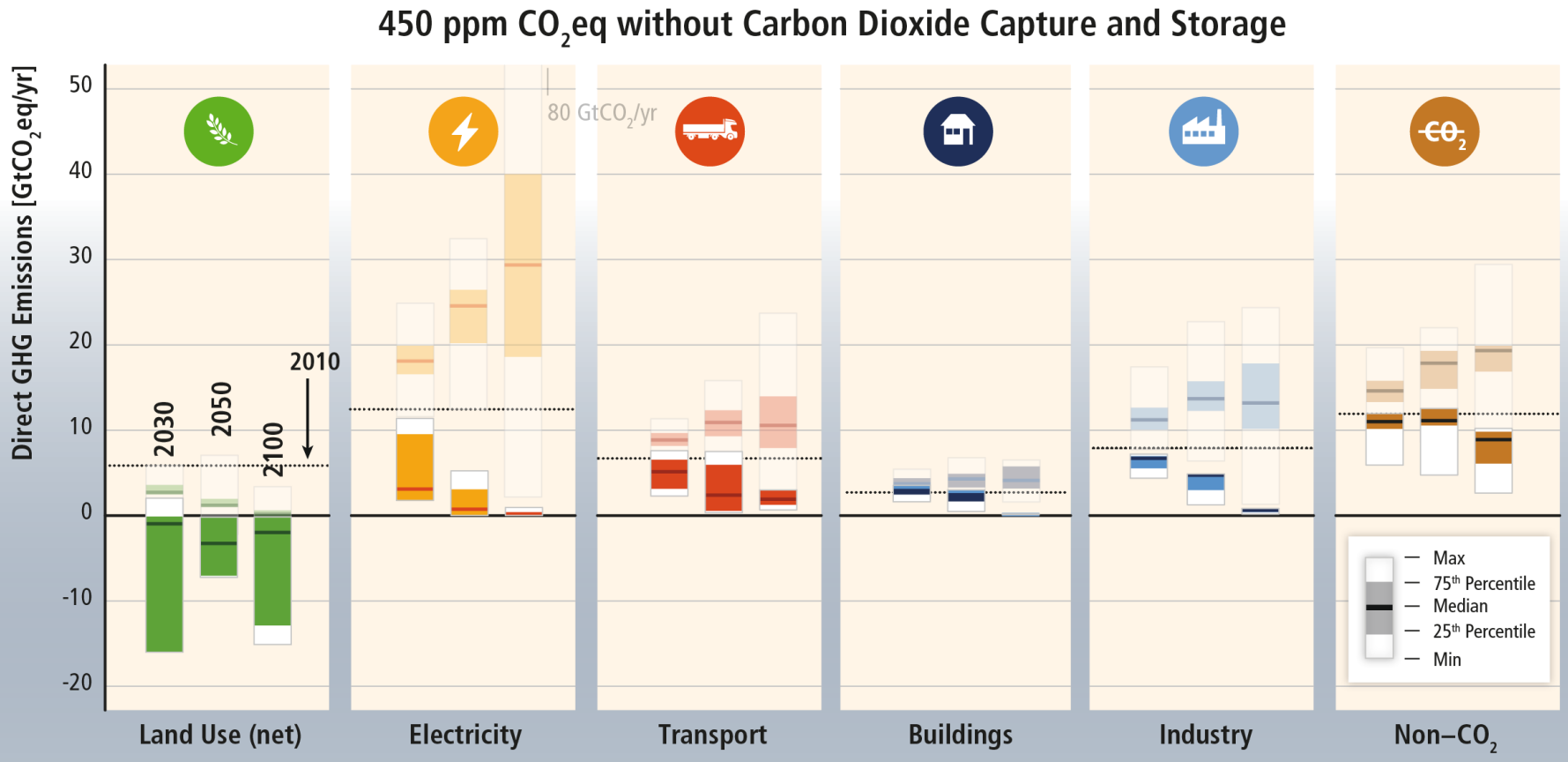
Based on Figure TS.15

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



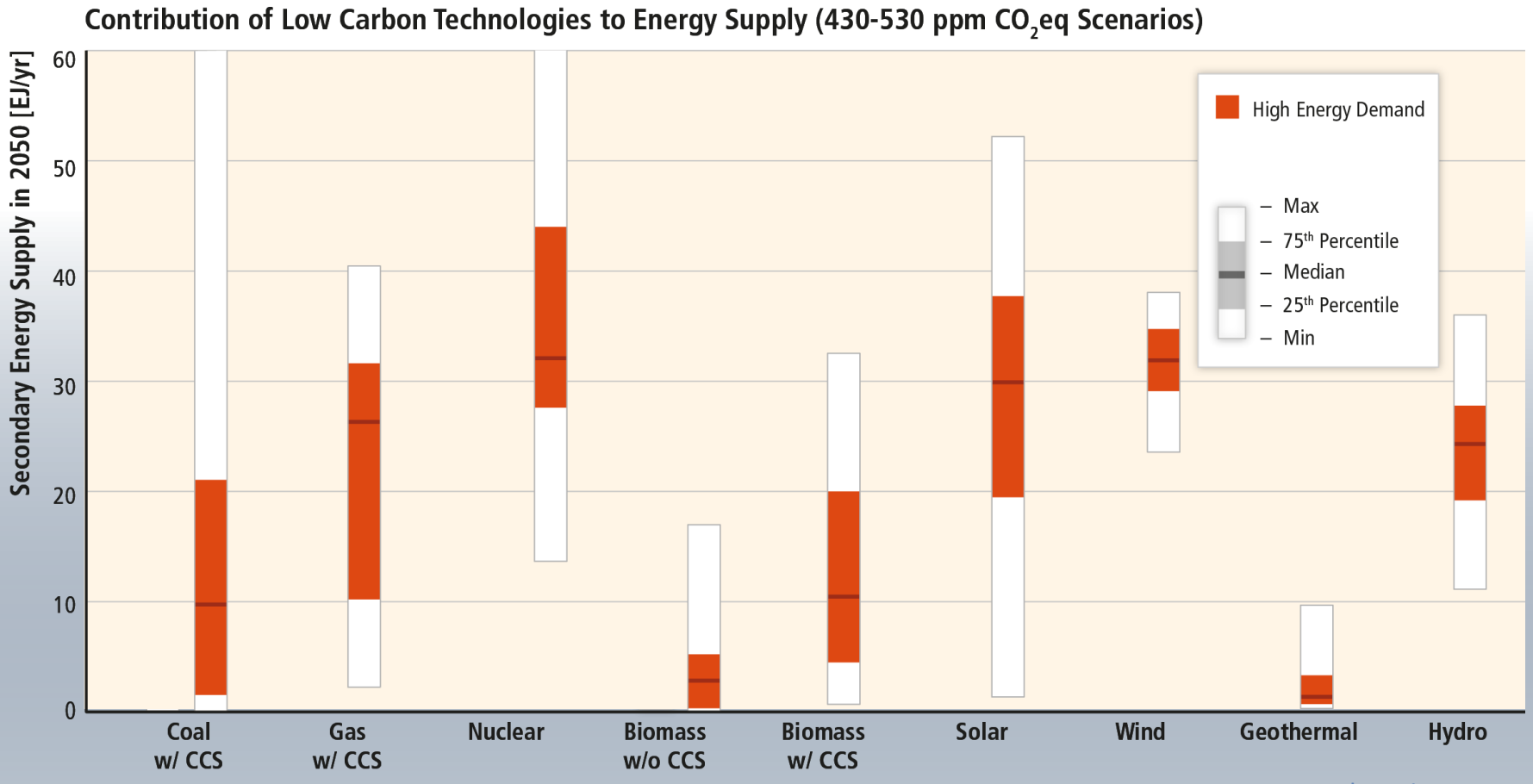
Based on Figure TS.17

Mitigation efforts in one sector determine efforts in others.



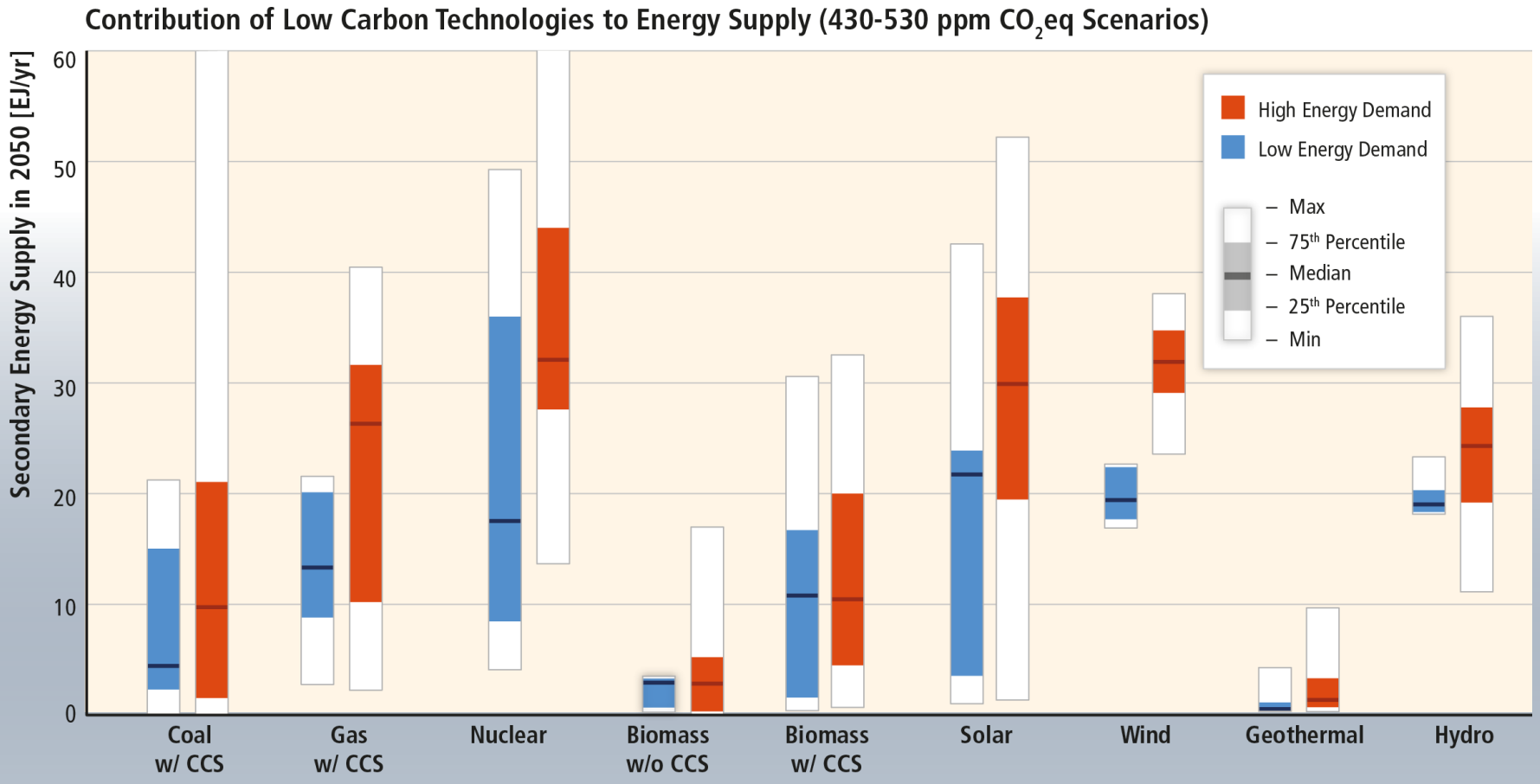
Based on Figure TS.17

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



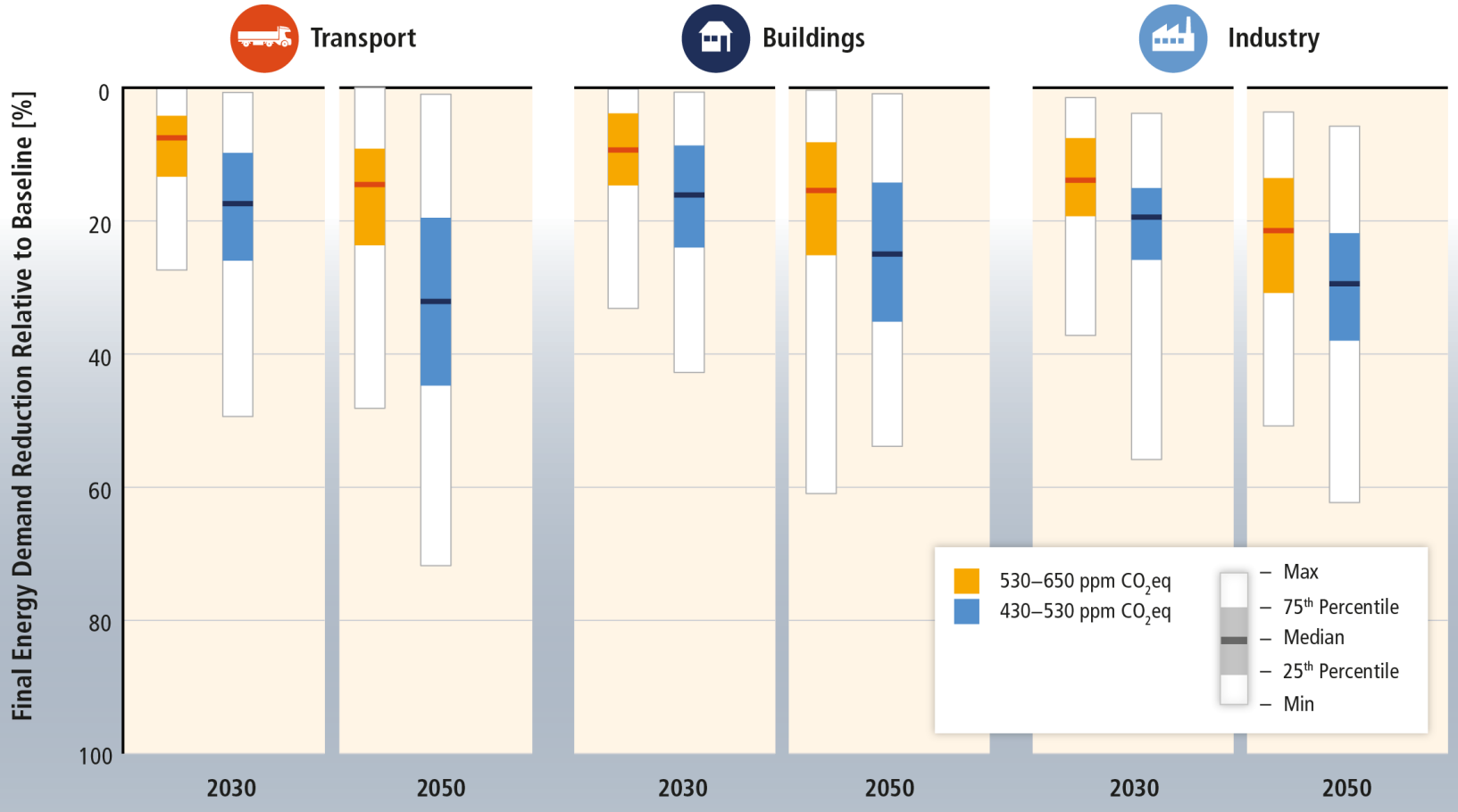
Based on Figure 7.11

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



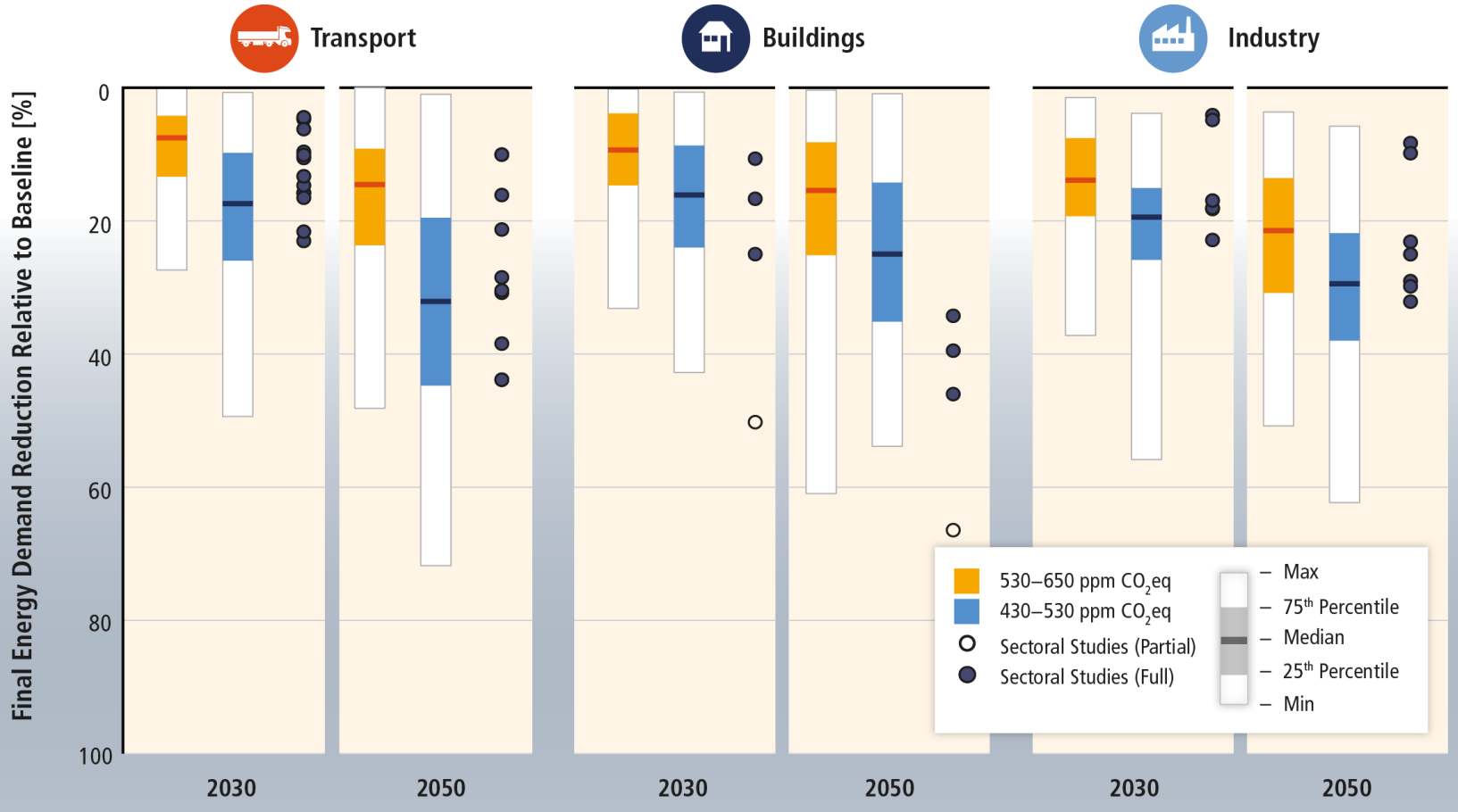
Based on Figure 7.11

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



Based on Figure SPM.8

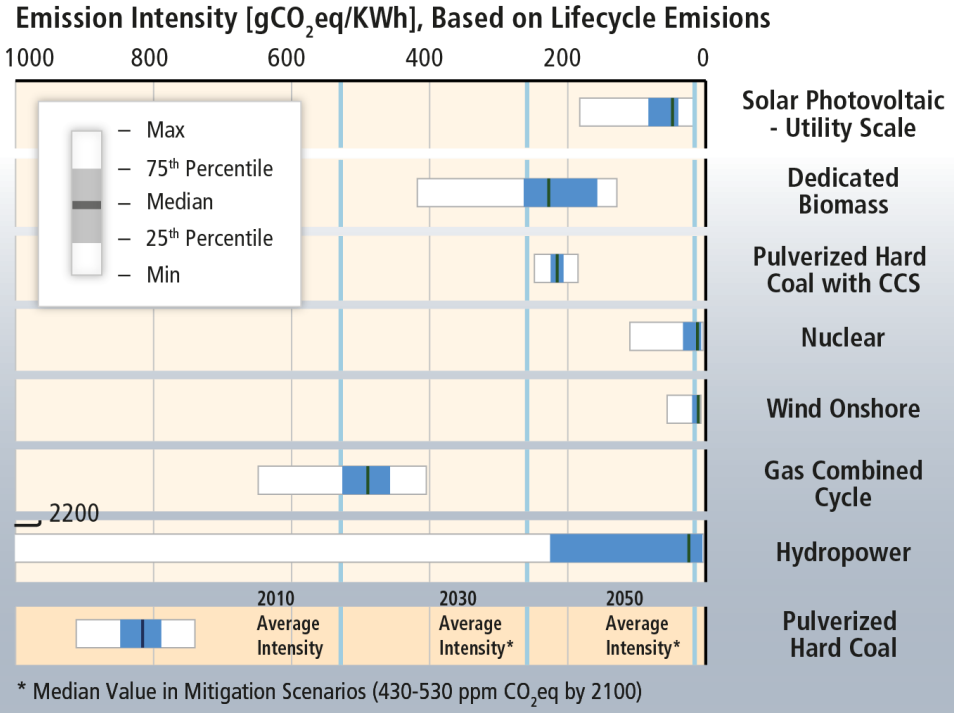
Reducing energy demand through efficiency enhancements and behavioural changes are a key mitigation strategy.



Based on Figure SPM.8


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

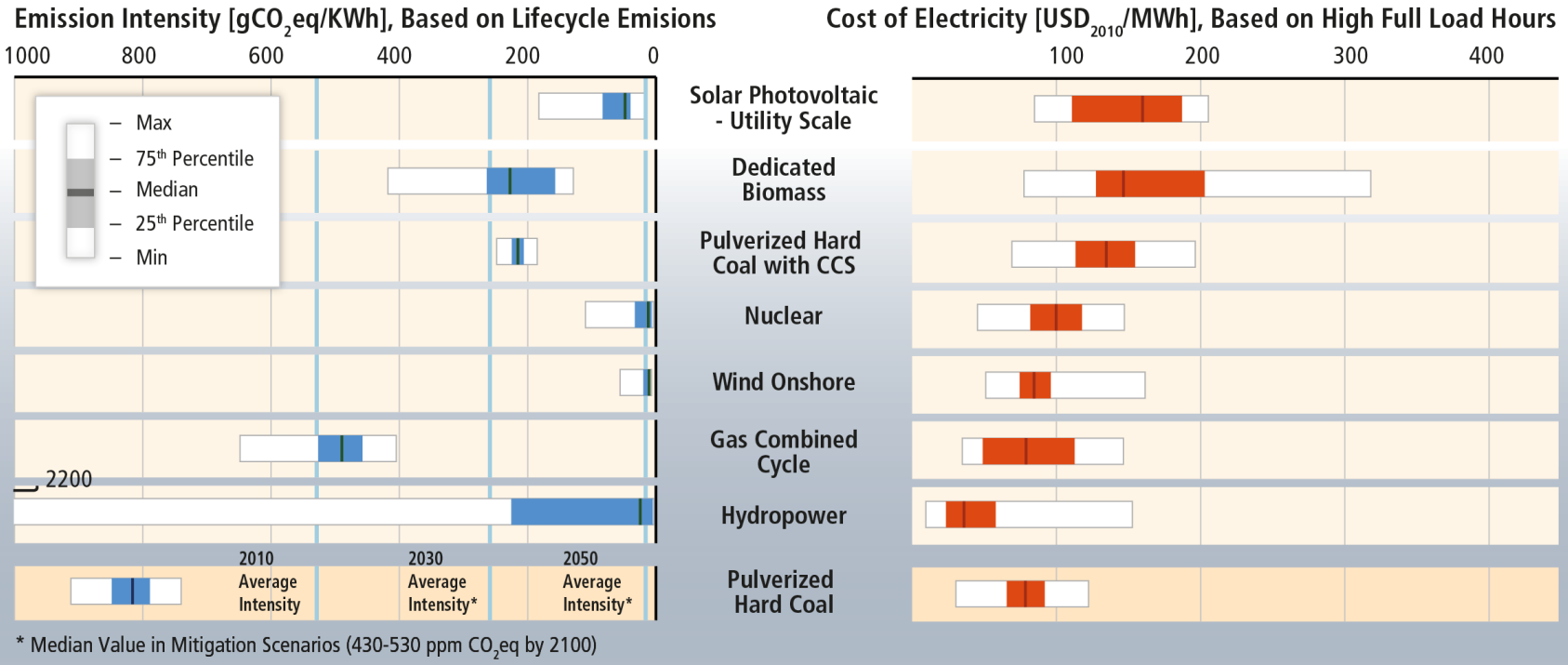
Examples from electricity generation: Low emission technologies exist, but emissions are reduced to different degrees.



* Median Value in Mitigation Scenarios (430-530 ppm CO_2eq by 2100)

Based on Figure 7.7

Due to cost decline, renewable energy technologies are becoming economical solutions in an increasing number of countries.



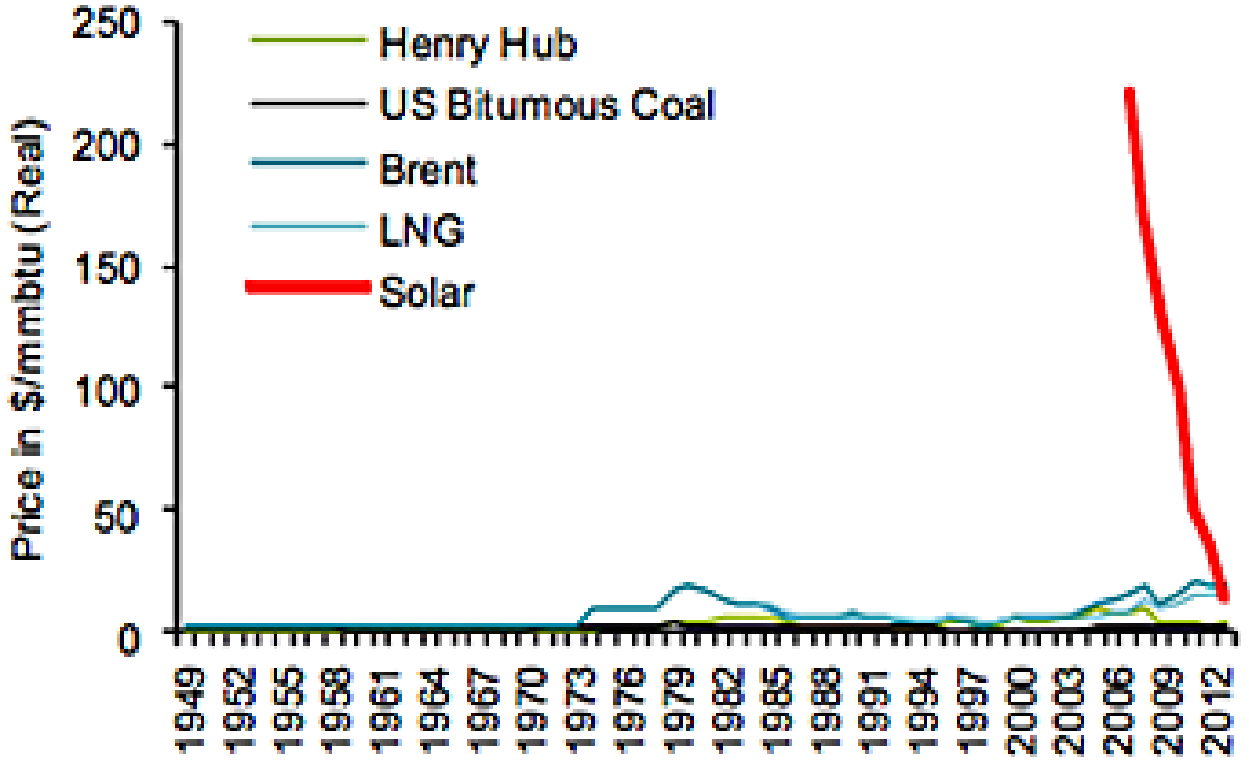
* Median Value in Mitigation Scenarios (430-530 ppm CO_2eq by 2100)

Based on Figure 7.7

PV Revolution

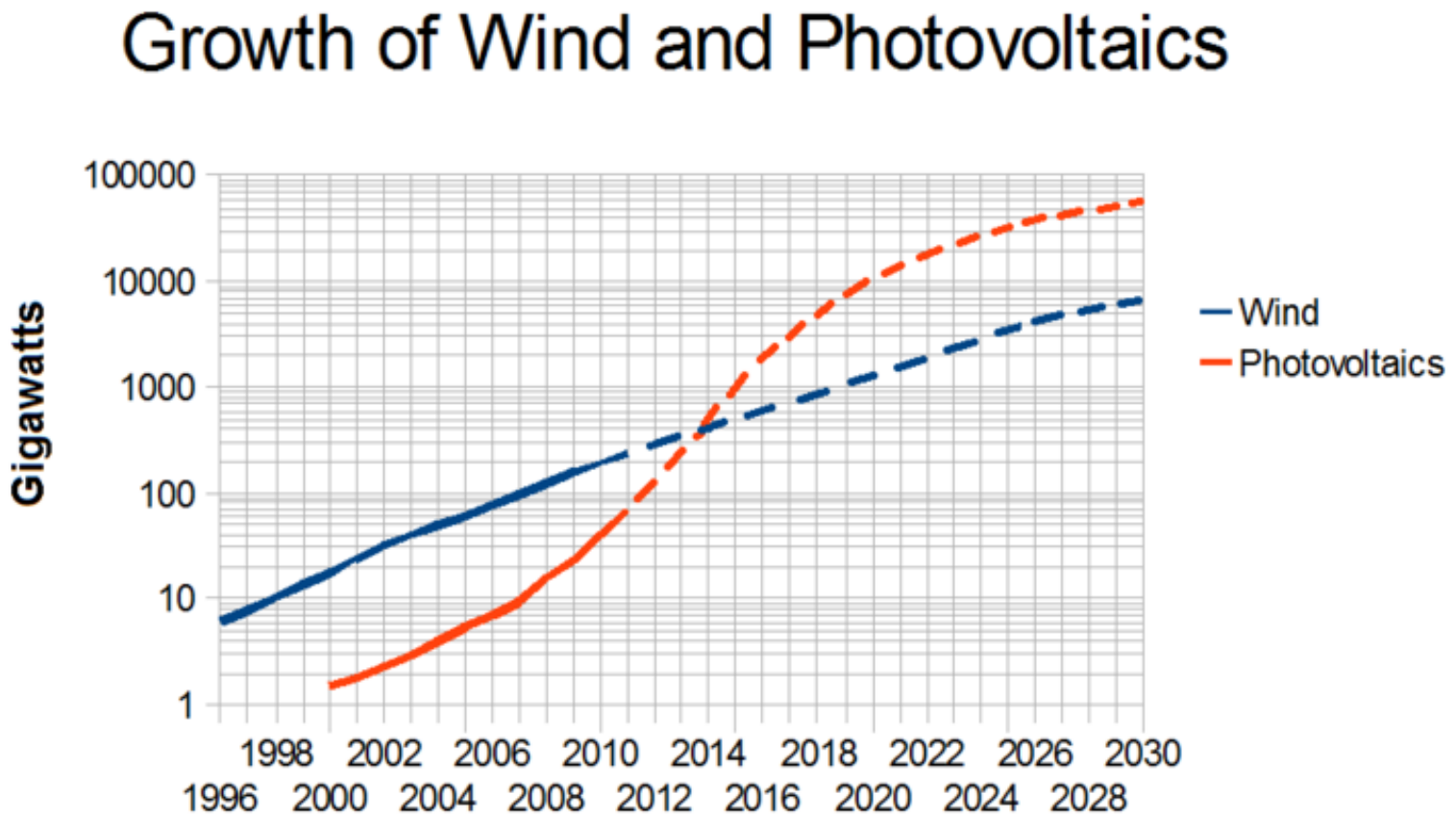
Exhibit 2

Welcome to the Terrordome… $/MMBTU by Energy Type

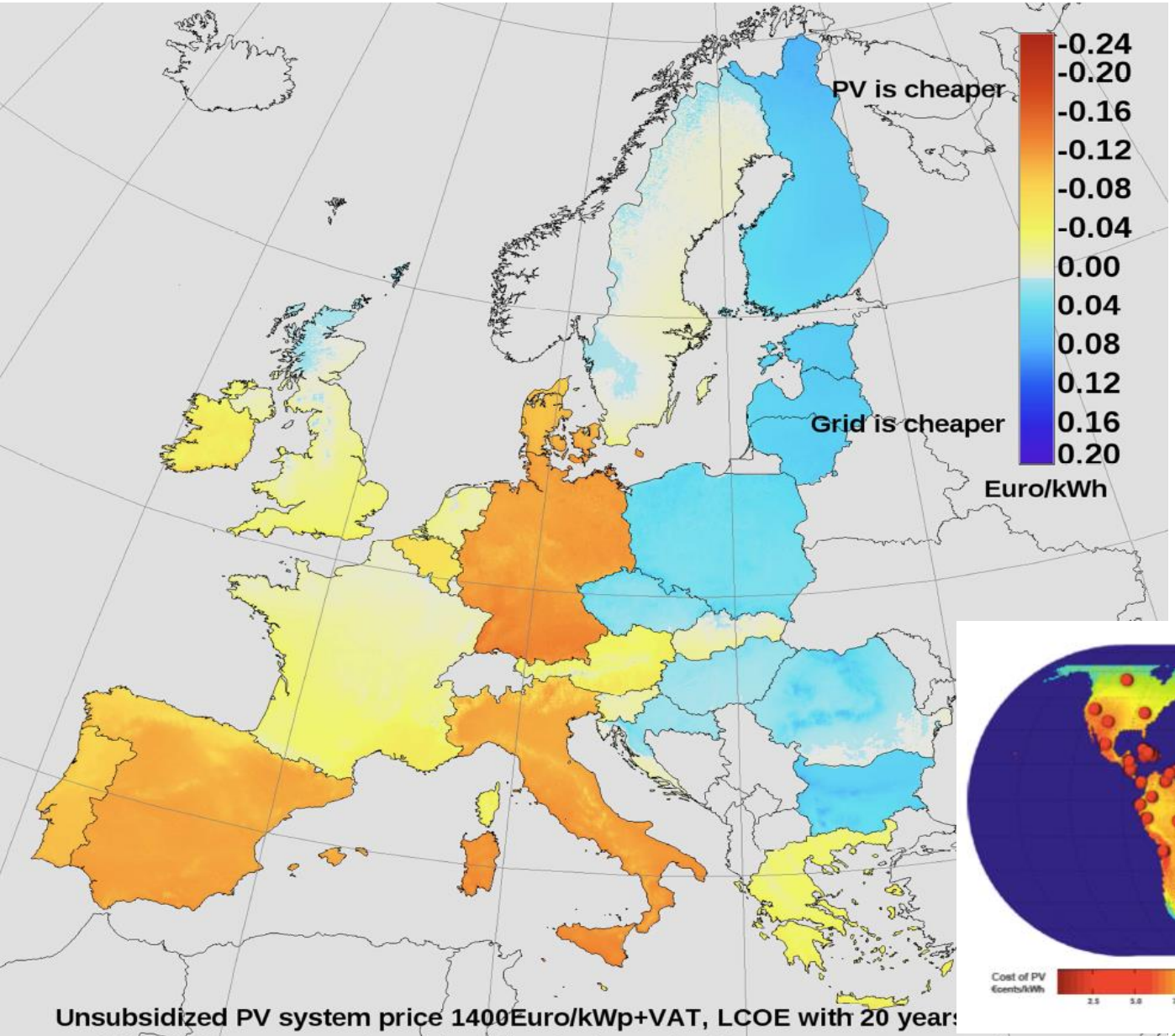


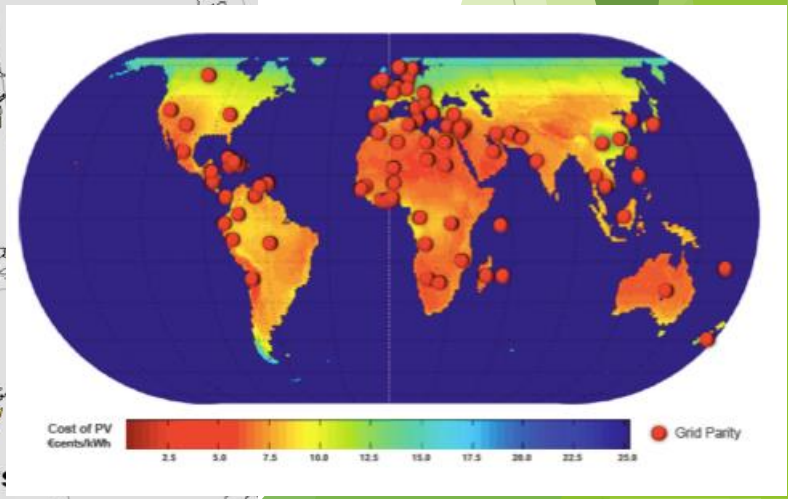
Source: EIA, CIA, World Bank, Bernstein analysis

PV Revolution



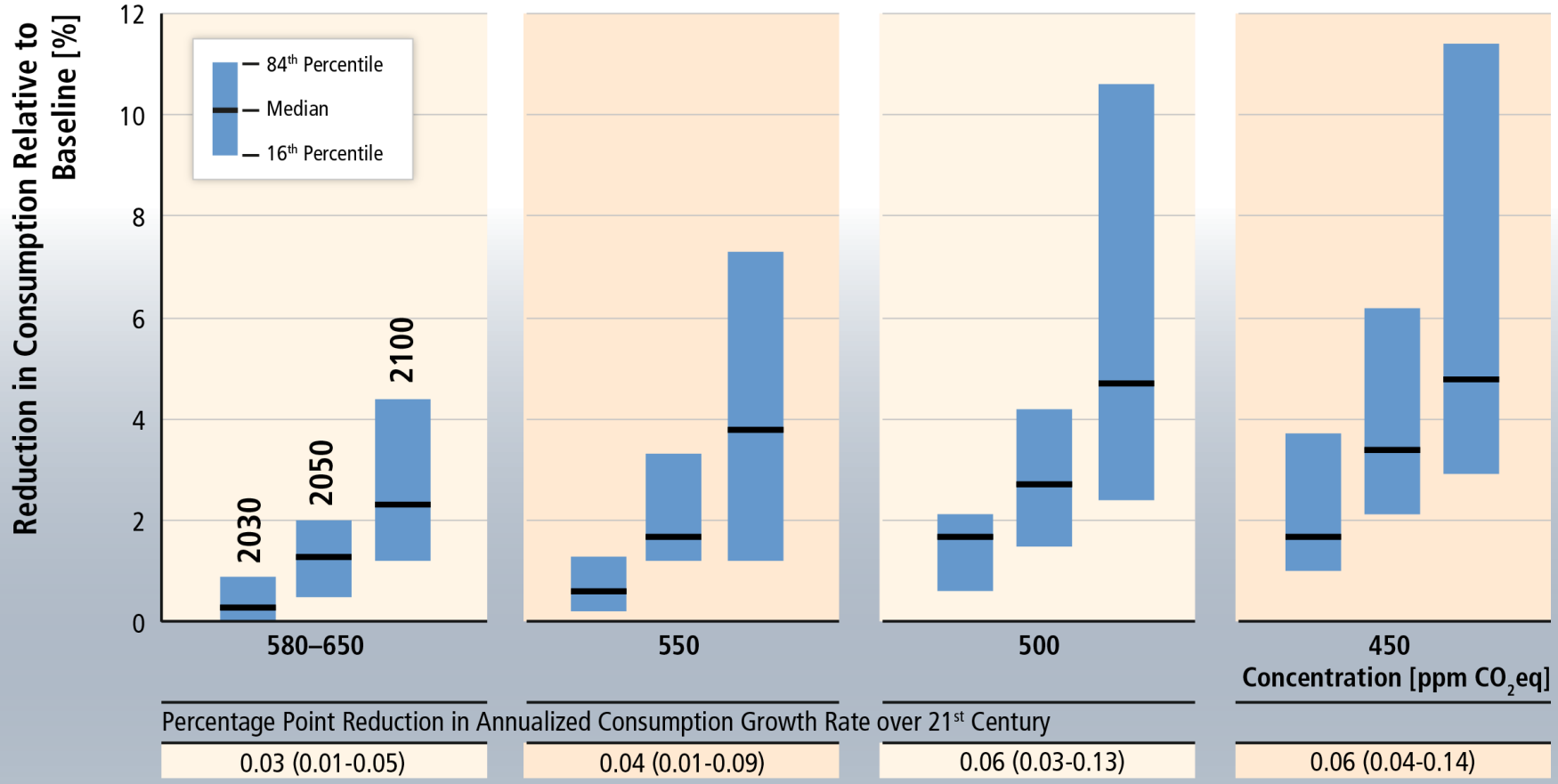
Grid parity in 102 countries





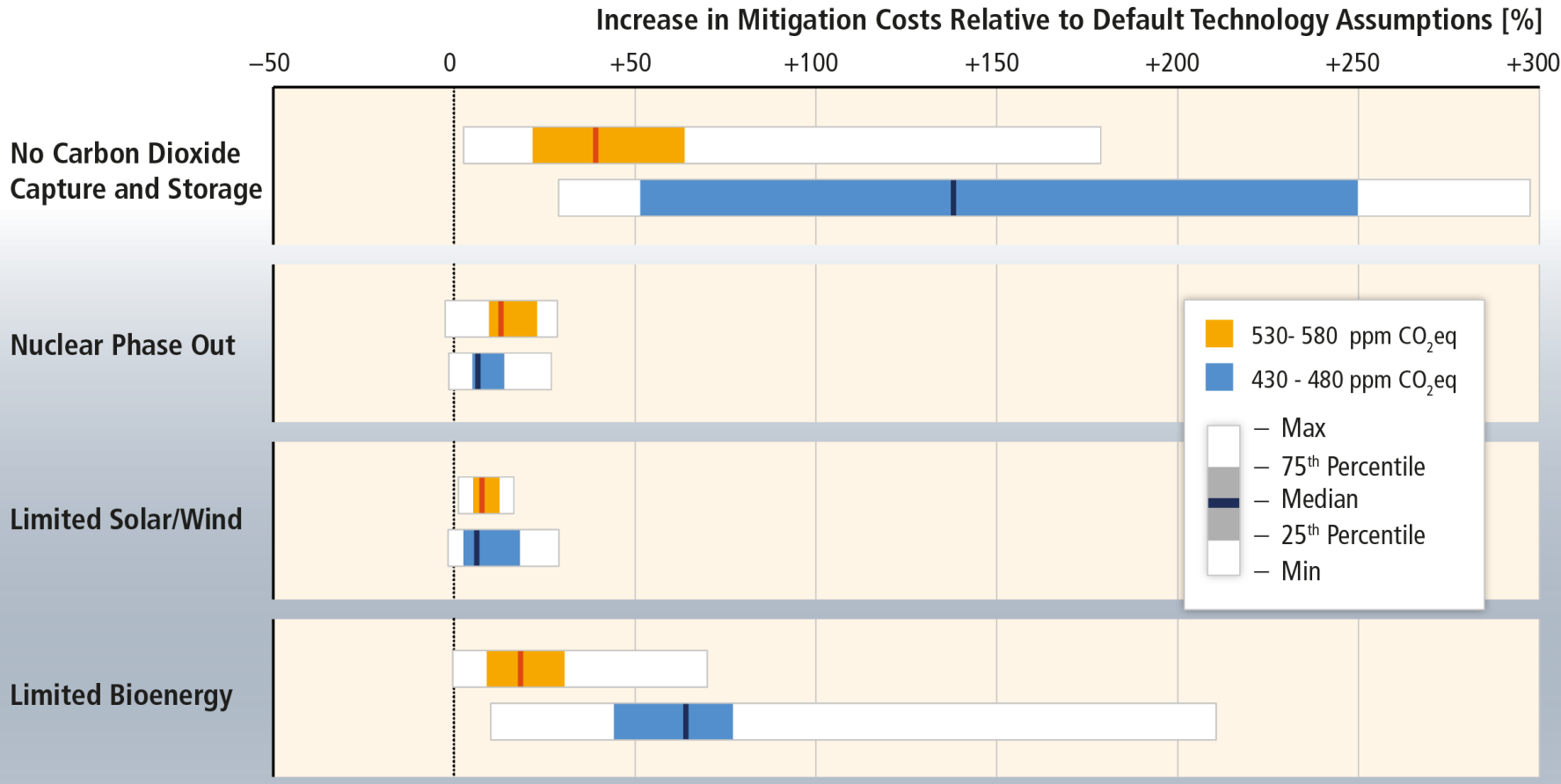

Mitigation cost estimates vary, but global GDP growth may not be strongly affected.

Global costs rise with the ambition of the mitigation goal.



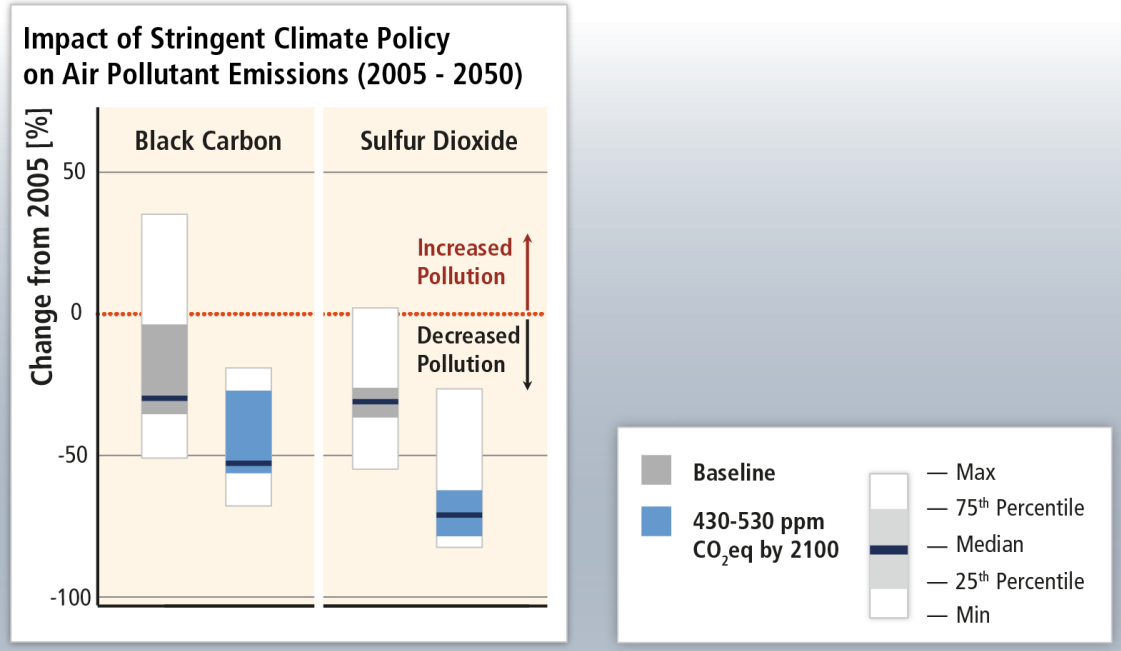
Based on Table SPM.2

Technological limitations can increase mitigation costs.



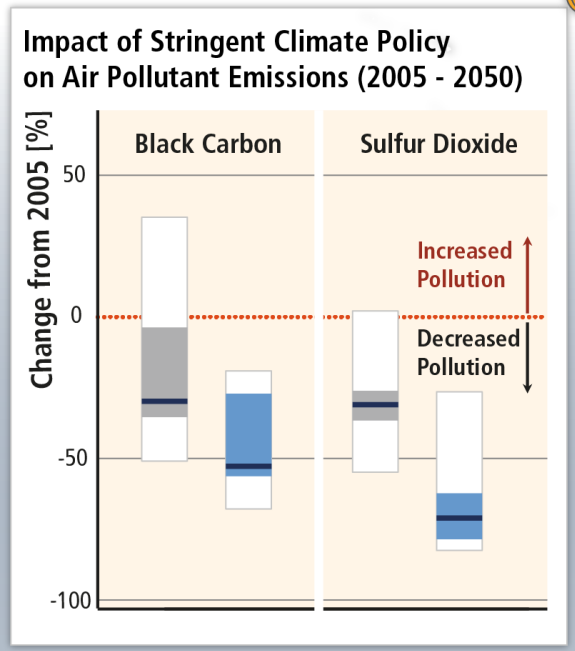
Based on Figure 6.24

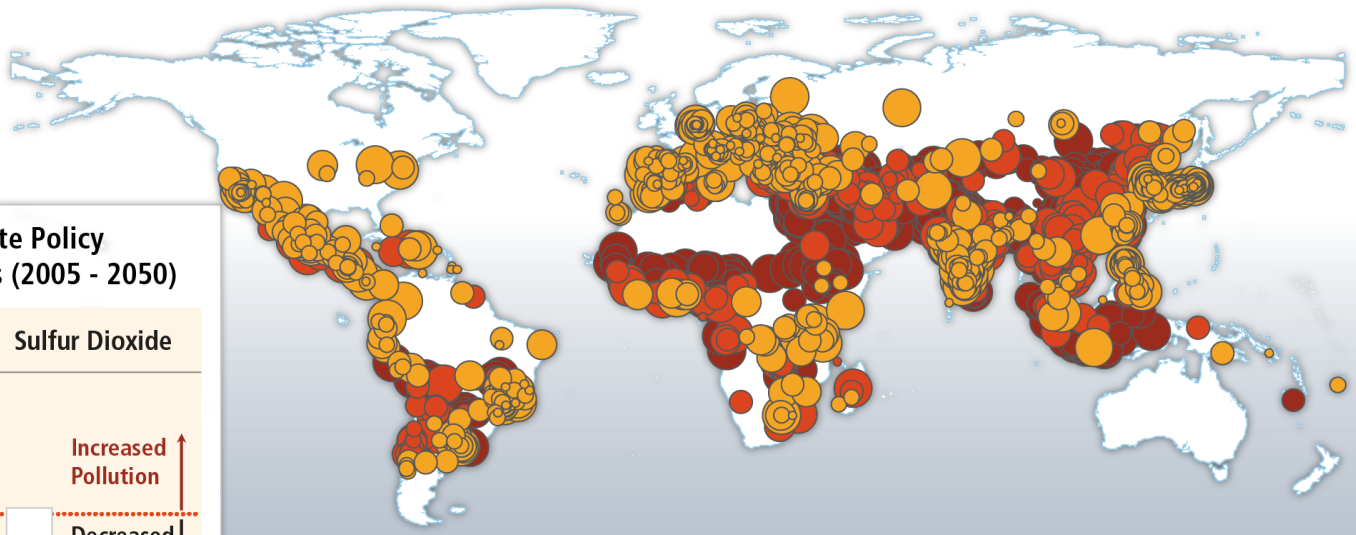
Mitigation can result in co-benefits for human health and other societal goals.

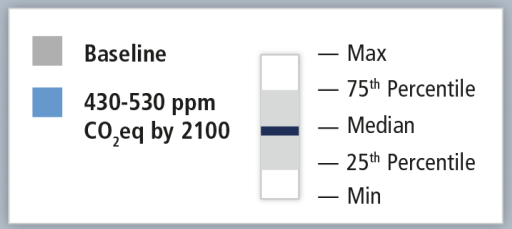


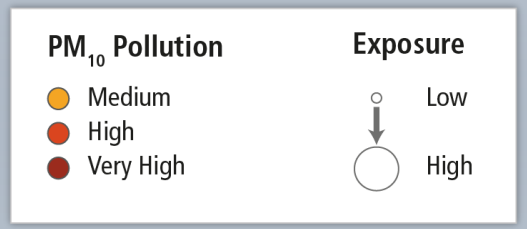
Based on Figures SPM.6 and 12.23

Climate change mitigation can result in co-benefits for human health and other societal goals.









Based on Figures SPM.6 and 12.23

	Average emplyment over life of facility (Jobs per megawatt of average capacity)		
	Manufacturing, construction, instalation	Operating & maintenance/ fuel processing	Total
Solar PV	5.76-6.21	1.20-4.80	6.96-11.01
Wind power	0.43-2.51	0.27	0.70-2.78
Biomass	0.40	0.38-2.44	0.78-2.84
Coal-fired	0.27	0.74	1.01
Natural gas-fired	0.25	0.70	0.95

Note: Based on findings from a range of studies published in 2001-04. Assumed capacity factor is 21% for solar PV, 35% for wind, 80% for coal, and 85% for biomass and natural gas.

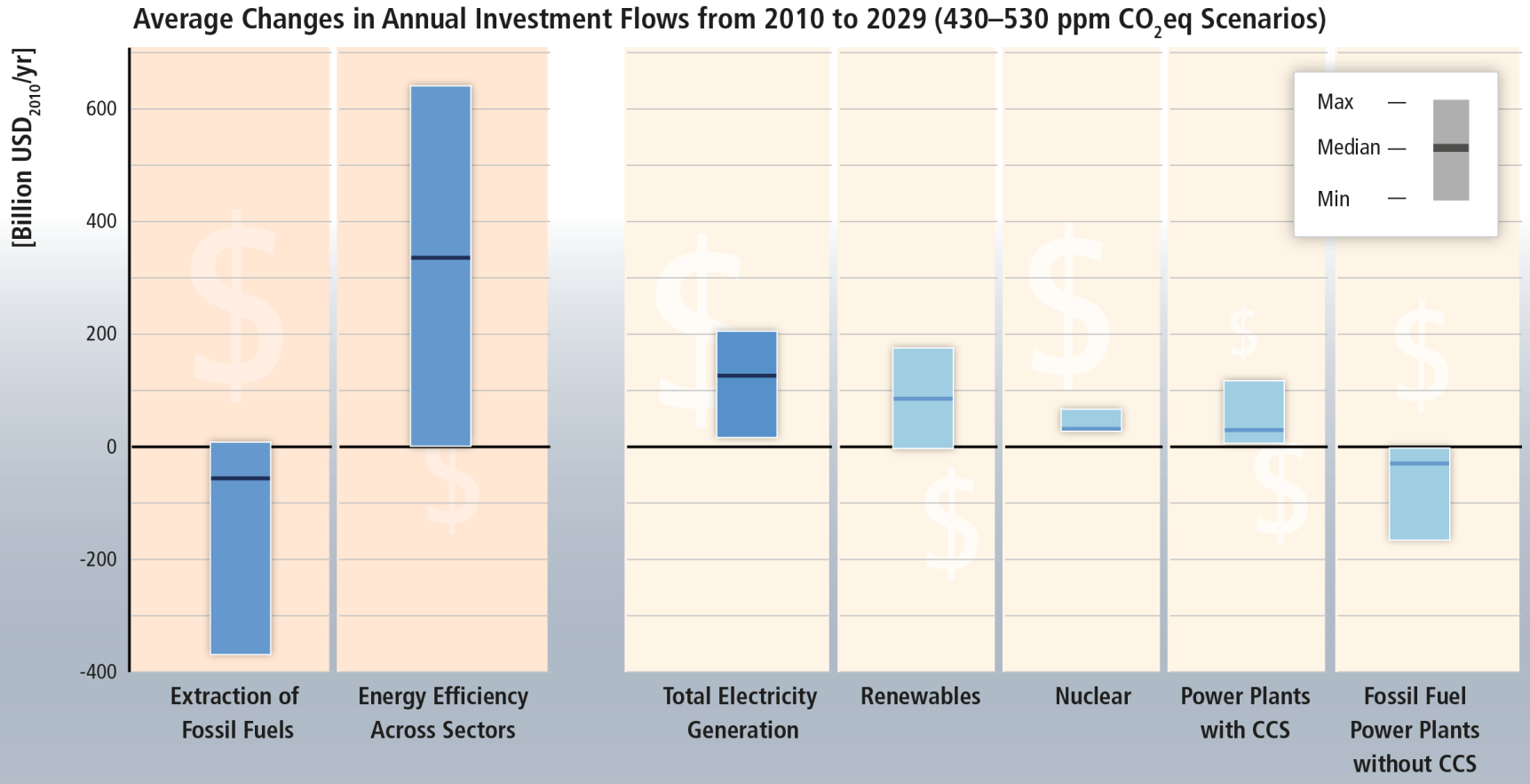
Table 8: Average employment over life of facility (Jobs per megawatt of average capacity)

Source: UNEP, ILO, IOE and ITUC (2008)

Prerequisites for effective mitigation

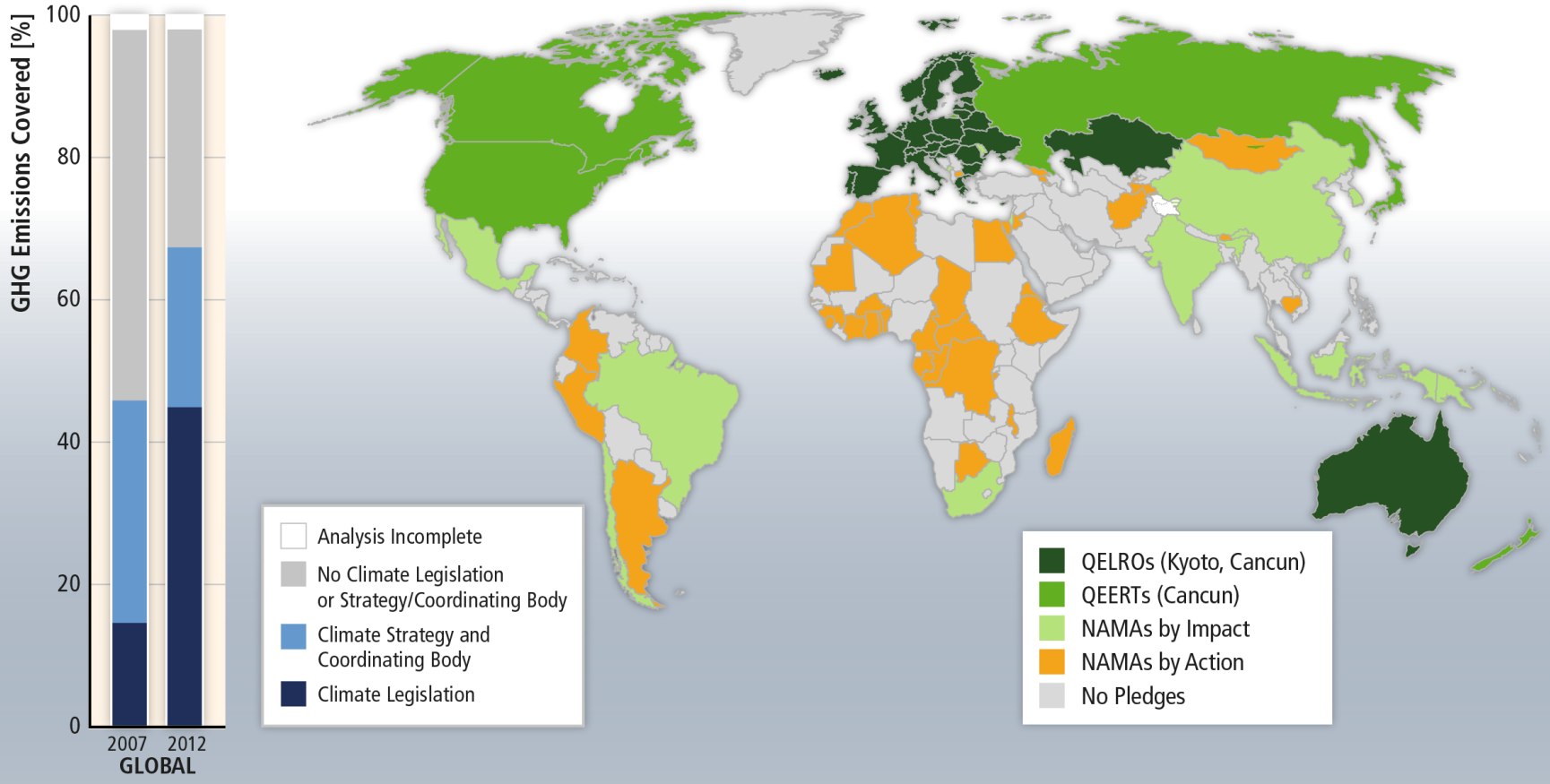
Changes in investment patterns and appropriate policies

Substantial reductions in emissions require significant changes in investment patterns.



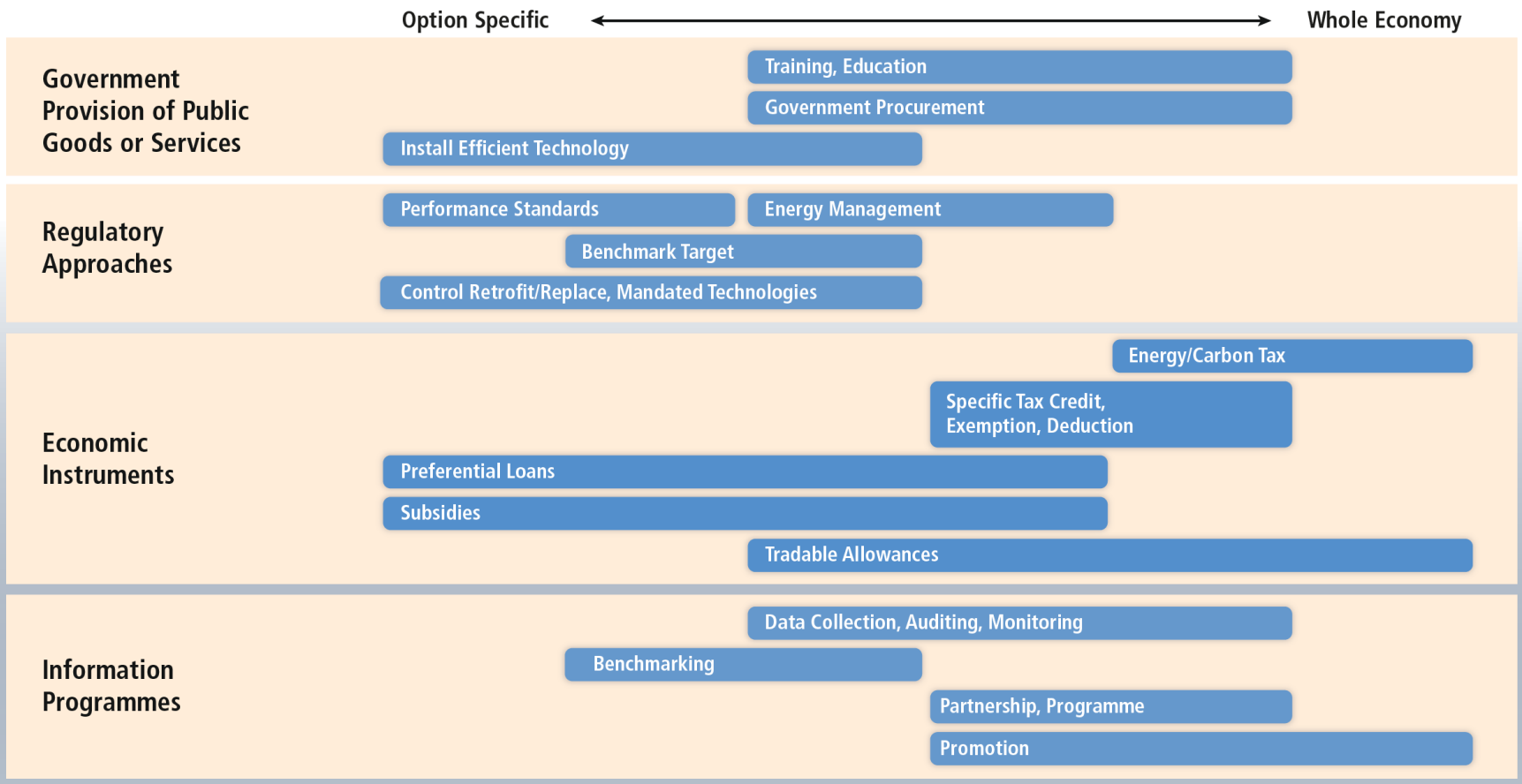
Based on Figure SPM.9

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

Science for technology advancement and informed policy design

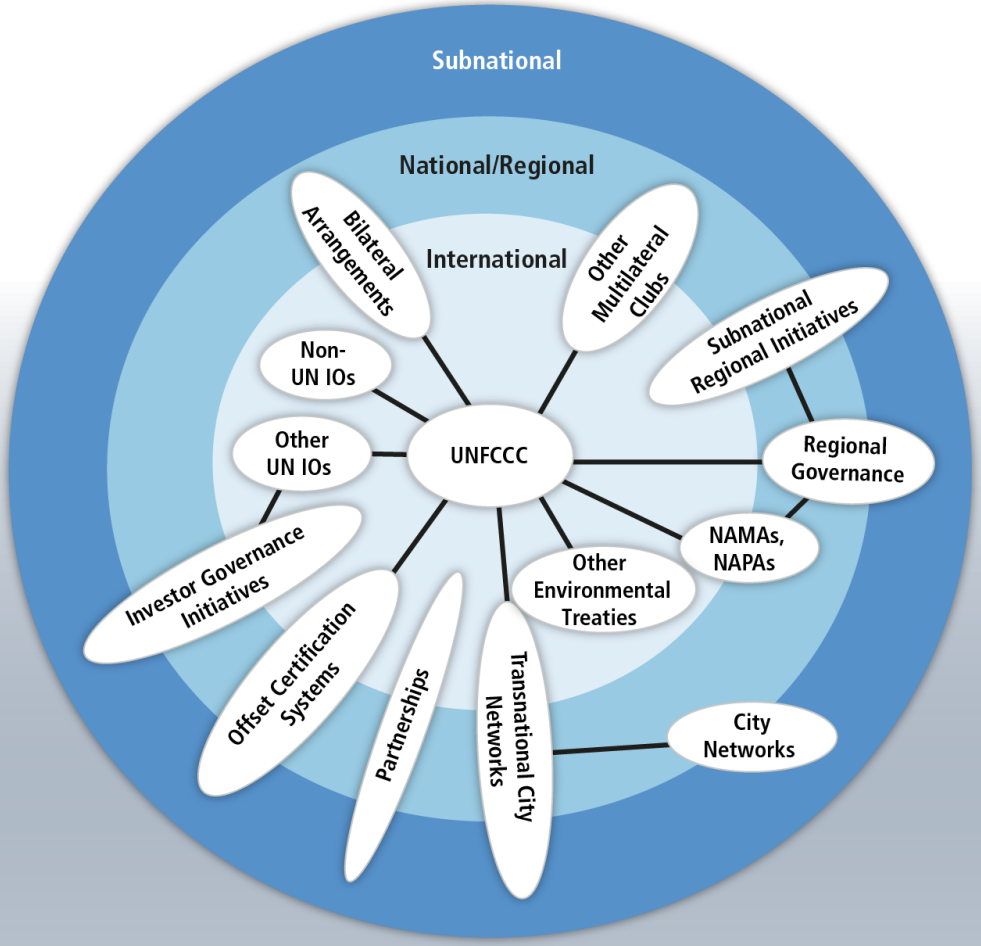
GREAT TIME FOR 

SCIENTISTS !!!

Hot topics

- Better integration of wind and solar
- Integration of power, heating, cooling, water and transport systems
- Market arbitrage (time delay, power-heat, power-water, demand management, power-fuels)
- Solution for road freight, shipping, aviation and high temperature processes – biomass + synthetic fuels?
- Quantification of socioeconomic impacts of mitigation measures and policies

International cooperation across scales



Based on Figure 13.1

Latest developments
(UNFCC – INDC portal, 1 Oct 2015)

- Submitted INDCs: 120
- Parties represented: 148
- Global GHG emissions % covered by Parties which already submitted: over 85%
- Expected GHG variation compared to 1990 with the submitted INDCs: +19% (source: Factor CO2, No.4, Sept 2015)

Latest developments

- European Union: At least -40% (vs 1990)
- Mexico: -22% (vs BAU)
- USA: -26%/-28% (vs 2005) in 2025
- Russia: -25%/-30% (vs 1990)
- Canada: -30% (vs 2005)
- Morocco: -13% (vs BAU)
- China: -60%/-65% per unit of GDP (vs 2005)
- Republic of Korea -37% (vs BAU)
- Macedonia: -36% (vs BAU)
- Australia: -26%/-28% (vs 2005)

Latest developments

- The commitments made, and likely to be made by December, will not by themselves be enough to achieve the 2 degrees goal.
- Approaches for bolstering these targets:
  - Engaging “non-state actors” (cities, local governments and businesses);
  - INDCs should be subject to regular review and ratcheting up in the years after the Paris meeting.
- Sorting out the finance part of the deal remains a burning issue.
- There is dispute over a number of issues such as “loss and damage”.
- Questions still hovered over what would appear in the core agreement.

Will we make it?

- The idea of success might seem as a long shot, but the present actions bring hope that all the individual agents will advance their interests coherently towards the common goal of saving the planet.

Will we make it?

The role of science:

- To assess the risks and options;
- To innovate technologies and devise new solutions;
- In a rigours and policy-neutral way, to inform the processes for reaching decisions.