Social Cost of Carbon: Computer-Aided Sophistry, Menace to Society

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Social Cost of Carbon (SCC): State of Play

• The social cost of carbon (SCC) is a guesstimate of the cumulative damage to society from a ton of carbon dioxide-equivalent (CO$_2$-e) greenhouse gases emitted in a given year. Thus also a guesstimate of the benefits of carbon reduction policies.

• SCC increasingly invoked to justify carbon taxes, EPA greenhouse gas (GHG) regulations, Soviet-style production quota for renewable energy, other policies to tilt the market against fossil fuels.

• Between May 2008 and Aug. 2014, federal agencies, chiefly EPA, DOE, and NHTSA, included SCC estimates in the Regulatory Impact Analyses (RIAs) of 68 major rules, according to the Government Accountability Office (GAO).

• Although originally intended to estimate the benefits of carbon-reducing taxes and regulations, the Obama Council on Environmental Quality (CEQ) is requiring agencies to incorporate SCC analysis in National Environmental Policy Act (NEPA) reviews of project applications.
Overview

1. Social Cost of Carbon is an unknown quantity, discernible in neither meteorological nor economic data.
2. The SCC is a product of speculative climatology combined with speculative economics. By fiddling with inputs in complex computer models, SCC analysts can get just about any result they desire.
3. What EPA and climate campaigners desire are ever-bigger SCC values to justify ever-more costly anti-carbon taxes and regulations.
4. However interesting as an academic exercise, when used to guide policy, SCC analysis is computer-aided sophistry. Its political function is to make renewable energy look like a bargain at any price and make fossil fuels look unaffordable no matter how cheap.
5. Even if SCC analysis were an exact science, it would still be biased unless paired with rigorous assessment of the social benefits of carbon energy and the social costs of carbon mitigation. It never is.
6. The economic and social costs of carbon mitigation in all likelihood greatly exceed the social costs of carbon.
7. By promoting regulatory excess, pseudo-scientific groupthink, and noble cause corruption, SCC analysis has become a menace to society.
SCC: Unknown quantity, not discernable in meteorological or economic data

(It's X)
Decline in Frequency

US Hurricane Landfalls 1900-2013

Source: NOAA
http://rogerpielkejr.blogspot.com
5 June 2014
Decline in Strength

Source: NOAA
http://rogerpielkejr.blogspot.com
5 June 2014
No trend in normalized U.S. hurricane losses since 1900
No trend in global frequency or strength of land-falling hurricanes since 1970 (Weinkle et al 2012)
Global accumulated cyclone energy (ACE) today: about what it was in the early 70s

Figure: Last 4-decades of Global and Northern Hemisphere Accumulated Cyclone Energy: 24 month running sums. Note that the year indicated represents the value of ACE through the previous 24-months for the Northern Hemisphere (bottom line/gray boxes) and the entire global (top line/blue boxes). The area in between represents the Southern Hemisphere total ACE.
1970- Sept 2012 global tropical cyclone frequency monthly Data File
No trend in normalized global weather related losses since 1960

“Economic growth, including greater concentrations of people and wealth in periled areas and rising insurance penetration, is the most important driver of increasing losses.” IPCC AR5 WGII, Ch. 10, p. 680
Global normalized weather-related losses declined as proportion of GDP since 1990

Global Weather-Related Disaster Losses as a Proportion of Global GDP: 1990-2012

Roger Pielke Jr
18 July 2013
No trend in U.S. flood frequency/strength since 1950
Drought not increasing for the U.S. as a whole since 1895.
IPCC AR5: Global Flood and Drought Trends

- There continues to be a lack of evidence and thus low confidence regarding the sign of trend in the magnitude and/or frequency of floods on a global scale.
- There is low confidence in detection and attribution of changes in drought over global land areas since the mid-20th century.
11% Increase in green foliage cover in arid areas on all continents since 1982

Donahue et al 2013 GRL
As U.S. urban air temperatures increased, heat-related mortality declined.
Due to the increasing safety of hot weather, millions of American seniors elect to experience almost 4X more warming in their golden years (3.85°F) than rising GHG concentrations potentially caused since the turn of the last century.

Demographic Consensus

Figure 2. The state-by-state average annual temperature for the period 1900-2010 (statewide temperature data available from the U.S. National Climatic Data Center).
Declined 99.98% and 99.99% since the 1920s.

Figure 3: Droughts: Global Deaths and Death Rates, 1900–2010

Note: For the last period, 2000–2010, annual deaths and death rates are based on an 11-year average.
Figure 2: Global Death and Death Rates Due to Extreme Weather Events, 1900–2010

Wealth/technology trump climate in determining malaria risk.

Malaria endemicity in 1900 (a, top) and 2007 (b, middle), and the difference (c, bottom).
Source: Gething et al. 2010

Since 2000 in Africa, incidence of malaria fell by 34% and malaria-related mortality rates fell by 58%, despite a 43% increase in population living in malaria transmission areas.
WHO 2014
Crop yields up by 100% or more since 1960

Source: Roy Spencer, plotting USDA data
Craig Idso estimates CO2 fertilization effect added $3.2 trillion to food crop Production in 1961-2011; will add another $9.8 trillion in 2011-2050.
The real Hockey Stick

Global Progress, 1 A.D.–2009 A.D. (as indicated by trends in world population, gross domestic product per capita, life expectancy, and carbon dioxide [CO₂] emissions from fossil fuels)

Amazing correlation between CO₂ emissions and best overall indicators of human health and welfare.
SCC estimates are driven by accounting gimmicks (discussed in later slides) and assumptions about inherently speculative issues including --

- Climate sensitivity (how feedback mechanisms, positive or negative, will amplify or damp down the direct warming effect of rising GHG concentrations)
- Climate impacts (how projected warming will affect weather patterns, ice-sheet dynamics, sea-level rise, and eco-system services)
- Economic impacts (how projected changes in global temperature, weather, sea-level rise, and eco-systems will affect heat-related mortality, disease vectors, agriculture, forestry, tourism, and other climate-related activities absent adaptation)
- Technological change (how adaptive capacities will develop as climate changes to offset potential damages to economic output and public health).
Models are run over an immense span of time – until 2300, when Capt. Kirk is an old man.

Yet today’s state of the art models increasingly fail to hind-cast the temperature trend of the past 36 years. Why trust their ability to forecast the next 285?
“Pretense of knowledge and precision” – MIT Prof. Robert Pindyck

• The IAMs compute climate change damages and climate policy benefits out to the year 2300 and beyond.
• That is loopy:
  – Today’s state-of-the-art climate models are on the verge of statistical failure.
  – More importantly, no one can foresee how human adaptive capabilities will develop over time.
• Technology is what enables humans to adapt to whatever climatic conditions they happen to live in.
• So to compute the cumulative damage of an incremental ton of CO2, SCC analysts must forecast technological change decades and even hundreds of years into the future.
• Good luck with that!
By fiddling with non-validated climate parameters, made-up damage functions, and below-market discount rates, agencies can get almost any result they desire.

What they desire is ever-higher SCC values to justify ever-more-costly climate policies.

Consequently, agencies have an incentive to continually inflate SCC values to increase the purported net benefits of their rules. In other words, they have an incentive to continually find that climate change is “worse than we thought!”

For example, the Obama administration’s Interagency Working Group (IWG) published two technical support documents (TSDs) on the social cost of carbon. The 2013 TSD estimates on average are about 60% higher than the 2010 TSD estimates.

In just four years, climate change got 60% worse and carbon reduction regulations became 60% more valuable. Amazing!
Eight Tricks for getting big, scary-sounding SCC numbers
(1) Ignore recent climate sensitivity literature

- Administration’s 2013 TSD does not revise 2010 TSD sensitivity estimates, which come straight from the IPCC’s 2007 Fourth Assessment Report (AR4).
- The IWG makes no effort to reconcile its higher SCC estimates with post-AR4 research on the warming pause, model failure, or climate sensitivity.
- The 2013 TSD simply sweeps those issues under the rug.
(2) Project faster warming for any climate sensitivity assumed

- One reason given for 2013 TSD’s higher SCC values is a revision in the FUND model, such that global temperatures increase faster for any level of sensitivity assumed. Hence higher temperatures are reached earlier and the associated damages are discounted less.
- Makes little sense. Warming is occurring more slowly than predicted, not faster.
More than 31% of all CO2 emissions since 1750 occurred during 1998-2014.

* The linear trend of all three curves intersects at zero in 1979, with the values shown as departures from that trend line.

Sources: Various, as described in the “State of the Climate in 2012” in the Bulletin of the American Meteorological Society, August 2013.
(3) Use below-market discount rates to calculate the present value of future CO2 impacts and reductions

- IWG uses three IAMs – DICE, FUND, and PAGE – to estimate SCCs, and three discount rates: 2.5%, 3.0%, and 5%.
- OMB Circular A-4 requires agencies to calculate regulatory costs and benefits using 3% and 7% discount rates.
- Heritage analysis of DICE model:
  - Using the 7% discount rate the IWG omitted reduces the 2020 SCC estimate by more than 80%;
  - An updated estimate of the equilibrium climate sensitivity distribution (ECS)—a measure of CO2’s temperature impact—reduces the 2020 estimate of SCC by more than 40%; and
  - With an updated ECS distribution, a less unrealistic time horizon up to 2150, and the omitted discount rate, the 2020 SCC estimate by nearly 90%, from $37.79/Ton to $4.03/Ton.
More on discount rates . . .

- PAGE Model creator Chris Hope recommends using 1%, 1.5%, and 2% discount rates.
- That inflates SCC for 2010 up to $266/Ton.
- Implication: Renewables are “more efficient” than new natural gas combined cycle, installing solar power is “more efficient” than maintaining existing coal plants.
- Computer-aided sophistry. Fiddle with discount rates and other inputs, and voilà: Renewables are a bargain at any price; fossil fuels are unaffordable no matter how cheap!
Present only global SCC estimates, not domestic SCC estimates

- 2010 TSD guesses that the domestic SCC value is only 7%-23% of the global value, because U.S. adaptive capabilities greatly surpass those of developing countries.
- OMB Circular A-4 says presenting domestic values is mandatory, global values optional.
- 2010 and 2013 TSDs present only the global values!
- So recall in the Heritage analysis, DICE global SCC for 2020 should be reduced from $37.79/Ton to $4.03/Ton. The U.S. domestic SCC would thus be $0.28/Ton - $0.92/Ton – truly negligible.
(5) Ignore the monetary benefits of CO2 fertilization

• Two of the IWG’s three main IAMs, DICE and PAGE, have little-to-no CO2 fertilization benefit.
• Use of such inherently biased models flouts the Data Quality Act.
• FUND model has a significant CO2 fertilization benefit but likely much smaller than Craig Idso’s estimate: $3.2 trillion 1961-2011, $9.8 trillion 2011-2050.
• Nonetheless, when Heritage analysts ran FUND with updated sensitivity estimates, SCC in 2020 was negative (i.e. a net benefit) in 70% of model runs.
• “At least we know SCC is not zero.” – Sens. Schatz and Whitehouse. **No, we don’t.**
(6) Assume adaptation is impossible above a 2°C warming threshold

- That’s an assumption of the PAGE model.
- Even in 2300, technology won’t be able to offset damages from 2°C warming.
- “Humans are a tough and adaptable species. People live on the equator and in the Arctic, in the desert and in the rainforest. We survived ice ages with primitive technologies. The idea that climate change poses an existential threat to humankind is laughable.” – Richard Tol
(7) Assume catastrophic impacts are more likely and more costly “than we thought.”

- Per the revised PAGE model, doomsday in the 2013 TSD is both more likely and more costly than in the 2010 TSD.
- Yet: “Every single catastrophic scenario considered by the IPCC (Table 12.4) has a rating of very unlikely or exceptionally unlikely and/or has low confidence. The only tipping point that the IPCC considers likely in the 21st century is disappearance of Arctic summer sea ice (which reforms each winter, in any event).” – Judith Curry, Testimony, House Science, April 14, 2015
IPCC has had to lower its methane concentration prediction three times. Yet observations are below the low end of the range of the most recent (2007) prediction. No evidence of a tipping point.
Assume Oceans are weaker carbon sink than previously thought

- Per revised DICE model, 2013 TSD assumes oceans are a weaker carbon sink; hence a given emissions pathway leads to higher CO2 concentrations & more warming.
- But the quantity of CO2 retained by atmosphere ("airborne fraction") has held constant despite model predictions.
One-Sided (i.e. Biased, Partisan)

• Even if SCC analysis got science and economics of climate change exactly right, it is inherently biased unless the social costs of CO2 are weighed and balanced against the economic and social benefits of carbon-based energy.

• There’s no IWG on the economic and social benefits of carbon-based energy.
Baby & Bathwater Problem

• Could civilization have achieved the phenomenal increases in population, life expectancy, and per capita income, or reductions in weather-related mortality, without the CO2 emissions?

• Could those gains and future progress be sustained if governments bankrupt fossil energy industries before commercially viable substitutes are available?
Economist Roger Bezdek, using EIA data, estimates that in 2010, carbon energy supported about $2,400 in global GDP for every ton of CO$_2$ emitted.
Even if we generously assume the 2013 TSD got the SCC exactly right, economic benefits of the carbon energy associated with each ton of CO2 exceed the SCC by 30:1 to 40:1.
Social Benefits of Carbon Energy

• Carbon taxes and other policies based on SCC estimates assume all the benefits of carbon energy are captured in motor fuel prices and monthly utility bills, hence the only relevant externalities are negative.

• In fact: Carbon energy supports all the technological advances that sustain and improve a world of seven billion people who on average live longer, healthier, and with greater access to information than the privileged elites of former ages.

• Fossil fuels have been and remain the chief energy source of what economist Indur Goklany calls a “virtuous cycle of progress” in which economic growth, technological change, human capital formation, and freer trade co-evolve and mutually reinforce each other.

• Progressive civilization is the very context of modern life. It is the most valuable of all public goods. Without carbon energy, humankind would be dramatically smaller, poorer, sicker.
A closer look at the tight correlation between CO2 emissions and the best overall indicators of human health and welfare.

Global Progress, 1760–2009 (as indicated by trends in world population, GDP per capita, life expectancy, and carbon dioxide (CO$_2$) emissions from fossil fuels)
Social Benefits of Fossil-Fueled Agriculture

• In addition to 99.8% reduction in drought-related deaths. . .
  – A more abundant, affordable, and secure food supply makes human life more abundant. More people = more ideas = more innovations = more wealth = more ideas, etc.
  – A better-fed population is healthier, longer-lived, and more productive.
  – More productive farms allow more people to develop skills and pursue vocations unrelated to farm work.
  – Higher yields rescue nature from humanity. To maintain current food production without fossil fuels would require converting 2.3 billion hectares of habitat to farmland – an area equal to U.S., Canada, and India combined.

• Compared to those gigantic but often unappreciated social benefits, the hypothetical social costs of carbon are vanishingly small.
Affordable Energy and Freedom

• Affordable energy puts superhuman ability at the beck and call of ordinary people.
• The industrial revolution – fundamentally an energy revolution -- created the material foundations for abolishing serfdom and slavery. Ancient Athens, e.g., was a “democracy,” but slaves outnumbered citizens by perhaps 2-1 or more.
• “If we think of the energy we use in terms of servants, each with the same work power as a human being, each person in Western Europe has access to 150 servants, in the US 300, and even in India each person as 15 servants to help along. It is indeed unpleasant to imagine what it would be like to live without these helpers.” – Bjorn Lomborg
Because carbon energy has social benefits, CO2 mitigation policies have social costs.

Even without aggressive carbon policies in the 2000s, energy costs increased for low-income households, forcing many to spend less on food and medical care.
Social Costs of Global Carbon Mitigation
(Paris Treaty)

Reducing Global GHG Emissions 60% Below 2010 Level by 2050

Note: 2050 forecast from OECD Environmental Outlook to 2050.
If industrial countries cut their emissions to zero, developing countries will have to cut theirs 35% below current levels. If industrial countries cut emissions by 80%, developing countries will have to cut current emissions by 48%.
How do 3.6 billion people who have no or only partial access to electricity cut CO2 emissions 35%-48% below current levels and not condemn millions to poverty, misery, and death?

“The greatest threat to the alleviation of the structural poverty of the Third World is the continuing campaign by western governments, egged on by some climate scientists and green activists, to curb greenhouse gas emissions, primarily the CO2 from burning fossil fuels.”

– Depak Lal

Pachauri, Nature 2014