The Contribution of Economics to the Debate about Climate Change

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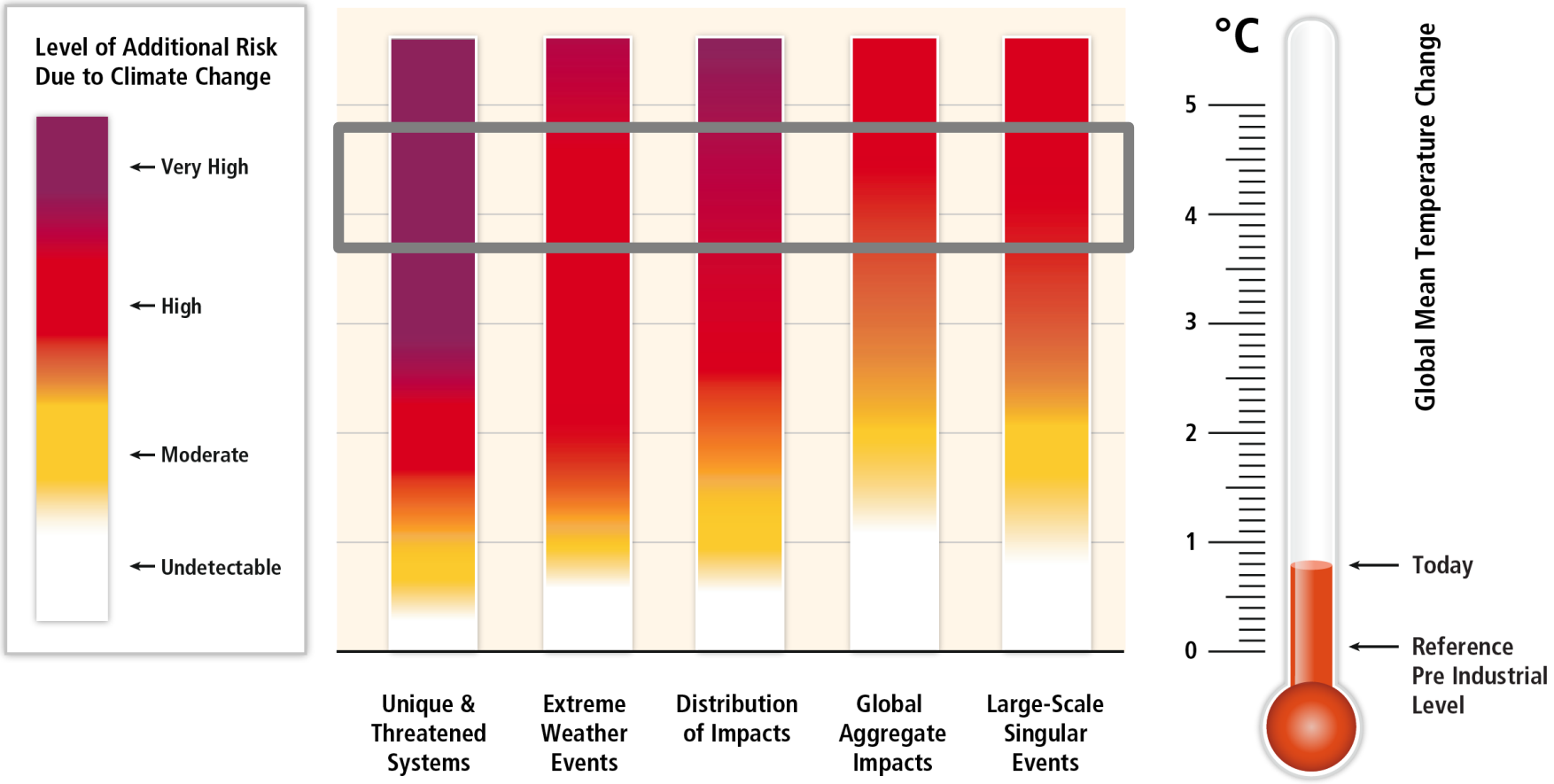
Scientific evidence and background
information about climate change

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



KAYA Identity: The drivers of greenhouse emissions

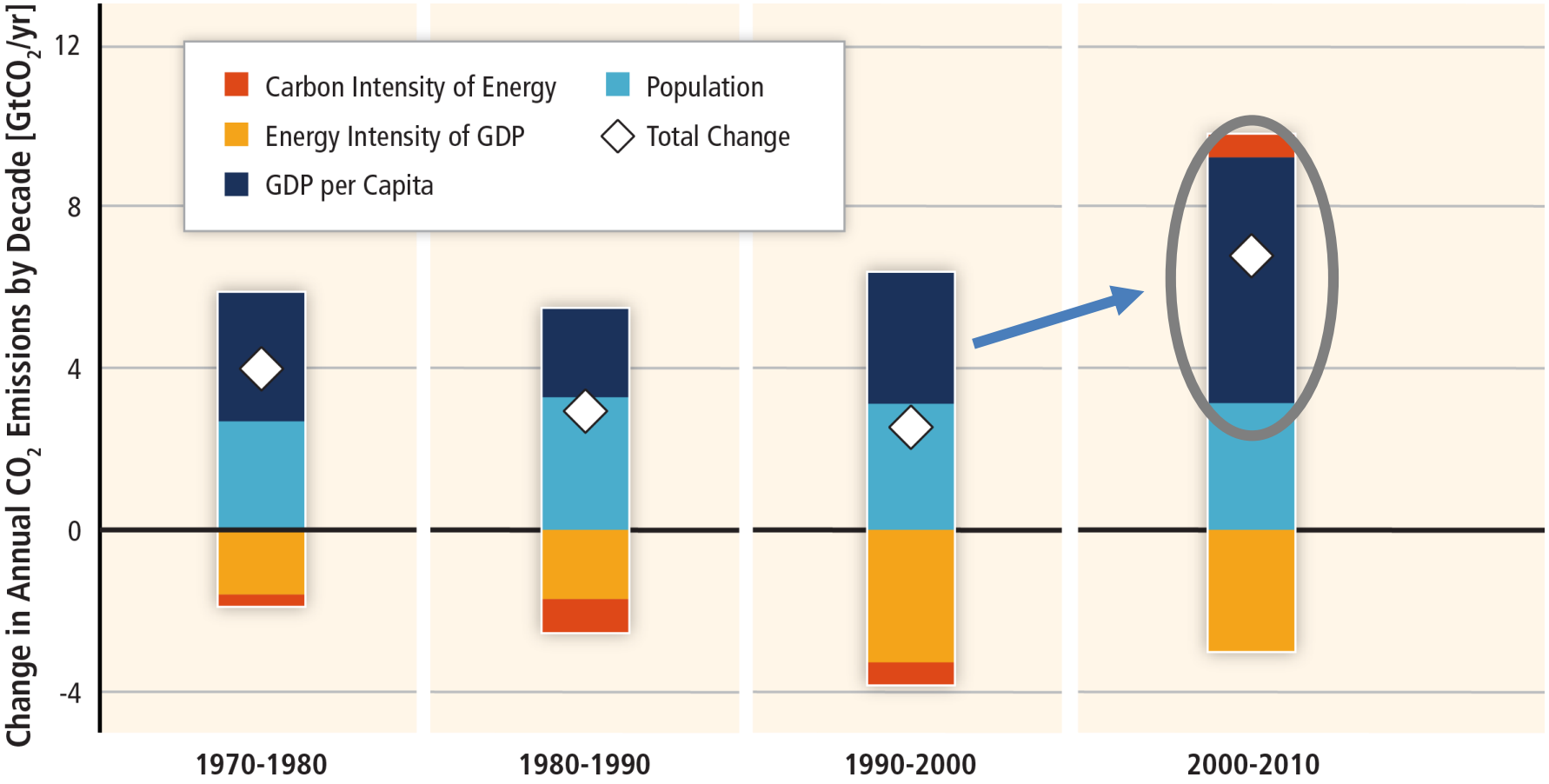
affluence

energy intensity

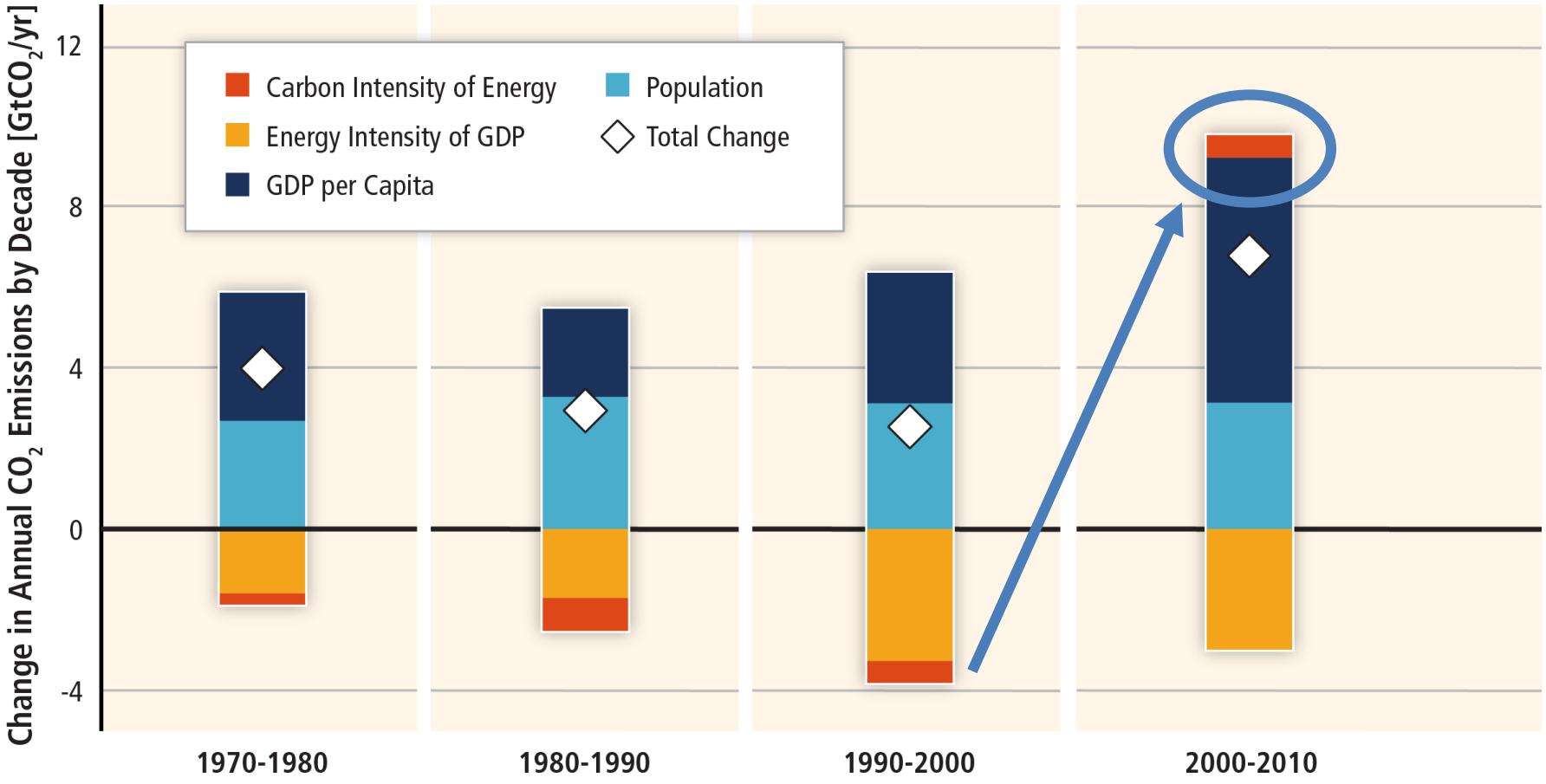
carbon intensity

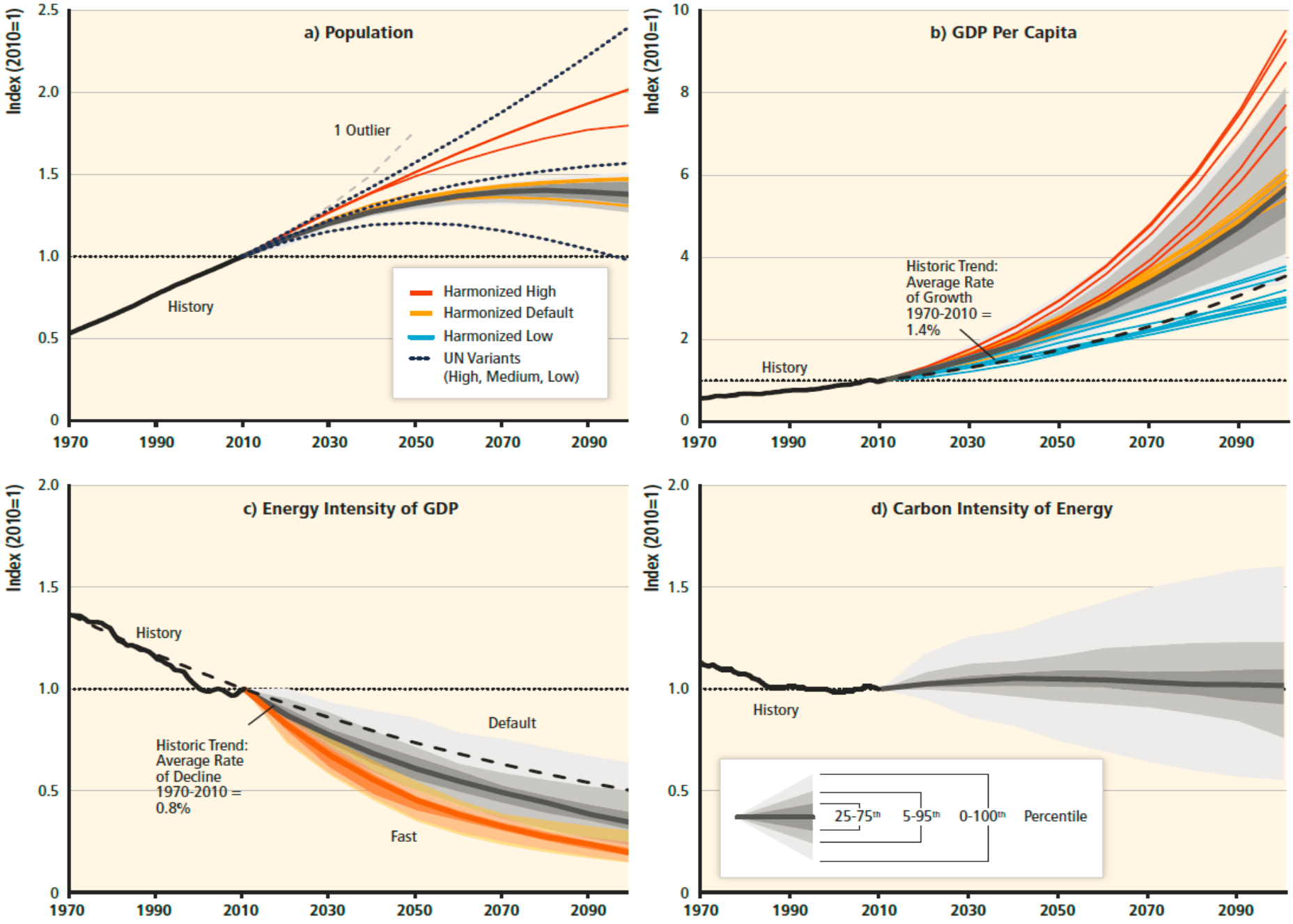
$$CO_2 = Population \bullet \frac{GDP}{Population} \bullet \frac{Energy}{GDP} \bullet \frac{CO_2}{Energy}$$

GHG emissions rise with growth in GDP and population.



The long-standing trend of decarbonization has reversed.




a) Population
Index (2010=1)
2.5
2.0
1.5
1.0
0.5
0
1 Outlier
History
Harmonized High
Harmonized Default
Harmonized Low
UN Variants
(High, Medium, Low)
1970
1990
2010
2030
2050
2070
2090
b) GDP Per Capita
Index (2010=1)
10
8
6
4
2
0
Historic Trend:
Average Rate
of Growth
1970-2010 =
1.4%
History
1970
1990
2010
2030
2050
2070
2090
c) Energy Intensity of GDP
Index (2010=1)
2.0
1.5
1.0
0.5
0
History
Historic Trend:
Average Rate
of Decline
1970-2010 =
0.8%
Default
Fast
1970
1990
2010
2030
2050
2070
2090
d) Carbon Intensity of Energy
Index (2010=1)
2.0
1.5
1.0
0.5
0
History
25-75th
5-95th
0-100th
Percentile
1970
1990
2010
2030
2050
2070
2090

Possible implications of the Kaya identity for limiting greenhouse gas emissions …

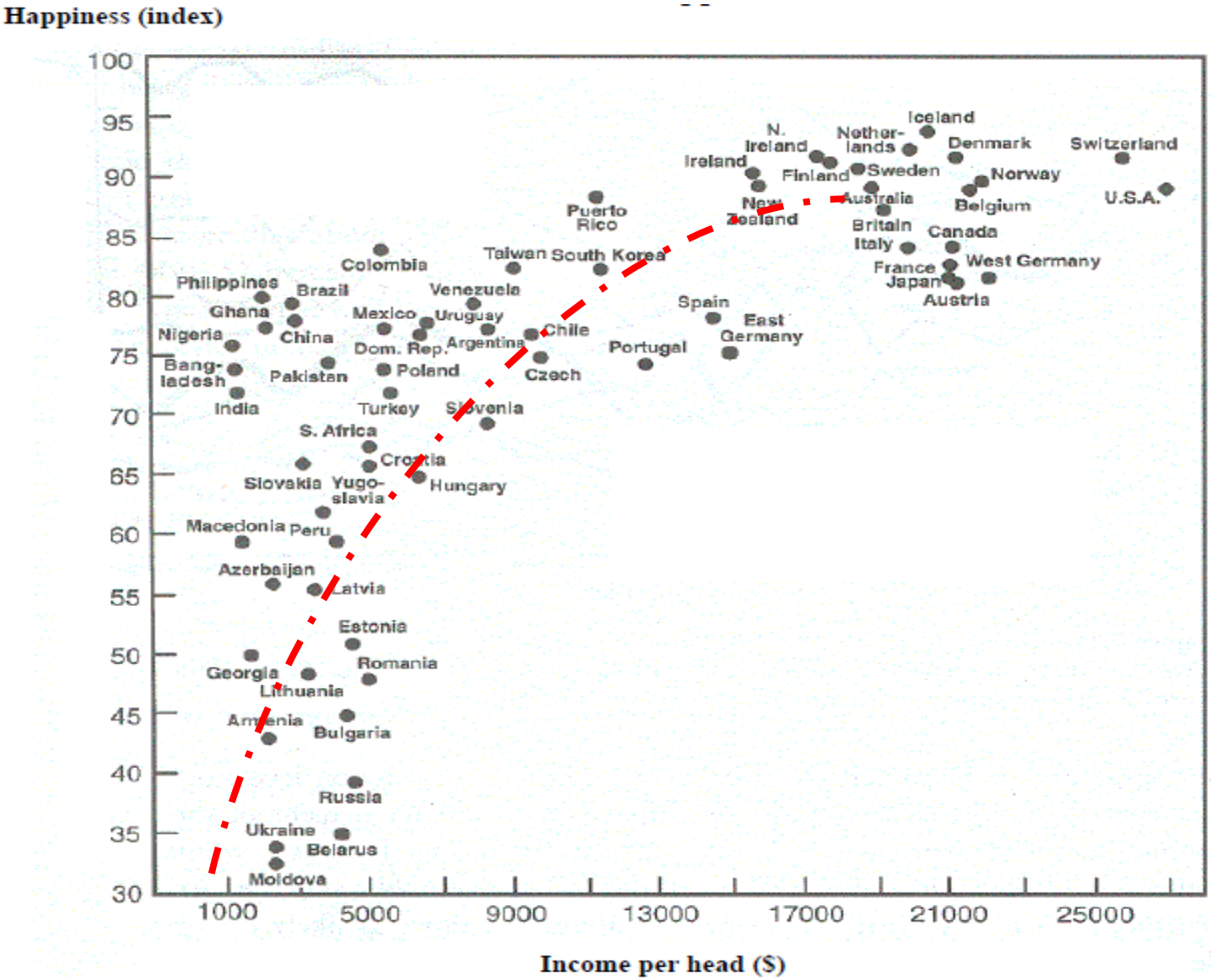
Even with moderate population growth, peaking by 2070, and moderate economic growth, energy intensity of GDP and carbon intensity of energy need to drop radically.

We need to follow a green growth strategy! Stabilising the climate with continued economic growth will require unprecedented technological change.

We need to follow a degrowth strategy!
But what about the millenium goals? Seems a too simple fix!

Economic policy can influence carbon intensity of energy, energy intensity of GDP and population growth.

Economic growth is not an objective in its own right.




Cost-Benefit Analysis: A First-best Approach
… which must fail

Cost-Benefit Analysis and the Stern Controversy

Choose the path of emission reduction such that the difference between benefits and costs is maximised over a given time horizon.

William R. Cline (1992) and William Nordhaus (1993): Integrated Assessment Models: Ramsey-type of growth models

Sir Nicholas Stern (2006), Stern Review

It is all about discounting!

100 years: £1 million

today: £369,00 if 1%
£52,000 if 3%
£ 1,152 if 7%

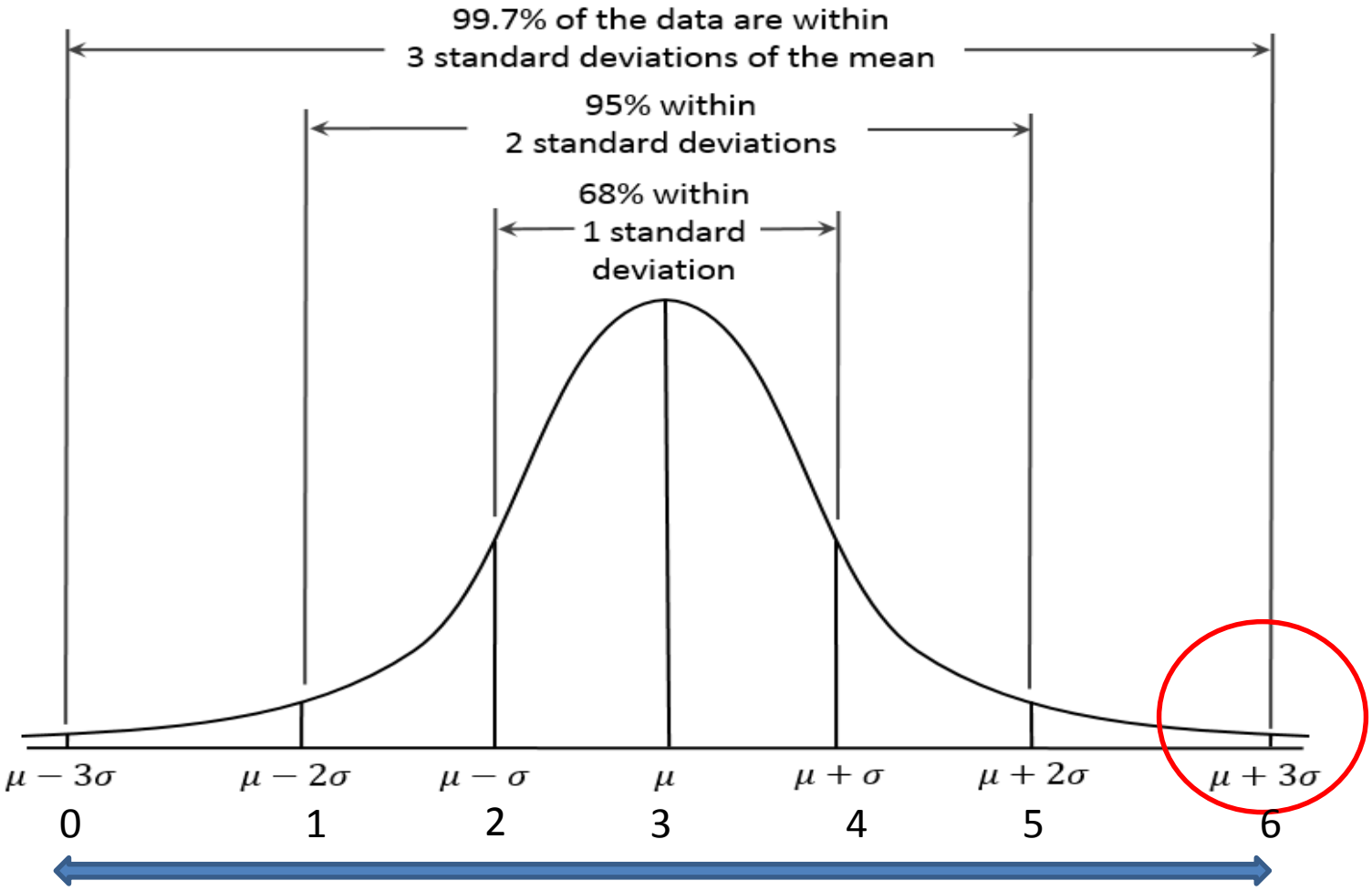
Cost-Benefit Analysis and its assumptions

- descriptive versus prescriptive
- positive versus normative

You cannot derive an ought from an is!

- monetising damages
- fat-tail-distribution for high temperature increases

… tails that matter …



A low probability of a high risk event with infinite damage calls for zero emissions.

- tipping points (irreversible events): terra incognita, science fiction

Martin Weitzman: "…. the probability distributions themselves become increasingly diffuse because the frequencies of rare events in the tails cannot be pinned down by previous experiences, past observations, or computer simulations.

The (unsurmountable) difficulties of Cost-Benefit Analyses

- substitution possibilities between physical, human and environmental capital
- strong versus weak sustainability
- intergenerational justice?
- future preferences?


Cost-Effectiveness Analysis: A Second-best Approach
… which will work

Cost-Effectiveness Analysis and the target

Choose the path of emission reduction such that a given target is achieved at least cost over a given time horizon. Those with lower costs should be more ambitious.

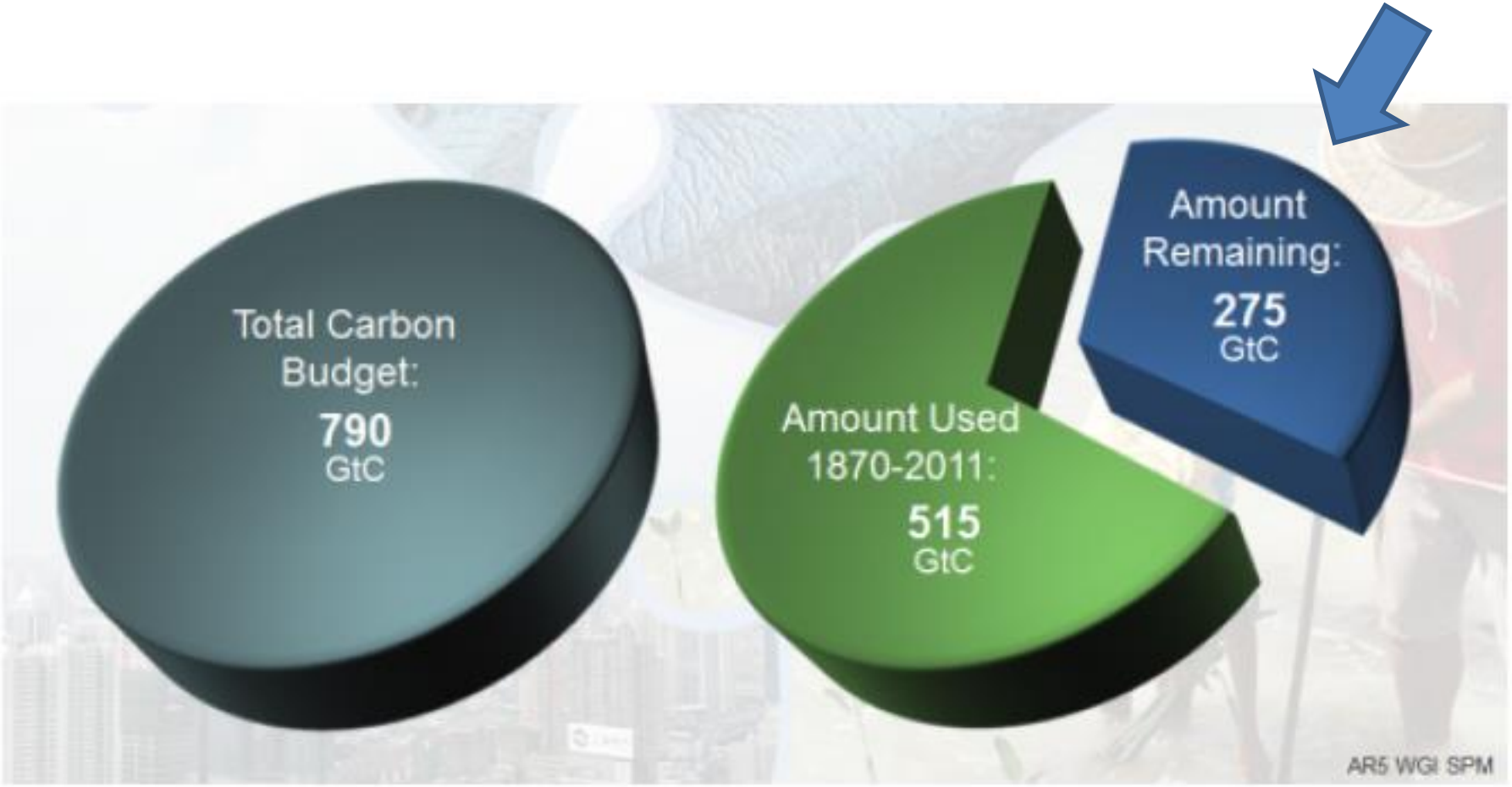
UNFCCC: 1992

The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

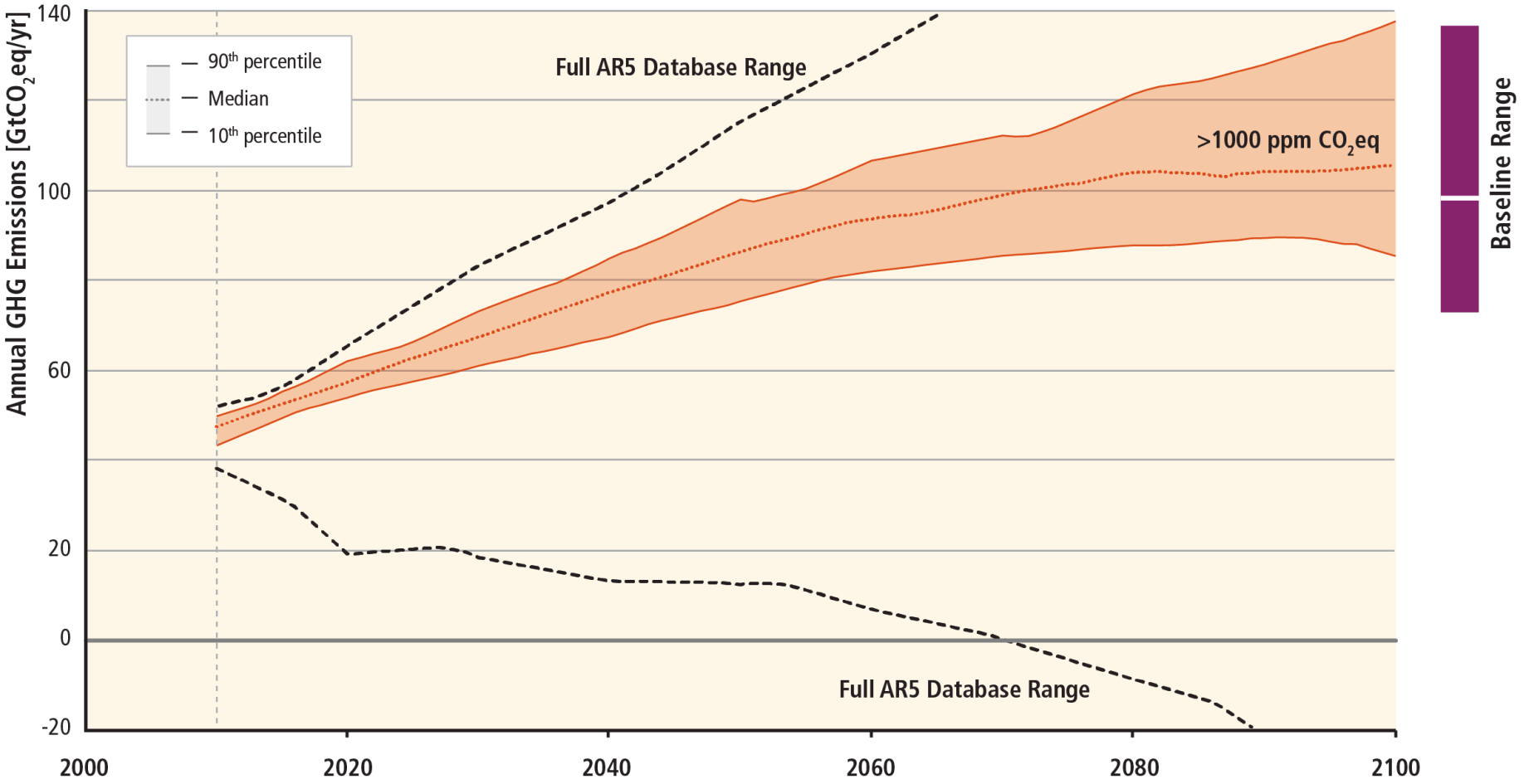
> ***"...stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system..."***

2 degrees Celsius

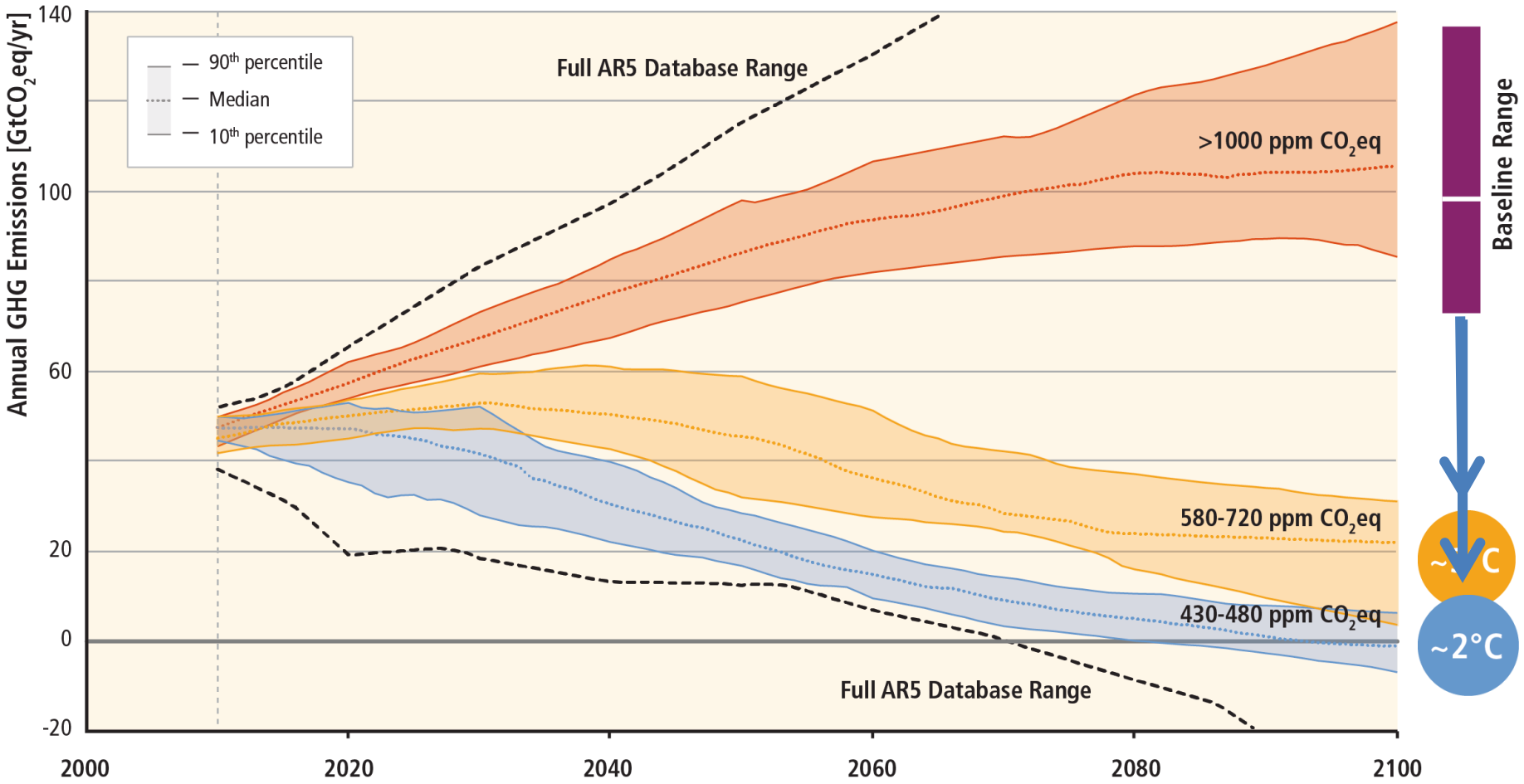
There is not much choice in the time path, given the carbon budget which has been used.



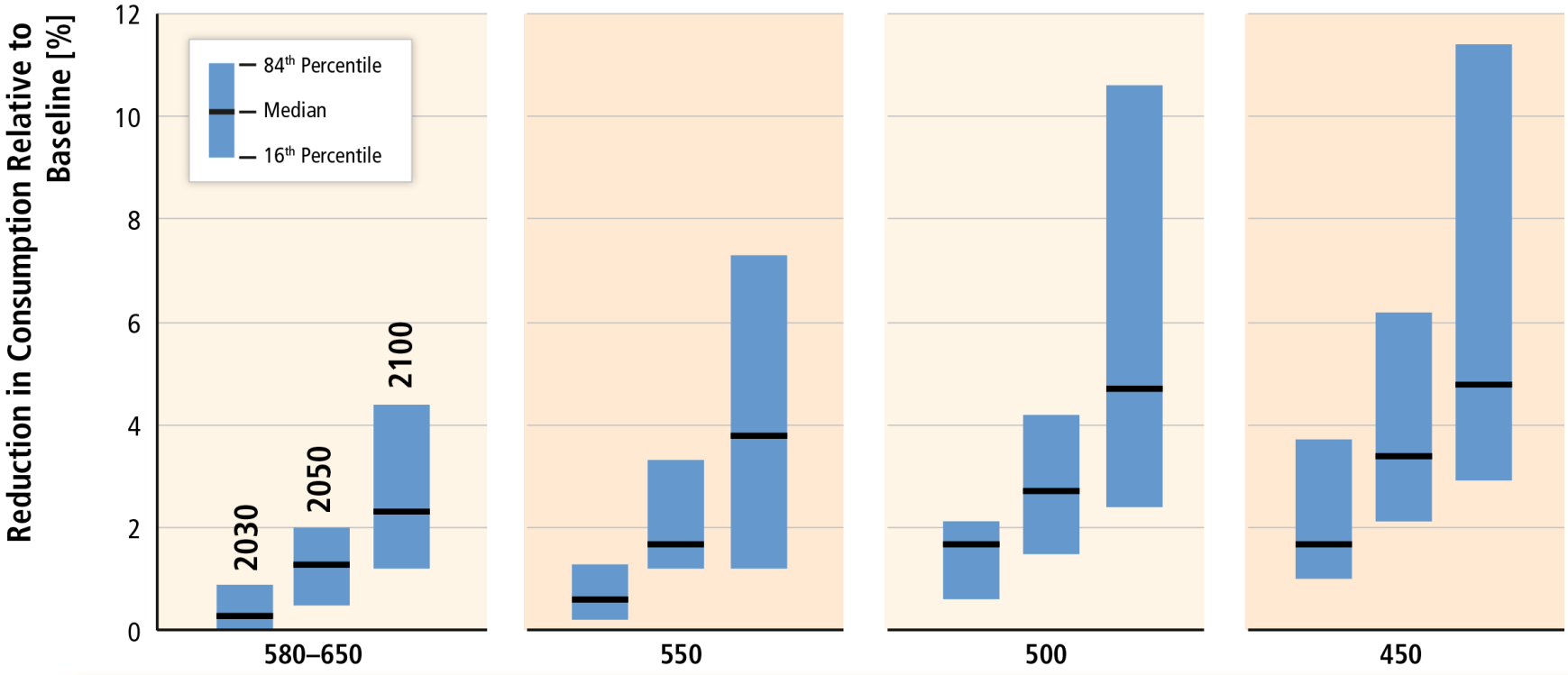
Stabilization of atmospheric GHG concentrations requires moving away from business as usual.



This must be quite radical.



Global costs rise with the ambition of the mitigation goal but GDP growth may not be strongly affected.



Percentage Point Reduction in Annualized Consumption Growth Rate over 21st Century			
0.03 (0.01-0.05)	0.04 (0.01-0.09)	0.06 (0.03-0.13)	0.06 (0.04-0.14)

Are we ready to invest? Priorities matter …

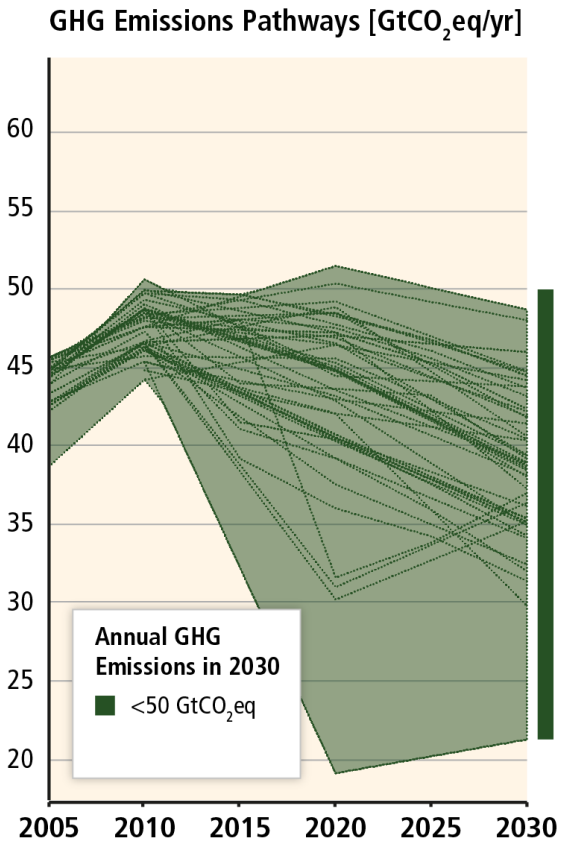
Financial Crisis

UK-government pledged £ 850 billion rescue package, having a GDP of £ 1,599 billion in 2011 (53%).

German government pledged £ 420 billion rescue package, having a GDP of £ 2,314 billion in 2011 (18%).

Considering various scenarios to remain below 2°C relative to pre-industrial levels …

Before 2030

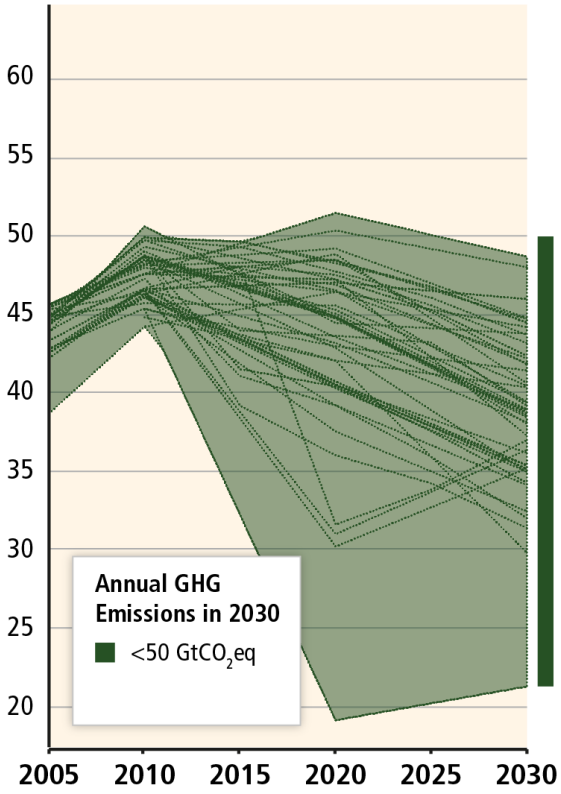


"Immediate Action"

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

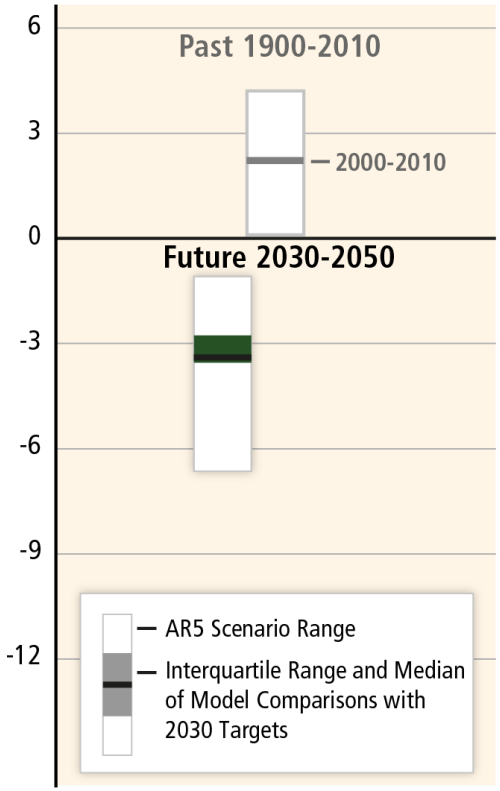
Before 2030

GHG Emissions Pathways [$GtCO_2eq/yr$]

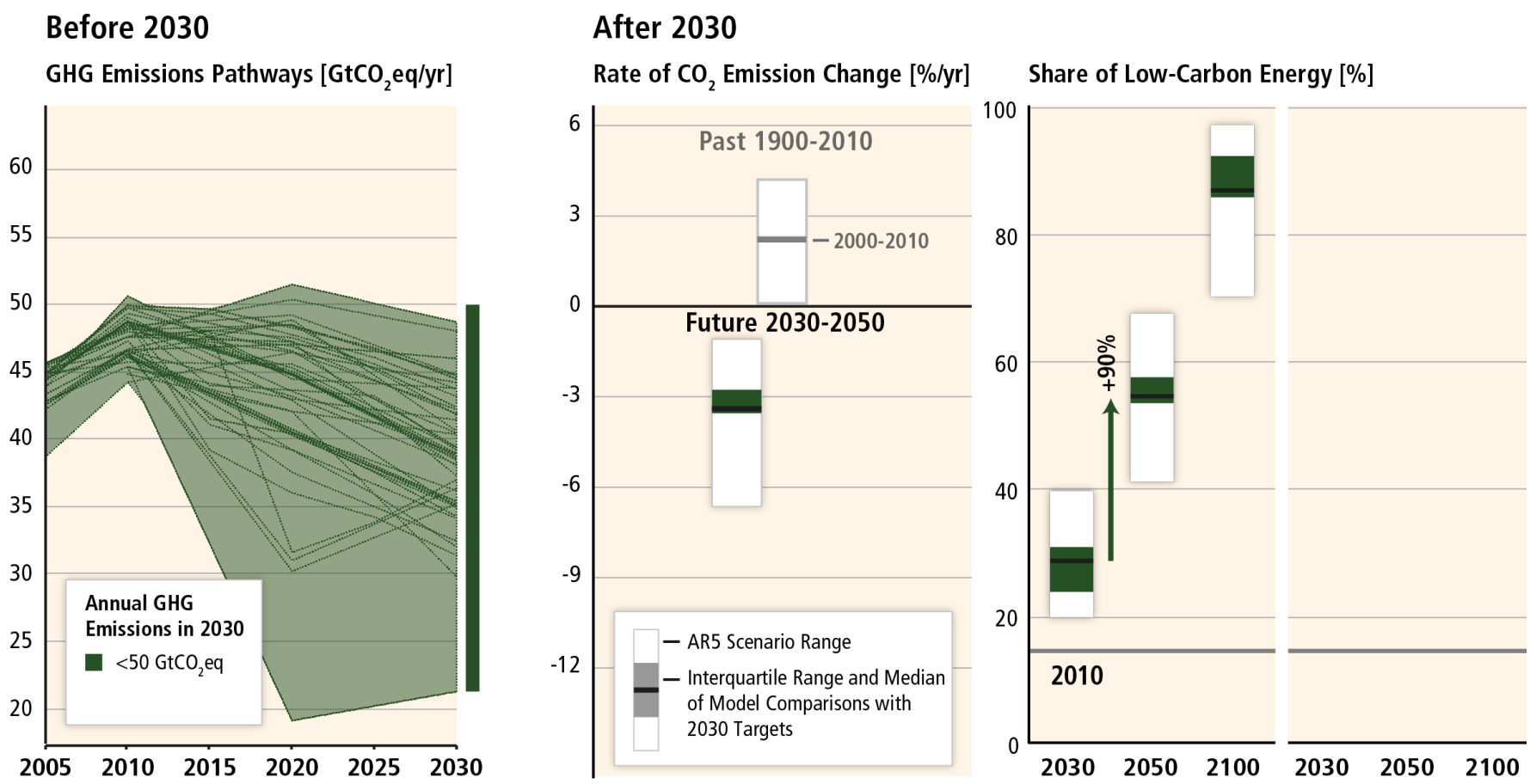


After 2030

Rate of CO_2 Emission Change [%/yr]

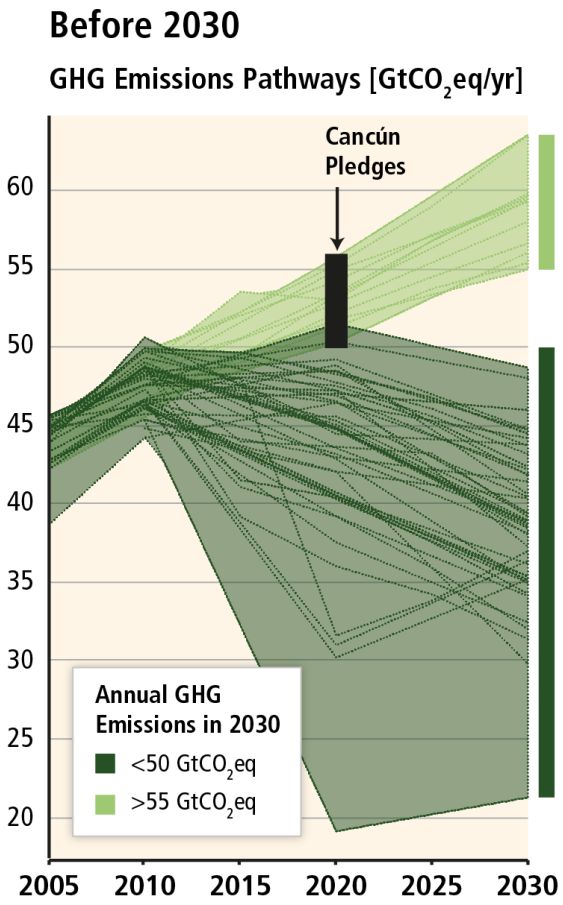


...implying a rapid scale-up of low-carbon energy.



Delaying emission reduction increases the difficulty and narrows the options for mitigation.

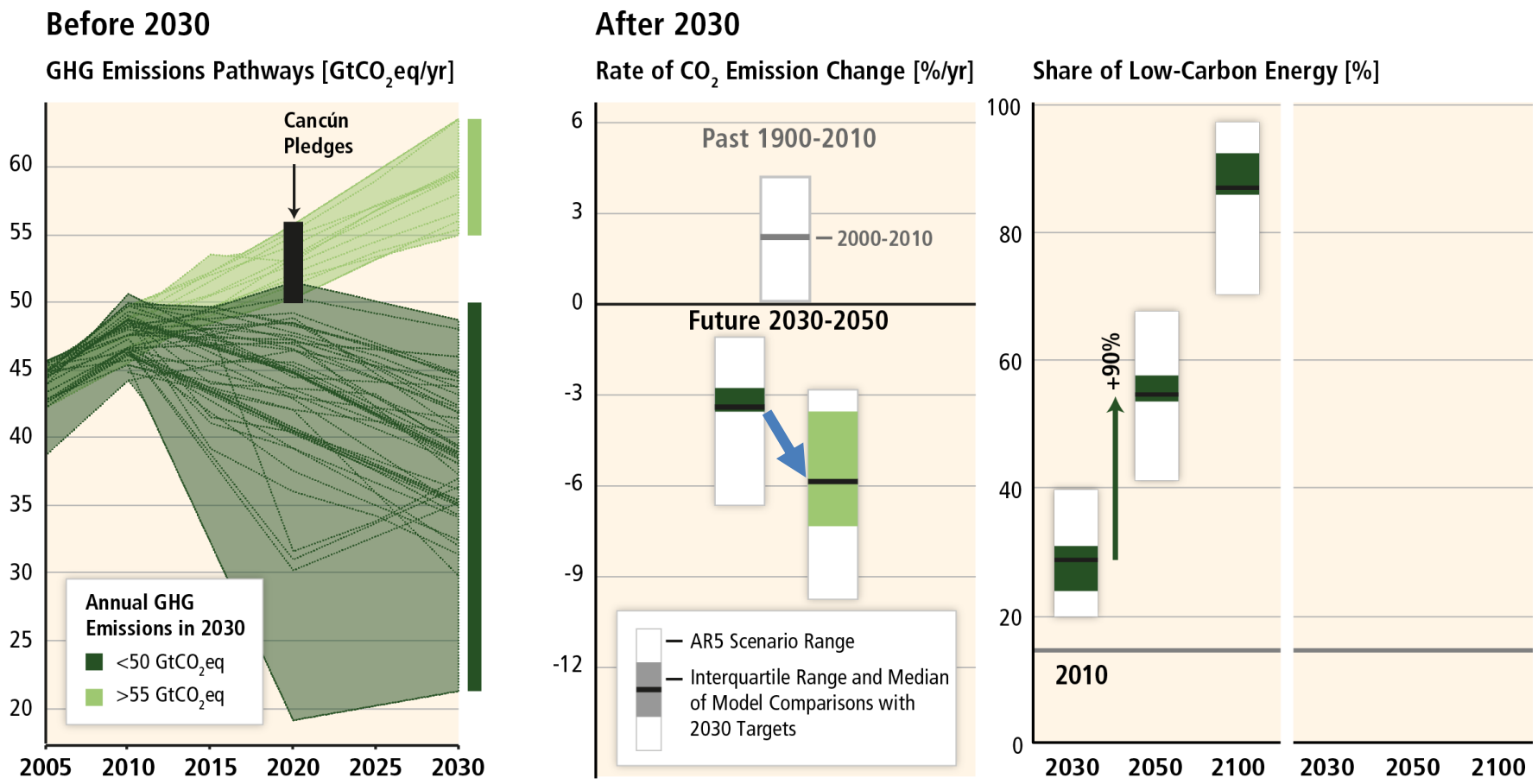
Before 2030



"Delayed Mitigation"

"Immediate Action"

Delaying emission reduction increases the difficulty and narrows the options for mitigation.



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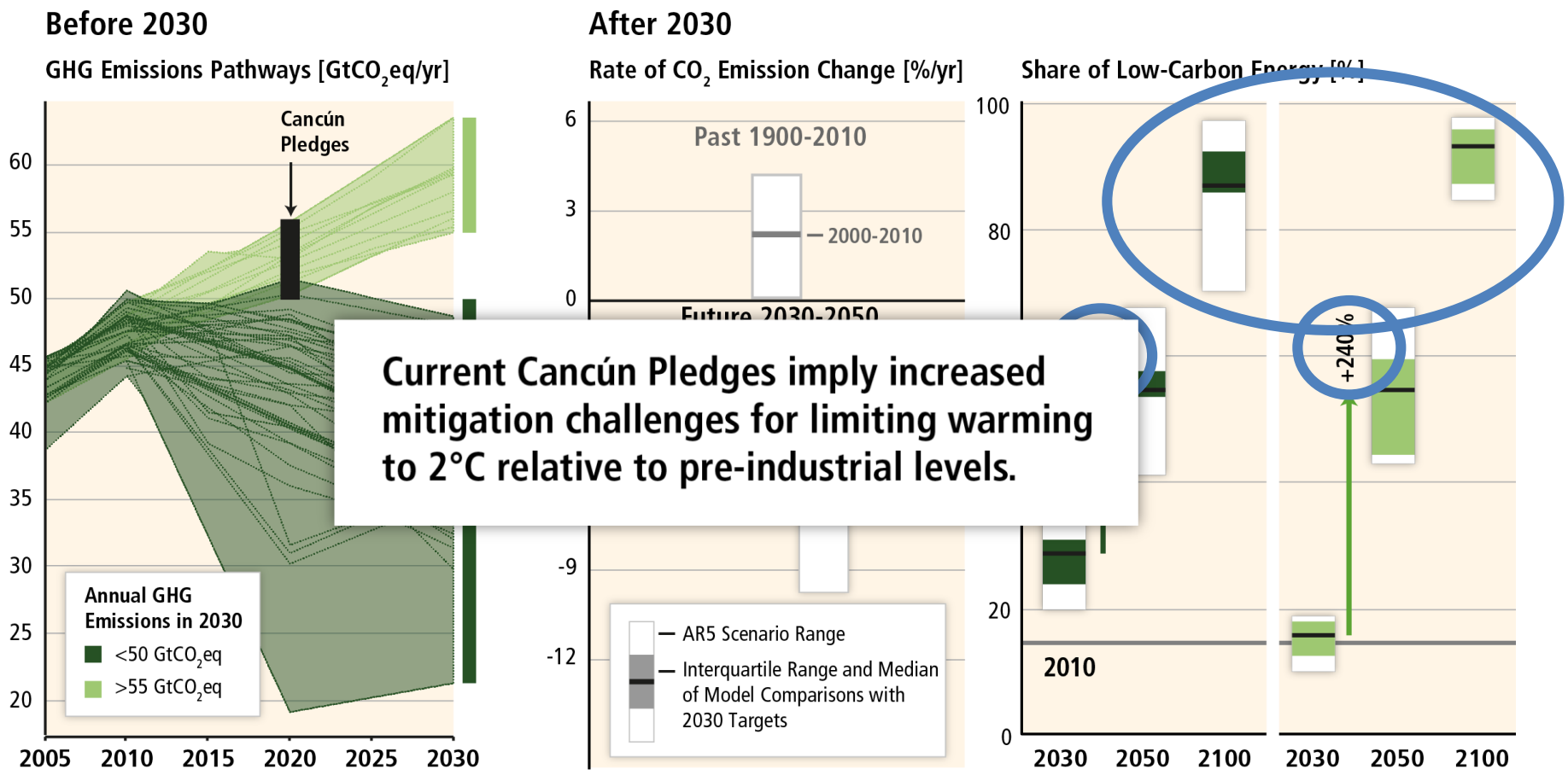

Current Cancún Pledges imply increased mitigation challenges for limiting warming to 2°C relative to pre-industrial levels.

The advantages of early action include …

- precautionary principle: flexibility to react to unexpected outcomes
- benefit from learning-by-doing
- negative costs of mitigation (McKinsey)
- double dividend
- reap co-benefits

Lessons we can learn and on what most economists agree …

- put a price on carbon: taxes versus permits
- permit trading does work if correctly implemented!!
- Problems with the EU-TS
  - over-allocation of permits
  - no policy certainty
  - negative spillovers from other policy instruments

Clean Development Mechanism (CDM)

Feed-in tariffs

Lessons we can learn and on what most economists agree …

- abolish subsidies for brown technologies
- subsidise only basic research in green technologies
- don’t pick winners: leave this to the market
- understand that people care about distribution and not allocation (fuel poverty)

Lessons economists need to learn

There are instances where prices do not work.

- time horizon too long
- loss aversion and uncertainty
- distorted property rights

Lessons economists need to learn

Social norms and habits are important for behavioural change.

People face cognitive limitations to process information rationally.

Behavioural change requires appropriate infrastructure.

Paris and beyond!

Paris and beyond!

Pledges are not sufficient to meet the 2 degree target.

Still no compliance procedures in place.

Fairness and equity needs to determine individual targets.

Still not enough thinking about how those who gain can compensate those who benefit.

Will we succeed?