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COMMENTARY

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What Is Endangered Now? Climate Science at the Crossroads

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Abstract The greenhouse gas "endangerment finding" of the U.S. Environmental Protection Agency (EPA), established in 2009 after a 2006 U.S. Supreme Court case (Massachusetts vs. EPA) in which we participated as amicus curiae (friends of the court), has become the basis for U.S. regulation of greenhouse gases in the years since. The current Administration of President Donald Trump is now seeking its repeal. Here, we review the role climate science played in that 2006 case, and how the scientific evidence that undergirds the endangerment finding has gotten stronger in the 16 years since. Finally, we consider what will be the fate of the endangerment finding—and indeed that of role of science in contributing to policy—in light of the current challenging environment for science in the U.S.

Key Points:

- The US EPA's greenhouse gas endangerment finding is itself now endangered by the current Presidential Administration
- Scientists had a key role in bringing about the endangerment finding
- The science supporting the finding has only gotten stronger in the 16 years since the endangerment finding

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1. Introduction

After 16 years of using climate science to inform climate policy, U.S. federal policymakers are now poised to backtrack, with the U.S. Environmental Protection Agency (EPA) seeking to reverse its 2009 science-based finding (EPA, 2009) that carbon dioxide (CO_2) and other greenhouse gas emissions "endanger human health and welfare" (EPA, 2025).

The finding by the EPA in 2009 that greenhouse gases do indeed endanger public health and welfare, referred to as the "Endangerment Finding," has served as the foundation for U.S. climate policymaking over the last decade and a half. It underpins regulations on greenhouse gas emissions from mobile and stationary sources, including new fossil fuel-fired power plants, passenger cars and trucks, and, in a 2016 update, certain aircraft (EPA, 2016).

But on March 12 of this year, EPA Administrator Lee Zeldin launched a drive to repudiate that finding, calling it the "holy grail of the climate change religion." This, along with 30 other actions to reverse regulatory limits on pollution amount, in his view, to "the greatest and most consequential day of deregulation in U.S. history." (EPA, 2025).

Here, we review the role that science and scientists have played in establishing the finding, including our role in the 2007 U.S. Supreme Court case on climate change that led directly to the endangerment finding. We then ask: Where do we go from here? What role will science play in shaping future climate policy in a world where U.S. leadership in science may be fundamentally weakened, at least in the short-term?

2. Science at the Supreme Court: The Role of Science and Scientists in the Endangerment Finding

We are scientists from multiple U.S. institutions who study the earth's climate system. We are not policy practitioners, and we don't believe that science in the abstract implies that we should adopt particular policies. But we do strongly believe that we have an obligation to help society use scientific knowledge to advance the well-being of humanity by accurately communicating the state of science to policymakers and to the public, by correcting the record when required by the facts, and by advising our elected and appointed officials when our research or expertise is relevant to particular policy goals. It was precisely in this vein that we submitted a "friend of the court" *amicus* brief (Climate scientists, 2006) in the first U.S. Supreme Court case to recognize the science of climate change (Massachusetts et al. vs. EPA, decided in 2007). This case led directly to the adoption of the EPA's endangerment finding.

It is helpful to understand a bit about the Supreme Court case: in 2003, a group of states and environmental groups sued EPA, on the ground that the agency had violated the Clean Air Act by failing to regulate greenhouse gas emissions from new motor vehicles. EPA argued, among other reasons, that climate science was too uncertain to support regulations, relying upon a 2001 National Academy of Sciences report authored by several of us (Climate Change Science: An Analysis of Some of the Key Questions, NAS, 2001), as its sole authoritative source of scientific information. Although this NAS report unambiguously stated that it is virtually certain that greenhouse gas emissions from human activities cause global climate changes, EPA drew selectively from the Report to downplay this conclusion and instead highlighted the Report's statement that a "causal linkage between the buildup of greenhouse gases in the atmosphere and the observed climate changes during the 20th century cannot be unequivocally established."

When Massachusetts and other states appealed EPA's regulatory denial, and the case eventually reached the Supreme Court, we submitted the *amicus* brief to correct what we saw as the government's fundamental misrepresentation of the 2001 NAS Report and to interpret, for the justices, the status of climate science and how it impacted EPA's duty to carry out Congress's directive under the Clean Air Act. The Act calls upon EPA to regulate the emissions of any air pollutants that "may reasonably be anticipated to endanger public health or welfare" (the "endangerment" standard).

In our brief, we explained the scientific data supporting the conclusion that global average temperature increases, and other associated climatic changes, were very likely to have been caused by humans and how the scientific record thus ought to trigger an EPA duty to regulate. The brief argued first, that EPA did not need "unequivocal" evidence to link human emissions to warming because the standard in law is precautionary, requiring only "reasonable anticipation of endangerment," and second, that in our professional judgment as climate scientists, the evidence at the time more than sufficed to meet that standard.

The state of the science played an important role during oral argument at the Court, in part because our *amici* group included a majority of authors from the NAS (2001) report. Accordingly, when the lawyer for the Bush administration argued that EPA used NAS (2001) to assess uncertainty, Justice Stevens interrupted him to cite our brief, saying "I find it interesting that the scientists who worked on that report said there were a good many omissions that would have indicated that there wasn't nearly the uncertainty that the [EPA] described."

In the end, the Court held that greenhouse gases did indeed constitute pollutants within the meaning of the Clean Air Act, and that EPA's decision not to regulate "rests on reasoning divorced from the statutory text… Nor can EPA avoid its statutory obligation by noting the uncertainty surrounding climate change… If the scientific uncertainty is so profound that it precludes EPA from making a reasoned judgment, it must say so." The court sent EPA back to determine whether such emissions met the level of certainty required by the Act's regulatory trigger. Thus, the groundbreaking case of *Massachusetts v. EPA*, 549 U.S. 497 (2007) set the stage for EPA to consider, and to affirm in 2009, the endangerment finding.

In its 2009 endangerment finding, EPA relied most heavily upon the assessments of the U.S. Global Climate Research Program, the National Research Council, and the Intergovernmental Panel on Climate Change, concluding that this body of scientific evidence "compellingly" supported the endangerment finding. For endangerment of public health, it relied on evidence of highly likely increases in ambient ozone concentrations, occurrences of longer and hotter heat waves, and other extreme weather events such as hurricanes and floods.

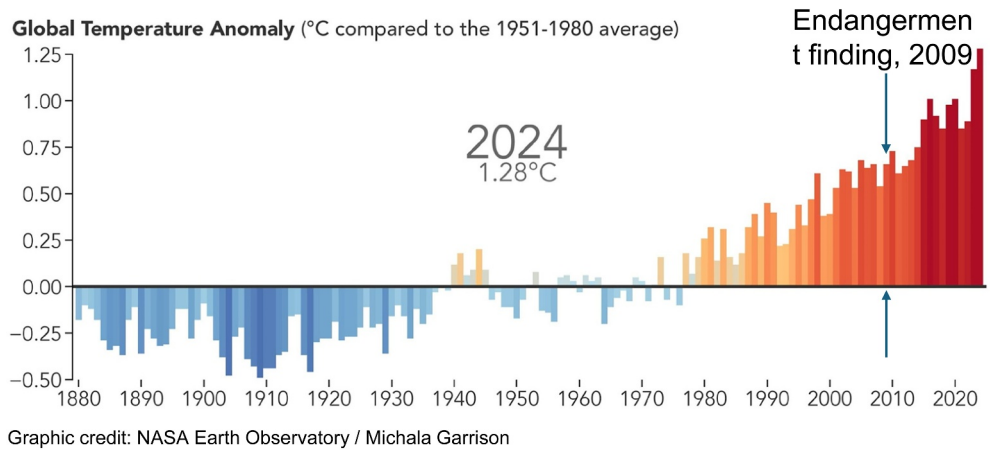

Figure 1. Global average surface temperature anomaly, 1880–2024 (degrees C, relative to the 1951–1980 average). The 2024 temperature anomaly of 1.28°C is close to twice that of 0.66°C in 2009, the year the endangerment finding was published. *Source*: Lenssen et al. (2024), as updated by GISTEMP Team (2025).

3. The State of the Science of Climate Change, 16 Years After the Endangerment Finding

Sixteen years later, the scientific evidence supporting the endangerment finding is even stronger, with zero countervailing evidence. Our *amicus* brief's predictions of future climate trends have all come true, some alarmingly faster than anticipated. For example,.

- *Global warming will continue*. Observations since 2009 confirm that the earth's net energy imbalance has approximately doubled. At least five climate metrics reveal that the most extreme years of the instrumental record have all been observed since the 2009 endangerment finding: (a) global surface temperature (the 12 warmest years on record are after 2009, Figure 1), (b) global ocean heat content (heat integrated down to 2000 m has been rising steadily since 2009, ORAS5, 2024), (c) arctic sea ice retreat (14 of the 16 lowest sea ice September minima have occurred after 2009, Copernicus, 2024b), (d) sea level rise (has accelerated since 2009, rising at 4.3 mm/yr during 2013–2023, compared to 2.1 mm/yr during 1993–2003, Copernicus, 2024a), and (e) ocean acidity increase (pH has continued to decline steadily, at −0.017 pH units per decade, Copernicus Marine Service, 2023).
- *Impacts directly related to public health and welfare will accelerate*. Observations show that the severity, extent, and/or frequency of multiple types of weather and climate-related extreme events are increasing, and impacting human health and welfare (USGCRP, 2023): heat-related deaths are rising, both in the U.S. and around the world (Romanello et al., 2024; Vicedo-Cabrera, 2021), woodland and forest fires in mediterranean climates, including the Western U.S., along with associated smoke events, are now more severe (Hagmann et al., 2021; USGCRP, 2023). Further, climate-enabled spread of disease has increased (Semenza et al., 2022), as have climate-related disruptions to agricultural productivity, both crop and livestock (FAO, 2015; Ortiz-Bobea et al., 2021).

In addition to observed climate change trends continuing as predicted, climate science has advanced. Particularly relevant for the strength of the endangerment finding, the science of attribution—the ability to attribute part of the extremeness of extreme events to the effects of climate change—has advanced significantly (Otto et al., 2024). Much more so than in 2009, we can now conclude with confidence that many climate and weather extreme events are more severe because of climate change. For example, the record-setting Pacific Northwest heat wave of 2021 was made about eight times more likely by greenhouse gas emissions (Leach et al., 2024). Absent mitigation, the future will be more dangerous than the past (Kemp et al., 2022).

4. Whither the Endangerment Finding?

In light of the accumulating evidence of the last 16 years, we strongly reiterate the conclusion stated in our Supreme Court *amicus* brief (Climate Scientists, 2006) that "in our professional opinion as climate scientists, the

evidence supporting such a determination [of reasonable anticipation of endangerment] is compelling." The evidence supporting this conclusion is significantly stronger today than it was 16 years ago.

While we do not know how EPA might justify a decision to reverse its 2009 endangerment finding, we do know that the logic of the scientists' brief at the Supreme Court in 2006–2007 constitutes the strongest reason for why its repeal should not happen now. To undo the endangerment finding, EPA would normally have to show (through a multi-year rulemaking and comment process sufficient to stand up in court) that the scientific evidence does *not* support a finding that it is reasonable to anticipate danger to human health and welfare from climate change, or that U.S. emissions do not "cause or contribute to" that danger. U.S. CO_2 emissions have fallen ∼20% since their peak in 2007, but US emissions are still the second largest in the world on an annual basis, after China, so they still mightily "contribute to" endangerment. As long as greenhouse gas emissions continue, the magnitude of climate change and its impacts will grow. Thus, EPA would have to show that it is *un*reasonable to anticipate danger to human health and welfare from climate change. (The administration has suggested that it might use the costs of regulating greenhouse gases as a reason to reverse the endangerment finding, but per the Court's opinion in *Massachusetts v. EPA*, an endangerment finding itself should not consider costs, because costs typically come into play later, in designing regulations that follow from that finding.) If, on the other hand, the endangerment finding is nonetheless repealed, it would seem to portend that science and scientific evidence will not guide U.S. climate policy in the coming years.

We are profoundly aware that we write at a time when science in the U.S. more broadly is facing an array of challenges. Even the basic expectation that policy-making decisions should be evidence-based and informed by science may not be assured in the future. But the scientific laws that govern our climate will continue to govern climate, no matter what rhetoric about "climate change religion" is asserted or which policies are adopted.

If science becomes more politicized, public support for science will decline, and its role in policy formation will diminish, with a consequential devastating and persistent impact on both scientific discovery and national policy, with negative impacts for our nation. A great nation requires the best science. More than ever, it is imperative that we apply our knowledge to create a thriving economy, a healthy population, and a strong society. That cannot be achieved if we simultaneously ignore the danger of ever-climbing concentrations of atmospheric CO_2 and other greenhouse gases while undermining the foundations of climate science itself.

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Conflict of Interest

The authors declare no conflicts of interest relevant to this study..

Data Availability Statement

As a commentary, no original data was generated in the production of this article, and the data referred to in this article is generally available in publications cited herein.

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Note: Many high-quality authoritative climate datasets and analysis have long been curated and regularly updated at U.S. Government websites, and we cite these where relevant. However, as the current Administration appears to be censoring or scrubbing climate and other datasets (Nost & Paz, 2025), we have, in anticipation of potential further deletions, also provided parallel citations from the general literature, the National Academy, or other official sources, such as Copernicus, the European Union's Earth Observation Programme.

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