Stephen H. Schneider*
Melvin and Joan Lane Professor for Interdisciplinary Environmental Studies,
Professor, Department of Biological Sciences
Senior fellow, Woods Institute for the Environment
Stanford University

Mediarolgy: Communicating the seriousness of global warming without omitting the uncertainties

Workshop on the Impacts of Climate Change on Air Quality in the Pacific Southwest
The Federal Building at 7th & Mission Streets
San Francisco
October 11, 2007
12:30pm -1:10pm

*[Website for more info: www.climatechange.net.]*
The Heat Is On
How the Earth’s Climate Is Changing
Why the Ozone Hole Is Growing
EXCLUSIVE INTERVIEW: DUKAKIS ON SCIENCE

THE GREENHOUSE EFFECT
THIS SUMMER WAS MERELY A WARM-UP

DOLPHINS IN THE MILITARY

KRKATAU: BACK FROM THE DEAD

DESIGNER PROTEINS

RESEARCH NEWS:
The Real Temple of Doom
Early Americans
Rise of the Tetrapods
EARTH ON ICE
A Bold Attack on Global Warming
PRESENTATIONAL STYLES

"Scientists"

Caveats
Data
Facts
Methods
Results
Recommendations
Outside review + rethinking (i.e., benevolent censorship)
Scientist gets last word
PRESENTATIONAL STYLES

"Scientists"

Caveats
Data
Facts
Methods
Results
Recommendations
Outside review + rethinking (i.e., benevolent censorship)
Scientist gets last word

"Journalists"

Recommendations
Results
Methods
Facts
Data
Caveats
Independence, scoop + deadline (i.e., benevolent inaccuracy)
Editor gets last word
Headline writer sets tone
THE JURY'S STILL OUT ON CLIMATE CHANGE.
Endangered

Threatened

BUSH JUNK SCIENCE
Is the Science “Settled”?
Figure 2.4. Atmospheric concentrations of carbon dioxide, methane and nitrous oxide over the last 10,000 years (large panels) and since 1750 (inset panels). Measurements are shown from ice cores (symbols with different colours for different studies) and atmospheric samples (lines). The corresponding radiative forcings are shown on the right hand axes of the large panels. [WGI Figure SPM-1]
Interglacial warm period

Ice Age

TIME SERIES

δ¹⁸O (per mil)

AGE (THOUSANDS OF YEARS)

~6°C
Sea level some five meters higher
Global Warming is Happening NOW:

“Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level (see Figure SPM-3). {3.2, 4.2, 5.5}.”

*IPCC, Summary for Policymakers, Contribution of Working Group I to the Fourth Assessment Report, February, 2007*
Figure 1.1. Changes in global mean temperature, sea level, and snow cover area. Panel (a) shows global mean temperatures as annual values (open circles) and a smoothed curve (black line) with uncertainty in the smoothed curve shown by the yellow shaded area. Panel (b) shows global mean sea level from tide gauge data (circles) and recent satellite measurements (red line). Panel (c) shows April Northern Hemisphere snow cover area each year (circles) with smoothed values (black line). [WGI Figure SPM-3]
Figure SPM-4. Comparison of observed continental- and global-scale changes in surface temperature with results simulated by climate models using natural and anthropogenic forcings. Decadal averages of observations are shown for the period 1906-2005 (black line) plotted against the centre of the decade and relative to the corresponding average for the 1901–1950. Lines are dashed where spatial coverage is less than 50%. Blue shaded bands show the 5–95% range for 19 simulations from 5 climate models using only the natural forcings due to solar activity and volcanoes. Red shaded bands show the 5–95% range for 58 model simulations from 14 climate models using both natural and anthropogenic forcings. [Figure 2.5]
Munich Re:
“We need to stop this dangerous experiment humankind is conducting on the Earth’s atmosphere.”
Article 2 of the UN Framework Convention on Climate Change (UNFCCC) states that: “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”. The Framework Convention on Climate Change further suggests that “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.”
“Dangerous” Climate Change

• Who decides what is “dangerous” in DAI?
“Dangerous” Climate Change

Who decides what is “dangerous” in DAI?

Many ways to define DAI

Ultimately, not a scientific choice
Climate Uncertainty

- Inherent uncertainty in projections of future climate
Climate Uncertainty

- Inherent uncertainty in projections of future climate
- Best guess → Range
Climate Uncertainty

- Inherent uncertainty in projections of future climate
- Best guess → Range *

*Climate Sensitivity: 1.5 → 4.5 °C:
Climate Uncertainty

- Inherent uncertainty in projections of future climate

- Best guess → Range* → PDFs

*Climate Sensitivity: 1.5→4.5 C:
Climate Uncertainty
Climate Uncertainty

Temperatures change above 2000 \( ^\circ\text{C} \) vs. density.
Climate Uncertainty

Most sensible decision paradigm?: Risk-management.
Is the Science “Settled”?
Double Ethical Bind:

*full disclosure
Double Ethical Bind:

*full disclosure

*be effective
Double Ethical Bind:

* full disclosure  (in 20 second sound bites??!!@#$???)
* be effective
Double Ethical Bind:

*full disclosure (in 20 second sound bites??!!@#$???)

*be effective (need 20 second sound bites!)
CAN WE ‘SOLVE” THE “DOUBLE ETHICAL BIND” ?
CAN WE ‘SOLVE” THE “DOUBLE ETHICAL BIND” ?

USE METAPHORS THAT CONVEY BOTH URGENCY AND UNCERTAINTY
The great “greenhouse gamble”…

- <1°C (4.1%; 1 in 24 odds)
- 1 to 1.5°C (11.4%; 1 in 9 odds)
- 1.5 to 2°C (20.6%; 1 in 5 odds)
- 2 to 2.5°C (22.5%; 1 in 4 odds)
- 2.5 to 3°C (16.8%; 1 in 6 odds)
- 3 to 4°C (16.2%; 1 in 6 odds)
- 4 to 5°C (4.6%; 1 in 22 odds)
- >5°C (3.8%; 1 in 26 odds)

Source: MIT Joint Program on the Science and Policy of Climate Change
To Help Ensure Credibility (in Writing)*

• Hierarchy of backup products:
  ▪ Op-ed pieces
  ▪ Longer popular articles
  ▪ Books

*Explain how your views were modified with new evidence
To Help Ensure Credibility (in Speaking)

- Hierarchy of backup products:
  - 15 second sound bites
  - 1 minute explanation
  - 10 minute talk
  - 50 minute lecture (sometimes more for some of us!)
SCHNEIDER’S “THREE COMMANDMENTS” OF COMMUNICATION:

Know thy audience!
SCHNEIDER’S “THREE COMMANDMENTS” OF COMMUNICATION:

Know thy audience!
Know thy self!
SCHNEIDER’S “THREE COMMANDMENTS” OF COMMUNICATION:

Know thy audience!
Know thy self!
Know thy stuff!
IMPACTS:
A Brief Litany
Figure 1.1. Changes in global mean temperature, sea level, and snow cover area. Panel (a) shows global mean temperatures as annual values (open circles) and a smoothed curve (black line) with uncertainty in the smoothed curve shown by the yellow shaded area. Panel (b) shows global mean sea level from tide gauge data (circles) and recent satellite measurements (red line). Panel (c) shows April Northern Hemisphere snow cover area each year (circles) with smoothed values (black line). [WGI Figure SPM-3]
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Good news! At the current rate of global warming we should be able to just swim over there and eat him in under five years...!
Inuit to file anti-U.S. climate petition
Wed Jun 15, 2005 11:09 AM

OSLO (Reuters) - Inuit hunters threatened by a melting of the Arctic ice plan to file a petition accusing Washington of violating their human rights by fueling global warming, an Inuit leader said Wednesday.

Sheila Watt-Cloutier, chair of the Inuit Circumpolar Conference (ICC), also said Washington was hindering work to follow up a 2004 report by 250 scientists that said the thaw could make the Arctic Ocean ice-free in summer by 2100.

Watt-Cloutier, in Oslo to receive an environmental prize, said the inuits' planned petition to the 34-member Organization of American States (OAS) could put pressure on the United States to do more to cut industrial emissions of heat-trapping gases. "It's still in the works, the drafting is still going on," she said of a long-planned petition to the OAS' human rights arm, the Inter-American Commission on Human Rights.
The Ukukus Wonder
Why a Sacred Glacier Melts in Peru's Andes

It Could Portend World's End,
So Mountain Worshipers
Are Stewarding the Ice

By ANTONIO REGALADO
Staff Reporter of THE WALL STREET JOURNAL
June 17, 2005; Page A1

An ukuku hauls a block of mountain ice near Cuzco, Peru, in 1999. The tradition is disappearing along with Peru's glaciers.
...there goes the neighborhood...
The “Real” Cause of Global Warming
The “Real” Cause of Global Warming

Victims As Villains
The bad news is the ice cap is melting and it's going to be almost impossible to catch seals.

The good news is if we keep moving south, there's tons of fat animals called "humans" who can't run very fast.
Governor of California: 80% reduction in emissions by 2050
Motivating Issues For A Sustainability Agenda For California on Climate Change
In California, this trend is widespread in the Sierra Nevada, and has yielded flows that are about 2 weeks earlier now.

Timing of Center of Mass of Water-Year Full-Natural Flows

- Sacramento Basin
- San Joaquin Basin

Roos, 1989, 1991; Dettinger and Cayan, 1995
Not surprisingly, these timing and snowpack changes are attributable to long-term winter-spring warming trends across the West.

Cayan et al., 2001
“Very High Confidence” Global Warming Impacts

- North American Impacts Projected (cont’d)
  - Fire & Pest Impacts: “Disturbances from pests, diseases, and fire are projected to have increasing impacts on forests, with an extended period of high fire risk and large increases in area burned. “

*IPCC, Summary for Policymakers, Working Group II Contribution to the Fourth Assessment Report, April, 2007*
Risk of catastrophic fires (and other disturbances)
Wildfires frequency increased four fold in last 30 years.

Source: Westerling et al. 2006
We can Choose our Emissions Future
(Intergovernmental Panel on Climate Change Emission Scenarios)

Just fossil fuel emissions shown in graphic.
Increase in Wildfires

Source of data: Westerling and Bryant, “Climate change and wildfire in and around California: Fire modeling and loss modeling” (2006), www.climatechange.ca.gov
Extraordinary & Compelling Conditions

Hotter Days Lead to More Smog

South Coast Air Basin
Ozone Levels
(1996-1999)

Our Changing Climate: Assessing the Risks to California (2006),
www.climatechange.ca.gov. Source: Air Resources Board, 2000
More Smog Likely: Section 209(b) clearly covers this extraordinary and compelling condition

Data from GFDL B1 and A2 runs. SOURCE: Kleeman et al. 2006
Diminishing Sierra Snowpack

% Remaining, Relative to 1961-1990
# Decreasing Wine Grape Quality Temperature Impacts

<table>
<thead>
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<td>Wine Country</td>
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<td>Optimal (mid)</td>
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<td>Cool Coastal</td>
<td>Optimal (low)</td>
<td>Optimal (mid-high)</td>
<td>Optimal (high)</td>
</tr>
<tr>
<td>Northern Central Valley</td>
<td>Marginal</td>
<td>Impaired</td>
<td>Impaired</td>
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Wine Country: (Sonoma, Napa Counties)  
Cool Coastal: (Mendocino, Monterey Counties)  
Northern Central Valley: (San Joaquin, Sacramento Counties)
WHAT ARE THE FUTURE IMPLICATIONS OF POPULATION, AFFLUENCE AND TECHNOLOGY GROWTH PROJECTIONS?

HOW CAN THE FUTURE BE SCIENTIFICALLY ANALYSED?
NOSTRADAMUS PREDICTS HOTTEST SUMMER IN HISTORY

FAMOUS seer Nostradamus wrote a clear and specific poem that reveals the horrors of our upcoming weather.
"We're not certain why they disappeared, but archeologists speculate that it may have had something to do with their size."
Large Vehicles Are the Solution, Not the Problem

By Sam Kazman

If you listen to journalists, you’d think sport-utility vehicles were dangerous. The National Highway Traffic Safety Administration (NHTSA), an agency whose middle name is safety, would have brought this issue to the forefront of public attention. But instead NHTSA has repeatedly claimed that CAFE has no safety effect. In a 1992 court case brought by the Competitive Enterprise Institute and Consumer Alert, a panel of federal appeals judges blasted NHTSA’s position as “fudged analyses,” “statistical legerdemain” and “bureaucratic mumbo-jumbo.”

If CAFE had been a privately produced product, it would long ago have been recalled as defective and its producer, NHTSA, jailed for the coverup. But because CAFE is a product of Washington rather than Detroit, it remains in place; worse yet, it threatens to expand in the face of the SUV “threat.”

The over-regulatory nature of that threat is demonstrated by a study issued last month by the Insurance Institute for Highway Safety. Journalists widely reported the study as demonstrating the need for action against SUVs, but its findings indicate otherwise. What the institute found was that collisions between cars and SUVs account for only 4% of car occupants fatalities.

CARS are most vulnerable in side impact collisions. According to the institute, in fatal collisions involving cars that are hit on the side by SUVs, the relative risk that the death will be in the car rather than the SUV is an apparently lopsided 27-to-1. But when this relative risk is broken down by car weight categories, it turns out that car-SUV mismatches are frequently outweighed by other common collision factors.

This was a CAFE-driven downsizing of approximately 500 pounds per car.

Smaller cars, however, are less crashworthy than similarly equipped large cars in practically every type of accident. According to a 1989 Harvard-Brookings study, CAFE-induced downsizing has increased car occupant fatalities by between 14% and 27%; that translates to between 2,000 and 4,000 extra deaths a year.

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Smaller cars, however, are less crashworthy than similarly equipped large cars in practically every type of accident. According to a 1989 Harvard-Brookings study, CAFE-induced downsizing has increased car occupant fatalities by between 14% and 27%; that translates to between 2,000 and 4,000 extra deaths a year. That is, there is a greater mismatch between light cars and heavy cars than between heavy cars and SUVs.

What this means is that up-sizing the cars fleets may well be the most important step we could take toward improving safety. But up-sizing, of course, is what CAFE currently restricts.

The same conclusion emerges from a 1997 NHTSA study, which was similarly characterized as indicating CAFE’s restrictions. A.NHTSA press release touted the study’s finding that a 100-pound decrease in SUV weight would prevent 40 fatalities per year, most of them in cars colliding with SUVs. But according to the study itself, this conclusion was not statistically significant even as a net loss of life from such downsizing, and on balance the overall effect would be “negligible.” More important, these minimal effects on fatalities in SUV-collisions show to the effects of a 100-pound increase in passenger car weight—a saving of over 300 lives a year. And the effect of this passenger car up-sizing was found to be statistically significant, unlike the SUV downsizing.

Up-sizing, however, would entail relaxing CAFE rules rather than tightening it—a move that would be consistent with this administration and to its environmentalist supporters. The Sierra Club, for example, claims that higher CAFE standards would be “the biggest single step to curtailing global warming.” In their 1995 campaign book, Bill Clinton and Al Gore recommended raising CAFE to 40 mpg by 2000—a level whose potential safety consequences add more than a little irony to the book’s title. “Putting People First.”

SUV critics argue, to use Consumer Reports’ words, that “most people who buy an SUV don’t need one.” But what one person doesn’t need is largely a matter of another person’s opinion. In the early 1980s the late Ed Welts thought that NHTSA was overreacting and pointed out that the new railroad cars “would only encourage the common people to move about needlessly.” Today the elitist view is that the he bought it for safety, to distinguish himself from “some teenager trying to be cool.” Too bad his regulatory approach doesn’t do much for other people’s safety.

In fact, much of the SUV’s current popularity stems from CAFE itself. CAFE’s restrictions took their greatest toll on large cars and station wagons. As economist Paul Gaudette pointed out in a study published last fall, light trucks were the only real alternative for consumers concerned about safety and seating capacity. In effect, he concludes, most of the weight of the passenger car fleet by CAFE has disappeared in the light truck fleet.

So the real problem is CAFE, not SUVs. The next time you hear the term SUV, remember: The “S” might as well stand for scapegoat.

Mr. Kazman is general counsel of the Competitive Enterprise Institute in Washington.

March 17, 1992

THE WALL STREET JOURNAL

Peter R. Kann
Chairman & Publisher

Paul E. Stauden
Managing Editor

Byron E. Colman
Deputy Managing Editor

Daniel Harris
Editorial Page Editor

Published since 1869 by

DOW JONES & COMPANY

Peter R. Kann, Chairman & Chief Executive Officer; Kenneth L. Burem, President & Chief Operating Officer; CEO, Dow Jones Markets.

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‘The words of the prophet are written on the…?’
MELTING

DOES WELL AT THE POLES.

THE NEW H2.

HUMMER® LIKE NOTHING ELSE.
Cars on a diet!
We can Choose our Emissions Future
(Intergovernmental Panel on Climate Change Emission Scenarios)

CO2 tripling by 2100, then more >2100
CO2 doubling, then stabilized

Just fossil fuel emissions shown in graphic.
Projectsed patterns of precipitation changes

Any Robust Conclusions?

Figure 3.3. Relative changes in precipitation (in percent) for the period 2090–2099, relative to 1980–1999. Values are multi-model averages based on the SRES A1B scenario for December to February (left) and June to August (right). White areas are where less than 66% of the models agree in the sign of the change and stippled areas are where more than 90% of the models agree in the sign of the change. [WGI Figure 10.9]
Yes (unfortunately) in many drier areas

More precipitation in higher latitudes, especially in winter

Figure 3.3. Relative changes in precipitation (in percent) for the period 2090–2099, relative to 1980–1999. Values are multi-model averages based on the SRES A1B scenario for December to February (left) and June to August (right). White areas are where less than 66% of the models agree in the sign of the change and stippled areas are where more than 90% of the models agree in the sign of the change. [WGI Figure 10.9]
Calculating The Range of Warming

Source: IPCC, WG 1, AR4, 2007
Is The Science "Settled"?
Warming Very Likely—But How Much?: Wide Range

Source: IPCC, WG 1, AR4, 2007
Risk = Probability* x Consequence

[What metrics** of harm?]

-$/ton C avoided
-lives lost/ton C avoided
-species lost/ton C avoided
-increased inequity/ton C avoided*
-quality of life degraded/ton

*Subjective probability density functions

**Any weights on each metric are normative
Risk management framework emerges as a useful framework to address key vulnerabilities.
PARADIGMATIC DILEMMA (All language is from IPCC SPMs):

Risk management framework emerges as a useful framework to address key vulnerabilities.

“versus”

However, the assignment of probabilities to specific key impacts is often very difficult due to the large uncertainties involved.
~ 15% of Annual Electricity Use in California in 2003
If a KWh is $0.15, then 40,000 GWh hours per year is a savings of about $6 billion per year!
Methods to achieve announced climate sustainability goals?

• Volunteerism
Brisbane is in the worst drought for 100 years. Please use water carefully.
Methods to achieve announced climate sustainability goals?

- Volunteerism
- Technology, R,D & D subsidies
Some general principles:

• Start smart
Some general principles:

- Start smart
- Do well by doing good
Some general principles:

• Start smart
• Do well by doing good
• Stress the win-wins
Some general principles:

• Start smart
• Do well by doing good
• Stress the win-wins
• Just transitions for those negatively affected
Some general principles:

• Start smart
• Do well by doing good
• Stress the win-wins
• Just transitions for those negatively affected
• Advanced notice
Some general principles:

• Start smart
• Do well by doing good
• Stress the win-wins
• Just transitions for those negatively affected
• Advanced notice
• Inexorability
Some general principles:

• Start smart
• Do well by doing good
• Stress the win-wins
• Just transitions for those negatively affected
• Advanced notice
• Inexorability
• Rewards for early adaptors
Questions?

Comments??