CENTER FOR SCIENCE & TECHNOLOGY POLICY RESEARCH

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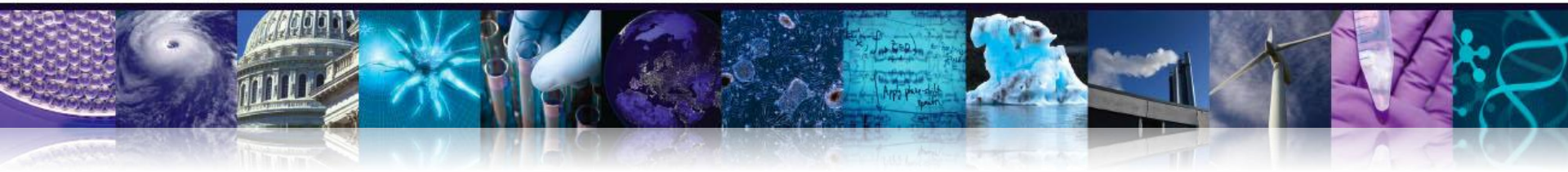
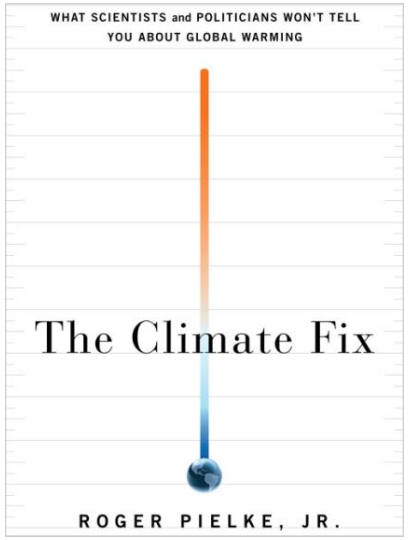
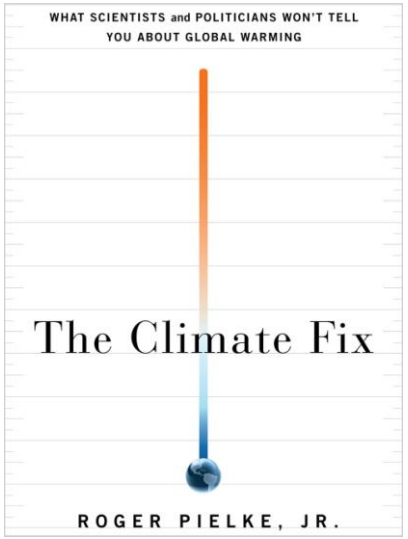




The Climate Fix

Roger A. Pielke, Jr.
University of Colorado



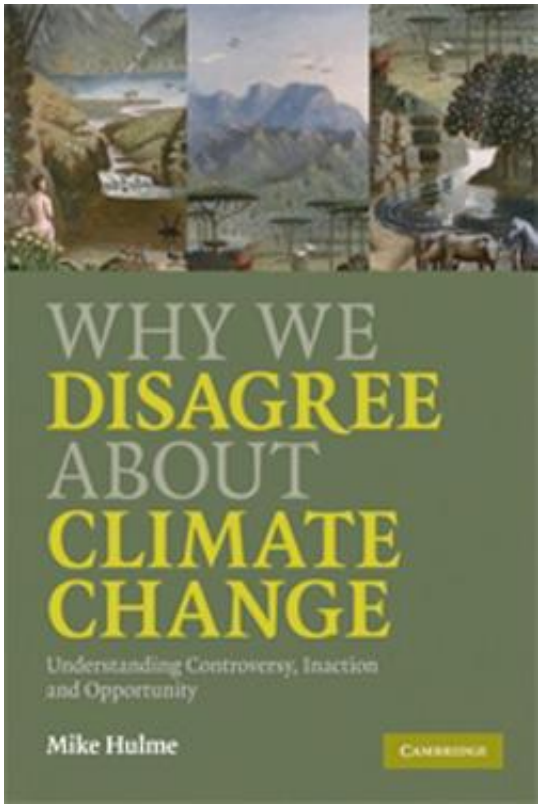
HC Coombs Policy Forum
Australian National Institute for Public Policy
Australian National University
Canberra, Australia
2 February 2012

Understanding the current context

- The 2011 climate negotiations in Durban ended in a decision to continue meeting but to put off decisions to 2015 or later
- Europe and the US are focused on the economy
- Australia's seemingly unending carbon drama continues, despite passage of a carbon tax
- Japan and Germany's emissions have already begun to increase sharply
- China and India keep growing, and emitting …
- . . . And so on . . .
- How might we understanding this context?

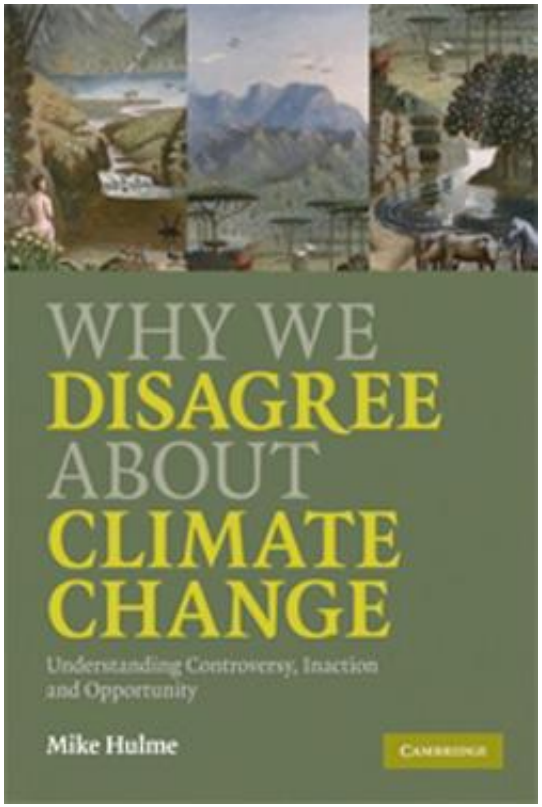
Mike Hulme, on debates about climate science

". . . arguments about climate change are invested with powerful ideological instincts and interests. Solutions to climate change vary from market-based mechanisms and technology-driven innovation to justice-focused initiatives and low-consumption localism as a form of lifestyle, each carrying ideological commitments. It is despairingly naive to reduce such intense (and legitimate) arguments to the polarities of 'belief' or 'scepticism' about science."

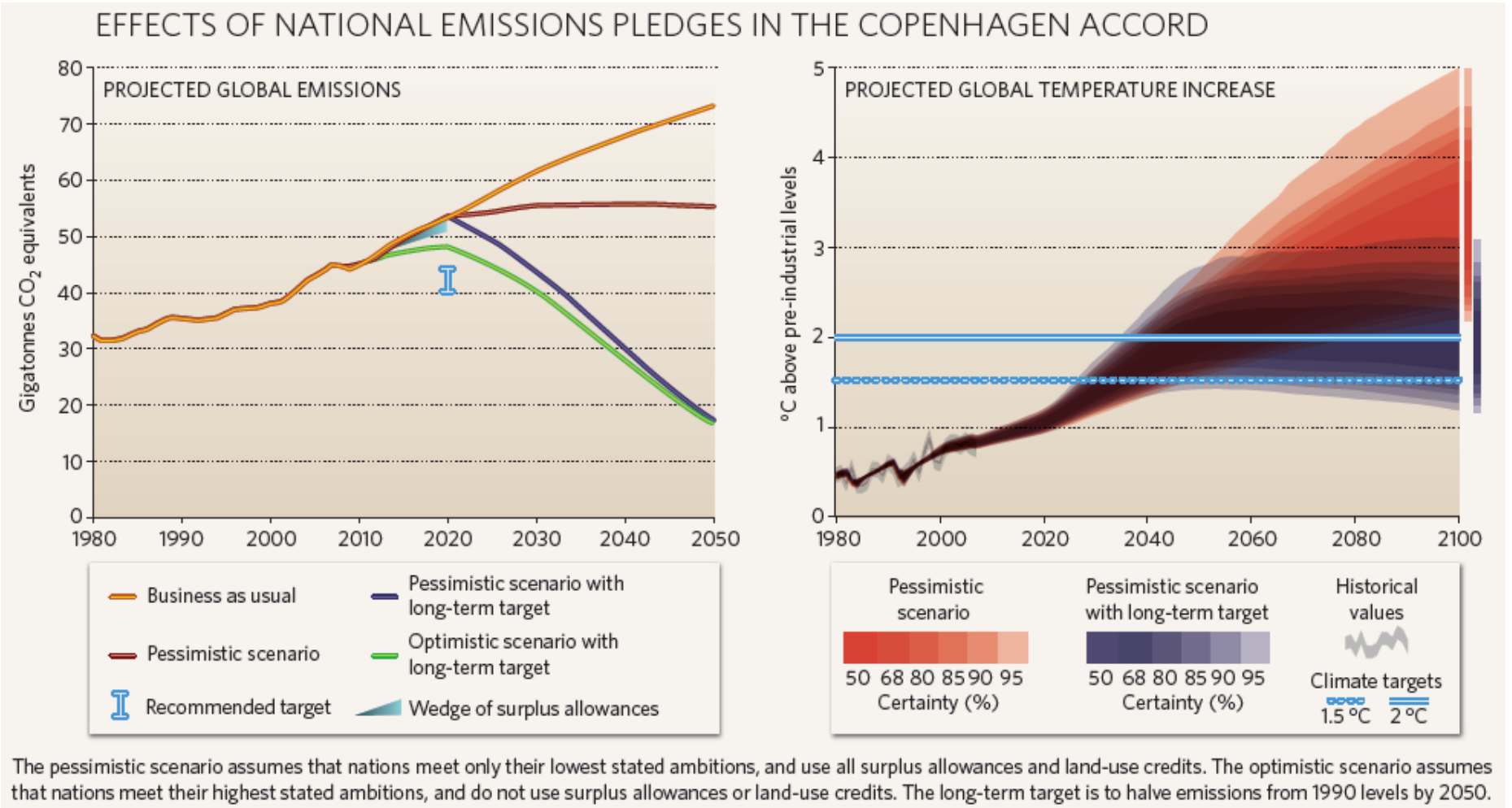


Mike Hulme, on debates about climate science

"The problem here is the tendency to reduce all these complexities into a simple litmus test of whether or not someone believes orthodox scientific claims about the causes and consequences of climate change. This is dividing the world into goodies and baddies, believers and deniers. Climate change demands of us something much more sophisticated than this…"

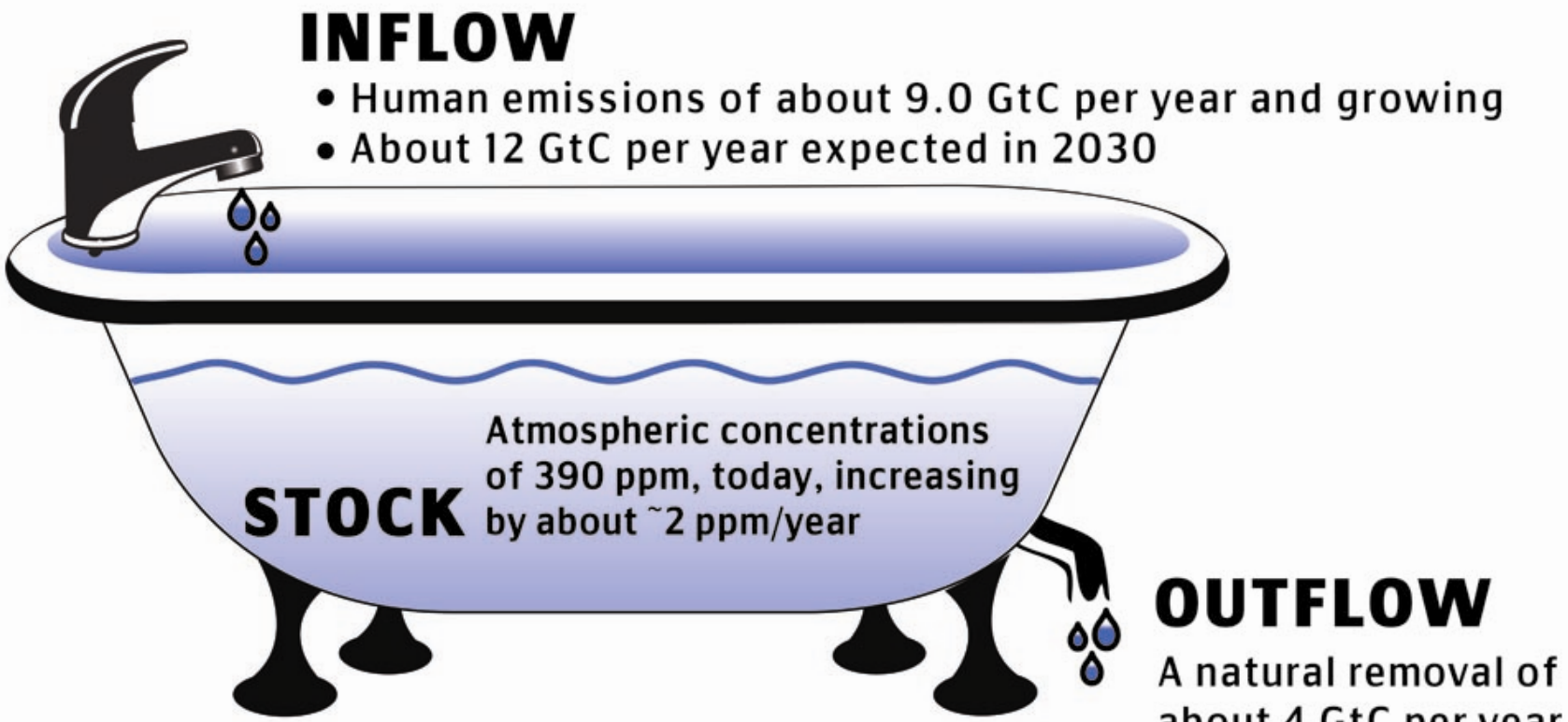


Mainstream approach – targets and timetables

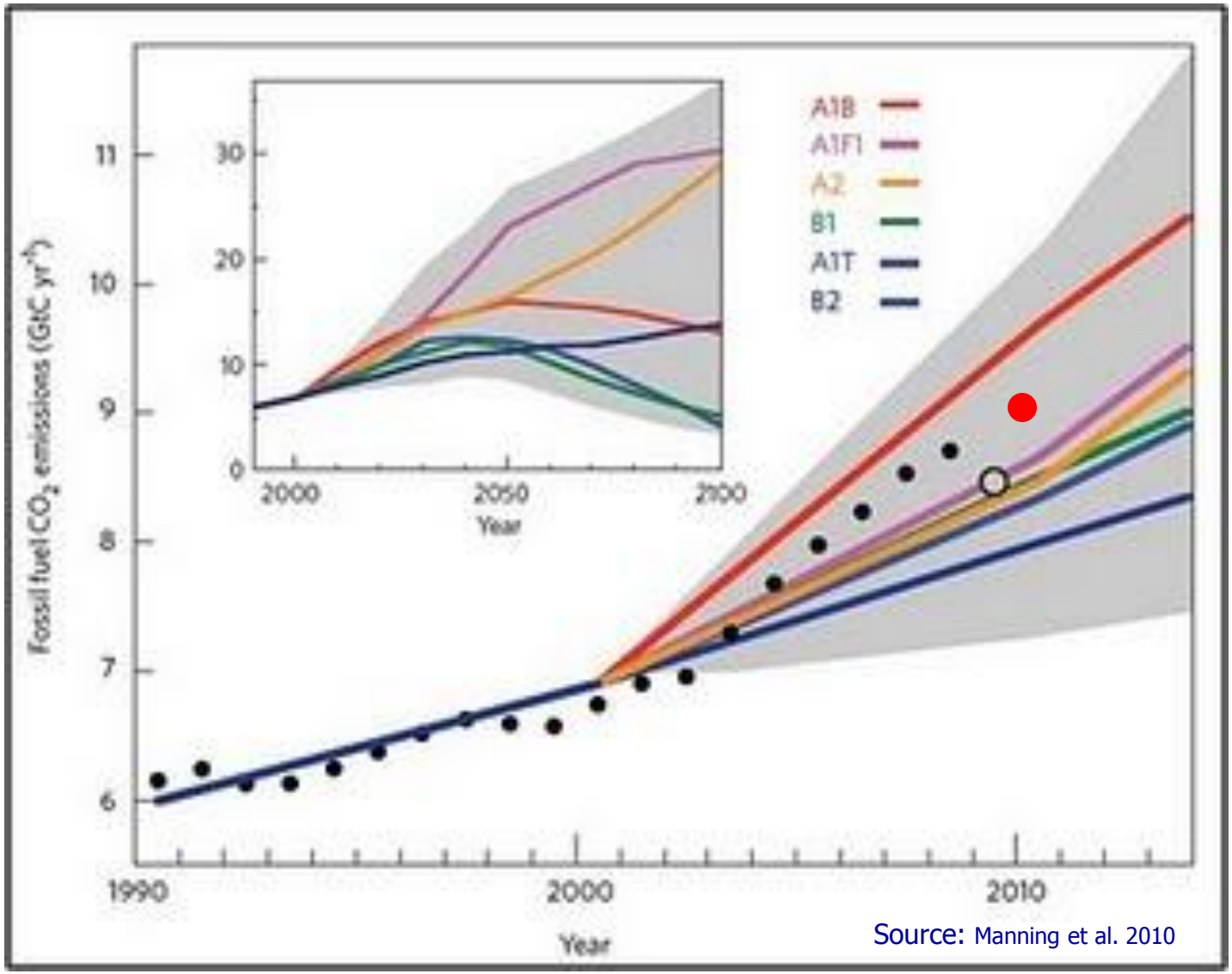


The pessimistic scenario assumes that nations meet only their lowest stated ambitions, and use all surplus allowances and land-use credits. The optimistic scenario assumes that nations meet their highest stated ambitions, and do not use surplus allowances or land-use credits. The long-term target is to halve emissions from 1990 levels by 2050.

Understanding the Build-Up of Carbon Dioxide



Emissions are growing faster than expected



Source: Manning et al. 2010

Where do emissions come from?

People
engage in economic activity that
uses energy
from carbon emitting generation

Where do emissions come from?

People	Population	P
Engage in economic activity that	GDP per capita	GDP/P
Uses energy from	Energy intensity of the economy	TE/GDP
Carbon emitting generation	Carbon intensity of energy	C/TE

$$\text{Carbon emissions} = C = \cancel{P} * \frac{\cancel{GDP}}{\cancel{P}} * \frac{\cancel{TE}}{\cancel{GDP}} * \frac{C}{\cancel{TE}}$$

The "Kaya Identity"

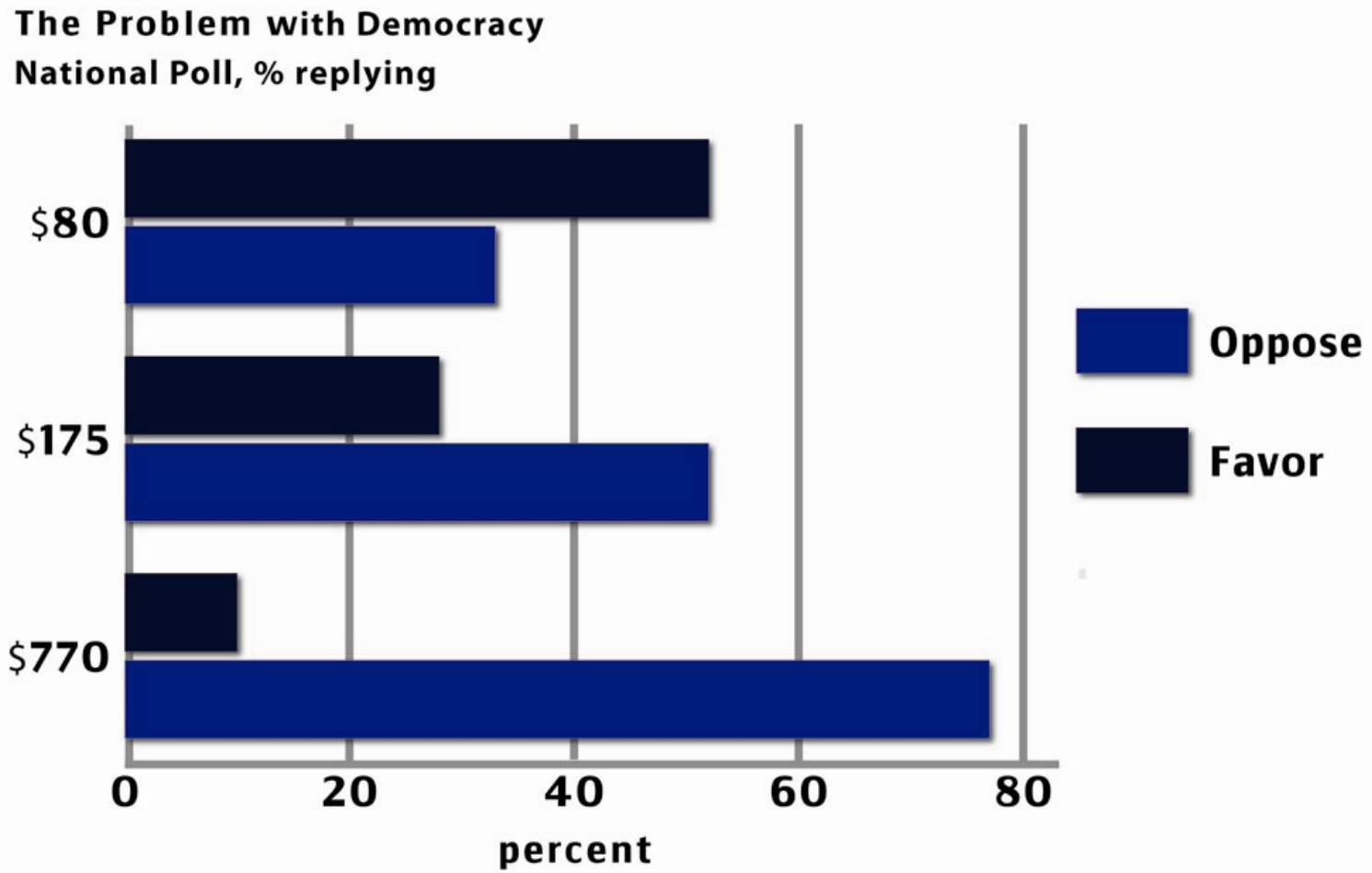
What tools do we have to reduce emissions?

	Factor	Lever	Approach to Policy
P	Population	Less people	Population management
GDP/P	GDP per capita	Smaller economy	Limit generation of wealth
TE/GDP	Energy intensity	Increase efficiency	Do same or more with less energy
C/TE	Carbon intensity	Switch energy sources	Generate energy with less emissions

$$\text{Carbon emissions} = C = \frac{P}{P} * \frac{GDP}{GDP} * \frac{TE}{GDP} * \frac{C}{TE}$$

GDP **Technology**

The Iron Law of climate policy



Would you support a climate bill if the annual cost per household was?

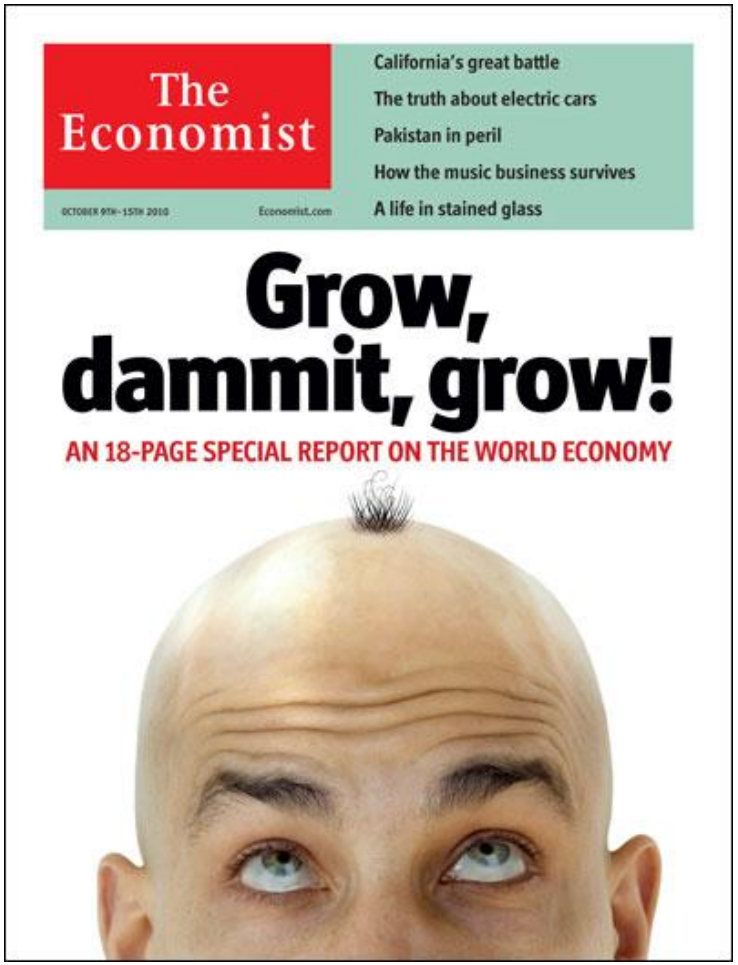
Source: YouGov/Polimetrix Poll, June 28th-30th 2009

The Iron Law of climate policy

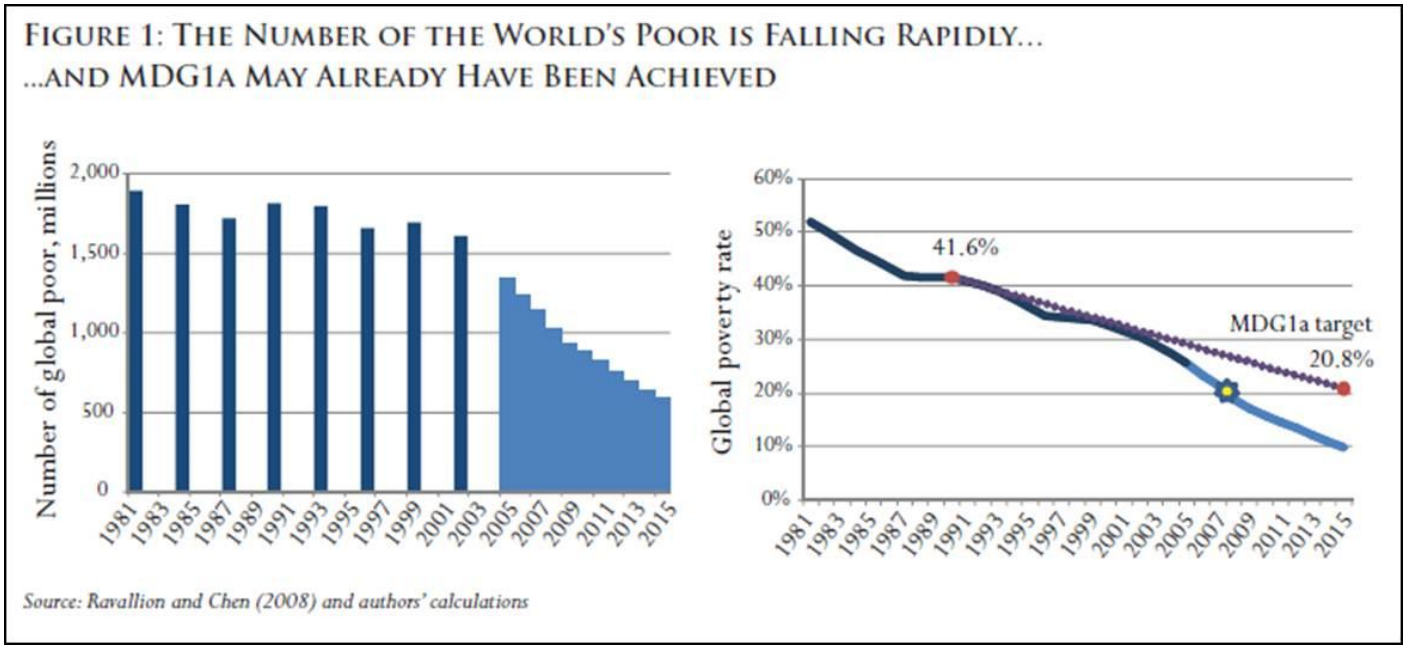
People around the world are willing to pay some price for climate policies, but this willingness has its limits.

These limits mean that reducing GDP or noticeably reducing GDP growth are simply not options as a strategy of emissions reduction.

A Boundary Condition for Policy Design: Climate policies must not cost too much, better yet, they should foster economic growth



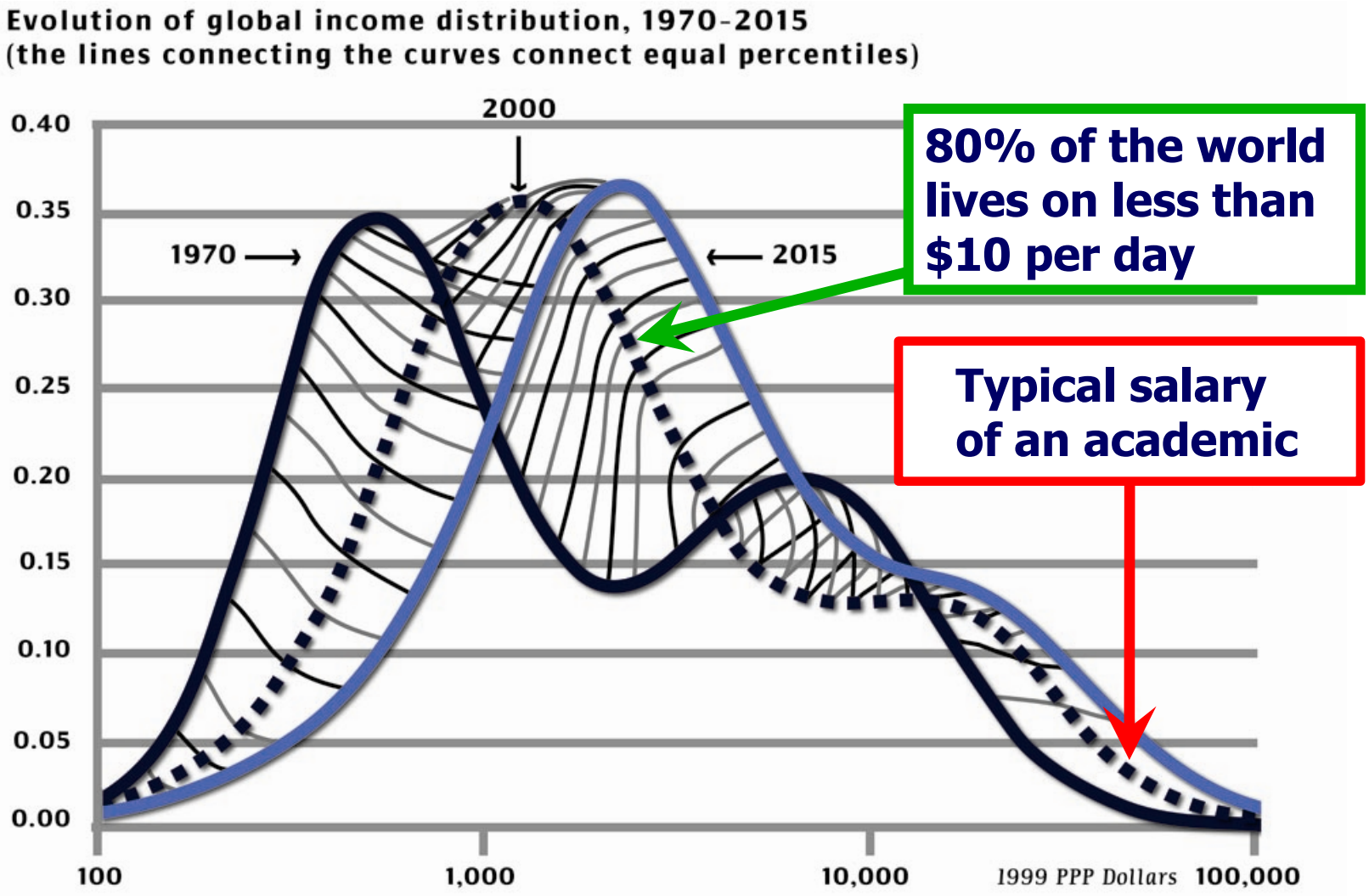
Poverty Reduction: A Success Story?



Source: Chandy and Gertz (2011, Brookings Institution)

"The new estimates of global poverty presented in this brief serve as a reminder of just how powerful high growth can be in freeing people from poverty."

Reducing GDP or GDP growth is not an option



Source: Y. Dikhanov, *Trends in Global Income Distribution, 1970-2000, and Scenarios for 2015* (New York: Human Development Report Office, 2005).

Decarbonization defined

$$\text{Carbon emissions} = C = \frac{P}{P} * \frac{GDP}{GDP} * \frac{TE}{TE} * \frac{C}{C}$$

Emissions= GDP x Technology

$$\frac{\text{Emissions}}{\text{GDP}} = \text{Technology}$$

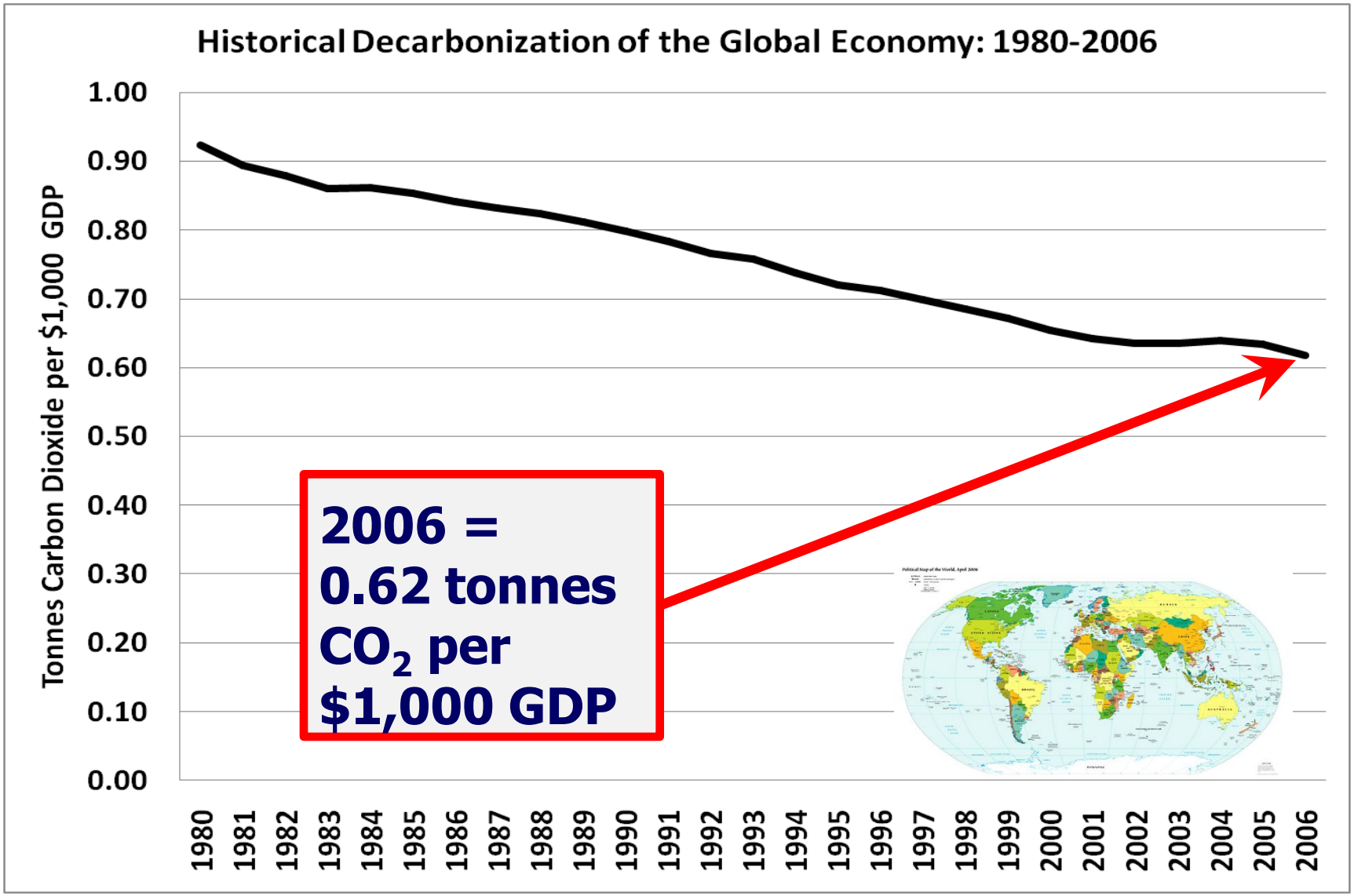
Decarbonization: CO_2 per $1,000 GDP

Decarbonization of the economy is reflected in a decrease in the ratio of carbon dioxide emissions to GDP . . .

$$\text{For 2006} = \frac{29.12 \text{ Gt } CO_2}{\$47.267 \text{ Trillion}} = 0.62 \text{ tonnes } CO_2 \text{ per \$1,000 GDP}$$

. . . in a manner consistent with desired stabilization targets

First, some good news . . .



Historical Decarbonization of the Global Economy: 1980-2006

Tonnes Carbon Dioxide per $1,000 GDP

1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00

1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006

What would this curve look like if we seek to reduce emissions by 80% by 2050?

To answer this question we need to specify a rate of future GDP growth.

Implied Decarbonization of the Global Economy
Based on Attaining 80% below 1990 Levels by 2050: 2006-2050

Average annual World GDP growth 1980 to 2006 was 3.5%

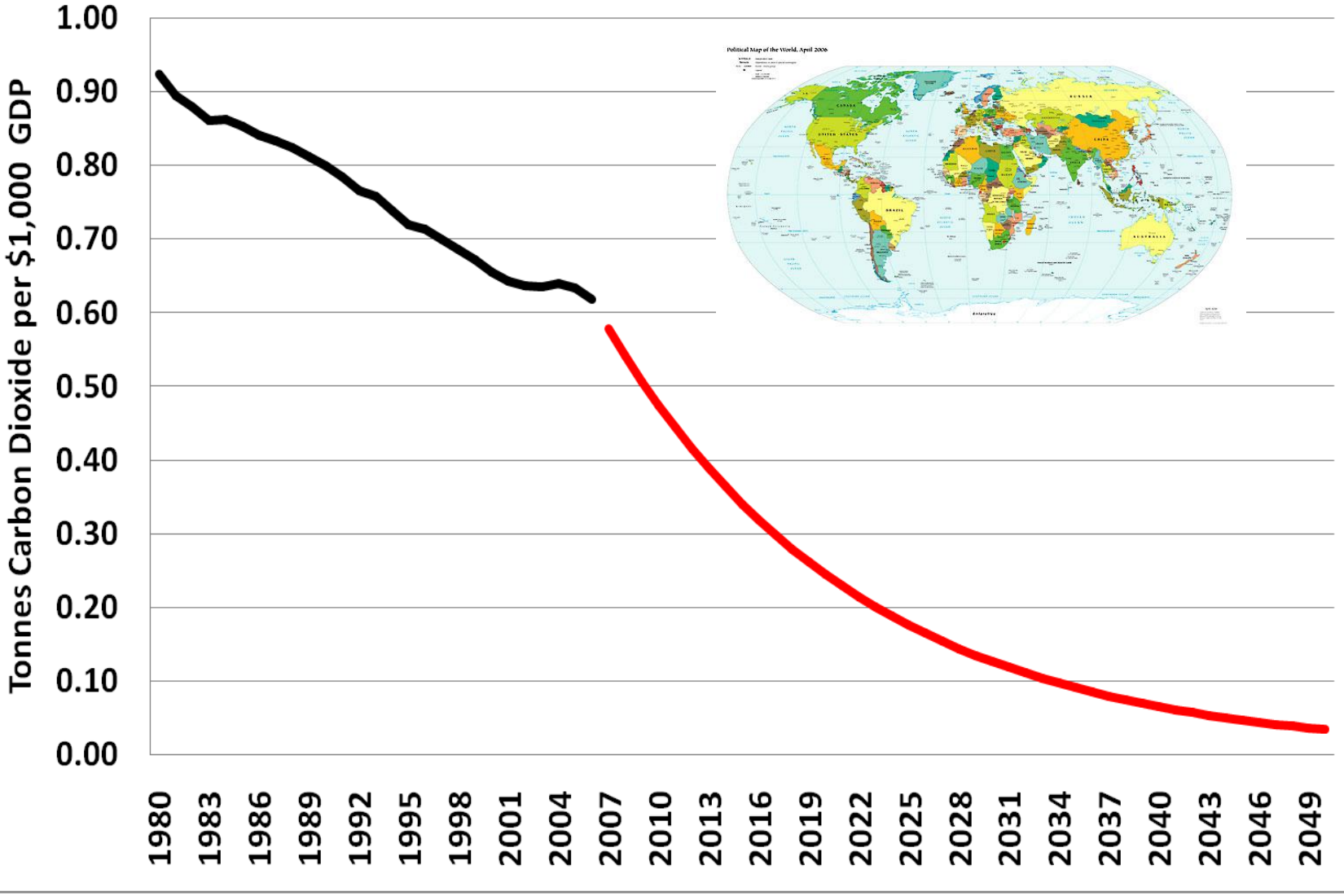
Axis Title

0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00

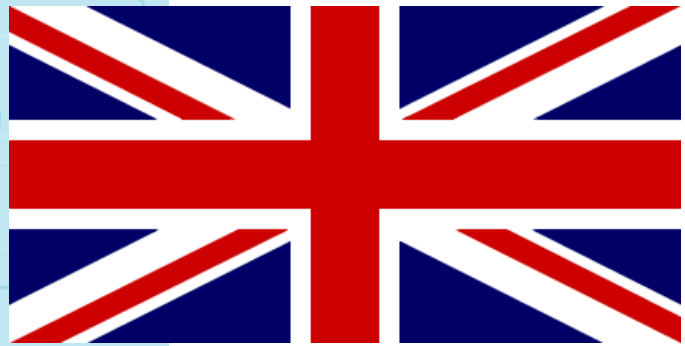
2006 2008 2010 2012 2014 2016 2018 2020 2022 2024 2026 2028 2030 2032 2034 2036 2038 2040 2042 2044 2046 2048 2050

- 1.0% Annual GDP Growth
- 2.0% Anuual GDP Growth
- 3.0% Annual GDP Growth
- 4.0% Annual GDP Growth
- 5.0% Annual GDP Growth

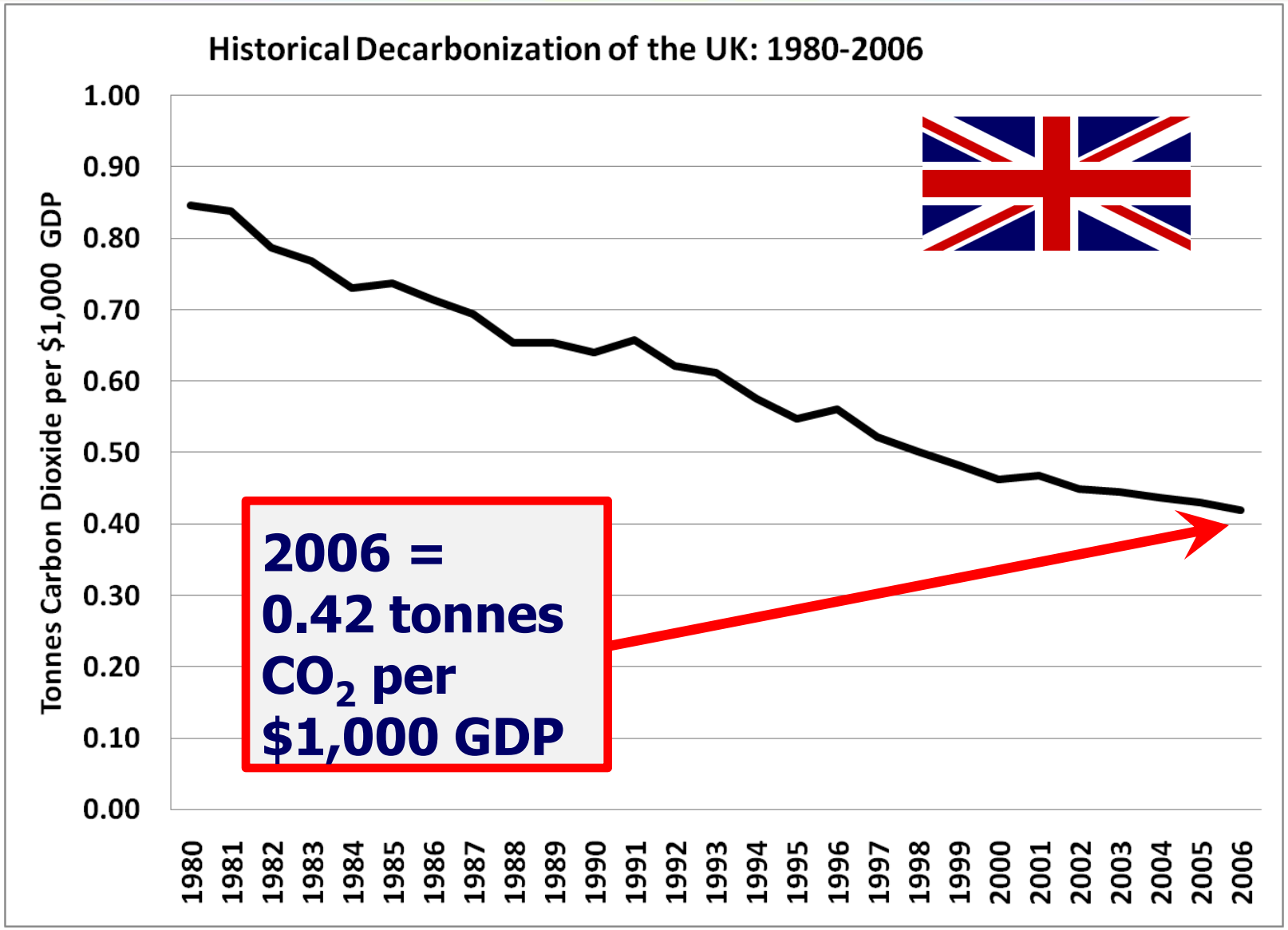
Historical and Projected Decarbonization of the Global Economy Assuming 3.0% Annual GDP Growth for 80% Reduction Below 1990 by 2050: 1980-2050



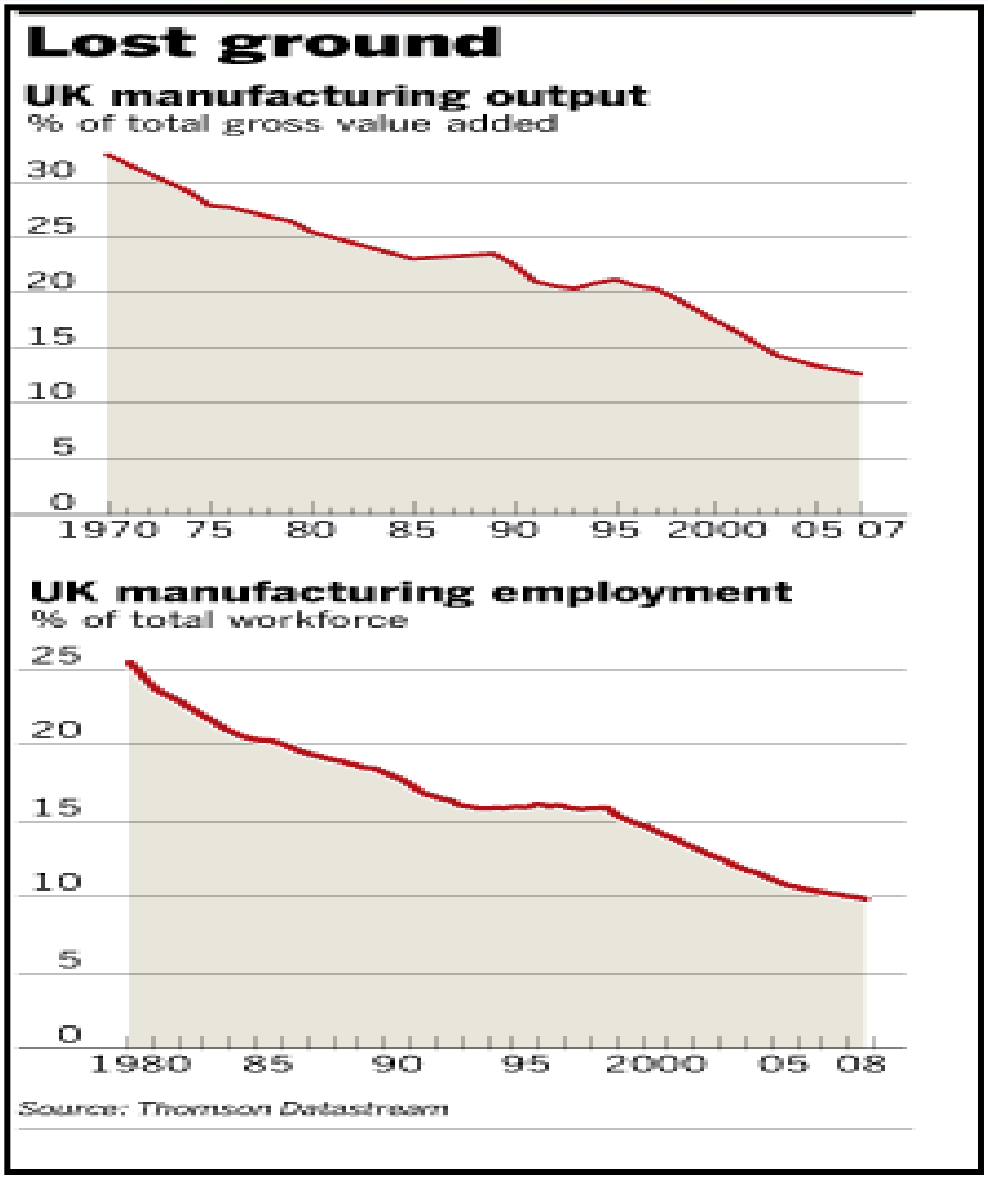
The Case of the United Kingdom

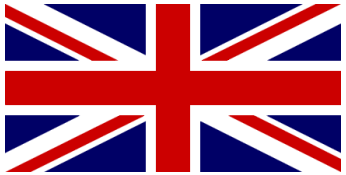


Decarbonization of the United Kingdom economy

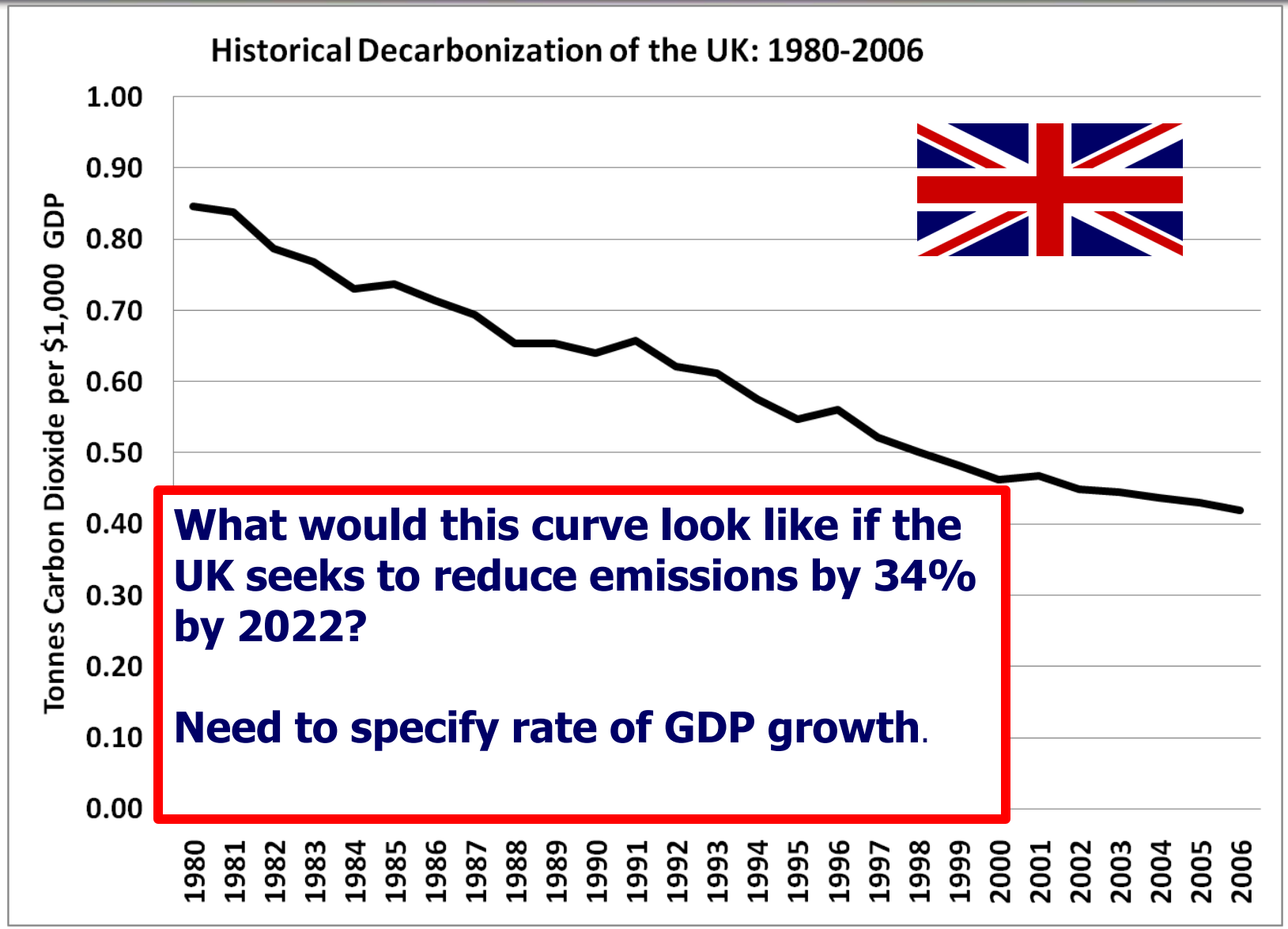


UK Decarbonization

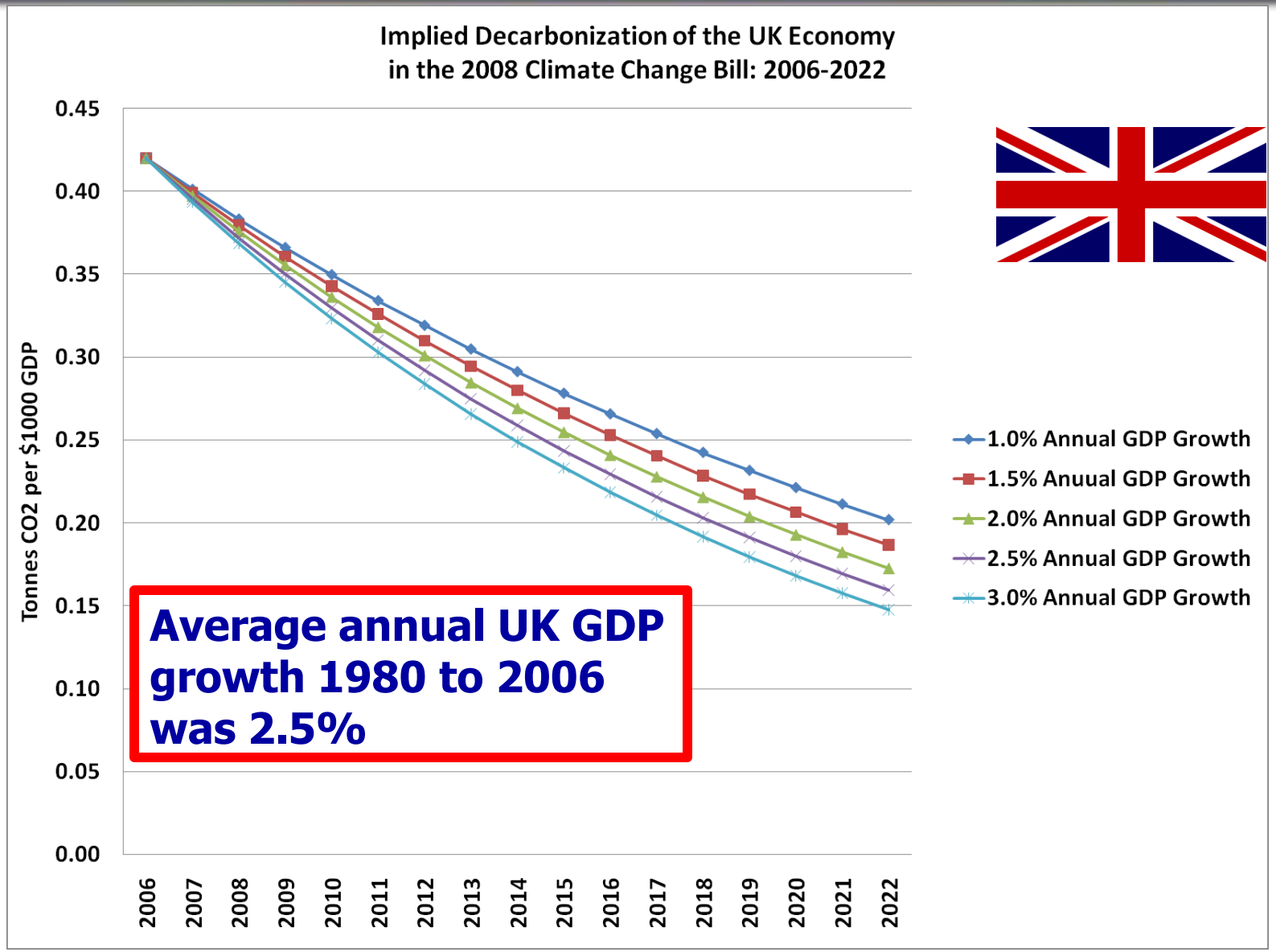




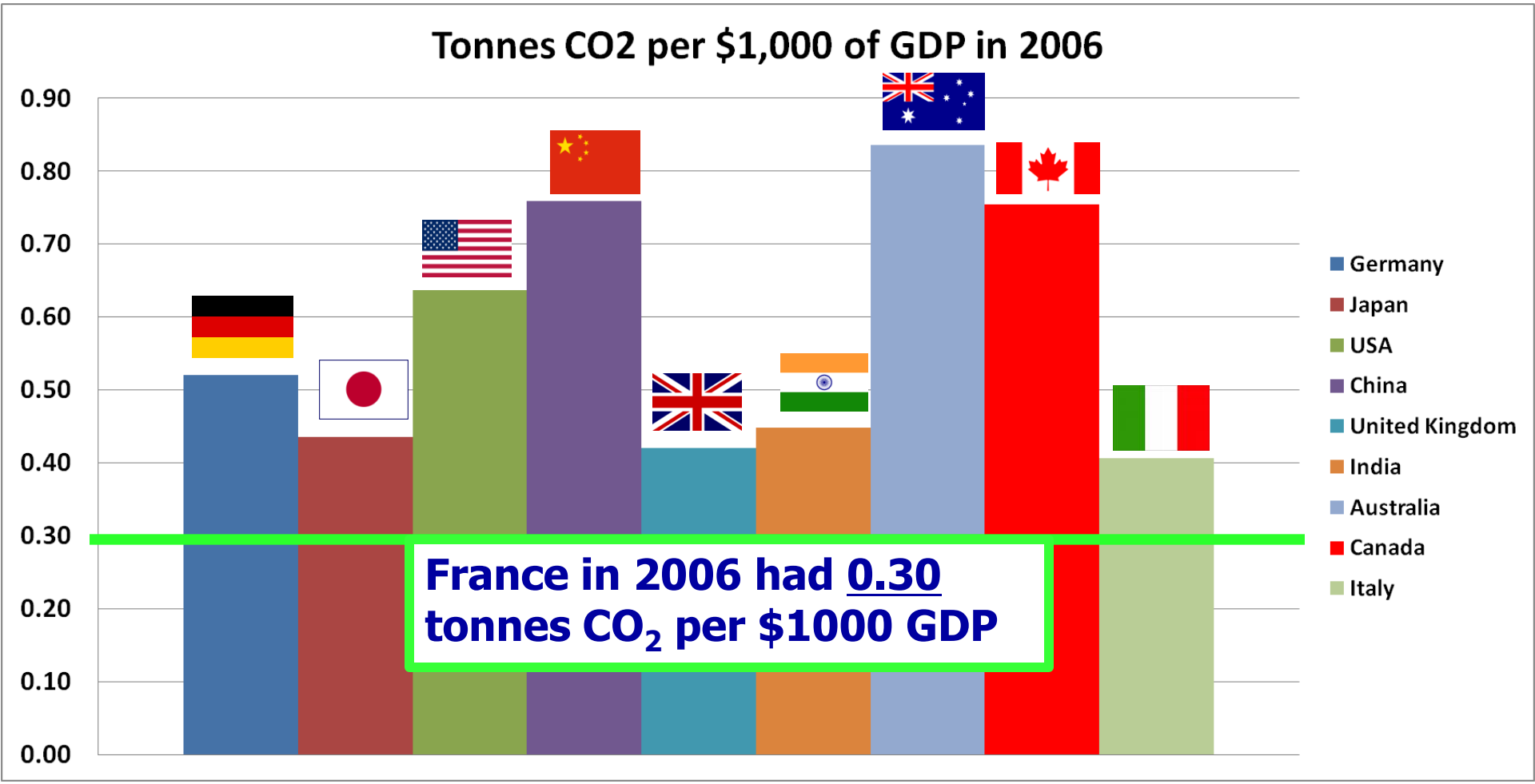
Decarbonization of the United Kingdom economy



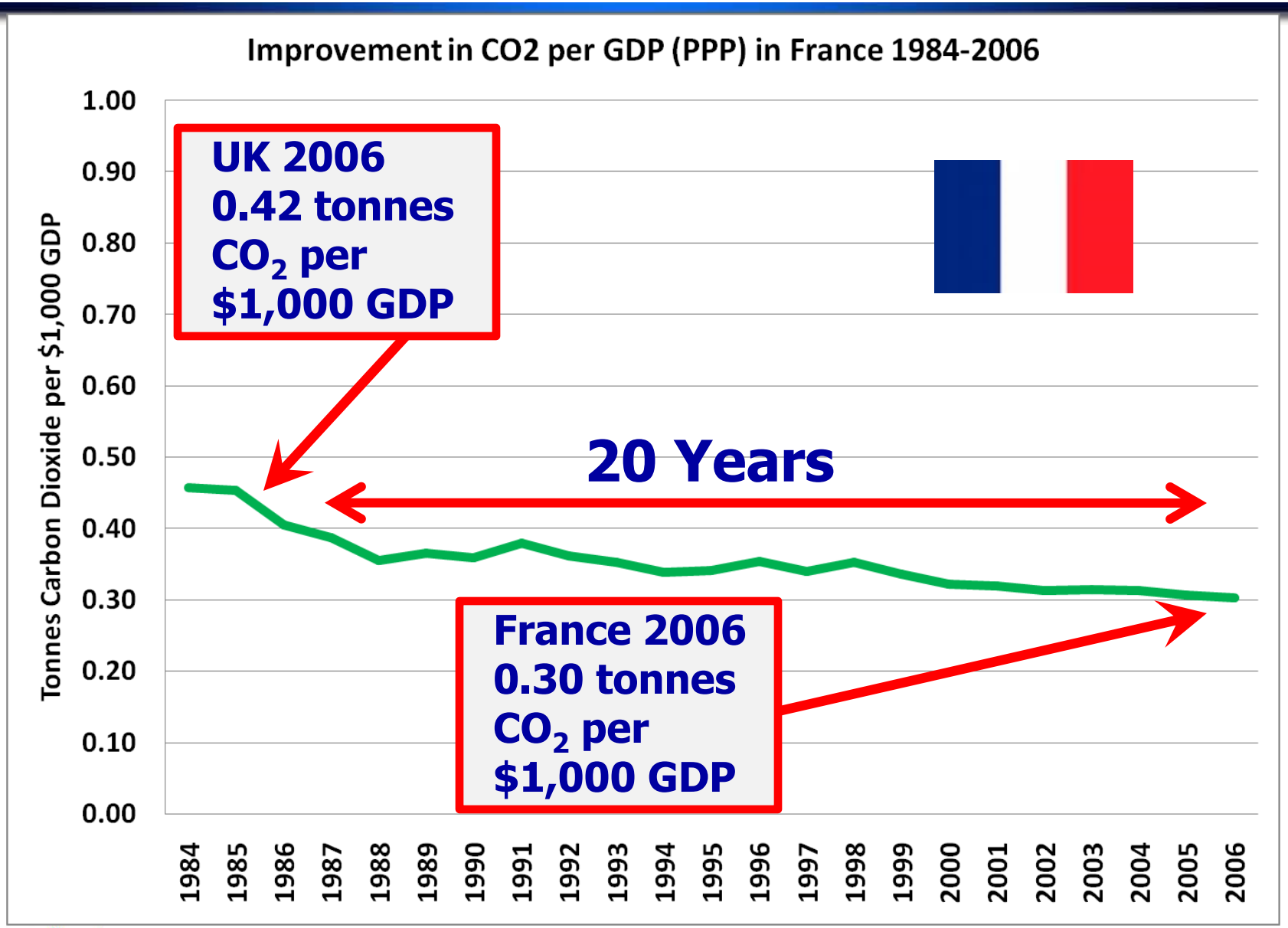
Implied decarbonization in the 2008 CC Act



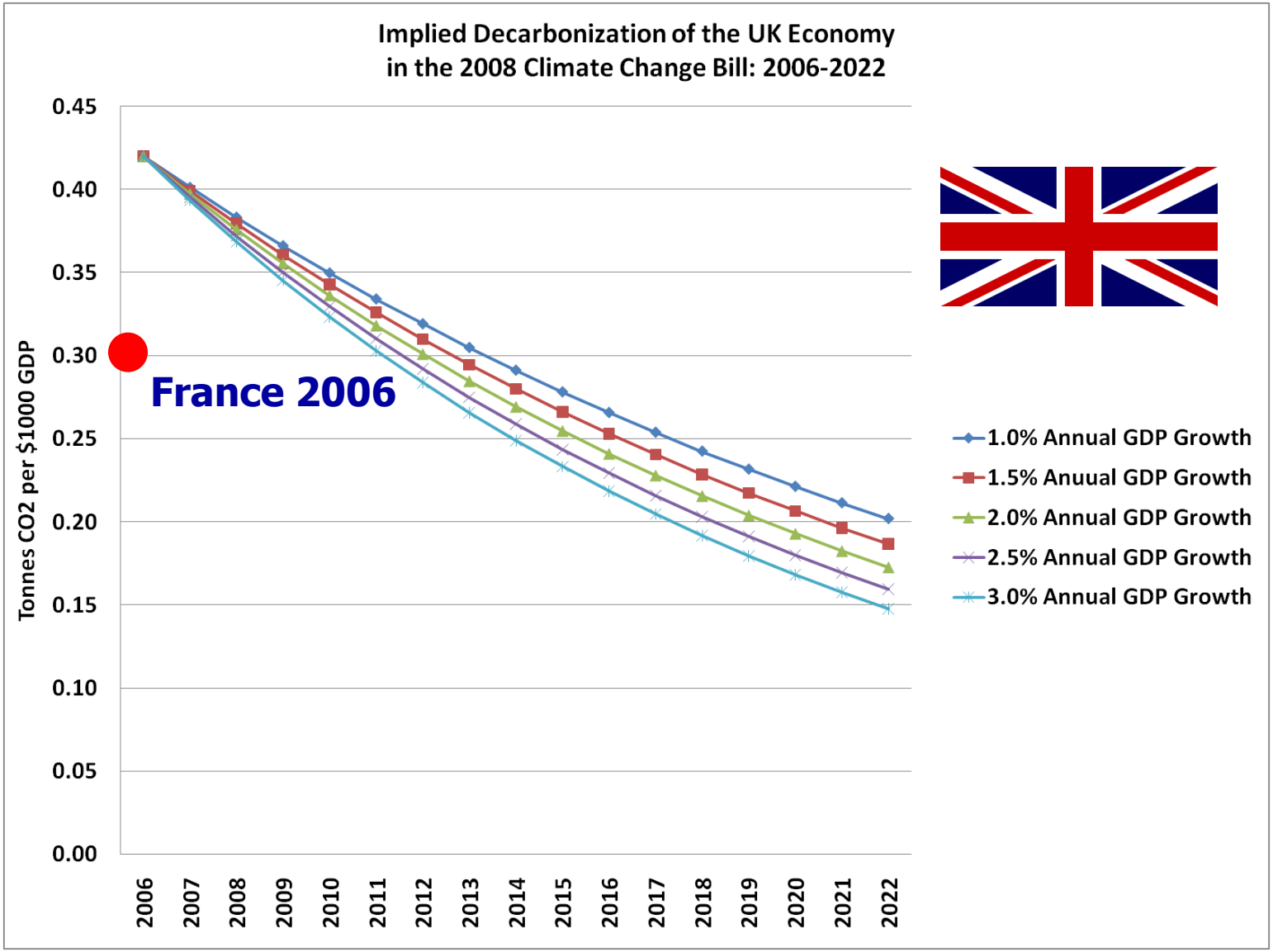
France as a point of comparison



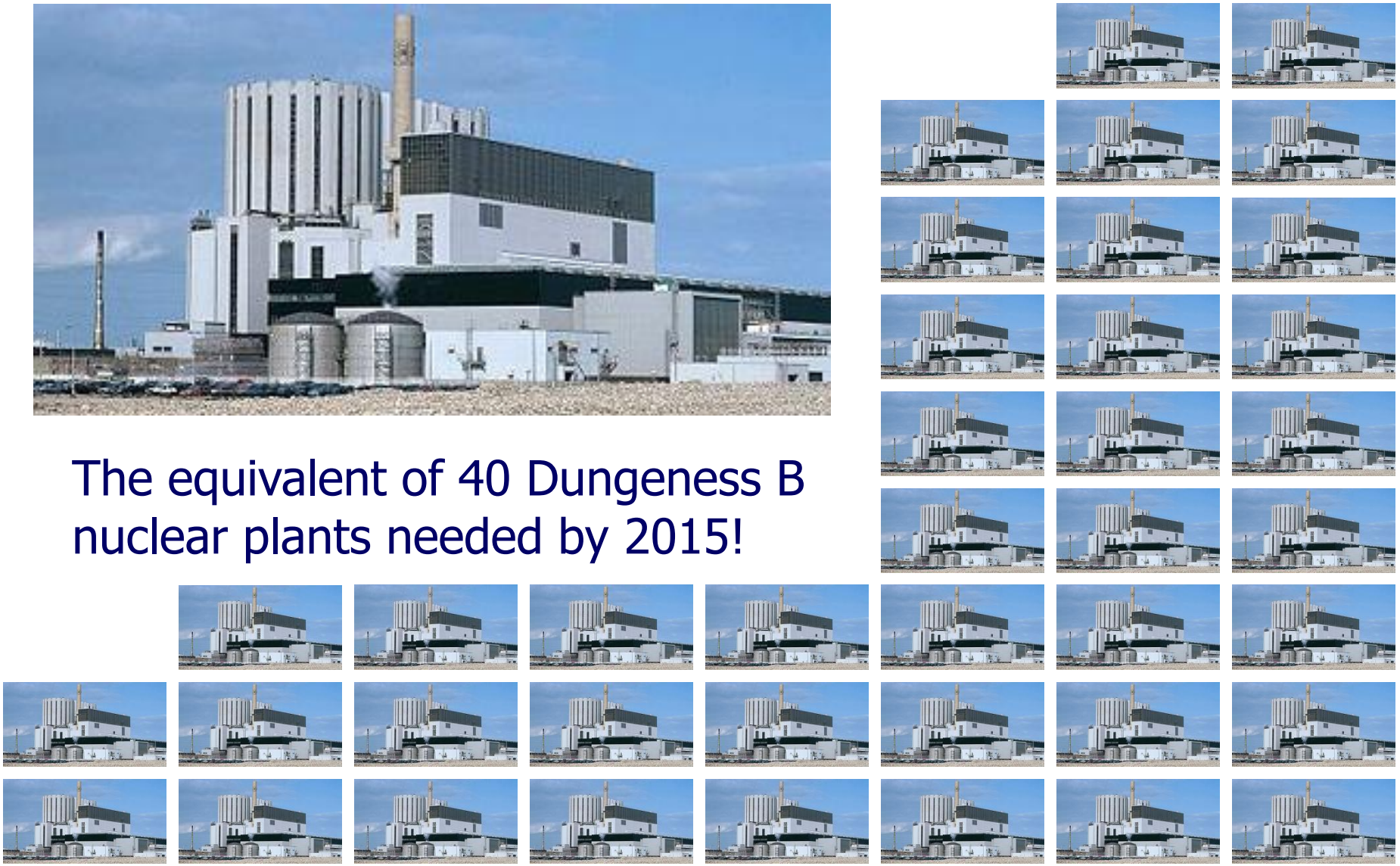
Decarbonization in France 1984 to 2006



Can the UK Become France by 2015?



Dungeness B Nuclear Power Plant



The equivalent of 40 Dungeness B nuclear plants needed by 2015!

A policy maker's response . . .

"[Pielke's analysis] raises questions which I do not think have been factored into the thinking behind the Climate Change Act.

The task (of cutting emissions by 80% from 1990 levels by 2050) is already staggeringly huge and, as we have seen, well beyond our current political capacity to deliver.

Heathrow is a prime example of ducking the responsibility. It is hard to see any tough choices being made in the current climate."

Colin Challin, Member of UK Parliament
Chairman of the All Party Parliamentary Climate Change Group
11 February 2009
BBC News -- http://news.bbc.co.uk/1/hi/sci/tech/7881868.stm

Time helps resolve policy debates. . .

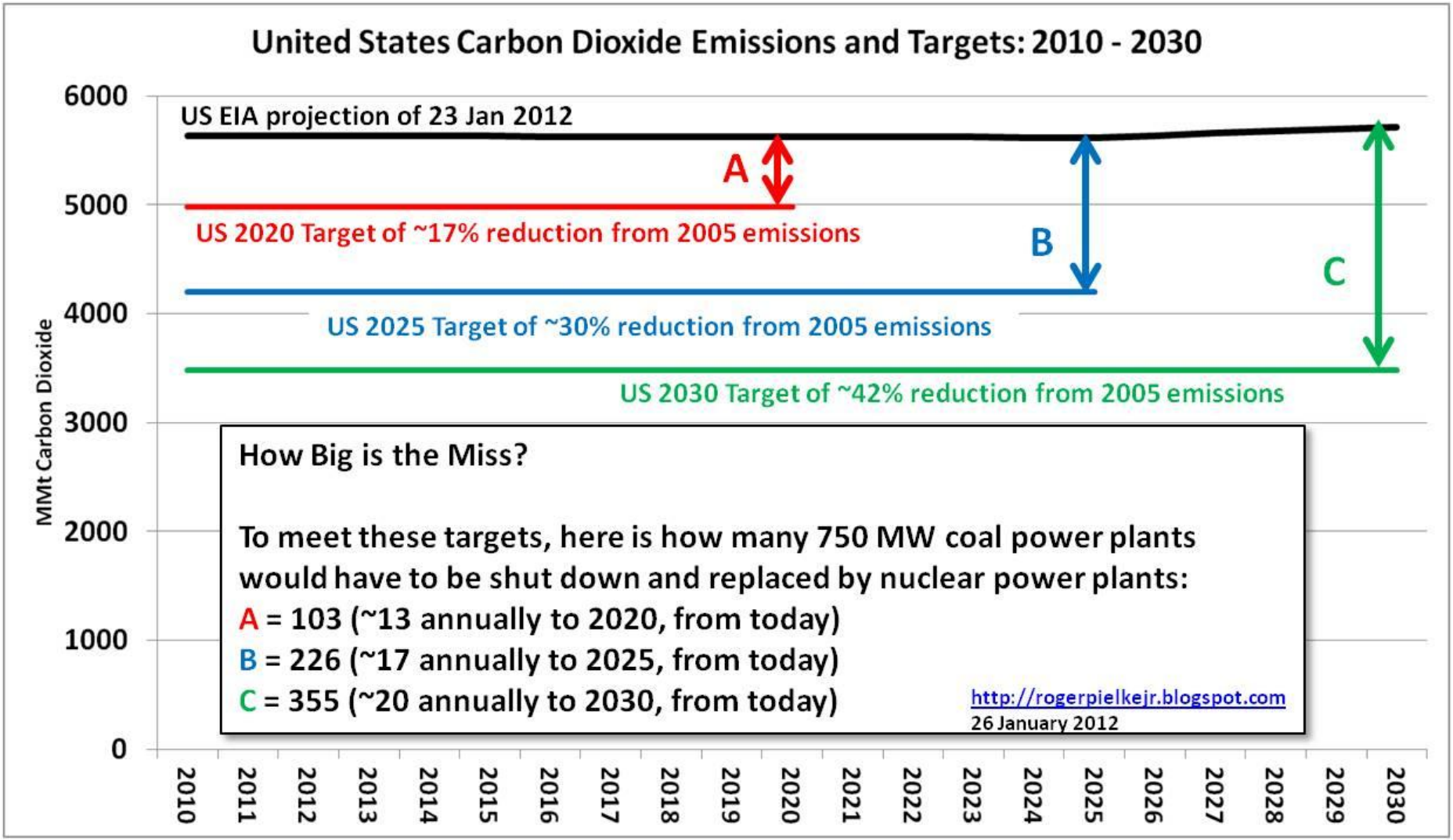
"**Professor Pielke's intervention was rejected by economist Terry Barker**, a lead author for the Intergovernmental Panel on Climate Change (IPCC)."

BBC News, February 2009
BBC News -- http://news.bbc.co.uk/1/hi/sci/tech/7881868.stm

"**Britain will miss government carbon targets by increasingly wide margins over the next 20 years** unless it introduces radical policy measures, a report warned on Thursday. . . **argues [Cambridge Econometrics], a private company owned by a charity and chaired by the Cambridge University academic, Terry Barker**."

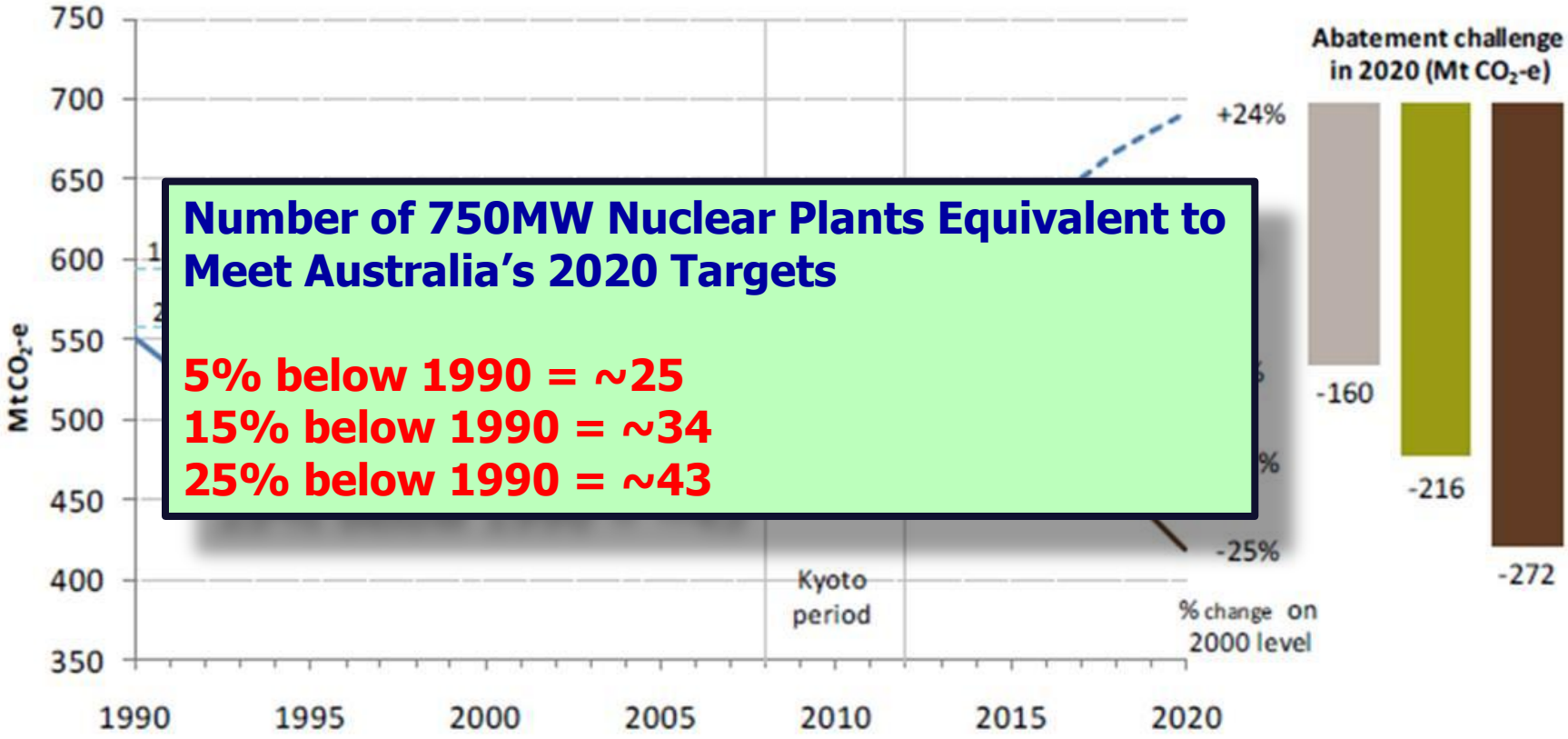
The Guardian, September 2011
http://www.guardian.co.uk/environment/2011/sep/16/uk-miss-carbon-targets

How about the United States?



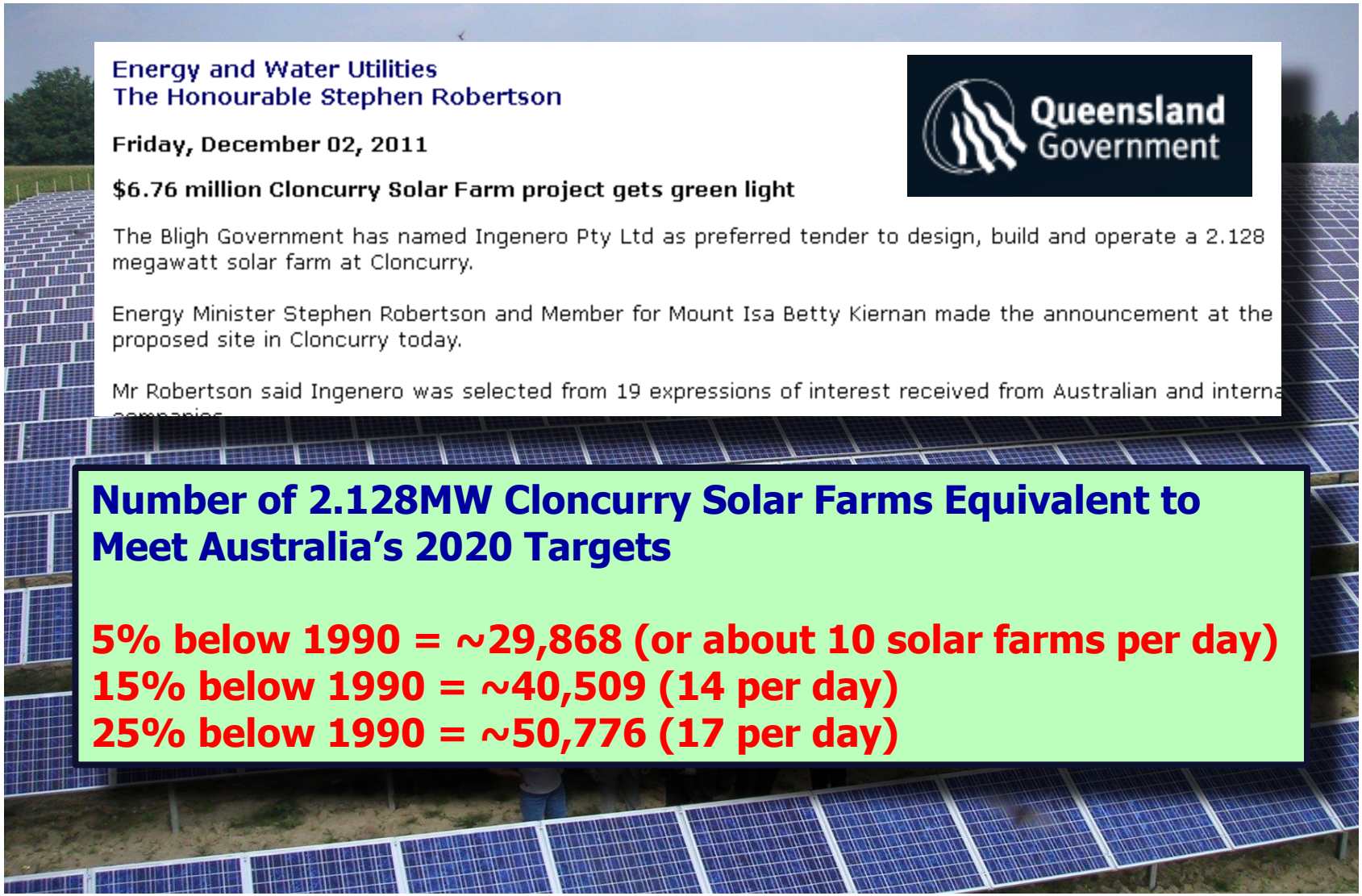
How about Australia?

Figure 1 Australia's emissions trends, 1990 to 2020



Note: Trajectories to the 2020 target range are illustrative, they begin in 2011-12 at 108 per cent of 1990 levels (consistent with Australia's Kyoto Protocol first commitment period target) and assume a straight line reduction to the target.

What about Solar Energy for Australia?



Energy and Water Utilities
The Honourable Stephen Robertson

Queensland Government

Friday, December 02, 2011

$6.76 million Cloncurry Solar Farm project gets green light

The Bligh Government has named Ingenero Pty Ltd as preferred tender to design, build and operate a 2.128 megawatt solar farm at Cloncurry.

Energy Minister Stephen Robertson and Member for Mount Isa Betty Kiernan made the announcement at the proposed site in Cloncurry today.

Mr Robertson said Ingenero was selected from 19 expressions of interest received from Australian and interna

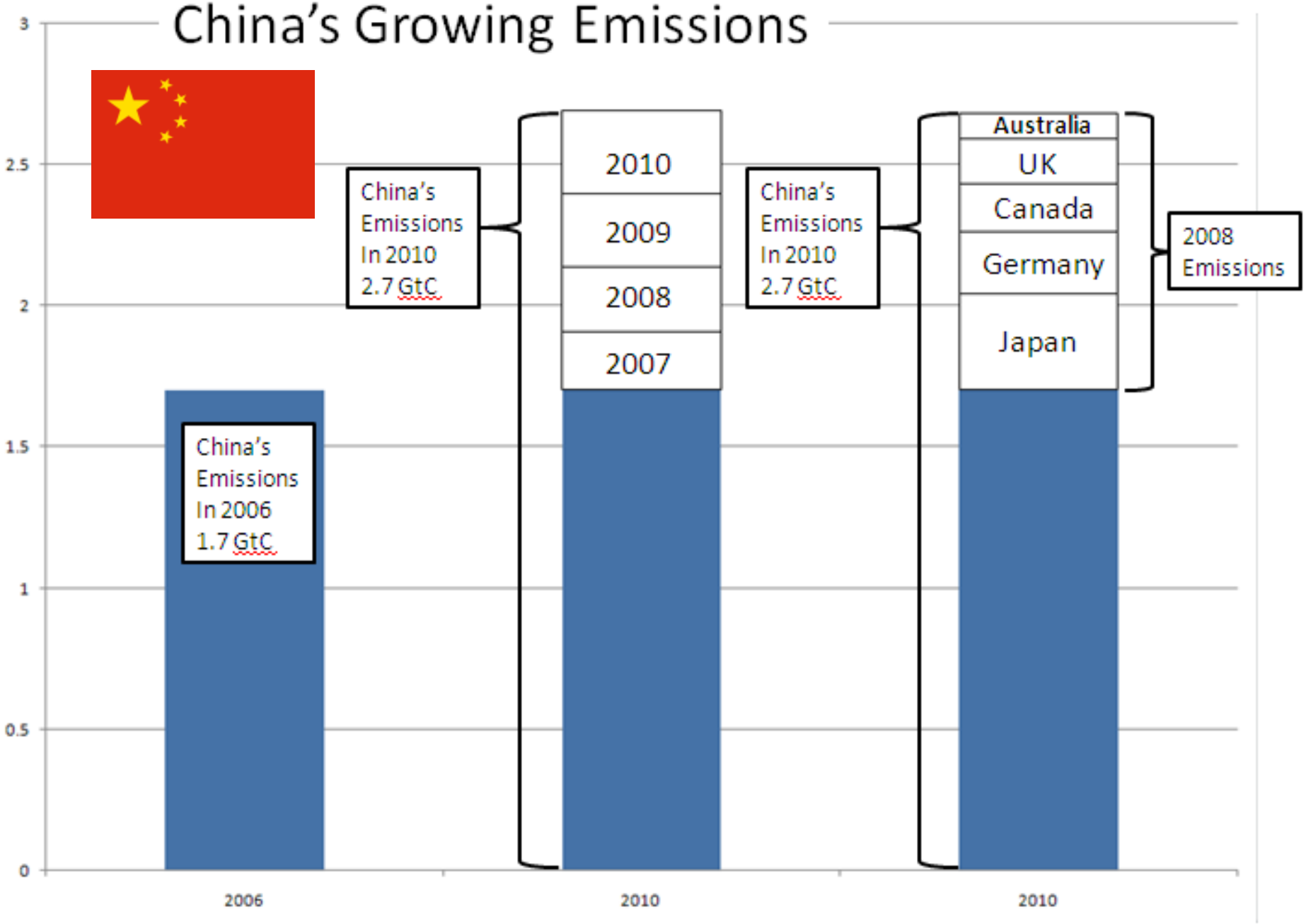
Number of 2.128MW Cloncurry Solar Farms Equivalent to Meet Australia's 2020 Targets

5% below 1990 = ~29,868 (or about 10 solar farms per day)
15% below 1990 = ~40,509 (14 per day)
25% below 1990 = ~50,776 (17 per day)

The Heathrow 3rd runway debate . . .

. . . In broader context

China's Growing Emissions



A Global Perspective

To achieve stabilization at a 2°C warming, we would need to install ~900 ± 500 MW [mega-watts] of carbon emissions-free power generating capacity each day over the next 50 years. **This is roughly the equivalent of a large carbon emissions-free power plant becoming functional somewhere in the world every day.** In many scenarios, this pace accelerates after mid-century. . . even stabilization at a 4°C warming would require installation of 410 MW of carbon emissions-free energy capacity each day.

Caldeira et al. 2003

1.5 billion (!) people lack access to electricity

Can we change the narrative?

- From
  - We use too much energy
  - Fossil fuels are too cheap

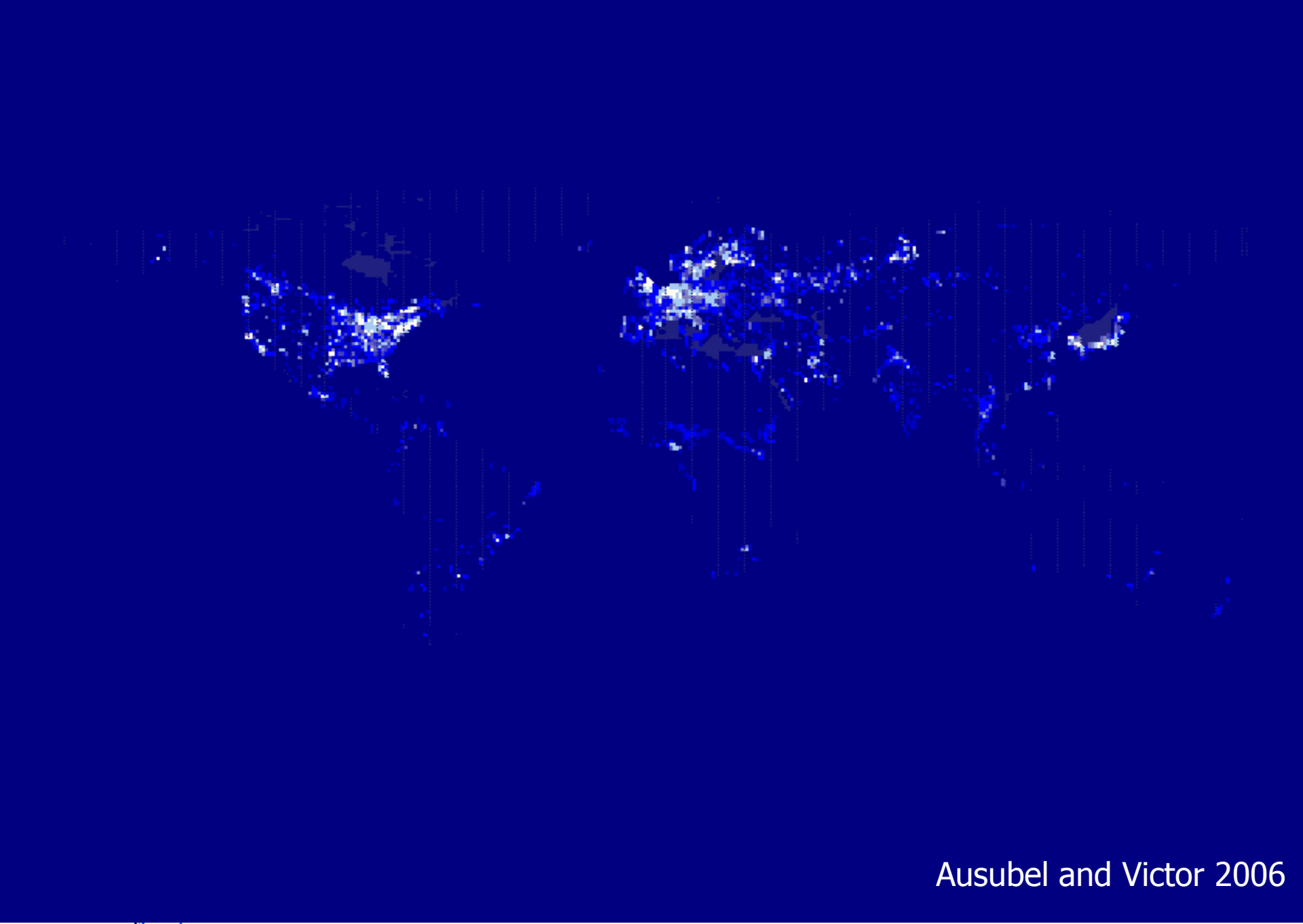
- To
  - We need more energy
  - Fossil fuels are too expensive

How fast can decarbonization occur?

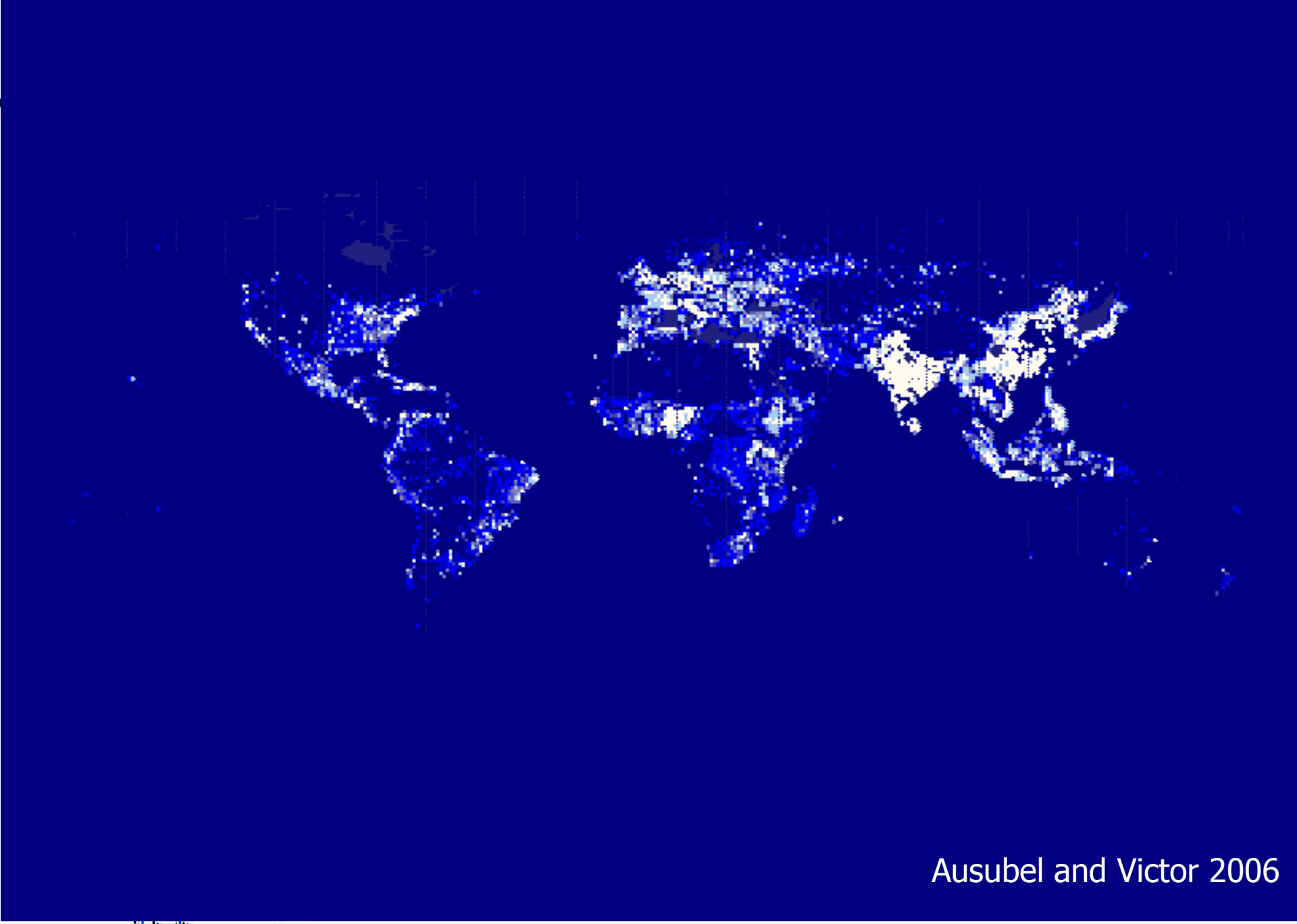
- The honest answer is "no one knows"
- Historical rates of 1-2% per year have occurred in developed countries
- For short periods some countries have achieved rates >2% per year
- Achieving 17% (for instance) reductions in US emissions by 2020 while maintaining modest economic growth requires rates of decarbonization of >5% per year (!)

What about current policy options?

- The policy logic of targets and timetables is exactly backwards
- Cap and trade cannot succeed
  - European experience
- A carbon tax cannot alone do the job
  - but is important if used wisely
- How do we deal with other "wicked problems"?
  - Advancing human life spans
  - Increasing agricultural production
  - Winning the Cold War



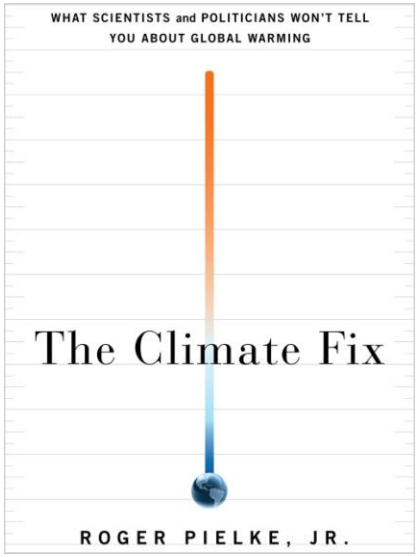
Ausubel and Victor 2006



Ausubel and Victor 2006

How to provide feedback!

- pielke@colorado.edu
- Papers etc. can be downloaded from: http://sciencepolicy.colorado.edu
- http://rogerpielkejr.blogspot.com



Thank you!