

**United States Senate
Environment and Public Works Committee**

Minority Report
(Updated for 2014)

Critical Thinking on Climate Change



***Empirical Evidence to Consider Before Taking
Regulatory Action and Implementing Economic
Policies***

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U.S. Senate Environment and Public Works Committee (Minority)

INTRODUCTION (2014)

When this report was first introduced in July of 2013, a number of important assertions were being made in the public forum, particularly on Capitol Hill, that were wholly factually and scientifically inaccurate. The original version of the report, as well as the expert scientific testimony provided to Congress in the interim, was meant to be helpful in limiting some of the more egregious claims that were being perpetuated. Unfortunately, much of the public discourse on important issues related to climate science has devolved into name-calling, including terminology such as “denier” or “dirty denier.”¹ Both have connotations which frequent use of is counter-productive to an honest public discussion involving a matter of such incredible scientific and economic importance. No scientific discussion that requires precision, particularly when it relates to issues as complex as climate science, should utilize means to limit debate and understanding when critical evaluation is necessary.

Additional events that have transpired since the first version of this report was introduced clarify the need for providing some basic level scientific facts that are important to understanding carbon dioxide’s (CO₂) role in our environment. Certain media figures have gone so far as to try and discredit the basic science of photosynthesis² and our understanding of the impacts of anthropogenic CO₂. Such mischaracterization does an additional disservice to the understanding of this important greenhouse gas and related policy making.

To rectify some of the challenges in ensuring additional factors based on empirical evidence were understood, this report has been updated to include the following:

1. A new section has been added on the benefits of CO₂.
2. Wildfires and forestry management have garnered additional public attention of late, and so was split into its own section with additional information.
3. A new section has been added on the impacts European countries have seen as a result of their climate regulations.
4. A new section has been added on Polar Bear populations and claims of mass extinctions.
5. Nearly all sections have been updated with new information.
6. An addendum was added to provide examples of how the Obama Administration’s National Climate Assessment report ignores critical scientific evidence when submitted by top researchers and scientists.

Four former Environmental Protection Agency (EPA) Administrators testified before the EPW Committee in 2014 and provided important answers to questions for the record as it relates to basic CO₂ science, economics, and EPA regulations:

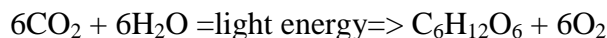
1. CO₂ is necessary to life on earth. It is in fact plant food, and makes possible the process of photosynthesis. Photosynthesis is the process whereby plants using light energy from

¹ Melissa Harrison, *Daily Dirty Denier*, NRDC ACTION FUND (July 28, 2014), <http://www.nrdcactionfund.org/press-release/daily-dirty-denier-2.html>.

² *Priority Fail* (Comedy Central television broadcast June 26, 2014), available at <http://thedailyshow.cc.com/videos/y54hug/priority-fail>.

the sun convert carbon dioxide and water to glucose sugar and oxygen gas through a series of reactions. The general equation for photosynthesis is:³

carbon dioxide + water = light energy => glucose + oxygen



2. Humans exhale CO₂ at a rate of approximately 40,000 parts per million (ppm). Humans inhale CO₂ at the rate it currently exists in the atmosphere, which is just below 400 ppm. Accordingly, humans exhale CO₂ at a much higher rate than they inhale. Not a single former Administrator could answer a question on these rates.⁴
3. As all four EPA Administrators made clear, EPA's decision to regulate CO₂ is the first time the agency has ever regulated a gas that is necessary to and makes life on earth possible. As well, it is also the only gas the federal government has ever tried to regulate that humans exhale at a greater rate than they inhale. Given both these facts, the claim that CO₂ is a "pollutant" deserves further scrutiny.⁵
4. Finally, all four former EPA Administrators were unable to name even a single product that could be made out of wind and sunlight. Everything in modern society, from computers, laptops, solar panels, iPads and flat screen televisions, to advanced medical equipment and all our nation's critical infrastructure is built out of fossil resources and their derivative products.⁶

An important note that bears repeating is the clear and simple fact that the climate has always and will always be changing. That is an indisputable scientific fact that should be the starting point of any honest discussion on the state of climate science and our understanding of a very complex system that is impacted by everything from solar radiation and ocean currents, to volcanic activity, cosmic rays and a number of greenhouse gases. Some of the false claims that seem to have largely been eliminated from the public discussions, at least on Capitol Hill, since the introduction of the first version of this report (and the expert testimony noted) include:

1. That hurricane activity is increasing in either frequency or intensity.
2. That the impact from human emissions has turned out to be worse than was predicted even as recent as ten years ago.
3. That drought and heat wave conditions are getting worse.
4. That a warming trend has been continuous over the last fifteen years.
5. That economic benefits will certainly accrue from regulatory policies to address theoretical impacts from CO₂ production.

³ *Photosynthesis*, CHEMICAL FORMULA, <http://www.chemicalformula.org/photosynthesis> (last visited Sept. 2, 2014).

⁴ *Climate Change: The Need to Act Now: Hearing Before the Subcomm. on Clean Air and Nuclear Safety of the S. Comm. on Env't and Pub. Works*, 113th Cong. (2014) (responses to questions for the record of William D. Ruckelshaus, Christine T. Whitman, William K. Reilly, & Lee M. Thomas).

⁵ *Climate Change: The Need to Act Now: Hearing Before the Subcomm. on Clean Air and Nuclear Safety of the S. Comm. on Env't and Pub. Works*, 113th Cong. 6 (2014) (responses to questions for the record of William K. Reilly).

⁶ Ruckelshaus, *et. al.*, *supra* note 4.

These claims are demonstrably false and have been rejected by expert testimony and largely abandoned in discussions on Capitol Hill. As well, the fact that the climate has not been notably warming for at least the last 15 years has received considerable attention: multiple theories have been proposed as to why the climate models failed to foresee this trend, again highlighting our lack of understanding of a very complex system.

Important events have occurred internationally since the report was first released that are worth noting:

1. Australia repealed their carbon tax after the economic consequences of such regulation was recognized.⁷
2. Australia is now investigating serious concerns with corruption of the temperature records to artificially produce a warming trend that did not exist.⁸ It is important to note that similar charges and concerns have been raised with the UK Met office as well as the U.S. data.⁹
3. The economic impacts in European Union countries that adopted climate regulations, including Germany,¹⁰ Italy,¹¹ Spain,¹² and the United Kingdom¹³ have been disastrous. Serious concerns are now being raised over the economic viability of their manufacturing sectors as well as budget and energy poverty concerns.¹⁴ The poor and elderly are suffering the worst consequences from these policies.¹⁵
4. India has since identified Greenpeace as an economic threat,¹⁶ with Greenpeace long having a record of making significant, scientifically implausible claims, while simultaneously having executives who fly jets to work.¹⁷

⁷ *Repealing the Carbon Tax*, AUSTRALIAN GOVERNMENT DEPARTMENT OF THE ENV'T, <http://www.environment.gov.au/climate-change/repealing-carbon-tax> (last visited Sept. 2, 2014).

⁸ Graham Lloyd, *Heat is on over weather bureau 'homogenising' temperature records*, THE AUSTRALIAN, Aug. 23, 2014, <http://www.theaustralian.com.au/national-affairs/opinion/heat-is-on-over-weather-bureau-homogenising-temperature-records/story-e6frgd0x-1227033714144?nk=d8efb57d0efec4a6a8f8b2208d94583a>.

⁹ Christopher Booker, *Climate change: this is the worst scientific scandal of our generation*, THE TELEGRAPH, Nov. 28, 2009, <http://www.telegraph.co.uk/comment/columnists/christopherbooker/6679082/Climate-change-this-is-the-worst-scientific-scandal-of-our-generation.html>.

¹⁰ Will Boisvert, *Germany's Green Energy Bust*, THE BREAKTHROUGH, July 30, 2013, <http://thebreakthrough.org/index.php/programs/energy-and-climate/germanys-green-energy-bust>.

¹¹ Kenneth Green, *On Green Energy: Italy and the Eco-Mafia*, THE AMERICAN, May 26, 2011, <http://www.american.com/archive/2011/may/on-green-energy-italy-and-the-eco-mafia>.

¹² Michael Bastasch, *Spain's Green Economy: Skyrocketing Power Prices and Higher CO2 Emissions*, THE DAILY CALLER, Aug. 28, 2014, <http://dailycaller.com/2014/08/28/spains-green-economy-skyrocketing-power-prices-and-higher-co2-emissions/#ixzz3BmZLWo7t>.

¹³ Daniel Boffey, *Soaring energy and housing costs force poorest homes to turn to food banks*, THE GUARDIAN, May 17, 2014, <http://www.theguardian.com/society/2014/may/18/energy-housing-costs-push-poor-to-food-banks>.

¹⁴ *Soaring Energy costs make Europeans poor*, EURACTIVE.COM, May 21, 2013, <http://www.euractiv.com/energy/soaring-energy-costs-europeans-p-analysis-519884>.

¹⁵ *Examining the Threats Posed by Climate Change: The Effects of Unchecked Climate Change on Communities and the Economy: Hearing Before the Subcomm. on Clean Air and Nuclear Safety of the S. Comm. on Env't and Pub. Works*, 113th Cong. 18 (2014) (testimony of Bjorn Lomborg).

¹⁶ Priyadarshi Siddhanta & Amitav Ranjan, *IB report to PMO: Greenpeace is a threat to national economic security*, THE INDIAN EXPRESS, June 11, 2014, <http://indianexpress.com/article/india/india-others/ib-report-to-pmo-greenpeace-is-a-threat-to-national-economic-security>.

¹⁷ Emily Gosden, *Greenpeace executive flies 250 miles to work*, THE TELEGRAPH, June 23, 2014, <http://www.telegraph.co.uk/earth/earthnews/10920198/Greenpeace-executive-flies-250-miles-to-work.html>.

5. China and India are now indicating that they will not attend the UN summit conference in New York City this year.¹⁸
6. Only 11 of the 144 original parties to the Kyoto Protocol have thus far signed an extension.¹⁹
7. Most importantly, it appears President Obama is attempting to force an international agreement that would not require Senate ratification as a way of “shaming” countries into implementing carbon emissions reductions.²⁰ Rather than adhering to the prescribed ratification process, Obama is attempting to do an end-run around the Constitution.²¹

As understanding of the science behind the many factors impacting our ever-changing climate grows, it became important to update this report to provide the latest scientific information and empirical evidence to compare to the theorized impacts and public assertions that may be without merit. It is also increasingly important to address the over-simplified question that will always require a very complex answer:

Do you believe in global warming? Or in another iteration, Why do you deny climate change?

Few people asking such a question have an interest in an honest discussion on the state of climate science. It is almost impossible to appropriately answer such an imprecise question with the level of precision that a realistic understanding of the current state of climate science deserves. Certain scientific facts are well understood. They include the fact that CO₂ in the atmosphere is increasing as a result of anthropogenic use of fossil resources, and the fact that humans have already done an amazing job of adapting to our ever changing climate. This is how a more legitimate question would read:

Given the current state of climate science and the significant amount of money that we continue to spend on research, what do you believe is the true state of our understanding of the human impact on climate?

And this is how an honest answer would read:

There is no doubt that humans are increasing the amount of CO₂ in the atmosphere, particularly China. There is also no doubt that the earth has had previous levels much higher than today, and there are many benefits of increased CO₂ that are not often discussed in the media. It is clear that we have much to learn about our ever-changing climate. Many top caliber scientists are trying to determine why most of the predictions about extreme weather events (increasing

¹⁸ Sangwon Yoon & Mark Dragem, *China and Indian Leaders Skipping UN Climate Summit*, BLOOMBERG BUSINESSWEEK, Sept. 4, 2014, <http://www.businessweek.com/news/2014-09-03/xi-and-modi-said-to-skip-un-climate-summit-later-this-month>.

¹⁹ Ed King, *UN urges countries to ratify Kyoto Protocol extension*, RESPONDING TO CLIMATE CHANGE, Sept. 4, 2014, <http://www.rtcc.org/2014/09/03/un-urges-countries-to-ratify-kyoto-protocol-extension>.

²⁰ Coral Davenport, *Obama Pursuing Climate Accord in Lieu of Treaty*, NY TIMES, Aug. 26, 2014, http://www.nytimes.com/2014/08/27/us/politics/obama-pursuing-climate-accord-in-lieu-of-treaty.html?_r=0.

²¹ Justin Sink, *WH defends UN gambit on climate*, THE HILL, Aug. 27, 2014, <http://thehill.com/homenews/administration/216087-white-house-defends-un-gambit-on-climate>.

in intensity and frequency) have failed to come true. As well, there is clear concern with the climate models' failure to predict the pause in warming over the last 15+ years. As some scientists have testified before Congress, it seems to be clear that we underestimated natural variability in our climate, which has led to the failure of many of the predictions. Additional research is still necessary, and a more honest and precise debate in the public forum would be beneficial. What is also clear is that the regulatory policies to control CO₂ emissions implemented by European Union member nations have been economically crippling. We should view the EU disaster as a clear warning of what lies ahead—not only for our economy but for the elderly and poor as well -- if we enact similar destructive policies while we still have so much to learn.

If there existed broad certainty in climate science regarding all the factors that influence our climate, then we could stop funding climate science immediately. One can imagine the outcry if there was a call to defund climate research. Accordingly, continuing research and skepticism as a natural component of the scientific process must be supported.

The real question is why do certain media outlets, politicians, and activist organizations repeatedly attempt to answer with a single question an issue that is so incredibly complex, demanding a response that is intended to label rather than to encourage scientific debate, understanding, and appropriate policy making?

*Let's be clear: the work of science has nothing whatever to do with consensus. Consensus is the business of politics. Science, on the contrary, requires only one investigator who happens to be right, which means that he or she has results that are verifiable by reference to the real world. In science consensus is irrelevant. What is relevant is reproducible results. The greatest scientists in history are great precisely because they broke with the consensus.*²² —Michael Crichton, MD

*The right to search for truth implies also a duty; one must not conceal any part of what one has recognized to be true.*²³ —Albert Einstein, German Physicist

²² Michael Crichton, Lecture at the California Institute for Technology Michelin Lecture: Aliens Cause Global Warming (Jan. 17, 2003), available at <https://www.cfa.harvard.edu/~scanmer/SPD/crichton.html>.

²³ Albert Einstein, see <http://www.nasonline.org/about-nas/visiting-nas/nas-building/the-einstein-memorial.html>.

TABLE OF CONTENTS

INTRODUCTION (2014).....	ii
INTRODUCTION (2013).....	1
I. CLIMATE MODELS: THE 15-YEAR HIATUS IN WARMING	2
II. THE BENEFITS OF CARBON DIOXIDE VERSUS TRADITIONAL POLLUTANTS	14
III. SEA LEVEL RISE: IT’S MEASURED IN MILLIMETERS, NOT FEET	21
IV. EXTREME WEATHER: HURRICANES, DROUGHTS, HEAT WAVES AND TEMPERATURES	27
V. WILDFIRES	37
VI. POLAR BEARS AND MASS EXTINCTIONS.....	45
VII. ECONOMIC IMPACTS IN EUROPE FROM CLIMATE REGULATIONS	50
VIII. CLIMATE REGULATION: WHAT IS IT REALLY ABOUT?	56
IX. THE SCIENCE IS SETTLED: THE GOVERNMENT CAN’T CONTROL CLIMATE	59
X. CONCLUDING POINTS ON U.S. UNILATERAL REGULATION	62
XI. ADDENDUM: A TOP ECOLOGIST’S CONCERNS WITH THE NATIONAL CLIMATE ASSESSMENT	66
XII. ADDENDUM: SUPPLEMENTARY SEA LEVEL RISE GRAPHS	80

INTRODUCTION (2013)

The climate has always and will always be changing, and that is unquestionable. What is in question is the amount of influence human activity has on climate patterns, and this report is intended to provide an opportunity to think critically and review some of the more important global warming predictions made over the last several decades.

For more than thirty years, a litany of predictions and claims have been made about what impact anthropogenic (human-caused) greenhouse gases (GHGs) would be on the earth's climate, and on plant and animal life directly. Much of the concern that has been raised—and which continues to be raised—focuses on carbon dioxide (CO₂) emissions, an otherwise naturally occurring gas that makes the process of photosynthesis and life on earth possible. Over nearly four decades, numerous predictions have had adequate time to come to fruition, providing an opportunity to analyze and compare them to today's statistics.

There is little doubt that affordable reliable energy is one of the greatest equalizers in our society. Our use of fossil energy has established a standard of living in the United States that provides families of any income level the ability to heat and cool their home, drive to work or their children to school, or even visit far away family members. In fact, the National Academy of Engineering dubbed electrification “the greatest engineering achievement of the 20th Century.”²⁴ Inevitably, the use and production of this energy releases some CO₂ into our atmosphere.

The use of fossil energy has increased and expanded internationally, and GHG emissions are anticipated to continue to grow in developing nations such as China and India. This report posits that as the developing world has greatly expanded its use of fossil energy and CO₂ emissions have increased, then the predictions and claims regarding human influence on climate patterns should be apparent and easily proven. It is important to keep in mind that many of the predictions and claims analyzed in this report were made prior to China surpassing the United States in 2011 as the largest global GHG emitter. Accordingly, if things are “worse than predicted” as many climate activists and politicians have recently asserted, impacts should prove themselves out as worse than the predictions and claims reviewed in this report.

*In questions of science, the authority of a thousand is not worth the humble reasoning of a single individual.*²⁵ —Galileo Galilei, Italian Physicist

*The truth may be puzzling. It may take some work to grapple with. It may be counterintuitive. It may contradict deeply held prejudices. It may not be consonant with what we desperately want to be true. But our preferences do not determine what's true.*²⁶ —Carl Sagan, American Scientist

²⁴ *The Greatest Achievements of the 20th Century*, NAT'L ACADEMY OF ENGINEERING, (Dec. 3, 2004), <http://www.mae.ncsu.edu/eischen/courses/mae415/docs/GreatestEngineeringAchievements.pdf>.

²⁵ FRANCOIS ARAGO, BIOGRAPHIES OF DISTINGUISHED SCIENTIFIC MEN 365 (Baden Powell, Robert Grant, and William Fairbairn trans.) (1859).

²⁶ Carl Sagan, *Wonder and Skepticism*, 19 SKEPTICAL ENQUIRER 1 (Jan.-Feb. 1995).

I. CLIMATE MODELS: THE 15-YEAR HIATUS IN WARMING

*An experiment is a question which science poses to Nature and a measurement is the recording of Nature's answer.*²⁷ —Max Planck, German Physicist

Predictions:

1. “Most of the climate models...now project that average global temperatures will rise somewhere from 3 to 8 degrees Fahrenheit toward the middle of next century.... A range as high as 14.4 degrees and 18 degrees cannot be ruled out.”²⁸ —*New York Times*, January 17, 1989
2. “Using computer models, researchers concluded that global warming would raise average annual temperatures nationwide two degrees by 2010.”²⁹ —*Associated Press*, May 15, 1989
3. “Children just aren't going to know what snow is.”³⁰ —Dr. David Viner, Senior Research Scientist at the Climatic Research Unit (CRU) of the University of East Anglia, interviewed by the *UK Independent*
4. “The entire north polar ice cap will be gone in 5 years.”³¹ —Former Vice President Al Gore

Claims:

1. “The climate is heating up far faster than scientists had predicted, spurred by sharp increases in greenhouse gas emissions from developing countries like China and India.”³² —*Reuters*, February 14, 2009
2. “The temperature around the globe is increasing faster than was predicted even 10 years ago.”³³ —President Barack Obama

²⁷ MAX PLANCK, SCIENTIFIC AUTOBIOGRAPHY AND OTHER PAPERS (1968).

²⁸ Philip Shabecoff, *Global Warming: Experts Ponder Bewildering Feedback Effects*, N.Y. TIMES, Jan. 17, 1989, <http://www.nytimes.com/1989/01/17/science/global-warming-experts-ponder-bewildering-feedback-effects.html?pagewanted=all&src=pm>.

²⁹ Kirk Myers, *Arctic Ocean warming, icebergs growing scarce*, *Washington Post reports*, THE EXAMINER, Mar. 2, 2010, <http://www.examiner.com/article/arctic-ocean-warming-icebergs-growing-scarce-washington-post-reports> (quoting Associated Press).

³⁰ Charles Onians, *Snowfalls are now just a thing of the past*, THE INDEPENDENT, Mar. 20, 2000, <http://www.independent.co.uk/environment/snowfalls-are-now-just-a-thing-of-the-past-724017.html>.

³¹ Charles J. Hanley, *Gore: Polar Ice May Vanish in 5 Years*, HUFFINGTON POST, Dec. 14, 2009, http://www.huffingtonpost.com/2009/12/14/gore-polar-ice-may-vanish_n_391632.html.

³² Julie Steenhuisen, *Global warming seen worse than predicted*, REUTERS, Feb. 14, 2009, <http://www.reuters.com/article/2009/02/14/us-climate-idUSTRE51D29E20090214>.

³³ *Transcript of President Obama's News Conference*, N.Y. TIMES, Nov. 14, 2012, http://www.nytimes.com/2012/11/14/us/politics/running-transcript-of-president-obamas-press-conference.html?pagewanted=10&_r=2&src=twr.

The Latest Science:

The predictions seem unlikely to come true, and the claims contradict the data, as noted by entities generally supportive of the Administration's climate change policies. For instance, *The Economist* recently explained that "temperatures have not really risen over the past ten years"³⁴ and that "[o]ver the past 15 years air temperatures at the Earth's surface have been flat."³⁵ Last month, *BBC News* reported, "Since 1998, there has been an unexplained 'standstill' in the heating of the Earth's atmosphere."³⁶

Furthering the concern that past climate models have not proven true, Dr. Judith Curry, Chair of the School of Earth and Atmospheric Sciences at Georgia Institute of Technology, stated on June 14, 2013, "Attention in the public debate seems to be moving away from the 15-17 year 'pause' to the cooling since 2002."³⁷ She further stated, "This period since 2002 is scientifically interesting, since it coincides with the 'climate shift' circa 2001/2002 posited by Tsonis and others."³⁸ This shift and the subsequent slight cooling trend provide a rationale for inferring a slight cooling trend over the next decade or so, rather than a flat trend from the 15 year 'pause.'"³⁹

Importantly, the U.S. Environmental Protection Agency (EPA) has essentially ignored Members of Congress who asked for EPA data supporting the President's claims about global temperature predictions. For example, on December 4, 2012, Senator Sessions wrote former Administrator Jackson:

The actual temperature data show no significant change in global temperatures over the past decade and certainly less warming than the climate change models predicted. At an August 1, 2012, hearing before the Senate Committee on Environment and Public Works...climatologist Dr. John Christy of the University of Alabama-Huntsville offered testimony demonstrating that the IPCC climate models, which have been relied upon by alarmists, vastly over-stated the degree of warming in comparison to actual temperature data observed by advanced satellites. Dr. Christy's chart...demonstrates that the IPCC models, on average, predicted a significant amount of warming that has not actually occurred. In fact, contrary to the President's assertion, the chart shows that global average temperatures have not increased at all over the past decade, and certainly less than was predicted 10 years ago.

³⁴ *Apocalypse perhaps a little later*, *ECONOMIST*, Mar. 30, 2013, <http://www.economist.com/news/leaders/21574490-climate-change-may-be-happening-more-slowly-scientists-thought-world-still-needs>.

³⁵ *Climate Science: A Sensitive Matter*, *ECONOMIST*, Mar. 30, 2013, <http://www.economist.com/news/science-and-technology/21574461-climate-may-be-heating-up-less-response-greenhouse-gas-emissions>.

³⁶ Matt McGrath, *Climate slowdown means extreme rates of warming 'not as likely'*, *BBC NEWS*, (May 19, 2013, 1:31 PM), <http://www.bbc.co.uk/news/science-environment-22567023>.

³⁷ Judith Curry, *Week in Review*, *CLIMATE ETC.*, (June 14, 2013), <http://judithcurry.com/2013/06/14/week-in-review-3>.

³⁸ Bill Osmulski, *UW-Milwaukee Professor Predicts 50 Years of Global Cooling*, *MACIVER INSTITUTE* (Jan. 13, 2010, 2:59 PM), <http://www.maciverinstitute.com/2010/01/uw-milwaukee-professor-predicts-50-years-of-global-cooling>.

³⁹ *Id.*

The President's assertion also conflicts with the views of many other scientists and experts. In an editorial published earlier this year in the Wall Street Journal, scientists and engineers from MIT, Princeton, Cambridge, and other leading institutions explained that 'perhaps the most inconvenient fact is the lack of global warming for well over 10 years now' and that there has been a 'smaller-than-predicted warming over the 22 years since the U.N.'s Intergovernmental Panel on Climate Change (IPCC) began issuing projections.' Additionally, the lead author of the 2007 IPCC climate report stated in an email that 'we can't account for the lack of warming at the moment...'

As policymakers consider proposals aimed at addressing concerns about rising temperatures predicted by the IPCC climate models, a critical question is whether the planet is warming to the extent predicted by these models. The data suggest to me that the planet is not warming to the extent predicted 10 years ago.⁴⁰

To shed light on this issue, Senator Sessions asked EPA to "provide the best available data that EPA would rely upon to support the President's assertion"⁴¹ along with an EPA-prepared chart comparing "actual global average temperature increases since 1979 (when satellite temperature data became available) versus the latest IPCC predictions."⁴²

Gina McCarthy, nominee to be EPA Administrator, responded to Senator Sessions in a letter dated February 14, 2013, by asserting that "there are multiple lines of evidence that clearly demonstrate that average global temperatures are rising,"⁴³ yet she did not provide any of the requested data relating to average global temperatures. Instead, the letter seems to dodge Senator Sessions' data request by claiming that "only looking at 10 years of a single dataset cannot provide a full picture of climate change trends, and should also not be the sole test by which to judge the usefulness of climate models in either simulating past climates or projecting further climate change."⁴⁴

The lack of responsiveness on these points was raised at McCarthy's April 11, 2013, nomination hearing when Senator Sessions presented information demonstrating global temperatures have not increased over the last decade and certainly not to the extent predicted by the climate models:

⁴⁰ Letter from Sen. Jeff Sessions to Lisa Jackson, EPA Adm'r, (Dec. 4, 2012) (on file with author).

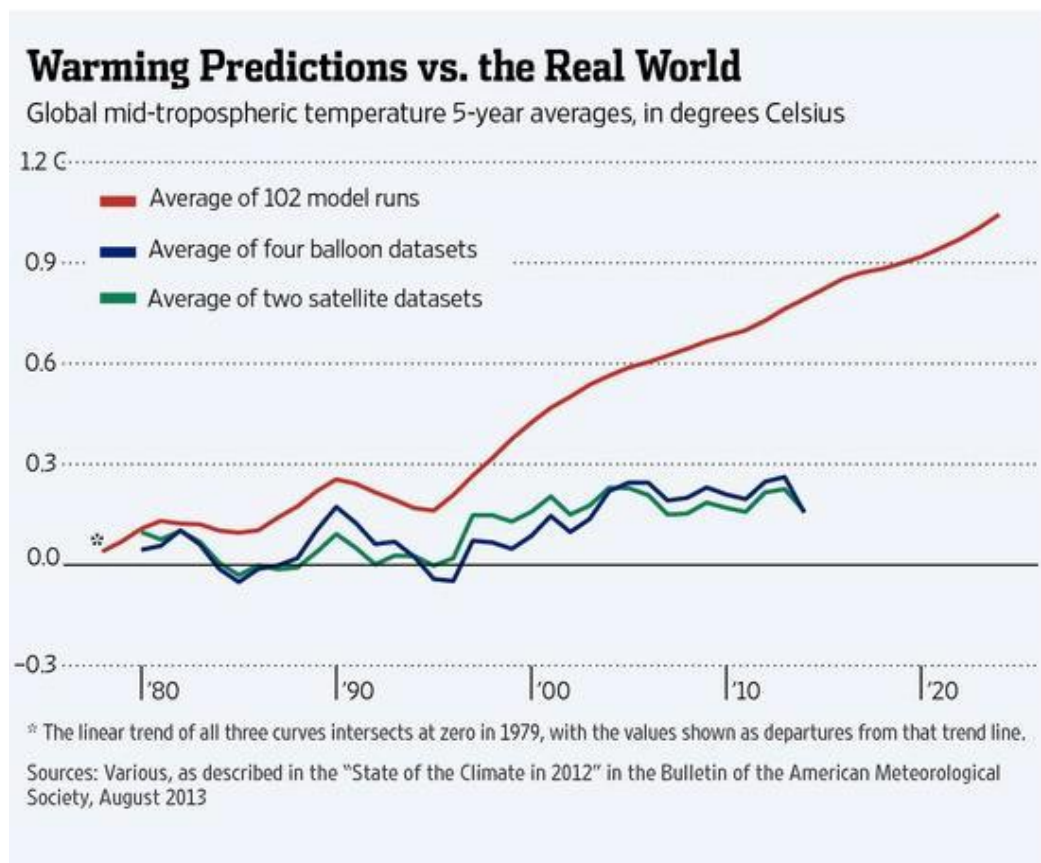
⁴¹ Letter from Sen. Jeff Sessions et al. to Gina McCarthy, EPA Asst. Adm'r Office of Air & Radiation, (June 24, 2013) (on file with author).

⁴² *Id.*

⁴³ *Id.*

⁴⁴ *Id.*

Figure 1.⁴⁵



In his questions for the record, Senator Sessions once again requested the data from McCarthy: “Will you provide me with data showing actual global average temperatures since 1979 versus IPCC predictions, as was requested in my letter?”⁴⁶

On April 30, 2013, the EPA responded to Senator Sessions. Yet, instead of providing the requested analysis including a chart showing official predictions versus actual global temperatures, the Agency simply stated that “EPA has not produced its own analysis, but we expect a definitive comparison in the forthcoming [International Panel on Climate Change] Fifth Assessment Report.”⁴⁷ Unlike EPA, the IPCC is an international body outside the jurisdiction and oversight of the United States Congress. Moreover, EPA is the entity of the United States government that is seeking sweeping regulations on the basis that GHGs are increasing global temperatures. EPA’s reliance on the IPCC is not only a violation of the Data Quality Act,⁴⁸ but also violates the Agency’s own internal policy.⁴⁹

⁴⁵ *Climate Change: The Need to Act Now: Hearing Before the Subcomm. on Clean Air and Nuclear Safety of the S. Comm. on Env’t and Pub. Works*, 113th Cong. 4 (2014) (Testimony of Daniel B. Botkin) (Graph provided by Prof. John Christy, University of Alabama).

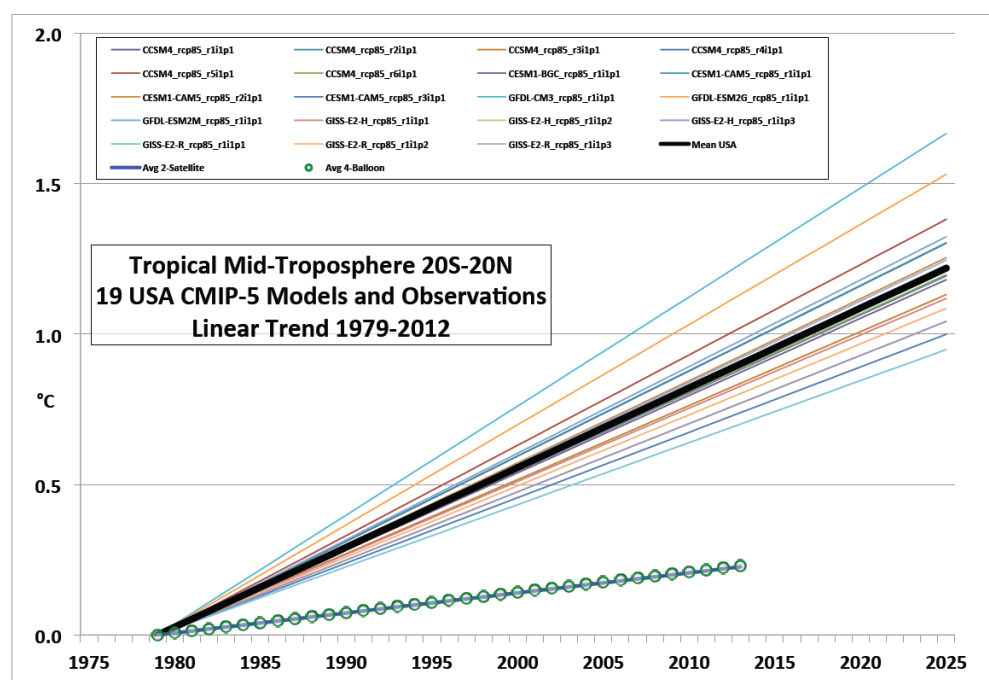
⁴⁶ *Hearing on the Nomination of Gina McCarthy to be Administrator of the U.S. Env’t. Prot. Agency: Hearing Before the S. Comm. on Env’t. and Pub. Works*, 113th Cong. (2013) (questions for the record of Senator Sessions).

⁴⁷ *Id.*

⁴⁸ The DQA directs the Office of Management and Budget (OMB) to issue government-wide guidelines that “provide policy and procedural guidance to Federal agencies for ensuring and maximizing the quality, objectivity,

To support the President’s claim that the temperature around the globe is increasing faster than was predicted even 10 years ago, EPA referred to a short paper by Stefan Rahmstorf⁵⁰ published in an online journal whose editor-in-chief also happens to be the “coordinating lead author”⁵¹ for the IPCC—during the time the IPCC published the climate models vastly over-predicting global temperature increases. It is remarkable that EPA—without first conducting its own analysis—would endorse that paper’s finding that “global temperature continues to increase in good agreement with the best estimates of the IPCC,”⁵² a view that appears to be contrary to the actual current data and facts. This is shown by a comprehensive comparison of climate models used by the IPCC, which is reflected in the following chart:⁵³

Figure 2.⁵⁴



utility, and integrity of information (including statistical information) disseminated by Federal agencies.” See Data Quality Act §515, 42 U.S.C. §502-504.

⁴⁹ Peer Review Advisory Grp., *Addendum to: Guidance for Evaluating the Quality of Scientific and Technical Information*, EPA’s SCI. AND TECH. POLICY COUNCIL (Dec. 2012), <http://www.epa.gov/spc/pdfs/assess3.pdf>.

⁵⁰ Stefan Rahmstorf et al., *Comparing climate projections to observations up to 2011*, 7 ENVTL. RES. LETTERS 044035 (2012), available at http://iopscience.iop.org/1748-9326/7/4/044035/pdf/1748-9326_7_4_044035.pdf. It is also noteworthy that this paper was published on November 27, 2012—almost two weeks after the President stated that “the temperature around the globe is increasing faster than was predicted even 10 years ago.” *Transcript of President Obama’s News Conference*, NY TIMES, Nov. 14, 2012, <http://www.nytimes.com/2012/11/14/us/politics/running-transcript-of-president-obamas-press-conference.html?pagewanted=10&r=2&src=twr>.

⁵¹ Dr. Daniel M. Kammen’s Personal Website. BERKELEY.EDU, <http://kammen.berkeley.edu/> (last visited July 16, 2013).

⁵² Stefan Rahmstorf et al., *Comparing climate projections to observations up to 2011*, 7 ENVTL. RES. LETTERS 044035 (2012), available at http://iopscience.iop.org/1748-9326/7/4/044035/pdf/1748-9326_7_4_044035.pdf.

⁵³ Dr. John Christy, *Tropical Mid-Troposphere 20S-20N*, (June 4, 2013), <http://www.drroyspencer.com/wp-content/uploads/CMIP5-19-USA-models-vs-obs-20N-20S-MT.png>.

⁵⁴ *Id.*

The American public should be deeply troubled to learn that EPA is actively working to increase energy prices based on predicted global temperature increases without first undertaking efforts to determine if temperatures are actually increasing to the extent predicted by the climate models they are using. This refusal to provide reasonable data requested by Members of Congress comes on the heels of the EPA Inspector General's highly critical report investigating EPA's review of external data for the GHGs endangerment finding.⁵⁵

Congress continues to wait for the federal agency's supporting data and analysis the President cited which shows actual global average temperatures since 1979 versus IPCC predictions, as was requested in Senator Sessions' December 2012 letter and again during McCarthy's nomination hearing to lead the Agency.

⁵⁵ ENVTL. PROT. AGENCY, OFFICE OF INSPECTOR GEN., REPORT NO. 11-P-0702, PROCEDURAL REVIEW OF EPA'S GREENHOUSE GASES ENDANGERMENT FINDING DATA QUALITY PROCESSES (2011), *available at* <http://www.epa.gov/oig/reports/2011/20110926-11-P-0702.pdf>.

Social Cost of Carbon Concerns

“To anyone outside of the Administration, including me, this is like a black box. We’ve been asking a number of legitimate questions through at least two letters about that process [of developing updated social cost of carbon estimates] and the participants. And I’ve just gotten no information yet.” —Senator David Vitter

Acquiring data from the EPA has also proven to be challenging when the requests are related to the Social Cost of Carbon (SCC). In May 2013, the Administration quietly convened an Interagency Working Group (IWG) to update the 2010 estimate for the SCC.⁵⁶ Senator Vitter targeted this estimate and the IWG responsible for its development because the SCC is a critical component of the Administration’s climate change agenda due to the number’s direct correlation to the benefits attributed to costly environmental regulations. The estimate was developed in secret, lacked stakeholder involvement, and also failed to fully comply with Office of Management and Budget (OMB) existing guidance.⁵⁷

In June 2013, Senator Vitter was joined by Senators Blunt, Sessions, Barrasso, Inhofe, Wicker, and Boozman, in initiating a series of inquiries to the relevant agencies (EPA, Department of Energy, and OMB) that are responsible for making, reviewing, or defending certain environmental regulations’ benefits claims based on the Federal government’s assessment of the SCC.⁵⁸ The Senators challenged the transparency and openness in the development and revision process, focusing on requesting the names of the members of the anonymous IWG and how the group justified the increased estimates. After receiving only a vague, unsatisfactory response from the Office of Information and Regulatory Affairs, the seven Senators followed up with EPA Administrator Gina McCarthy, focusing their questions on how the estimates will be used in Agency rulemakings, as well as repeating their request for names of the IWG participants.⁵⁹ Administrator McCarthy failed to respond to the letter.

In November, Senator Vitter took the opportunity to discuss the SCC process with EPA’s Director of the Office of Atmospheric Programs, Sarah Dunham, when she testified before the Committee.⁶⁰ Vitter described the SCC development process as a “black box” to anyone outside

⁵⁶ Interagency Working Group on Social Cost of Carbon, *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis under Executive Order 12866*, U.S. GOV’T (May 2013), http://www.whitehouse.gov/sites/default/files/omb/inforeg/social_cost_of_carbon_for_ria_2013_update.pdf

⁵⁷ OFFICE OF MGMT. & BUDGET, CIRCULAR A-4: REGULATORY ANALYSIS 34 (2003), *available at* <http://www.whitehouse.gov/sites/default/files/omb/assets/omb/circulars/a004/a-4.pdf> (for regulatory analysis, provide estimates of net benefits using both 3 percent and 7 percent).

⁵⁸ *New Energy Efficiency Standards for Microwave Ovens to Save Consumers on Energy Bills*, DEP’T OF ENERGY, (May 31, 2013), <http://energy.gov/articles/new-energy-efficiency-standards-microwave-ovens-save-consumers-energy-bills> (*citing* Energy Conservation Program: Energy Conservation Standards for Standby Mode and Off Mode for Microwave Ovens, http://www1.eere.energy.gov/buildings/appliance_standards/pdfs/mwo_final_rule.pdf).

⁵⁹ Letter from Sens. David Vitter, Ranking Member, S. Comm. on Env’t & Public Works, Jeff sessions, Roy Blunt, John Barrasso, James Inhofe, Roger Wicker, and John Boozman to Gina McCarthy, Adm’r, U.S. Env’tl. Prot. Agency (Sept. 17, 2013), *available at* http://www.epw.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=837e520f-b15d-4d0c-9086-6f61767a6ce0.

⁶⁰ U.S. Senate, Comm. on Env’t and Pub. Works, *Fugitive Methane Emissions*, Hearing, Nov. 5, 2013, <http://www.vitter.senate.gov/newsroom/video-and-audio/view/vitter-questions-epa-on-social-cost-of-carbon>.

of the Administration and elicited a commitment from Dunham to provide him with substantial answers related to EPA's involvement in the updated SCC. Dunham never responded to Vitter's follow-up letter, reminding her of the agreement they reached during the Committee hearing.

Disregarding the stonewall attempts by the Administration, the same seven Senators who initiated the SCC IWG challenge requested OIRA Director Howard Shelanski take several key steps to ensure a transparent review process of the SCC estimates due to their use by multiple federal agencies to justify costly new rules and regulations.

President Obama's regulatory agenda, which circumvents Congress in order to unilaterally and aggressively regulate carbon dioxide through unelected federal agencies, only escalates the importance of the SCC's thorough review. The regulatory uncertainty surrounding the SCC remains alarming, as highlighted by your office's recent revisions to the SCC based on newly found deficiencies in the models. Given the integral role of the estimates in existing, pending, and future regulations that could impose trillions of dollars in costs on our economy, it is imperative that the Administration address these concerns.⁶¹

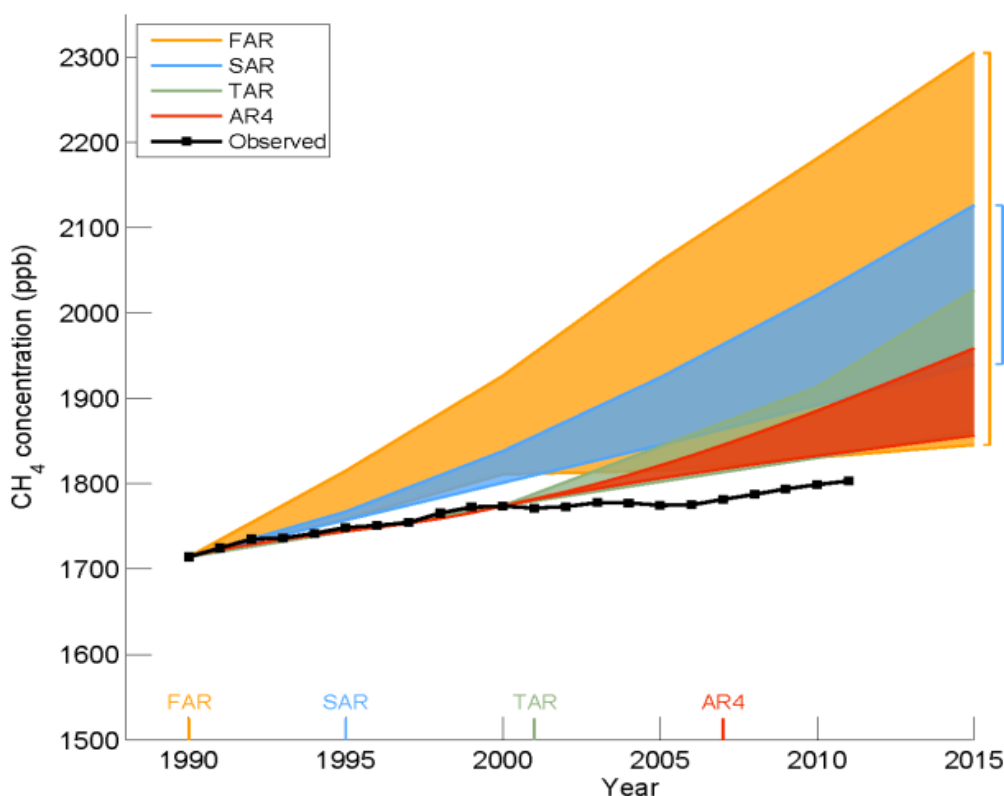
Senator Vitter has been leading the campaign for openness and transparency by the Obama Administration regarding the SCC for 15 months and, as of yet, the Administration has failed to shed any light on the process and personnel responsible for updating the estimates. The scrutiny of the estimates and their use has brought to light technical flaws as well as the fact that one of the three models used is unavailable to the public without either supervision of the creator or a sizeable fee. The Administration has disregarded all of the concerns raised by Senator Vitter and his colleagues, and the minimal displays of effort put out by the Administration have been too little, too late.

⁶¹ Letter from Sens. David Vitter, Ranking Member, S. Comm. on Env't & Public Works, Jeff Sessions, Roy Blunt, John Barrasso, James Inhofe, Roger Wicker, and John Boozman to Howard Shelanski, Director, Office of Management and Budget Office of Information and Regulatory Affairs (Jan. 14, 2014).

Additional Modeling Concerns

It is also important to note that not only have the climate models been wholly inaccurate as they relate to temperature increases, but have similarly failed in measuring methane accumulation in the atmosphere.

Figure 3.⁶²



Graph: Climate scenarios (repeatedly) overestimate the increase in methane in the atmosphere.

Critical to a discussion on climate change is the understanding of the history of warming periods and ice ages. Dr. Patrick Moore, Chair and Chief Scientist at Ecosense Environment, notes the following:

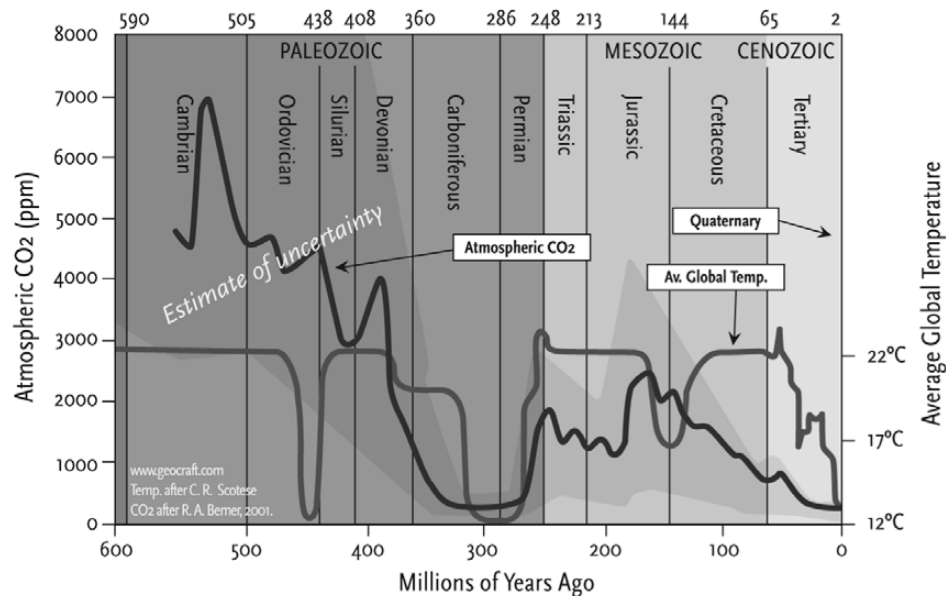
During the past 500 million years, since modern life forms emerged, the earth's climate has been warmer than it is today most of the time. During these "Greenhouse Ages" the earth's temperature averaged around 22 to 25 degrees Celsius (72 to 77 Fahrenheit). All the land was either tropical or subtropical and the world was generally wetter. The sea level was much higher than today and life flourished on land and in the oceans. These warm periods were punctuated by three Ice Ages during which large ice sheets formed at the poles and in

⁶² *Farming, Fishing, Forestry, and Hunting in an Era of Changing Climate: Hearing Before the Subcomm. on Green Jobs and the New Economy of the S. Comm. on Env't and Pub. Works, 113th Cong. 6 (2014) (responses to questions for the record of Dr. David South).*

mountainous areas, effectively eliminating most plants and animals in those regions.

The two Ice Ages that preceded the current one occurred between 460 and 430 million years ago and between 360 and 260 million year ago. From 260 million years ago until quite recently, a Greenhouse Age existed for about 250 million years. Ice started to accumulate in Antarctica beginning 20 million years ago and eventually the current Ice Age, known as the Pleistocene, began in earnest about 2.5 million years ago. *The Pleistocene, which we are still in today and during which our species evolved to its current state, accounts for only 0.07 percent of the history of life on earth.*⁶³

Figure 4.⁶⁴

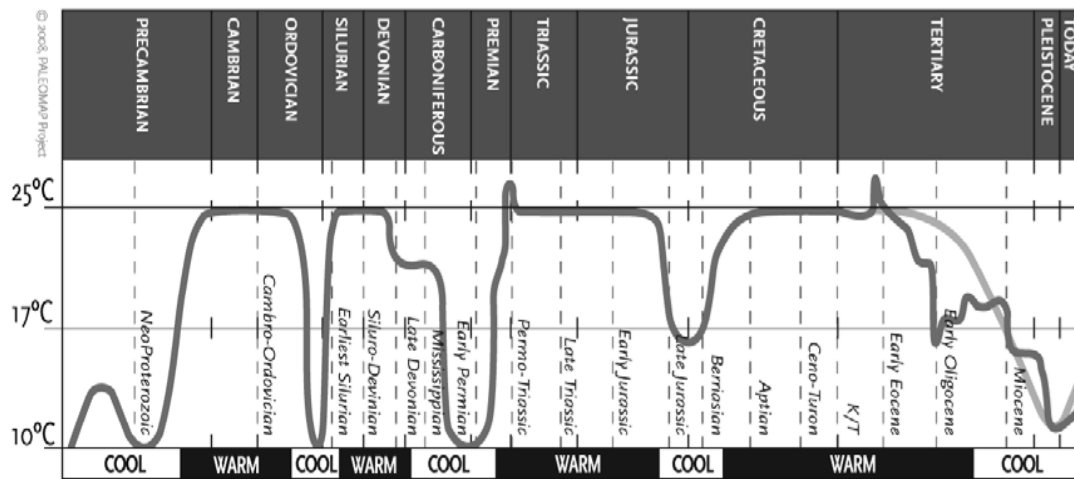


Graph: This graph shows global levels of CO₂ and the global temperature for the past 600 million years. The correlation between the two parameters is mixed at best, with an Ice Age during a period of high CO₂ levels and Greenhouse Ages during a period of relatively low CO₂ levels.

⁶³ PATRICK MOORE, CONFESSIONS OF A GREENPEACE DROPOUT 347 (Beatty St. Publ'g, Inc. ed., 2013) (emphasis added).

⁶⁴ Monte Hieb, *Climate and the Carboniferous Period*, PLANT FOSSILS OF WEST VIRGINIA, http://www.geocraft.com/WVFossils/Carboniferous_climate.html (last updated Mar. 21, 2009).

Figure 5.⁶⁵



Graph: Graph showing global average temperature during the past billion years.

Dr. Daniel Botkin, Professor Emeritus of Biology at the University of California, Santa Barbara—a renowned ecologist—provided testimony before the U.S. Senate on the matter of earth’s temperature change in recent years, but with a bit of additional information that helps put things in perspective when comparing what the IPCC and President Obama’s National Climate Assessment conversely indicate:

HAS IT BEEN WARMING? Yes, we have been living through a warming trend, no doubt about that. The rate of change we are experiencing is also not unprecedented, and the “mystery” of the warming “plateau” simply indicates the inherent complexity of our global biosphere. Change is normal; life on Earth is inherently risky. It always has been. The two reports, however, make it seem that environmental change is apocalyptic and irreversible. It is not.⁶⁶

Questions for Critical Thinking:

1. If the computer models and predictions have been inaccurate, what strategies are being implemented to correct these errors? Should potentially economically crippling policies be put in place before those errors are resolved?
2. If global warming has truly been “worse than predicted,” why won’t the federal government provide the data supporting this claim?
3. As it continues to be recognized that the Earth has not warmed for at least the past 15 years, will we see the term “global warming” abandoned and replaced in its entirety by “climate change?”

⁶⁵ Christopher R. Scotese, *Climate History*, PALEOMAP PROJECT (Apr. 20, 2002), <http://www.scotese.com/climate.htm>.

⁶⁶ Botkin, *supra* note 45, at 3.

4. Given that many of these models predicted warming trends well before China surpassed the United States as the largest GHG emitter, and given the fact that emissions continue to grow at a pace beyond what was originally incorporated into the models, shouldn't the warming be far worse than what was predicted in the worst case scenarios rather than well below predictions?
5. Given Earth's long history of a changing climate, why does the public discussion only tend to focus on the last 70 years or so?

II. THE BENEFITS OF CARBON DIOXIDE VERSUS TRADITIONAL POLLUTANTS

*There is no such thing as consensus science. If it's consensus, it isn't science. If it's science, it isn't consensus. Period.*⁶⁷ —Michael Crichton, MD

Claims:

1. “Carbon pollution is the main contributor to climate disruption, making extreme weather worse—including more severe floods, widespread wildfires and record drought. It is also linked to life-threatening air pollution—such as the smog that can trigger asthma attacks.”⁶⁸ —Sierra Club
2. “For Americans' health and welfare, for the nation's economy, and for the health of the planet, we can't afford not to curb the carbon pollution from existing power plants.”⁶⁹ —NRDC
3. “We simply cannot continue to use the atmosphere as an open sewer for dirty and dangerous global warming pollution that endangers our health and makes storms, floods, mudslides and droughts much more dangerous and threatening – not only in the future, but here and now.”⁷⁰ —Former Vice President Al Gore
4. “We can't let carbon polluters pass the buck to hard-working American families through higher doctor bills and the devastation of extreme weather.”⁷¹ —Senator Ed Markey

The Latest Science:

Claiming CO₂ is a “pollutant” is dubious at best. CO₂ serves a critical role in making life on earth possible. As noted earlier, CO₂ concentrations in the atmosphere have been much higher in the past, even well before any human industrial activities were emitting the gas into the atmosphere. Moreover, the public discussion often seems to miss critical, scientific data demonstrating the likely benefits from increased concentrations of CO₂ in the atmosphere. EPA has traditionally had an appropriate role in regulating legitimate pollutants such as lead (0.15 micrograms of lead per cubic meter of air over a three-month period, or 10 micrograms of lead per deciliter of blood), which can lead to damage to the brain, nervous system, and kidneys⁷²; carbon monoxide (the existing primary standards are 9 parts per million (ppm) measured over 8

⁶⁷ Crichton, *supra* note 22.

⁶⁸ *Carbon Pollution and Climate Disruption*, SIERRA CLUB, <http://content.sierraclub.org/coal/burning-carbon-pollution-and-climate-disruption> (last visited Sept. 3, 2014).

⁶⁹ *Using the Clean Air Act to Sharply Reduce Carbon Pollution from Existing Power Plant, Creating Clean Energy Jobs, Improving Americans' Health, and Curbing Climate Change*, NRDC (Dec. 2012), <http://www.nrdc.org/air/pollution-standards/files/pollution-standards-IB.pdf>.

⁷⁰ Al Gore, *The Most Important Step Taken to Combat Climate Change in Our Country's History*, THE HUFFINGTON POST, June 3, 2014, http://www.huffingtonpost.com/al-gore/the-most-important-step-t_b_5435702.html.

⁷¹ Press Release, Office of Sen. Ed Markey, Markey Statement on the Release of the National Climate Assessment (May 6, 2014), <http://www.markey.senate.gov/news/press-releases/markey-statement-on-the-release-of-the-national-climate-assessment>.

⁷² *Human Health and Lead*, ENVTL. PROT. AGENCY, <http://www.epa.gov/superfund/lead/health.htm> (last updated Nov. 25, 2013).

hours, and 35 ppm measured over 1 hour), exposure to which can reduce the oxygen-carrying capacity of the blood and result in myocardial ischemia, angina, or death⁷³; and sulfur dioxide (1-hour standard set at 75ppb), which is linked to a number of adverse effects on the respiratory system.⁷⁴ However, CO₂ is not known to have any such impacts on human health, and again, it is essential to plant life and the process of photosynthesis. Expert testimony before the United States Senate expanded on these benefits.

Dr. Patrick Moore, Chair and Chief Scientist at Ecosense Environment and one of the founders of Greenpeace, notes the following contradictory evidence to the claim CO₂ is a pollutant:

What about the undisputed fact that CO₂ is the most important food for all life on earth? Every green plant needs CO₂ in order to produce sugars that are the primary energy source for every plant and animal. To be fair, water is also essential to living things, as are nitrogen, potassium, phosphorus, and many other minor elements. But CO₂ is the most important food, as all life on earth is carbon-based, and the carbon comes from CO₂ in the atmosphere. Without CO₂ life on this planet would not exist. How important is that?⁷⁵

I searched the Internet using the phrase “optimum CO₂ level for plant growth.” All I needed were the first few results to see plants grow best at a CO₂ concentration of around 1500 ppm, which boosts plant yield by 25 to 65 percent. The present CO₂ level in the global atmosphere is about 390 ppm. In other words, the trees and other plants that grow around the world would benefit from a level of CO₂ about four times higher than it is today. There is solid evidence that trees are already showing increased growth rates due to rising CO₂ levels.⁷⁶

According to Dr. David Legates, Professor of Climatology at the University of Delaware:

In an article entitled “The Many Benefits of Atmospheric CO₂ Enrichment”... Drs. Craig and Sherwood Idso describe fifty-five benefits arising from increased atmospheric carbon dioxide concentrations. They note that plants grow faster, their photosynthetic rate is increased, and plants significantly increase their biomass under higher atmospheric carbon dioxide concentrations (see Figure [6]) and that because their stomates can be closed longer, they have decreased water demands and suffer less air pollution stress. In particular, this decreases soil erosion by expanding plant cover. Biodiversity too is enhanced because it increases the niche security of many different forms of plants and with more biodiversity, net primary productivity, and biomass comes a greater ability to remove that carbon from the atmosphere, creating a natural negative feedback on CO₂. This, in turn, enhances the plant resistance to disease and increases the positive effects of earthworms and microbes in the soil as well as the response of nitrogen-fixing soil bacteria. Production of the protein Glomalin is increased,

⁷³ *Regulatory Actions*, ENVTL. PROT. AGENCY, <http://www.epa.gov/airquality/carbonmonoxide/actions.html#aug11> (last updated Aug. 14, 2014).

⁷⁴ *Sulfur Dioxide*, ENVTL. PROT. AGENCY, <http://www.epa.gov/airquality/sulfurdioxide> (last updated Aug. 15, 2014).

⁷⁵ Moore, *supra* note 63, at 360.

⁷⁶ *Id.* at 364.

which enhances the soil and decreases the risk of potentially toxic soil elements, as well as other beneficial substances such as phosphorus and other nutrients as well as vitamin C and other antioxidants. Tropospheric ozone is enhanced by isoprene which will be significantly reduced under increased CO₂ concentrations. Humans too will be benefit. Longevity has increased through increased agricultural productivity as well as a decrease in human mortality due to slightly increased temperatures, decreased cardiovascular diseases, and a positive impact on respiratory health.⁷⁷

Figure 6.⁷⁸



Picture: Dr. Sherwood Idso showing the effect of carbon dioxide on spruce trees under different atmospheric carbon dioxide concentrations.

Dr. Legates further expands in follow-up questions important science on marine life and some of the concerns that have been raised about ocean acidification:

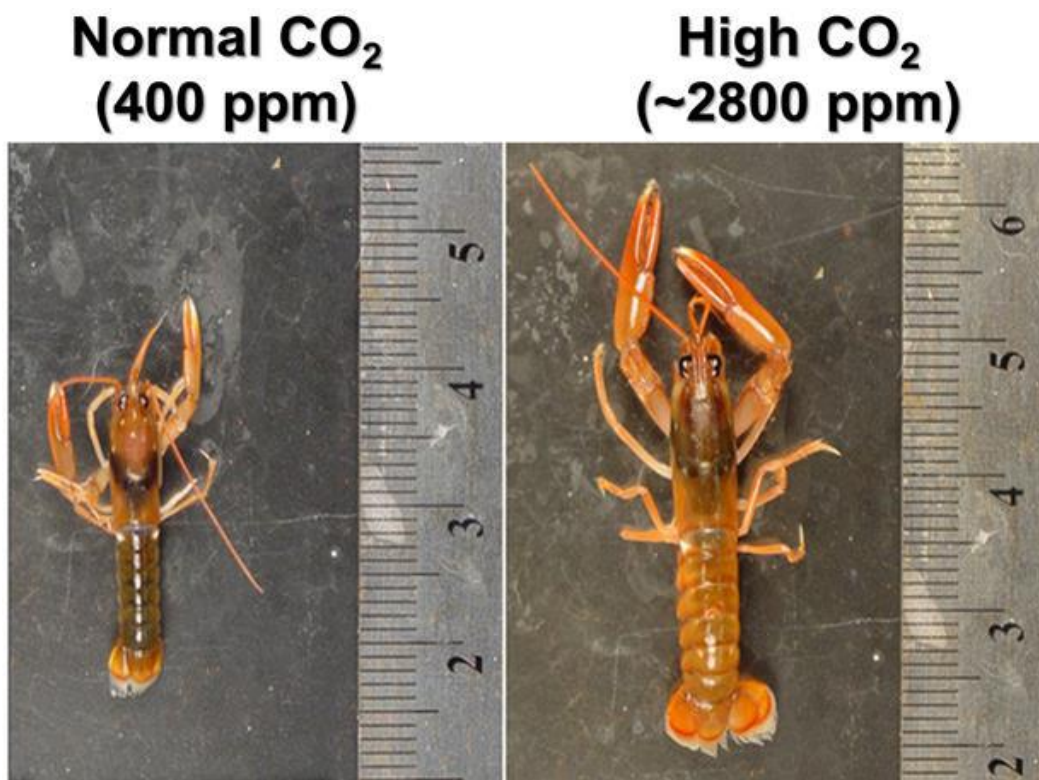
The other big concern is oceanic acidification. Although the oceans will remain alkaline (or basic), upwelling zones are the most productive where nutrients and phytoplankton are more prevalent. Ironically, these areas are where the oceans are the least alkaline. When Dr. Jane Lubchenco, Under Secretary of Commerce for Oceans and Atmosphere, testified on December 2, 2009 on “The Administration’s View on the State of Climate Science,” she said, “So who in the ocean is affected by this [acidification]? Any plant or animal that has a shell or skeleton made of calcium carbonate...the hard parts of many familiar animals such as oysters, clams, corals, lobsters, crabs...are made of calcium carbonate.” Her figures show

⁷⁷ *Farming, Fishing, Forestry, and Hunting in an Era of Changing Climate: Hearing Before the Subcomm. on Green Jobs and the New Economy of the S. Comm. on Env’t and Pub. Works, 113th Cong. 5 (2014) (responses to questions for the record of Dr. David R. Legates).*

⁷⁸ *Id.* at 4 (Figure provided by Dr. Sherwood Idso, President, Ctr. for the Study of Carbon Dioxide and Global Change).

shells dying in low pH (acidic) conditions. But as recent research has noted, “Most of these experiments used semicontinuous cultures, in which the carbonate system was modified by the addition of acid and/or base to control pH” (Iglesias-Rodriguez *et al.*, 2008) and “...previous lab studies...used hydrochloric acid, not carbon dioxide [carbonic acid], to lower the pH of the water in the calcification studies (Pennisi, 2009). Research by Dr. Justin Ries has shown that for the Maine lobster (Figure 2) and the blue crab (Figure 3) higher concentrations of carbon dioxide enhance growth rather than stunt it. This is because the chemistry is different for water acidified by hydrochloric acid (HCl) than carbonic acid (H₂CO₃). Iglesias-Rodriguez *et al.* (2008) concludes, “Increased atmospheric CO₂ also enhances marine life, in contradiction to previous claims where lower pH in the ocean was said to be dissolving calcium material (*i.e.*, CaCO₃) and therefore causing harm to marine life.”⁷⁹

Figure 7.⁸⁰

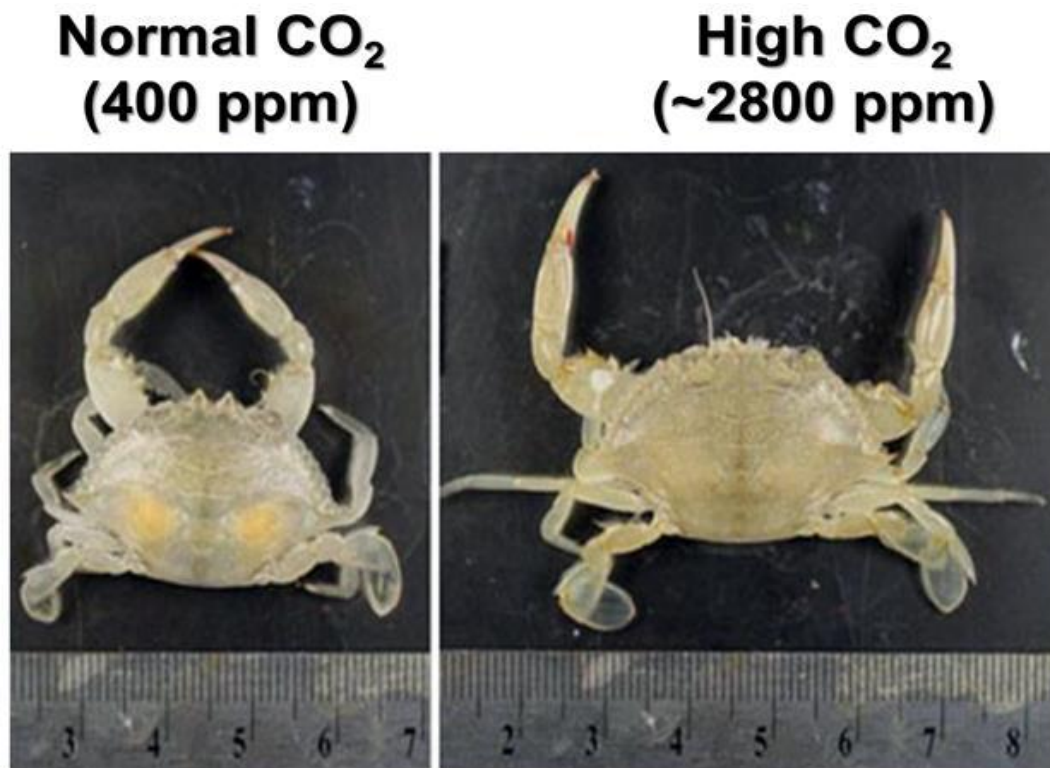


Picture: Effect of different carbon dioxide concentrations on the development of Maine lobsters. Picture provided by Dr. Justin Ries, University of North Carolina-Chapel Hill.

⁷⁹ *Id.* at 5.

⁸⁰ *Id.* (Figure 7 provided by Dr. Justin Ries, University of North Carolina-Chapel Hill).

Figure 8.⁸¹



Picture: Effect of different carbon dioxide concentrations on the development of Blue Crabs. Picture provided by Dr. Justin Ries, University of North Carolina-Chapel Hill.

Perhaps Dr. Moore says it best, in quoting directly from his book *Confessions of a Greenpeace Dropout*:

It has been widely reported in the media, based on a few scientific papers that the increasing levels of CO₂ in the atmosphere will result in “ocean acidification,” threatening coral reefs and all marine shellfish with extinction within 20 years. The story goes like this: The oceans absorb about 25 percent of the CO₂ we emit into the atmosphere each year. The higher the CO₂ content of the atmosphere, the more CO₂ will be absorbed by the oceans. When CO₂ is dissolved in water, some of it is converted into carbonic acid that has a weak acidic effect. If the sea becomes more acidic, it will dissolve the calcium carbonate that is the main constituent of coral and the shells of clams, shrimp, crabs, etc. It is one more doomsday scenario, predicting the seas will “degrade into a useless tidal desert”.⁸²

In his latest book, *Earth: Making a Life on a Tough New Planet*, Bill McKibben claims, “Already the ocean is more acid than any time in the last 800,000 years, and at current rates by 2050 it will be more corrosive than any time in the past 20 million years.” In typical hyperbolic fashion, McKibben, the author of the well-known essay, “The End of Nature,” uses the words acid and corrosive as if the

⁸¹ *Id.* at 6 (Figure provided by Dr. Justin Ries, University of North Carolina-Chapel Hill).

⁸² Moore, *supra* note 63, at 382.

ocean will burn off your skin and flesh to the bone if you dare swim in it in 2050. This is just plain fear-mongering.

Results of research published in the journal *Science* by M.R. Palmer *et al.*, indicate that over the past 15 million years, “All five samples record surface seawater pH values that are within the range observed in the oceans today, and they all show a decrease in the calculated pH with depth that is similar to that observed in the present-day equatorial Pacific.” The five samples recorded pH values for 85,000 years ago and for 2.5, 6.4, 12.1, and 15.7 million years ago.⁸³

First, one should point out that the ocean is not acidic, it has a pH of 8.1, which is alkaline, the opposite of acidic. A pH of 7 is neutral, below 7 is acidic, above 7 is alkaline. Researchers have reported in scientific journals that the pH of the seas has gone down by 0.075 over the past 250 years, “Between 1751 and 1994 surface ocean pH is estimated to have decreased from approximately 8.179 to 8.104 (a change of -0.075).” One has to wonder how the pH of the ocean was measured to an accuracy of three decimal places in 1751 when the concept of pH was not introduced until 1909.⁸⁴

It turns out that just as with climate science in general, these predictions are based on computer models. But oceans are not simple systems whose components can just be plugged into a computer. First, there is the complex mix of elements and salts dissolved in the sea. Every element on Earth is present in seawater and these elements interact in complex ways. Then there is the biological factor, tens of thousands of species that are consuming and excreting every day. The salt content of seawater gives the oceans a very large buffering capacity against change in pH. Small additions of acidic and alkaline substances can easily alter the pH of freshwater, whereas seawater can neutralize large additions of acidic and alkaline substances.

One of the most important biological phenomena in the sea is the combining of calcium, carbon, and oxygen to form calcium carbonate, CaCO_3 , the primary constituent of corals and shells, including the skeletons of microscopic plankton. The formation of calcium carbonate is called calcification. All of the vast chalk, limestone, and marble deposits in the earth’s crust are composed of calcium carbonate, which was created and deposited by marine organisms over millions of years. The carbon in calcium carbonate is derived from CO_2 dissolved in seawater. One might therefore imagine that an increase in CO_2 in seawater would enhance calcification rather than destroy it. It turns out this is precisely the case.

As is the case with terrestrial plants, it has been thoroughly demonstrated that increased CO_2 concentration in the sea results in higher rates of photosynthesis and faster growth. Photosynthesis has the effect of increasing the pH of the water, making it more alkaline, counteracting any minor acidic effect of the CO_2 itself.⁸⁵

⁸³ *Id.* at 383.

⁸⁴ *Id.* at 385.

⁸⁵ *Id.* at 386.

The owners of saltwater aquariums often add CO₂ to the water in order to increase photosynthesis and calcification, a practice that is similar to greenhouse growers adding CO₂ to the air in their greenhouses to promote the faster growth of plants. The vast bulk of scientific literature indicates increased CO₂ in the ocean will actually result in increased growth and calcification, as opposed to the catastrophe scenario pushed by the NRDC, Greenpeace, and many other activist organizations.⁸⁶

A long list of scientific publications that support the view that increased CO₂ in seawater results in increased calcification can be found on the CO₂ Science website.⁸⁷ A paper by Atkinson *et al.*, published in the journal *Coral Reefs*, states that their finding “seems to contradict conclusions ...that high CO₂ may inhibit calcification.”⁸⁸

Questions for Critical Thinking:

1. Given that the federal government failed to consider any of the benefits of higher CO₂ concentration in the atmosphere cited in this section in developing the Social Cost of Carbon, how is it possible that the EPA’s estimates of the Social Cost of Carbon is correct?
2. Should the Social Cost of Carbon estimates have considered the multiple benefits of higher CO₂ concentration in the atmosphere that empirical evidence has shown and weighted those potential effects more heavily than the model predictions?
3. Why have media outlets largely ignored or refused to publish the uncertainties of the impacts to our oceans, the many factors influencing ocean life, and the potential benefits to ocean life from CO₂?
4. How often are the benefits to plant life, and the fact that CO₂ is “plant food” which makes the process of photosynthesis possible, ignored in media stories that identify CO₂ as a pollutant?

⁸⁶ *Id.* at 387-388.

⁸⁷ *Id.* at 389.

⁸⁸ *Id.* at 390.

III. SEA LEVEL RISE: IT'S MEASURED IN MILLIMETERS, NOT FEET

*Science is built up of facts, as a house is built of stones; but an accumulation of facts is no more science than a heap of stones a house.*⁸⁹ —Jules Henri Poincaré, French Mathematician

Predictions:

1. “In 1989, Noel Brown, then-Director of the United Nations Environment Program (UNEP) New York office, warned of a ‘10-year window of opportunity to solve’ global warming. ‘A senior U.N. environmental official says entire nations could be wiped off the face of the Earth by rising sea levels if the global warming trend is not reversed by the year 2000. Coastal flooding and crop failures would create an exodus of ‘eco-refugees,’ threatening political chaos.’”⁹⁰ —*Miami Herald*, July 5, 1989
2. “By the year 2100, ‘Global mean sea level will rise 15 to 95 centimeters.’”⁹¹ —*New York Times*, December 1, 1997
3. “Rising sea levels, desertification and shrinking freshwater supplies will create up to 50 million environmental refugees by the end of the decade, experts warn today.”⁹² —*UK Guardian*, October 11, 2005
4. “The last time the world was three degrees warmer than today – which is what we expect later this century – sea levels were 25m higher (75 feet). So that is what we can look forward to if we don’t act soon. None of the current climate and ice models predict this. But I prefer the evidence from the Earth’s history and my own eyes. I think sea-level rise is going to be the big issue soon, more even than warming itself.”⁹³ —James Hansen, Climate Activist and Adjunct Professor at Columbia University

Claims:

1. “The newer analyses that have been done since the IPCC report came out indicate that the upper limit for the year 2100 is probably between 1 and 2 meters, and those are the numbers that I now quote, because they are the latest science.”⁹⁴ —John Holdren, White House Science Advisor

⁸⁹ Henri Poincare, *Quotable Quote*, GOODREADS, INC., <http://www.goodreads.com/quotes/4065-science-is-built-up-of-facts-as-a-house-is> (last visited Sept. 3, 2014).

⁹⁰ *Gore’s Really Inconvenient Timing- ‘Consensus’ On Man-Made Global Warming Collapses in 2008*, REPUBLICAN ENV’T AND PUB WORKS COMM., July 18, 2008, http://www.epw.senate.gov/public/index.cfm?FuseAction=Minority.Blogs&ContentRecord_id=37ae6e96-802a-23ad-4c8a-edf6d8150789.

⁹¹ *Id.*

⁹² David Adam, *50m environmental refugees by end of decade, UN warns*, THE GUARDIAN, Oct. 11, 2005, <http://www.guardian.co.uk/environment/2005/oct/12/naturaldisasters.climatechange1>.

⁹³ Jim Hansen, *Climate change: On the edge*, THE INDEPENDENT, Feb. 17, 2006, <http://www.independent.co.uk/environment/climate-change-on-the-edge-466818.html>.

⁹⁴ *Hearing before the Comm. On Commerce, Science, and Trans.*, 111th Cong., (2009) (statement of John Holdren, White House Science Advisor).

2. “Sea level could rise more than six feet by the end of the century” and “could continue rising a foot each decade after that.”⁹⁵ —Jeff Goodell for *Rolling Stone*, June 20, 2013

The Latest Science:

Both the predictions and claims are highly inconsistent with the latest science. In fact, the United Nations has already made their 2005 prediction disappear.⁹⁶ Citing NOAA directly, the “numbers represent the globally averaged changes in sea level and have magnitudes on the order of millimeters per year.”⁹⁷ Accordingly, at the current rate of sea level rise, it would take approximately 25,000 years (around the year 27013) for the oceans to reach Hansen’s 2006 prediction levels rather than something “we expect” to reach by the year 2100.⁹⁸

During his 2009 confirmation hearing, Dr. John Holdren, the present White House science advisor, retracted from his prior claim that sea levels could rise “13 feet” and instead revised down his own predictions to match the lower numbers from the IPCC 2007 report. The following is an excerpt from the February 12, 2009, hearing:

Senator Vitter: Final question: In 2006, obviously pretty recently, in an article, “The War on Hot Air,” you suggested that global sea levels could rise by 13 feet by the end of this century. And in contrast to that, the IPCC’s 2007 report put their estimate at between 7 and 25 inches. So their top line was 25 inches, about 2 feet. What explains the disparity?

Dr. Holdren: My statement was based on articles in the journals *Science* and *Nature*, peer reviewed publications by some of the world’s leading specialists in studying ice, who had concluded that twice in the last 19,000 years, in natural warming periods of similar pace to the warming period that we’re experiencing now, in large part because of human activities, sea level went up by as much as 2 to 5 meters per century.

Senator Vitter: The bottom line: Do you think the better worst-case estimate is 25 inches or 13 feet?

Dr. Holdren: The newer analyses that have been done since the IPCC report came out indicate that the upper limit for the year 2100 is probably between 1 and 2 meters, and those are the numbers that I now quote, because they are the latest science.⁹⁹

A further review of the science shows that the rate of sea level change has been found to be larger in the early part of last century (2.03 ± 0.35 mm/yr 1904–1953), in comparison with the

⁹⁵ Jeff Goodell, *Goodbye, Miami*, ROLLING STONE, June 20, 2013, <http://www.rollingstone.com/politics/news/why-the-city-of-miami-is-doomed-to-drown-20130620>.

⁹⁶ U.S. DEP’T OF COMMERCE, NAT’L OCEANIC AND ATMOSPHERIC ADMIN. THE BUDGET OF RECENT GLOBAL SEA LEVEL RISE 2005–2012 (2012).

⁹⁷ *Id.*

⁹⁸ *Id.*

⁹⁹ *Hearing before the Comm. On Commerce, Science, and Trans.*, 111th Cong., (2009) (statement of John Holdren, White House Science Advisor).

latter part (1.45 ± 0.34 mm/yr 1954–2003).¹⁰⁰ Analysis from a recent peer-reviewed study had findings consistent with the following:¹⁰¹

Although the mean rate of change of global mean sea level is found to be greater in the first half of the twentieth century, the two rates are consistent with being the same at the 95% confidence level, given their individual standard errors. However, a greater rate of rise in the early part of the record is consistent with previous analyses of tide gauge records which suggested a general deceleration in sea level rise during the 20th century [Woodworth, 1990; Douglas, 1992; Jevrejeva *et al.*, 2006]. A twentieth century deceleration is consistent with the work of Church and White [2006] who, although finding evidence for a post-1870 acceleration based on an EOF reconstruction of global sea level, found that much of the overall acceleration occurred in the first half of the 20th century. Church and White [2006] suggested that the greater rate of sea level rise observed in the first half of last century was due to reduced volcanic emissions (and hence also lower variability in sea level) during the 1930s to 1960s. This idea is supported by results from the HadCM3 model which suggest that the simulated global mean sea level did not accelerate through the twentieth century due to the offsetting of anthropogenic warming by reduced natural forcing [Gregory *et al.*, 2006].¹⁰²

The Senate Environment and Public Works Committee was fortunate to have Dr. Judith Curry, Chair of the School of Earth and Atmospheric Sciences at the Georgia Institute of Technology, testify on the complexity and science of sea level change in July 2013:

Global sea level has been rising for the past several thousand years. The key issue is whether the rate of sea level rise is accelerating owing to anthropogenic global warming. It is seen that the rate of rise during 1930-1950 was comparable to, if not larger than, the value in recent years. Hence the data does not seem to support the IPCC's conclusion of a substantial contribution from anthropogenic forcings to the global mean sea level rise since the 1970s. Further, the growing realization of the importance of land water storage to sea level rise is diminishing the percentage of sea level rise that is associated with warming. Better understanding of natural versus anthropogenic components of sea level rise and the impacts of land use (especially groundwater depletion) on sea level rise is needed to effectively evaluate policy responses to sea level rise.¹⁰³

Figure 9 shows local trends in sea level for the U.S. coast. The predominant arrow color is green (0-3 mm/yr), which is nominally below mean global sea level rise. In Florida, sea level is rising at a rate of only 0.75 to 2.4 mm/yr. By contrast, Louisiana sea level rise exceeds 9 mm/yr. The Mid Atlantic coast has sea level

¹⁰⁰ S.J. Holgate, *On the decadal rates of sea level change during the twentieth century*, 34 GEOPHYSICAL. RES. LETTERS L01602 (2007), available at <http://onlinelibrary.wiley.com/doi/10.1029/2006GL028492/abstract>.

¹⁰¹ *Id.*

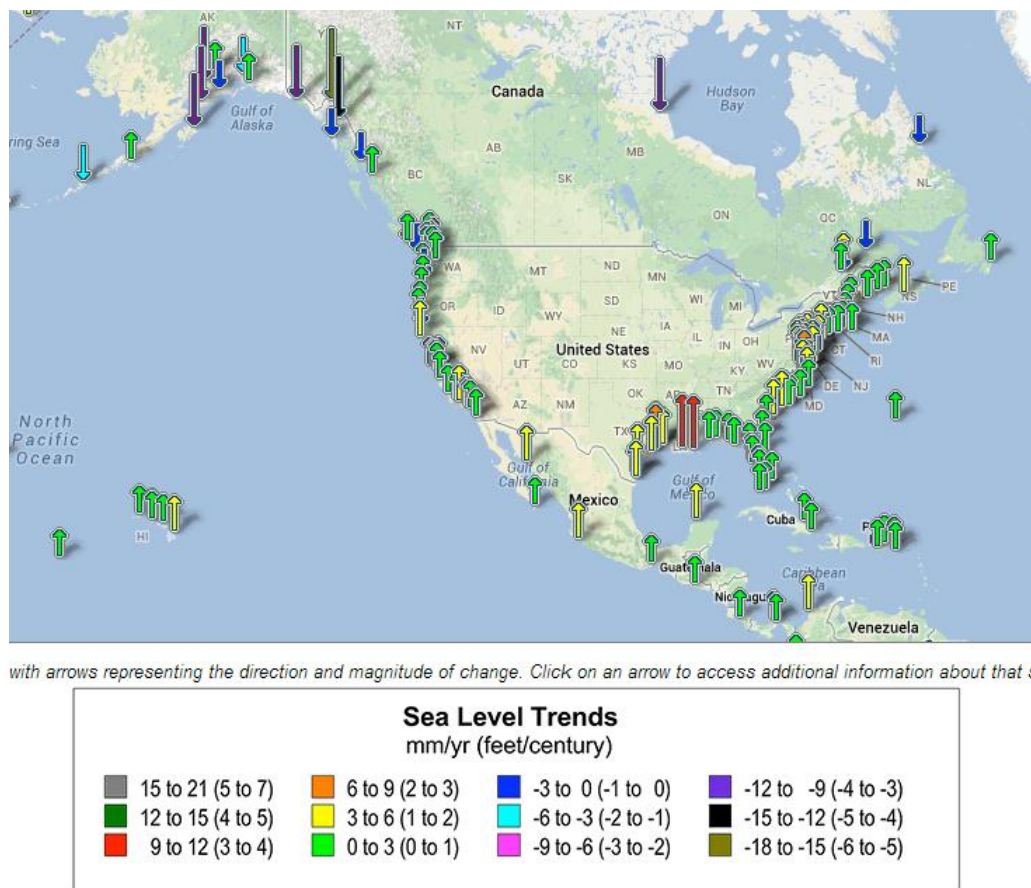
¹⁰² *Id.*

¹⁰³ *Review of the President's Climate Action Plan: Hearing Before the S. Comm. on Env't and Pub. Works*, 113th Cong. 6 (2014) (testimony of Dr. Judith Curry).

risers ranging from 2.5 to 6 mm/yr. Along the coast of the Gulf of Alaska, sea level is decreasing at rates exceeding -10 mm/yr.¹⁰⁴

Many locations have a rate of sea level rise that differs significantly from the global average value. This occurs owing to the dominance of local factors (geologic and/or land use) on sea level rise. Projected rates of sea level rise for the period 2081-2100 depend on emission scenarios, and range Page 11 of 14 from 3 to 15 mm/yr, with most scenarios projecting a substantial acceleration over the current rate. Sea level rise projections using climate models may be too high owing to biases in sensitivity to greenhouse gases, and projections based on semi-empirical models may be too high owing to insufficient consideration given to land water storage. Assessing vulnerability of individual locations to anthropogenically-induced sea level rise also needs to account for local factors (e.g. geologic and land use) driving sea level rise as well as natural variability in sea level rise.¹⁰⁵

Figure 9.¹⁰⁶



Picture: Local trends in sea level determined from tide stations, with arrows representing the direction and magnitude of the change. <http://tidesandcurrents.noaa.gov/sltrends>.

¹⁰⁴ *Id.* at 10.

¹⁰⁵ *Id.* at 11.

¹⁰⁶ *Id.*

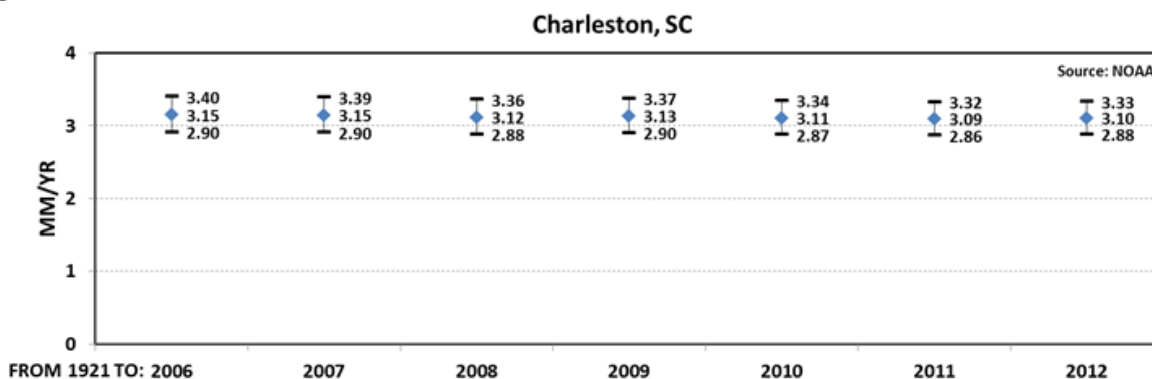
One of the Senate’s expert witnesses, Dr. David South, Emeritus Professor of Forestry, Auburn University, has gone so far as to start offering up bets on the issue of sea level rise.¹⁰⁷ During his testimony his focus was on South Carolina in particular, and the following is informative:

I would like to take this opportunity to offer another “global warming” bet. This time the outcome will be based on sea level data for Charleston, SC. Recently I was told that “If we do nothing to stop climate change, scientific models project that there is a real possibility of sea level increasing by as much as 4 feet by the end of this century”.¹⁰⁸

At Charleston, the rate of increase in sea level has been about 3.15 mm per year. A four foot increase (over the next 86 years) could be achieved by rate of 14 mm per year. I am willing to bet \$1,000 that the mean value (e.g. the 3.10 number for year 2012 in Figure 16) will not be greater than 7.0 mm/yr for the year 2024. I wonder, is anyone really convinced the sea will rise by four feet, and if so, will they take me up on my offer? Dr. Julian Simon said making bets was a good way to see who was serious about their beliefs and who is just “talking the talk”.¹⁰⁹

The short-term trend shows no increase in the rate of sea level rise despite the increase in CO₂ emissions during this time period:

Figure 10.¹¹⁰



¹⁰⁷ David South, Letter to Mr. Henry Paulson, Jr. (July 31, 2014) (on file with author).

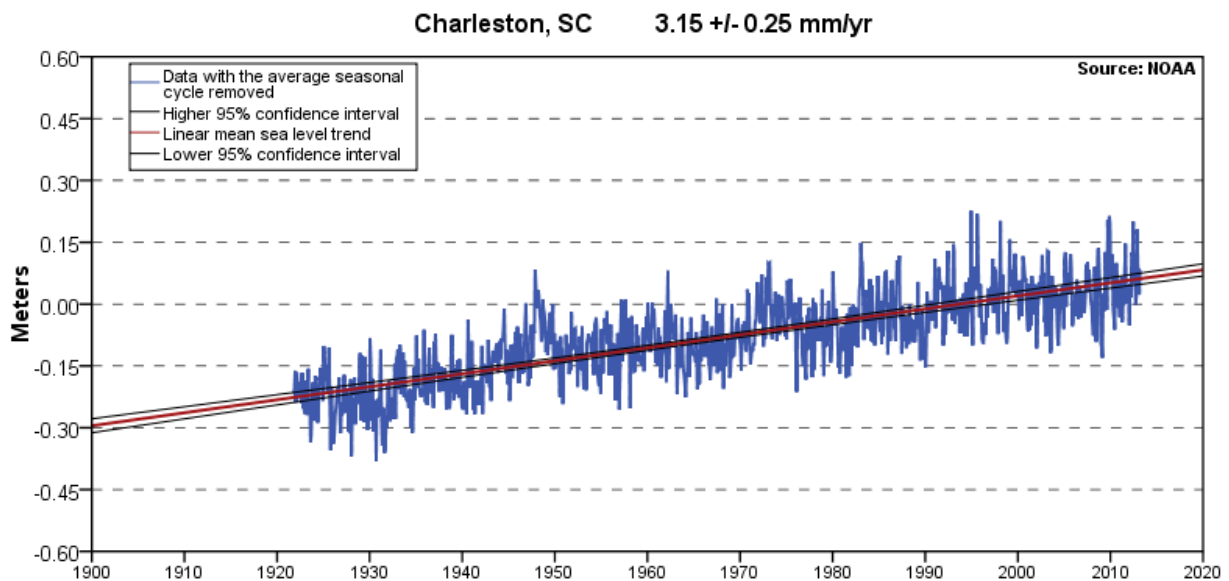
¹⁰⁸ *Farming, Fishing, Forestry, and Hunting in an Era of Changing Climate: Hearing Before the Subcomm. on Green Jobs and the New Economy*, 113th Cong. 17 (2014) (testimony of Dr. David South) (quoting Sen. Dianne Feinstein, Address before Cong. (Mar. 10, 2014)).

¹⁰⁹ *Id.*

¹¹⁰ *Id.*

The long-term rate is as follows:

Figure 11.¹¹¹



Graph: http://tidesandcurrents.noaa.gov/sltrends/sltrends_station.shtml?stnid=8665530

A review of tide gauge data from other parts of the world also show no increase in the rate of sea level rise, and are included as an Addendum on page 80.

Questions for Critical Thinking:

1. If the present rate of sea level rise would put the world on pace to see an increase of less than 7 inches by the end of the century, then where are the data sets the IPCC and other advocates use to come up with estimates that are in feet and/or meters?
2. What data did Al Gore rely on to come to the conclusion that the oceans would rise 20 feet or more?
3. What exactly is meant by the statement that the scientific literature “is consistent with previous analyses of tide gauge records which suggested a general deceleration in sea level rise during the 20th century?”¹¹²
4. If empirical evidence suggests that the sea level has been rising since the last ice age, and regional impacts are also significantly influenced by land use decisions, isn’t sea level rise something local planners should have been considering regardless of theoretical impacts from CO₂ emissions?

¹¹¹ *Id.* at 18.

¹¹² S.J. Holgate, *On the decadal rates of sea level change during the twentieth century*, 34 GEOPHYSICAL. RES. LETTERS L01602 (2007), available at <http://onlinelibrary.wiley.com/doi/10.1029/2006GL028492/abstract>.

IV. EXTREME WEATHER: DROUGHTS, HEAT WAVES, HURRICANES AND TEMPERATURES

*When the number of factors coming into play in a phenomenological complex is too large, scientific method in most cases fails. One need only think of the weather, in which case the prediction even for a few days ahead is impossible.*¹¹³
—Albert Einstein, German Physicist

Predictions:

1. “Increasingly, it is being recognized that other climatic factors, including changes in rainfall patterns and the frequency and intensity of hurricanes, cyclones and wildfire, may have far greater consequences than a rise in temperature.”¹¹⁴ —*New York Times*, August 17, 1993
2. “Global warming is likely to produce a significant increase in the intensity and rainfall of hurricanes in coming decades, according to the most comprehensive computer analysis done so far.”¹¹⁵ —*New York Times*, September 30, 2004
3. “From heat waves to storms to floods to fires to massive glacial melts, the global climate seems to be crashing around us.”¹¹⁶ —*TIME*, March 26, 2006

Claims:

1. “At the same time, we must be very clear. Hurricane Sandy is a wake-up call for all Americans that we must act to reverse global warming. While scientists do not attribute this storm or any single weather disturbance to global warming, it is increasingly clear that global warming is fueling more extreme weather disturbances.”¹¹⁷ —Senator Bernie Sanders
2. “Heat waves, droughts, wildfires, and floods—all are now more frequent and intense.”¹¹⁸ —President Obama
3. “The effects of climate change, driven by carbon pollution, hit Americans harder each year. Extreme weather events like hurricanes, wildfires and droughts are growing ever more frequent and severe.”¹¹⁹ —Senator Sheldon Whitehouse

¹¹³ *Science, Philosophy and Religion, A Symposium*, published by the *Conference on Science, Philosophy and Religion in Their Relation to the Democratic Way of Life, Inc.*, New York (1941); later published in *Out of My Later Years* (1950).

¹¹⁴ *Dangers to Forests Seen From Warming*, N.Y. TIMES, Aug. 17, 1993, <http://www.nytimes.com/1993/08/17/science/dangers-to-forests-seen-from-warming.html>.

¹¹⁵ Andrew C. Revkin, *Global Warming is Expected to Raise Hurricane Intensity*, N.Y. TIMES, Sept. 30, 2004, http://www.nytimes.com/learning/students/pop/articles/30hurricane_LN.html.

¹¹⁶ Jeffrey Kluger, *Earth at the Tipping Point: Global Warming Heats Up*, TIME, Mar. 26, 2006, <http://www.time.com/time/magazine/article/0,9171,1176980,00.html>.

¹¹⁷ Press Release, Office of Sen. Bernie Sanders, Global Warming and Hurricane Sandy (Nov. 1, 2012) <http://www.sanders.senate.gov/newsroom/news/?id=ad66348a-d6cc-4d43-8241-c5f2bffa633>.

¹¹⁸ President Barack Obama, State of the Union Address (Feb. 12, 2013).

4. “Crop-baking droughts, home-burning fires and apocalyptic storms will define 2012 as the year we finally saw what global warming really looks like. While the Republican-led House of Representatives refuses to take climate action, carbon pollution is mixing a deadly cocktail of heat and extreme weather that is costing lives and billions of dollars in damages.”¹²⁰ —Senator Ed Markey
5. “Climate change is already here, lapping at our doorstep in the form of more extreme weather and rising sea levels. That’s why we have to deal with the realities of resiliency against these impacts we can no longer avoid, even as we try to cut the pollution that could make climate change even worse.”¹²¹ —Senator Ed Markey

The Latest Science:

Droughts have not increased:

Dr. Bjorn Lomborg: “The world has not seen a general increase in drought. A study published in *Nature* in November shows globally that ‘there has been little change in drought over the past 60 years.’ The U.N. Climate Panel in 2012 concluded: ‘Some regions of the world have experienced more intense and longer droughts, in particular in southern Europe and West Africa, but in some regions droughts have become less frequent, less intense, or shorter, for example, in central North America and northwestern Australia.’”¹²²

Dr. David South: “From 1890 to 2014, the carbon dioxide in the atmosphere has increased. Some might claim CO₂ increases are the cause of droughts (Figure 12), especially when they ‘cherry-pick’ limited time-periods that show an increasing trend in drought over time. In contrast, objective scientists look at the entire period and see no such trend.”¹²³

Dr. David South: “Some regions have experienced increased precipitation while other areas (located far from storm tracks) are likely to experience less precipitation and increased risk of drought. Since the 1950s, some regions of the world have experienced longer and more intense droughts, particularly in southern Europe and West Africa, while other regions have seen droughts become less frequent, less intense, or shorter (for example, in the USA). Some advocates are willing to scare the public by ‘cherry picking’ regions that have seen an increase in drought over time. They might plot CO₂ in the

¹¹⁹ Sen. Sheldon Whitehouse, *The Price of Ignoring Climate Change*, REUTERS, June 19, 2013, <http://blogs.reuters.com/great-debate/2013/06/19/the-price-of-ignoring-climate-change>.

¹²⁰ Press Release, H. Comm. on Natural Resources, Deadly Connection: Extreme Weather and Climate Change, (Sept. 25, 2012), <http://democrats.naturalresources.house.gov/press-release/deadly-connection-extreme-weather-and-climate-change>.

¹²¹ Press Release, Office of Sen. Ed Markey, Bicameral Task Force on Climate Change Applauds President Obama’s Commitment to Climate Change Resilience Preparation (Nov. 1, 2013), <http://www.whitehouse.senate.gov/news/release/-bicameral-task-force-on-climate-change-applauds-president-obamas-commitment-to-climate-change-resilience-preparation>.

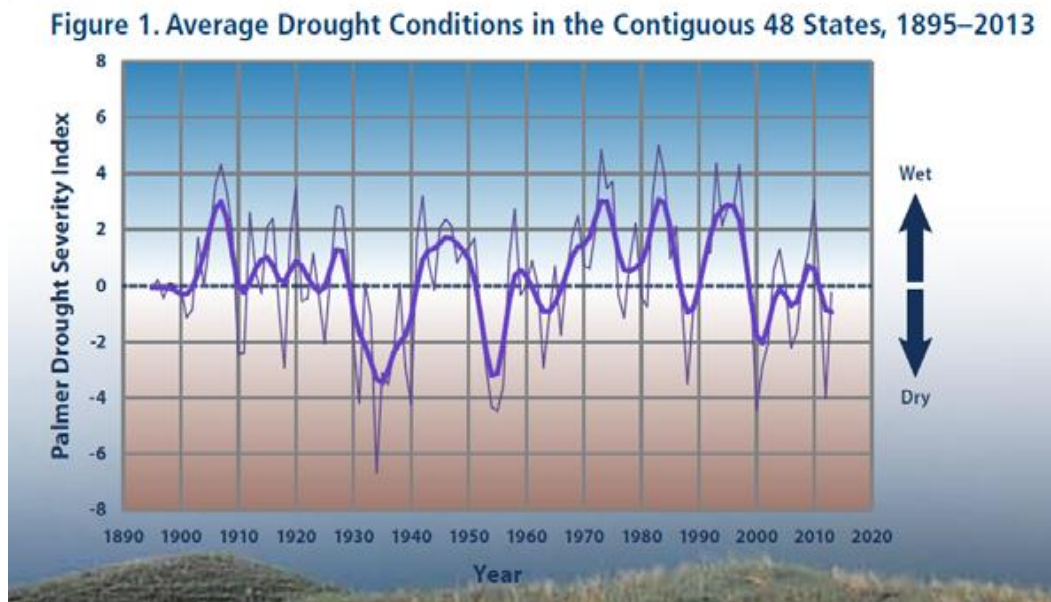
¹²² Bjorn Lomborg, *Climate-Change Misdirection*, WALL STREET J., Jan. 23, 2013,

<http://online.wsj.com/article/SB10001424127887323485704578258172660564886.html>.

¹²³ South, *supra* note 62, at 7.

atmosphere along with a trend of increasing drought (e.g. 1905 to 1935). Claiming droughts during this period were caused by carbon dioxide increases (due to a cherry-picked correlation) is both unscientific and unethical. Many advocates fail to understand that, just because results show a correlation, there is no proof of an underlying causality.”¹²⁴

Figure 12. ¹²⁵



A discussion of the possible results of soil moisture availability in a warmer world depends on a complicated interaction of two factors – changes in the precipitation climatology and increases in evapotranspiration (the combined effect of soil evaporation and plant transpiration). The impacts of these two factors are opposite in sign; precipitation, when it occurs, is likely to increase but the potential for evapotranspiration also is likely to increase, both due to the increase in the saturation vapor pressure as a function of increasing air temperature. The question then is which dominates – does the increase in precipitation compensate for the increase in the evapotranspiration demand or does the increase in air temperature reduce soil moisture reserves such that droughts will become more likely? Complicating this discussion is the fact that atmospheric circulation changes may affect the patterns of precipitation so that some areas may become more drought-prone while others may become less so. Pinpointing the exact geographical areas for which drought/increased rainfall are likely to occur lie far beyond our technology for the foreseeable future.¹²⁶

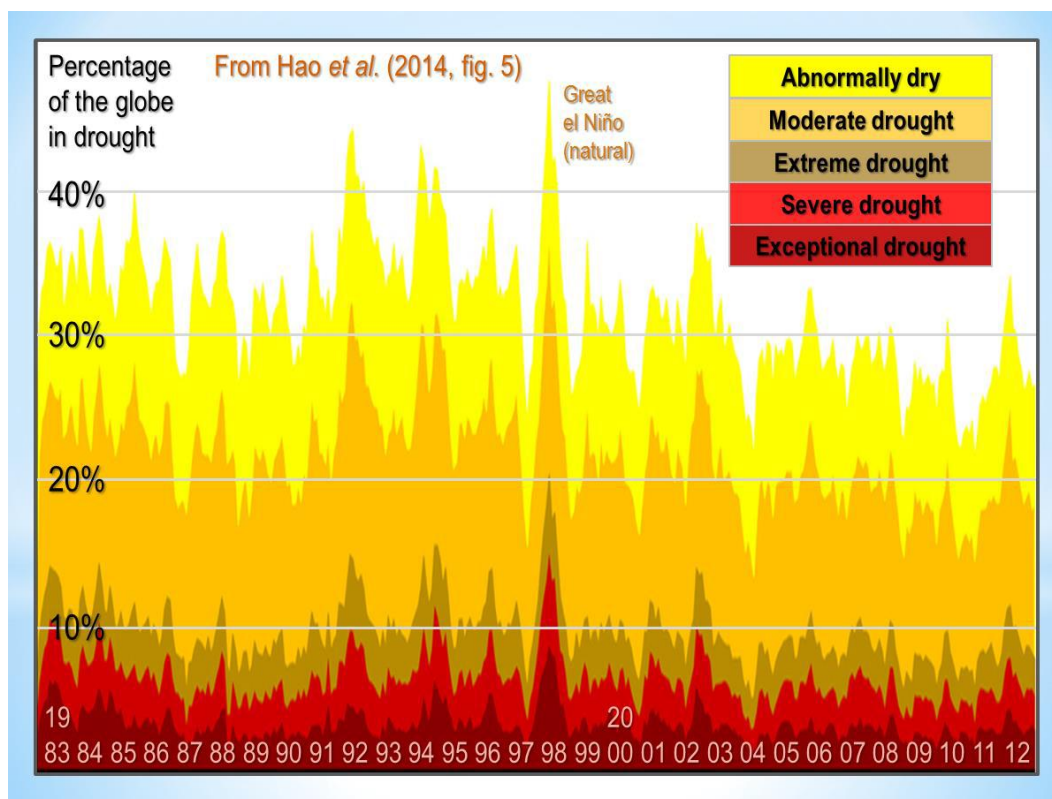
¹²⁴ *Id.*

¹²⁵ *Id.*

¹²⁶ *Farming, Fishing, Forestry, and Hunting in an Era of Changing Climate: Hearing Before the Subcomm. on Green Jobs and the New Economy of the S. Comm. on Env't and Pub. Works*, 113th Cong. 2 (2014) (testimony of Dr. David R. Legates).

Several analyses have focused on patterns and trends associated with drought. Hao *et al.* (2014) used satellite analysis to examine global patterns of drought from June 1982 through December 2012 (Figure 1). Only a slight decrease in abnormally dry and moderate drought conditions has occurred, though it is not statistically significant. Note particularly the increase in global drought in 1998 resulting from the rather strong naturally-occurring El Niño of that year. Patterns in precipitation for the Twentieth Century show no observable trend over the entire period of record for either the globe or for either hemisphere (New *et al.* 2001 – Figure 2). Regionally, the only statistically significant pattern occurs for the upper latitudes of the Northern Hemisphere (where snowfall is better measured in the latter portion of the record due to better snow-gage instruments) and for the lower latitudes of the Northern Hemisphere (dominated by the Sahel region in Africa, where overgrazing has substantially changed the landscape and, consequently, the precipitation climate of the region). Sheffield *et al.* (2012) concur with the results of Hao *et al.* (2014): “more realistic calculations...suggest there has been little change in drought over the past 60 years.”¹²⁷

Figure 13.¹²⁸

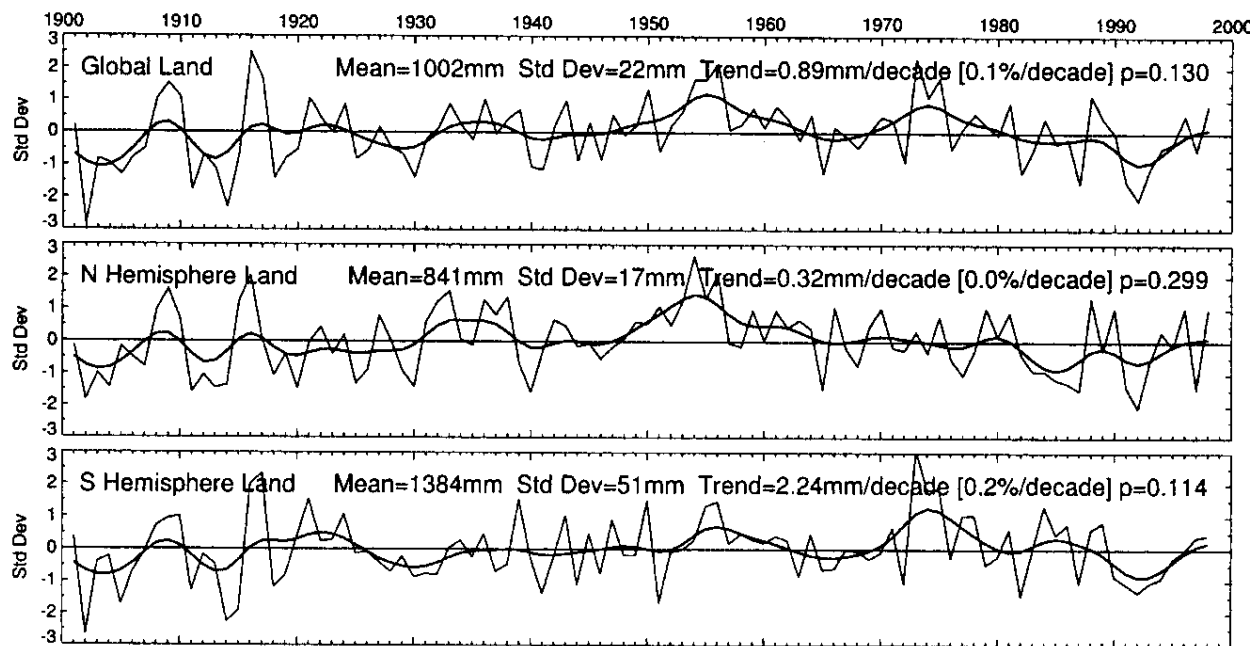


Graph: Fraction of the global land in D0 (abnormally dry), D1 (moderate), D2 (severe), D3 (extreme), and D4 (exceptional) drought condition (adapted from Figure 5 of Hao *et al.* (2014).

¹²⁷ *Id.* at 4.

¹²⁸ *Id.* at 3.

Figure 14. ¹²⁹



Graph: Precipitation for the globe and both hemispheres for the Twentieth Century (from Figure 3 of New et al. (2001). p-values indicate that none of these trends are statistically significant.

Hurricane activity has not increased:

According to Dr. Bjorn Lomborg, Director of Copenhagen Consensus Center and Adjunct Professor at Copenhagen Business School, “As for one of the favorites of alarmism, hurricanes in recent years don't indicate that storms are getting worse. Measured by total energy (Accumulated Cyclone Energy), hurricane activity is at a low not encountered since the 1970s. The U.S. is currently experiencing the longest absence of severe landfall hurricanes in over a century—the last Category 3 or stronger storm was Wilma, more than seven years ago.”¹³⁰

“While it's hardly mentioned in the media, the U.S. is currently in an extended and intense hurricane ‘drought.’”¹³¹ —Roger Pielke, Jr., Professor of Environmental Studies in the Centre for Science and Technology Policy Research at the University of Colorado

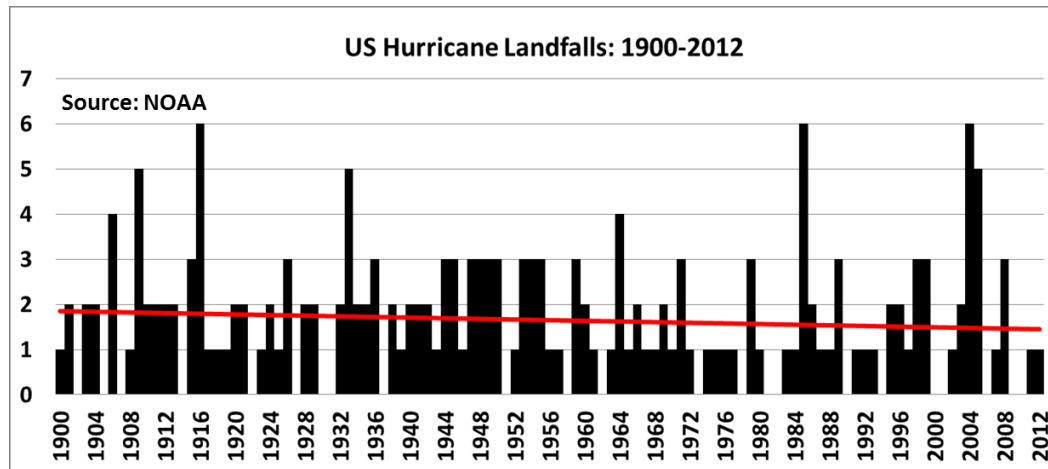
¹²⁹ *Id.* at 4.

¹³⁰ Lomborg, *supra* note 122.

¹³¹ Roger Pielke, *Hurricanes and Human Choice*, WALL STREET J., Oct. 31, 2012, <http://online.wsj.com/article/SB10001424052970204840504578089413659452702.html>.

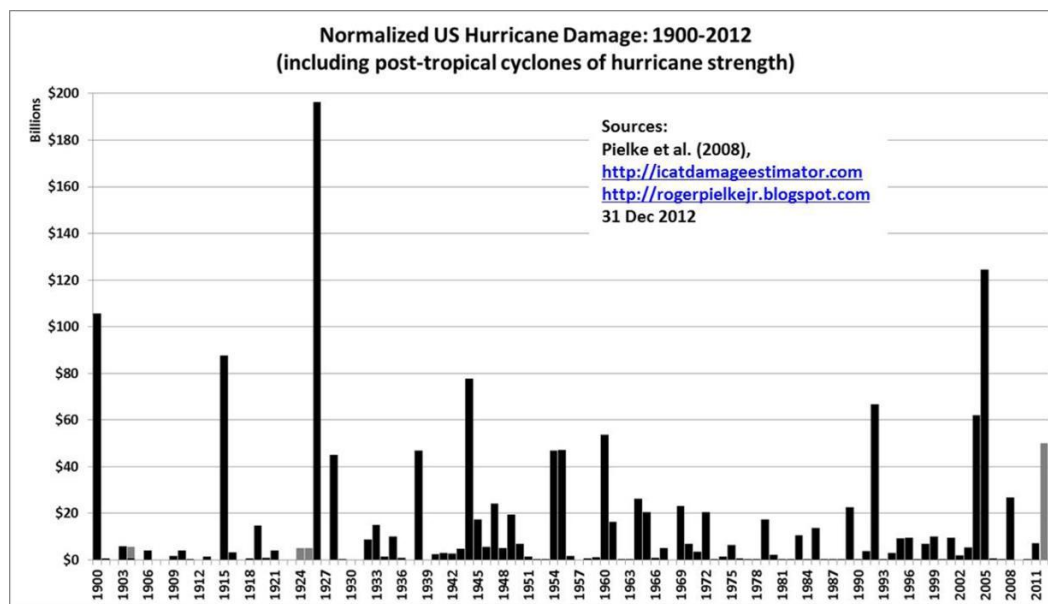
The source of the following three graphs is Professor Roger Pielke, Jr., in his July 18, 2013, testimony before the Senate EPW Committee:

Figure 15.¹³²



Graph: Number of landfalling U.S. hurricanes from 1900-2012. The red line shows the linear trend, exhibiting a decrease from about 2 to 1.5 landfalls per year since 1900. Source: NOAA.

Figure 16.¹³³

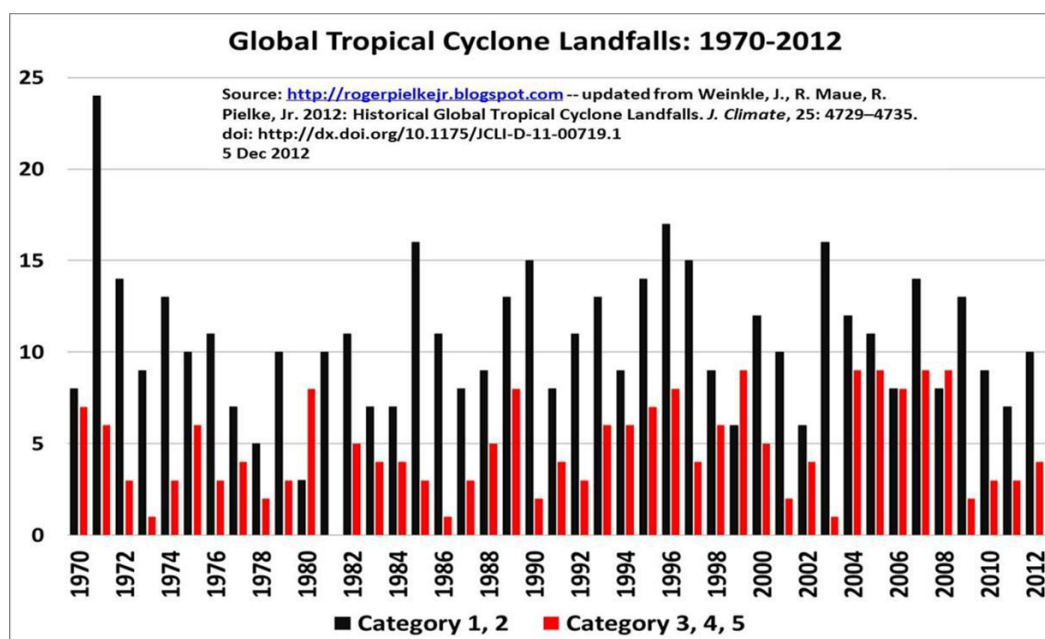


Graph: Normalized U.S. hurricane damage 1900-2012, estimated total damage if each past hurricane season occurred with 2012 levels of development. After Pielke et al. 2008. Note that the figure includes “Superstorm” Sandy (2012) in gray and placeholders for the three other post-tropical cyclones of hurricanes which made landfall in 1904, 1924 and 1925.

¹³² *Chronological List of All Hurricanes: 1851-2012*, Nat’l Oceanic & Atmospheric Admin. Hurricane Research Div., http://www.aoml.noaa.gov/hrd/hurdat/All_U.S._Hurricanes.html.

¹³³ Roger A. Pielke, Jr. et al., *Normalized Hurricane Damages in the United States: 1900-2005*, 9(1) Natural Hazards Rev. 29-42 (2008) (the data is updated to 2012 values using the ICAT Damage Estimator. ICAT Damage Estimator, <http://www.icatdamageestimator.com>).

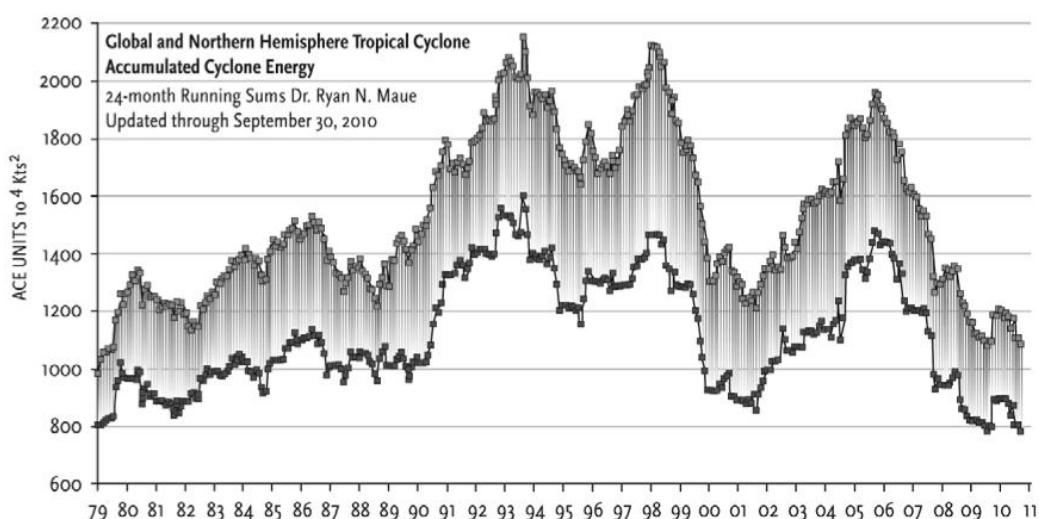
Figure 17.¹³⁴



Graph: Global tropical cyclone (called hurricanes in the North Atlantic) landfalls, 1970-2012, after Weinkle et al. 2012.

As the following graph shows, since the peak during the 1990s, the frequency and intensity of tropical cyclones has diminished considerably.¹³⁵

Figure 18.¹³⁶



Graph: Global and Northern Hemisphere tropical cyclone energy 1979 to 2010.

¹³⁴ Jessica Weinkle et al., *Historical Global Tropical Cyclone Landfalls*, 25 J. CLIMATE 4729-4735 (2012), available at <http://journals.ametsoc.org/doi/abs/10.1175/JCLI-D-11-00719.1>.

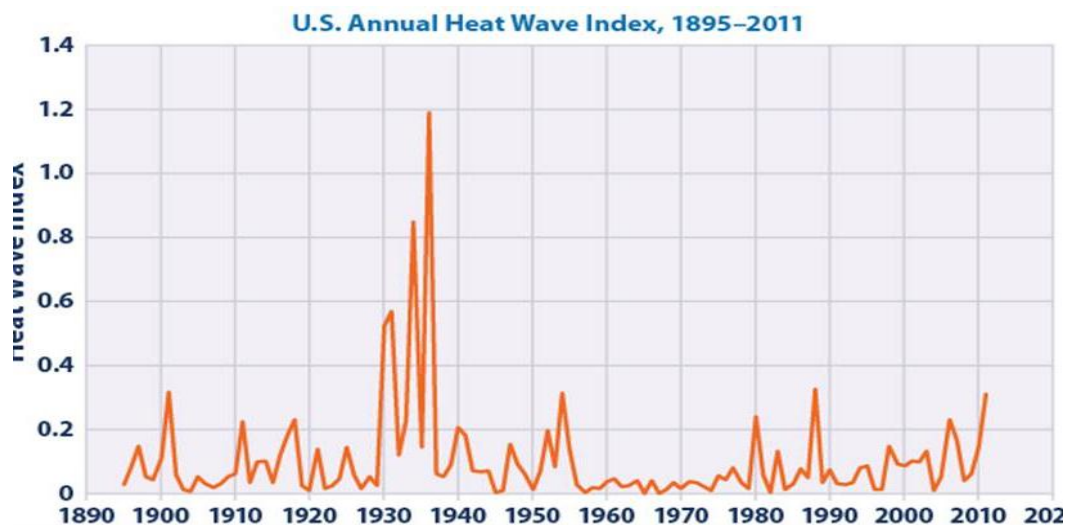
¹³⁵ Ryan Maue, *Global Tropical Cyclone Activity Update*, POLICLIMATE, <http://www.coaps.fsu.edu/~maue/tropical> (last visited Sept. 2, 2014).

¹³⁶ *Id.*

Temperature extremes have not increased:

“The ‘Dust Bowl’ years of 1930-36 brought some of the hottest summers on record to the United States, especially across the Plains, Upper Midwest and Great Lake States. For the Upper Mississippi River Valley, the first few weeks of July 1936 provided the hottest temperatures of that period, including many all-time record highs. The string of hot, dry days was also deadly. Nationally, around 5000 deaths were associated with the heat wave. In La Crosse, WI, there were 14 consecutive days (July 5th-18th) where the high temperature was 90 degrees or greater, and 9 days that were at or above 100. Six record July temperatures set during this time still stand, including the hottest day on record with 108 on the 14th. The average high temperature for La Crosse during this stretch of extreme heat was 101.”¹³⁷

Figure 19.¹³⁸

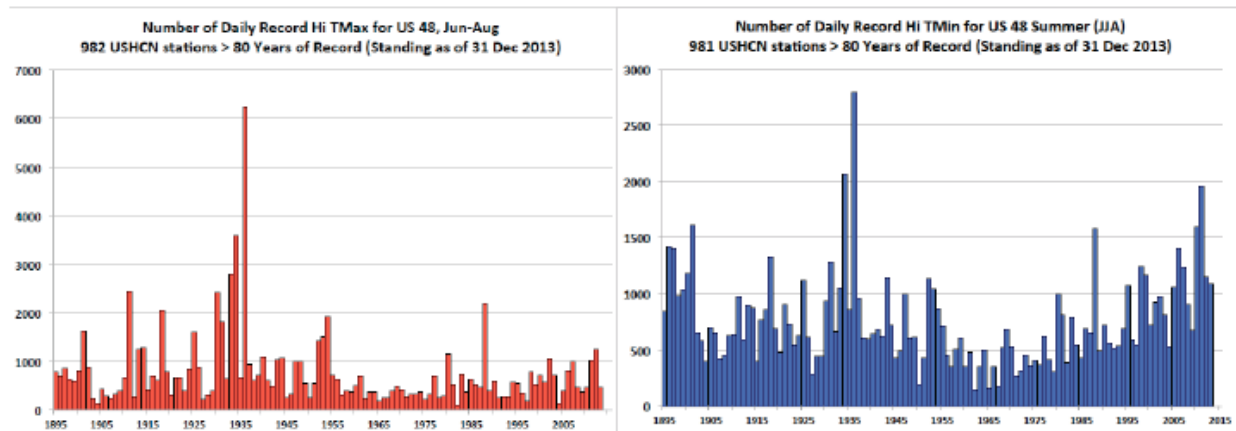


¹³⁷ *The Heatwave of July 1936*, NAT'L OCEANIC & ATMOSPHERIC ADMIN. NAT'L WEATHER SERV., <http://www.crh.noaa.gov/arx/events/heatwave36.php> (last modified Oct. 7, 2010).

¹³⁸ *Climate Change Indicators in the United States*, ENVTL. PROT. AGENCY, <http://www.epa.gov/climatechange/science/indicators/weather-climate/high-low-temps.html> (last updated July 2, 2014).

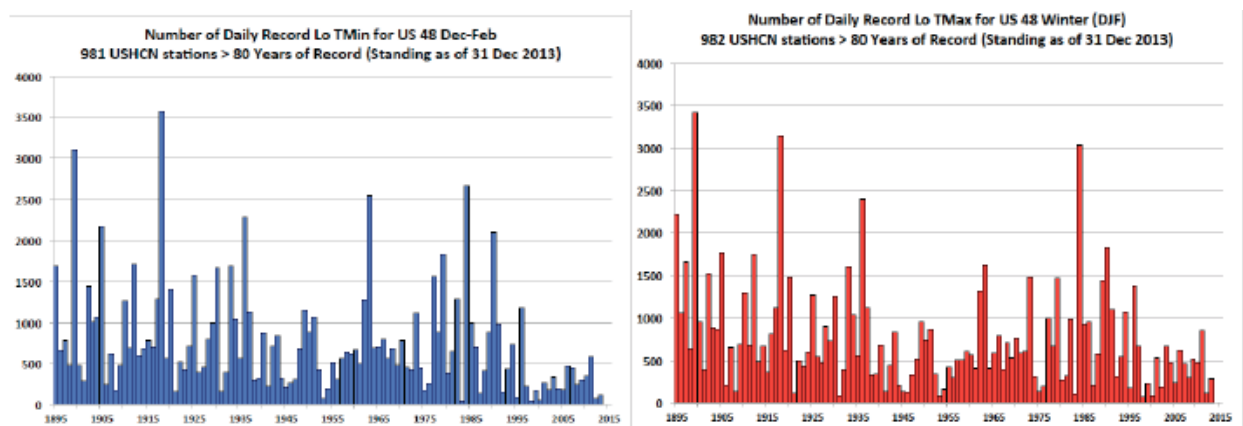
Dr. Judith Curry provided the following graphical analysis on temperature extremes as part of her recent Senate testimony:

Figure 20.¹³⁹



Graph: Number of daily record high Tmax (red; left) and Tmin (blue; right) for the summer season (Jun-Aug) for the continental U.S. Data obtained from 981 USHCN stations with surface temperature records exceeding 80 years and standing as of 12/31/13. Figure courtesy of John Christy, University of Alabama Huntsville.

Figure 21.¹⁴⁰

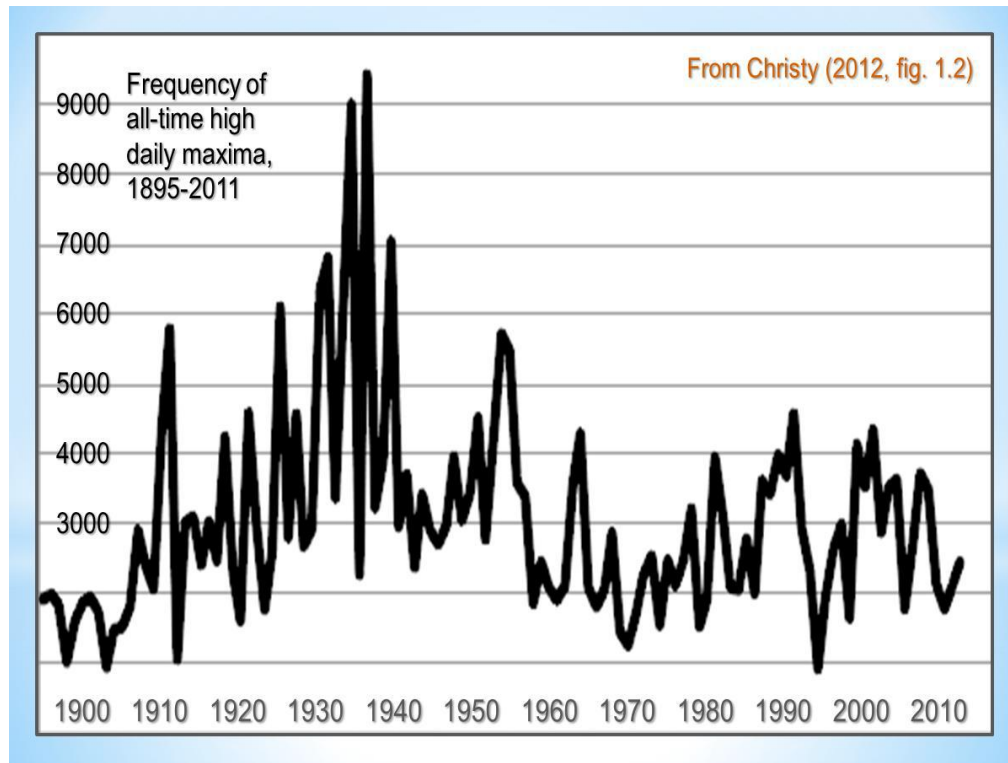


Graph: Number of daily record low Tmin (left) and Tmax (right) for the winter season (Dec-Feb) for the continental U.S. Data obtained from 981 USHCN stations with surface temperature records exceeding 80 years, and standing as of 12/31/13. Figure courtesy of John Christy, University of Alabama Huntsville.

¹³⁹ Curry, *supra* note 103, at 9.

¹⁴⁰ *Id.*

Figure 22.¹⁴¹



Graph: Frequency of all-time high maximum daily air temperatures, 1895 to 2011, at 970 USHCN stations with at least eighty years of observations (from Figure 1.2 of Christy 2012).

Questions for Critical Thinking:

1. When we are unable to predict extreme weather events, and empirical evidence does not show that extreme weather events are increasing, why would some scientists and activists claim that extreme weather events are increasing with human emissions of CO₂?
2. Did extreme weather events begin with the advent of the internal combustion engine, or does historical and geological evidence exist indicating extreme weather events have been occurring for hundreds, thousands, or even millions of years?
3. What is the level of confidence that extreme weather events won't decrease in a warming climate? Is there evidence that colder climates can be harsher for living organisms and people?
4. Given that droughts have happened in the past and are likely to happen in the future with similar frequencies and intensities, does it make sense to prepare for and mitigate drought impacts through preparation strategies such as developing more water storage capacity? Or is a smarter approach initiating CO₂ emissions controls which potentially may not impact drought conditions at all?

¹⁴¹ *Id.*

V. WILDFIRES

*Causality is the area of statistics that is most commonly misused, and misinterpreted, by nonspecialists. Media sources, politicians and lobby groups often leap upon a perceived correlation, and use it to 'prove' their own beliefs. They fail to understand that, just because results show a correlation, there is no proof of an underlying causality.*¹⁴² —Martyn Shuttleworth, Author

Claims:

1. “Climate change is increasing the vulnerability of many forests to ecosystem changes and tree mortality through fire, insect infestations, drought, and disease outbreaks.” —U.S. National Climate Assessment¹⁴³
2. “The West is being devastated by wildfires. Millions of acres are burning. Millions of acres have burned....They're occurring all over. Why? Because the climate has changed. The winters are shorter, the summers are hotter.”¹⁴⁴ —Harry Reid, U.S. Senate Majority Leader
3. “We have climate change. It's here. You can't deny it. Why do you think we are having all these fires? You can make all the excuses [that fires are disasters that] just happen every so often.”¹⁴⁵ —Harry Reid, U.S. Senate Majority Leader

The Latest Science:

“Historical analysis of wildfires around the world shows that since 1950 their numbers have decreased globally by 15%. Estimates published in the Proceedings of the National Academy of Sciences show that even with global warming proceeding uninterrupted, the level of wildfires will continue to decline until around midcentury and won't resume on the level of 1950—the worst for fire—before the end of the century.”¹⁴⁶ —Dr. Bjorn Lomborg, Director of Copenhagen Consensus Center and Adjunct Professor at Copenhagen Business School

Perhaps a better way to editorialize the misinformation related to wildfires in the public forum is best described by Dr. David South, Emeritus Professor of Forestry, Auburn University:

Policy makers who halt active forest management and kill “green” harvesting jobs in favor of a “hands-off” approach contribute to the buildup of fuels in the forest. This eventually increases the risk of catastrophic wildfires. To attribute this

¹⁴² Martyn Shuttleworth, *Correlation and Causation*, EXPLORABLE (Feb. 26, 2008), <https://explorable.com/correlation-and-causation>.

¹⁴³ U.S. GLOBAL CHANGE RESEARCH PROGRAM, U.S. National Climate Assessment: Climate Change Impacts in the United States 176 (Jerry Melillo, Terese Richmond, & Gary Yohe, eds., 2014).

¹⁴⁴ Amy Harder, *Harry Reid Blames Nevada Wildfires on Climate Change*, NATIONAL JOURNAL, July 18, 2013, <http://www.nationaljournal.com/energy/harry-reid-blames-nevada-wildfires-on-climate-change-20130718>.

¹⁴⁵ Steve Tetreault, *Reid blames climate change: 'West is burning'*, REVIEW JOURNAL, July 17, 2013, <http://www.reviewjournal.com/news/fire-rescue/reid-blames-climate-change-west-burning>.

¹⁴⁶ Lomborg, *supra* note 122.

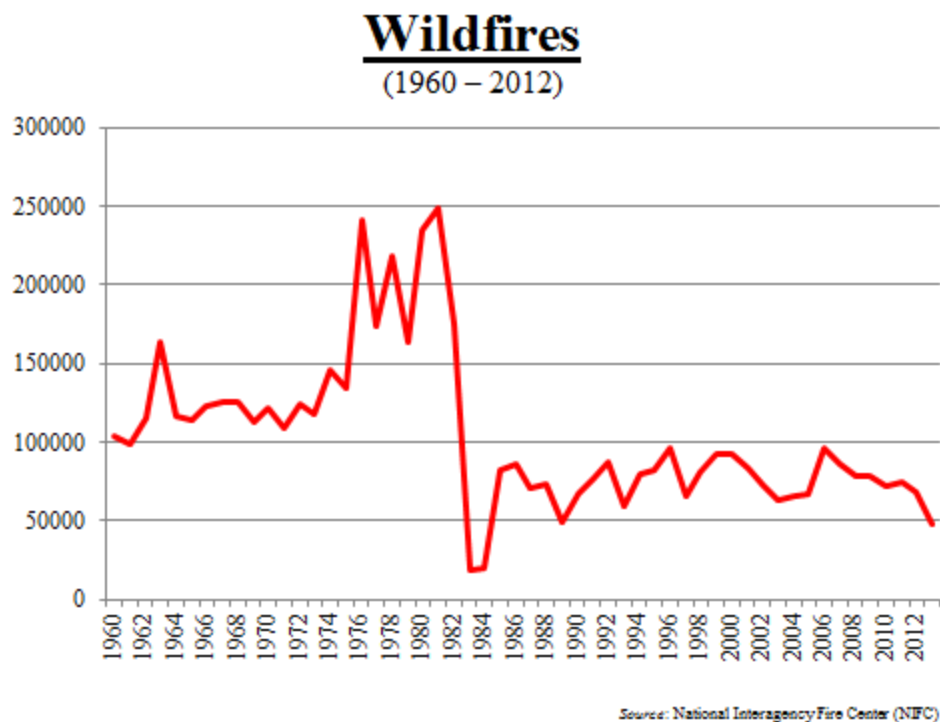
human-caused increase in fire risk to carbon dioxide emissions is simply unscientific. However, in today's world of climate alarmism, where accuracy doesn't matter, I am not at all surprised to see many journalists spreading the idea that carbon emissions cause large wildfires.¹⁴⁷

Dr. South goes on to further state that:

Untrue claims about the underlying cause of wildfires can spread like “wildfire.” For example, the false idea that “wildfires in 2012 burned a record 9.2 million acres in the U.S.” is cited in numerous articles and is found on more than 2,000 web sites across the internet. In truth, many foresters know that in 1930, wildfires burned more than 4 times that amount. Wildfire in 2012 was certainly an issue of concern, but did those who push an agenda really need to make exaggerated claims to fool the public?¹⁴⁸

In the United States, the number of wildfires over the last fifty years is as follows:

Figure 23.¹⁴⁹



Dr. South continues:

I say that intensity is directly related to fuel loads (see my testimony). In contrast, Senator Reid apparently believes those who claim that the number and size of wildfires (from 1926 to 2013) is related to atmospheric carbon dioxide. I say to

¹⁴⁷ South, *supra* note 108, at 1.

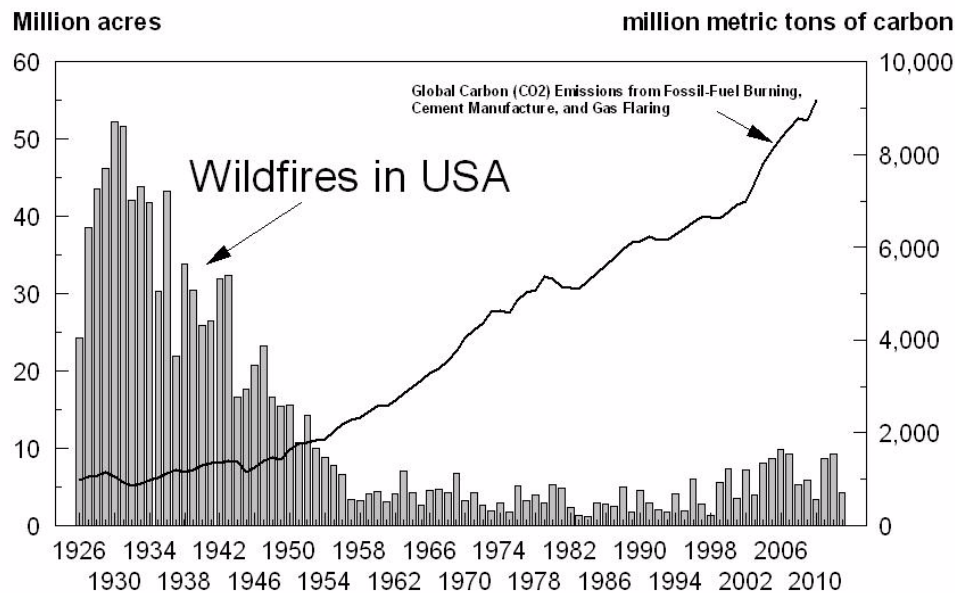
¹⁴⁸ *Id.*

¹⁴⁹ See *Statistics*, NAT'L INTERAGENCY FIRE CTR., http://www.nifc.gov/fireInfo/fireInfo_statistics.html (last visited Sept. 3, 2014).

make such a claim is unscientific and detracts from discussing policies that could be helpful in reducing the severity of wildfires.¹⁵⁰

Dr. South argues his concern not only from a position of knowledge and experience, but with empirical evidence as follows:

Figure 24.¹⁵¹



Source: 1960-2013 National Interagency Coordination Center
1926-1960; Dr. Stephen Pyne Bureau of the Census, Historical Statistics of the United States

http://cdiac.ornl.gov/ftp/ndp030/global.1751_2010.ems

In conclusion, I am certain that attempts to legislate a change in the concentration of carbon dioxide in the atmosphere will have no effect on reducing the size of wildfires or the frequency of droughts. In contrast, allowing active forest management to create economically-lasting forestry jobs in the private sector might reduce the fuel load of dense forests. In years when demand for renewable resources is high, increasing the number of thinning and harvesting jobs might have a real impact in reducing wildfires.¹⁵²

NUMBER OF WILDFIRES PER YEAR

In regards to the frequency of wildfires (since 1983), I agree with EPA. They say, "The data do not show an obvious trend during this time."¹⁵³ I want to point out that counting the number of wildfires is not an exact science. The total number for a given year can vary by more than 40,000. The average size of wildfires also

¹⁵⁰ South, *supra* note 62, at 1.

¹⁵¹ *Id.* at 2.

¹⁵² South, *supra* note 108, at 3.

¹⁵³ *Climate Change Indicators in the United States: Wildfires*, EPA 2 (May 2014), http://www.epa.gov/climatechange/pdfs/print_wildfires-2014.pdf.

likely depends on if the number for a given year was 120,000 (USFS) or 70,000 (NIFC). If we can't agree on the number of wildfires, how can anyone say how many (of the extra 50,000 estimated by the USFS in the year 2011) were caused by extra carbon dioxide? I expect scientists will not attempt to answer this question since (1) the variability in the estimate for the number varies so widely; so many human-caused factors are confounded with year.¹⁵⁴

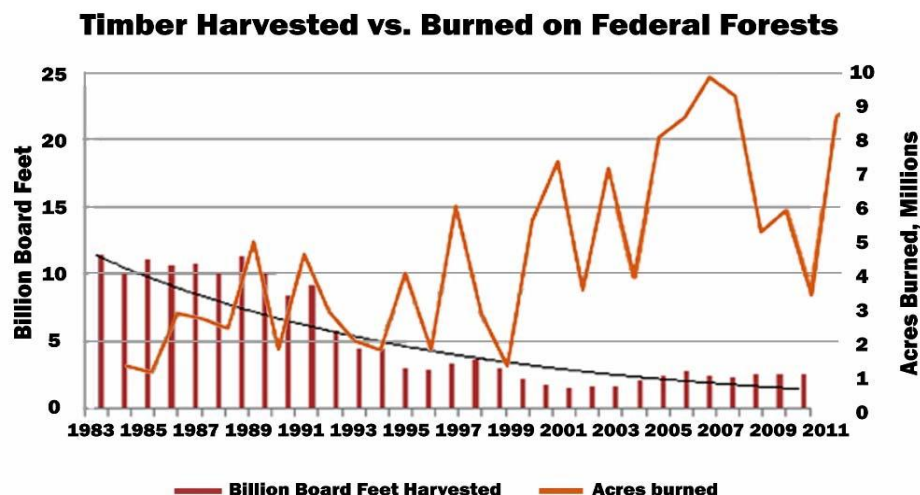
This year, 100 percent of the wildfires in Southwest Oregon were caused by humans. When compared to the previous 10-yr, the number of wildfires started by smokers has increased by 43%, and the number caused by debris burning has increased by 71%. I would not at all be surprised if some lobby group says the increase in wildfires in Oregon is due to increases in carbon dioxide. By ignoring the facts, these groups lose credibility.¹⁵⁵

Dr. South was very clear on the issue of fuel loads in responding to this question by Senator Sessions: "All else being equal, would increasing the number of board-feet harvested from U.S. National Forests each year, over the long-run, reduce the severity of wildfires?"

Yes. Reducing the amount of wood in a forest by commercial thinning reduces the energy released in a wildfire. This reduces the severity since heat emitted is directly related to the amount of standing and dead timber. As an example, the heat given off from a bundle of 10 matches is half that from 20 matches. A fire occurs in both cases, but the severity is doubled for the 20 match bundle.¹⁵⁶

Dr. South provides additional detailed information on fuel loads and wildfires:

Figure 25.¹⁵⁷



¹⁵⁴ South, *supra* note 62, at 1.

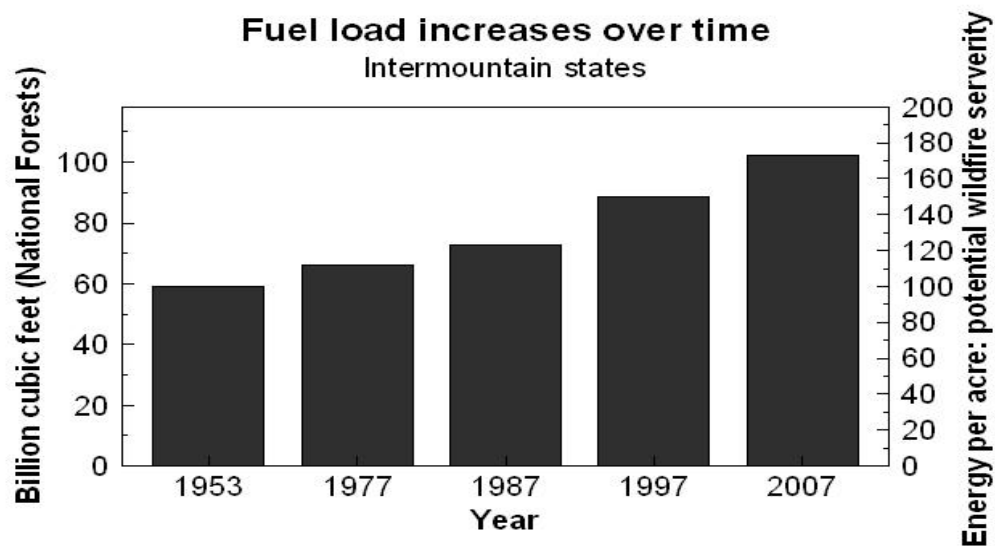
¹⁵⁵ *Id.*

¹⁵⁶ *Id.* at 10.

¹⁵⁷ *Id.*

Some National Forests now have about 70% more stored energy per acre than 6 decades ago. Firefighters know it is much harder to put out a wildfire when the amount of energy released per acre is increased by 70%. This extra energy increases the effort needed to extinguish the fire and the intensity results in additional burned acreage. The following graph illustrates how quickly fuel loads have increased in the Intermountain region (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah and Wyoming). A forest policy that allows harvesting only a fraction of annual growth is equivalent to a policy that promotes an increase in the severity of future wildfires (i.e. it increases the fuel load of forest). National forest policies that limit commercially viable logging have increased the fuel load and thus have increased the risk of catastrophic wildfires.¹⁵⁸

Figure 26.¹⁵⁹

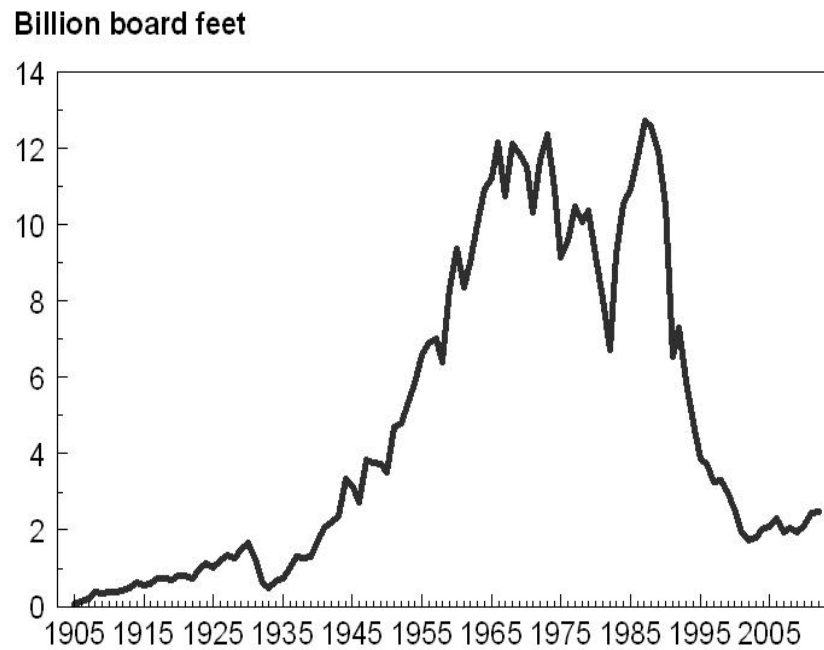


Graph: Increases in volume and energy (stored in wood) on USFS forests in the Intermountain states over time. Wood energy is expressed in relative units with 1953 set at 100.

¹⁵⁸ *Id.*

¹⁵⁹ *Id.* at 11.

Figure 27.¹⁶⁰



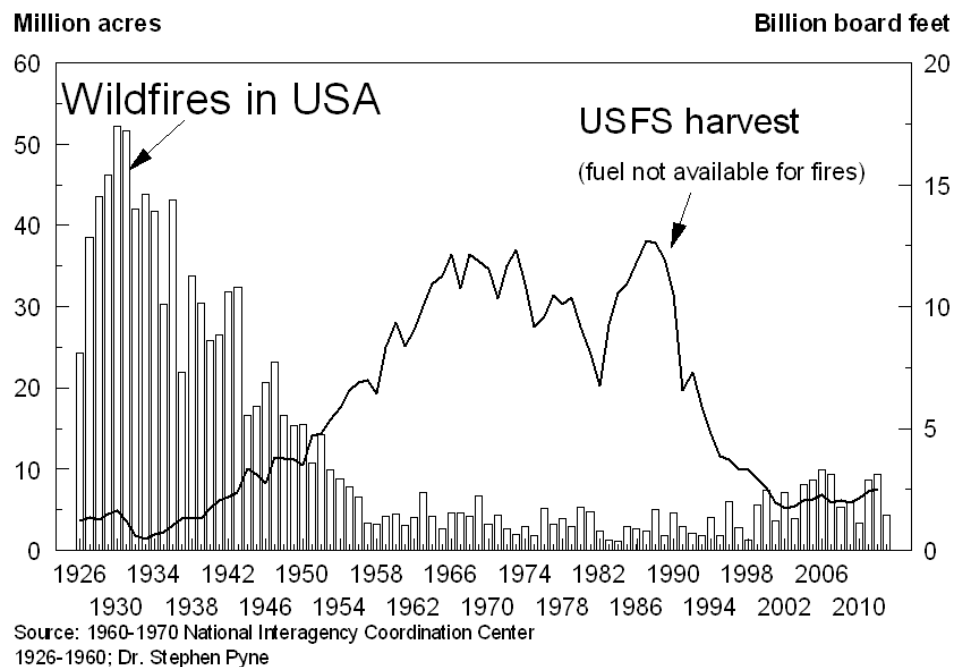
Graph: Annual harvest rates of timber from National Forests

From about 1965 to 1990, the U.S. Forest Service harvested about 12 billion board feet per year on National Forests. Removing this wood reduced the rate of increase in fuel loads on our National Forests. As a result, the wood volume on timber land in the West changed very little between 1977 (346.7 billion cubic feet) and 1987 (347 billion cubic feet). In contrast, wood volume over the next 10-years increased by 5 percent. Obviously stopping the harvesting of trees has increased wildfire risk in National Forests (due to increasing average wood biomass and fuel loads).¹⁶¹

¹⁶⁰ *Id.* at 13.

¹⁶¹ South, *supra* note 108, at 8.

Figure 28.¹⁶²



The primary reason why timber harvests have declined by more than 80% is due to a desire by the public and environmental groups to “preserve” national forests by keeping logging to a minimum. It seems to me that many environmental groups want the Natural Forests to be managed the same way as National Parks are managed.¹⁶³

During the post-World War II housing boom, national forests were viewed as a ready supply of building material. A common economic, harvesting method used involved clear-cutting. Even with this rate of harvesting, the amount of standing timber on National Forests increased by 59% (from 1953 to 1977). This level of harvest was not sufficient to keep the risk of wildfire from increasing (due to an increase in fuel load). Due to public concerns over the environment, Congress passes several laws to protect forests. Additional laws formalized the concept of “multiple-use,” whereby the uses of timber, forage, and water shared equal footing with wildlife conservation and recreation opportunities. As the above graph illustrates, timber sales on national forests increased to the 12 billion board foot mark during this period. As James Walls pointed out to the sub-committee (on June 1, 2014), there were five mills in operation at this time in Lake County, Oregon, but now only one remains in operation. As harvests decreased, we began

¹⁶² *Id.*

¹⁶³ South, *supra* note 62, at 13.

importing more wood to help meet increasing demand. The country continues to import more wood than it exports.¹⁶⁴

Questions for Critical Thinking:

1. In 1871 a fire in Wisconsin and Michigan burned 3.78 million acres and killed over 1,500 people, far more than any other in U.S. history. Why doesn't the media and those who are pushing for CO₂ regulation cite this fire as the "most destructive" in U.S. history?
2. A number of environmental groups have aggressively litigated under multiple environmental laws to close off access to timber harvesting, particularly in the Western United States. As a result fuel loads have increased significantly. Why aren't these anti-forestry management policies cited more frequently in the press as a reason of concern for wildfires versus anthropogenic CO₂ emissions?
3. When reporting on potential increases in forest fires in the coming decades why does the media so often cite "climate change" as a factor and fail to mention forestry management practices and fuel loads?
4. How has the successful litigation by activist organizations to limit access to timber harvesting impacted communities including jobs, poverty, and revenue to public services such as schools and fire departments?

¹⁶⁴ *Id.*

VI. POLAR BEARS AND MASS EXTINCTIONS

*If a man will begin with certainties, he shall end in doubts; but if he will be content to begin with doubts he shall end in certainties.*¹⁶⁵ —Sir Francis Bacon, English Scientist

Predictions:

1. The “entire North Polar ice cap will be gone in five years.”¹⁶⁶ —Former Vice President Gore
2. “A few years ago, scientists were predicting the Arctic Ocean could be ice-free in summer as early as 2100, then that prediction was moved up to 2050, then 2040 and 2030. Late last year, one leading scientist predicted the Arctic Ocean could be ice free in summer as soon as 2012. It seems clear that the pace of global warming in the Arctic is outrunning predictions and is happening faster than expected.”¹⁶⁷ —Greenpeace
3. “Global warming and rising temperatures in the Arctic jeopardize the polar bear's very existence...Polar bears cannot survive without sea ice, and these bears could disappear in our lifetime if we don't take action.”¹⁶⁸ —Melanie Duchin, Greenpeace

Claims:

1. “The melting of the ice cap represents bad news for creatures like polar bears. A new study shows that for the first time, polar bears have been drowning in significant numbers.”¹⁶⁹ —Al Gore, *An Inconvenient Truth*
2. “As the effects of climate change become more pronounced, wildlife will be faced with ever greater challenges to their survival. Polar bears already are suffering due to melting sea ice, desert animals will face more severe droughts, and marine life will be forced to contend with the increasing warming and acidification of their ocean environments.”¹⁷⁰ —League of Conservation Voters

¹⁶⁵ Francis Bacon, *Francis Bacon Quotes*, GOODREADS, INC., https://www.goodreads.com/author/quotes/50964.Francis_Bacon (last visited Sept. 3, 2014).

¹⁶⁶ EDITORIAL: *Al Gore, soothsayer*, THE WASHINGTON TIMES, Dec. 16, 2013, <http://www.washingtontimes.com/news/2013/dec/16/editorial-al-gore-soothsayer>.

¹⁶⁷ *Endangered Species Act threatens Polar Bears*, GREENPEACE (May 15, 2008), <http://www.greenpeace.org/international/en/news/features/endangered-polar-bears150508>.

¹⁶⁸ *Conservationists File Lawsuit to Protect Polar Bear Under Endangered Species Act*, GREENPEACE (Dec. 15, 2005), <http://www.greenpeace.org/usa/en/media-center/news-releases/polar-bear-threatened-with-ext>.

¹⁶⁹ Al Gore, *Al Gore in An Inconvenient Truth*, by Al Gore, ON THE ISSUE.ORG, http://www.ontheissues.org/Archive/Inconvenient_Truth_Al_Gore.htm (last updated Sept.27, 2012).

¹⁷⁰ *Wildlife and Climate Change*, LEAGUE OF CONSERVATION VOTERS, <http://www.lcv.org/issues/wildlife> (last visited Sept. 3, 2014).

3. “What we need is for the United Nations to do the same thing for the Arctic – protect that amazing, icy wateriness, and make sure that our grandkids have the hope of living on a planet that still has polar bears.”¹⁷¹ —Briar Marbeck, Greenpeace

The Latest Science:

For many years, Greenpeace and other activist organizations have used the polar bear as a symbol of the threat from future theoretical impacts from our changing climate. The claims have centered on the notion that the ice-free winters were looming,¹⁷² and winter sea ice was disappearing at a rate that ensured the species extinction. However, there is limited scientific support for such claims consistent with the vast majority of cataclysmic predictions failing to materialize.

What is important to note is the lack of our scientific understanding of polar populations and trends in those populations. Fortunately, one of the country’s foremost ecologists, Dr. Daniel Botkin, Professor Emeritus of Biology at the University of California, Santa Barbara, recently provided testimony before the United States Senate on our understanding of Polar Bear populations and species extinctions:¹⁷³

[The IPCC report’s] conclusions are the opposite of those given in articles cited in defense of those conclusions. For example, the IPCC 2014 Terrestrial Ecosystem Report states that “there is medium confidence that rapid change in the Arctic is affecting its animals. For example, seven of 19 subpopulations of the polar bear are declining in number” citing in support of this an article by Vongraven and Richardson, 2011. That report states the contrary, that the “decline” is an illusion.

In addition, I have sought the available counts of the 19 subpopulations. Of these, only three have been counted twice; the rest have been counted once. Thus no rate of changes in the populations can be determined. The first count was done in 1986 for one subpopulation.

On May 22, Vongraven, a member of the international team that created these estimates, stated that the polar bear population size, “never has been an estimate of total abundance in a scientific sense, but simply a qualified guess given to satisfy public demand...the range given for total global population should be viewed with great caution as it cannot be used to assess population trend over the long term.” The U.S. Marine Mammal Commission, charged with the conservation of this species, acknowledges “*Accurate estimates of the current and historic sizes of polar bear stocks are difficult to obtain for several reasons—the species’ inaccessible habitat, the movement of bears across international boundaries, and the costs of conducting surveys.*”

¹⁷¹ Briar Marbeck, *Greenpeace unleashes polar bear on Auckland*, 3 NEWS, Apr. 23, 2014, <http://www.3news.co.nz/environmentsci/greenpeace-unleashes-polar-bear-on-auckland-2014042308>.

¹⁷² *Update On John Holdren’s Ice Free Winter*, REAL SCIENCE: WORDPRESS BLOG (Oct. 8, 2010), <http://stevengoddard.wordpress.com/2010/10/08/update-on-john-holdrens-ice-free-winter>.

¹⁷³ Botkin, *supra* note 45, at 5.

According to Dr. Susan Crockford, “out of the 13 populations for which some kind of data exist, five populations are now classified by the PBSG [IUCN/SSC Polar Bear Specialist Group] as ‘stable’ (two more than 2009), one is still increasing, and three have been upgraded from ‘declining’ to ‘data deficient’... That leaves four that are still considered ‘declining’—two of those judgments are based primarily on concerns of overhunting, and one is based on a statistically insignificant decline that may not be valid and is being reassessed (and really should have been upgraded to ‘data deficient’). That leaves only one population—Western Hudson Bay—where PBSG biologists tenaciously blame global warming for all changes to polar bear biology, and even then, the data supporting that conclusion is still not available.”¹⁷⁴

Dr. Moore also provides some important background on the history of polar bears and their populations:

The polar bear did not exist until the Pleistocene Ice Age froze the Arctic and created the conditions for adaptation to a world of ice. Polar bears are not really a distinct species; they are a variety of the European brown bear, known as the grizzly bear in North America. They are so closely related genetically that brown bears and polar bears can mate successfully and produce fertile offspring. The white variety of the brown bear evolved as the ice advanced, the white color providing a good camouflage in the snow. Once bears could walk out to sea on the ice floes, it became feasible to hunt seals. It is possible that if the world warmed substantially over the next hundreds of years that the white variety of the brown bear would become reduced in numbers or even die out. This would simply be the reverse of what happened when the world became colder. Some varieties of life that exist today are only here because the world turned colder a few million years ago, following a warmer period that lasted for over 200 million years. If the climate were to return to a Greenhouse Age those varieties might not survive. Many more species would benefit from a warmer world, the human species among them.

The polar bear did not evolve as a separate variety of brown bear until about 150,000 years ago, during the glaciation previous to the most recent one. This is a very recent adaptation to an extreme climatic condition that caused much of the Arctic Ocean to freeze over for most of the past 2.5 million years. The polar bear did manage to survive through the inter-glacial period that preceded the one we are in now even though the earth’s average temperature was higher during that interglacial than it is today. So as long as the temperature does not rise more than about 5 degrees Celsius (9 degrees Fahrenheit) above the present level, polar bears will likely survive. But that is a prediction, not a fact.

To listen to climate activists and the media, you would think the polar bear population is already in a steep decline. A little investigation reveals there are actually more polar bears today than there were just 30 years ago. Most

¹⁷⁴ Botkin, *supra* note 45, at 5-6.

subpopulations are either stable or growing. And the main cause of polar bear deaths today is legally sanctioned trophy hunting, not climate change. Of an estimated population of 20,000 to 25,000 bears, more than 700 are shot every year by trophy hunters and native Inuit. One hundred and nine are killed in the Baffin Bay region of Canada alone. And yet activist groups like the World Wildlife Fund use the polar bear as a poster child for global warming, incorrectly alleging that they are being wiped out by climate change.

The population of polar bears was estimated at 6000 in 1960. In 1973 an International Agreement between Canada, the United States, Norway, Russia, and Greenland ended unrestricted hunting and introduced quotas. Since then only native people have been allowed to hunt polar bears, although in Canada the native Inuit often act as guides for non- native hunters. As a result of this restriction on hunting, the population has rebounded to its present level of 20,000 to 25,000. The International Union for the Conservation of Natural Resources Polar Bear Specialist Group reports that of 18 subpopulations of bears, two are increasing, five are stable, five are declining, while for six subpopulations, mainly those in Russia, there is insufficient data. There is no reliable evidence that any bear populations are declining due to climate change and all such claims rely on speculation; they are predictions based on conjecture rather than actual scientific studies.¹⁷⁵

The use, or misuse for that matter, of the iconic polar bear as a rallying cry for concerns over potential species extinctions should lead to additional critical thinking on the subject. Some additional thoughts from Dr. Botkin as it relates to IPCC claims and species extinctions:

The IPCC Report for Policymakers on Impacts, Adaptation, and Vulnerability repeats the assertion of previous IPCC reports that “large fraction of species” face “increase extinction risks” (p15). Overwhelming evidence contradicts this assertion. And it has been clearly shown that models used to make these forecasts, such as climate envelope models and species-area curve models, make incorrect assumptions that lead to erroneous conclusions, over-estimating extinction risks. Surprisingly few species became extinct during the past 2.5 million years, a period encompassing several ice ages and warm periods. Among other sources, this is based on information in the book *Climate Change and Biodiversity* edited by Thomas Lovejoy, one of the leaders in the conservation of biodiversity.⁶ The major species known to have gone extinct during this period are 40 species of large mammals in North America and Northern Europe. (There is a “background” extinction rate for eukaryotic species of roughly one species per year.)¹⁷⁶

¹⁷⁵ Moore, *supra* note 63, at 353-355.

¹⁷⁶ Botkin, *supra* note 45, at 7.

Questions for Critical Thinking:

1. Why was the polar bear chosen as the symbol for fundraising efforts by Greenpeace and other activist organizations? Was the lack of scientific data that is available on polar bear populations an important factor?
2. What is meant by the following statement? “Never has [there] been an estimate of total abundance in a scientific sense, but simply a qualified guess given to satisfy public demand...the range given for total global population should be viewed with great caution as it cannot be used to assess population trend over the long term.”
3. How often do you see these facts provided in the public forum in media outlets reporting on polar bear extinction claims? “A little investigation reveals there are actually more polar bears today than there were just 30 years ago. Most subpopulations are either stable or growing. And the main cause of polar bear deaths today is legally sanctioned trophy hunting, not climate change.”
4. What does it say to species extinctions and climate change when polar bears evolved and have thrived as a result of climate change well before there were any anthropogenic CO₂ emissions?

VII. ECONOMIC IMPACTS IN EUROPE FROM CLIMATE REGULATIONS

*I have been asked to talk about what I consider the most important challenge facing mankind, and I have a fundamental answer. The greatest challenge facing mankind is the challenge of distinguishing reality from fantasy, truth from propaganda. Perceiving the truth has always been a challenge to mankind, but in the information age (or as I think of it, the disinformation age) it takes on a special urgency and importance.*¹⁷⁷ —Michael Crichton, MD

*To invent a new market was only a matter of finding a new asset to hock.*¹⁷⁸
—Michael Lewis, Author, *The Big Short*

Claims:

1. Environment Commissioner Stavros Dimas said: “Today’s decision reinforces the strong signal we gave with previous decisions that Europe is fully committed to achieving its Kyoto target and to making the Emissions Trading Scheme a successful weapon for fighting climate change. The Commission is assessing all national plans in a consistent way to ensure equal treatment of Member States and to create the necessary scarcity in the European carbon market. This is how we have assessed the plan decided today, and the same standards will be applied to all others.”¹⁷⁹
2. “Will America watch as the clean energy jobs and industries of the future flourish in countries like Spain, Japan, or Germany?”¹⁸⁰ —President Obama
3. “Whatever the final outcome, the UK is already exploring a vast expansion of wind energy offshore, and tidal power on the Severn, and we are already thoroughly reviewing our strategy to drive progress further.”¹⁸¹ — John Hutton, Business Secretary
4. “This is the moment when we must come together to save this planet. Let us resolve that we will not leave our children a world where the oceans rise and famine spreads and terrible storms devastate our lands. Let us resolve that all nations - including my own - will act with the same seriousness of purpose as has your nation, and reduce the carbon we send into our atmosphere. This is the moment to give our children back their future. This is the moment to stand as one.”¹⁸² —President Obama

¹⁷⁷ Michael Crichton, Remarks to the Commonwealth Club San Francisco (Sept. 15, 2003), *available at* <http://perc.org/articles/remarks-commonwealth-club>.

¹⁷⁸ MICHAEL LEWIS, *THE BIG SHORT* 8 (2010).

¹⁷⁹ *Emissions trading: Commission adopts decision on Hungary’s national allocation plan for 2008-2012*, EUROPA.EU, Apr. 16, 2007, http://europa.eu/rapid/press-release_IP-07-501_en.htm?locale=en.

¹⁸⁰ *Obama’s Speech in Lansing, Michigan*, NY TIMES, Aug. 4, 2008, http://www.nytimes.com/2008/08/04/us/politics/04text-obama.html?pagewanted=print&_r=1&.

¹⁸¹ Jessica Aldred, *EU sets 20% target for carbon cuts*, THE GUARDIAN, Jan. 23, 2008, <http://www.theguardian.com/environment/2008/jan/23/climatechange.eu1>.

¹⁸² *Full script of Obama’s Speech*, CNN, July 24, 2008, <http://www.cnn.com/2008/POLITICS/07/24/obama.words>.

5. “To achieve the target of an 80% reduction in (UK) carbon emissions by 2050 virtually all our electricity will need to come from clean sources.”¹⁸³ —Gordon Brown, former Prime Minister

The Reality:

European Union nations that adopted policies to limit CO₂ emissions are now suffering severe consequences. The toll taken on their economies and populations include job loss, economic stagnation, energy poverty with a significant impact on the standard of living for the poor and elderly, and energy reliability and security concerns that are now exacerbated by geopolitical issues.

The Obama Administration is essentially working to implement the policies of EU nations domestically with the most recent Existing Source Performance Stands (ESPS), and New Source Performance Standards (NSPS) for greenhouse gas emissions. The economic reality those countries are now facing is ugly. According to recent analysis by experts at Liberum Capital, an investment firm out of London, UK:¹⁸⁴

UK Energy Policy is not Plausible: In our view successive UK governments have grossly underestimated the engineering, financial, and economic challenges posed by the drive to decarbonise the electricity sector by 2030. Moving from a largely fossil fuel based power system to one dominated by renewables and nuclear in just a decade and a half, whilst keeping the lights on and consumer bills affordable, may simply be impossible.

Economic Rationale Looks Weak: The fundamental economic argument for the EU’s energy policy is that fossil fuels are scarce, and will therefore become ever more expensive. The belief is that those that move first away from fossil fuels will gain a substantial competitive advantage. But the arrival of unconventional gas and oil makes this assumption look shaky at best. Without clear economic benefits it is not at all certain that the public will be willing to bear the costs. Without public support the policy is bound to fail at some point.

Re-nationalisation: The decarbonisation agenda has required the government to intervene in the energy market in ever more aggressive ways. The Energy Bill takes this to a new level and effectively re-nationalises the investment-making decision process in the power sector. But it is not clear that policy makers yet appreciate that this also means that the risks and costs associated with these decisions must also transfer to the public.

Probable Triggers for the Crisis: We identify a number of possible triggers; a generation capacity crunch in the 2014-17 period leading to a sharp spike in power prices, a lack of dispatchable generation by the end of this decade onwards, and spiralling consumer costs / developer profits that a future government will find untenable.

¹⁸³ *Gordon Brown’s speech in full*, POLITICS.CO.UK, Nov. 19, 2007, <http://www.politics.co.uk/news/2007/11/19/gordon-brown-s-speech-in-full>.

¹⁸⁴ *A Crisis in UK Energy Policy Looks Inevitable*, LIBERUM CAPITAL (Apr. 30, 2013), available at http://issuu.com/simplymarcomms/docs/liberumcapital_crisisinukenergypolicy_03may2013.

A similar cap-and-trade type system has long been the end goal of corporate environmental groups here in the United States. They had previously claimed that such a program would create jobs and benefit the economy. After all that has failed in the EU, even the far-left Center for American Progress is resigned to claiming action can be taken “without meaningfully reducing economic growth.”¹⁸⁵ It is likely a matter of perspective as to whose job is “meaningful” to whom.

Recently, Professor Joseph Mason, Professor of Finance and Senior Fellow at Louisiana State University and the Wharton School, testified before the U.S. Senate on the litany of challenges EU nations were facing as a result of their CO₂ trading policies. The new asset (CO₂) being hocked is of significant importance.

Worse yet, if carbon markets just benefit Wall Street then they just create new interest groups to capture the government and the financial markets

The Interpol Environmental Crime Programme now lists ten classifications of carbon crimes that have already occurred throughout the world and continue to remain a threat. Those include:

- Manipulating measurements to fraudulently claim additional carbon credits (Additionality);
- Sale of carbon credits that either do not exist or belong to someone else;
- False or misleading claims with respect to the environmental or financial benefits of carbon market investments;
- Exploitation of weak regulations to commit financial crimes;
- Tax Fraud;
- Securities Fraud;
- Transfer mispricing;
- Money laundering;
- Internet crimes and computer hacking to steal carbon credits; and
- Phishing/Theft of personal information or identity theft.¹⁸⁶

To further concerns, Dr. Bjorn Lomborg, Director of Copenhagen Consensus Center and Adjunct Professor at Copenhagen Business School, recently testified before the U.S. Senate that:

It is often emphasized how global warming will eventually harm the world’s poor the most. In the words of UN General-Secretary Ban Ki-Moon, “Climate change harms poor first and worst.” It will harm the poor because they are the most vulnerable and have the least resources to adapt. But this neglects the other climate impact: Current global warming policies make energy much more costly. This negative impact is often much larger, harms the world’s poor much more, and is much more immediate.¹⁸⁷

¹⁸⁵ Nigel Purvis, *Raising Global Climate Ambition*, CTR. FOR AMERICAN PROGRESS, Sept. 3, 2014, <http://www.americanprogress.org/issues/green/report/2014/09/03/96290/raising-global-climate-ambition>.

¹⁸⁶ *Climate Change: The Need to Act Now: Hearing Before the Subcomm. on Clean Air and Nuclear Safety of the S. Comm. on Env’t and Pub. Works*, 113th Cong. 10 (2014) (testimony of Joseph R. Mason).

¹⁸⁷ Lomborg, *supra* note 15, at 17.

Dr. Lomborg goes on to further state:

Over the past five years, heating a home in the UK has become 63% more expensive, while real wages have declined. Unsurprisingly, a greater number of poor households must spend more than 10% of their income on energy, becoming what is known as energy poor. More than 17% of all British households are now energy poor. Worse, because the elderly are typically poorer, energy poverty affects about a quarter of all households above 60 years of age. Deprived pensioners are spending their days riding heated busses or burning old books to keep warm, while a third are leaving part of their homes cold.¹⁸⁸

In Germany green subsidies will cost Euro 23.6 billion this year. Real household electricity prices have increased 80 percent since 2000. This has contributed to the almost seven million households now living in energy poverty. A fourth of all consumer electricity costs are now direct subsidies to renewables.¹⁸⁹

Additional testimony on the challenges other EU nations are now facing was provided at a hearing titled *Review of the President's Climate Action Plan*, by the Honorable Kathleen White, Distinguished Senior Fellow and Director of the Armstrong Center for Energy and the Environment at the Texas Public Policy Foundation and Chairman of the Texas Commission on Environmental Quality:

The soaring electric prices in European countries with ambitious renewable programs should give pause. Germany's rush to renewables has led to the highest electric prices in any developed country. Coupled with energy surcharges, taxes and fees, household energy costs have doubled since 2000. Germany has adopted the most audacious renewable initiative with a goal of 35 percent of electric generation from renewables by 2020 and 85 percent by 2050.¹⁹⁰

Britain, Denmark, and Spain also rushed to renewables - and their energy consumers have suffered for it - but Germany tops the list for energy cost and human loss. Major media in Germany report increasing energy poverty - where heat energy is viewed as a "luxury good" in competition with food. This was the human condition for the majority of the population 250 years ago before the Industrial Revolution when England first tapped the vast store of energy in coal. For the first time since the Industrial Revolution, energy regression- as a policy choice in the most developed and affluent nations of the world, rears its head.¹⁹¹

Germany began its "Energy Revolution" (Energiewende) in 2000 and dramatically accelerated renewable installations in 2011 after the Fukushima nuclear disaster in Japan. Since 2000, Germany's electric prices have increased 50 percent and are now three times higher than average U.S. prices. By 2020,

¹⁸⁸ *Id.* at 18.

¹⁸⁹ *Id.*

¹⁹⁰ *Review of the President's Climate Action Plan: Hearing Before the S. Comm. on Env't and Pub. Works*, 113th Cong. 6 (2014) (testimony of the Honorable Kathleen White).

¹⁹¹ *Id.* at 7.

German officials now conservatively estimate electric prices at 40 percent more than current prices.¹⁹²

Der Spiegel reports that over 600-700,000 German households are cut off from electricity because residents could not pay their continually increasing energy bills. The Catholic charity, Caritas, takes energy saving light bulbs on their home visits and notes families must decide between using a light bulb or having a hot meal. Has Germany's ambitious deployment of renewables reduced CO₂ emissions? No, quite the contrary. Germany's CO₂ emissions associated with electric generation have increased as more coal has been used to back up inherently intermittent and thus unreliable wind or solar electric generation – a problem that increases in frequency the larger the load renewables are called upon to play.¹⁹³

As anecdotal evidence about energy regression, consider that trees in the U.S. are now felled and turned into wood pellets to be exported to Germany and Britain for home heating, cooking fuel and (not-so-low-carbon) electric generation. While in principle renewable, wood when burned emits abundant CO₂ and particulate matter (otherwise known as harmful pollution). Let's hope U.S. energy policies do not lead to headlines reporting that "Rising Energy Costs Drive Up Forest Thievery," as more and more people revert to burning wood for heat.¹⁹⁴

Likewise, Britain- the cradle of the Industrial Revolution that released entire populations from abject poverty- recently announced that one in four households now live in energy poverty. The Daily Mail warns of the risks of 24,000 deaths of the elderly this winter who cannot afford to heat their homes.¹⁹⁵

That such a regression from modern living standards could occur so rapidly in these highly developed economies is a stunning turn of events that U.S. policy makers would be wise to absorb. Haphazard wishful- thinking policies that dismiss energy physics and transfer the cost to consumers are regressive and morally objectionable.¹⁹⁶

Questions for Critical Thinking:

1. Why is it that Administration officials and their allies in the environmental community and the far-left, including the Center for American Progress, no longer cite the European Union member nations as a good example of economic benefits from CO₂ regulations?

¹⁹² *Id.*

¹⁹³ *Id.*

¹⁹⁴ *Id.*

¹⁹⁵ *Id.*

¹⁹⁶ *Id.*

2. How would increased energy poverty in America impact the federal budget, and are environmental groups willing to compensate low-income consumers for the increased cost of energy and a reduced standard of living?
3. What has the Obama Administration publicly stated it has learned from the EU disaster and is utilizing to mitigate similarly destructive impacts from happening in the United States?

VIII. CLIMATE REGULATION: WHAT IS IT REALLY ABOUT?

If you once forfeit the confidence of your fellow citizens, you can never regain their respect and esteem. It is true that you may fool all of the people some of the time; you can even fool some of the people all of the time; but you can't fool all of the people all of the time. —Abraham Lincoln, 16th President of the United States¹⁹⁷

The following is a list of claims made by key activists and political officials in the climate science community:

- Stephen Schneider, who authored *The Genesis Strategy*, a 1976 book warning that global cooling risks posed a threat to humanity, later changed that view 180 degrees when he served as a lead author for important parts of three sequential IPCC reports. In an article published in *Discover*, he said: “On the one hand, as scientists we are ethically bound to the scientific method, on the other hand, we are not just scientists, but human beings as well. And like most people, we’d like to see the world a better place, which in this context translates into our working to reduce the risk of potentially disastrous climatic change. To do that, we need to get some broad-based support, to capture the public’s imagination. That, of course, entails getting loads of media coverage. So we have to offer up scary scenarios, make simplified, dramatic statements, and make little mention of the doubts we might have. Each of us has to decide what the right balance is between being effective and being honest.”¹⁹⁸
- In 1988, the former Canadian Minister of the Environment told editors and reporters of the *Calgary Herald*, “No matter if the science of global warming is all phony...climate change [provides] the greatest opportunity to bring about justice and equality in the world.”¹⁹⁹
- Maurice Strong, who organized the first U.N. Earth Climate Summit (1992) in Rio de Janeiro, Brazil, expressed his true position on climate issues when he said, “We may get to the point where the only way of saving the world will be for industrialized civilization to collapse.”²⁰⁰
- Timothy Wirth, former U.S. Senator (D-CO) and former U.S. Undersecretary of State for global issues, expressed a similar, supporting statement with Maurice Strong at the same Rio Climate Summit when he stated: “We have got to ride the global warming issue. Even if the theory of global warming is wrong, we will be doing the right thing in terms of economic policy and environmental policy.”²⁰¹

¹⁹⁷ President Abraham Lincoln, Speech at Clinton, IL (Sept. 8, 1854).

¹⁹⁸ STEPHEN H. SCHNEIDER & LYNNE E. MESIROW, *THE GENESIS STRATEGY: CLIMATE AND GLOBAL SURVIVAL* (1976).

¹⁹⁹ Larry Bell, *Global Warming Alarmism: When Science IS Fiction*, FORBES, May 29, 2012, <http://www.forbes.com/sites/larrybell/2012/05/29/global-warming-alarmism-when-science-is-fiction/2>.

²⁰⁰ LARRY BELL, *CLIMATE OF CORRUPTION: POLITICS AND POWER BEHIND THE GLOBAL WARMING HOAX* 226 (2011).

²⁰¹ Larry Bell, *In Their Own Words: Climate Alarmists Debunk Their ‘Science’*, FORBES, Feb. 5, 2013, <http://www.forbes.com/sites/larrybell/2013/02/05/in-their-own-words-climate-alarmists-debunk-their-science>.

- Also at the Rio conference, then-Deputy Assistant of State Richard Benedick, who headed the policy divisions of the U.S. State Department, stated: “A global warming treaty [such as the Kyoto Protocol] must be implemented even if there is no scientific evidence to back the [enhanced] greenhouse effect.”²⁰²
- Speaking at the 2000 U.N. Conference on Climate Change in the Hague, former President Jacques Chirac of France explained why the IPCC’s climate initiative supported a key Western European Kyoto Protocol objective: “For the first time, humanity is instituting a genuine instrument of global governance, one that should find a place within the World Environmental Organization which France and the European Union would like to see established.”²⁰³
- On November 14, 2010, Ottmar Edenhofer, a U.N. IPCC Official, stated, “First of all, developed countries have basically expropriated the atmosphere of the world community. But one must say clearly that we redistribute de facto the world’s wealth by climate policy. Obviously, the owners of coal and oil will not be enthusiastic about this. One has to free oneself from the illusion that international climate policy is environmental policy. This has almost nothing to do with environmental policy anymore...”²⁰⁴
- On August 26, 2014, columnist John Powers described Naomi Klein’s new book on climate change, *This Changes Everything*, quoting her as saying, “It’s about how all the pieces fit together.” Powers then goes on to say: “Klein moves from an analysis of how huge corporations and free-market ideology block the attempt to fight climate change, to a critique of many of our supposed saviors (big green organizations that are actually bound up with oil companies; billionaires like Richard Branson who promise more than they deliver), and then winds up giving examples of where people are doing things right. In the end, Klein argues that the climate crisis can become a catalyst of great and positive social transformation. But to get there means retooling a capitalism that runs on fossil fuels, demands endless growth, and concentrates power in the hands of the 1 percent. ‘Dealing with the climate crisis,’ she says simply, ‘will require a completely different economic system.’”²⁰⁵
- Attorney David Sitarz, a key editor of the UN’s Agenda 21 document, stated at the UN’s 1992 Conference on Environment and Development in Brazil, “Effective execution of Agenda 21 will require a profound reorientation of all human society, unlike anything the world has ever experienced—a major shift in the priorities of both governments and individuals and an unprecedented redeployment of human and financial resources. This shift will demand that a concern for the environmental consequences of every human action be integrated into individual and collective decision-making at every level.”²⁰⁶

²⁰² *Id.*

²⁰³ *Id.*

²⁰⁴ *The Science is Settled: U.N. Official Admits Climate Policy is About Wealth Redistribution and Not Global Warming*, MOTOR CITY TIMES, Nov. 18, 2010.

²⁰⁵ John Powers, *Naomi Klein on This Changes Everything, Her New Book About Climate Change*, VOGUE, Aug. 26, 2014, <http://www.vogue.com/1009011/naomi-klein-this-changes-everything-climate-change>.

²⁰⁶ John McManus, *The United Nations Agenda 21*, WHAT IS AGENDA 21, <http://whatisagenda21.net/iclei.htm> (last visited Sept. 4, 2014).

Just something to ponder:

- As Greenpeace co-founder Patrick Moore observed on Fox Business News in January 2011, “We do not have any scientific proof that we are the cause of the global warming that has occurred in the last 200 years....The alarmism is driving us through scare tactics to adopt energy policies that are going to create a huge amount of energy poverty among the poor people. It’s not good for people and it’s not good for the environment...In a warmer world we can produce more food.”²⁰⁷
- “The World Bank board of directors could today endorse a sweeping new energy policy that for the first time restricts financing for new coal plants in poor countries, bank officials confirmed.” —Lisa Friedman, *E&E* reporter, July 16, 2013²⁰⁸

²⁰⁷ Larry Bell, *In Their Own Words: Climate Alarmists Debunk Their ‘Science’*, FORBES, Feb. 5, 2013, <http://www.forbes.com/sites/larrybell/2013/02/05/in-their-own-words-climate-alarmists-debunk-their-science>.

²⁰⁸ Lisa Friedman, *World Bank Approves Landmark Coal Restrictions*, E&E PUBL’G, July 17, 2013.

IX. THE SCIENCE IS SETTLED: THE GOVERNMENT CAN'T CONTROL CLIMATE

Any physical theory is always provisional, in the sense that it is only a hypothesis: you can never prove it. No matter how many times the results of experiments agree with some theory, you can never be sure that the next time the result will not contradict the theory. On the other hand, you can disprove a theory by finding even a single observation that disagrees with the predictions of the theory.

—Stephen Hawking, Director of Research at the Centre for Theoretical Cosmology at the University of Cambridge²⁰⁹

Claim:

1. “Humanity is sitting on a time bomb. If the vast majority of the world's scientists are right, we have just ten years to avert a major catastrophe that could send our entire planet's climate system into a tail-spin of epic destruction involving extreme weather, floods, droughts, epidemics and killer heat waves beyond anything we have ever experienced—a catastrophe of our own making.” —Former Vice President Al Gore²¹⁰

Can our government and the U.N. control these factors?

- Solar Radiation: “Variations in the amount of solar radiation reaching the Earth are thought to influence climate, but the extent of this influence on timescales of millennia to decades is unclear. A number of climate records show correlations between solar cycles and climate, but the absolute changes in solar intensity over the range of decades to millennia are small and the influence of solar flux on climate is not well established.”²¹¹
- Cosmic Rays: “The second type of mechanisms is indirect, through the solar modulation of the cosmic ray flux and the effect that the latter may have on the climate. Cosmic rays are high energy particles (primarily protons) which appear to originate from supernova remnants (the leftovers from the explosive death of massive stars). A possible climatic link through cosmic rays was first suggested by Edward Ney already in 1959. It was well known that the solar wind decreases the flux of these high energy particles and that these particles are the primary source of ionization in the troposphere (which is the lower part of the atmosphere). Ney proposed that the changing levels of ionization can play some climatic role.”²¹²
- Supernovae: “The hypothesis that a high GCR flux should coincide with cold conditions on the Earth is borne out by comparing the general geological record of climate over the past 510 million years with the fluctuating local SN rates. Surprisingly a simple combination of

²⁰⁹ STEPHEN HAWKING, A BRIEF HISTORY OF TIME: FROM THE BIG BANG TO BLACK HOLES 10 (1988).

²¹⁰ Documentary, AN INCONVENIENT TRUTH (2006).

²¹¹ U. Neff, et al., *Strong Coherence between Solar Variability and the Monsoon in Oman between 9 and 6 kyr ago*, 411 NATURE J. 290-293 (2001).

²¹² Nir Shaviv, *20th Century Global Warming "There is Nothing New Under the Sun"*, Racah Inst. of Physics, Hebrew Univ. of Jerusalem (June 2010), available at <http://www.sciencebits.com/NothingNewUnderTheSun-I>.

tectonics (long-term changes in sea level) and astrophysical activity (SN rates) largely accounts for the observed variations in marine biodiversity over the past 510 Myr.²¹³

- Ocean Currents: “Understanding the processes that drive sea-ice formation and advancement can help scientists predict the future extent of Arctic ice coverage — an essential factor in detecting climate fluctuations and change. But existing models vary in their predictions for how sea ice will evolve.”²¹⁴

Summary Thoughts:

- Given the dynamic nature of our climate and the factors well outside of human control (many of which are not listed above), including lack of technology to govern these factors, is it possible to control and stop climate change through government regulations?
- In addition, who determined, and how did they determine, the optimum climate in which the earth should suspend itself?
- Consider this statement provided by one research scientist who recently testified before Congress:

Historically, the definition of “climate” as “average weather” has given the impression to many that climate is not dynamic and is little more than a statistical summary. This has led to the erroneous belief that climate should not change and that any change in climate is bad. Climate itself has been oversimplified by arguments such as “the Earth’s atmosphere acts like a blanket” or that “carbon dioxide causes the Earth to heat like the windows of a car on a hot afternoon”. Both reduce the atmosphere to only its radiative properties and ignore the effect of atmospheric motions (both horizontally and vertically) and the evaporation of water on the climate. I believe that in the early days of modeling, much of the focus was based largely on the radiation budget. Simple 0-dimensional (Earth as a point in space) or 1-dimensional (Earth has only Pole-to-Equator variations) models could either ignore the horizontal and vertical patterns or simply parameterize them with a simple latitudinal diffusion coefficient. Even as 2-dimensional Radiative-Convective models were being developed, our understanding of the radiation budget was more complete than other processes such as large-scale cloud formation and spatial gradients. Thus, radiation and the temporal changes in ‘simple’ atmospheric molecules such as carbon dioxide and methane were given more attention and impact than the more complex interrelationships with climate inferred by the most important greenhouse gas, water vapor. Because water exists on Earth in all three phases – solid, liquid, and gas – and because it transitions through these three phases relatively easily, transferring energy through the movement of evaporated water, it is the most important gas in the atmosphere and, since its phase change involves the creation

²¹³ Henrik Svensmark, *Evidence of Nearby Supernovae Affecting Life on Earth*, 423 MONTHLY NOTICES OF ROYAL ASTRONOMICAL SOC’Y 1234-1253 (Apr. 2012).

²¹⁴ Jennifer Chu, *Ocean Currents Play a Role in Predicting Extent of Arctic Sea Ice*, Mass. Inst. of Tech. News, Nov. 21, 2012, <http://web.mit.edu/newsoffice/2012/ocean-currents-and-sea-ice-1121.html>.

and dissipation of clouds, ice sheets, and sea ice, it is the most difficult to model correctly. Most telling was the comment of Dr. Michael Mann at my Senate Testimony in 2005 when asked why we were not more interested in water vapor, he responded “...**because it cannot be regulated**.”²¹⁵

²¹⁵ Legates, *supra* note 77, at 3 (emphasis added).

X. CONCLUDING POINTS ON U.S. UNILATERAL REGULATION

- On December 7, 2009, the EPA expanded its regulation over air quality through an endangerment finding, determining that GHGs harm public health. This has become a cornerstone of the Obama Administration's regulatory agenda.
- However, EPA's Inspector General released a report in September 2011, "Procedural Review of EPA's Greenhouse Gases Endangerment Finding Data Quality Processes,"²¹⁶ revealing that the scientific assessment underpinning the EPA's endangerment finding for GHGs was inadequate and in violation of the Agency's own peer review procedures.
- According to the EPA's own website, total GHG emissions have only risen 1% in the U.S. since 2005,²¹⁷ while levels in China, India, and Russia have combined to rise more than 6%.²¹⁸ China is responsible for two-thirds of that number.
- China has surpassed the United States as the world's largest producer of CO₂.²¹⁹ They emit more CO₂ than the U.S. and Canada combined, and India is now the world's third biggest emitter of CO₂ - pushing Russia into fourth place. Simultaneously, U.S. CO₂ levels have been steadily declining.²²⁰
- According to a recent report from the World Resources Institute, there are plans to build nearly 1,200 coal-fired power plants in 59 different countries, totaling over 1.4 million megawatts. China and India alone account for 76 % of the proposals.²²¹ China now burns more coal than all countries combined, and India will surpass the United States as the world's second-largest consumer of coal by 2017.²²²
- Future emissions will come overwhelmingly from the developing world, and the most significant emitters (China, India, and Russia) do not ascribe to international GHG reduction agreements. Regardless, the Obama Administration maintains that it is in our best interest to regulate CO₂ domestically.
- Senator Joe Manchin (D-WV) had this to say about EPA's approach to climate and energy: "You know my concerns about the EPA not having an all-in energy policy. If we're talking about climate change and we're talking about the world consuming 8 billion tons of coal and

²¹⁶ ENVTL. PROT. AGENCY, OFFICE OF INSPECTOR GEN., REPORT NO. 11-P-0702, PROCEDURAL REVIEW OF EPA'S GREENHOUSE GASES ENDANGERMENT FINDING DATA QUALITY PROCESSES (2011), *available at* <http://www.epa.gov/oig/reports/2011/20110926-11-P-0702.pdf>.

²¹⁷ *Global Greenhouse Gas Emissions Data*, U.S. Env'tl. Prot. Agency, <http://www.epa.gov/climatechange/ghgemissions/global.html>.

²¹⁸ *Canada's Emissions Trends*, Env't Canada (2011) <http://www.ec.gc.ca/doc/publications/cc/COM1374/ec-com1374-en-es.htm>.

²¹⁹ *World Carbon Dioxide Emissions Data by Country: China Speeds Ahead of the Rest*, THE GUARDIAN DATA BLOG, <http://www.guardian.co.uk/news/datablog/2011/jan/31/world-carbon-dioxide-emissions-country-data-co2>.

²²⁰ *Id.*

²²¹ Ailun Yang & Yiyun Cui, *Global Coal Risk Assessment: Data Analysis and Market Research*, (World Res. Inst., Working Paper, Nov. 2012), *available at* http://pdf.wri.org/global_coal_risk_assessment.pdf.

²²² Brad Plumer, *China Now Burning as much Coal as the Rest of the World*, WASH. POST, (Jan. 29, 2013), <http://www.washingtonpost.com/blogs/wonkblog/wp/2013/01/29/china-is-burning-nearly-as-much-coal-as-the-rest-of-the-world-combined>.

the United States of America consuming less than 1 billion tons of coal, what's their proposal for cleaning up the environment on a global market?"²²³

- Even former EPA Administrator Lisa Jackson confirms that only having the United States regulate carbon will not have any impact on worldwide carbon levels. She testified at the July 7, 2009, EPW hearing, "Moving America toward a Clean Energy Economy and Reducing Global Warming Pollution: Legislative Tools," "I believe the central parts of the [EPA] chart are that U.S. action alone will not impact world CO₂ levels."²²⁴
- Regardless of her admission, EPA perseveres in moving forward with regulations targeting GHG emissions while justifying these rules as being beneficial to the economy, as well as public health and welfare. However, in February 2013, the U.S. Chamber of Commerce released a study examining dozens of air pollution rules dating from the 1990s. It reveals flawed analyses that do not take into account economy-wide impacts or negative impacts of the rules, raising significant concerns with the underlying economic modeling EPA utilizes.²²⁵
- President Obama's "green jobs" movement represents the epitome of failed government based on the false belief that U.S action alone is sound policy. Estimates from the National Renewable Energy Laboratory show that the government spent about \$9 billion on green jobs and created just 910 new, long-term jobs. This means taxpayers spent \$9.8 million per job.²²⁶
- The EU Emissions Trading Scheme (ETS) has cost their consumers \$287 billion for "almost zero impact" on cutting carbon emissions, according to a 2011 UBS study.²²⁷
- Imposing a carbon tax on corporations and private business, which ultimately impacts consumers, is no wiser than unilateral regulation. In November 2012, the Congressional Budget Office released a study noting a carbon tax would "impose a larger burden, relative to income, on low-income households than on high-income households."²²⁸ Furthermore, there exists zero evidence that carbon trading schemes in the EU, much less the United States, are having any impact on climate nor are they resulting in positive economic impacts or job creation in those regions.

²²³ Jason Plautz, *Former McCarthy Skeptic Signals 2nd-round Battle over Nomination*, ENV'T & ENERGY DAILY, March 5, 2013, <http://www.eenews.net/EEDaily/2013/03/05/1>.

²²⁴ *Hearing before the S. Comm. on Env't & Public Works*, 111th Cong. (2009) (statement of Lisa Jackson, former EPA Administrator).

²²⁵ See generally IMPACTS OF REGULATIONS ON EMPLOYMENT: EXAMINING EPA'S OFT-REPEATED CLAIMS THAT REGULATIONS CREATE JOBS, U.S. CHAMBER OF COMMERCE (Feb. 2013), available at http://www.uschamber.com/sites/default/files/reports/020360_ETRA_Briefing_NERA_Study_final.pdf.

²²⁶ David Horowitz & Jacob Laksin, *Obama's Green Jobs Bust*, THE DAILY CALLER, July 10, 2012, <http://dailycaller.com/2012/07/10/obamas-green-jobs-bust>.

²²⁷ Sid Maher, *Europe's \$287bn Carbon 'Waste': UBS Report*, THE AUSTRALIAN, Nov. 23, 2011, <http://www.theaustralian.com.au/national-affairs/europes-287bn-carbon-waste-ubs-report/story-fn59niix-1226203068972>.

²²⁸ Terry Dinan, *Offsetting a Carbon Tax's Costs on Low-Income Households* (Cong. Budget Office, Working Paper No. 16, 2012), available at <http://www.cbo.gov/sites/default/files/cbofiles/attachments/11-13LowIncomeOptions.pdf>.

- In late February 2013, the National Association of Manufacturers (NAM) released a study demonstrating the devastating effects a carbon tax would have on the economy, including manufacturing output falling up to 15 percent, millions of jobs lost, and approximately a \$1 trillion reduction in economic growth.²²⁹ Unilateral regulatory action by the EPA is set to similarly undermine our national economy.
- EPA seems to have a hard time getting their story straight on the purpose of their carbon pollution plan. In particular, they have both denied and claimed that the plan's main purpose is pollution control. On June 19, EPA Deputy Administrator Janet McCabe testified to the House Energy and Commerce Subcommittee on Energy and Power, "This is not an energy plan... The rule is a pollution control rule." One month later, on July 23, EPA Administrator Gina McCarthy said the exact opposite when testifying in front of the Senate Environment and Public Works Committee: "This is not about pollution control... It's about... energy."²³⁰
231
- In his book, Confessions of a Greenpeace Dropout: The Making of a Sensible Environmentalist, Dr. Patrick Moore states:

Over the years the media have largely ignored the scientists and organizations that remain skeptical of human-caused global warming and climate change. The public has been inundated with alarmist headlines about catastrophic climate change and many governments have bought into the belief there is a global emergency that must be addressed quickly and decisively. As with fear of chemicals, fear of climate change results in a convergence of interests among activists seeking funding, scientists applying for grants, the media selling advertising, businesses promoting themselves as green, and politicians looking for votes. It may not be a conspiracy, but it is a very powerful alignment that is mutually reinforcing.²³²

- Additional key points to ponder from Dr. Patrick Moore:

Today we remain locked in what is essentially still the Pleistocene Ice Age, with an average global temperature of 14.5oC. This compares with a low of about 12oC during the periods of maximum glaciation in this Ice Age to an average of 22oC during the Greenhouse Ages, which occurred over longer time periods prior to the most recent Ice Age. During the Greenhouse Ages, there was no ice on either pole and all the land was tropical and sub-tropical, from pole to pole. As recently as 5 million years ago the Canadian Arctic islands were completely

²²⁹ ECONOMIC OUTCOME OF A U.S. CARBON TAX, NERA ECONOMIC CONSULTING (Feb. 26, 2013) http://www.nam.org/~media/64FDD87B13C44C3E8E95CC805E4E5952.ashx?utm_source=nam&utm_medium=alias&utm_campaign=CarbonTax+Full+Report.

²³⁰ Press Release, H. Comm. on Energy & Commerce, Pollution vs. Energy: Lacking Proper Authority, EPA Can't Get Carbon Message Straight (July 23, 2014).

²³¹ *Fact of the Day: EPA Administrator Says Clean Air Act is About "Investment Opportunity"*, THE CTR. FOR REGULATORY SOLUTIONS, <http://centerforregulatorysolutions.org/fact-of-the-day-epa-administrator-says-clean-air-act-is-about-investment-opportunity> (last visited Sept. 4, 2014).

²³² Moore, *supra* note 63, at 345.

forested. Today, we live in an unusually cold period in the history of life on earth and there is no reason to believe that a warmer climate would be anything but beneficial for humans and the majority of other species. There is ample reason to believe that a sharp cooling of the climate would bring disastrous results for human civilization.²³³

Moving closer to the present day, it is instructive to study the record of average global temperature during the past 130 years. The IPCC states that humans are the dominant cause of warming “since the mid-20th century”, which is 1950. From 1910 to 1940 there was an increase in global average temperature of 0.5oC over that 30-year period. Then there was a 30-year “pause” until 1970. This was followed by an increase of 0.57oC during the 30-year period from 1970 to 2000. Since then there has been no increase, perhaps a slight decrease, in average global temperature. This in itself tends to negate the validity of the computer models, as CO₂ emissions have continued to accelerate during this time.²³⁴

The increase in temperature between 1910-1940 was virtually identical to the increase between 1970-2000. Yet the IPCC does not attribute the increase from 1910-1940 to “human influence.” They are clear in their belief that human emissions impact only the increase “since the mid-20th century”. Why does the IPCC believe that a virtually identical increase in temperature after 1950 is caused mainly by “human influence”, when it has no explanation for the nearly identical increase from 1910-1940?²³⁵

*The energy of the mind is the essence of life.*²³⁶ —Aristotle, Greek Philosopher

²³³ Natural Resource Adaptation: Protecting ecosystems and economies: Hearing Before the Sub. Comm. on Oversight of the S. Comm. on Env’t and Pub. Works, 113th Cong. 2 (2014) (testimony of Dr. Patrick Moore).

²³⁴ *Id.*

²³⁵ *Id.*

²³⁶ See *The Power of the Mind: Quotes to Get You Thinking*, PSYCHOLOGY TODAY (Jan. 4, 2012), <http://www.psychologytoday.com/blog/high-octane-women/201201/the-power-the-mind-quotes-get-you-thinking>.

XI. ADDENDUM: A TOP ECOLOGIST'S CONCERNS WITH THE NATIONAL CLIMATE ASSESSMENT

REVIEW OF *Climate Change Impacts in the United States: The Third National Climate Assessment*. U.S. Global Change Research Program

Jerry M. Melillo, Terese (T.C.) Richmond, and Gary W. Yohe, Eds.
841 pp. doi:10.7930/J0Z31WJ2.

By Daniel B. Botkin: May 29, 2014

[Note regarding my connections with Jerry M. Melillo, one of the three primary editors of this report: When I was on the faculty of the Yale School of Forestry and Environmental Studies, Jerry Melillo was a graduate student working on his doctorate and we interacted frequently. Beginning in 1975, Jerry Melillo and I worked at the Ecosystems Center, Marine Biological Laboratory, Woods Hole, MA, and we published four scientific papers together, listed at the end of this document.¹

COMMENTS ON THE ASSESSMENT

GENERAL COMMENTS:

The opening statement of the Assessment (p.1), reproduced here, is characteristic of the entire Assessment in that it violates one of the basic principles of good climatology --- never use short-term weather changes as proof of climate change. Climatologists I have worked with over the decades have said this repeatedly. In 1962, when I was a graduate student at the University of Wisconsin working under a science writing fellowship, I spoke with Reed Bryson, said to be the father of the International Geophysical Year and the person who persuaded Richard Keeling to begin measuring atmospheric carbon dioxide concentration on Mauna Loa, Hawaii. At that time Earth had been undergoing a global cooling since about 1940. At first Professor Bryson said "if present trends continue, we are entering a new ice age." But when I drafted a press release that quoted him so, he thought about it carefully and told me that we could not make that statement, because this was just a short- term weather event.

In the 1980s, I worked closely with climatologist Stephen Schneider and we often gave talks at the same events. Steve, one of the leaders of the modern concern about a possible human-induced global warming, also said that you should never use short-term weather events to infer climate change. I agreed with these experts, and therefore was taken aback by the overall tone of the new White House Climate Change Assessment, which begins: "Climate change, once considered an issue for a distant future, has moved firmly into the present. Corn producers in Iowa, oyster growers in Washington State, and maple syrup producers in Vermont are all observing climate-related changes that are outside of recent experience. So, too, are coastal planners in Florida, water managers in the arid Southwest, city dwellers from Phoenix to New York, and Native Peoples on tribal lands from Louisiana to Alaska. This National Climate Assessment concludes that the evidence of

human-induced climate change continues to strengthen and that impacts are increasing across the country.

Based on what my climatologist colleagues had always told me, the Assessment should have begun instead by stating: “Corn producers in Iowa, oyster growers in Washington State, and maple syrup producers in Vermont are all observing weather-related changes” outside of their personal recent experience. So, too, are coastal planners in Florida, water managers in the arid Southwest, city dwellers from Phoenix to New York, and Native peoples on tribal lands from Louisiana to Alaska.”

The Assessment concludes that opening paragraph by stating: *This National Climate Assessment concludes that the evidence of human-induced climate change continues to strengthen and that impacts are increasing across the country.*

Americans are noticing changes all around them. Summers are longer and hotter, and extended periods of unusual heat last longer than any living American has ever experienced. Winters are generally shorter and warmer. Rain comes in heavier downpours. People are seeing changes in the length and severity of seasonal allergies, the plant varieties that thrive in their gardens, and the kinds of birds they see in any particular month in their neighborhoods (p.1).

These opening paragraphs and several that follow directly communicate to the reader, both lay and professional, that human-induced global warming in an immediate disaster. For example:

Other changes are even more dramatic. Residents of some coastal cities see their streets flood more regularly during storms and high tides. Inland cities near large rivers also experience more flooding, especially in the Midwest and Northeast. Insurance rates are rising in some vulnerable locations, and insurance is no longer available in others. Hotter and drier weather and earlier snowmelt mean that wildfires in the West start earlier in the spring, last later into the fall, and burn more acreage. In Arctic Alaska, the summer sea ice that once protected the coasts has receded, and autumn storms now cause more erosion, threatening many communities with relocation.

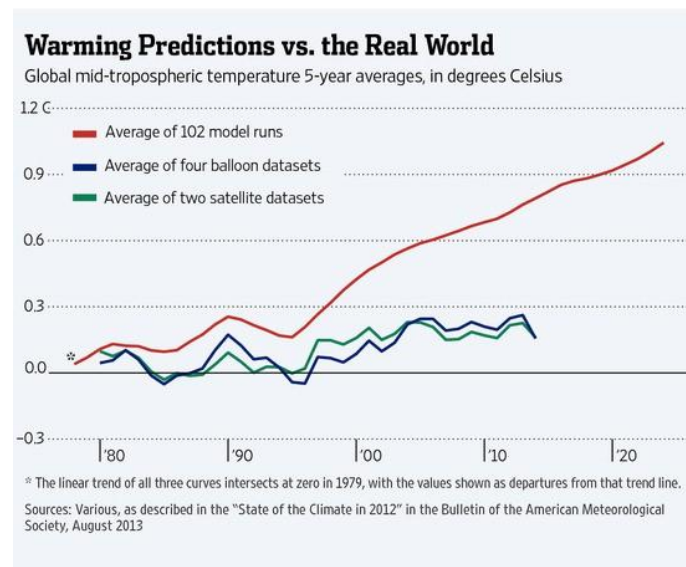
Scientists who study climate change confirm that these observations are consistent with significant changes in Earth’s climatic trends. Long-term, independent records from weather stations, satellites, ocean buoys, tide gauges, and many other data sources all confirm that our nation, like the rest of the world, is warming. Precipitation patterns are changing, sea level is rising, the oceans are becoming more acidic, and the frequency and intensity of some extreme weather events are increasing (p. 1).

To be scientifically accurate, these paragraphs should instead have been written (my changes noted by underlining): *Other weather changes are even more dramatic. Residents of some coastal cities see their streets flood more regularly during storms and high tides. Inland cities near large rivers also experience more flooding, especially in the Midwest and Northeast. Insurance rates are rising in some vulnerable locations, and insurance is no longer available in others. Hotter and drier weather and earlier snowmelt mean that wildfires in the West start earlier in the spring, last later into the fall, and burn more acreage. In Arctic Alaska, the summer sea ice that once protected the coasts has receded, and autumn storms now cause more erosion, threatening many communities with relocation.*

Scientists who study weather and climate change point out that short-term, including several decades and longer, changes in weather do not confirm that these observations are consistent with significant changes in Earth's climatic trends.

These opening statements are directly followed by: *Many lines of independent evidence demonstrate that the rapid warming of the past half-century is due primarily to human activities. The observed warming and other climatic changes are triggering wide-ranging impacts in every region of our country and throughout our economy. Some of these changes can be beneficial over the short run, such as a longer growing season in some regions and a longer shipping season on the Great Lakes. But many more are detrimental, largely because our society and its infrastructure were designed for the climate that we have had, not the rapidly changing climate we now have and can expect in the future. In addition, climate change does not occur in isolation. Rather, it is superimposed on other stresses, which combine to create new challenges* (p. 1). **The assertions in this paragraph are based on the forecasts from climate models and from temperature records. However, Figure 1 shows that the climate models greatly exaggerate the rate and amount of temperature change and are not making forecasts that come even close to fitting the data. Furthermore, Figure 1 also shows that the average Earth temperature in the past 30 years has changed very little if at all, contradicting the assertions on the first page of the Assessment.**

Figure 1: Climate model forecasts compared to real world temperature observations
(From John Christy, University of Alabama and Alabama State Climatologist. Reproduced with permission from him.)



The Assessment further attributes the supposed climatic warming to human activities that are releasing greenhouse gases, especially carbon dioxide, into the atmosphere. Therefore the claimed disaster is our fault. But recent evidence shows that temperature change is not tracking the increase in carbon dioxide. The gas has increased from 370 ppm to just over 400ppm, 8 percent, between year 2000 and year 2014 (Figure 2), while the temperature has changed either only slightly or not at all, depending on how

one does the analysis (Figure 3). Instead, temperature change tracks closely changes in the energy output from the sun (Figure 4).

Figure 2. Mauna Loa Observatory CO₂ measurements

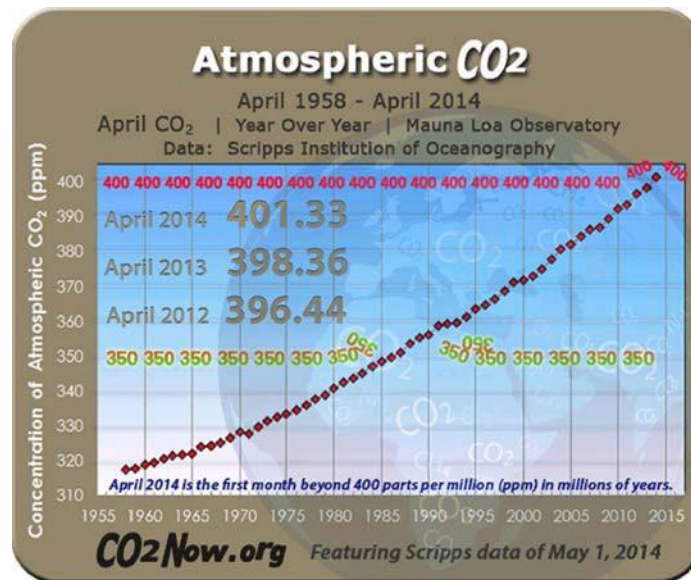


Figure 3. Earth Surface Temperature Departure from 1950-1980 Average

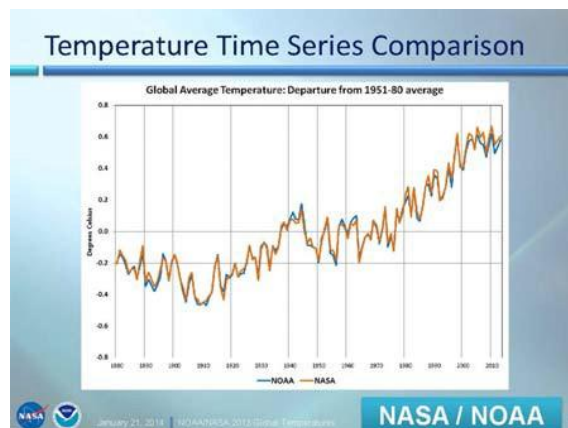
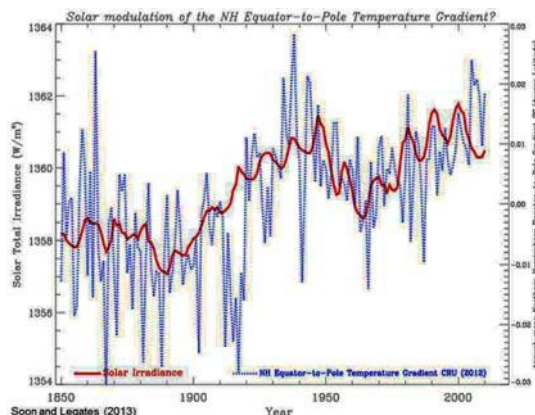


Figure 4. Correlation Between Solar Irradiance and Poleward flux of energy.

Thus the Assessment's early statements about the dangerous climate change have to do with a hypothetical, not a real, world.



The current evidence from scientific observations show that Earth's temperature has not changed very much, if at all, since the start of the new century, while carbon dioxide has increased considerably.

Given these facts, the basic opening assertions of the new U.S. Climate Change Assessment are about a hypothetical world, not a real world, and must be taken as a “what if” rather than “what is”. Therefore the dire consequences forecast in the Assessment cannot be taken as reliable, nullifying many, if not most, of the ecological and biological implications the Assessment makes heavy use of.

The time available to write and the space available to publish as written testimony prevent a comprehensive, detailed review of the entire White House Climate Change Assessment. As a result, I have used as an example of the kinds of problems throughout the Assessment the table appearing on pages 204-5, *Biological Responses To climate Change*. As an ecologist, I have taken that table and reorganized it. This reorganization follows.

Although the document is titled “Climate Change Assessment,” the term “climate change” is not defined and is in fact used with two meanings, natural and human-induced. There are places in the Assessment where only the second meaning makes sense, so that meaning has to be assumed. There are other places where either meaning could be applied. In those places where either meaning can be interpreted, if the statement is assumed to be a natural change, then it is a truism, a basic characteristic of Earth's environment and something people have always known and experienced. If the meaning is taken to be human-caused, then in spite of the assertions in the Assessment, the available data do not support the statements.

For example, the Assessment's section titled *CLIMATE CHANGE AND THE AMERICAN PEOPLE* begins with the statement: *Climate change, once considered an issue for a distant future, has moved firmly into the present. Corn producers in Iowa, oyster growers in Washington State, and maple syrup producers in Vermont are all observing climate-related changes that are outside of recent experience.*

If this is to be interpreted as natural, then people have frequently in history experienced “climate-related changes that are outside of [their] recent experiences,” as the Medieval

Warming and Little Ice Age demonstrate,^{2,3,4} and therefore it is not unusual nor unexpected in ordinary life. If this is to be interpreted to be human-induced, then the evidence just discussed demonstrates that this kind of change cannot be attributed to human actions and therefore the statement is false.

ANALYSIS OF THE CLIMATE CHANGE IMPACTS ASSESSMENT TABLE OF ECOLOGICAL EFFECTS (Assessment's pages 204-205)

Biological responses to climate change

The Assessment presents a list of 30 biological responses to climate change. Since this is my particular area of expertise, I have analyzed this list and sorted the items into the following categories: **Where the Assessment is wrong** based on my understanding (10 items); **Improvements** (12 items); **Declines** (which can be taken as worsening) (No items); **Predicted from Climate Models**, Therefore Not Fact, especially given the failure of climate models to forecast with any reliability Earth's increase in temperature since the 1990s (see figure 1) (3 items); and **Unlikely or Unsupported Statement** (5 items). **Within the context of the Assessment, this table comes across as meaning to demonstrate more very negative effects of a human-induced global warming, but since upon analysis none of the 30 appears to be a legitimately supported decline that might occur under a hypothetical global warming or have been directly observed, this table in fact is an argument against the overall message of the Assessment.**

(The number that appears at the beginning of each entry is the number in the Assessment's list. The numbers following each of the Assessment's entry are the citation number as listed in the Assessment. The Assessment's statements are in italics; my comments appear in plain font.)

ASSESSMENT IS WRONG

1. *21. Seedling survival of nearly 20 resident and migrant tree species decreased during years of lower rainfall in the Southern Appalachians and the Piedmont areas, indicating that reductions in native species and limited replacement by invading species were likely under climate change.* Since the climate models are admittedly weak about changes in rainfall, this statement has no relevance to purported human-induced global warming.
2. *27. Water temperature data and observations of migration behaviors over a 34-year time period showed that adult pink salmon migrated earlier into Alaskan creeks, and fry advanced the timing of migration out to sea. Shifts in migration timing may increase the potential for a mismatch in optimal environmental conditions for early life stages, and continued warming trends will likely increase pre-spawning mortality and egg mortality rates.* Salmon have evolved and are adapted to environmental change.
3. *3. Conifers in many western forests have experienced mortality rates of up to 87% from warming-induced changes in the prevalence of pests and pathogens and stress from drought.* Important causes of the mortality of trees in western forests are: fire suppression, which promotes insect and disease outbreaks, and from introduced (invasive) insects and diseases.
4. *8. Warmer and drier conditions during the early growing season in high-elevation habitats in Colorado are disrupting the timing of various flowering patterns, with*

potential impacts on many important plant-pollinator relationships. “Disrupting” is a politically loaded term. The scientific term would be “changed” and this is a good sign, showing the adaptability of species to changing environments.

5. *12. Variation in the timing and magnitude of precipitation due to climate change was found to decrease the nutritional quality of grasses, and consequently reduce weight gain of bison in the Konza Prairie in Kansas and the Tallgrass Prairie Preserve in Oklahoma. Results provide insight into how climate change will affect grazer population dynamics in the future. This is stated in a way that is not open to scientific evaluation. No doubt lower rainfall has negative effects, but the statement is “variation.” In fact, the publication cited (Craine et al., 2008)⁵ states that “Greater late-summer precipitation increased bison weight gain . . . “greater midsummer precipitation decreased weight gain.” This is a scientifically interesting result for those focused on wildlife in grasslands, but it is neither a negative nor positive in terms of global warming, because the forecasting models are weakest in forecasting rainfall even annually, let alone seasonally. Therefore these results cannot be taken as negative (nor positive) effects of a global rise in average temperature.*
6. *10. Cutthroat trout populations in the western U.S. are projected to decline by up to 58%, and total trout habitat in the same region is projected to decline by 47%, due to increasing temperatures, seasonal shifts in precipitation, and negative interactions with nonnative species. Stresses on Cutthroat extend considerably beyond climate change and have to do with fishing intensity, water diversions and other habitat changes, such as competition from introduced, invasive species such as lake trout and rainbow trout.⁶*
7. *28. Warmer springs in Alaska have caused earlier onset of plant emergence, and decreased spatial variation in growth and availability of forage to breeding caribou. This ultimately reduced calving success in caribou populations. The implication is that warming will necessarily have a negative effect on caribou, but the paper cited (Post et al., 2008) actually is much more cautious, stating “it is highly relevant to herbivore ecology to consider the manner in which warming will alter spatial patterns of plant phenology at more immediate spatial scales than that of the regional landscape. The paper concludes, cautiously: “Large herbivores prefer newly emergent forage, presumably owing to the high digestibility and nutrient content of young plant tissues...future warming could conceivably impair the ability of herbivores such as caribou to forage selectively, with adverse consequences for their productivity. We suggest, therefore, that it is highly relevant to herbivore ecology to consider the manner in which warming will alter spatial patterns of plant phenology at more immediate spatial scales than that of the regional landscape.”⁷*

There is again an inherent assumption that a steady-state between living things and climate is natural and necessary for a species’ persistent. Wildlife population can and do adjust to changes, but this can take some time. See the examples of current adjustments, which I have added below this table. Give the populations a little time to adjust.

8. *26. Changes in female polar bear reproductive success (decreased litter mass and numbers of yearlings) along the north Alaska coast have been linked to changes in body size and/or body condition following years with lower availability of optimal sea ice habitat. There is evidence that polar bears are adjusting by feeding more on terrestrial prey. Contrary to the publicity about polar bears, there is little information*

demonstrating any statistically, scientifically valid decline in polar bear populations. I have sought the available counts of the 19 subpopulations. Of these, only three have been counted twice; the rest have been counted once. Thus no rate of change in the population is possible. The first count was done 1986 for one subpopulation.⁸

9. 7. *Quaking aspen-dominated systems are experiencing declines in the western U.S. after stress due to climate induced drought conditions during the last decade.* Anderegg, W. R. L., J. M. Kane, and L. D. L. Anderegg, 2012: *Consequences of widespread tree mortality triggered by drought and temperature stress.* *Nature Climate Change*, 3, 30-36, doi:10.1038/nclimate1635. Given the failure of the climate models to predict temperature change and the observed lack of a significant recent rise in temperature, it is incorrect to refer to this as a “climate induced” drought. Moreover, a thousand year tree- ring study shows that deep droughts are characteristic of California. Meteorologist Martin P. Hoerling wrote on March 8, 2014 that “At present, the scientific evidence does not support an argument that the drought there is appreciably linked to human-induced climate change.” Hoerling is a research meteorologist, specializing in climate dynamics, at the Earth System Research Laboratory of the National Oceanic and Atmospheric Administration, and the White House's National Climate Assessment cites many of Hoerling's papers, including figure 20.4 “Longer Frost-free Season Increases Stress on Crops,” so his work is respected by the authors.
10. 9. *Population fragmentation of wolverines in the northern Cascades and Rocky Mountains is expected to increase as spring snow cover retreats over the coming century.* The paper cited, Dawson et al. (2011)⁹, does not mention wolverines. And contrary to making a highly negative statement, the paper states *Populations of many species have persisted in situ at individual sites since the last glacial maximum (toleration) and many have undergone habitat shifts, moving short distances (1 to 10 km) to sites with different aspects, slopes, elevations, and other attributes as the environment changed. Migrations of 100 to 1000 km are well documented for many species.*

IMPROVEMENTS

1. 2. *Northern flickers arrived at breeding sites earlier in the Northwest in response to temperature changes along migration routes, and egg laying advanced by 1.15 days for every degree increase in temperature, demonstrating that this species has the capacity to adjust their phenology in response to climate change.*
2. 11. *Comparisons of historical and recent first flowering dates for 178 plant species from North Dakota showed significant shifts occurred in over 40% of species examined, with the greatest changes observed during the two warmest years of the study.*
3. 14. *Migratory birds monitored in Minnesota over a 40-year period showed significantly earlier arrival dates, particularly in short-distance migrants, indicating that some species are capable of responding to increasing winter temperatures better than others.*
4. 15. *Up to 50% turnover in amphibian species is projected in the eastern U.S. by 2100, including the northern leopard frog, which is projected to experience poleward and elevational range shifts in response to climatic changes in the latter quarter of the century.*
5. 16. *Studies of black ratsnake (*Elaphe obsoleta*) populations at different latitudes in Canada, Illinois, and Texas suggest that snake populations, particularly in the*

northern part of their range, could benefit from rising temperatures if there are no negative impacts on their habitat and prey.

6. *17. Warming-induced hybridization was detected between southern and northern flying squirrels in the Great Lakes region of Ontario, Canada, and in Pennsylvania after a series of warm winters created more overlap in their habitat range, potentially acting to increase population persistence under climate change.*
7. *18. Some warm-water fishes have moved northwards, and some tropical and subtropical fishes in the northern Gulf of Mexico have increased in temperate ocean habitat.¹³⁰ Similar shifts and invasions have been documented in Long Island Sound and Narragansett Bay in the Atlantic.*
8. *23. Over the last 130 years (1880-2010), native bees have advanced their spring arrival in the northeastern U.S. by an average of 10 days, primarily due to increased warming. Plants have also showed a trend of earlier blooming, thus helping preserve the synchrony in timing between plants and pollinators.*
9. *24. In the Northwest Atlantic, 24 out of 36 commercially exploited fish stocks showed significant range (latitudinal and depth) shifts between 1968 and 2007 in response to increased sea surface and bottom temperatures.*
10. *25. Increases in maximum, and decreases in the annual variability of, sea surface temperatures in the North Atlantic Ocean have promoted growth of small phytoplankton and led to a reorganization in the species composition of primary (phytoplankton) and secondary (zooplankton) producers.*
11. *29. Many Hawaiian mountain vegetation types were found to vary in their sensitivity to changes in moisture availability; consequently, climate change will likely influence elevation-related vegetation patterns in this region.*
12. *5. In response to climate-related habitat change, many small mammal species have altered their elevation ranges, with lower-elevation species expanding their ranges and higher-elevation species contracting their ranges.*

DECLINES

None.

PREDICTED FROM CLIMATE MODELS, THEREFORE NOT FACT

1. *30. Sea level is predicted to rise by 1.6 to 3.3 feet in Hawaiian waters by 2100, consistent with global projections of 1 to 4 feet of sea level rise (see Ch. 2: Our Changing Climate, Key Message 10). This is projected to increase wave heights, the duration of turbidity, and the amount of re-suspended sediment in the water; consequently, this will create potentially stressful conditions for coral reef communities.*
2. *6. Northern spotted owl populations in Arizona and New Mexico are projected to decline during the next century and are at high risk for extinction due to hotter, drier conditions, while the southern California population is not projected to be sensitive to future climatic changes.*
3. *19. Global marine mammal diversity is projected to decline at lower latitudes and increase at higher latitudes due to changes in temperatures and sea ice, with complete loss of optimal habitat for as many as 11 species by midcentury; seal populations living in tropical and temperate waters are particularly at risk to future declines.*

UNLIKELY CORRELATION OR UNSUPPORTED STATEMENT

1. 13. (a and b) Climatic fluctuations were found to influence mate selection and increase the probability of infidelity in birds that are normally socially monogamous, increasing the gene exchange and the likelihood of offspring survival.
2. 20. Higher nighttime temperatures and cumulative seasonal rainfalls were correlated with changes in the arrival times of amphibians to wetland breeding sites in South Carolina over a 30-year time period (1978-2008). Of course. The time period precedes any possible effect of human-induced global warming, and the effect is a truism. Rainfall will affect amphibians. Since the climate models are admittedly weak about changes in rainfall, this statement has no relevance to purported human-induced global warming.
3. 22. *Widespread declines in body size of resident and migrant birds at a bird-banding station in western Pennsylvania were documented over a 40-year period; body sizes of breeding adults were negatively correlated with mean regional temperatures from the preceding year.* The citation for this statement is NatureServe, cited 2012: Ecosystem-based Management Tools Network. [Available online at www.ebmtools.org]. This is a general website. I used its search option and did not find bird-banding nor Pennsylvania, nor any reference to a study of bird-banding in Pennsylvania.
4. 4. *Butterflies that have adapted to specific oak species have not been able to colonize new tree species when climate change-induced tree migration changes local forest types, potentially hindering adaptation.* The citation 119 in the Assessment is Aumen, N., L. Berry, R. Best, A. Edwards, K. Havens, J. Obeyseker, D. Rudnick, and M. Scerbo, 2013: Predicting Ecological Changes in the Florida Everglades Under a Future Climate Scenario, 33 pp., U.S. Geological Survey, Florida Sea Grant, Florida Atlantic University. [Available online at http://www.ces.fau.edu/climate_change/ecology-february-2013/PECFEFCS_Report.pdf]. I searched this report and found no mention of butterflies. This is probably an inadvertent editing error and the authors of the Assessment meant to refer to some other paper, but since this is the actual listing, the statement is unsupported.
5. 1. *Mussel and barnacle beds have declined or disappeared along parts of the Northwest coast due to higher temperatures and drier conditions that have compressed habitable intertidal space.* 116. The citation listed is Burke, L., L. Reyter, M. Spalding, and A. Perry, 2011: Reefs at Risk Revisited. World Resources Institute, 130 pp. [Available online at http://pdf.wri.org/reefs_at_risk_revisited.pdf]. I searched this citation and did not find any mention of the words mussel or barnacle and the only mention of “northwest” was “northwestern Hawaii.” Again this is likely a typographic error, but no other statement in the Assessment brought me to a relevant paper either, so the statement is unsupported by the report.

SOME OTHER EXAMPLES OF SPECIFIC STATEMENTS THAT ARE INCORRECT, OR OVERSTATED, OR LIMITED TO A FEW SPECIFIC CASES, OR OTHERWISE OF DOUBTFUL GENERALITY

Given the length of the just-released White House Climate Change Assessment and the time available to review it, I am able to consider only a few examples of other specific

problems with the Assessment. I have focused on those that have to do with biological factors. These, however, are representative of problems throughout the Assessment.

(Once again, the material in italics is quotes from the Assessment; the material in standard font is my text.)

Cores from corals, ocean sediments, ice records, and other indirect temperature measurements indicate the recent rapid increase of ocean temperature is the greatest that has occurred in at least the past millennium and can only be reproduced by climate models with the inclusion of human-caused sources of heat-trapping gas emissions (p. 559). As we saw earlier, the climate models are not coming even close to forecasting air temperature change, and therefore could not be expected to forecast accurately changes in ocean temperature, so it is not correct to say that something "can only be reproduced by climate models with the inclusion of human-caused sources of heat-trapping gas emissions."

Warmer air and ocean temperatures are also causing the continued, dramatic decline in Arctic sea ice during the summer (panel D) (p. 560). We published a paper comparing Arctic sea ice extent in the nineteenth century, using historical records from ships hunting the bowhead whale, with those in recent times.¹⁰ In this paper we wrote, "Records from May indicate that end-of-winter sea-ice extent in the Bering Sea during the mid-19th century closely resembled that in the 1972–82 data. However, the historical data reveal that sea ice was more extensive during summer, with the greatest difference occurring in July. This pattern indicates a later and more rapid seasonal retreat." While the statement in the White House Climate Change Assessment is not contradicted by our paper, the limited statement (about the summer) in the Assessment once again paints a dire picture to the average reader, whereas our work suggests that in fact the sea ice extent recovered over winter, and changes in arctic sea ice are more complicated than the Assessment implies. The problem here is a matter of tone and communication.

Key Message 4: Seasonal Patterns: Timing of critical biological events—such as spring bud burst, emergence from overwintering, and the start of migrations—has shifted, leading to important impacts on species and habitats (p.201). The implication here is that this is entirely negative for life on Earth and will forever be so. But on the contrary, the environment has always changed and is always changing, and living things have had to adapt to these changes. Interestingly, many, if not most, species that I have worked on or otherwise know about require environmental change, including salmon and sequoia trees.^{11, 12}

Two of the longest studies of animals and plants in Great Britain show that at least some species are adjusting to recent weather changes in "timing of critical biological events, such as spring bud burst, emergence from overwintering." For example, a 47-year study of the bird *Parus major* (one of the longest monitoring of any bird species) shows that these birds are responding behaviorally to recent weather changes. A species of caterpillar that is one of the main foods of this bird during egg-laying has been emerging earlier as spring temperatures have risen. In response, females of this bird species are laying their eggs an average of two weeks earlier.¹³

The second study, one of the longest experiments about how vegetation responds to temperature and rainfall, shows that long-lived small grasses and sedges are highly resistant to climate change. The authors of the study report that changes in temperature and rainfall during the past 13 years "have had little effect on vegetation structure and physiognomy."¹⁴

Of course with any environmental change, not all species will do well. This has always been the case, and is consistent with Darwinian evolution and with ecological knowledge. Black guillemots (*Cepphus grylle*), birds that nest on Cooper Island, Alaska, illustrate that some species are having difficulties adjusting to climate change. (However, black guillemots in their entire range are not a threatened or endangered species. It is only their abundance on Cooper Island that has declined.)

The problem has been that temperature increases in the 1990s caused the sea ice to recede farther from the island each spring. The parent birds feed on Arctic cod found under the sea ice and must then return to the nest to feed their chicks, who are not yet mature enough to survive on their own. For the parents to do this, the distance from feeding grounds to nest must be less than about 30 km, but in recent years the ice in the spring has been receding as much as 500–800 km (300–500 mi) from the island. As a result, the black guillemots on the island have lost an important source of food. The birds have sometimes targeted sculpin, which is not as abundant as cod.¹⁵

But the real problem these Cooper Island birds face today is egg predation by polar bears. With less sea ice during this time period, bears have gone ashore and eaten young birds. In 2009, of the 180 guillemots that hatched, only one on the island fledged (flew away). The solution to this has been to build bear-proof nesting boxes for the birds. In 2010, bear-proof nesting boxes resulted in about 100 birds that fledged.

Two points emerge here. One is that living things do in fact often adjust to changes in the timing of climate events; if not, there would be little or no life on Earth. The second is that the real problem black guillemots face is here-and-now predation, which can be and has been dealt with and does not require a single focus on whether or not the climate change was human-induced.

Chapter 7, *Forests*, opens with this:

Key Messages

1. Climate change is increasing the vulnerability of many forests to ecosystem changes and tree mortality through fire, insect infestations, drought, and disease outbreaks.

As I noted before, the Assessment suffers from the use of the term “climate change” with two meanings: natural and human-induced. The implication in this key message is that the forest problems are the result of human-induced climate change, but as I have made clear, both the failure of the models and the failure of temperature change to closely track CO₂ make this key statement false. Furthermore, it is well known that (1) forest wildfires are largely due to long-term suppression of fires in the twentieth century, which allowed the buildup of excessive fuel; and (2) that insect infestations and disease outbreaks are heavily the result of introduced species and the failure to remove dead and decaying timber from forests. In addition, this key statement is another example where recent weather patterns are said to represent and prove human-induced global warming, which I pointed out at the beginning is incorrect.

Key Message 2. *U.S. forests and associated wood products currently absorb and store the equivalent of about 16% of all carbon dioxide (CO₂) emitted by fossil fuel burning in the U.S. each year. Climate change, combined with current societal trends in land use and forest management, is projected to reduce this rate of forest CO₂ uptake.*

As explained in my review of the IPCC 2014 report, the estimates of carbon uptake by vegetation used by IPCC and in major articles cited by the reports are based on what can best

be called “grab samples,” a relatively small number of studies done at a variety of times using a variety of methods, mainly in old-growth areas. The results reported by IPCC overestimate carbon storage and uptake by as much as 300%.¹⁶ Therefore this is an unreliable statement.

As I stated at above, these are representative examples of problems that exist throughout the Climate Change Assessment.

NOTES

1. Publications by myself and J. M. Melillo: Aber, J.S., D.B. Botkin and J.M. Melillo, 1978, Predicting the effects of different harvesting regimes on forest floor dynamics in northern hardwoods, Canad. J. Forest Research 8: 306 - 315.; Aber, J.D., D.B. Botkin and J.M. Melillo, 1979, Predicting the effects of different harvesting regimes on productivity and yield in northern hardwoods, Canadian J. Forest Research 9: 10 - 14.; Aber, J.S., G.R. Hendrey, D.B. Botkin, A.J. Francis, and J.M. Melillo, 1980, Simulation of acid precipitation effects on soil nitrogen and productivity in forest ecosystems, Brookhaven National Laboratory Publications BNL 28658, Associated Universities, Inc, N.Y. Botkin, D.B., J.M. Melillo and L.S. Wu, 1981, “How ecosystem processes are linked to large mammal population dynamics,” pp. 373 - 387. In: C.W. Fowler and T. Smith, eds. *Population Dynamics of Large Mammals*, John Wiley and Sons, NY.; Aber, J.D., G.R. Hendrey, A.J. Francis, D.B. Botkin and J.M. Melillo, 1982, Potential effects of acid precipitation on soil nitrogen and productivity of forest ecosystems, pp. 411 - 433, In: F.M. D’itri, ed., *Acid Precipitation: Effects on Ecological Systems*. Ann Arbor Science, MI.

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3. Botkin, D. B., 2012, *The Moon in the Nautilus Shell: Discordant Harmonies Reconsidered* (Oxford University Press, New York, hardback and ebook, September 14, 2012)

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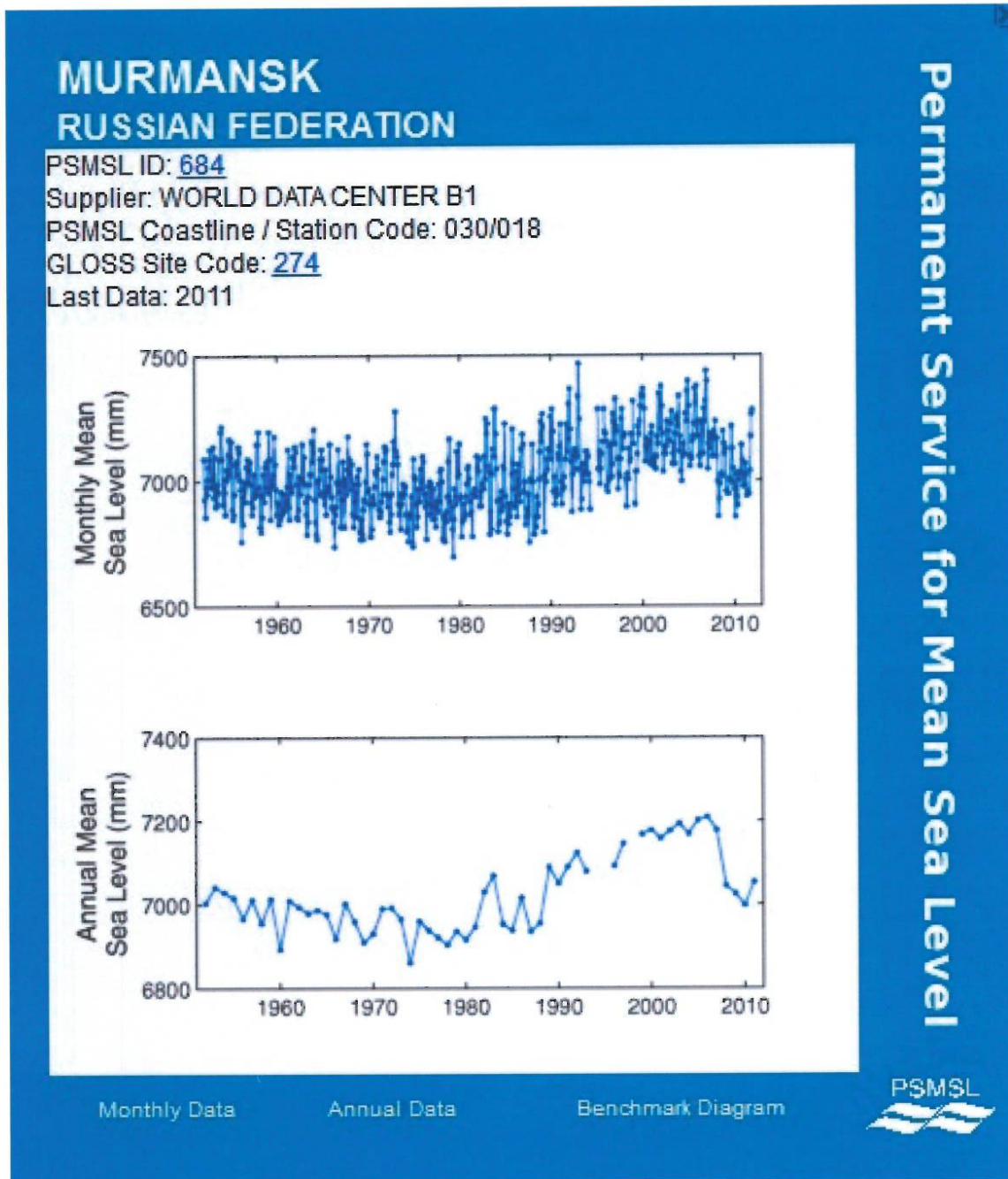
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8. IUCN Summary of polar bear population status per 2013
<http://pbsg.npolar.no/en/status/status-table.html>
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16. Botkin, D. B., and L. Simpson, 1990, Biomass of the North American Boreal Forest: A step toward accurate Global Measures: *Biogeochemistry* 9:161-174; Botkin, D. B., Simpson, L. G., and H. J. Schenk, 1992, Estimating Biomass, *Science Letters*. Vol. 257, No. 5067. (Jul. 10, 1992), pp. 146-147; Botkin, D. B., Simpson, L. G., and R. A. Nisbet, 1993, Biomass and Carbon Storage of the North American Deciduous Forest, *Biogeochemistry* 20: 1-17; Botkin, D. B., Ngugi, M.R., D. Doley (submitted). "Statistically Valid Estimates and Accurate Forecasts of Forest Biomass and Carbon Sequestration: A Forty-Five Year Quest." Keynote speech at IUFRO Forest Biomass Conference, October 7, 2013, to be published in *Drewno (Wood) Journal*.

XII. ADDENDUM: SUPPLEMENTARY SEA LEVEL RISE GRAPHS



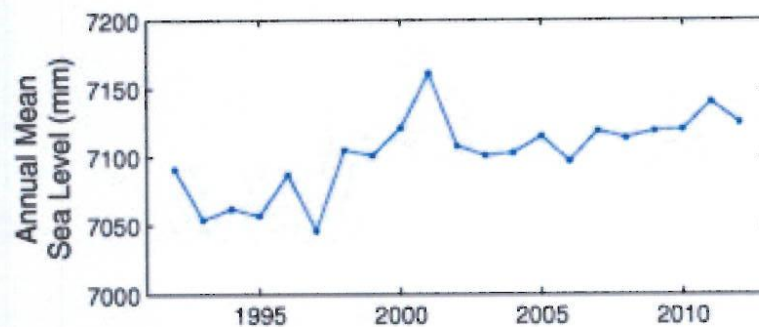
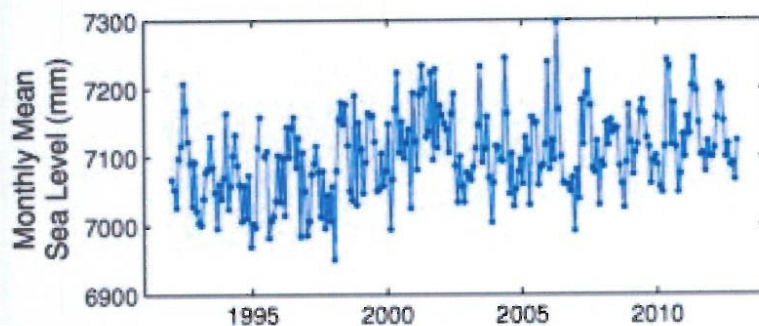
PORT KEMBLA AUSTRALIA

PSMSL ID: [831](#)

Supplier: [NATIONAL TIDAL CENTRE](#)

PSMSL Coastline / Station Code: 680/161

Last Data: 2012



Monthly Data

Annual Data

Benchmark Diagram



Permanent Service for Mean Sea Level

KUSHIRO JAPAN

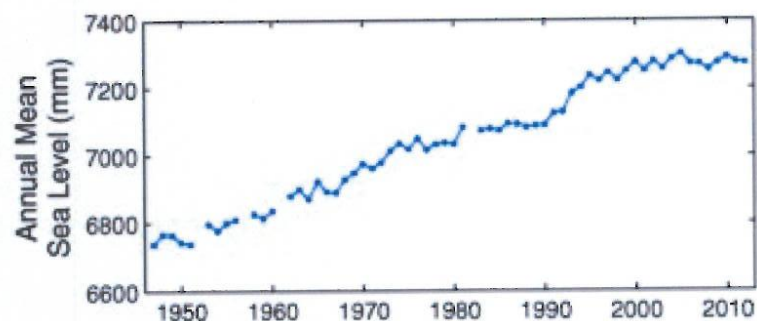
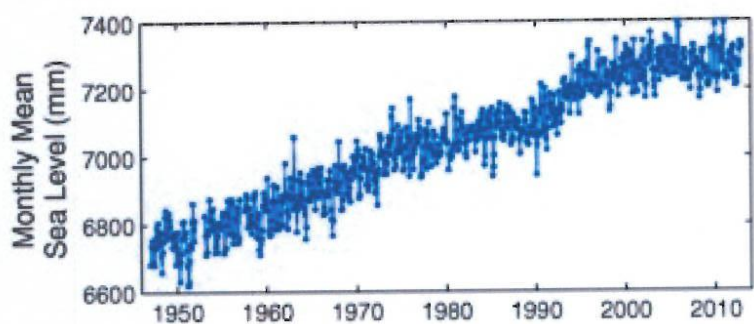
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Supplier: [JAPAN METEOROLOGICAL AGENCY](#)

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GLOSS Site Code: [89](#)

Last Data: 2012



Monthly Data

Annual Data

Benchmark Diagram

Permanent Service for Mean Sea Level



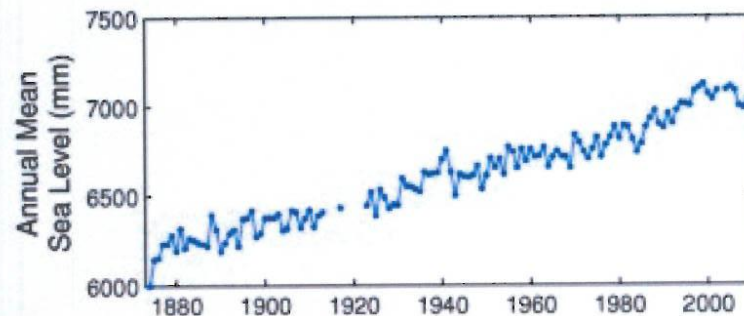
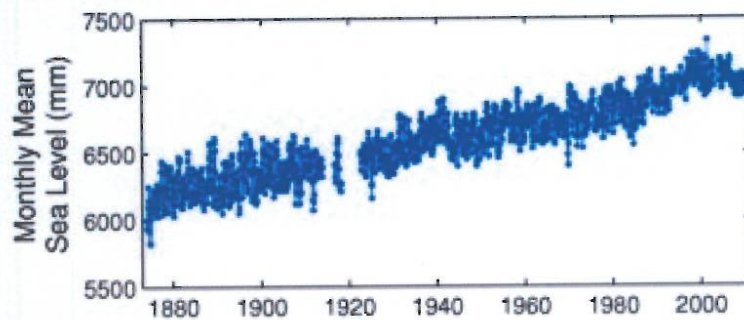
POTI GEORGIA

PSMSL ID: [41](#)

Supplier: DEPT. OF OCEANOLOGY AND METEOROLOGY, GEORGIA

PSMSL Coastline / Station Code: 305/021

Last Data: 2009



Monthly Data

Annual Data

Benchmark Diagram

Permanent Service for Mean Sea Level



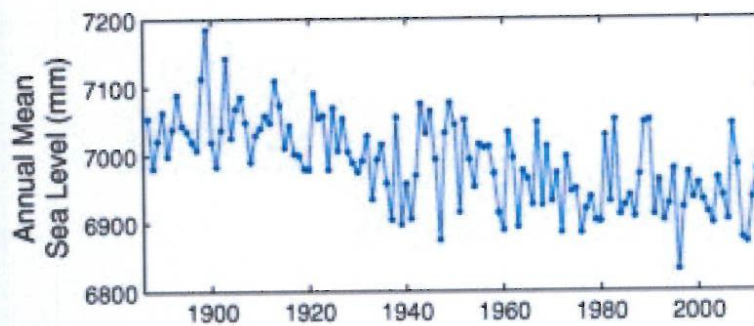
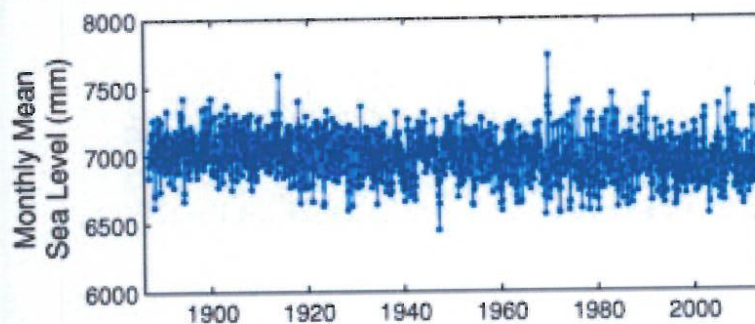
OLANDS NORRA UDDE SWEDEN

PSMSL ID: 69

Supplier: SWEDISH MET. AND HYD. INSTITUTE

PSMSL Coastline / Station Code: 050/091

Last Data: 2012



Monthly Data

Annual Data

Benchmark Diagram

Permanent Service for Mean Sea Level



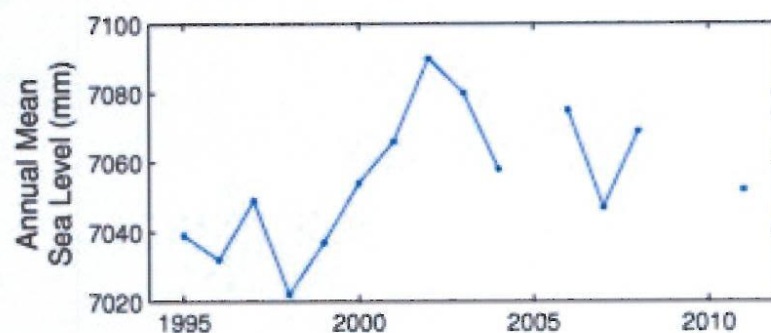
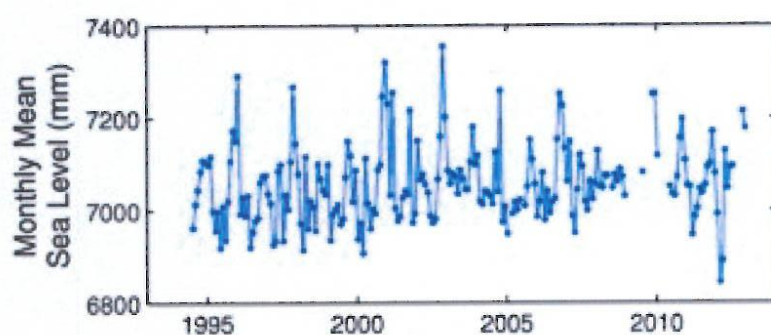
ST. MARYS UNITED KINGDOM

PSMSL ID: [1855](#)

Supplier: [N.O.C.](#)

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Last Data: 2012



Monthly Data

Annual Data

Benchmark Diagram



Permanent Service for Mean Sea Level

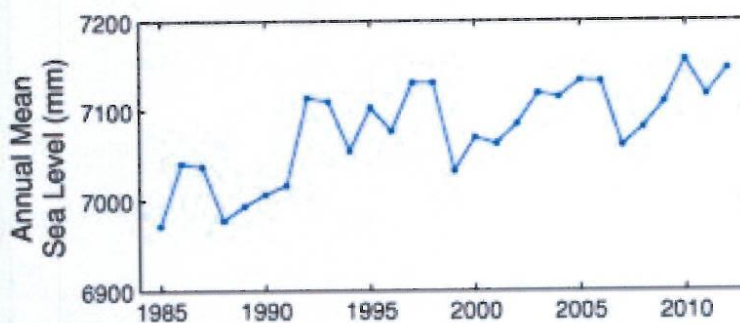
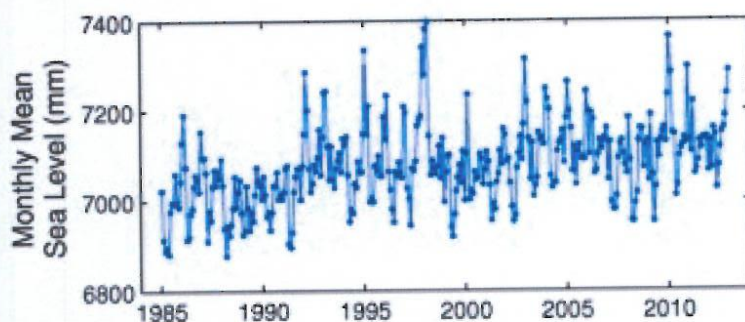
N. SPIT, HUMBOLDT BAY UNITED STATES

PSMSL ID: [1639](#)

Supplier: [N.O.A.A. / N.O.S.](#)

PSMSL Coastline / Station Code: 823/024

Last Data: 2012



Monthly Data

Annual Data

Benchmark Diagram



Permanent Service for Mean Sea Level

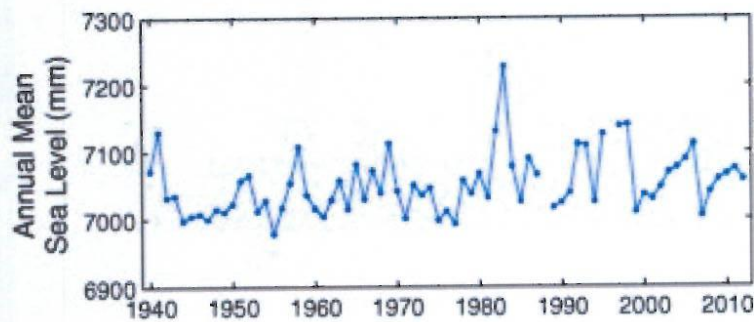
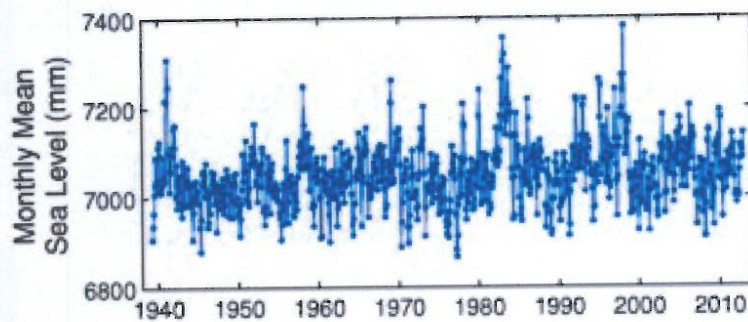
ALAMEDA (NAVAL AIR STATION) UNITED STATES

PSMSL ID: [437](#)

Supplier: [N.O.A.A. / N.O.S.](#)

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Monthly Data

Annual Data

Benchmark Diagram

Permanent Service for Mean Sea Level



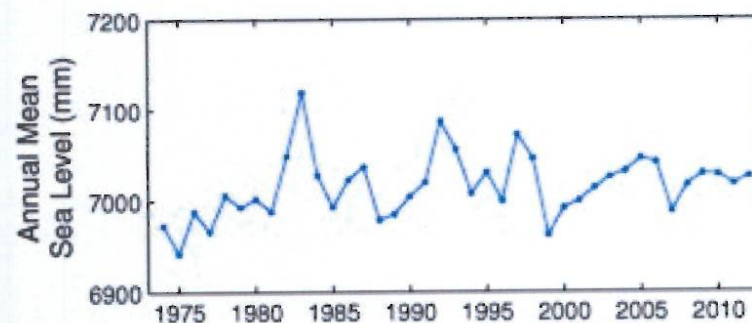
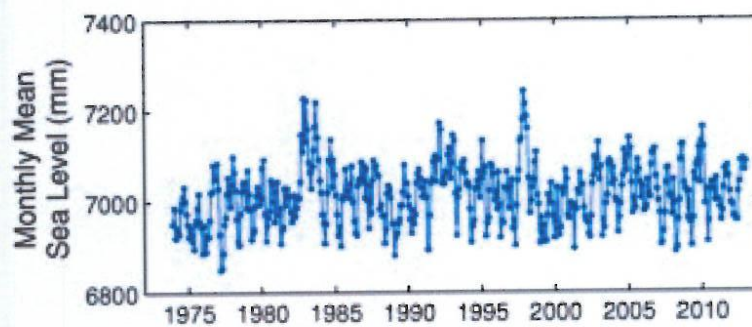
MONTEREY UNITED STATES

PSMSL ID: [1352](#)

Supplier: [N.O.A.A./N.O.S.](#)

PSMSL Coastline / Station Code: 823/036

Last Data: 2012



Monthly Data

Annual Data

Benchmark Diagram

Permanent Service for Mean Sea Level



GALVESTON I, PLEASURE PIER, TX UNITED STATES

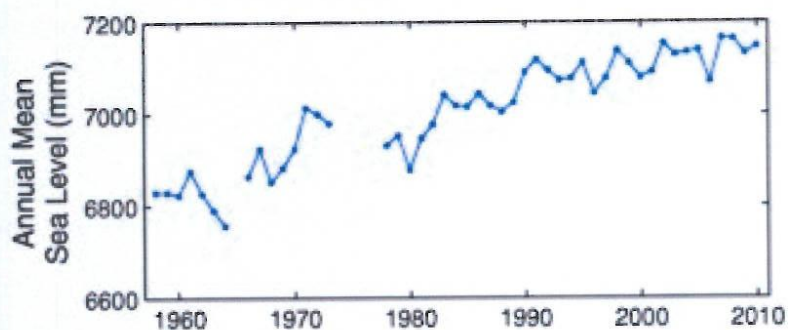
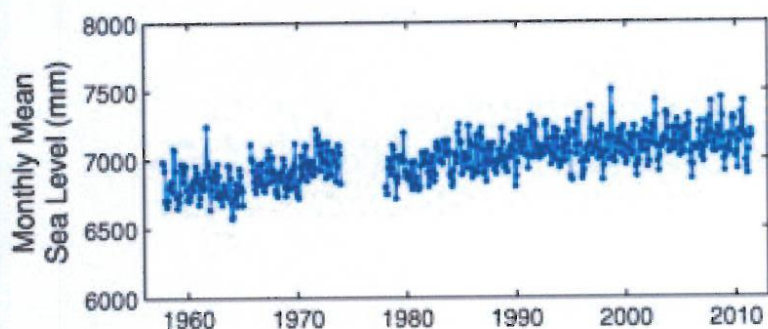
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Supplier: [N.O.A.A. / N.O.S.](#)

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GLOSS Site Code: [217](#)

Last Data: 2011



Monthly Data

Annual Data

Benchmark Diagram

Permanent Service for Mean Sea Level



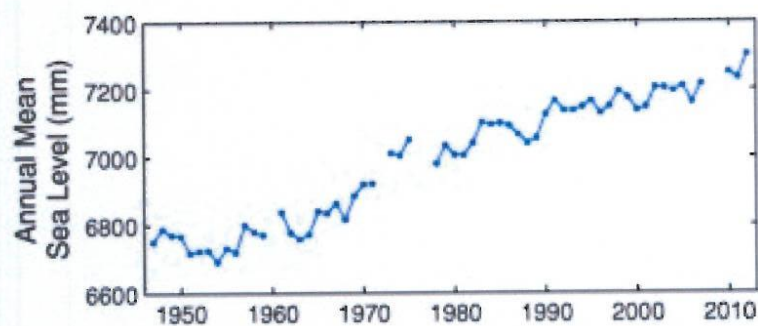
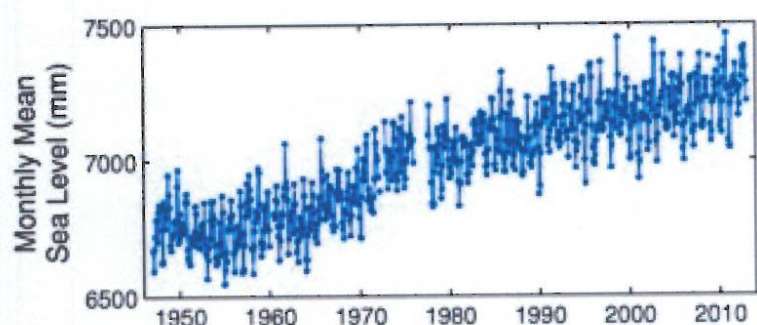
GRAND ISLE UNITED STATES

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PSMSL Coastline / Station Code: 940/021

Last Data: 2012



Monthly Data

Annual Data

Benchmark Diagram



Permanent Service for Mean Sea Level