PUBLIC LECTURE

The Climate Fix

Professor Roger Pielke Jr.
Professor of Environmental Studies, Centre for Science & Technology Policy Research, University of Colorado at Boulder

Thursday 2 February 2012  5.30 – 6.30pm
Molonglo Theatre  Level 2 & 3, JG Crawford Building #132, Lennox Crossing, ANU, Canberra

Presented by the
HC Coombs Policy Forum,
Australian National Institute of Public Policy,
Crawford School of Economics and Government, ANU
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?
“... 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.”
“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

EFFECTS OF NATIONAL EMISSIONS PLEDGES IN THE COPENHAGEN ACCORD

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

**INFLOW**
- Human emissions of about 9.0 GtC per year and growing
- About 12 GtC per year expected in 2030

**STOCK**
Atmospheric concentrations of 390 ppm, today, increasing by about ~2 ppm/year

**OUTFLOW**
A natural removal of about 4 GtC per year
Emissions are growing faster than expected

Source: Manning et al. 2010
People engage in economic activity that uses energy from carbon emitting generation.
Where do emissions come from?

<table>
<thead>
<tr>
<th>People</th>
<th>Population</th>
<th>Carbon emissions = C =</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engage in economic activity that uses energy from carbon emitting generation</td>
<td>GDP per capita</td>
<td>( P \times GDP \times \frac{TE}{GDP} \times \frac{C}{TE} )</td>
</tr>
</tbody>
</table>

The “Kaya Identity”
What tools do we have to reduce emissions?

<table>
<thead>
<tr>
<th>Factor</th>
<th>Lever</th>
<th>Approach to Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>Population</td>
<td>Less people</td>
</tr>
<tr>
<td>GDP/P</td>
<td>GDP per capita</td>
<td>Smaller economy</td>
</tr>
<tr>
<td>TE/GDP</td>
<td>Energy intensity</td>
<td>Increase efficiency</td>
</tr>
<tr>
<td>C/TE</td>
<td>Carbon intensity</td>
<td>Switch energy sources</td>
</tr>
</tbody>
</table>

Carbon emissions = \( C = \frac{P \times GDP \times TE \times C}{P \times GDP \times TE} \)

GDP Technology
The Iron Law of climate policy

The Problem with Democracy
National Poll, % replying

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

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

“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.

80% of the world lives on less than $10 per day.

Typical salary of an academic.
Decarbonization defined

Carbon emissions = \( C = \frac{P \times GDP}{P} \times \frac{TE \times C}{GDP \times TE} \)

Emissions = \( \frac{GDP \times Technology}{GDP} \)
Decarbonization of the economy is reflected in a decrease in the ratio of carbon dioxide emissions to GDP . . .

For 2006 = \[ \frac{29.12 \text{ Gt CO}_2}{47.267 \text{ Trillion}} = 0.62 \text{ tonnes CO}_2 \text{ per } $1,000 \text{ GDP} \]

. . . in a manner consistent with desired stabilization targets
First, some good news . . .

2006 = 0.62 tonnes CO₂ per $1,000 GDP
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.
Average annual World GDP growth 1980 to 2006 was 3.5%
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

Historical Decarbonization of the UK: 1980-2006

2006 = 0.42 tonnes CO$_2$ per $1,000$ GDP
UK Decarbonization

Lost ground

UK manufacturing output
% of total gross value added

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UK manufacturing employment
% of total workforce

Source: Thomson Datastream
Decarbonization of the United Kingdom economy

What would this curve look like if the UK seeks to reduce emissions by 34% by 2022?

Need to specify rate of GDP growth.
I mplied decarbonization in the 2008 CC Act

Average annual UK GDP growth 1980 to 2006 was 2.5%
France as a point of comparison

France in 2006 had 0.30 tonnes CO₂ per $1,000 GDP
Decarbonization in France 1984 to 2006

Improvement in CO2 per GDP (PPP) in France 1984-2006

UK 2006
0.42 tonnes CO₂ per $1,000 GDP

France 2006
0.30 tonnes CO₂ per $1,000 GDP

20 Years
Can the UK Become France by 2015?

Implied Decarbonization of the UK Economy in the 2008 Climate Change Bill: 2006-2022

France 2006

- 1.0% Annual GDP Growth
- 1.5% Annual GDP Growth
- 2.0% Annual GDP Growth
- 2.5% Annual GDP Growth
- 3.0% Annual GDP Growth
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
“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

“The Guardian, September 2011
http://www.guardian.co.uk/environment/2011/sep/16/uk-miss-carbon-targets
How about the United States?

**United States Carbon Dioxide Emissions and Targets: 2010 - 2030**

- **US EIA projection of 23 Jan 2012**
- **US 2020 Target of ~17% reduction from 2005 emissions**
- **US 2025 Target of ~30% reduction from 2005 emissions**
- **US 2030 Target of ~42% reduction from 2005 emissions**

**How Big is the Miss?**

To meet these targets, here is how many 750 MW coal power plants would have to be shut down and replaced by nuclear power plants:

- **A = 103 (~13 annually to 2020, from today)**
- **B = 226 (~17 annually to 2025, from today)**
- **C = 355 (~20 annually to 2030, from today)**

[http://rogerpielkejr.blogspot.com](http://rogerpielkejr.blogspot.com)
26 January 2012
How about Australia?

Number of 750MW Nuclear Plants Equivalent to Meet Australia’s 2020 Targets

- 5% below 1990 = ~25
- 15% below 1990 = ~34
- 25% below 1990 = ~43

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

Friday, December 02, 2011

$6.76 million Cloncurry Solar Farm project gets green light

The Bligh Government has named Ingenro 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 Kierman made the announcement at the proposed site in Cloncurry today.

Mr Robertson said Ingenro was selected from 19 expressions of interest received from Australian and international companies.

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

To stimulate development outside of major cities such as Beijing and Shanghai, the Chinese government plans to open about **100 new airports by 2020 at a cost of some $62 billion**. The expansion sites—from Mohe, the northernmost town in China, to Hainan island in the south to Bachu in the far west—are like a treasure map for GE’s infrastructure units.
China’s Growing Emissions

- China’s Emissions in 2006: 1.7 GtC
- China’s Emissions in 2010: 2.7 GtC

Comparison with 2008 Emissions:
- Australia
- UK
- Canada
- Germany
- Japan

Timeline:
- 2006
- 2007
- 2008
- 2009
- 2010
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
How to provide feedback!

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

Thank you!
If you are in government, research, business or civil society and are interested in the links between government policy and research, then please register with ANIPP (Australian National Institute for Public Policy) 

http://publicpolicy.anu.edu.au

to receive updates on thematic policy studies, events, research, activities and initiatives.

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