

Dangerous Scientific Reticence

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Sorry for another long note, but no time for a briefer note right now – will work on that later.

Several years ago I wrote a paper¹ on scientific reticence, naively thinking that drawing attention to the phenomenon might ameliorate its incidence. Specific reference then was to likelihood of large sea level rise, which also is a central topic in our current paper². However, here I address a broader issue of scientific reticence, because, I believe, the affliction is widespread and severe. Unless recognized, it may severely diminish our chances of averting dangerous climate change.

It may be clearest if I describe two of my experiences in the last few years, and then comment on why this topic is important. However, I want to emphasize that my experience with *Atmospheric Chemistry and Physics* was exceedingly good. First, I recommend their open procedure, i.e., publication of a discussion version of the paper in *ACPD*, and a final version in *ACP*, if the paper passes review, and publication of Comments by the scientific community, referee reports, and author responses, which is helpful for public understanding of the publication process. Second, we appreciate the exceptional help of all people at *ACPD* and *ACP*, and are especially grateful to the *ACP* editor for his generous work in support of publication of our paper and the paper's title. Without his help the paper may still be unpublished.

The paper's subtitle differs between the *ACPD* and *ACP* versions of the paper. The main issue about the title concerned the word "dangerous," as in the case of an earlier paper³ that provided the scientific basis for a law suit aimed at requiring stronger action by the U.S. government to avert dangerous climate change. We ultimately lost that case at the United States District Court Level, one level below the Supreme Court. Recently 21 youths and I have filed a new case in which we have made clearer the Constitutional rights of young people and future generations, as described in my recent Communication [Our Children's Right to a Viable Future](#).

I submitted the earlier paper³ initially to *PNAS* along with reviews by two relevant scientists, one an NAS member, both of whom gave the paper the highest rating. As an NAS member, I expected that to be sufficient for publication, but the Editor gave the paper to an anonymous Editorial Board member who insisted that we remove "normative" statements from the paper. After multiple iterations this anonymous Board member informed me that "dangerous" was normative. We thus withdrew the paper from *PNAS*, and published it in *PlosOne*. The paper provided a prescription for how fast fossil fuel emissions must be decreased if CO₂ is to be

¹ Hansen, J.E., 2007: [Scientific reticence and sea level rise](#). *Environ. Res. Lett.*, **2**, 024002, doi:10.1088/1748-9326/2/2/024002.

² Hansen, J., M. Sato, P. Hearty, R. Ruedy, M. Kelley, V. Masson-Delmotte, G. Russell, G. Tselioudis, J. Cao, E. Rignot, I. Velicogna, B. Tormey, B. Donovan, E. Kandiano, K. von Schuckmann, P. Kharecha, A.N. LeGrande, M. Bauer, and K.-W. Lo, 2016: [Ice melt, sea level rise and superstorms: Evidence from paleoclimate data, climate modeling, and modern observations that 2°C global warming could be dangerous](#). *Atmos. Chem. Phys.*, **16**, 3761-3812, doi:10.5194/acp-16-3761-2016.

³ Hansen, J., P. Kharecha, M. Sato, V. Masson-Delmotte, F. Ackerman, D. Beerling, P.J. Hearty, O. Hoegh-Guldberg, S.-L. Hsu, C. Parmesan, J. Rockstrom, E.J. Rohling, J. Sachs, P. Smith, K. Steffen, L. Van Susteren, K. von Schuckmann, and J.C. Zachos, 2013: [Assessing "dangerous climate change": Required reduction of carbon emissions to protect young people, future generations and nature](#). *PLOS ONE*, **8**, e81648, doi:10.1371/journal.pone.0081648.

returned to 350 ppm by 2100, information needed to define a remedy to keep global temperature close to its Holocene range. The dispute over normative statements delayed publication a year, but did not prevent eventual publication. The fact that we had to use a draft of an unpublished paper in this initial court case, may or may not have affected the outcome of the case.

Our new paper² strengthens the case that global warming of even 2°C would have deleterious effects and heightens the urgency of phasing out fossil fuel emissions. However, the word “dangerous” again raised flags among referees (labeled R1, R2, R3 and R4) and the editorial board. Their full reviews are published on the *ACP* web site. Here (the following section in smaller font) is my initial response to the editor about the objections to the paper title:

Paper Title

You mention that referees R3 and R4 question the title of the paper. The issues raised about the title concern the word “Dangerous” in the title, and they are important because they get at the very heart of our paper and the overall topic of human-made climate change. I think that the discussions raised are pertinent and I am glad that you give us the chance to propose a title and show that it is well motivated.

I believe that you may have misread the relevant comment of R4. R4 notes that a major goal of our paper is to define “dangerous anthropogenic interference”, and he then quotes the 1992 United Nations Framework Convention on Climate Change (UNFCCC), as follows

“...to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.”

R4 then says that our paper: “...significantly advances this quest for a more quantified definition of such human impact. Very few serious efforts have been made to arrive at a useful definition of ‘dangerous anthropogenic interference’. Previous efforts focused on sea level rise have been less rigorous, I believe, with less analysis of the coupling of ice meltwater with oceanic dynamics.”

R4 does not mention the paper’s title or criticize it, but explicitly recommends publication of the paper.

R3, on the other hand, does criticize the title and does so by referring to the UNFCCC, but his reference is not correct. The word “dangerous” appears once and only once in the UNFCCC, namely in the most fundamental phrase of the Convention, which is given in the inset phrase above. R3 says that “...in the climate change debate, the term ‘dangerous’ has been given a rather precise definition in Art 2 of the UNFCCC, namely a change that doesn’t allow ecosystems to adapt, that threatens the food production and that prevents economic development in a sustainable manner”. This is a rephrasing of Article 2 that seems to slightly change its meaning. Let us look at Article 2 in its entirety:

The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

Article 2 thus uses the word “dangerous” with regard to the level of greenhouse gases in the atmosphere. The ecosystems/food/economics sentence refers to timeframe in which that level should be obtained.

The word “dangerous” is not further defined, and that is probably for good reason: the public understands what “dangerous” means. The concept was understood before humans had a language to express it.

Let us give an analogy. Say there is a poorly lit street frequented by gangs, thugs and robbers, which police reports indicate has continually been the location of crimes, and newspapers have reported such. A person looking down this street late at night and seeing a number of loiterers, one seemingly with a blackjack in his hand, might well conclude that it would be dangerous to go down that street.

What is shown in our paper is analogous. It would be dangerous in a sense that people would understand.

One suggestion is that we enclose the word dangerous in parentheses. That would not be right, because it implies that we mean something different by the word dangerous than what the public understands. However, we mean exactly what the public understands. Or the parentheses could mean that the UNFCCC meant something different by the word than what the public understands, but they mention the word only once, clearly expecting that the word will be understood.

A second suggestion is that we write that we have shown that 2°C warming is “potentially dangerous”. That also is wrong. Consider this: when a person decides not to walk down that street, is it because he has concluded that it is absolutely certain that he will be mugged if walks down the street? No, dangerous does not imply certainty of harm. Dangerous means that there is a serious threat that he will be harmed. [I note that R2 suggested “potentially dangerous”; probably you meant to refer to R2, rather than R4.]

There is a very important issue at play here: the relevant scientific community, in our opinion, has been exercising self-censorship in its warning to the public about the danger of human-made climate change. It would be difficult to overstate the threat of increasing human-made climate change, which we suggest threatens to bring about some of the greatest injustices in the history of the planet: of current adult generations to young people and future generations, and of people of the industrialized North to people of the South, as climate change is due mainly to emissions from nations at middle and high latitudes.

As R4 discusses, our paper makes an important contribution toward defining dangerous anthropogenic interference with the climate system. We do not want to self-censor this clear, substantiated conclusion.

As a compromise, we suggest that “highly dangerous” be changed to “dangerous” in the title, which has several merits. (1) it slightly shortens the title, (2) it avoids the need to define the difference between “dangerous” and “highly dangerous”, (3) it makes the title less “journalistic”, which was a concern of R3. I hope that the Editor agrees that our proposed alternative phrasing for the title is well motivated.

I hoped my response above was a winning argument, but the editor (who interacted with higher levels, including the editorial board, and was being as helpful as possible to our case), warned that I should not include the “dark street” discussion in my official response to the journal, that such analogy is relevant to the public, but our paper was written for scientists not for the public.

In fact, we were in part writing for the public. I had assembled a stellar international group of co-authors, for this paper as well as for our 2013 “Assessment” paper and our 2008 “Target CO₂” paper⁴, because of relevance to the public and because I wanted it to be clear that the results were not just my analysis but those of an exceptional group of scientists.

⁴ Hansen, J., M. Sato, P. Kharecha, D. Beerling, R. Berner, V. Masson-Delmotte, M. Pagani, M. Raymo, D.L. Royer, and J.C. Zachos, 2008: [Target atmospheric CO₂: Where should humanity aim?](#) *Open Atmos. Sci. J.*, **2**, 217-231, doi:10.2174/1874282300802010217.

However, I felt that by continuing to push on the title in a potentially time consuming indirect interaction with the editorial board, relations could deteriorate as they had with the anonymous editorial board member at *PNAS* and publication was already delayed. Given the urgency of getting the paper out for the court case, when I was told to change “is dangerous” to “could be dangerous” in the title, I agreed to that. That title is disappointing, because “could be dangerous” is a conclusion that can be reached with little or no research.

The editor, who himself may have been becoming frustrated with the process of interacting with the editorial board, noted that he had only instructed me to change the statement that 2°C global warming “would be” dangerous to “could be” in the title, although he also noted that there would be an inconsistency if I left it as “would be” in the abstract. I did not want to raise a flag that could result in further delay or threaten publication, so I wrote “could be” in the abstract as well.

It seems to me that scientific reticence is now greater than when I first wrote on the topic.^{5,6,1} Do the public, policymakers, and courts understand that scientists use the word “dangerous” with a different meaning than that in the dictionary? Did the Framework Convention not mean the common dictionary definition of the word? In the “dark street” analogy, a person does not need to conclude with certainty that he would be killed on that street to conclude that it is dangerous.

Inertia of the climate system reduces present climate impacts, but it also makes it difficult to stop larger ones in decades ahead. Inertia in our energy systems implies that it takes decades to make major changes in emissions and atmospheric composition. Because of the combination of these two slow systems, we are in danger of passing points of no return, such that we hand young people a climate system with great consequences, including the potential for large sea level rise and shutdown of the ocean’s overturning circulations, consequences that could be locked in soon if we do not reduce global emissions rapidly.

Scientific reticence is dangerous, and wrong in my opinion. I will return to that subject soon.

One final comment, closely related to scientific reticence. A criticism of our paper that may warrant response is that the ice melt rates that we assumed were “unrealistic”. In fact it is certain that multi-meter per century melt rates have occurred many times in Earth’s history, spurred by much weaker forcings than the human-made forcing. We presented evidence in our paper that rapid sea level rise even occurred in late-Eemian, when there was less ice available for melt than today. Just this week a paper was published showing that the fastest natural increase of greenhouse gas climate forcing in the past 66 million years was at least 10 times slower than the human-made change⁷. Unfortunately, the melt rates we talk about for the next several decades are very realistic, and we are already seeing expected response to current melt rates.

⁵ Hansen, J.E., 2005: [A slippery slope: How much global warming constitutes "dangerous anthropogenic interference"? An editorial essay](#). *Climatic Change*, **68**, 269-279, doi:10.1007/s10584-005-4135-0.

⁶ Hansen, J., 2006: [The threat to the planet](#). *New York Rev. Books*, **53**, no. 12 (July 13, 2006), 12-16.

⁷ Zeebe, R.E., Ridgwell, A. and Zachos, J.C.: Anthropogenic carbon release rate unprecedented during the past 66 million years, *Nature Geosci.*, published online 21 March 2016, doi:10.1038/NGEO2681