

When It Comes To Climate Policies, 'Trust But Verify'

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Evidence of Incomplete Science of Ozone Depletion Supporting former Secretary of Shultz's U.N. Montreal Protocol negotiating position:

See Institute for Trade, Standards and Sustainable Development, *FOIA Request No. DOC-NOAA-2014-001694* (Sept. 22, 2014) [Hereinafter "ITSSD September FOIA"], at pp. 13-15, available at:

<https://nebula.wsimg.com/86e0c3d9f0c18e77b33e25d935498bcc?AccessKeyId=39A2DC689E4CA87C906D&disposition=0&alloworigin=1> .

Excerpt: (pp. 13-15 and accompanying endnotes)

- c. *The Impact that Susan Solomon's Ozone-Hole and Climate Change Research and Findings Have Had Upon Ozone and Climate Policymaking and Diplomacy*

With regard to Mr. Allison-Holman's third quoted statement (*"Susan Solomon would not know EPA would use [those assessments] for the endangerment finding"*), ITSSD provides the following response.

Minimal due diligence reveals that Susan Solomon was formerly a senior NOAA scientist¹ of atmospheric chemistry. While serving as a NOAA employee from 2002-2007, Ms. Solomon also had worked on IPCC matters^{2 3} as Co-Chair of the Science Working Group I of the Intergovernmental Panel on Climate Change's Fourth Assessment Report ("IPCC-AR4-WGI").^{4 5} Such due diligence also reveals that Susan Solomon currently serves as MIT Professor,⁶ University of Colorado Adjunct⁷ and CIRES Fellow,⁸ and National Academy of Science member.⁹

In addition, minimal due diligence reveals that Dr. Solomon is globally recognized for her prior research and findings suggesting that

"the Antarctic ozone hole involved reactions on polar stratospheric clouds (PSCs) [that...] release chlorine molecules, which separate and act as catalysts in destroying ozone",¹⁰ and that "the lack of ozone [leading] to increases in ultraviolet radiation [...] also impacted on climate. In particular, the ozone hole has a clear effect on wind and rain patterns in the southern hemisphere."¹¹

Although her ozone-hole research and findings "did not necessitate a precautionary approach" to managing ozone-depleting chemicals' manufacture and use,¹² Professor Solomon's work has long been credited by advocates of the politics, social values and interests-laden, information-framing and language-engineered new paradigm of postmodern *policy*-based "science" premised on the precautionary principle¹³ (with its attendant focus on hazard rather than risk assessment and on plausible correlative rather than actual causal proof of harm) as providing *the* catharsis for "knowledge brokers" (whose "most important asset is their flair for translating science, often with a 'spin', into language accessible to decision-makers,")¹⁴ to forge a discursive shift that successfully persuaded governments¹⁵ to strengthen the 1985 United Nation Environment Program's Vienna Convention for the Protection of the Ozone Layer via adoption of the "landmark" 1989 Montreal Protocol on Substances that Deplete the Ozone Layer.¹⁶ In fact, the Montreal Protocol¹⁷ was the first international treaty to go into legal force that mandates

national “precautionary measures” (without explicitly using the term “precautionary principle”) to ensure against possible environmental harm.^{18 19}

Dr. Solomon’s ozone-hole research and findings, which became well known amid then current deficient computer models, had been scientifically plausible but inconclusive.^{20 21} Although her research and findings “did not necessitate a precautionary approach” to managing ozone-depleting chemicals manufacture and use,²² EPA and the State Department used them as the basis for an interagency and administration Montreal Protocol bargaining position “call[ing] for a 95 percent cutback of CFCs and halons by the year 2000.”^{23 24} While Dr. Solomon was likely aware of how these agencies were then using her research and findings, she did not object. At least one commentator has emphasized that the U.S. negotiating position had been anchored by the radically new “precautionary orientation” of former EPA Administrator Lee Thomas²⁵ who supported the “chlorine-loading strategy [authored by] EPA “knowledge broker,” John Hoffman, Chairman of the EPA’s Stratospheric Protection task force.^{26 27} According to said commentator, the “strategic [...] decision to shift the debate from ozone depletion to chlorine concentrations,”²⁸ based on Susan Solomon’s research and findings, effectively served to “*shift[] the focus to the warming issue, and in general to the responsibility to the future*” (emphasis added),²⁹ which thereby transformed the debate from one of science to one of politics, philosophy and social responsibility.³⁰

Clearly, while it had been reported that two of Dr. Solomon’s close colleagues, atmospheric scientists Robert Watson and Daniel Albritton, had been “reluctant to commit themselves to concrete policy recommendations before *the [evidentiary] causes* of the Antarctica ozone hole were understood” (emphasis added),³¹ it is nowhere recorded that Dr. Solomon, had objected to EPA’s framing of the issue in this manner. Considering that such issue framing has since been characterized as “misleading because it implie[d] that all forms of chlorine are equally menacing to the ozone”,³² Dr. Solomon’s apparent tacit acceptance of it at that time, for whatever reason (i.e., whether for the sake of interagency coherence or to support the administration’s broader precautionary principle-based policy objectives),³³ raises serious questions about her professional commitment to *currently* ensure the integrity of climate science.

Indeed, these questions assume greater saliency today given the influential leadership role Professor Solomon had since exercised as Co-Chair of the IPCC-AR4-WGI in addressing climate change science issues at the global level, and her more recent noted contributions to climate change modeling. Minimal due diligence, for example, also reveals that Dr. Solomon has since been recognized for her contribution to the development of the two-dimensional chemical atmospheric *climate* computer model known as the Middle Atmosphere Model (NOCAR),³⁴ which “capture[s] the processes important for calculating globally averaged total ozone.”³⁵ It also reveals that Dr. Solomon has more recently been engaged in the development of an ozone-climate computer model to explain the relationship between carbon dioxide, decreases in tropical ozone and climate change.³⁶

As discussed above, Dr. Solomon was likely aware of, but failed to object to EPA’s ‘spinning’ of her inconclusive research and scientific findings to secure political support for the international adoption of the Montreal Protocol which, in turn, enabled subsequent enactment of parallel domestic legislation and EPA implementing regulations curtailing the manufacture and use of ozone-depleting chemicals. In addition, it is clear that Professor Solomon had served as Co-Chair of IPCC-AR4-WGI which produced a dramatic and politically influential report concluding that the global atmospheric concentrations of carbon dioxide had increased to their highest level in recorded human history by a wide margin, it was at least 90 percent certain that the cause of such CO₂ increase was anthropogenic activities,³⁷ and that such CO₂ concentrations are likely to lead to more frequent and more intense future hurricanes.³⁸ Dr. Solomon also had become well aware that IPCC and U.S. policymakers had designs to use this report to call for massive national cuts in greenhouse gas emissions to stabilize global GHG emissions.³⁹ She had

likely became aware of such designs as early as 2001, following the withdrawal of her former NOAA-NMFS colleague and fish and oceans expert, John Everett, from the IPCC AR3 development process on science integrity grounds.⁴⁰ Thereafter, in 2005, another former NOAA-ML colleague, Dr. Christopher Landsea, very publicly withdrew as an IPCC-AR4-WGI chapter author, on science integrity grounds,⁴¹ identifying IPCC lead author Kevin Trenberth of NCAR-NSF (mentioned in this new FOIA request) as the source of his concerns about the scientific integrity of the then forthcoming IPCC-AR4-WGI report.⁴² And, Dr. Solomon also likely had become aware of other prominent U.S.^{43 44} and foreign^{45 46} scientists who had withdrawn from the IPCC AR2, AR3 or AR4 report development processes on similar alleged grounds.

¹ See National Oceanic and Atmospheric Administration, *Top Ten History Makers, Susan Solomon: Pioneering Atmospheric Scientist*, NOAA website, available at: <http://celebrating200years.noaa.gov/historymakers/solomon/welcome.html#understanding>.

² See United States Department of Commerce Office of the Inspector General, *Correspondence to United States Senator James Inhofe Regarding the Examination of Issues Related to the Internet Posting of Email Exchanges Taken from the Climatic Research Unit (CRU) of the University of East Anglia in the United Kingdom* (Feb. 18, 2011) at pp. 15-16, available at: <http://www.oig.doc.gov/OIGPublications/2011.02.18-IG-to-Inhofe.pdf>. However, Dr. Solomon's resume indicates that she had served as the IPCC-AR4-WGI Co-chair from "April 2002-September 2008". See *Susan Solomon CV*, available at: <http://www.esrl.noaa.gov/csd/staff/susan.solomon/susan.solomon.cv.pdf>.

³ During Susan Solomon's tenure as IPCC-AR4-WGI Co-Chair, the Department of Commerce's Office of Inspector General ("DOC-OIG") had conducted an investigation of the relationship between DOC-NOAA and the IPCC. Said investigation had been prompted by "the internet posting of email exchanges taken from the Climatic Research Unit (CRU) of the University of East Anglia in the United Kingdom in a reported computer hacking incident on or about November 17, 2009." *Id.*, at p. 1. Dr. Solomon had been identified as one of two NOAA scientists whose name appeared frequently in the "289 emails that [the DOC-OIG] identified as relating to NOAA and/or its employees". *Id.*, at p. 20. "The two NOAA scientists whose names most frequently appear in the emails³⁰ included the Director of the NCDC and Transitional Director of NOAA's Climate Service (103 emails); and a NOAA senior scientist who served as Co-Chair of Working Group 1 (WG1) for the United Nations Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) (108 emails)" (emphasis added). *Id.* The DOC-OIG had investigated, in part, whether the IPCC, during Dr. Solomon's detail as IPCC-AR4-WGI Co-Chair, had manipulated data related to its high profile climate change report – i.e., whether "the emails allegedly showed that climate change-related data had been manipulated or deleted to support the theory that global warming is caused by human activity." *Id.*, at p. 1. In addition, the DOC-OIG investigation also examined whether Dr. Solomon, who had followed the advice of NOAA's Office of General Counsel, had improperly failed to respond to various email-related NOAA FOIA requests forwarded to her during that period. *Id.*, at p. 2. While the DOC-OIG had not found any wrongdoing, it recommended, based on the findings of a prior DOC-OIG investigation of NOAA's FOIA-related practices, that NOAA "[c]arry out a proper search for responsive records to the four FOIA requests seeking NOAA records regarding review comments on the Second Order Draft and Final Draft of the IPCC AR4 WG1, and reassess the agency's response to these requests as appropriate," and "should consider whether these issues warrant an overall assessment of the sufficiency of its FOIA process." *Id.*, at pp. 3, 17. Furthermore, the DOC-OIG examined whether DOC-NOAA had institutionally failed "to adhere to its peer review procedures prior to its [public] dissemination of [such email] information", and consequently, whether the Agency had failed to comply with its obligations under the Information Quality Act and relevant OMB and agency IQA-implementing guidelines with respect to its handling of such email exchanges. *Id.*, at p. 2. The DOC-OIG "found no evidence in the CRU emails to suggest that NOAA failed to adhere to its peer review procedures prior to its dissemination of information" and "no evidence in the CRU emails to suggest that NOAA violated its obligations under the IQA." *Id.*, at pp. 11-12.

⁴ See Intergovernmental Panel on Climate Change Fourth Assessment Report, *Climate Change 2007: Working Group I: The Physical Science Basis, Coordinating Lead Authors: Susan Solomon (USA), Dahe Qin (China), Martin Manning (USA, New Zealand)* (2007), available at: http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ts.html.

⁵ Like "other NOAA employees who participated in the AR4...the Co-Chair...performed much of [her] IPCC-related work at NOAA offices and/or using NOAA equipment, received [her] pay from NOAA, and [...] continued to work on other NOAA matters and remained subject to the supervision of other NOAA employees." *Id.*, at p. 15.

⁶ See Massachusetts Institute of Technology Program in Atmospheres, Oceans and Climate, *People – Susan Solomon*, available at: <http://eaps-www.mit.edu/paoc/people/susan-solomon/bio>. See also Massachusetts Institute of Technology, *Introducing Atmospheric Chemist Susan Solomon*, available at: <http://video.mit.edu/watch/introducing-atmospheric-chemist-susan-solomon-8844/>. See Atmospheric Environmental Research, *AER Seminar with MIT Climate Scientist Susan Solomon* (Nov. 15, 2012), available at: <http://www.aer.com/news-events/events/aer-seminar-mit-climate-scientist-susan-solomon> ("AER will host a noontime seminar by MIT Professor Susan Solomon on 'Emerging Signals of Climate Changes: Where in the World will Climate Change First?' As climate models

improve and computing resources increase, decision makers' hopes for accurate local climate predictions are growing. Solomon, recently recruited by MIT to be the Ellen Swallow Richards Professor of Atmospheric Chemistry and Climate Science at MIT, will summarize recent research showing the surprising result that an early onset of significant local warming that exceeds past variability is already emerging or will likely emerge in the next two decades in many tropical countries.”) *Id.*

⁷ See Massachusetts Institute of Technology Program in Atmospheres, Oceans and Climate, *People – Susan Solomon, supra* (“Professional Experience [...] *Professor Adjoint, University of Colorado at Boulder, 1985-present*”) (emphasis added). *Id.*; Sneha Abraham, *Climate Scientist Susan Solomon Presents 51st Annual Robbins Lecture: "Exploring Our Atmosphere's Climate and Chemistry"*, Pomona College News (Jan. 31, 2013), available at: <http://www.pomona.edu/news/2013/01/31-robbins-lecture-solomon.aspx> (“Solomon is currently the Ellen Swallow Richards Professor of Atmospheric Chemistry & Climate Science at the Massachusetts Institute of Technology. She was a scientist at the National Oceanic and Atmospheric Administration (NOAA), from 1981 to 2011, and *has been an adjunct professor at the University of Colorado in Boulder since 1982*” (emphasis added). *Id.*

⁸ See University of Colorado, Cooperative Institute for Research in Environmental Sciences (CIRES), *People – Susan Solomon*, available at: <http://cires.colorado.edu/people/solomon/>. See also Carl Kisslinger, *CIRES, 1967–2002 Cooperative Institute for Research in Environmental Sciences - Pioneering a Successful Partnership* (CIRES 2002), at pp. 33, 119-121, available at: <http://cires.colorado.edu/about/history/CIRES1967-2002.pdf>.

⁹ See National Academy of Sciences, *Member Directory - Susan Solomon*, available at: <http://www.nasonline.org/member-directory/members/50261.html> (“My primary research interest is atmospheric chemistry, particularly depletion of the stratospheric ozone layer, coupling between chemical species and climate change, and tropospheric pollution.”) *Id.*

¹⁰ See World Meteorological Organization, *Bulletin, Interview with Susan Solomon*, available at: http://www.wmo.int/pages/publications/bulletin_en/interviews/int_solomon_en.html.

¹¹ See PR Newswire, *Susan Solomon Wins the BBVA Foundation Frontiers of Knowledge Award for Establishing the Links Between Atmosphere, Climate and Human Activity*, Digital Journal (Jan. 10, 2013), available at: <http://www.digitaljournal.com/pr/1008948> (“The BBVA Foundation Frontiers of Knowledge Award in the Climate Change category goes in this fifth edition to U.S. scientist Susan Solomon for her work on determining how human action alters the composition of the atmosphere and how these changes, in turn, affect the Earth's climate.”) *Id.*

¹² See Karen T. Liftin, *Framing Science: Precautionary Discourse and the Ozone Treaties*, *Millennium: Journal of International Studies*, Vol. 24, No. 2 (1995), at pp. 251, 260, available at: <http://faculty.washington.edu/litfin/research/framing-science.pdf>.

¹³ *Id.*, at pp. 251-253.

¹⁴ *Id.*, at pp. 253-254.

¹⁵ “[K]nowledge brokers [...] translate and interpret knowledge in accordance with new or pre-existing sets of linguistic practices which entail specific constructions of the world. [...] Their influence derives from the plausibility of their interpretations, the loudness of their voices, and the political context in which they act. While they typically operate at low or middle levels of governments and international organizations, they are also found at higher levels, as in the US President’s Council of Economic Advisors and the Science Advisor. They may also come from the ranks of nongovernmental organizations (NGOs), which aim their interpretations not just at policy-maker, but at the public through the mass media. *The ability of knowledge brokers to frame and interpret information is a substantial source of power, especially under conditions of scientific uncertainty such as those which characterize environmental problems.* Essentially knowledge brokers serve as channels for discourse and as intermediaries between information and decision-makers, often clothing bare facts with social meaning” (emphasis added). *Id.*

¹⁶ “Superficially, the landmark treaties appear to have been the result of a rigorous process of risk analysis, with sophisticated atmospheric models providing the scientific basis of the negotiations. This is the thesis of Ambassador Richard Benedick, US Chief negotiator for the Montreal Protocol and author of a widely read version of the ozone story. It would be a mistake, however, to conclude that science provided a body of objective and value-free facts from which international cooperation emerged, as the epistemic cooperation hypothesis would suggest. Rather, knowledge was ‘brokered’, so that questions of value were rendered as questions of fact, with exogenous factors shaping the credibility of alternative discursive strategies: in the Montreal Protocol process, science was *framed* by knowledge brokers (emphasis in original). While [Peter] Haas’ reading of the ozone regime as the work of an epistemic community highlights the role of knowledge in shaping interests, his inattentiveness to discourse causes him to neglect the role of values and interests in shaping knowledge claims. *Consequently, he overestimates the role of scientists – information producers – and underestimates the role of knowledge brokers – information framers* (emphasis added). Similarly, he fails to grasp the significance of contextual factors like the Antarctic Ozone hole, which was crucial to the eventual outcome of the negotiation process” (emphasis in original) *Id.*, at pp. 254-255.

¹⁷ “The Montreal Protocol on Substances that Deplete the Ozone Layer, and its subsequent amendments, provide an excellent case for a discursive approach, because of the pivotal role of science. In general, environmental problems are not simply physical events; they are *discursive phenomena* that can be studied as struggles among contested knowledge claims, which become incorporated into divergent narratives about risk and responsibility. The struggle that ensues is a struggle for meaning in which no meanings are ontologically fixed [fn]” (emphasis added). *Id.*, at p. 254, citing Charles J. Fox and Hugh T. Miller, *Postmodern Public Administration: Toward Discourse*

(Beverly Hills, CA; Sage, 1995), pp. 10-11. (“Fox and Miller use Habermas’ theory of ideal speech acts to distinguish between authentic and monologic discourse...” *Id.*, at fn 18.

¹⁸ The Preamble to the Montreal Protocol on Substances that Deplete the Ozone Layer, which implements the Vienna Convention for the Protection of the Ozone Layer, states as follows: “Determined to protect the ozone layer *by taking precautionary measures* to control equitably total global emissions of substances that deplete it, with the ultimate objective of their elimination on the basis of developments in scientific knowledge...taking into account technical and economic considerations...*Noting the precautionary measures* for controlling emissions of certain chloroflourocarbons (CFCs) that have already been taken at national and regional levels...” (emphasis added). See “Preamble”, Montreal Protocol on Substances that Deplete the Ozone Layer, to the Vienna Convention for the Protection of the Ozone Layer.

¹⁹ “The Montreal Protocol process is essentially the story of how a status quo discourse favouring inaction was supplanted by a precautionary discourse. The precautionary principle, an emerging principle of international environmental law, holds that, in the face of scientific uncertainty, regulators should act to prevent harm rather than wait until damage occurs. This premise, which expresses a *philosophical* rather than a *scientific* judgment, entails radically different discursive strategies from those which underlie the premise that chemicals are innocent until proven guilty. **Precautionary discourse [...] refers to a set of linguistic practices informed by this principle and embedded in a social network (in this case, a group of knowledge brokers); precautionary action applies this principle to specific policies**” (italicized emphasis in original; boldfaced emphasis added). *Id.*, at p. 255.

²⁰ See W. Henry Lambright, *NASA and the Environment: The Case of Ozone Depletion*, National Aeronautics and Space Administration Monographs in Aerospace History No. 38 (2005), available at: <http://history.nasa.gov/monograph38.pdf> (“In March [1986], Watson, Albritton, and others met in Boulder and decided to conduct a field expedition to Antarctica as soon as possible. With Albritton’s help, Watson hurriedly dispatched a 13-member team of scientists to Antarctica during the August–September period when the depletion seemed to be most pronounced. He placed Susan Solomon, a NOAA scientist from Albritton’s lab, in charge. Known as NOZE (National Ozone Expedition), the expedition’s purpose was to explain the ozone hole and determine which of the various theories accounted for it [...] The team took balloon and ground-based measurements and also had the benefit of satellite data. [fn] At the end of NOZE, Solomon held a press conference from Antarctica. *Although there still was much work to do analyzing the data, the NOZE team felt that public alarm about the ozone hole required them to say something (rather than waiting [...] until their work had cleared the lengthy peer-review, publication process). Solomon declared, ‘We suspect a chemical process is fundamentally responsible for the formation of the hole.’* [fn] *There were caveats, and by no means did Solomon say the data were conclusive. But Solomon’s statement about causation received a negative reaction from many scientists* who favored a meteorological explanation and from industry, which thought the statement much too premature. In November 1986, critics of NOZE aired their views in a special edition of *Geophysical Research Letters*. Many of those who published opinions in the journal wanted a higher standard of proof than existed at the time. [fn] Watson decided that there would have to be a second expedition to settle the scientific questions regarding the cause of ozone depletion.” [...] *The first expedition obtained satellite and ground data. The data were suggestive but inconclusive*”) (emphasis added). *Id.*, at pp. 18-19.

²¹ “The ozone hole was very much on the minds of negotiators.[fn] The delegates saw the hole over Antarctica as a warning, even though conclusive scientific findings were unavailable. Watson and Albritton told the delegates what they knew, and what they did not know. However, *there were many nonscience issues that still had to be addressed.* [...] In September 1987, [Robert] Watson and [Daniel] Albritton flew up to Montreal during the final negotiations to present the participants with the preliminary results of the expedition. However, before the final scientific facts were in from Antarctica, the Montreal Protocol had concluded. [...] In October, leaders of the second antarctic expedition studied their results. [...] This second expedition also provided the ‘*smoking gun*’ for which participating scientists had been looking—a very clear ‘*anti-correlation*’ between chlorine monoxide (the chemically active form of chlorine in the stratosphere) and ozone. That is, the more chlorine, the less ozone! Critical to this finding were two instruments on the ER-2—the chlorine monoxide instrument from Anderson’s group at Harvard, and an ozone instrument from the NOAA Aeronomy Lab” (emphasis added). *Id.*, at pp. 20-22.

²² See Karen T. Lipton, *Framing Science: Precautionary Discourse and the Ozone Treaties*, Millennium: Journal of International Studies, Vol. 24, No. 2 (1995), at pp. 251, 260, available at: <http://faculty.washington.edu/litfin/research/framingscience.pdf>.

²³ See Karen T. Lipton, *Framing Science: Precautionary Discourse and the Ozone Treaties*, Millennium: Journal of International Studies, Vol. 24, No. 2 (1995), *supra* at p. 262.

²⁴ The U.S. delegation ultimately scaled back its position and called only for a 50 percent cutback by 1999. “The final agreement, while falling short of the US position, required scheduled reductions of domestic CFC and halon consumption by up to 50 percent by the year 2000.” *Id.*, at p. 266. See also Karen T. Lipton, *Ozone Discourse: Science and Politics in Global Environmental Cooperation*, (Columbia University Press 1995), at “Chap. 4 - The Employment of Knowledge in the Montreal Protocol Negotiations”, *supra*. (“The original 95 percent position was not revoked, primarily because ‘it had already been put out on the street’ (interview with David Gibbons). But the U.S. delegation received instructions to press only for a 50 percent reduction in CFCs and a freeze on halons (Doniger 1988:90).” *Id.*

²⁵ “From the beginning of his tenure as EPA Administrator in 1985, Lee Thomas took a considerable interest in the ozone issue.[fn] He personally announced the EPA’s new perspective on ozone at a workshop in March 1986: ‘[i]n the face of all this scientific uncertainty, one might ask why...not simply adopt a ‘wait-and-see’ attitude until depletion is actually confirmed? Let me address this question

squarely. EPA does not accept, as a precondition for decision, empirical verification that ozone depletion is occurring...[We] may need to act in the near term to avoid letting today's 'risk' become tomorrow's 'crisis.'" Rather than the science itself, it was Thomas' *discursive orientation* that drove his decision: his understanding of the problem was rooted in a particular narrative about risk and responsibility in the social world. As Thomas recalls, referring to his disagreement with William Graham, President Reagan's Science Advisor and a staunch opponent of regulation, "Graham look at it from a purely scientific perspective, whereas I looked at it from more of a policy perspective. Where there was uncertainty, he thought we needed more research and I thought we needed to be cautious. We just looked at the same science and came to two different conclusions" [...] **Rather, it was the EPA's knowledge brokers, with later support from the UNEP and other national environmental agencies, who framed the science in light of the precautionary discourse**" (italicized emphasis in original; boldface emphasis added). *Id.*, at pp. 262-263. See also *See also* Karen T. Liftin, *Ozone Discourse: Science and Politics in Global Environmental Cooperation*, (Columbia University Press 1995), at "Chap. 4 - The Employment of Knowledge in the Montreal Protocol Negotiations", available at: <http://www.columbia.edu/dlc/cup/litfin/litfin14.html> ("***Rather than the science itself, it was Thomas's interpretation of the science and his own philosophical orientation to the problem of risk that drove his decision***") (emphasis added). *Id.*²⁶ *Id.*, at p. 269. See also Karen T. Liftin, *Ozone Discourse: Science and Politics in Global Environmental Cooperation*, (Columbia University Press 1995), at "Chap. 4 - The Employment of Knowledge in the Montreal Protocol Negotiations", *supra*. ("As John Hoffman argued at the Leesburg meeting, an 85 percent reduction in CFC emissions would be necessary just to keep atmospheric chlorine levels constant (paper 2, UNEP/WG.148/3). His calculations required no modeling, only knowledge about production data and the compounds' atmospheric lifetimes. If the hole was caused by CFCs, suggesting a radically nonlinear relationship between CFC emissions and ozone depletion, there was good reason to want at least to freeze atmospheric chlorine concentrations. Hoffman's chlorine-loading argument gained salience from the ozone hole for another reason. Because of the earth's weather patterns, most chemicals penetrate the stratosphere over the tropics. Ozone, however, is much more sensitive to chlorine at the higher latitudes, where at least some of the CFCs decompose because of their long atmospheric lifetimes. Thus, the latitude at which CFCs break apart makes a crucial difference, *but there is no clear sense in the models of when CFCs release their chlorine. The extreme losses over Antarctica suggested that much of the chlorine could be released in the polar regions, which would mean that the models' had underestimated the threat.* As one modeler explains, 'the truth will be between the chlorine-loading perspective and the calculations based on ozone depletion potential, but *the ozone hole gave credence to the chlorine-loading scheme*' (interview with Guy Brasseur). Hoffman's simple calculation received a great deal of publicity in congressional hearings and in the press (United States Senate 1987a:61; Palm Beach Post 1987; Science 1986:928). When the issue was framed in these terms, suddenly a phaseout did not seem like a drastic proposal.") *Id.*

²⁷ "The papers by John Hoffman [...] [were] especially noteworthy for their emphasis on the long atmospheric lifetimes of CFCs. [fn] His primary contribution to the discourse of precautionary action was his 'chlorine-loading' analysis: in order simply to stabilise chlorine concentrations at 1986 levels, the presence of past emissions in the atmosphere required an immediate 85 per cent cutback in DVC emissions. [fn] [...] Two factors in particular had considerable significance in shaping the EPA's discursive strategy: first, the discovery of the Antarctic ozone 'hole'[fn] crucially enhanced the credibility of Hoffman's proposal. Second, the discursive proclivities of the EPA were in large part determined by key EPA knowledge brokers' general social orientation towards risk and responsibility." *Id.*, at pp. 258-259.

²⁸ "According to EPA contractor Michael Gibbs, '[t]here was no new information here, just a different way of framing it. We thought: since the hole may be linked to concentrations, let's shift the debate. This also shifts the focus to the warming issue, and in general to the responsibility to the future. It would not have worked one year before; it only worked because of the Antarctic hole.'" *Id.*, at p. 261. See also Karen T. Liftin, *Ozone Discourse: Science and Politics in Global Environmental Cooperation*, (Columbia University Press 1995), at "Chap. 4 - The Employment of Knowledge in the Montreal Protocol Negotiations", *supra*.

²⁹ *Id.*

³⁰ *Id.* See also Karen T. Liftin, *Ozone Discourse: Science and Politics in Global Environmental Cooperation*, (Columbia University Press 1995), at "Chap. 4 - The Employment of Knowledge in the Montreal Protocol Negotiations", *supra*. "*In other words, the hole enhanced the status of a particular mode of scientific framing, one with explicitly political purposes: to promote an environmentalist agenda.* Groups like the NRDC used the chlorine-loading analysis to promote sweeping controls; '85 percent became the line in the sand for environmentalists' (interview with James Losey) (emphasis added)." *Id.*

³¹ See Karen T. Liftin, *Framing Science: Precautionary Discourse and the Ozone Treaties*, Millennium: Journal of International Studies, Vol. 24, No. 2 (1995), *supra* at p. 275. "In actuality, very few scientists offered any policy recommendations. Watson, for instance, believed that 'the science didn't justify a 95 per cent cut', expressing concern that the rush could promote unsafe alternatives. [fn] Daniel Albritton, the other major US scientist advising policy-makers, continued to harbour doubts about the CFC-ozone link.[fn]" *Id.*, at p. 263. See also Karen T. Liftin, *Ozone Discourse: Science and Politics in Global Environmental Cooperation*, (Columbia University Press 1995), at "Chap. 4 - The Employment of Knowledge in the Montreal Protocol Negotiations", *supra* ("[V]ery few scientists offered any policy recommendations and [] most of those who did thought a 50 percent cut would be enough (interviews with Ralph Cicerone, Nien Dak Sze, and Robert Watson). Watson, for instance, testified before Congress that 'the science doesn't justify a 95 percent cut' and expressed concern that the rush could promote unsafe alternatives (United States Congress 1987b:90). Dr. Daniel Albritton of NOAA, the other major U.S. scientist coordinating ozone research, continued to harbor doubts about the CFC-ozone link (interview with Ralph Cicerone).

Since Watson and Albritton were the two top scientists advising policymakers on the ozone layer, it is difficult to see how they could have been the ‘driving force’ behind the U.S. position” (emphasis added). *Id.*

³² “Framing the issue in terms of chlorine loading, as Hoffman did, rather than in terms of ozone depletion potential (ODP), as did the atmospheric models, is somewhat misleading because it implies that all forms of chlorine are equally menacing to ozone. But, as the discovery in Antarctica demonstrated, the models were also misleading. As one scientist puts it in 1990: ‘Chlorine doesn’t affect us; ozone does. ODP is more sophisticated, more complicated. Two years ago, I would have said chlorine loading was a good measure; now I think we should use the state-of-the-art models. At the time the models couldn’t account for the Antarctic hole, and now they can’ (interview with Nien Dak Sze)” (emphasis added). *Id.*, at note 23.

³³ “**Evolution of the U.S. Position** - During the previous summer [1986], the EPA and the State Department’s Bureau of Oceans and International Environmental and Scientific Affairs (OES), had convened interagency meetings to develop the U.S. position, but there was little interest from other agencies. [fn] This essentially gave the EPA and OES free reign to devise the position (interview with Richard Benedick). Their draft paper called for a near-term freeze on the consumption [fn] of CFC-11, -12, and -113, as well as Halon-1211 and -1301; a scheduled phaseout of these compounds; and periodic policy reviews based on new scientific knowledge (U.S. Department of State 1986). The U.S. negotiating position grew out of an interesting set of interrelated political and scientific considerations. The EPA was under some pressure to promote stringent controls because of the pending NRDC suit, but the proposed phaseout went beyond what the NRDC had expected and probably further than would have been legally necessary. [fn] According to EPA staff who were deeply involved in working out the position, the NRDC suit was only a secondary consideration (interviews with James Losey and Stephen Seidel). *More important was the belief on the part of the EPA and OES that, despite the scientific uncertainties, the risks demanded precautionary intervention. During the debates, both domestic and international, they argued for ‘a prudent insurance policy,’ even without the Antarctic ozone hole* (Benedick 1987). But the hole clearly and dramatically drew attention to those risks”) (emphasis added). See Karen T. Liffin, *Ozone Discourse: Science and Politics in Global Environmental Cooperation*, (Columbia University Press 1995), at “Chap. 4 - The Employment of Knowledge in the Montreal Protocol Negotiations”, *supra*.

³⁴ See United States Department of Commerce, National Oceanic and Atmospheric Administration, *Atmospheric Chemistry Modeling Atmospheric Chemistry Modeling An Inventory of Model Platforms in use at NOAA An Inventory of Model Platforms in use at NOAA*, Chemical Workshop (Aug. 2007), available at: <http://www.esrl.noaa.gov/events/2007/chemworkshop/pdf/NOAAAtmosChemModeling.pdf> (“2-D Middle Atmosphere Model (NOCAR) 1. Brief description of model Coupled dynamical-radiative-chemical two-dimensional model of the middle atmosphere, including detailed ozone chemistry and its interaction with long and short lived gases. 2. Principal applications or customers Evolution of ozone, ozone depletion potentials, lifetimes of source gases. 3. Key participants, lab/organization, effort, contact information Robert Portmann, ESRL/CSD, robert.w.portmann@noaa.gov. Susan Solomon, ESRL/CSD, susan.solomon@noaa.gov [...] 8. Description of key outcomes, applications (including literature citations describing work), and other information about modeling capabilities a. Evolution of Ozone: Elucidating the effect of volcanic aerosols on the evolution of ozone and their effect on ozone photochemistry [...] b. Role of NO_x in the stratosphere: Evaluations of the effect of NO_x on stratospheric photochemistry including its effect on other ozone destroying catalytic cycles and ozone trends...”) *Id.*, at p. 21.

³⁵ See J. S. Daniel, E. L. Fleming, R. W. Portmann, G. J. M. Velders, C. H. Jackman, and A. R. Ravishankara, *Options to Accelerate Ozone Recovery: Ozone and Climate Benefits*, Atmospheric Chemistry and Physics, Vol. 10, 7697–7707 (European Geosciences Union 2010), at 7699, available at: <http://www.atmos-chem-phys.net/10/7697/2010/acp-10-7697-2010.pdf>.

³⁶ See Jean-Francois Lamarque and Susan Solomon, *Impact of Changes in Climate and Halocarbons on Recent Lower Stratosphere Ozone and Temperature Trends*, American Meteorological Society Journal of Climate Vol. 23 2599-2611 (May 15, 2010), available at: <http://acd.ucar.edu/~lamar/PDF/2010JCLI3179.pdf> (“In particular, we have shown that much of the lower stratospheric tropical ozone decrease between 1980 and the late 1990s can be attributed to long-term increases in CO₂ and sea surface temperatures (through acceleration in the tropical lower stratosphere vertical velocity,) at least for the region between 100 and 50 h.Pa [...] We have also shown that the strengthening of the simulated temperature gradient across the Southern Hemisphere subtropical jet was larger when CFCs were allowed to increase over their 1970 levels [...] Further, we showed that the decrease in tropical tropopause pressure at most latitudes in our model is associated with changes in CO₂ and SSTs [...] In our case, we explicitly compute [an ozone change] and have shown that the trends in ozone over much of the tropics are themselves driven by climate change [...] Therefore, the results presented here show that the full understanding and attribution of the impact of recent and future changes in the tropopause region and in the width of the tropics and their implications for global change will require the use of interactive chemistry in climate models to fully capture forcings and feedbacks.”) *Id.*, at p. 2609.

³⁷ See IPCC, 2007: Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)) (Camb. Univ. Press 2007), at pp. 2-3, available at: <https://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf> (“Global atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased markedly as a result of human activities since 1750, and now far exceed pre-industrial values determined from ice cores spanning many thousands of years. The global increases in carbon dioxide concentration are due primarily to fossil fuel use

and land use change, while those of methane and nitrous oxide are primarily due to agriculture [...] The understanding of anthropogenic warming and cooling influences on climate has improved since the TAR, leading to very high confidence [fn7] that the global average net effect of human activities since 1750 has been one of warming [...] 7 In this Summary for Policymakers the following levels of confidence have been used to express expert judgements on the correctness of the underlying science: *very high confidence represents at least a 9 out of 10 chance of being correct*; high confidence represents about an 8 out of 10 chance of being correct”) (emphasis added). *Id.*

³⁸ “Based on a range of models, it is likely that future tropical cyclones (typhoons and hurricanes) will become more intense, with larger peak wind speeds and more heavy precipitation associated with ongoing increases of tropical sea surface temperatures.” *Id.*, at p. 15.

³⁹ See, e.g., U.S. Senate Committee on Environment and Public Works, *Media Covering Up UN Global Warming Report’s Political Agenda*, Senator Inhofe Charges (Jan. 31, 2007), available at: http://www.epw.senate.gov/public/index.cfm?FuseAction=Minority.Blogs&ContentRecord_id=79C41A1E-802A-23AD-40C1-210D91AC6AFE.

⁴⁰ On April 17, 2007, Dr. Everett testified before the Committee on Natural Resources, Subcommittee on Fisheries, Wildlife and Oceans of the U.S. House of Representatives, about his author role in the development of IPCC-AR3-WGI. “I will present the results of the work I led for the Intergovernmental Panel on Climate Change from 1988 to 2000, while an employee of NOAA. This is still the most thorough, comprehensive, and broadly reviewed work on the subjects that has been published. The reports were reviewed by hundreds of government and academic scientists as part of the IPCC process. My work included five impact analyses: Fisheries (Convening Lead Author), Polar Regions (Co-Chair), Oceans (Lead Author), and Oceans and Coastal Zones (Co-Chair/2 reports). Since leaving NOAA I have kept abreast of the literature, have talked to many individuals and groups and have maintained these subjects in the UN Atlas of the Oceans, where I am the Chief Editor and Project Manager. While I will present the results from IPCC documents I led or helped write, all opinions are mine alone, and are at the end. I was assigned the climate change duties when I was the National Marine Fisheries Service Division Chief for Fisheries Development in the 1970s. The agency was very concerned about the impact of climate change on the United States fisheries and fishing industry. Global cooling would be devastating to our fisheries and aquaculture. About 1987, the momentum shifted to fears of global warming and with my background, I was tasked to lead our efforts dealing with it. In 1996 I received the NOAA Administrator’s Award for ‘accomplishments in assessing the impacts of climate change on global oceans and fisheries’ [...] In this light *I view with grave concern the two latest IPCC Summary for Policy Makers which use truncated data in text and graphics to misrepresent the amount of warming, causing undue alarm. For example, from the most recent SPM, ‘The Working Group I Fourth Assessment concluded that most of the observed increase in the globally averaged temperature since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations.’ This is a red flag. It begs the question of why the restriction ‘since the mid-20th century’. What is wrong with the full data set back into the 1800s? Is it restricted to ‘mid-20th century’ because it is too difficult to explain the prior decades of falling temperatures in the face of rising CO₂? This demonstration (and there are many others) is typical of what has led many disagreeing scientists to not be invited to IPCC anymore, and others to lose interest. Over 20 years the core IPCC-participating scientists have become more homogeneous. The consensus has become stronger as dissenting scientists have moved to become the ‘other consensus’, usually called climate skeptics. The source of the warming or cooling is of little importance to an impacts assessment, except where it provides a clue as to future trends. Most people agree that there has been a warming of 1 degree Fahrenheit in the instrumental record of 150 years. Those in the ‘IPCC-oriented consensus’ believe it is due to mankind’s increased CO₂ and other gas emissions; therefore temperatures are likely to rise as more humans inhabit the earth and economies grow. This is important information to a specialist in assessments. Also important, though, is staying in touch with other views. Scientists in the “other consensus” believe that, even if the 1 degree change is accurate (and is not just ‘noise’), the CO₂ rise can, at most, explain a piece of the temperature rise. Many believe that increased water vapor, solar variations in radiation and magnetic flux, our relative position in the solar system, the tilt of our planet’s axis, the clearing of our atmosphere of pollutants which allows more sunlight to reach the ground, or our position in the Milky Way galaxy that affects the amount of radiation reaching our atmosphere and affecting cloud formation, are also important and are not (and cannot be yet) adequately considered in the computer models used by the IPCC consensus. Many believe CO₂ may not be the culprit” (emphasis added). See *Written Statement By Dr. John T. Everett*, Hearing on Wildlife and Oceans in a Changing Climate, before the Committee on Natural Resources, Subcommittee on Fisheries, Wildlife and Oceans of the U.S. House of Representatives (April 17, 2007), available at: <http://www.climatechangeinfo.org/ClimateChangeDocuments/StatementJohnEverett.htm>. See also *Climate Change Facts, John T. Everett*, available at: <http://www.climatechangeinfo.org/DrJohnEverett.htm> (“Dr. Everett’s breadth is demonstrated by prior appointments to many NOAA-wide Boards, such as: NOAA High Performance Computing Council, National Review Panel of the National Undersea Research Program, NOAA Environmental Sciences and Data Information Management Program, Sea Grant Science and Technology Committee, US Interagency El Niño Southern Oscillation Systems Council, NOAA Total Quality Management Board; NOAA Quality Council, NOAA Performance Standards Review Board, and Co-Chair of NOAA, EPA and Coast Guard Committee on ocean dumping. From its inception until his leaving NOAA, he was on the Board of directors of the NOAA Program in Climate Change.”) *Id.**

⁴¹ In January 2005, Dr. Christopher Landsea, from the Hurricane Research Division of the National Oceanographic and Atmospheric Administration’s (NOAA) Atlantic Oceanographic and Meteorological Laboratory, withdrew via written correspondence from participating in the development of the IPCC-AR4-WGI report on science integrity grounds. See *World Climate Report* (Jan. 18, 2005),

available at: <http://www.worldclimaterreport.com/index.php/2005/01/18/2500-less-1-2/> (“Dear colleagues, After some prolonged deliberation, I have decided to withdraw from participating in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). I am withdrawing because I have come to view the part of the IPCC to which my expertise is relevant as having become politicized. In addition, when I have raised my concerns to the IPCC leadership, their response was simply to dismiss my concerns. With this open letter to the community, I wish to explain the basis for my decision and bring awareness to what I view as a problem in the IPCC process. The IPCC is a group of climate researchers from around the world that every few years summarize how climate is changing and how it may be altered in the future due to manmade global warming. I had served both as an author for the Observations chapter and a Reviewer for the 2nd Assessment Report in 1995 and and the 3rd Assessment Report in 2001, primarily on the topic of tropical cyclones (hurricanes and typhoons). My work on hurricanes, and tropical cyclones more generally, has been widely cited by the IPCC. *For the upcoming AR4, I was asked several weeks ago by the Observations chapter Lead Author - Dr. Kevin Trenberth - to provide the writeup for Atlantic hurricanes. As I had in the past, I agreed to assist the IPCC in what I thought was to be an important, and politically-neutral determination of what is happening with our climate. Shortly after Dr. Trenberth requested that I draft the Atlantic hurricane section for the AR4’s Observations chapter, Dr. Trenberth participated in a press conference organized by scientists at Harvard on the topic “Experts to warn global warming likely to continue spurring more outbreaks of intense hurricane activity” along with other media interviews on the topic. The result of this media interaction was widespread coverage that directly connected the very busy 2004 Atlantic hurricane season as being caused by anthropogenic greenhouse gas warming occurring today. Listening to and reading transcripts of this press conference and other media interviews, it is apparent the Dr. Trenberth was being accurately quoted and summarized in such statements and was not being misrepresented in the media. These media sessions have the potential to result in a widespread perception that global warming has made recent hurricane activity much more severe.* I found it a bit perplexing that the participants in the Harvard press conference had come to the conclusion that global warming was impacting hurricane activity today. To my knowledge, none of the participants in that press conference had performed any research on hurricane variability, nor were they reporting on any new work in the field. All previous and current research in the area of hurricane variability has shown no reliable, long-term trend up in the frequency or intensity of tropical cyclones, either in the Atlantic or any other basin. The IPCC assessments in 1995 and 2001 also concluded that there was no global warming signal found in the hurricane record. Moreover, the evidence is quite strong and supported by the most recent credible studies that any impact in the future from global warming upon hurricane will likely be quite small. The latest results from the Geophysical Fluid Dynamics Laboratory (Knutson and Tuleya, *Journal of Climate*, 2004) suggest that by around 2080, hurricanes may have winds and rainfall about 5% more intense than today. It has been proposed that even this tiny change may be an exaggeration as to what may happen by the end of the 21st Century (Michaels, Knappenberger, and Landsea, *Journal of Climate*, 2005, submitted). It is beyond me why my colleagues would utilize the media to push an unsupported agenda that recent hurricane activity has been due to global warming. *Given Dr. Trenberth’s role as the IPCC’s Lead Author responsible for preparing the text on hurricanes, his public statements so far outside of current scientific understanding led me to concern that it would be very difficult for the IPCC process to proceed objectively with regards to the assessment on hurricane activity. My view is that when people identify themselves as being associated with the IPCC and then make pronouncements far outside current scientific understandings that this will harm the credibility of climate change science and will in the longer term diminish our role in public policy.* My concerns go beyond the actions of Dr. Trenberth and his colleagues to how he and other IPCC officials responded to my concerns. I did caution Dr. Trenberth before the media event and provided him a summary of the current understanding within the hurricane research community. I was disappointed when the IPCC leadership dismissed my concerns when I brought up the misrepresentation of climate science while invoking the authority of the IPCC. Specifically, the IPCC leadership said that Dr. Trenberth was speaking as an individual, even though he was introduced in the press conference as an IPCC lead author; I was told that that the media was exaggerating or misrepresenting his words, even though the audio from the press conference and interview tells a different story (available on the web directly); and that Dr. Trenberth was accurately reflecting conclusions from the TAR, even though it is quite clear that the TAR stated that there was no connection between global warming and hurricane activity at this time. The IPCC leadership saw nothing to be concerned with in Dr. Trenberth’s unfounded pronouncements to the media, despite his supposedly impartial important role that he must undertake as a Lead Author on the upcoming AR4. [...] *I personally cannot in good faith continue to contribute to a process that I view as both being motivated by pre-conceived agendas and being scientifically unsound. As the IPCC leadership has seen no wrong in Dr. Trenberth’s actions and have retained him as a Lead Author for the AR4, I have decided to no longer participate in the IPCC AR4*”) (emphasis added). *Id.*

⁴² *Id.*

⁴³ For example, MIT Professor of Meteorology, Richard Lindzen, who had served as chapter author in the IPCC-AR3-WGI, had testified before the Senate Commerce Committee in May 2001 that, “[t]he IPCC does a number of things which encourage misuse: ! Use a summary to misrepresent what scientists say. ! Use language which conveys different meaning to laymen and scientists. ! Exploit public ignorance (and the embarrassment about this ignorance) over quantitative matters. ! Exploit what scientists can agree on in order to support one’s agenda. ! Exaggerate scientific accuracy and certainty. ! Exaggerate the authority of undistinguished scientists. ! Pose leading questions (WG II’s Impact Report).” *See Testimony of Richard S. Lindzen before the Senate Commerce Committee on 1 May 2001* (May 1, 2001), at pp. 6-8, available at: http://www.lavoisier.com.au/articles/climate-policy/science-and-policy/Lindzen_McCain.pdf.

⁴⁴ Roger A. Pielke Sr. is Senior Research Scientist, Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado in Boulder and Professor Emeritus of the Department of Atmospheric Science, Colorado State University, Fort Collins. See Cooperative Institute for Research in Environmental Studies (CIRES), *Roger A. Pielke Sr.*, available at: <http://cires.colorado.edu/science/groups/pielke/people/pielke.html>. “In 1995 [he] was invited to serve as a contributing author to their Chapter which dealt with regional climate modeling. [He] sent in recommended text and papers. All of this material was ignored (as it was in 1992 when [he] was asked to review several chapters in the IPCC supplement report). Subsequently, in 1995 [he] sent the letter below in which [he] resigned from the IPCC.” See Climate Science: Roger Pielke Sr., *My 1995 Resignation Letter From The IPCC* (Sept. 30, 2011), available at: <http://pielkeclimatesci.wordpress.com/2011/09/30/my-1995-resignation-letter-from-the-ipcc/>. See also Climate Science: Roger Pielke Sr., *My Comments For The InterAcademy Council Review of the IPCC* (June 16, 2010), available at: <http://pielkeclimatesci.wordpress.com/2010/06/16/my-comments-on-questionnaire-on-ipcc-processes-and-procedures/> (“As I have written on in papers and on weblog posts, which I will list some of below, the IPCC involves a top down management of the chapters. The 2007 Statement for Policymakers is a narrowly focused summary which was used to promote the perspective of climate variability and change of the organizers and leadership of the IPCC assessments. [...] For the 1992 Supplement to the 1990 IPCC Report [...] I was asked to review several Chapters of the draft. I made a number of suggestions, including the need to introduce the role of land use/land cover change as an important regional and global climate forcing. My input was totally ignored without any response. In the 1995 IPCC Report [...] I was invited to be a contributing coauthor on the chapter on regional climate. Again, I prepared detailed input for the Report, and again all of my comments were ignored without even a rebuttal. At that point, I concluded that the IPCC Reports were actually intended to be advocacy documents designed to produce particular policy actions, but not as a true and honest assessment of the understanding of the climate system. As a result of this second refusal to include peer reviewed scientific information, I called the IPCC and resigned from any further involvement in this clearly biased assessment process. I was not invited to contribute to the more recent IPCC reports [...] The summary of my experience with the IPCC is that it is managed with particular outputs in place before the assessments are even started. The Lead Authors have almost complete control with respect to what is accepted in their Chapter, and what is ignored. The IPCC is actually a relatively small group of individuals who are using the IPCC process to control what policymakers and the public learn about climate on multi-decadal time scales.”) *Id.*

⁴⁵ For example, Professor Paul Reiter of the Institut Pasteur, Paris, France, and a contributory author of the IPCC Third Assessment Report Working Group II, wrote in a March 31, 2005 memorandum submitted to the British Parliament’s House of Lords Select Committee on Economic Affairs of the poor quality science and misrepresentations reflected in the chapter addressing the impact of climate change on mosquito-borne disease. See Parliament of the United Kingdom, *Memorandum by Professor Paul Reiter, Institut Pasteur, Paris - THE IPCC AND TECHNICAL INFORMATION. EXAMPLE: IMPACTS ON HUMAN HEALTH* (March 31, 2005), available at: <http://www.publications.parliament.uk/pa/ld200506/ldselect/ldeconaf/12/12we21.htm>. (“IPCC SECOND ASSESSMENT REPORT, WORKING GROUP II. CHAPTER 18. HUMAN POPULATION HEALTH 11. This chapter appeared at a critical period of the climate change debate. Fully one third was devoted to mosquito-borne disease, principally malaria. The chapter had a major impact on public debate, and is quoted even today, despite the more informed chapter of the Third Assessment Report (see below). 12. The scientific literature on mosquito-borne diseases is voluminous, yet the text references in the chapter were restricted to a handful of articles, many of them relatively obscure, and nearly all suggesting an increase in prevalence of disease in a warmer climate. The paucity of information was hardly surprising: not one of the lead authors had ever written a research paper on the subject! Moreover, two of the authors, both physicians, had spent their entire career as environmental activists. One of these activists has published “professional” articles as an ‘expert’ on 32 different subjects, ranging from mercury poisoning to land mines, globalization to allergies and West Nile virus to AIDS. 13. Among the contributing authors there was one professional entomologist, and a person who had written an obscure article on dengue and El Niño, but whose principal interest was the effectiveness of motor cycle crash helmets (plus one paper on the health effects of cell phones). 14. The amateurish text of the chapter reflected the limited knowledge of the 22 authors. Much of the emphasis was on ‘changes in geographic range (latitude and altitude) and incidence (intensity and seasonality) of many vector-borne diseases’ as ‘predicted’ by computer models. Extensive coverage was given to these models, although they were all based on a highly simplistic model originally developed as an aid to malaria control campaigns. The authors acknowledged that the models did not take into account ‘the influence of local demographic, socioeconomic, and technical circumstances’. 15. Glaring indicators of the ignorance of the authors included the statement that ‘although anopheline mosquito species that transmit malaria do not usually survive where the mean winter temperature drops below 16-18°C, some higher latitude species are able to hibernate in sheltered sites’. In truth, many tropical species must survive in temperature below this limit, and many temperate species can survive temperatures of -25°C, even in ‘relatively exposed’ places. 16. The authors also claimed that climate change was already causing malaria to move to higher altitudes (e.g. in Rwanda). They quoted information published by non-specialists that had been roundly denounced in the scientific literature. In the years that followed, these claims have repeatedly been made by environmental activists, despite rigorous investigation and overwhelming counter-evidence by some of the world’s top malaria specialists. [85] Moreover, climate models suggest that temperature changes will be relatively small in the tropics, and carefully recorded meteorological data—e.g. in the Brook-Bond tea estates in Kenya—shows no demonstrable warming since the 1920s. The IPCC authors even claimed that ‘a relatively small increase in winter temperature’ in Kenya (!) ‘could extend mosquito habitat and enable ...malaria to reach beyond the usual altitude limit of around 2,500m to the large malaria free urban highland

populations,' e.g. Nairobi. This despite the fact that in the 1960s the mosquitoes were present above 3,000m and Nairobi is at only 1,600m! 17. A similar claim was made that the dengue vector, *Stegomyia aegypti* was once limited to 1,000m in Colombia but had 'recently been reported above 2,200m' One of the authors (the activist with the 32 different specialities) had recently published a claim (in *The Lancet*) that dengue had reached 2,200m 'in the past 15 years'. I had pointed out (again in *The Lancet*) that the publication he was quoting had categorically stated that dengue was not found above 1,750m. Moreover, although the maximum altitude of 2,200 m for the mosquito had been established (by two colleagues of mine) in 1979, this was the first ever investigation of the issue, so there was no evidence of an increase in altitude! Since that time, he has abandoned the claim that dengue has moved to higher altitudes, but still claims (e.g. in January 2005 at a UNESCO conference in Paris) that the mosquito has leapt from 1,000 to 2,200m in a matter of 15 years. 18. In summary, the treatment of this issue by the IPCC was ill-informed, biased, and scientifically unacceptable. The final 'Summary for Policymakers stated: 'Climate change is likely to have wide-ranging and mostly adverse impacts on human health, with significant loss of life...Indirect effects of climate change include increases in the potential transmission of vector-borne infectious diseases (eg malaria, dengue, yellow fever, and some viral encephalitis) resulting from extensions of the geographical range and season for vector organisms. Projections by models...indicate that the geographical zone of potential malaria transmission in response to world temperature increases at the upper part of the IPCC-projected range (3-5°C by 2100) would increase from approximately 45 per cent of the world population to approximately 60% by the latter half of the next century. This could lead to potential increases in malaria incidence (on the order of 50-80 million additional annual cases, relative to an assumed global background total of 500 million cases), primarily in tropical, subtropical, and less well-protected temperate-zone populations'. 19. These confident pronouncements, untrammelled by details of the complexity of the subject and the limitations of these models, were widely quoted as 'the consensus of 1,500 of the world's top scientists' (occasionally the number quoted was 2,500). This clearly did not apply to the chapter on human health, yet at the time, eight out of nine major web sites that I checked placed these diseases at the top of the list of adverse impacts of climate change, quoting the IPCC. 20. The issue of consensus is key to understanding the limitations of IPCC pronouncements. Consensus is the stuff of politics, not of science. Science proceeds by observation, hypothesis and experiment. Professional scientists rarely draw firm conclusions from a single article, but consider its contribution in the context of other publications and their own experience, knowledge, and speculations. The complexity of this process, and the uncertainties involved, are a major obstacle to meaningful understanding of scientific issues by non-scientists. 21. In the age of information, popular knowledge of scientific issues—particularly issues of health and the environment—is awash in a tide of misinformation, much of it presented in the 'big talk' of professional scientists. Alarmist activists operating in well-funded advocacy groups have a lead role in creating this misinformation. In many cases, they manipulate public perceptions with emotive and fiercely judgmental 'scientific' pronouncements, adding a tone of danger and urgency to attract media coverage. Their skill in promoting notions of scientific 'fact' sidesteps the complexities of the issues involved, and is a potent influence in education, public opinion and the political process. These notions are often re-enforced by attention to peer-reviewed scientific articles that appear to support their pronouncements, regardless of whether these articles are widely endorsed by the relevant scientific community. Scientists who challenge these alarmists are rarely given priority by the media, and are often presented as 'skeptics'.") *Id.*

⁴⁶ Hans von Storch is a professor at the Meteorological Institute of the University of Hamburg, and Director of the Institute of Coastal Research, GKSS, Germany. He also "served as a Lead Author for Working Group I of IPCC [AR3 and] acted as a Lead Author of Chapter 2 'Foundations of Decision Making' of Working Group II of IPCC AR5 until April 2014." See Dr. Hans von Storch, available at: <http://www.hvonstorch.de/klima/>. Dr. Storch prepared a powerpoint presentation highlighting scientific errors and exaggerations in the IPCC-AR4-WGI and WGII reports, recommending revisions in IPCC procedures, and identifying how climate science is in a postnormal state. See Hans von Storch, *InterAcademy Council Review of the IPCC* (2011), available at: <http://reviewipcc.interacademycouncil.net/storch.IAC.1006.ppt> ("Climate science is in a postnormal state - Postnormal science: Jerry Ravetz, Silvio Funtovicz, 1986 and earlier. When facts are uncertain, values in dispute, stakes high and decisions urgent, **science is not done for reasons for curiosity but is asked for as support for preconceived value-based agendas.** Climate science is in a postnormal state") (emphasis in original). *Id.*, at p. 9. ("Postnormality requires Analysis of two bodies of knowledge claims, namely (dominantly) scientifically constructed knowledge, and (dominantly) culturally constructed knowledge. Analytical support by cultural sciences needed. Discrimination between scientifically solid core of knowledge vs. added politically convenient (contested) knowledge claims") (blue emphasis in original). *Id.*, at p. 11. See also Dennis Bray and Hans von Storch, *Climate Science: An Empirical Example of Postnormal Science*, Bulletin of the American Meteorological Society, Vol. 80, No.3 (March 1999), available at: <http://journals.ametsoc.org/doi/pdf/10.1175/1520-0477%281999%29080%3C0439%3ACSAAEEO%3E2.0.CO%3B2>. ("This paper addresses the views regarding the certainty and uncertainty of climate science knowledge held by contemporary climate scientists. More precisely, it addresses the extension of this knowledge into the social and political realms as per the definition of postnormal science.") *Id.*, at Abstract. See also Hans von Storch, *Climate Science, IPCC, Postnormality and the Crisis of Trust*, Institute of Coastal Research and University of Hamburg (2011), available at: <http://www.hvonstorch.de/klima/pdf/kap9-Storch.pdf>; Olaf Stampf and Gerald Traufetter, *Climate Expert von Storch: Why Is Global Warming Stagnating?*, Der Spiegel (June 20, 2013), available at: <http://www.spiegel.de/international/world/interview-hans-von-storch-on-problems-with-climate-change-models-a-906721.html>.